To safely and cost-effectively solve your deepwater challenges in these dynamic market conditions, choose from our portfolio of advanced technologies and innovative subsea tieback solutions. As your trusted field-development partner, our unmatched experience and advanced engineering enable us to adapt and evolve to safely meet the current and future demands of the oil and gas industry.

By working together, we will safely and reliably re-shape the future of the oil and gas industry.

Connect with what’s next at Oceaneering.com
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Deepsea Power & Light
www.deepsea.com San Diego, CA, USA

Southwest Electronic Energy Corporation (SWE)
www.swe.com Houston, TX, USA
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

BATTERY PACKS & CELLS
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

BATTERY PACKS & CELLS

I. 01.

DEEPSEA POWER & LIGHT

HQ Location: 4033 Ruffin Road, San Diego, CA 92123, USA

Company Intro
DeepSea Power & Light is a privately held design and manufacturing company serving the subsea industry. They design and manufacture durable products for subsea applications, including video cameras, lights, lasers, power modules, and pressure relief valves. Uses range from industrial applications and research to cinematography. Their philosophy is to continually advance technology for use in the harshest environments with ease of service, reliability, high performance, and cost effectiveness as important design criteria. DeepSea Power & Light values innovation, collaboration, and the shared success of their employees, customers, suppliers, representatives, and partners.

Contact
sales@deepsea.com
+1 858 576 1261

SEABATTERY™ POWER MODULE

- Ocean Trench Rated
- Excellent Capacity Retention
- Operates Even if Inverted
- Available in 6v, 12v, 24v or 48v Configurations
- ABS Type Certification Available

The SeaBattery Power Module by DeepSea Power & Light is a pressure-compensated submersible battery pack designed to perform at any depth, including the high pressure, low temperature environment of deep ocean trenches. Routine deployments to 6,000 meters as part of sea floor instruments and towed camera sleds have proven the SeaBattery Power Module to be both reliable and robust in the most demanding of subsea applications.

At the heart of each power module are rechargeable lead-acid batteries that use Absorbent Glass Mat (AGM) technology. AGM batteries provide advantages over wet cell batteries, including no maintenance, no electrolyte spills, inverted operation, low self discharge, and vibration and shock resistance. Recombinant chemistry inside the battery cells minimizes outgassing by rejoining free oxygen and hydrogen molecules into water. The SeaBattery Power Module may be shipped by cargo-only air transport according to U.S. DOT and IATA guidelines.

Each AGM cell is electrically conditioned to provide maximum capacity. These cells adapt each battery for pressure-compensation, and mount them in a virtually indestructible, heavy-wall polyethylene case filled with high purity inert oil. Built into the top of each SeaBattery Power Module case is a flexible urethane diaphragm that provides a continuous transfer of pressure to the interior.

The see-through urethane diaphragm incorporates a molded-in valve assembly for filling or venting the battery interior. The diaphragm also permits visual inspection of the SeaBattery Power Module interior, allowing your deck crew to confirm the integrity of the wiring harness and interior battery mounts at a glance. Carrying handles are included on the case to simplify handling.

DeepSea Power and Light’s SeaBattery Power Module has been a tried and true veteran of deep ocean systems for more than 30 years. Get the power you need with the SeaBattery Power Module.
Please check out our website on: www.ROVPlanet.com

THE MOST
ROV FOCUSED
MAGAZINE

FOR SUBSEA CONSTRUCTION & ROV PROFESSIONALS!
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

BATTERY PACKS & CELLS

I. 01.

SOUTHWEST ELECTRONIC ENERGY CORPORATION (SWE)

HQ Location: P.O. Box 31340, Houston, TX 77231, USA
823 Buffalo Run, Missouri City, TX 77489, USA

Company Intro
Since 1964, SWE has been a pioneer in innovative energy solutions serving the needs of original equipment manufacturers in diverse fields such as oil and gas, oceanographic, military and remote. SWE has changed the game in subsea and oceanographic applications with SWE SeaSafe, SeaSafe II and SeaSafe-Direct, lithium-ion battery solutions that power subsea vehicles, control systems and oceanographic equipment safer and longer with four times the energy of a sealed lead acid battery. SWE leads downhole battery solutions with superior quality engineered Lithium primary battery packs for high temperature Measurement While Drilling (MWD) and Logging While Drilling (LWD) applications. SWE also provides custom battery solutions for the exploration of the earth’s oceans by powering the infrastructure, vehicles and buoys that collect needed data.

Contact
Leon Adams
Email: Info2@SWE.com
Phone Number: +1.281.240.4000

www.swe.com

The future of subsea operations is all-electric and Southwest Electronic Energy (SWE) is committed to providing reliable subsea battery solutions to “untether” data acquisition and monitoring equipment. SWE’s American Bureau of Shipping (ABS) and International Electrical Code (IEC) certified lithium Ion polymer battery modules can make that future a reality.

With a goal of providing safe light-weight solutions, SWE designed and introduced the cost-effective SeaSafe-Direct, which can go immediately into the water leaving the pressure vessel and oil case behind. The battery is enclosed in flame-retardant urethane, designed for complete water submersion. It has built-in subsea connectors for power and communications. With the need to generate reliable power subsea, this battery can power AUVs, ROV sleds, and provide power for sensors to determine equipment conditions and send needed data to determine maintenance needs.

Pressure tolerant to 6000m depth, SeaSafe batteries include SWE’s patented battery management system (BMS). The BMS has the brainpower to assure safe operation, protect the module’s cells from damage, allow reliable distributed battery system architecture, and prolong battery life. Rechargeable with a standard power supply, SeaSafe Smart modules are easy to use battery building blocks. The original SeaSafe and SeaSafe II can be used in oil-filled pressure equalization enclosures, while the SeaSafe Direct can be used directly in the water. Modules can be connected in series or parallel to meet voltage and capacity (Ah) needs. Each smart module is autonomous with its own BMS containing advanced algorithms for automatic and continuous safety protection, charge control and balancing.

Additional components to support SWE SeaSafe include the Parallel Integrator Isolator and the SWE SeaSafe Observer Support Software, which allows the user to monitor the health of the battery in real time. The Woods Hole Oceanographic Institution has partnered with SWE in the development of SeaSafe, utilizing it in various Nereid AUV and Hybrid ROVs. The SeaSafe II and SeaSafe-Direct received a Certificate of Design Assessment from ABS in December 2017.
SUPERIOR POWER FOR SUBSEA APPLICATIONS

SWE SeaSafe II and SeaSafe Direct Smart Battery Modules

- HIGHER PERFORMANCE & REWARD
  - 4X Longer Mission Run Time
  - 6X Longer Battery Life Time
  - 100% Condition Based Monitoring

- LOWER RISK
  - ABS Certified & 2nd Generation Learned
  - 6000 M Pressure Tolerant Tested
  - Safety Tested and Patented

- EASE OF USE
  - No Pressure Vessel Required
  - Direct in Water Viable
  - Simple Battery Sizing & Operation

SWE SeaSafe II
- Pressure Balanced
- Oil-Filled 30V 28Ah

SWE SeaSafe Direct
- Direct in Water 30V 28Ah

AUV
ROV
MUV
Oil & Gas

SERVICE QUALITY RELIABILITY
281.240.4000 | seasafetech@swe.com
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<th>Website</th>
<th>Location</th>
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<tr>
<td>Balmoral Offshore</td>
<td><a href="http://www.balmoraloffshore.com">www.balmoraloffshore.com</a></td>
<td>Aberdeen, UK</td>
</tr>
<tr>
<td>Blue Robotics</td>
<td><a href="http://www.bluerobotics.com">www.bluerobotics.com</a></td>
<td>Torrance, CA, USA</td>
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<tr>
<td>BMTI (ALSEAMAR)</td>
<td><a href="http://www.bmti-alseamar.com">www.bmti-alseamar.com</a></td>
<td>Six Fours, France</td>
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<td>DeepWater Buoyancy</td>
<td><a href="http://www.deepwaterbuoyancy.com">www.deepwaterbuoyancy.com</a></td>
<td>Biddeford, Maine, USA</td>
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<td>Engineered Syntactic Systems</td>
<td><a href="http://www.esyntactic.com">www.esyntactic.com</a></td>
<td>Attleboro, MA, USA</td>
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<tr>
<td>Evonik</td>
<td><a href="http://www.evonik.com">www.evonik.com</a></td>
<td>Essen, Germany</td>
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<tr>
<td>Forum Energy Technologies – Syntech</td>
<td><a href="http://www.f-e-t.com">www.f-e-t.com</a></td>
<td>Bryan, TX, USA</td>
</tr>
<tr>
<td>Manuplas</td>
<td><a href="http://www.manuplas.co.uk">www.manuplas.co.uk</a></td>
<td>Plymouth, England, UK</td>
</tr>
<tr>
<td>SynFoam</td>
<td><a href="http://www.synfoam.com">www.synfoam.com</a></td>
<td>Livingston, NJ, USA</td>
</tr>
<tr>
<td>Trelleborg</td>
<td><a href="http://www.trelleborg.com">www.trelleborg.com</a></td>
<td>Randolph, MA, USA</td>
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</table>
Balmoral is a trusted partner to the global offshore energy sector. We offer unrivalled technical expertise, a vast project track record, evidence-based buoyancy, protection and insulation product design, development and delivery. This, combined with an open approach to stakeholder engagement, ensures success.

Contact
Gary Yeoman
gary.yeoman@balmoral.co.uk
+44 (0) 1224 859000

**ROV/AUV BUOYANCY**
*(TO 7,000MSW DEPTHS)*

**Composite Foam Systems:** A “composite” buoyancy system refers to a syntactic foam comprising glass microspheres and macrospheres held together within an epoxy resin system to create a homogenous matrix. Composite buoyancy systems are cast using dedicated mould tooling providing repeatable consistent production and are therefore ideally suited in applications such as work class ROV’s particularly on a multi-build requirement. Each component within any given Balmoral syntactic foam is individually rated for specific operating depths resulting in a strong, lightweight composite formulation. There is an overlap in the operating depth ranges which is caused by macro efficiency changes in design operating depths. This means that more efficient, lower density composites may generate improved uplift for a given volume as the operating depth increases. Composite buoyancy systems comprise an integrated shell to ensure maximum protection of the core material in the event of accidental impact.

**Pure Foam Systems:** Pure foams offer many advantages over macrosphere composite foam systems including robustness, ease of repair and modification in the event of damage or design changes, and extremely low water ingress rates. It should be noted, however, that this is a premium product and is therefore typically selected for more demanding service conditions such as extreme operating depths and/or service criticality such as manned service. The “ultra-low density range” of pure syntactic foam is normally produced in pre-cast blocks. These blocks may be supplied for client assembly or can be factory assembled into finished buoyancy modules. The buoyancy performance of Balmoral’s ultra-low density material is understood to be unique amongst ROV buoyancy foams in that the buoyancy does not progressively reduce due to hydrostatic compression as the ROV moves into deeper water. This is because the bulk modulus ie, the compressibility under hydrostatic pressure of the foams is marginally less than sea water.

<table>
<thead>
<tr>
<th>Operating depth (ft/msw)</th>
<th>Typical core density kg/m³</th>
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<tbody>
<tr>
<td>6500 / 2000</td>
<td>385</td>
</tr>
<tr>
<td>9850 / 3000</td>
<td>401</td>
</tr>
<tr>
<td>13100 / 4000</td>
<td>435</td>
</tr>
<tr>
<td>16500 / 5000</td>
<td>479</td>
</tr>
<tr>
<td>23000 / 7000</td>
<td>519</td>
</tr>
</tbody>
</table>
**FLEXLINK™ ARTICULATED UMBILICAL BUOYANCY**

FlexLink™ was developed to meet the needs of large, tracked, trenching vehicles that operate on the sea bed. To prevent such vehicles damaging their control lines, FlexLink is installed at the tether point to provide a continuous, articulate buoyant section above the vehicle, thereby ensuring the umbilical remains out of the vehicle work zone at all times. FlexLink is used as a permanent installation which is designed to pass through the sheave wheels of launch and recovery systems (LARS). It is supplied for installation onto umbilicals ranging in size 25-75mm OD while the buoyancy can be specified to suit project requirements. Typical uplift ranges from 6-12kg/m in design operating depths of 0-6000msw.

**UMBILICAL FLOTATION**

BOE provides a range of floats to suit most control umbilicals. These floats comprise a pair of symmetrical half shells which are profiled to permit the line to flex within its specified bend radius. Each float is manufactured using a low density composite foam core covered in a high performance impact and abrasion resistant polyethylene shell. BOE’s umbilical floats are hinged using two stainless steel latches. The floats are designed to grip the umbilical by means of a natural rubber internal grommet. Balmoral umbilical floats are designed to suit umbilical diameters ranging from 25-50mm OD. Umbilical floats can be supplied to suit larger diameter umbilicals if required.

<table>
<thead>
<tr>
<th>Operating depth (msw)</th>
<th>Weight in air (kg)</th>
<th>Nominal buoyancy (kg)</th>
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</thead>
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<tr>
<td>1000</td>
<td>14.7</td>
<td>15.2</td>
</tr>
<tr>
<td>1500</td>
<td>15.9</td>
<td>14</td>
</tr>
<tr>
<td>2000</td>
<td>17.3</td>
<td>12.6</td>
</tr>
<tr>
<td>2500</td>
<td>18.1</td>
<td>11.8</td>
</tr>
<tr>
<td>3000</td>
<td>19.1</td>
<td>10.8</td>
</tr>
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**BALMORAL SUBSEA TEST CENTRE**

**Hydrostatic testing**

23 test vessels: internal lengths from 1010-10400mm, testing to 96-700bar

**Mechanical testing**

A proprietary test rig performs load, axial, lateral, static, 3-point, compression, shear, dropped weight, swing arm and bend testing.

**Submersion test tanks**

Three tanks spanning 6600×2300mm-9000mm dia, 2200-4500mm depths

**Development and test laboratories**

Ultramodern facility offers chemical, thermal, hydrostatic and mechanical testing in a highly controlled scientific environment.

**BUOYANCY REPAIR**

It is vital that repair and refurbishment is carried out by fully qualified teams that understand the materials, procedures and environments to which marine buoyancy is exposed. It is vital that repair and refurbishment is carried out by fully qualified teams that understand the materials, procedures and environments to which marine buoyancy is exposed. Balmoral benefits from many years’ design, manufacture and materials experience and has dedicated teams of experienced repair personnel travelling the world on a regular basis.

**INDUSTRY REGISTRATIONS**

BMTI (ALSEAMAR)

HQ Location: 117 rue d’Ollioules, 83140 Six Fours, France

Company Intro
BMTI is a leading manufacturer of engineered pure syntactic foam subsea buoyancy products for the Oil & Gas, Oceanography and Defense industries. Using innovative and advanced own-formulation syntactic foam materials technology and manufacturing processes, BMTI® delivers optimal performance in subsea products for deepwater applications. We offer the smartest buoyancy solutions: own formulations and associated manufacturing processes, testing throughout the production chain, low densities for maximum buoyancy, long-term operational performance, deepwater & very deepwater buoyancy.

Contact
Alexia Ballatore
aballatore@alseamar-alcen.com
+33 (0)4948 70777

ROV / AUV / TRENCHER BUOYANCY

BMTI® offers a state-of-the-art ROV buoyancy manufacturing process to ensure the best possible quality. We select the best foam grade for you on the basis of your specifications (depth rating and uplift are generally required). We are different from other buoyancy providers because we have the largest range of off-the-shelf blocks, densities and grades, so we can quickly take care of any application. Buoyancy assemblies are then machined to the exact shape, before being finished with our own-formulation protective PUR and painting, including the positioning of inserts for which we offer premium strengths. We carry out quality controls and testing to a high standard throughout the manufacturing process, so as to guarantee the best product performance.

- BMTI® combines materials technology and design experience to manufacture highly sophisticated ROV/AUV buoyancy modules
- BMTI® offers the lowest pure syntactic foam densities on the market for depths from 1 000 to 10 000 m, for maximum vehicle buoyancy.
- BMTI® also has extensive experience in the positioning and incorporation of metal inserts, and in protective skins and coatings.
- BMTI® can provide both standard blocks (large size means limited bonding) or finished buoyancy modules.

BUOYANCY REPAIR

BMTI® offers a repair and refurbishment service for damaged or worn subsea buoyancy modules. We are experienced in the repair of complete module breakages or the replacement of missing sections, ensuring you get maximum usage from your subsea buoyancy assets by extending their lifespan.
SYNTACTIC FOAM BLOCKS

Lightweight and strong: BMTI® syntactic foam blocks offer the best performance for all your buoyancy requirements, if you prefer to shape locally. The blocks are ready to use for assembly or cut-to-fit applications and can also be bonded together to form larger structures.

We have an important stock policy, of various densities and depths, as to deliver quickly worldwide.

We offer the lowest variations of density tolerances to ensure maximum uplift.

<table>
<thead>
<tr>
<th>LOW DENSITY GRADE (±15 kg/m³)</th>
<th>Reference</th>
<th>Depth rating (m)</th>
<th>Average Density on a 1 m³ batch (kg/m³)</th>
<th>Average Density on a 1m³ batch (lb/cuft)</th>
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<tbody>
<tr>
<td>LD2000</td>
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<td>420</td>
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<td>470</td>
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<table>
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<th>VERY LOW DENSITY GRADE (±10 kg/m³)</th>
<th>Reference</th>
<th>Depth rating (m)</th>
<th>Average Density on a 1 m³ batch (kg/m³)</th>
<th>Average Density on a 1m³ batch (lb/cuft)</th>
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<tr>
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<td>390</td>
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<th>Average Density on a 1m³ batch (lb/cuft)</th>
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<td>28.0</td>
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<th>HIGH STRENGTH AND VERY LOW DENSITY</th>
<th>Reference</th>
<th>Depth rating (m)</th>
<th>Average Density on a 1 m³ batch (kg/m³)</th>
<th>Average Density on a 1m³ batch (lb/cuft)</th>
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<tbody>
<tr>
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<td>455</td>
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COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

I. 02.

BUOYANCY

COMPANY INTRO

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative engineered solutions accelerate performance for customers in a sustainable way. Trelleborg Applied Technologies specializes in the development and production of polymers and syntactic foam. Our goal is to perform at every level to deliver innovative and reliable solutions that maximize business performance to meet our customers needs.

Remotely Operated Vehicle (ROV), Autonomous Underwater Vehicle (AUV) and Human Occupied Vehicle (HOV) Buoyancy Systems are being used at increasingly deeper water depths, creating the need for low density materials with high buoyancy and reduced volumes. We develop, design and manufacture these buoyancy systems to be used in oceanographic, marine and offshore applications. Trelleborg Applied Technologies is ISO 9001 certified.

USA Contact
Will Ricci
will.ricci@trelleborg.com
+1 774 719 1400

Europe & rest of world contact
David Clayton
david.clayton@trelleborg.com
+44 7760 556828

ROV/AUV BUOYANCY

ECCOFLOAT® SYNTACTIC FOAM

Trelleborg Applied Technologies manufactures a range of high performance, low density syntactic foam for deep sea buoyancy applications called Eccofloat®. These composite foams provide ultra-low densities by selecting only the highest specification hollow glass microspheres, called Eccospheres®, and combining them within a rigid, high strength resin system. The syntactic foam is typically cast into standard blocks.

