Commercial off the shelf (COTS)
Products for Naval Applications
COTS – products for Naval applications

**KONGSBERG Maritime Subsea commercial products**

Underwater positioning products

Precision depth recorders

Hull mounted Sidescan sonar (for shallow waters)

Multibeam echo sounders

Sub bottom profiler/3D object search

Autonomous Underwater Vehicles

Sonars for Naval Applications

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**HUGIN 1000 in operation onboard KNM Karmøy Royal Norwegian Navy**
**Commercial Off The Shelf Technology**

Kongsberg Maritime a major worldwide supplier of high quality marine electronics, with a vast range of products ranging from triple redundant dynamic positioning systems for oil drilling rigs to sonars and instrumentation systems for scientific research vessels. The products are designed, tested and produced to be reliable enduring in the tough marine environment. Our specifications for environmental conditions are based upon DNV and ABS specifications and stronger requirements for vibration and shock can normally be met. Commercial, scientific and offshore user requirements and expectations are high, and the products are highly refined before launching to make them free of design defects. However, a world wide service network is in operation 24 hours per day to respond quickly in case of problems. We are of the opinion that many of the Kongsberg Maritime "COTS" products are well suited also for naval applications, and in several cases of equal or better quality than a custom design. In this brochure we present some of our "COTS" products. The matrix below gives an overview of possible operations covered by these products.

The matrix below gives an overview of possible operations covered by our commercial products.

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Underwater positioning products for use in naval operations

Kongsberg Maritime has produced sophisticated acoustic positioning systems for some 30 years, and is today the leading supplier on the world market. While the early products were based upon super short baseline (SSBL) principles alone, the new generation supports both long baseline LBL and SSBL principles, as well as the multi user long baseline principle (MULBL). The use of digital beam forming in the HiPAP systems eliminates or greatly reduces the problems caused by ship noise, so that the position data becomes accurate under a wide range of operating conditions.

HiPAP 500 – provide optimal accuracy and cost effective operations

To achieve world’s best underwater positioning accuracy, HiPAP 500 uses a spherical shaped transducer design and a new signal processing technique. This new technique enables narrow beams to be generated in all directions within the lower half of the transducer using only electronic beam control. The HiPAP 500 operates as an SSBL system, measuring angles and range by using a unique processing technique that provides very high accuracy. For LBL operation the system can simultaneously position several seabed transponders and compute the vessel’s position. The HiPAP 500 has a full spherical transducer body including 241 transducer elements. This model measures an angle to the subsea target with an accuracy of 0.1 degree, and this is the half sphere sector below the vessel. The HiPAP 500 can also track targets above the half sphere sector, all the way up to the surface provided a free line of sight is present.

The use of very narrow listening beams provides:
• High accuracy
• Long range
• Good noise reduction capabilities

The HiPAP 500 is installed with a 500 mm gate valve.
Transponder
The HiPAP systems are designed to accurately position different subsea targets "marked with a transponder". The transponder is the battery-powered subsea part of the system, on which the HiPAP interrogate to get a response pulse to position. Many transponder types are available, varying in size and weight, depending on the size of battery, the mechanical design and the shape of transducer beam. Some transponders are small and weigh only 1 kg in water, whilst other are larger and has battery endurance of 3 years.

Operating modes
The HiPAP system has the following main operating modes:
• **SSBL** – Positions various targets by directional and range measurements
• **LBL** – Positions the surface vessel by simultaneous use of combined directional and range measurements to transponders in an LBL array
• **MULBL** – Positions many surface and underwater vessels in one MULBL transponder array

Application areas
The HiPAP systems are designed to accurately position different subsea targets "marked with a transponder".

In naval operations typical operations are:
• Remotely Operated Vehicles (ROV’s)
• Autonomously Underwater Vehicles (AUV’s)
• Towed bodies
• Seabed deployed structures VDS (variable depth sonars)
• Divers (some transponders are small and weighs only 1 kg in water)
• Fixed seabed installed transponders for marking an area or object and as navigation support for AUV operations.

HiPAP 500 standard features:
• SSBL, LBL, and MULBL operation modes
• 56 transponder channels
• Hull unit for transducer deployment
• WindowsXP-based operation system
• Receive frequency band: 27.0 – 30.5 kHz
• Telemetry frequency band: 24.5 – 27.0 kHz
• Transmit frequency band: 21.0 – 24.5 kHz
• Comprehensive on-line help
• Automatic transducer alignment calibration
• Compensation for ray-bending
• Display of ray-bending
• External depth sensor interface
• DGPS interface
• Responder mode (optional)
• Telegram output to DP and survey systems
• Transponder telemetry for full utilization
HiPAP 350

The system has the same functionality as the HiPAP 500 as it is designed to provide accurate positions of subsea targets such as Remotely Operated Vehicles (ROVs), towed bodies or fixed transponders. To achieve high accuracy, it uses a spherical shaped transducer design and a new signal processing technique. This new technique enables narrow beams to be generated in all directions within the lower half of the transducer using only electronic beam control. The HiPAP 350 operates as an SSBL system, measuring angles and range by using a unique processing technique that provides very high accuracy. For LBL operation the system can simultaneously position several seabed transponders and compute the vessel’s position. The HiPAP 350 has a spherical transducer with a cylindrical body including 46 transducer elements. This model has good accuracy in the +/-60 degrees coverage sector.