Oceanographers also depend on syntactic foams to suspend instrumentation in deep ocean studies. For these applications, the syntactic foam is used in either block form or custom molded shapes for installation in manned and unmanned submersibles such as the legendary Alvin and Jason vehicles that were used to discover and explore the Titanic.

Eccofloat® TG Grade syntactic foams are lightweight for building manned and remote operating vehicles. The foams are also used to manufacture mine neutralization systems because of their zero magnetic and sea-water comparable acoustic signatures. Applications include hydroplanes, rudders, trim adjustment modules for submarines and specialized applications such as acoustic windows due to the material profile and ability to significantly improve sonar functions.

Eccofloat® DS Grade syntactic foams combine lightweight glass Eccospheres® with multifunctional epoxy resin to produce ultra-high strength-to-weight materials for high-performance, deep sea applications including manned and unmanned submersibles.

Eccofloat® SG Grade syntactic foams offer a more economical solution which is also castable. They are available at all depths and are suitable for all subsea equipment.

www.trelleborg.com/applied-technologies
## ECCOFLOAT® PRODUCT SIZES

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### UMBILICAL BUOYANCY

Our range of UF-series umbilical buoyancy is constructed using a polyethylene outer shell filled with a high performance syntactic foam core. Umbilical buoyancy is used in conjunction with ROVs to keep the required length of umbilical buoyant underwater. They can also be used in a number of general cable or hose buoyancy applications where the diameter of the cable or hose does not exceed 90mm.

- Quick installation – Incorporates two quick release, double locking latch mechanisms.
- Changeable grommet – interchangeable internal grommet allows use of standard floats on all umbilicals 25–90mm in diameter.

### MINING & EXCAVATION BUOYANCY

Mineral rich deposits are found in deep water environments and machines capable of operating in deep and ultra-deep water require high performance composite materials that can provide buoyancy with long term performance. Trelleborg Eccofloat™ can be custom built into buoyancy modules for just such applications. The reduced density of Eccofloat™ enables smaller more compact buoyancy modules, which provide increased uplift (buoyancy) with reduced in air weight, thereby enabling smaller handling systems. With many of the mining vehicles being controlled via umbilical’s, the requirement to support the weight of the umbilical and keep it clear of the vehicle track system requires Linksyn® and Linksyn® HD. Eccofloat™ is also used in Umbilical and Recovery Hose Floatation.

### SUBSEA SPHERICAL AND ELLIPSOIDAL BUOYS

Subsea spherical and ellipsoidal buoys, providing long term, stable buoyancy to arrays of underwater equipment. With a full line of buoyancy solutions ranging from 100 meters to 6,000-meter water depths, these buoys are available in numerous sizes and shapes to ensure successful deployment and recovery during mooring expeditions.

### NANO BUOYS

Trelleborg’s range of subsea modular buoys, called Nano buoys, are suitable for subsea equipment installation, each buoy core varies in density to suit individual project water depth needs (assemblies are available at depth ratings from 1,000 to 6,000 meters). The unique nesting design of the individual buoyancy elements enables them to quickly assemble into a rigid structure with a specific uplift. Nano buoys are manufactured from a low-density carbon fibre macrosphere and syntactic foam. The core is then encapsulated in a high-density polyethylene shell for impact and abrasion protection.
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<td>DeRegt Marine Cables</td>
<td><a href="http://www.deregtcables.com">www.deregtcables.com</a></td>
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<td>TE Connectivity – Rochester Cables</td>
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NEXT » CABLES, TETHERS & UMBILICALS

20  DeRegt
22  Hydro Group Plc.
24  Novacavi
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

CABLES, TETHERS & UMBILICALS
The race to reach greater depths is in full swing

ROV manufacturers are continuously searching for new, innovative ways that will allow existing and new ROV models to dive deeper. As a supplier of ROV cables, we have an unrivalled understanding of the challenges facing ROV manufacturers. Interested in finding out how you, as an ROV manufacturer, can benefit from the latest cable technology?

Meet us
Zaag 2-4, 2931 LD Krimpen aan de Lek, The Netherlands
+31 180 66 88 52 | deregtcables.com

Connect
Stay tuned, keep in touch with DeRegt.
Scan the QR code and be the first to know about our updates.
Middle weight ROV class cable
- Two layer armour package
- High temperature resistant materials
- Optical fiber communication
- 4km waterdepth

Fall pipe cable
- Triple layer high tensile steel
- Combination of High power, auxiliary power and communication
- Up to 3.5km waterdepth

Trenching umbilical
- High tensile steel package to support cable weight
- High power consumption – 1.5mW power
- Combination of main power, auxiliary and communication pairs
- 750 meter length

Lightweight tether cable
- Light weight design
- Aramid strength member
- Designed for deep water application
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

CABLES, TETHERS & UMBILICALS

I. 03.

HYDRO GROUP PLC.

HQ Location: Hydro House, Claymore Avenue, Aberdeen Energy Park, Bridge of Don, AB23 8GW, Scotland, UK

Company Intro
With over 35 years of international experience, Hydro Group designs, manufactures and installs bespoke subsea electrical and optical connectivity solutions for use in harsh environments in the international oil and gas, defence and renewable energy sectors. Headquartered in Aberdeen, United Kingdom, Hydro Group’s regional subsidiaries Hydro Group Asia Pte and Hydro Group Systems, Inc offer support and aftersales service from Singapore and Florida, USA. A network of Hydro Group business partners are also on hand to support your product from initial quotation to final installation around the globe.

Contact
The Hydro Group Plc. sales team
sales@hydrogroup.plc.uk
+44 (0)1224 825 050

www.hydrogroupplc.com

PRODUCTS

Hydro Group has over three decades of experience in the creation of bespoke and ex-stock cables, tethers and umbilicals and is certified to ISO 9001:2015 and 14001:2015 quality standards. The company is a proud recipient of the 2018 Queen’s Award for Enterprise: International Trade, recognising the success of its exports around the world.

The Group’s subsidiaries, Hydro Bond Engineering and Hydro Cable Systems, manufacture a wide range of subsea connectivity solutions including armoured cables, tow cables, fibre optic hybrid cables and ROV tethers. Over 6000 configurations of cable design are available, with a large choice of armour and sheath materials to choose from to suit your specific application.

ARMOURED CABLES

- Subsea armoured cables can withstand higher stresses with superior crush resistance, corrosion resistance and better cold impact bend performance, ideal for harsh underwater environments
- Hydro Group offers multi-core power and data cables with single layer, contra-helical and high tensile armouring
- Our in-house armouring facilities can include armoured wire sizes between 0.5 – 2.5mm diameters for cables up to 80mm in diameter. Minimum order quantities of 100 metres for cable products.
- Protection options include Aramid, Kevlar, Vectran, galvanised or stainless steel (including steel wire rope or steel wire armour)

FIBRE OPTIC/HYBRID CABLES

- Our fibre optic cables can be supplied in multiple numbers within a gel-filled stainless steel tube, or as individual fibres within a jacket
- 9/125 Single mode, 50/125 and 62.5/125 Multimode Fibre Optics can be supplied as a standalone cable or as part of a bigger bundle
TOW CABLES
- Range of applications including in defence industry e.g. anti-submarine warfare and reconnaissance
- Experienced in creating heavy and light tow cables for several international defence forces
- Previous example of 600m long steel wire armour heavy tow body sonar cable with hairy fairing on the umbilical to increase coefficients while towed at 20 knots
- Extensive and gruelling testing process – example operational weight of 5 tons, pull weight 40 tons, destruction at 48 tons

ROV TETHERS
- A range of custom and ex-stock options available, providing extended operating range between ROV and operating base
- We can engineer neutral, negative or positive-buoyancy cables with fibre optic, strain-bearing braid and waterblocking capabilities (other options available)
- Illuminated tether offering with LED elements and Polyurethane (PU) sheath – ideal for inspection ROVs utilised in murky waters to avoid entanglement in limited visibility operations
- Durable cables provided with tough sheathing options to protect against abrasion and damage in harsh subsea environments

UMBILICALS
- Hydraulic umbilicals can include different components including thermoplastic hoses, medium voltage power cores, low voltage electrical power cables, electrical signal cables, fibre optic cables
- Bundled assemblies protected by layers of steel wire/Vectran armour and inner and outer sheaths of thermoplastic material, either as extrusions or helically-wrapped roving
- Electrical and Electro-Hydraulic umbilicals also available
- Neutral buoyancy increases safety for divers and machinery operating in close contact with umbilicals
- Hydro Group experienced in manufacturing hydraulic umbilical hose bundles for subsea diving, BOP control, topside control umbilicals and Intervention Workover Control Systems (IWOCS) ratings available upon request
Italian privately owned company established in 1975. Specialist in custom cables design and manufacturing, NOVACAVI is involved in providing innovative specialty cables for a broad variety of underwater or water-based environments in high-tech applications.

ISO 9001 certified design and production process since 1995.

For the new challenges of Oceanographic, Seismic, Hydrographic, Defence, Offshore Oil & Gas, Aquaculture, Renewable Energy and Water Utility market sectors NOVACAVI offers great experience in subsea application, material expertise, engineering versatility and production flexibility, prototyping development, low volume & high mix production of custom, reliable, in fit for purpose quantity, lengths and packaging.
NOVACAVI’s custom-engineered cables for underwater technologies feasible on any conceivable configuration.

- **ROV tether cables**

- **Underwater drones & robots cables**

- **Fiber Optic subsea hybrid cables**

- **Umbilicals**

- **Subsea armoured tow cables**

- **Subsea detection and instrumentation cables**

Contact NOVACAVI for custom requirements: tech@novacavi.it - www.novacavi.it
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<td>Rolloos</td>
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COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

CAMERAS & LIGHTS
DEEPSEA POWER & LIGHT

HQ Location: 4033 Ruffin Road, San Diego, CA 92123, USA

Company Intro
DeepSea Power & Light is a privately held design and manufacturing company serving the subsea industry. They design and manufacture durable products for subsea applications, including video cameras, lights, lasers, power modules, and pressure relief valves. Uses range from industrial applications and research to cinematography. Their philosophy is to continually advance technology for use in the harshest environments with ease of service, reliability, high performance, and cost effectiveness as important design criteria. DeepSea Power & Light values innovation, collaboration, and the shared success of their employees, customers, suppliers, representatives, and partners.

Contact
sales@deepsea.com
+1 858 576 1261

CAMERAS:

APEX™ SEACAM®
DeepSea Power&Light has elevated its HD camera offerings with the new 4K UHD capable Apex SeaCam. This camera incorporates proprietary corrector optics for superior imaging performance. Rigorously tested with over 10,000 pressure cycles to 10,000 psi during the design and qualification process, the titanium housing and optically polished dome are depth rated to 6,000 m.

- 4K UHD and multiple HD formats
- Superior performance with proprietary corrector optics
- 70° horizontal FOV
- 12× optical zoom
- 24× combined lossless digital zoom in HD output formats
- 4K UHD resolution ver FleXlink™, fiber, and coax options

SUPER WIDE-I SEACAM®
The Super Wide-i SeaCam features an extreme wide angle field of view in a compact housing, ideal for observation tasks, exploration, and other work environments that benefit from a broad field of view.

- 150° horizontal FOV
- Available with aluminum or titanium housing
- Up to 11,000 m depth rating

LED MICRO SEACAM®
The small and durable LED Micro SeaCam is ideal for manipulator arms and the inspection of wells, pipes, and other confined applications. The flexible integrated cable between the camera and connector allows the LED Micro SeaCam to maneuver through tight locations, while integrated LED lights provide clear imaging.

- Ultra small 22 mm diameter
- 55° horizontal FOV
- Sapphire port
- Up to 6,000 m depth rated titanium housing

**LIGHTS:**

**LED SEALITE®**

Specifically developed to exceed current market demands, the LED SeaLite delivers a high-performance, field serviceable, and affordable subsea light. Versatile configuration options allow the LED SeaLite to meet specific performance requirements.

- Up to 10,000 lumens
- Spot, flood, or wide beam configurations
- 4,000 m, 6,000 m, and 11,000 depth rated
- Digital and analog dimming interfaces supported
- User configurable power limit
- Customer serviceable

**MULTIRAY™ LED SEALITE®**

The Multiray™ LED SeaLite combines the function of two fixtures in a single light. This enables operators to expand vehicle capability while saving space, avoiding downtime for switching luminaires, and lowering costs compared to the multiple luminaires it replaces.

- Operate two sets of LED sources in a single fixture
- Choose from whites, colors, ultraviolet, and infrared
- Choose from a combination of optics that range from a 115° wide flood to a 28° narrow spot
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS
CAMERAS & LIGHTS

I. 04.
FEATURED PRODUCTS: CAMERAS

DVCi-R
With the ability to work over a twisted pair or an Ethernet link and with a 10 times optical zoom ability, the DVCiR is the ideal inspection camera for your IRM or Decommissioning projects. The camera uses intelligent light compensation so additional lighting is generally not required. The DVCi R also supports IR lighting when used in conjunction with our IR lamp.

The camera video uses H264 compression and encodes the video subsea thus reducing the required bandwidth to transmit the signal over the ROVs own Ethernet or twisted pair. There are three different depth ratings (1000, 3000 and 6000m).

The DVCi R is supported in E-Inspect and Coabis Ver 11 and above.

DVCi-D
The first HD over Ethernet camera for divers for either surface or bell operations. Use your existing umbilical and improve your video capability with this small camera system. With it’s intelligent light compensation the supervisor will now be able to watch welding operations during the welding rather than after the event. The cameras are made of a plastic that is durable and hard wearing but more importantly light in weight. The system allows the operator to use their existing lamps and comms systems. The DVCi D also supports IR lighting when used in conjunction with our IR lamp.

The DVCi D is supported in E-Inspect and Coabis Ver 11 and above.
**DVCi-SR**

Designed to fit smaller ROVs, the DVCiR uses the vehicle’s copper conductors to bring HD to many vehicles that do not generally support HD video thus allowing access to more difficult areas. On the VideoRay it connects to the Auxilliary connector. The topside unit is a ruggedised cased version of the new DVR.

The DVCi D is supported in E-Inspect and Coabis Ver 11 and above.

**DVCi-P**

Set to revolutionise the pipeline inspection market, the DVCi P is the only multichannel camera system, working over Ethernet, designed specifically for the pipeline market. With ease of installation and integration to survey software the DVCi P is a cost effective solution to upgrading your pipeline video acquisition system whilst giving your clients the clearest image of the pipe.

**IR LAMP**

Extend your visual inspections in difficult visibility scenarios with our IR lamp. Either ROV or hand held, the IR lamp will allow the DVCi range of cameras to see further in difficult conditions. Just switch the DVCi camera to black and white operations and see into the depth beyond.

**DIVER CAMERA AND LAMP**

A lightweight but high resolution camera with separate LED lamp, these units are low cost but rugged products. The lamp is available as a wide angle flood or a spot light and the camera has 1/3” 650TVL module. The cameras and lamps can be sold separately or as part of a diver spread with rack or portable case controller.

---

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**INNOVATIVE MARINE RECORDING TECHNOLOGY**
SIDUS SOLUTIONS

HQ Location: 7352 Trade Street, San Diego, CA 92121, USA

Company Intro
SIDUS Solutions LLC, a Service Disabled Veteran Owned Small Business based in San Diego, CA, was founded in 2000. SIDUS is an integrated systems provider of security and video surveillance systems for worldwide businesses in the research, heavy industry, commercial, military, and energy markets. For 19 years we still remain true to our goal of providing the most innovative and robust subsea & hazardous area monitoring products in the industry. Specializing in environmental cameras, robotic-positioning, and lighting systems, SIDUS services and manufactures complete, integrated security and surveillance solutions for any marine, defense and subsea application. SIDUS equipment, is operational in blue water and 6500 meter depths, also is available alone or integrated with existing systems. From concept design to technical support, we have solutions for every need. SIDUS has grown from designing primarily subsea pan and tilts and rotors to providing an extensive product line of underwater positioners, high definition cameras, penetrating bright lights, projection lasers, and inspection systems, as well as an array of engineering services. Our world-class engineering staff provides seamless integration, design, installation, documentation and commissioning for all systems. From sea-floor observation platforms, to surveillance systems for drilling rigs, ships, to sonar deployment systems – SIDUS is a field proven solution. We provide Solutions on Target!

Contact
L.Hagstrom@sidus-solutions.com
+1 (619) 275 5533
SDVOSB#: 222120

www.sidus-solutions.com

FEATURED PRODUCTS: CAMERAS / PAN & TILTS / LIGHTS

HIGH DEFINITION CAMERAS (SS446 / SS465 / SS474 / SS490)

SS446 offers stunning full 1080i/720p HD-SDI features a 1/3” CMOS HD sensor, 10x optical zoom with auto focus and is rated to 3000m.

SS465 series, offers HD – IP and POE convenience from 3000m to full ocean depth.

SS474 series, compact HD-SDI fixed focal length optical corrected lens and compact size. 3000m

SS490 series, offers 4K UHD (ultra high definition) with a number of streams and outputs including IP, HDMI, SDI, Fibre Optic. 300m, 3000m, 7000m and full ocean depth upon request.

Pan and Tilt and single axis positioners for cameras lights sonars lydars and more...

SS109 series: 10 pound-force foot. 13.6 Newton Metre torque

SS250MK2 series: 65 pound-force foot. 88 Newton Metre torque

SS260 absolute encoder high degree of accuracy .001°
COLOUR ZOOM CAMERAS (SS420 / SS449 / SS427)

**SS420 Series:** 36x optical zoom automatic and manual control of focus and exposure settings ¼ inch ExView HAD depth of 10,000 feet.

**SS449 Series:** high definition 1080i or 720p HD-SDI (2,000,000 pixels) CMOS Up to 20,000 ft (6000 m) Titanium

**SS481 Series:** high definition IP-POE color zoom, customizable internal red & white LED’s and lasers internal in one housing stainless steel 3000m

LOW LIGHT B&W CAMERAS (SS408 / SS425 / SS426 / SS435)

Sidus Solutions’ SS408 B&W cameras are lightweight and robust inspection tools. Designed for high sensitivity in low light, this camera employs a 420 TVL black & white module that has a 1/3” Sony ExView HAD CCD imaging sensor. The video output is provided in EIA or CCIR formats, with a standard 2.97 mm lens that offers 98° FOV in air. The durable acetal housing is corrosion resistant, and will provide years of quality service. The camera is available as part of a complete system or as a low cost replacement for the camera you now use.

LIGHTS

**SS182MKII LED, LIGHT LINE LASER AND STROBE COMBO**

*(SS181 COMPACT)* HIGH OUTPUT LED LIGHT WITH DIMMING

"DARK SABER" – SS182mkII is distinctively suited for lighting applications on inspection systems and other operations where illumination and the ability to scale and image is required. The SS182 mkII provides outstanding brightness, warm color for subsea videos and its adjustable green laser projector offers the perfect illumination solutions for vast number of applications. It’s features safe operations in air with intelligent thermal management and is 35% lighter than previous version. Light functions (including strobing) can be controlled remotely via analog, control through digital inputs, over a serial communication port and while being synced to a digital still camera. The LED life is a 50,000 hour minimum with DC constant current, no flicker and no acoustic noise. The SS182 mkII is field configurable allowing the operator to satisfy exact operational needs.

Sidus Solutions’ SS181 high output LED underwater light offers the perfect illumination solution for a vast number of applications. The compact design and depth rating of 1,000 meters makes the SS181 an ideal light for installation on a diver helmet or other tight spot. With a 6500 K color temperature and Color Reproduction Index (CRI) of 80, the SS181 provides outstanding brightness and luminance for underwater video. The SS181 will far outlast the leading halogen dive lamps with an illumination life of 50,000 hours.

The SS186 OceanLink units are the latest generation of Li-Fi optical communication using free space optics, utilizing the latest technology in a handheld package. The eye-safe blue light LED used by OceanLink allows communications between units at distances up to 100 meters*. The units function as a transparent Ethernet link to a remote computing device or to another system via a standard 10/100mHz Ethernet connection. In addition to data communication, OceanLink provides full-duplex voice communication over a separate channel. OceanLink will provide 3 mbps at self selecting brightness as a function of range to optimize transmission while conserving power*. In situations where a hardware connection is unavailable or undesirable, OceanLink is a perfect deep water alternative to cables.
**COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS**

**CAMERAS & LIGHTS**

**I.04.**

**SUBC IMAGING**

**HQ Location:** 317 Memorial Drive, Clarenville, NL, A5A 1R8, Canada

**Company Intro**

SubC Imaging’s mission is to continuously create the most technologically advanced and capable video equipment for the offshore and subsea markets. Its products are used in remote vehicle operations including deep sea mining, marine research, archaeology, and in offshore oil and gas service work. SubC has made revolutionary changes in the way subsea imaging is conducted with Remote Operated Vehicles (ROVs). The company has developed a client list that reaches around the world. Currently its clients are based in over 20 countries including the United States, Brazil, China, Italy, Australia, Saudi Arabia, and Singapore to name a few.

**Contact**

Carlos Sanyer  
info@subcimaging.com  
+1 709 702 0395

**CAMERAS:**

**RAYFIN™**

Autonomy is the future of underwater systems. SubC has developed plug and play equipment with the goal of simplifying autonomous image and video collection. The Rayfin is the center of this development. Designed as an autonomous or controlled science payload with 21 megapixel digital stills, 4K and HD recording to internal storage.

At its core, a smart Ethernet camera with autonomous dive interval programming. Built in sensor fusion will simplify advanced computer vision applications such as image mosaics, object detection and 3D model creation.

- Autonomous operation to reduce cost and complexity
- Internal 4K UHD recording and 21 megapixel digital stills
- Hybrid LED strobe/lamp and external laser sync direct from camera
- Dive interval programming (automated stills, recording, hibernate)
- Live video and image file transfer over Gigabit Ethernet
- Sensor fusion; built in IMU data logged with images/video
- Video, stills and data storage in SubC Dive Log format for easy review
- 512GB of solid state storage for video, stills and data
- Control via Ethernet, RS232 and RS485

**1CAM™ MK6**

The Mk6 is built upon SubC’s time proven 1Cam product line. It is the sixth generation of Smart Camera and has models and options to suit any underwater application.

All models include built in 4K UHD and HD Video recording, 6.2 16.6 megapixel stills and 512GB of storage. Except the Mk6 Lite, which is a low cost option for live video only.

We recognize that no two projects are the same. That is why we have various options such as Ethernet downloading and control, 5D video long line driver, 100% Titanium housing, auxiliary I/O pins for custom events and triggers and more. SubC excels at building reliable custom equipment.

- Live 4K UHD via Fiber
- Live HD via Coax
**CAMERAS & LIGHTS**

**I. 04.**

- 20x optical zoom
- Composite 700TVL
- 6000m depth rated
- 16.6 megapixel digital stills
- 4K UHD and HD recording to 512GB storage
- 3 year standard warranty
- Video Management

---

**DVRO™**

The DVRO is an all-in-one video management system. It includes many features previously requiring multiple systems into a single 19” 3U rack unit. Designed for ease of operation and reliability it includes smart data monitoring to let users know immediately if operations have been interrupted during.

- Input up to six channels of 4K, HD, SD, 3D and IP video
- Record and Blackbox on all channels
- Overlay and Dive Event Log
- Stream video over the internet or local area network.
- Remote login for tech support

---

**LIGHTS:**

**AQUOREA™ LED MK2**

The Aquorea Mk2 is a hybrid strobe/lamp that synchronizes with SubC cameras. The LED driver synchronizes the camera exposure time with its activation time while strobing. This freezes the stills taken so objects photographed can be captured in the highest detail. The built in charge control allows it to strobe while limiting the current draw from the system’s power supply. The Mk2 LED can also operate as a stand-alone product with serial control.

- Output: 12,500 lumen lamp / 25,000 lumen strobe
- Color: 5000K white or 725nm far-red
- Beam angle: 80° wide angle beam
- Protection: power monitoring, charge control, temperature, voltage and current
- Material/Depth: 6000m Grade 5 Titanium
- Includes: 10’ cable when bought with a SubC camera
SULIS SUBSEA CORPORATION

HQ Location: 17 Dundee Ave, Mt. Pearl, NL, Canada

Company Intro
SULIS Subsea Corporation is a Canadian company that develops and produces ultra-high-resolution camera technology for a range of aquatic environments, from shallow coastal and freshwater bodies to the deepest depths of the world’s oceans. Through partnerships with leading scientists, explorers, and filmmakers, SULIS helps create the awe-inspiring footage found in IMAX films, world-class scientific laboratories, and Remotely Operated Vehicle (ROV) control rooms, often streaming to millions of online viewers. Some of our current partners include James Cameron’s DEEPSEA CHALLENGE, Schmidt Ocean Institute, Schmidt Family Foundation, Woods Hole Oceanographic Institution, Black Sea Maritime Archeology Project, and Parks Canada. Our mission is to enable advancements in exploration, discovery and knowledge, across all aquatic environments through the lens of SULIS’s ever-advancing imaging products. In addition, SULIS is committed to providing outstanding product quality and global support for your demanding application.

Contact
info@sulissubsea.com
+1 709 745 5080

SULIS Z70 4K UHD CAMERA

The SULIS Z70 provides high-end remote underwater imaging for science, exploration, broadcast, and digital cinema.

- The finest image quality available in a deep-sea camera
- Live 4K UHD video transmission via fiber or Ethernet, or internally recorded
- 12x optical zoom with ultra-wide-angle field of view
- Unparalleled multi-group aquatic optical corrector with corner-to-corner 4K resolution
- 6,000m depth rating
- 20-megapixel stills capture
- Full manual controls

SULIS CB1 CAMERA CONTROL UNIT

The SULIS CB1 provides the same level of control you would expect from the world’s top terrestrial cameras, at its deepest depths.

- Precision 3-axis joystick for zooming and pan/tilt control.
- Dials for fine-tuned adjustment of focus, iris, and other settings
- 7” touchscreen for camera status monitoring and full control of all settings.
THE PRESSURES OF THE DEEP SHOULD NOT CRUSH YOUR STANDARDS.

SULIS Z70 4K UHD DEEP-SEA CAMERA WITH CUSTOM AQUATIC OPTICS
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

CAMERAS & LIGHTS

I. 04.

SUPER SEASPY – COLOUR CCD UNDERWATER CAMERA

The Tritech Super SeaSpy underwater video camera is a compact, high resolution, full colour camera with integral low voltage lighting. Built to survive the harsh underwater inspection environment, the Super SeaSpy has been designed to be compact and rugged whilst providing high quality colour video.

The Super SeaSpy incorporates a ring of white LEDs which provide uniform illumination over the field of view. The LED Engine utilises Dynamic Light Control (DLC) which automatically adjusts the lighting level to optimise video image quality, regardless of the reflectivity of the work surface. This feature also helps enhance picture quality by reducing the amount of backscatter from suspended particles in the water column.

The Super SeaSpy is fitted with a water corrected lens system which optimises the picture quality by reducing radial distortion and reducing chromatic aberration.

COMPANY INTRO

Tritech International Limited [Tritech], a Moog Inc. company, is a high-technology business dedicated to providing the most reliable imaging and ancillary equipment for use in underwater applications. Tritech operates in many professional underwater markets, including; Defence, Energy, Engineering, Survey and Underwater Vehicles and remains an industry leader in the provision of sensors and tools for ROVs and AUVs, a reputation achieved from over 25 years of delivering expertise through key products.

Contact

sales@tritech.co.uk
+44 (0)1224 744111
+44 (0) 7801 151 833 (24 hour on call support)

www.tritech.co.uk
TYPHOON - COLOUR UNDERWATER VIDEO CAMERA WITH ZOOM

The Tritech Typhoon is a robust, high resolution colour underwater video camera with an auto-focus zoom lens, which maintains focus throughout x23 Optical and additional ×12 Digital Zoom ranges. Both PAL and NTSC Broadcast Standards are supported.

The Typhoon combines the latest CCD with numerous digital enhancements and the camera's wide dynamic range technology compensates for bright backgrounds and low light conditions; providing clear, low noise video with good contrast. The auto white balance maintains natural colours under wide ambient lighting conditions and also the Digital Slow Shutter and IR Cut Filter options deliver higher sensitivity at low levels of illumination.

All optical and digital functions can be controlled via a user-friendly GUI, or integrated within an ROV control system via a RS232 Command Protocol. The GUI provides default system settings or user-specific configurations. Alternatively, focus and zoom can be controlled by analogue signal inputs. Digital Slow Shutter and Back Light Compensation functions can be optionally 'hard-wired'. An 'Ivanoff Corrected' lens system optimises picture quality by reducing radial distortion and chromatic aberration. In benchmark tests, the Typhoon delivered sharper definition and better colour rendering than similar cameras.

Typhoon can be supplied with an integral overvoltage protected Video Line Driver, which with electable gain, this can compensate for video signal attenuation through longer umbilicals.

TORNADO - LOW LIGHT UNDERWATER VIDEO CAMERA

The Tritech Tornado underwater video camera is a high quality low light camera system using the very latest CCD technology.

A ½" Interline CCD sensor provides a high-resolution 570 horizontal line monochrome picture. The camera module has a light sensitivity of 3x10-4 lux. The Tornado camera is contained within a new 4000m compact stainless steel housing fitted with a high quality water corrected acrylic view port.

The importance of the view port is often underestimated in underwater cameras. The acrylic view ports used on all Tritech cameras have similar refractive properties to that of water providing the optimum solution for deep water lenses. This ensures a clear and sharp picture during close proximity viewing in all water conditions.

The Tornado underwater video camera is supplied with a switchable high frequency boost amplifier making it suitable for use with short or long umbilicals.
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<th>Connector Manufacturer</th>
<th>Website</th>
<th>City, Country</th>
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COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

CONNECTORS & PENETRATORS
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

CONNECTORS & PENETRATORS

I. 05.

GLENAIR

HQ Location: 1211 Air Way, Glendale, CA 91201, USA
Regional Offices: 40 Lower Oakham Way, Oakham Business Park, Mansfield, Notts, NG18 5BY, UK

Company Intro
If you are like most professionals in the electrical interconnect industry, you know that Glenair has been the leading manufacturer and supplier of commercial and Mil-Spec connector accessories since 1956. Building on that foundation, we now offer a dozen, full-spectrum product lines designed to meet your every interconnect requirement. From hermetic connectors to fiber optics, from conduit systems to Micro-D assemblies, from composite enclosures to assembly tooling – Glenair does it all. And throughout the years, we’ve made outstanding customer service our approach to earning your trust, and to maintaining our position as the industry’s best-value interconnect supplier:

- By designing quality into every part we ship.
- By delivering the fastest turnaround on quotes and custom orders.
- By establishing an unsurpassed sales, support and engineering presence in every major market in the world.
- By building the largest capacity, broadest capability factory in the interconnect accessory industry.
- By avoiding cumbersome business practices such as minimum orders and expediting charges, and...
- By maintaining the world’s largest “Same-Day Shipment” inventory.

Contact
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+1 818 247 6000

www.glenair.com
www.glenair.co.uk

DEEP UNDERWATER SUBSEA, HIGH-PRESSURE
10K PSI / 700 BAR / 7000M CONNECTORS

Next-generation high-speed, signal, and power connectors for mission-critical applications – from submarines and ROVs to seafloor oil and gas

SEAKING™

The SeaKing is a high density, glass sealed connector that utilizes dual O-rings and redundant sealing as standard. It is a 21st century connector that has been designed based on the best industry practices with much creative and unique advancement which address known limitations of existing designs. The SeaKing was designed with an eye toward modularity and flexibility which eliminates the need for special configurations for different applications. Furthermore, the connector series is designed to optimize electrical and mechanical performance in high-pressure environments – rated to 10,000 psi open face and mated (tested to 15,000 psi). Integrated dual O-ring seals, anti-galling marine bronze coupling, corrosion-resistant stainless steel shells and other material choices maximize durability and reliability. Goldplated copper contacts in both high-density signal and standard-density power contact arrangements provide optimal data and power transmission. SeaKing includes the complete range of connector styles: cable plugs, flange connector receptacles and bulkhead connector receptacles. Pressure Balanced Oil Filled (PBOF) configurations, as well as a purpose-designed family of connector accessories and backshells are available.

- 10,000 psi working pressure and 15,000 psi test pressure on all designs
- Glass-to-metal sealed receptacle inserts
- 500lb pull strength plug to receptacle
- Dual O-rings on all critical leak paths
- Solder cup contacts
- Plug shell is universal for overmolding and PBOF
- Wrench flats and knurl for easy mate and demate
- Metal-to-metal seating
- Polarized metal keyways
- Standard configurations in stock
**SEAKING™ FIBER OPTIC**

The SeaKing Fiber Optic connector offers the 10,000 psi rating in both Open Face and Mated conditions. They are offered in a variety of shell sizes and configurations, and can be terminated with molded cable or PBOF. When used as a PBOF, Glenair uses the same seals to the individual conductors so that the connector will continue to operate in the event of a catastrophic hose flood. As a vertically integrated company, Glenair performs all fiber termination and manufacturing in-house.

**SEAKING™ POWER**

The SeaKing Power connector is currently offered in a 4 pin configuration (with other configurations upon request) which is designed for operation at 5kV. This connector too, has incorporated many valuable features in the standard SeaKing. The connector includes API O-ring test ports which allow the user to certify the integrity of the dual O-rings. The interchangeable inserts make it easy to swap genders without having to use different shells, and the aft loaded inserts are secured with a threaded retaining ring to accommodate high pressure in both directions. A detached flange allows the bulkhead to be mounted in a position to reduce stress on the cable and ease of clocking. Additionally, the SeaKing Power connector incorporates an accessory porch very similar to the standard SeaKing which facilitates over-molding, PBOF backshells or other termination accessories.

**SUPER G55 CONNECTOR**

The Super G55 family of dry-mate underwater connectors is a revolutionary new design of the popular industry-standard marine interconnection used in countless ROV, underwater camera, diver communications, lights, pan and tilts, and other subsea applications. Available in 3 shell sizes, the Super G55 is manufactured from 316L Stainless Steel with insert mold-ed contact assemblies designed for pressure-sealed applications up to 10,000 psi mated and unmated. Intermateable and intermountable with other “55” series connectors, the Glenair solution introduces a long list of product innovations designed to improve performance and durability. Our PBOF versions, for example, utilize easy-to-assemble threaded fittings which deliver both superior sealing performance while reducing installation time. Other innovations include full-mate inspection windows, improved solder cup contact design, improved potting and sealing, and more. Cable plugs and receptacles are available in attachable (user-terminatable) versions or factory overmolded single-ended whips.

- 10,000 psi mated/ unmated (approx. 22,500ft/7,000m)
- Recessed plug socket contacts for safety
- Intermateable and intermountable with other “55” series connectors
- 3 shell sizes — 15, 20 and 24, with 3 to 21 contacts
- PBOF versions available
- 600 VDC, 5 to 18 Amps (dependent on conductor and cable size and make-up)
- Retractable, anti-galling coupling nuts prevent mis-mating and improve durability

**NON-STANDARD MATERIALS:** Other material options are available as part of our non-catalog offerings including Anodized aluminium, Titanium, and Aluminium Bronze. Glenair is also able to supply Super G55 interconnects in composite thermoplastic (PEEK) to meet application requirements for reduced cathodic corrosion as well as weight reduction without affecting connector performance.

**HIGH-SPEED ETHERNET:** The Super G55 Ethernet option is available in the 1508, 2013 and 2021 contact configurations and provides both high speed (Up to 1GB) and power (600Volts) in a full subsea environment (10,000 psi). Gigabit speed data transfer up to a distance of 75 meters.
**COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS**

**CONNECTORS & PENETRATORS**

I.05.

**HYDRO GROUP PLC.**

**HQ Location:** Hydro House, Claymore Avenue, Aberdeen Energy Park, Bridge of Don, AB23 8GW, Scotland, UK

**Company Intro**

With over 35 years of international experience, Hydro Group designs, manufactures and installs bespoke subsea electrical and optical connectivity solutions for use in harsh environments in the international oil and gas, defence and renewable energy sectors. Headquartered in Aberdeen, United Kingdom, Hydro Group’s regional subsidiaries Hydro Group Asia Pte and Hydro Group Systems, Inc offer support and aftersales service from Singapore and Florida, USA. A network of Hydro Group business partners are also on hand to support your product from initial quotation to final installation around the globe.

**Contact**

The Hydro Group Plc. sales team
sales@hydrogroup.plc.uk
+44 (0)1224 825 050

**PRODUCTS**

Hydro Group is a reliable provider of high-quality connectors and penetrators and is certified to ISO 9001:2015 and 14001:2015 quality standards. With products tailored to the exact demands of your project regardless of location, the company is a proud recipient of the 2018 Queen’s Award for Enterprise: International Trade.

The Group’s subsidiaries, Hydro Bond Engineering and Hydro Cable Systems, manufacture a wide range of subsea connectivity solutions including its durable range of HRS, HRM and HDM connectors. Hydro Group also manufactures manned and unmanned penetrators suited for electrical, coaxial, optical or hybrid applications.

**HRS CONNECTORS**

- Hydro Rubber Sealing (HRS) ideal for harsh subsea uses
- Underwater mateable; available in moulded or unmoulded configurations with up to 70 pins
- Rated up to 3.3kV, depth-rated to 2440 MSW
- Bulkhead, panel mount or cable mount options available
HDM CONNECTORS
- Hydro Deck Mate (HDM) are robust and designed for continuous mate/de-mate cycles
- Deck mateable, up to 110 pins density
- Rated to 6900 MSW and up to 3300 Volts RMS
- Ideal for fibre optic connectivity (Multimode 62.5/125 and 50/125, Single mode 9/125)
- Submarine Deck Mate (SDM) connectors available for defence applications upon request

HRM CONNECTORS
- Hydro Rubber Moulded (HRM) connectors are versatile and reliable
- Surface mateable, durable rubberised connectors with precision-engineered and reliable injection moulding fitment
- Offered with bulkhead, attachable, inline, dummy plug and overmould options
- Connectors available in Standard Circular, Micro Series and Low Profile connectivity
- Rated to 600 VDC (configuration dependent) and between 10 and 60 Amps/pin for SC configurations

MANNED/UNMANNED PENETRATORS
- Penetrators are suited to applications including diving bell and deck decompression chamber systems
- Lloyd’s Register-certified manned submersible electrical penetrators type approved for use at a depth of up to 650 MSW
- Broad operating window of -40°C to 60°C and working voltages of up to 500V
- Fully pressure-blocked with right-angled/in line designs and mono/bi-directional pressure design options
- Rated up to 3,000 Volts RMS, available in stainless steel, titanium, aluminium silicon bronze
- Current ratings up to 140 Amps with higher ratings available upon request
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

I. 09.

NEXT ➔ DIGITAL VIDEO RECORDING

48 Digital Edge Subsea
50 NETmc Marine
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

DIGITAL VIDEO RECORDING
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

DIGITAL VIDEO RECORDING

I. 06.

DIGITAL EDGE SUBSEA

HQ Location: Doubletree Court, Cavendish St, Ulverston, Cumbria, LA12 7AD, UK

Company Intro
Digital Edge Subsea supplies the Oil & Gas industry with our digital video recording inspection system, the EdgeDVR. The company was formed in 2009 and began trading in 2010. The Digital Edge Subsea product range has been developed with the end user as one of the main focuses. We pride ourselves on how user friendly our product range is, whilst satisfying the requirements of our global clients. We now have over 500 systems offshore and have a large rental pool of over 70 units.

During 2019 the company has been developing the next generation of digital recording equipment, which are due for release Q3 2019. The new Version 5 software and hardware, will keep the original mandate, of being easy, simple to use and most of all, reliable. The software will now have 3 levels, EdgeLite, Edge and EdgePro.

With regards to the hardware we will also have 3 main types, Standard Definition, High Definition and our first 4K system. The addition of a 4K(UHD) model is a reflection of the latest technology that is now being used on some of the latest ROV and diving systems worldwide. The standard 4U rackmounted model is also complimented by a new portable laptop version, both models are available for purchase and rental.

Digital Edge is a trusted brand with a reputation for excellent tech support.

Contact
John Benson
john@digiitedgesubsea.com
+44 (0)1229 206456

www.digitedgesubsea.com

EDGE LITE – ENTRY LEVEL DVR

- 4 Channel Recording
- Online Video Clips and Photos
- 3 Hardware Models (SD, HD and 4K)
- 4 Serial Inputs
- 4 Channel Digital Overlay
- Multibeam Sonar Recording and control
- Offline Editor – Offline Video Clips and Photos
- Built-in Blackbox Recording
- Network Video Streaming
- Network Viewer
- Client Viewer
- Coabis, Nexen & Apollo Support

EDGE – STANDARD LEVEL DVR

- 4 Channel Recording
- Online Video Clips and Photos
- 3 Hardware Models (SD, HD and 4K)
- Automatic Dive, Photo, Video and Anomaly Logs
- User Configurable Eventing
- 4 Serial Inputs
- 4 Channel Digital Overlay
- Multibeam Sonar Recording and control
- Offline Editor – Offline Video Clips and Photos
- Offline Eventing
- Import/Export Workpack
- Built-in Blackbox Recording
- Network Video Streaming
- Network Viewer
- Client Viewer
- Coabis, Nexen & Apollo Support
**EDGE PRO - ADVANCED LEVEL DVR**

- 4 Channel Recording
- Online Video Clips and Photos
- 3 Hardware Models (SD, HD and 4K)
- Automatic Dive, Photo, Video and Anomaly Logs
- User Configurable Eventing
- 4 Serial Inputs
- 4 Channel Digital Overlay
- Multibeam Sonar Recording and control
- Offline Editor - Offline Video Clips and Photos
- Offline Eventing
- Import/Export Workpack
- Task Based Inspection Workpack
- Report Generation
- Built-in Blackbox Recording
- Network Video Streaming
- Network Viewer
- Client Viewer
- Coabis, Nexen & Apollo Support

**HARDWARE**

The 4U Rackmounted version has a total storage capacity of 12TB. The system has 3 removable hard drives, which store the survey data. The Windows 10 operating system is stored on a solid state hard drive for increased speed and reliability, with a second mirrored SSD for redundancy. The laptop version has a total storage capacity of 3TB. The system has an external 2 TB SSD drive, which store the survey data. The Windows 10 operating system is stored on a 2× solid state hard drive (Raid) for increased speed and reliability.
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

DIGITAL VIDEO RECORDING

I. 06.

NETmc MARINE

HQ Location: Turfhill, New Deer, Turriff, AB53 6TL, Scotland, UK

Company Intro

NETmc Marine has been at the cutting edge of digital video solutions since the beginning of the millennium. With market knowledge drawn on over 40 years accumulative field experience, we are the perfect partner to provide solutions for your digital video acquisition projects.

Since the beginning, our innovative products have been favourites for ROV fleet managers and inspection engineers alike. In recent years our DVCi range of ‘over Ethernet/Copper’ cameras have added HD video acquisition capabilities to ROVs without the requirement to upgrade the umbilical or transmission system; thus expanding the capability of the ROV at a modest cost.

Now we are changing the shape of DVRs. By using years of technological innovation we have developed a single adaptive and expandable video recorder. Start with the basic unit and add multi-channel operations, overlay or a number of other options by simply buying a code or renting an upgrade for a specific job.

Tying the cameras and the DVR together is our E-Inspect software, a low cost easy to use integrity reporting package.

With our background in a wide range of offshore projects, including all aspects of diving and ROV video inspections, we will make sure you select right configuration for your application and that the product we sell you is fit for purpose.

Contact

Raymond Ruth
sales.uk@netmcmarine.co.uk
+44 (0)1771 644001

www.netmcmarine.co.uk

FEATURED PRODUCTS

DVR

The NETmc Marine DVR is a new concept in video acquisition; a single unit that can be upgraded in the field simply by adding a new code, it replaces all previous DVRs in our product range.

The basic configuration is a single composite channel recorder, but up to three more channels can be added as well as overlay, black box functionality and compatibility with third party softwares. Imagine being able to covert a single channel unit to a full pipeline spread as easily as adding a USB device.

Other options include HD recording, compatibility with the DVCi range of cameras and recording IR feeds on Coastal and Border Patrol vessels. The system can also be installed in ruggedised cases for portability e.g. to work with the DVCi SR.

N.B. future options may require hardware upgrades.
SYSTEM OPTIONS

Some of the upgrades available:
- Multi channels
- Hi-Def input
- Video overlay
- Blackbox recording
- Integrity Software Control (Coabis/EIVA)

DIGITAL DIVE LOG

The Digital Dive Log (DDL) is an interactive electronic dive log for use with the NETmc Marine DVR Inspector or X-Ops DVR. The software can run on the DVR itself or on a separate PC and automates the input of data normally recorded during ROV and diving operations.

E-INSPECT

Stand-alone workpack driven inspection / video acquisition package – for each workpack a list of Inspection Points or groups of associated Inspection Points can be created, to which Tasks are allocated e.g. take CP.

Chassis options:

1U Rack Mount
- Base model
- Single channel
- composite video or HD

4U Rack Mount
- 4U Rack Mount
- multi channel
- Hi-Def and composite options
- Supports extra storage

Peli Case version
- Ruggedised construction
- IP rated keyboard and connectors

Introducing the revolutionary
DVCi Camera Systems

Complete high definition recording systems featuring cameras, topside and software. Available for use over twisted pair or ethernet.

For more information
+44 (0) 1771 840001
sales.uk@NETmcMarine.co.uk
www.NETmcMarine.co.uk
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Website</th>
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<td><a href="http://www.engelement.com">www.engelement.com</a></td>
<td>Washington, DC, USA</td>
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COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

LAUNCH & RECOVERY SYSTEMS (LARS)
A-FRAMES
We supply a large range of fixed and mobile systems from 6Te to more than 300Te SWL. All of our systems are tailored to our customers’ requirements and are capable of handling vehicles, quadrants, scientific instruments, subsea modules and amongst other tools. Our A-Frame systems can be suited to a variety of vessels such as PSV, survey, dive support, construction and specialised lay vessels. All of our A-Frames are certified to Lloyds and DNV rules.

WINCHES
We offer a range of umbilical lift, storage winches and wire rope towing and lifting winch packages. We are able to tailor our winch systems to incorporate features such as constant tension, active heave compensation, electric / hydraulic drive, safe area or zone 2 operation for operations down to 6000m water depth. Our versatile fleeting systems allow maximum flexibility on winch location and high strength steel reduces weight. Our lifting umbilical winches are capable of handling loads up to 25Te operating in up to sea-state 7. The umbilical cables are double armoured and operate at voltages from 3300 to 4500 volts. Lifting umbilical winches are primarily used to power Q-Trencher ROVs, such as the QT1400 and the QT600 and lightweight tractor systems. Tow winches are primarily used in conjunction with cable plough systems, with tow capacities from 35Te to 200Te tow load. The tow winches incorporate fleeting systems in conjunction with render functions for various towing speeds.

DECK HYDRAULIC POWER UNITS
Our standard deck Hydraulic Power Units (HPUs) are manufactured to interface with SMD A-Frames and Umbilical Winches to minimise deck space, forming a complete equipment handling system. SMD standalone HPUs include dual motors for redundancy and a lightweight open frame design suitable for road transportation. All our HPU’s are designed for easy integration with other SMD equipment and incorporate designs to enable long service life. All SMD built HPUs are available with DNV or Lloyds Design Approval. Ask us about Safe Area or Zone II, Active Heave Compensation (AHC) suitable, containerised and enclosed versions.

LAUNCH SOLUTIONS FOR WORK CLASS ROVS
SMD bring years of knowledge and experience to the design and manufacture of launch and recovery systems (LARS) for operators, system integrators and Original Equipment Manufacturers (OEMs) of Work Class ROV systems and other subsea assets. Standard SMD LARS systems are manufactured to interface seamlessly with SMD WROV systems but can be easily interfaced to other equipment suppliers WROV and TMS systems. All SMD turnkey WROV LARS systems are designed for long service life and are available with DNV or Lloyds Design Approval as standard and can be load tested at SMD’s in-house production facility according to both standards and IMCA if required. SMD’s unique turnkey solutions can include umbilical
wind on under back tensions of up to 12Te, mechanical termination of the bullet (with confidence pull test) and facility for a full system electrical and mechanical stack up test (e.g. Control cabin, HPU, Winch, A-Frame and any other accessories).

Optional features such as Electric Drive, AHC, Enhanced instrumentation and automation packages, deck lighting, cameras and umbilical cooling/monitoring systems are available on request.

GENERAL FEATURES:
Standard 6Te, 8Te, 12Te and 15Te SWL LARS available • Light weight designs • Up to sea state 6 • Road Transportable • Bunded skid bases • Suitable for a wide range of 3rd party ROV’s, umbilicals & slip-rings • Custom designs can be provided

A-FRAME FEATURES:
Self-erecting designs • Anti-crush mechanism • Integrated Docking Head • Pivoting sheave wheel • Umbilical length out sensor • Fail-safe docking head latch system • Outboard safety gates • Main gantry cylinders mounted in-line with legs to improve maintenance access

UMBILICAL WINCH FEATURES:
Dual control for remote or local operation • Closed-loop fleeting control with Manual / Automatic modes • Electric or Hydraulic Drive • Active Heave Compensation Operations • Adjustable fleeting box to allow different configurations of fleeting entry angles • Conventional (Transverse) or Axial Fleeting • Optional bolt-on grooved drum shells • Integrated crash frame with lift points • Fail-safe brake • Quick coupling hydraulic connections

LAUNCH SOLUTIONS FOR TRENCHING ROVS & TRACTORS
SMD offer the most comprehensive range of LARS solutions on the market for trenching ROVs and subsea tractors. This range of LARS has been designed utilising SMDs unique knowledge of trenching vehicles and handling systems. The LARS offers special features for handling heavy in air to light in water vehicles while protecting the umbilical cable at all times. SMD’s dedicated Deck Equipment Sales team are able to advise on optimum deck layout and structural interface of equipment, ensuring that customers are supported every step of the way.

FEATURES:
| Wide and narrow angle A-Frame designs available | Automated launch features with safety interlocks to prevent user error |
| Integrated system controls for ease of operation | Cursor launch systems with lift winches for heavier vehicles |
| Axial or drum fleeting winch options to reduce deck space if required | Slack arm winch option to prevent umbilical snatch loads |
| Designed to Lloyds or DNV rules up to sea state 6 | Passive heave compensation packages for landing over products on the seabed |

LAUNCH SOLUTIONS FOR PLOUGHS
SMD offer a range of LARS for plough systems for operation on multiple applications including fibre optic, power or pipe line installation. We have the ability in house to advise on deck layout to optimise ease of launch and recovery and ensure efficiency throughout the operation. Our sales team also offer vessel integration support and ship design consultancy to ensure that all LARS are designed to meet individual specifications. All SMD LARS are designed for long service life and are available with DNV or Lloyds Design Approval as standard and can be load tested at SMD’s in-house production facility according to both standards and IMCA if required.

FEATURES:
| Standard turnkey packages for fibre and power cable systems | Stabilising Frames to suit a range of systems |
| Wide angle plough launch systems for launching / towing on the same wire | Option to add quadrant handling functionality for power cable operations |
| Heave compensation systems for controlled subsea landing | Range of tow winches and over boarding sheaves |
| Bespoke solutions for pipeline ploughs |  |
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

I. 06. LIFTING & RIGGING

58 RUD – RUD Ketten Rieger & Dietz GmbH
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

LIFTING & RIGGING
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

LIFTING & RIGGING

1.08.

RUD – RUD KETTEN RIEGER & DIETZ GMBH

HQ Location: Friedensinsel, 73432 Aalen, Germany

Regional Offices:
- RUD Chains Ltd. Chestfield, Whitstable CT5 3QT, UK
- RUD Chain Inc. 840 N. 20th Av., 52233 Hiawatha, Iowa, USA
- RUD Chains Pty Ltd. Commerce Place 12, QLD 4110 Larapinta, Australia
- RUD Correntes Industriais Ltd. Rua Andreas Florian Rieger 381, 08745-260 Mogi das Cruzes, São Paulo, Brazil

Company Intro

RUD Ketten, based in Aalen/Germany, is a leading manufacturer of round steel chains, producing top quality chain components and systems for a wide variety of markets and applications, including lifting and lashing means, conveyor systems, hoists and tyre protection. Operating for 140 years you can be confident in the quality and expertise of the RUD product portfolio. RUD is ISO 9001 certified and is renowned for its expertise in heat treatment methods for high tensile steel. RUD’s innovative lifting and lashing solutions “made in Germany” guarantee ultimate safety when lifting, moving and securing heavy loads. Offering over 600 different tested and certified lifting and lashing points, for both bolting and welding, in conjunction with its high quality chains portfolio; VIP (Grade 100) and ICE (Grade 120) RUD provides standard and tailored applications to meet the highest demands in all areas of application of future-oriented lashing and lifting equipment from 80 kg to 200t WLL.

Contact

slings@rud.com
+49 7361 504 1371

RUD ROV HOOK

RUD’s latest innovation, the ROV HOOK, has been specially designed and engineered for the subsea industry. The new RUD ROV HOOK was developed in cooperation with one of the world-leading subsea construction and remote intervention companies, Subsea 7. The hook features a novel outwards moving safety latch, which closes and locks automatically. By providing the highest level of safety and reliability, combined with speed and ease of use, it ultimately reduces operational costs. A simple, but ingenious solution for lowering and lifting loads in harsh subsea applications.

The RUD ROV hook
- No shedding of loads
- No snagging due to its smooth shape
- Innovative mechanism saving time & costs
- Singled-handed operation
- Designed for harsh operational conditions

LIFTING AND LASHING PRODUCTS

RUD disposes of an impressive product portfolio for lifting and lashing means and have earned its global reputation as a leading manufacturer of high quality round steel link chains and associated components working across a vast array of industries, including mining, automotive, machinery manufacturing, construction, military, shipbuilding, maritime and offshore, just to name a few. RUD lifting and lashing products can be used in a wide variety of demanding environments, helping to deliver solutions that are tailored to specific requirements, project aims and working conditions. In particular, RUD’s products have been increasing popular across the offshore industry, due to their heavy lift capabilities of up to 200 tonnes WLL, and their robust resistance to corrosion. RUD components are equipped with award winning RFID technology, enabling users to easily track, identify, inspect and trace their lifting and lashing equipment.
LIFTING/LASHING POINTS

Offering over 550 different tested and certified lifting and lashing points, for both bolting and welding, in conjunction with its premium quality chains portfolio; VIP (Grade 100) and ICE (Grade 120) RUD provides standard and tailored applications to meet the highest demands in all areas of application of future-oriented lashing and lifting from 80kg up to 200t WLL.

VIP CHAINS / SLING SYSTEMS

The VIP range of lifting means (Grade 100 chain) has been established since 1994, and is used in some of the toughest working environments. Although having the same chain diameter as grade 8 chain, the VIP range offers up to 30% increase in the WLL. The chain dimensions range from 4–28 mm (3/16” to 1-1/8”), with a WLL from 0.6t to 31.5t (1386–69300 lbs) in single leg, and up to 56 t (123458 lbs.) in a 4 leg configuration with a balancer.

VIP lifting means at a glance:
- Made from CrNiMo special steel, quenched and tempered
- VIP is less sensitive to notching and hydrogen embrittlement than quality Grade T, 8 or 80.
- Chains stamped with VIP are manufactured with tighter tolerances in the inner width (size B)
- VIP chain awarded via the BG German testing authority to stamp the chain with the following H1 stamp indicating manufacturer’s number: 1=RUD.
- 8S means special quality, higher than quality grade 8
- Offers safe lifting in any direction
- The bending test acc. to standard specifications of DIN EN 818-2-8, bending min F=0.8xd is by far exceeded.
- Comes with multi-functional WLL identification tag enabling simple inspection, can be documented on the tag
- RUD chains and components are in accordance with DIN EN818 and 1677
- Type approved acc. To DNVGL ST 0377 (shipboard cranes) and DNVGL ST 0378 platform cranes in the range of 6-22mm nominal chain diameter.

MASTER LINK CONNECTION

The chain connecting link VRG is attached to the corresponding master link in a permanent but flexible way. The fool-proof clevis connection always ensures that only the correct chain diameter can be fitted. The collection of master links range from the smallest VBK size for the high tensile hoist hooks up to crane hook No. 50 with Bi = 250mm in 1 to 4 leg assembly versions.

VIP COBRA HOOK
- Superior & safer than the common clevis sling hook
- Supplied complete with a forged and tempered safety latch
- Safety latch locks into hook tip to protect against lateral bending
- Safety latch supported by a triple coiled double leg
- Wear edges in both sides of hook protect against abrasion of the chain
- Gauge marks on the hook enable easy inspection for elongation of the width of hook opening

VIP SHORTENING CLAW
- According to DIN 5692
- No reduction of WLL
- Thickened hook tip to avoid misuse
- Chain support facilitated by calibrated lugs
- The u-bend insertion slot protects against accidental chain disengagement
- Can be mounted at every position in chain strand or move...
<table>
<thead>
<tr>
<th>Company</th>
<th>Website</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blueprint Subsea</td>
<td><a href="http://www.blueprintsbs.com">www.blueprintsbs.com</a></td>
<td>Ulverston, England, UK</td>
</tr>
<tr>
<td>Coda Octopus</td>
<td><a href="http://www.codaoctopus.com">www.codaoctopus.com</a></td>
<td>Edinburgh, Scotland, UK</td>
</tr>
<tr>
<td>Echologger</td>
<td><a href="http://www.echologger.com">www.echologger.com</a></td>
<td>Goyang-Si, South Korea</td>
</tr>
<tr>
<td>EvoLogics</td>
<td><a href="http://www.evologics.de">www.evologics.de</a></td>
<td>Berlin, Germany</td>
</tr>
<tr>
<td>Imagenex</td>
<td><a href="http://www.imagenex.com">www.imagenex.com</a></td>
<td>Port Coquitlam, BC, Canada</td>
</tr>
<tr>
<td>Impact Subsea</td>
<td><a href="http://www.impactsbs.com.uk">www.impactsbs.com.uk</a></td>
<td>Ellon, Scotland, UK</td>
</tr>
<tr>
<td>iXblue</td>
<td><a href="http://www.ixblue.com">www.ixblue.com</a></td>
<td>Cedex, France</td>
</tr>
<tr>
<td>Kongsberg Maritime</td>
<td><a href="http://www.km.kongsberg.com">www.km.kongsberg.com</a></td>
<td>Kongsberg, Norway</td>
</tr>
<tr>
<td>Kraken Robotics</td>
<td><a href="http://www.krakenrobotics.com">www.krakenrobotics.com</a></td>
<td>St John’s, NL, Canada</td>
</tr>
<tr>
<td>Norbit</td>
<td><a href="http://www.norbit.com">www.norbit.com</a></td>
<td>Trondheim, Norway</td>
</tr>
<tr>
<td>Nortek</td>
<td><a href="http://www.nortekgroup.com">www.nortekgroup.com</a></td>
<td>Rud, Norway</td>
</tr>
<tr>
<td>Silicon Sensing</td>
<td><a href="http://www.siliconsensing.com">www.siliconsensing.com</a></td>
<td>Plymouth, England, UK</td>
</tr>
<tr>
<td>Sonardyne</td>
<td><a href="http://www.sonardyne.com">www.sonardyne.com</a></td>
<td>Yateley, England, UK</td>
</tr>
<tr>
<td>Sonavision</td>
<td><a href="http://www.sonavision.com">www.sonavision.com</a></td>
<td>Aberdeen, Scotland, UK</td>
</tr>
<tr>
<td>Teledyne Marine</td>
<td><a href="http://www.teledyne.marine.com">www.teledyne.marine.com</a></td>
<td>Thousand Oaks, CA, USA</td>
</tr>
<tr>
<td>Tritech International</td>
<td><a href="http://www.tritech.co.uk">www.tritech.co.uk</a></td>
<td>Aberdeen, Scotland, UK</td>
</tr>
<tr>
<td>Valeport</td>
<td><a href="http://www.valeport.co.uk">www.valeport.co.uk</a></td>
<td>Devon, England, UK</td>
</tr>
<tr>
<td>Water Linked</td>
<td><a href="http://www.waterlinked.com">www.waterlinked.com</a></td>
<td>Trondheim, Norway</td>
</tr>
<tr>
<td>WFS</td>
<td><a href="http://www.wfs-tech.com">www.wfs-tech.com</a></td>
<td>Livingston, Scotland, UK</td>
</tr>
</tbody>
</table>
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

NAVIGATION, POSITIONING & SURVEY
IMAGING SONAR – ISS360

The ISS360 is the world’s smallest imaging sonar which provides exceptionally clear imagery to a range up to 90 meters. Available in Delrin or Titanium and with optional integrated Heading, Pitch & Roll, the ISS360 is ideal for a large number of underwater imaging applications.

- World’s Smallest Imaging Sonar
- 90+ Meter Range
- No Slip Rings
- Optional Heading, Pitch & Roll
- Software to View, Log & Configure
- Depth Rated to 4,000 Meters
- CHIRP Acoustics
- 360° field of vision

ALTITUDE & DISTANCE – ISA500

The ISA500 underwater Altimeter & Echo Sounder provides exceptionally long-range measurement capability – in excess of 120 meters. In addition to providing exceptionally long-range capability, the unit has a 1mm accuracy – allowing precision underwater distance measurements to be made.

- 120+ Meter Range
- Millimeter Accuracy
- Optional Heading, Pitch & Roll
- Software to View, Log & Configure
- Digital & Analogue Interfaces
- Robust & Compact Housing
- Emulate Any Device
- Multi Echo Output

DEPTH & TEMPERATURE – ISD4000

The ISD4000 is a compact, survey grade Depth & Temperature Sensor. Optionally, the unit can also be provided with an integrated Attitude and Heading Reference System (AHRS). This provides highly stable Heading, Pitch and Roll readings.

- 0.01% FS Depth Accuracy
- 0.01°C Temperature Accuracy
- Optional Heading, Pitch & Roll
- Software to View, Log & Configure
- Robust & Compact Housing
- Emulate Any Device
- Digital Interfaces
- Survey Grade
- AHRS
HEADING & MOTION – ISM3D

The ISM3D is a highly accurate underwater Attitude & Heading Reference System. The ISM3D utilises high grade MEMS based Accelerometers, Angular Rate Gyroscopes and Magnetometers all of which feed into an advanced fusion engine driven by a dual core micro-processor.

- ±0.5° Heading Accuracy
- ±0.07° Pitch & Roll Accuracy
- Software to View, Log & Configure
- Depth Rated to 6,000 Meters
- Robust & Compact Housing
- Emulate Any Device
- Digital Interfaces
- Immune to Magnetic Interference

FLOODED MEMBER DETECTION

The ISFMD system provides the latest in underwater ultrasonic Flooded Member Detection technology. Suitable for Diver or ROV deployment the ISFMD system provides the most advanced and reliable Flooded Member Detection system available today. Utilising an ultrasonic probe with a broadband composite transducer together with an advanced digital ultrasonic engine ensures the highest level of accuracy and reliability in readings. The ISFMD system does not use gamma ray or any other radioactive sources. The system is based entirely on the use of ultrasonics. This removes the logistical and health and safety difficulties associated with gamma ray based flooded member detection systems.

- Ultrasonic FMD System
- Visualise Acoustic Returns
- Automatic Report Generation
- Powerful & Intuitive Software
- ROV or Diver Operated
- Probe Orientation Sensor

SEAVIEW SOFTWARE FOR IMPACT SUBSEA SENSORS

seaView is an easy to use software package comprised of multiple applications (Apps) for viewing, logging, calibrating and configuring all Impact Subsea sensors. Additional Apps within seaView allow specific tasks to be undertaken – such as Hydrographic Single Beam Echosounder Surveys or Flooded Member Detection.

- View Live Data
- Log Data to CSV File
- Connect to Multiple Sensors
- Configure & Calibrate Sensors
- Conduct Hydrographic Surveys
- Conduct Flooded Member Detection
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

NAVIGATION, POSITIONING & SURVEY

I.09.

IXBLUE

HQ Location: 34 rue de la Croix de Fer, CS 70121, 78105, Saint-Germain-en-Laye, Cedex, France
Regional Offices: Unit G, The Entreprise Centre, Aberdeen Science & Energy Park, Exploration Drive, Bridge of Don, Aberdeen, AB23 8GX, United Kingdom
11 Erie Drive, 01760 Natick, MA, USA

Company Intro
ixblue is a global leader in the design and manufacturing of innovative solutions devoted to navigation, positioning and underwater imaging, as well as shipbuilding. Using its unique in-house technology, the company offers turnkey solutions to its Civil and Defense customers to carry out their sea, land and space operations with optimum efficiency and reliability. Employing a workforce of 600 people worldwide, ixblue conducts its business with over 35 countries.

Contact
contact@ixblue.com
+33 1 30 08 88 88
+44 1224 355 160
+1 888 600 7573

SUBSEA GYROCOMPASSES AND INERTIAL NAVIGATION SYSTEMS

OCTANS (NANO / 3000)

Octans nano is the smallest and most adept state-of-the-art 4 000 m depth rated attitude and heading reference system (AHRS). It is built on ixblue’s renowned fiber-optic gyroscope (FOG) technology and offshore instrumentation expertise. Octans nano offers an outstanding price/performance solution, with rugged titanium housing, meeting the most challenging requirements of subsea applications.

Octans 3000 is a subsea survey-grade gyrocompass and complete motion sensor for water depths up to 3,000 m. Based on ixblue’s fiber-optic gyroscope (FOG) technology it outputs heading, roll, pitch, heave, rate of turn and acceleration. Octans 3000 can be easily upgraded to full INS mode (i.e. Rovins).

ROVINS (NANO / 3000)

Rovins nano merges the established high-grade ixblue inertial navigation system with our competitive IMU. It is built on ixblue’s renowned FOG truly solid state technology and offshore instrumentation expertise. Rovins nano offers the unbeatable stability and accuracy of the inertial position while simplifying the operation with its automatic and autonomous external sensor management. Rovins nano is the ROV navigation solution you can rely on, bringing an additional level of safety in case of deficient aiding sensors.

Rovins is a survey-grade full featured inertial navigation system for water depths up to 3 000 m. Designed specifically for offshore survey and construction works, Rovins, thanks to its advanced Kalman filter, improves the efficiency of all operations where accurate position, heading and attitude are key benefits. Rovins is offered in stand alone, «DVL ready», and Rovins 154 (for OEM integration) versions.
**PHINS (6000)**

Phins 6000 is a subsea inertial navigation system (INS) providing position, true heading, attitude, speed, depth, and heave for deep water operations. Its high-accuracy inertial measurement unit is coupled with an embedded digital signal processor that runs an advanced Kalman filter. PHINS DVL Ready is pre-assembled and pre-calibrated with a Doppler velocity log version making the system easy to install and ready to use for more precise navigation.

**PHINS COMPACT**

Phins Compact Series has been designed to offer the AUV industry players the ability to choose an inertial navigation system adapted to their vehicle, whatever their size and mission, from accurate navigation to survey grade. Phins Compact Series are fully scalable systems with a similar architecture and interface. The three products includes the same algorithm and software, which enables seamless re-use of the control system on any vehicles’ sizes or types, via modern interfaces such as Ethernet, helping to reduce integration and non-recurring costs.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>OCTANS NANO</th>
<th>OCTANS 3000</th>
<th>ROVINS NANO</th>
<th>ROVINS 6000</th>
<th>PHINS 6000</th>
<th>PHINS COMPACT SERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heading, roll, and pitch</td>
<td>Heading, roll, pitch</td>
<td>Heading, roll, pitch, and heave</td>
<td>Position, heading, attitude, speed, depth, and heave</td>
<td>Position, heading, attitude, speed, depth, and heave</td>
<td>Position, heading, attitude, speed, depth, and heave</td>
<td>Position, heading, attitude, speed, depth, and heave</td>
</tr>
<tr>
<td>Depth rating</td>
<td>4 000 m</td>
<td>3 000 m</td>
<td>4 000 m</td>
<td>3 000 m</td>
<td>6 000 m</td>
<td></td>
</tr>
<tr>
<td>Heading accuracy</td>
<td>0.5 deg secant latitude</td>
<td>0.1 deg secant latitude</td>
<td>0.5 deg secant latitude</td>
<td>0.05 deg secant latitude (with USBL and/or DVL)</td>
<td>0.02 deg secant latitude (with USBL and/or DVL)</td>
<td>0.15 to 0.01 deg secant latitude</td>
</tr>
<tr>
<td>Roll and pitch accuracy</td>
<td>0.1 deg</td>
<td>0.01 deg</td>
<td>0.1 deg</td>
<td>0.01 deg</td>
<td>0.01 deg</td>
<td>0.05 deg to 0.01 deg</td>
</tr>
<tr>
<td>Position with DVL (Doppler velocity log)</td>
<td>N/A</td>
<td>N/A</td>
<td>0.5 % travelled distance</td>
<td>0.2 % travelled distance</td>
<td>0.1 % travelled distance</td>
<td></td>
</tr>
<tr>
<td>Heave, surge, sway accuracy</td>
<td>N/A</td>
<td>2.5 cm or 2.5 % (whichever greater)</td>
<td>N/A</td>
<td>2.5 cm or 2.5 % (whichever greater)</td>
<td>2.5 cm or 2.5 % (whichever greater)</td>
<td></td>
</tr>
<tr>
<td>Optional aiding sensor</td>
<td>N/A</td>
<td>N/A</td>
<td>USBL, LBL, DVL, GPS, Sparse Array (with RAMSES)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

I. 09.

NAVIGATION, POSITIONING & SURVEY

IXBLUE

HQ Location: 34 rue de la Croix de Fer, CS 70121, 78105, Saint-Germain-en-Laye, Cedex, France
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+1 888 600 7573

USBL POSITIONING SYSTEMS

GAPS

The ixblue fourth-generation pre-calibrated GAPS combines high performance ultra-short baseline (USBL) and a fiber-optic inertial navigation system (INS) in the same housing to provide accurate position of any subsea object, in diverse and challenging environments. Its performance ranges from extremely shallow water to deep sea. Its compact and all-in-one design allows both portable and permanent installations. One of GAPS key new features is support of dynamic positioning (DP).

POSIDONIA

POSIDONIA II is an ultra-short baseline (USBL) acoustic positioning system for high-accuracy and ultra–long range tracking of subsea vehicles. It offers enhanced performance with a new electronic cabinet (USBL-Box) including the most recent ixblue acoustic signal processing and full compatibility with RAMSES 6000 synthetic baseline positioning system.

<table>
<thead>
<tr>
<th>4TH GENERATION GAPS</th>
<th>POSIDONIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range (typical)</td>
<td>4 000 m</td>
</tr>
<tr>
<td>Position accuracy</td>
<td>0,06 % of the slant range</td>
</tr>
<tr>
<td>Antenna aperture</td>
<td>200 degrees</td>
</tr>
<tr>
<td>Operating frequency</td>
<td>20 kHz to 30 kHz</td>
</tr>
<tr>
<td>Integrated INS</td>
<td>Yes (PHINS class)</td>
</tr>
<tr>
<td>Option</td>
<td>Hoisting system</td>
</tr>
</tbody>
</table>
ACOUSTIC TRANSPONDERS

**OCEANO LF/TR**

iXBlue provides a wide range of low frequency (LF) transponders to operate with RAMSES 6000 (LF) and POSIDONIA. Standard product range includes transponder and responder modes, internal batteries, and recoverable (RT) or expendable (ET) configuration. Optional configurations are available for many applications.

**OCEANO MF/TR**

iXBlue provides a wide range of medium frequency transponders to operate with RAMSES (medium frequency) and GAPS USBL systems. It includes transponders for shallow water application (export free) to full ocean depth versions, reduced size for small vehicles or full size with long battery life, releasable or expendable, and optional features for easier integration.

<table>
<thead>
<tr>
<th></th>
<th>OCEANO LF TRANSPONDERS</th>
<th>OCEANO MF TRANSPONDERS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depth rating</strong></td>
<td>3 000–6 000 m</td>
<td>3 000–6 000 m</td>
</tr>
<tr>
<td><strong>Operation with USBL systems</strong></td>
<td>RAMSES LF POSIDONIA</td>
<td>RAMSES MF GAPS</td>
</tr>
<tr>
<td><strong>Operating frequency</strong></td>
<td>8-16 kHz</td>
<td>20–30 kHz</td>
</tr>
<tr>
<td><strong>Batteries</strong></td>
<td>Off-the-shelf or rechargeable batteries</td>
<td>Off-the-shelf batteries</td>
</tr>
<tr>
<td><strong>Telecommand unit</strong></td>
<td>iXBlue OCEANO TT801</td>
<td>Through RAMSES MF or GAPS systems</td>
</tr>
</tbody>
</table>

**LBL POSITIONING SYSTEMS**

**RAMSES**

Ramses is an acoustic synthetic baseline positioning system with self-contained computing, for simple real-time sparse array subsea navigation. Tightly coupled with iXblue inertial navigation system (INS), it delivers extreme precision and robustness in challenging acoustic operational environment. Available in MF and LF versions (medium frequency for most applications and low frequency for ultra-long range applications), RAMSES is part of iXblue inertial-acoustic solutions for underwater positioning and navigation thanks to the connection with iXblue GAPS or POSIDONIA ultra-short baseline (USBL) positioning systems.

<table>
<thead>
<tr>
<th></th>
<th>Ramses 6000 (LF band)</th>
<th>Ramses (MF band)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating frequency</strong></td>
<td>8–17.5 kHz</td>
<td>20–30 kHz</td>
</tr>
<tr>
<td><strong>Distance measurement accuracy (1)</strong></td>
<td>&lt; 0.05 m</td>
<td>&lt; 0.05 m</td>
</tr>
<tr>
<td><strong>Position accuracy (INS aided, 2 transponders)</strong></td>
<td>&lt; 0.10 m</td>
<td>&lt; 0.10 m</td>
</tr>
<tr>
<td><strong>Maximum range (1)</strong></td>
<td>8,000 m</td>
<td>4,000 m</td>
</tr>
<tr>
<td><strong>Depth rating</strong></td>
<td>6,000 m</td>
<td>6,000 m</td>
</tr>
</tbody>
</table>
KONGSBERG

HQ Location: Kirkegårdsveien 45, NO-3616 Kongsberg, Norway

Company Intro
Kongsberg Maritime is a global marine technology company providing innovative and reliable technology solutions for all marine industry sectors including merchant, offshore, subsea and naval. Headquartered in Kongsberg, Norway, the company has manufacturing, sales and service facilities in 20 countries. Kongsberg Maritime systems for vessels cover all aspects of marine automation, safety, maneuvering, navigation, and dynamic positioning. Subsea solutions include single and multibeam echo sounders, sonars, AUV and USV, underwater navigation and communication systems.

Contact
km.sales.vancouver@kongsberg.com
+1 888 464 1598
www.km.kongsberg.com

MULTIBEAM SONARS

M3 SONAR®

The innovative design of the M3 Sonar uses two sets of complementary transducers which allow it to generate both imaging and bathymetric data with the same head. Unique to the M3 Sonar is the patented eIQ mode of operation that generates multibeam images with unprecedented clarity.

- Up to 500 m and 4000 m water depth
- Portable, cost effective and light weight sonar
- Generates imaging and bathymetric datasets from one sonar head
- Produces single-beam image quality with the speed of multibeam sonar
- Provides GeoTIFF output and creates real-time mosaic using third-party software
- Compliant to IHO Special Order & 1A
- Uses Linear FM, CW and Doppler pulses
FLEXVIEW SONAR

The Flexview is designed specifically for small observation class ROVs where compact size and light weight are key selection criteria. Delivering superior image quality and coverage, the Flexview sonar reduces the time it takes to search for and locate targets.

- Frequency range: 950 kHz – 1.4 MHz
- Ideally suited for small observation class ROVs
- Distortion-free images at a high update rate
- 200m coverage over a 140° sector, reducing the time it takes to search for and locate targets
- Removable transducer for rapid field replacement
- User-friendly interface
- Low-profile wet mateable connector
- Applications: site inspection, underwater construction support, marine engineering, underwater science, search and recovery, and environmental monitoring

SCANNING SONAR

CLARISCAN

Clariscan is Kongsberg’s latest innovation in domed sonar technology. Clariscan combines the Company’s wide-bandwidth composite transducer with a patented acoustic lens to provide unprecedented image clarity from a domed sonar head.

- Patented acoustic lens technology
- Improved image resolution and sharpness
- Up to 4000 m operating depth
- Applications: obstacle avoidance, pipeline survey, target detection and underwater construction support

ALTIMETERS

Kongsberg’s underwater altimeters are primarily used to measure the altitude (height) of an object above the seafloor and are also suited to various other applications including positioning, berthing and below surface monitoring.

- Robust design
- Easily configurable analog/digital outputs
- Three depth ratings: 3000 m, 6000 m and 11,000 m
- Applications: ROV/AUV altitude, obstacle avoidance, positioning and below surface monitoring
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

I.09.

SV1010 SONAR

The SV1010 is a frequency agile, high performance, compact mechanical scanning sonar. It introduces a faster scan rate and improved resolution building on the solid foundation set by the successful Mercury Scanning Sonar. At the heart of the sonar is a class leading 1:3 composite transducer providing an operating frequency range of 600kHz to 1.2MHz. This continues to provide excellent long range performance at the lower frequencies whilst giving extremely high resolution at 1.2MHz. Improvements to the hardware and internal firmware have provided a scan rate improvement of a factor of typically 2 over the existing Mercury unit. Coupled with the enhanced resolution, this truly sets the SV1010 as the essential sonar to use when quality, reliability and price are all at a premium.

- Compact and robust design
- Evolved from the successful Mercury Sonar
- 1:3 Piezo Composite transducer
- Frequency agile, tuneable 600kHz to 1.2MHz
- True Acoustic Zoom
- Class leading resolution

SV2020 SONAR

The SV2020 is a frequency agile, high performance, mechanically scanning sonar. The SV2020 benefits from the use of similar upgraded hardware and firmware as the new SV1010, giving much improved scanning speeds and the capability of higher data transfer rates. At the heart of the sonar is a class leading 1:3 composite wideband transducer operating over the frequency band of 325kHz to 675kHz. This provides outstanding long range performance and resolution for a sonar of its size. The unit is manufactured from Titanium with its high corrosion resistance and light weight. The transducer is oil filled and compensated and there are no shaft seals to wear out or leak. The unit is capable of 3000m operation.

- Improved, faster scan rate
- Various display modes
  - PPI, A & B Scan and Sidescan
- Compatible with laptop or SCU
- Available in 300m and 3000m depth ratings

SONAVISION

HQ Location: Unit 13, Robert Leonard Centre, Howe Moss Drive, Kirkhill Industrial Estate, Dyce, AB21 0GG, Aberdeen, UK

Company Intro

Sonavision Limited are world leaders in the fields of seabed mapping, imaging sonar and acoustic communications and specialise in design, development and production of acoustic sonar and video technologies for underwater data acquisition. We are industry leaders with many years of experience in underwater technology and pride ourselves on customer service which is why our clients, who range from small companies to local authorities and plcs, highly recommend us.

Contact

Ravi Chandu
sales@sonavision.co.uk
+44 1224 707737

www.sonavision.co.uk
SV4040 SONAR

The SV4040 is a frequency agile, high performance mechanically scanning sonar. The SV4040 benefits from the use of similar upgraded hardware and firmware as used in the new SV1010, giving much improved scanning speeds and the capability of higher data transfer rates. At the heart of the sonar is a class leading 1:3 composite wideband transducer operating over a frequency band of 250kHz to 500kHz. This provides outstanding long range performance and resolution for its size. The unit is manufactured from Titanium with its high corrosion resistance and light weight. The motor assembly is oil filled and compensated and the shaft seal is fully pressure balanced and protected against damage from silt / sand ingress. The unit is provided for 3000m operation as standard.
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

I.09.

TRITECH INTERNATIONAL

**Headquarters, Sales & Support HQ Location:** Peregrine Road, Westhill Business Park, Westhill, Aberdeenshire, AB32 6JL, Scotland, UK

**Design & Manufacture & Service:** Oubas Hill, Next Ness Lane, Ulverston, Cumbria, England, LA12 7LB, UK

**US Sales & Support:** 1323 Price Plaza Drive, Katy, Texas 77449, USA

**Company Intro**
Tritech International Limited [Tritech], a Moog Inc. company is a high-technology business dedicated to providing the most reliable imaging and ancillary equipment for use in underwater applications.

Tritech operates in many professional underwater markets, including; Defence, Energy, Engineering, Survey and Underwater Vehicles and remains an industry leader in the provision of sensors and tools for ROVs and AUVs, a reputation achieved from over 25 years of delivering expertise through key products.

**Contact**
sales@tritech.co.uk
+44 (0)1224 744111

**www.tritech.co.uk**

MECHANICAL SCANNING SONARS:

Tritech's range of mechanical imaging sonars comprises the Super SeaKing DST, Super SeaPrince DST, SeaKing Hammerhead and Micron sonar. All products in the SeaKing and SeaPrince family can be run simultaneously on the ARCNET communication link, using the same processor and display; such as Tritech’s Surface Control Unit (SCU) or a customer supplied PC or laptop.

**SUPER SEAKING (WORK CLASS ROV)**
Tritech’s Super SeaKing sonar is the ultimate mechanical scanning sonar. Utilising Digital Sonar Technology (DST) composite transducer and Compressed High Intensity Radar Pulse (CHIRP) technology, the Tritech Super SeaKing offers exceptional clarity and resolution as a dual frequency mechanical scanning sonar. The Super SeaKing Sonar is the industry-standard obstacle avoidance sonar for larger ROVs and is so popular it can be found fitted to work-class ROV fleets around the world.

The Super SeaKing Sonar hosts two mechanically scanned imaging sonars in a single subsea pressure housing; a 325 kHz CHIRP sonar with a true operational range of up to 300 metres for long range target recognition and a 650 kHz CHIRP sonar for ultra-high definition images, other frequency options are available on request.

**SUPER SEAPRINCE (WORK CLASS ROV)**
The Super SeaPrince has been developed from the industry-standard Super SeaKing sonar. The Super SeaPrince utilises the same Digital Sonar Technology (DST) composite transducer and Compressed High Intensity Radar Pulse (CHIRP) technology, offering exceptional clarity and resolution as a dual frequency mechanical scanning sonar. Built to the highest quality standards, with a hard boot to protect the transducer, the Super SeaPrince is specifically designed for deployment on observation and light work-class ROVs.

**SEAKING HAMMERHEAD (360°)**
The SeaKing Hammerhead is at the forefront of sonar technology, offering high resolution, 360° mechanical scanning imaging. Utilising a wide transducer aperture, the SeaKing Hammerhead has a very fine mechanical step size and proven Digital Sonar Technology (DST), for outstanding image quality. The operational range of the SeaKing Hammerhead is increased with two frequencies; a high chirped 935 kHz frequency to enable high-resolution imagery and a second chirped frequency, 675 kHz to allow for long range capability. The unit also has an integrated three axis compass, to allow the sonar image bearing to be continually displayed and updated.
**MICRON**

The Micron Sonar is the smallest digital CHIRP sonar in the world and is ideal for use by small ROVs, as a first-rate obstacle avoidance sonar in miniature form. CHIRP technology dramatically improves the range resolution compared with conventional scanning sonars – it is a feature normally associated with much larger, more expensive systems. The sonar has a standard auxiliary port to allow it to interface with other Tritech sensors.

**MULTIBEAM SONARS:**

**GEMINI 720IS**

Tritech’s Gemini 720is multibeam imaging sonar provides users with real-time, crisp imagery for applications including obstacle avoidance, target detection and close-range inspection. With a 120 degree field of view, 20 degree vertical beam width (10 degree downward tilt) and a fast update rate of 30Hz, the Gemini 720is sonar is ideal for poor visibility environments. The Gemini 720is features a 720 kHz operating frequency and an integrated sound velocity sensor to assist in providing the sharpest image possible, with accurate ranging. The Gemini 720is utilises Ethernet or VDSL communication allowing it to be installed on most installations. The sonar’s compact size means that it can also be deployed using a pole-mount assembly (customer supplied).

**GEMINI 720IK**

Tritech’s Gemini 720ik multibeam imaging sonar provides users with real-time, crisp imagery at the same performance level as the Gemini 720is but in a smaller shallower rated configuration. A real-time, high frequency imaging solution, the Gemini 720ik operates at 720kHz and combined with Tritech’s advanced processing electronics, it produces images of outstanding clarity, benefitting from 512 beams which results in a 0.25° effective angular resolution. The Gemini 720ik has been developed specifically for shallow water operations with low power consumption and Compressed High Intensity Radar Pulse (CHIRP) processing for greater definition at long range. The product also has an integrated Velocity of Sound (VoS) sensor to ensure extremely accurate imaging and measurement.

**GEMINI NBI**

The Gemini NBI offers a narrow vertical beam and 130° swath. The Gemini NBI produces an acoustic image, cutting through the water with a narrow acoustic beam and at the high refresh rate users can expect from the Gemini range of multibeam sonars. Based on the proven design of the Gemini 720i, the Gemini NBI uses a 1° vertical beam instead of the 20° vertical beam found on the 720i. This reduced beam width allows the user to more precisely identify the position of the acoustic targets than is possible with a wide beam imaging sonar which is commonly used for obstacle avoidance operations. Operating at 620kHz the Gemini NBI is able to produce images with 10mm range resolution while the 0.5° horizontal angular resolution results in an extremely sharp sonar image. Where monitoring your position relative to a known target is the objective and not general obstacle avoidance, then the Gemini NBI can help guide you safely to the desired target. The multibeam transducer design used for the Gemini NBI results in a 130° sector scan width and advanced technology allows update rates as high as 30 scans per second. With wide angle imaging and a high refresh rate the user is able to quickly and effectively manoeuvre to a target in poor visibility conditions. Depth rated to 4000m and manufactured from titanium, the Gemini NBI has been designed to work in the harshest of environments such as those typically found in subsea mining and excavation.
I. 10.

COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

ROV PILOT TRAINING
I. CORPORATE ON-SITE ROV TRAINING

Course duration: Under request  
Languages: English or Spanish.

In addition to providing high quality training courses, QSTAR specialises in supplying on site and corporate training. We also offer training for ROV personnel from different companies worldwide by performing specific on-site training, tailored to the company’s individual needs and providing the best assessment following the IMCA guidelines. Furthermore, QSTAR Marine and Subsea Solutions division have been undertaking ROV installation and commissioning projects internationally, from both offshore vessels and onshore operating bases. QSTAR offers the locations, human technical resources and the experience accumulated over 15 years in services for the maritime industry and training of personnel. We have the most advanced facilities and the environment in order to carry out the specific technical training for the subsea industry and others sectors.
**ROV PILOT TECH. GRADE II**

**Course duration:** 120 hours in 3 weeks.

**Languages:** English or Spanish.

**Course Content:** Built upon the IMCA guidelines (IMCA C005) document R004. The Commercial ROV Pilot Tech II course delivers training on all the Industry standard competencies and goes further with additional technical training modules. The Course content is in line with guidance documents IMCA R002, R004, R010. Practical training are developed in our facilities, quay and on-board a Multipurpose ROV Vessel, performing real operations found in the industry and in Onshore & Offshore Waters.

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**ROV PILOT TECH. PREMIUM**

**Course duration:** 280 hours in 7 weeks.

**Languages:** English or Spanish.

**Course Content:** Built upon the IMCA guidelines (IMCA C005) document R004. The Commercial ROV Pilot Tech II Premium course delivers training on all the Industry standard competencies and goes further with additional technical competencies modules. Also includes additional training in Hydraulics / Electrical / Sonar / 7 function hydraulic Manipulator. The Course content is in line with guidance documents IMCA R002, R004, R010. This is our most complete training program including additional modules like Fiber Optic, Electricity, Electronic and Hydraulic, all of these focussed in the ROVs, its maintenance and repair. Practical training are developed in our facilities, quay and on-board our Multipurpose ROV Vessel, performing real operations found in the industry and in Onshore & Offshore Waters.

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**WORKCLASS ROV MAINTENANCE & REPAIRS**

**Course duration:** 80 hours.

**Languages:** English or Spanish.

**Course Content:** WCROV Maintenance & Repairs: This course consists of a theoretical part about Workclass ROVs, their operation and maintenance as well as a practical part that consists of performing various tasks of maintenance and repairs of Workclass ROVs. A Workclass ROV will be used for the practical module. In addition we will complement the training with 7 functions hydraulic manipulators and with practical piloting with a VMax Professional ROV simulator with different models and scenarios.
<table>
<thead>
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<td>Allspeeds</td>
<td><a href="http://www.allspeeds.co.uk">www.allspeeds.co.uk</a></td>
<td>Accrington, England, UK</td>
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<tr>
<td>Frontier Subsea</td>
<td><a href="http://www.frontiersubsea.com">www.frontiersubsea.com</a></td>
<td>Paradise, NL, Canada</td>
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<tr>
<td>J2 Subsea</td>
<td><a href="http://www.j2subsea.com">www.j2subsea.com</a></td>
<td>Aberdeen, Scotland, UK</td>
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<tr>
<td>Macfarlane Technology</td>
<td><a href="http://www.macfarlanetechnology.com">www.macfarlanetechnology.com</a></td>
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<tr>
<td>Miko Marine</td>
<td><a href="http://www.mikomarine.com">www.mikomarine.com</a></td>
<td>Lysaker, Norway</td>
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<tr>
<td>ROVQUIP</td>
<td><a href="http://www.rovquip.com">www.rovquip.com</a></td>
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<tr>
<td>Seanic Ocean Systems</td>
<td><a href="http://www.seanicusa.com">www.seanicusa.com</a></td>
<td>Houston, TX, USA</td>
</tr>
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<td>SeaTools</td>
<td><a href="http://www.seatools.com">www.seatools.com</a></td>
<td>Numansdorp, The Netherlands</td>
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<td>SengS – Pryme Group</td>
<td><a href="http://www.sengs.org.uk">www.sengs.org.uk</a></td>
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<td>Shark Marine</td>
<td><a href="http://www.sharkmarine.com">www.sharkmarine.com</a></td>
<td>St. Catharines, Ontario, Canada</td>
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<tr>
<td>Subsea Americas</td>
<td><a href="http://www.subseaamericas.com">www.subseaamericas.com</a></td>
<td>Berwick, LA, USA</td>
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<td>Subsea Tooling Services</td>
<td><a href="http://www.subseatoolingservices.com">www.subseatoolingservices.com</a></td>
<td>Aberdeenshire, Scotland, UK</td>
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<tr>
<td>The Blueprint Lab</td>
<td><a href="http://www.theblueprintlabs.com">www.theblueprintlabs.com</a></td>
<td>Sydney, NSW, Australia</td>
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<tr>
<td>ToolTec</td>
<td><a href="http://www.tooltec">www.tooltec</a> ltd.co.uk</td>
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<td>Utility ROV</td>
<td><a href="http://www.utrov.com">www.utrov.com</a></td>
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<tr>
<td>Zetechtics</td>
<td><a href="http://www.zetechtics.com">www.zetechtics.com</a></td>
<td>Amotherby, England, UK</td>
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<tr>
<td>WeSubsea</td>
<td><a href="http://www.wesubsea.no">www.wesubsea.no</a></td>
<td>Kristiansund, Norway</td>
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</tbody>
</table>
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

ROV TOOLING
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

ROV TOOLING

ROVQUIP
HQ Location: South Fornet Business Centre, Westhill, Aberdeen, AB32 7BX, Scotland, UK

Company Intro
ROVQUIP was established in 2012 and founded on decades of experience in Subsea intervention. We aim to challenge conventional thinking – offering our clients responsive, efficient and fit for purpose subsea tooling solutions with flexible thinking. In addition to our range of tried and tested ROV tooling, we have the in-house capability to design and build custom ROV Tooling solutions based on your project requirements. We understand that in the harsh subsea environment “failure is not an option”. You need rugged, reliable equipment.

ROVQUIP understand each project has its own unique requirements and all of our designs are flexible to make them fit for individual project needs. We specialise in concept design, prototype, fabrication and the testing of subsea tooling – either for purchase or rental, worldwide.

Contact
Gary McConnell
gary@aleron-group.com
+44(0)1330 861704

www.aleron-group.com

(This is a sample of tooling from a larger range available from ROVQUIP)

ROV SKID SYSTEMS

The ROVQUIP standard ROV Tooling Skid is suitable for connection to most work class ROV’s. The pin configuration is to fit the Triton XLX ROV as standard. We have a range of skid options available:

The Methanol Injection skid has been designed to inject Methanol at high pressure subsea via a client specified Hot Stab connection at pressures up to 10,000 PSI. Methanol is a dangerous substance for handling therefore the system has been designed for maximum safety with zero leakage at any time. The system has also been designed with a hydraulic seawater switch therefore once filled and deployed and injected the system is flushed before recovery and should never be returned to deck with Methanol still present.

BOP SHUTDOWN SYSTEMS

The ROVQUIP BOP Shutdown System (BOP-SS) has been specifically designed to provide a very high flow and pressure in order to shut down the BOP in under the required 45 seconds set by API standard 53.

The BOP-SS is designed to be run from a 150Hp vehicle and can be used with either water-based glycol, mineral oil or sea water. It has been designed to run directly from the ROV main system with absolutely Zero cross contamination allowing for maximum power input from ROV.

CUTTING & GRINDING TOOLS

17”ROTARY CUTTER

The 17” Rotary Cutter uses strong Steel jaws to securely clamp on to various structures and cut material from a minimum of 10 inches and up to a maximum of 17 inches in diameter. A variety of blade sizes and types can be mounted onto the blade hub, making this cutter not only light and simple to deploy but highly versatile.
MANIPULATOR MOUNTED SAW

The manipulator mounted cutter comes with a 14” Tungsten Carbide saw blade. The tool is designed for mounting onto a Rigmaster manipulator using the wrist bolts for quick installation.

During cutting operations, the manipulator saws are used to secure the ROV to the cut and once secure the motor starts by spinning the blade before actuating a hydraulic cylinder which pushes the blade through the cut.

Although the cutter has an optimum input of 50L/Min it can cut as low as 15L/min meaning it is also an ideal tool for smaller work class systems on IRM projects.

MANIPULATOR MOUNTED DIAMOND WIRE CUTTER

Building on the idea behind the manipulator rotary saw the diamond wire version offers a better stroking distance with the same tooling size. During cutting operations, the manipulator Jaws are used to secure the ROV to the cut and once secure the motor starts by spinning the blade before actuating two threaded rods which push the blade through the cut.

CLEANING TOOLS

We have a range of cleaning tools from 10,000 PSI water Jetting systems to rotary cleaning brushes. Many of our brush heads have been customised for different subsea infrastructure.

IHPU’S AND DWP’S

10K IHPU

We have a number of IHPU’s and Dirty work packs to service a range of subsea tasks.

A commonly used tool is the 10,000psi IHPU, which is a versatile tool used for numerous subsea applications including; Operating BOP Tooling, Transferring Media and Pressure Testing.

The output pressure is directly proportional to the output pressure. This allows the output to be adjusted from 0–10,000 psi (~690 Bar).

The pump can be connected to any subsea reservoir by the suction port (12 JIC). We can supply various sizes of soft reservoir and piston reservoir with an electronic readout depending on requirements.

0–75LPM DWP

A commonly build Dirty Work Pack is our 0-75 LPM unit. Designed to protect the main hydraulic circuit of the ROV system from contamination during fluid transfer operations by providing a isolated circuit this tool is commonly used with higher flow tooling such as dredge pumps.
SEANIC PRODUCTS
Seanic’s high-calibre engineering and development of custom intervention products will power the success of your ROV or diving operations as they face project challenges. Our real-world experience can help you merge cost effectiveness and efficiency into tooling packages that best suit your project needs. We also offer standard product lines that are immediately available for rent or purchase.

TORQUE TOOLS
Seanic’s array of various Torque Tools have been designed in our tradition of providing customers a Simple Rugged and Reliable product. Due to the high cost of downtime in the field, we recognised the industries need for a dependable tool and have built convenience and reliability into our torque tools ranging from Class 1-4, Class 5 and Class 6/7.

PUMPS
This unique pump has the ability to pump a multitude of fluids and can be used for methanol service with no risk of cross contaminating the ROV’s supply oil. These pumps can be delivered with a variety of different reservoirs and directional control valves rated for 10k and 15k service. The pump is rated for use in 10,000 FSW and is made of corrosion-resistant materials, making it robust and reliable for subsea use. The pump is ideally suited for hydrate remediation work, as it can draw a powerful 22 in HG vacuum.
INTERVENTION TOOLS
The LVOT and lockouts are designed to be deployed through ROV intervention. Custom lockout positions are available. In addition to the LVOT, three different size lockouts are supplied to lock the linearly actuated valve at the 2-inch, 5-inch and 7-inch positions. Seanic has also designed and manufactured an API 17H LVOT Type B for use in all standard API 17H Type B linear interfaces. This Tool is capable of 250,000 lbf for linear override, exceeding API 17H standard override force of 167,500 lbf.

STABS, MANIFOLDS & PANELS
Seanic can custom design and manufacture ROV Intervention Panels per customer requirements. All panels and components will be designed and built under API Guidance to ensure ROV friendliness. Our staff has years of experience designing and building this equipment, providing you the confidence it will be done right the first time, every time. Seanic can provide all components such as Hot Stabs/Receptacles, ROV Torque Receptacles, Ball Valve Actuators and Gauges.

CUTTING & DRILLING
Seanic’s hydraulic Core Drill is designed to make holes in jacket legs and other structures for lifting jig installation, flooding or inspection access. The drill is hydraulically actuated and attaches to the structure via sticky feet suction cups. Capable of being operated by any work class ROV of opportunity. Seanic can offer a variety of designs that includes a Mag Drill that allows an ROV to attach the drill to any metallic subsea surface to cut holes of varying diameters.

DECOMMISSIONING TOOLS
Seanic is known for providing robust products for decommissioning projects that includes hydraulic shear cutters, hydraulic grab tools, saws, ROV shackles of various types and sizes. When your planning you next project put Seanic on your list.
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COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

TETHER MANAGEMENT SYSTEMS (TMS)
TETHER MANAGEMENT SYSTEMS (TMS)

Four standard sizes of tophat Tether Management Systems (TMS) are available to suit a wide variety of applications for subsea operations. SMD’s standard units utilise a unique fleeting drum arrangement, which offers a simple tether path for extended tether life. A variety of tether sizes can be accommodated with options. The ultra-long excursion (ULX) TMS can also accommodate vectored thrusters for better subsea positioning.

SMD also offer three sizes of garage tether management system (TMS) which are suitable for accommodating a wide variety of work class ROVs. All models include height adjustment and space for installation of tooling, and many parts are interchangeable with SMD’s ROV and tophat TMS range. The SMD Garage TMS can also be customised to include thrusters for subsea positioning for prolonged periods of time. This is achieved using a unique winding technique which ensures cooler operation. Built in sensors monitor winding temperature as opposed to oil temperature and all motors incorporate oversized bearings for smooth concentric running.
## COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

### TETHER MANAGEMENT SYSTEMS (TMS)

#### COMPACT TOPHAT TMS

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#### ULX TOPHAT TMS

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Copenhagen Subsea
DWTEK
Forum Energy Technologies – Sub Atlantic
Hydromea
Lian Innovative
Marine Propulsion Solutions
maxon motor
SMD – Curvetech
Tecnadyne

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www.maxonmotor.com
www.smd.co.uk
www.tecnadyne.com

Torrance, CA, USA
Copenhagen, Denmark
Taiwan
Aberdeen, Scotland, UK
Lausanne, Switzerland
Shenzhen, China
Batam, Indonesia
Sexau, Germany
Newcastle, England, UK
San Diego, CA, USA

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90 Blue Robotics
92 maxon motor
94 Soil Machine Dynamics Ltd (SMD) – Curvetech
96 Tecnadyne
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

THRUSTERS
BLUE ROBOTICS

HQ Location: 2740 California St., Torrance, CA 90503, USA.

Company Intro
Launched in 2014 and based in Torrance, California, their mission is to provide low-cost, high-quality components to enable the future of marine robotics. Their first product, the T100 Thruster, was introduced in 2014 and since then, they have launched over 200 products including their flagship product, the BlueROV2.

Contact
sales@bluerobotics.com

www.bluerobotics.com/
product-category/thrusters/

THRUSTERS

T200 THRUSTER

The T200 Thruster is a patented underwater thruster designed specifically for marine robotics. With a unique, flooded motor design, The T200 doesn't have any air- or oil-filled cavities – water flows freely through all parts of the motor while it’s running and can handle extreme pressures. An affordable price point, openly available documentation and resources, and a strong community backing have made the T200 one of the most popular thrusters on the market.

Application
The thrusters are purpose-built for use in the ocean and are designed specifically for use on ROVs, AUVs, and robotic surface vehicles. Users include professionals performing inspections of ships and aqua farms, scientists conducting research in the marine environment, and students participating in robotics competitions around the world.
<table>
<thead>
<tr>
<th>Thruster Specifications</th>
<th>T200</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum Forward Thrust</strong></td>
<td>5.1 kgf / 11.2 lbf (@16V) 3.55 kgf / 7.8 lbf (@12V)</td>
</tr>
<tr>
<td><strong>Maximum Reverse Thrust</strong></td>
<td>4.1 kgf / 9.0 lbf (@16V) 3.0 kgf / 6.6 lbf (@12V)</td>
</tr>
<tr>
<td><strong>Minimum Thrust</strong></td>
<td>0.01 kgf / 0.02 lbf</td>
</tr>
<tr>
<td><strong>Rotational Speed</strong></td>
<td>300–3800 rev/min</td>
</tr>
<tr>
<td><strong>Operating Voltage</strong></td>
<td>6–20 V</td>
</tr>
<tr>
<td><strong>Max Current</strong></td>
<td>25 A</td>
</tr>
<tr>
<td><strong>Max Power</strong></td>
<td>350 W</td>
</tr>
<tr>
<td><strong>Phase Resistance</strong></td>
<td>0.18 +/– 0.01 Ohm</td>
</tr>
<tr>
<td><strong>Phase Inductance (at 1 kHz)</strong></td>
<td>0.077 +/– 0.008 mH</td>
</tr>
<tr>
<td><strong>Length</strong></td>
<td>113 mm / 4.45 in</td>
</tr>
<tr>
<td><strong>Diameter</strong></td>
<td>100 mm / 3.9 in</td>
</tr>
<tr>
<td><strong>Weight in Air</strong></td>
<td>0.76 lb / 344 g</td>
</tr>
<tr>
<td><strong>Weight in Water</strong></td>
<td>0.34 lb / 156 g</td>
</tr>
<tr>
<td><strong>Propeller Diameter</strong></td>
<td>76 mm / 3.0 in</td>
</tr>
<tr>
<td><strong>Mounting Hole Threads</strong></td>
<td>M3 x 0.5</td>
</tr>
<tr>
<td><strong>Mounting Hole Spacing</strong></td>
<td>19 mm / 0.75 in</td>
</tr>
<tr>
<td><strong>Cable Length</strong></td>
<td>1.0 m / 39 in</td>
</tr>
<tr>
<td><strong>Cable Diameter</strong></td>
<td>6.3 mm / 0.25 in</td>
</tr>
</tbody>
</table>
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

MAXON MOTOR

Location: Untere Ziel 1, 79350 Sexau, Germany

Company Intro
Maxon drives are used wherever reliability and precision are essential. Our underwater drives with brushless DC motors are pressure compensated, compact and energy efficient. They are perfectly suited to ROVs and AUVs. Having new components at our disposal that are lighter and more powerful is opening up new opportunities. Our specially developed underwater drive, for example, is able to penetrate depths of up to 6000 m and can work in over 95 % of the world’s oceans.

Contact
Marketing
aquaticsolutions@maxonmotor.com
+49 7641 / 9114 - 0 | +49 7641 / 9114 - 0

Maxon motor, the worldwide leading provider of high precision drive technology, draws on more than 50 years of experience and innovation to design underwater propulsion systems. Our motor-gear combinations are developed using DC brushless motors and planetary gearheads.

MAXON THRUSTER SERIES (MT20 / MT30 / MT40 / MT70)

Maxons thrusters are reliable drive solutions for manned and unmanned underwater vehicles such as ROVs (Remote operated Vehicles) and AUVs (Autonomous Unmanned Vehicles). Our underwater propulsions have a maximum depth limit of up to 6,000 meters. Maxon thrusters extend the operation time of underwater vehicles and they achieve longer distances with the same battery capacity. Our engineers focused on an optimal thrust/weight ratio during the development of our maxon thruster. The result is an underwater propulsion which is compact, lightweight and highly efficient. Maxon thrusters are available in sizes ranging from Ø20 mm to Ø70 mm.
## Thruster Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>MT20</th>
<th>MT30</th>
<th>MT40</th>
<th>MT70</th>
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</thead>
<tbody>
<tr>
<td><strong>Weight in air (g)</strong></td>
<td>210</td>
<td>450</td>
<td>960</td>
<td>4361</td>
</tr>
<tr>
<td><strong>Weight in water (g)</strong></td>
<td>130</td>
<td>262</td>
<td>540</td>
<td>2830</td>
</tr>
<tr>
<td><strong>Prop. diameter (mm)</strong></td>
<td>50</td>
<td>80</td>
<td>110</td>
<td>200</td>
</tr>
<tr>
<td><strong>Number of blades</strong></td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Depth rating (m)</strong></td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
<td>6000</td>
</tr>
<tr>
<td><strong>Oil filling</strong></td>
<td>Panolin HLPSyn15</td>
<td>Panolin HLPSyn15</td>
<td>Panolin HLPSyn15</td>
<td>Panolin HLPSyn15</td>
</tr>
<tr>
<td><strong>Pressure compensation</strong></td>
<td>0.1 to 0.7 bar</td>
<td>0.1 to 0.7 bar</td>
<td>0.1 to 0.7 bar</td>
<td>0.1 to 0.7 bar</td>
</tr>
<tr>
<td><strong>Max. forward bollard thrust (kg)</strong></td>
<td>2.2</td>
<td>6</td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td><strong>Cont. forward bollard thrust (kg)</strong></td>
<td>1.2</td>
<td>3.7</td>
<td>7</td>
<td>16.8</td>
</tr>
<tr>
<td><strong>Max. reverse bollard thrust (kg)</strong></td>
<td>1.7</td>
<td>4.4</td>
<td>8.6</td>
<td></td>
</tr>
<tr>
<td><strong>Cont. reverse bollard thrust (kg)</strong></td>
<td>1</td>
<td>2.6</td>
<td>5.5</td>
<td>11.2</td>
</tr>
<tr>
<td><strong>Max. efficiency (%)</strong></td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
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<tr>
<td><strong>Connector</strong></td>
<td>MCBH8M Ti</td>
<td>MCBH8M Ti</td>
<td>MCBH16M Ti</td>
<td>BH16M Ti</td>
</tr>
<tr>
<td><strong>Nominal Voltage (V)</strong></td>
<td>36</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td><strong>Max. current (A)</strong></td>
<td>8</td>
<td>16</td>
<td>29</td>
<td>17.6</td>
</tr>
<tr>
<td><strong>No load current @5000rpm (A)</strong></td>
<td>0.12</td>
<td>1</td>
<td>1.8</td>
<td>1 @2500rpm</td>
</tr>
<tr>
<td><strong>Max. stall current @nominal voltage</strong></td>
<td>78.1 (@36V)</td>
<td>140</td>
<td>470</td>
<td>139</td>
</tr>
<tr>
<td><strong>Cont. current (A)</strong></td>
<td>4.7</td>
<td>10.3</td>
<td>20</td>
<td>17</td>
</tr>
</tbody>
</table>
FOR ALL YOUR SUBSEA COMPONENT NEEDS

With over 20 years' knowledge and experience of providing integrated solutions for subsea and marine applications, Curvetech® subsea component products provide cost-effective and reliable solutions for use with marine and subsea operators, system integrators and Original Equipment Manufacturers (OEMs). SMD’s website offers specifications and 3D CAD models for Curvetech® components so that customers can ensure suitability to their product. Covering a range of applications, the Curvetech® product range includes:

- Subsea vehicle propulsion systems
- Subsea motors and hydraulic power units
- Hydraulic valve control
- Compensators
- Control systems and surface high voltage power units
- Subsea sensors and electrical control cards
- Subsea tooling
- Work Class ROV skid units

THRUSTERS

SMD offer a range of hydraulic thrusters available for subsea vehicle propulsion applications. Curvetech® Thrusters incorporate well proven robust designs that have been used on work class ROVs for over twenty years and offer impressive performance with unparalleled reliability. The latest HTE series thrusters are available in a range of sizes. The units are easy to maintain for minimal through life costs.

SUBSEA ELECTRIC MOTORS (3KV+)

SMD offer a range of oil filled submersible high voltage electric motors suitable for hydraulic power generation or running a variety of water pumps. The units are designed for work class ROVs, trenchers, ploughs, dredge systems and other customer design applications which demand long term reliability and high performance subsea. Aluminium or stainless steel versions are available and customers can choose from a range of electrical connector options. Curvetech® hydraulic motor units are dual-ended and can interface with a range of industry standard pumps. Alternatively SMD can provide a fully integrated subsea power unit with pump units fitted. Each unit is tested and certified to run at full power for prolonged periods of time. This is achieved using a unique winding technique which ensures cooler operation. Built in sensors monitor winding temperature as opposed to oil temperature and all motors incorporate oversized bearings for smooth concentric running.
**SUBSEA POWER UNITS**

SMD offer a range of oil filled submersible power packs suitable for hydraulic power generation or running a variety of water pumps. The units are designed for work class ROVs, trenchers, ploughs, dredge systems and other customer design applications which demand long term reliability and high performance subsea. Aluminium or stainless steel versions are available and customers can choose from a range of electrical connector options. Curvetech® Power Units are dual-ended and can interface with a range of industry standard pumps mounted on one or both ends of the unit. Each unit is tested and certified to run at full power for prolonged periods of time. This is achieved using a unique winding technique which ensures cooler operation. Built in sensors monitor winding temperature as opposed to oil temperature and all motors incorporate oversized bearings for smooth concentric running.

**COMPENSATORS**

With over 20 years of subsea manufacturing experience SMD can offer a range of Curvetech® compensators from a wide range of field proven reliable configurations. All Curvetech® compensators are designed for long-term reliability, simplicity and ease of use.

Monitoring vehicle oil condition is crucial during operations to ensure that the vehicle is functioning correctly. Entrained air, milky looking oil or even small items of debris within the oil are early warning signs that something is amiss with the machine and needs assessment. Capturing these issues early can significantly reduce consequential damage to other hydraulic components within the system. Curvetech® compensators (2.75l, 3l & 6l) have been designed with 100% visually clear windows allowing operators to easily view the oil condition. Industry standard and high reliability Rota transducers are also available and are retrofittable to all compatible units. Integrated relief valves and air bleed points are included on the majority of Curvetech® compensator units and rolling diaphragms ensure no sliding seal surfaces for ultimate system integrity. Curvetech® compensators are compatible with mineral oils and HEES oils as standard – for other oil types please enquire. Optional mounting kits are also available which allow reduced swap-out time – quick mounting and replacement of compensators is achieved via a single bolt whilst keeping them rigidly mounted to the vehicle for operations.

**HYDRAULIC VALVE PACKS**

Curvetech® Hydraulic Valve Packs from SMD are available equipped with solenoid, or servo controlled valves. A varying number of functions, flow rates and pressures can be offered by these lightweight and compact components. All packs include internal valve drive electronics addressed using a RS485 communication protocol (details available). Diagnostic LEDs are visible through the clear polycarbonate valve manifold cover.

**CURVETECH POWER AND CONTROL SYSTEM (PACS)**

Curvetech PACS systems is an integrated package of Curvetech components designed to work seamlessly to deliver hydraulic and electric power and control to any subsea machine. In this manner field proven reliability coupled with the power of Curvetech control technology can be simply integrated to any subsea unit. By supplying the units in a turnkey manner significantly improves engineering integration, reducing equipment interfaces and improving productivity allowing the end client to concentrate on their machines USP whilst SMD concentrate on providing an efficient power delivery system. Curvetech PACS systems can also include top-side tether winches and bespoke control systems utilising our well proven DVECSII control platform. Curvetech PACS can be engineered to suit any customer application including new builds or upgrades and refurbishments to current assets.
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

I. 13.

TECNADYNE

HQ Location: Suite A, 9770 Carroll Centre Rd, San Diego, CA 92126, USA

Company Intro

For over 30 years Tecnadyne has been a leader in the worldwide subsea robotics industry, manufacturing underwater brushless DC propulsion systems, rotary & linear actuators, pan & tilt positioners, hydraulic power units, position sensors, and pressure compensators for use on Remotely Operated Vehicles, Autonomous Underwater Vehicles, manned submersibles and other subsea platforms. Many leading subsea vehicle manufacturers (Deep Ocean Engineering, ECA Robotics, Outland Technology, Shark Marine, Triton, and Uboat Worx to name a few) use Tecnadyne products on their vehicles. These companies value Tecnadyne’s commitment to workmanship, quality and absolute reliability and recognize that this results in the most dependable and longest lasting products in the industry. Tecnadyne products are presently being used on thousands of vehicles throughout the world, operated by many leading offshore oil service companies, universities and research institutions.

Contact

sales@tecnadyne.com
+1 858 586 9660

www.tecnadyne.com

DC BRUSHLESS THRUSTERS

Product Features:
- Magnetically coupled propellers eliminate shaft seals
- Self-contained electronics up to 1500m (24 to 330VDC)
- Full ocean depth available with remote electronics
- Available with RS485 or analog speed control
- Thrust range 2.1 kgf – 230 kgf

<table>
<thead>
<tr>
<th>Model</th>
<th>Thrust</th>
<th>Input Power</th>
<th>Weight</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>2.1kgf Forward 1.1kgf Reverse</td>
<td>125Watts 12, 24, or 48VDC</td>
<td>0.7kg in air 0.5kg in water</td>
<td>Ø7.9cm nozzle 22.6cm length</td>
</tr>
<tr>
<td>260</td>
<td>5.4kgf Forward 1.8kgf Reverse</td>
<td>325–350Watts 24–330VDC</td>
<td>0.9kg in air 0.7kg in water</td>
<td>Ø9.5cm nozzle 22.6cm length</td>
</tr>
<tr>
<td>280</td>
<td>5.4kgf Forward 5.4kgf Reverse</td>
<td>315–350Watts 24–330VDC</td>
<td>1kg in air 0.8kg in water</td>
<td>Ø11.5cm nozzle 22.6cm length</td>
</tr>
<tr>
<td>300</td>
<td>8.2kgf Forward 3.6kgf Reverse</td>
<td>450–500Watts 24–330VDC</td>
<td>1kg in air 0.7kg in water</td>
<td>Ø11.1cm nozzle 22.6cm length</td>
</tr>
<tr>
<td>521</td>
<td>10.4kgf Forward 5.9kgf Reverse</td>
<td>450–500Watts 24–330VDC</td>
<td>1.8kg in air 1.4kg in water</td>
<td>Ø15.2cm nozzle 25.4cm length</td>
</tr>
<tr>
<td>540</td>
<td>10kgf Forward 10kgf Reverse</td>
<td>450–500Watts 24–330VDC</td>
<td>1.7kg in air 1.4kg in water</td>
<td>Ø15.2cm nozzle 23.4cm length</td>
</tr>
<tr>
<td>560</td>
<td>17.3kgf Forward 10kgf Reverse</td>
<td>925–975Watts 48–330VDC</td>
<td>1.9kg in air 1.4kg in water</td>
<td>Ø15.8cm nozzle 23.4cm length</td>
</tr>
<tr>
<td>580</td>
<td>17.3kgf Forward 10kgf Reverse</td>
<td>925–975Watts 48–330VDC</td>
<td>1.9kg in air 1.4kg in water</td>
<td>Ø15.8cm nozzle 29.7cm length</td>
</tr>
</tbody>
</table>

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AUV THRUSTERS

Tecnadyne’s brushless DC AUV thrusters use the same reliable features but with a focus on high efficiency. Each design has an option for direct drive motors to produce less noise.

**Product Features:**
- Brushless DC motor for maximum performance and longevity
- Magnetically coupled propeller drive eliminates all rotating shaft seals for optimum reliability
- Compound planetary gearbox and high rpm motor allows for a compact design
- Propeller designed for increased efficiency at various speeds
- Voltage options between 48 and 330vdc
- Self-contained electronics up to 1500m
- Full ocean depth available with remote electronics
- Available with RS485 or analog speed control

<table>
<thead>
<tr>
<th>Model</th>
<th>Thrust</th>
<th>Input Power</th>
<th>Weight (in air)</th>
<th>Weight (in water)</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>550</td>
<td>10kgf Forward @10knots, 12kgf Forward @3knots</td>
<td>525Watts, 48-330VDC</td>
<td>1.8-2.7kg</td>
<td>1.4-2.3kg</td>
<td>15.2cm propeller, 24.6cm length</td>
</tr>
<tr>
<td>1050</td>
<td>13kgf Forward @10knots, 20kgf Forward @5knots</td>
<td>1.2Kilowatts, 48-330VDC</td>
<td>2.7-4.8kg</td>
<td>1.8-3.2kg</td>
<td>20.3cm propeller</td>
</tr>
<tr>
<td>2050</td>
<td>63kgf Forward @10knots, 113kgf Forward @5knots</td>
<td>6.4Kilowatts, 150-330VDC</td>
<td>10.2-14.5kg</td>
<td>7.7-11kg</td>
<td>38.1cm propeller</td>
</tr>
<tr>
<td>8050</td>
<td>182kgf Forward @10knots, 109kgf Forward @6knots</td>
<td>8.7Kilowatts, 150-330VDC</td>
<td>40-47.6kg</td>
<td>30.8-40.4kg</td>
<td>50cm propeller, 74cm length</td>
</tr>
<tr>
<td>Company</td>
<td>Website</td>
<td>City, Country</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>--------------------------</td>
<td>--------------------------------</td>
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<td></td>
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<tr>
<td>2G Robotics</td>
<td><a href="http://www.2grobitics.com">www.2grobitics.com</a></td>
<td>Waterloo, ON, Canada</td>
<td></td>
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<tr>
<td>3D at Depth</td>
<td><a href="http://www.3datdepth.com">www.3datdepth.com</a></td>
<td>Boulder, CO, USA</td>
<td></td>
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<tr>
<td>Cathx Ocean</td>
<td><a href="http://www.cathxocean.com">www.cathxocean.com</a></td>
<td>Newhall, Ireland</td>
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<tr>
<td>Comex</td>
<td><a href="http://www.comex.fr">www.comex.fr</a></td>
<td>Marseille, France</td>
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<td>Dimensional Eye</td>
<td><a href="http://www.dimeye.com">www.dimeye.com</a></td>
<td>Calabasas, CA, USA</td>
<td></td>
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<tr>
<td>Kraken Robotics</td>
<td><a href="http://www.krakenrobotics.com">www.krakenrobotics.com</a></td>
<td>St. John's, NL, Canada</td>
<td></td>
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<tr>
<td>Marine Sense</td>
<td><a href="http://www.marine-sense.com">www.marine-sense.com</a></td>
<td>Aberdeen, UK</td>
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<tr>
<td>Newton Labs</td>
<td><a href="http://www.newtonlabs.com">www.newtonlabs.com</a></td>
<td>Renton, WA, USA</td>
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<td>Savante</td>
<td><a href="http://www.savante.co.uk">www.savante.co.uk</a></td>
<td>Aberdeen, UK</td>
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<tr>
<td>Viewport3</td>
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<td>Aberdeen, UK</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**NEXT ➔ UNDERWATER 3D IMAGING**

**100** Comex Innovation

**102** Dimensional Eye
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

UNDERWATER 3D IMAGING
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

UNDERWATER 3D IMAGING

I. 14.

ORUS 3D®: OPTIMAL RECONSTRUCTION OF UNDERWATER SITES
The photogrammetry solution that revolutionizes subsea inspection and metrology

The ORUS3D® is recognized as the most advanced underwater photogrammetry solution on the market. (COMEX ORUS 3D® first subsea photogrammetric system certified by BUREAU VERITAS Marine & Offshore Division)

The ORUS3D® non-contact underwater photogrammetry system allows three-dimensional, high-precision modelling of all subsea structures and seascapes.

Each ORUS 3D® system consists of two subsea parts: a neutral buoyancy tiltable support carrying a trifocal optical sensor whose shots are synchronized with 4 high power built-in LED lights, coupled with an acquisition unit, featuring quality control and real-time data processing. The system acquires multiple images of very high resolutions which are then processed automatically in order to deliver the most accurate possible 3D reconstruction of the visually inspected object. The unmatched to date and certified precision of the measurements, allow to realize underwater metrology in all fields of activity, meeting the requirements of the Industry, of Defense and of marine sciences. One of the main features of this standalone system is that it does not require any external underwater navigation sensors (namely USBL, LBL, inertial navigation + DVL, positioning systems) nor specific markers as no scale reference with the objects is necessary.

As a result, this system is completely contactless and non-intrusive. Mounted onto any type of ROV, it can be operated regardless of any constraints on the methodology of acquisition. The system only requires a power, video and data link to the surface from the ROV.

The real-time processing of the data carried out by the embedded acquisition unit enables a visual odometry producing a scaled sparse point cloud, thorough coverage monitoring of the inspected area as well as efficient quality control on each pictures confirming sufficient sharpness, illumination and overlap by a colour code indicator. This real time representation of the area surveyed provides useful indications to the ROV pilot, guiding him in his inspection task and guaranteeing full coverage of the scene. This process also provides all the information needed to validate the data before further post-processing, thus resulting in a 3D model with sub-millimetric precision. These results are usually presented in the form of scattered then dense clouds of dots, which can then be meshed and textured in order to obtain a visual rendering at the closest to reality. They are then accessible to as many people as possible via dedicated tools, web platforms or virtual reality systems.
### UNDERWATER 3D IMAGING

#### COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

<table>
<thead>
<tr>
<th>Specifications</th>
<th>3000 and 6000m systems</th>
<th>300m system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>0.1 mm</td>
<td>0.1 mm</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Sub-Millimetric / no navigation accuracy dependant</td>
<td>Sub-Millimetric / no navigation accuracy dependant</td>
</tr>
<tr>
<td>Optical</td>
<td>Very high-resolution trifocal sensor (Ultra HD stills capabilities) – Pre-calibrated sensor (scaled data acquisition)</td>
<td>Very high-resolution trifocal sensor (Ultra HD stills capabilities) – Pre-calibrated sensor (scaled data acquisition)</td>
</tr>
<tr>
<td>Point Cloud</td>
<td>Adaptive model density – Serval millions point on 1000 square meter or on 1 square meter</td>
<td>Adaptive model density – Serval millions point on 1000 square meter or on 1 square meter</td>
</tr>
<tr>
<td>Scan Method</td>
<td>Free flying data acquisition supported by real time visual odometry, data analysis and QC</td>
<td>Free flying data acquisition supported by real time visual odometry, data analysis and QC</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>300 Watts</td>
<td>250 Watts</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>110V to 310V AC or DC</td>
<td>48V DC or 230V AC</td>
</tr>
<tr>
<td>Data Interface</td>
<td>Optical fiber link, Ethernet link (Gigabit or 10/100) or single copper pair (Gigabit Ethernet Link Advisable)</td>
<td>Optical fiber link, Ethernet link (Gigabit or 10/100) or single copper pair (Gigabit Ethernet Link Advisable)</td>
</tr>
<tr>
<td>Depth Rating</td>
<td>3000m standard (6000m optional)</td>
<td>300m</td>
</tr>
<tr>
<td>Weight</td>
<td>10kg in sea water (3000Msw rated Buoyancy) 100 kg in air</td>
<td>1kg in sea water / 25 kg in air</td>
</tr>
<tr>
<td>Housings Material</td>
<td>Titanium</td>
<td>Aluminium</td>
</tr>
<tr>
<td>Camera Housing</td>
<td>Titanium camera housings with optically corrected glassdomes</td>
<td>Aluminium camera housings with optically corrected glassdomes</td>
</tr>
<tr>
<td>Size</td>
<td>Sensor beam (630×420×550mm); Embedded unit (470×220mm) – Integration from Observation to Work class ROV</td>
<td>Sensor beam (450×225×238mm); strobes powering unit (360×120mm) – Integration from Observation to Work class ROV or Diver handheld</td>
</tr>
<tr>
<td>Connectors</td>
<td>CRE-MARINE 6000Msw (or customer specified on demand)</td>
<td>CRE-MARINE 6000Msw (or customer specified on demand)</td>
</tr>
<tr>
<td>Data Acquisition</td>
<td>Real time acquisition with big data flow management / 2 To data storage standard (more optional)</td>
<td>Real time acquisition with big data flow management / 2 To data storage standard (more optional)</td>
</tr>
<tr>
<td>Data Processing</td>
<td>Real time analysis (Visual odometry, coverage with sparse point cloud, data quality control)</td>
<td>Real time analysis (Visual odometry, coverage with sparse point cloud, data quality control)</td>
</tr>
<tr>
<td>Surface Unit</td>
<td>Fast 3d reconstruction handling very big data collection – Models viewer, metrology tools ...</td>
<td>Fast 3d reconstruction handling very big data collection – Models viewer, metrology tools ...</td>
</tr>
<tr>
<td>Export Data Formats</td>
<td>.obj, .ply, .xyz, .neu, .sti, .3ds, .wrl, .dae, .jas, .e57, .cl3, .pts, .dxf, .u3d, .pdf, .fbx, .kmz, .csv, .asc, .bin, .shp, IGES, .Parasolids ...</td>
<td>.obj, .ply, .xyz, .neu, .sti, .3ds, .wrl, .dae, .jas, .e57, .cl3, .pts, .dxf, .u3d, .pdf, .fbx, .kmz, .csv, .asc, .bin, .shp, IGES, .Parasolids ...</td>
</tr>
</tbody>
</table>
VLS™ (VIDEO LASER SCAN)

Dimensional Eye offers revolutionary optical 3D measurement with VLS™ (Video Laser Scan). VLS™ is the result of a joint development between Dimensional Eye and BP America. VLS™ was developed to overcome specific measurement challenges in the subsea environment, and has proven to be an extremely versatile and highly accurate 3D metrology tool in multiple industries.

VLS™ is a unique combination of photogrammetry and laser technique which provides the advantages of both technologies without the disadvantages. VLS™ provides high-definition visual inspection, as-built 3D CAD modeling, 3D high density point cloud and mapping of deformations and anomalies (for example: cracks, dents, bulges).

VLS™ is a high accuracy metrology tool linked to NIST (National Institute of Standards and Technology) that provides high-redundancy through the volume of data collected (1000’s of still images can be captured from HD video in seconds rather than individual photos taken manually at each location). VLS™ provides reliable accuracy estimates (thanks to advanced processing and self-calibration algorithms developed by Dimensional Eye after years of industry experience in multiple measurement environments and scenarios).

VLS™ is deployed by ROV or divers for subsea applications and by drone for applications in air.

**VLS OFFSHORE APPLICATIONS**

VLS™ (Video Laser Scan™) is deployed by ROV or by divers to gather the data used to create high accuracy 3D measurements and models. If you can fly it, we can model it. The ROV simply flies by the structure in order to gather the data required for modeling. The VLS is designed to work with most ROV systems, contact us for more information on how we can put VLS™ to work on your 3D Measurement and As-Built CAD Modeling challenges.

- Flex Joint 3D Inspections
- Mooring Chain 3D Measurements
- Damage 3D Mapping
- Wellhead 3D Inspections
- Manifold 3D As-built CAD Modeling
- Jumper Hub Alignment
- Spool metrology
- Hull/Propeller Inspections in Water
- 3D As-Built CAD Modeling of any Industrial Installation
VIDEO LASER SCAN™
YOUR ROV IS
YOUR SURVEYOR.
COMPONENT SUPPLIERS AND EQUIPMENT MANUFACTURERS

UNDERWATER COMMUNICATIONS
HYDROMEA SA

HQ Location: EPFL Innovation Park, Bâtiment C, 1015 Lausanne, Switzerland

Company Intro
Founded in December 2014, Hydromea SA is a new start-up from the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland, with the goal to bring the latest advanced technology, from microengineering and robotics to the environmental market. The Hydromea technology is the result of over 10 years of experience gained through research of the founders in underwater communication, localization, propulsion and distributed systems. By leveraging automation and multi-robot systems, Hydromea aims to provide high-resolution in-situ data (which to date cannot be obtained by other means), cost-effectively and fast.

Contact
Alex Bahr
+41 78 746 86 39
info@hydromea.com

LUMA 250LP – ULTRA-EFFICIENT OPTICAL MODEM

The Hydromea LUMA 250LP optical modem combines outstanding performance and energy efficiency in a very compact form factor. Optical communication offers superior data rates, low latency and lower power requirements compared to acoustic modems. This makes it the perfect choice for applications such as data download from submerged sensor platforms (landers), as well as wireless interfacing between ROVs/AUVs and deep sea infrastructure.

The LUMA 250LP is very energy efficient, which makes it ideal for battery-powered applications. It can be configured to enter a sleep mode after a specified time of inactivity, and optically woken up from sleep by another modem when the link is re-established.

The software-configurable serial cable interface can be set to RS232 or RS485, which makes the LUMA 250LP the ideal drop-in replacement for cabled connections in many existing systems.

Features
- Ultra-compact and low weight, ideal for small ROVs/AUVs
- Four transmission power levels: 2–5 W
- Wide supply voltage range
- Ultra-low power sleep mode with optical wake-up
- Encryption of data link, ad-hoc networking (optional, on request)

Applications
- Wireless readout of landers and subsea infrastructure with ROV/AUV
- Low power communication for battery powered underwater devices
- Wireless video streaming for mini ROVs
- Subsea networks at deep sea sites

Specifications
- Dimensions: 100 × 50 × 30 mm
- Weight in air: 250 g
- Weight in water: 50 g
- Data rate: 250 Kbit/sec (up to 600 kbps at reduced range)
- Software features: Error detection, FEC, auto-wake-up (upgradeable for additional features)
- Range: up to 7 m
- Supply voltage: 12–36 V
- Power consumption:
  - sleep mode: < 10 mW
  - active, receiving: 0.5 W
  - transmitting: 2–5 W (typ.)
- Beam pattern: 120 deg. cone
- Interface: RS232 / RS485
- Depth rating: 6000 m
- Connector: SubConn MCIL6M or as requested

www.hydromea.com
LUMA 250LP
Optical modem

- ultra-low standby power
- sleep mode with optical wake-up
- 6000 m depth rating
- 250 kbps data rate
- advanced error correction codes
- RS232 and RS485 interface
- very compact

Ideal for:
- wireless data readout for submerged systems
- ROV-to-lander communication
- battery powered systems

www.hydromea.com
info@hydromea.com
Teledyne RDI’s new Tasman DVL represents the leading edge in DVL technology, promising to take your subsea navigation to the next level.

Teledyne RDI’s Workhorse Navigator created the DVL market nearly 25 years ago, and has remained the gold standard for precision subsea navigation around the globe. Our next generation Tasman DVL, with its reduced size and increased range, has been designed to supersede this industry icon with increased accuracy, improved INS integration, and a game changing field-replaceable phased-array transducer design. With bottom-tracking ranges from 0.15 m to 420 m, in up to 6,000 m water depths, the Tasman is poised to quickly become the industry’s new DVL of choice.

Learn more about the Tasman DVL at: www.teledynemarine.com/Tasman