The use of narrow beams provides:
- High accuracy
- Long range
- Good noise reduction capabilities

The HiPAP 350 transducer has a diameter of 320 mm and will be installed with a 350 mm gate valve. Installing the system with a 500 mm gate valve will enable an easy upgrade to a HiPAP 500 system.

HiPAP portable

HiPAP portable is a version of the HiPAP 350 that is designed for portable use. A motion sensor is mounted inside the transducer housing, and the transducer is prepared for mounting on a pole rather than a hull unit. By fitting a GPS compass to the top of the pole (i.e. Seapath 20), the system becomes independent of other external systems or sensors, it just needs power.

HPR 400P Family

An HPR 400P system is a stand-alone compact and very portable system. It is based around a rugged, splash-proof, shock resistant and "all in one" portable cabinet. The cabinet contains all the surface electronics necessary for underwater positioning. The portable cabinet is equipped with strong carrying handles and has detachable covers at the front and rear. Together with applicable software and a transducer, the system is easy to use by simply interfacing the applicable transducer to the back-plane of the portable unit. All systems are based around the same portable electronic cabinet, but software and transducer interfaces will vary. The connectors for all interfaces are made easily available from the rear. The transducer may be deployed from any vessel or platform. An HPR 400P system can be directly interfaced to a Differential Global Positioning System (DGPS) receiver, making it possible to give transponder position, Super Short Base Line (SSBL) or vessel position, Long Base Line (LBL) in UTM coordinates.
**HAIN – improve navigation accuracy**

Hydro Acoustic aided Inertial Navigation, or HAIN, can improve navigation accuracy by 2-3 times, by integrating the acoustic positioning measurements from the surface with a Doppler velocity log and an Inertial Motion Unit, both mounted on the subsea vehicle. When these are integrated with HiPAP 500 this represents the best and most accurate navigation system available for ROV’s, AUV’s and other underwater vehicles.

**APOS**

The HiPAP and the HPR systems are operated from the APOS, which is a Windows XP based software. The system can be operated from one single APOS station or from a wide number of APOS operator stations connected on a network as slaves. The APOS software can also be integrated with the Kongsberg Maritime DP system and easily be interfaced to 3rd party software like Win Frog or AquaNav.

**Sensors**

HiPAP systems have a wide range of interfaces to sensors from different manufacturers. A gyro compass a vertical reference sensor and a GPS will normally always be interfaced to a HiPAP system.

**Customers reference list:**

Royal Norwegian Navy – Mine Hunters, Search and Rescue vessel
Royal Swedish Navy – Mine Hunters, Corvettes
Finish Navy
US Navy
Echo sounder for naval applications

Kongsberg Maritime has been a producer of echo sounders for more than 50 years, EA 600 – deep water for fisheries, fisheries research, and hydrographic mapping purposes. Today this technology has shown to be of great value also for naval operations. The first KM MBES EM 3002 was installed onboard RNoN submarine KNM “Utsira” in 2005. The present product range uses digital techniques throughout the processing chain and, has sophisticated bottom detection algorithms. Color LCD screens are used for operation and display, and by separating the transmit/receive electronics from the operation display, one can mount the electronics close to the transducers and cut installation cost, at the same time as increasing performance.

Precision survey echo sounders
EA 400 – shallow water

For maximum flexibility and ease of operation, the EA 400 Series hydrographic single beam echo sounders use Windows®. You can operate the complete echo sounder using the ergonomically designed trackball supplied. You can set up the display picture to suit your needs. You can choose different windows on the screen for echogram, bottom expansion, A-scope and digital depth. You can even control all the functions in the EA 400 with just a click on the screen. These functions include comprehensive context sensitive online help, and your favorite settings can be saved to call them back when needed.

Unique features
• Up to four simultaneous frequencies, frequency range 33_710kHz
• Independent frequency operation, simultaneous transmission
• Built-in bitmap data storage: depth, position, heave and annotations
• Raw data storage with replay
• Memory of favorite settings
• A-scope
• 160 dB dynamic range, non-saturating receiver, no hardware TVG
• Simultaneous use of electronic chart or post-processing software (HYPACK, Hydro, QINSy)
• High resolution sidescan option
• Sub Bottom profiling option (15kHz)
• Colour printer output
• In/out data is time stamped to 1/100 seconds
EA 400 – sidescan option
EA 600 – deep water

EA 400 – sidescan option (for shallow waters)

The side-looking option is available for the EA 400 and EA 400P hydrographic echo sounders. Using a portable or hull mounted sidescan sonar transducer, these echo sounders produce sidescan sonar images for shallow water environments – for a port or dredged channel survey.

Typical applications: Mapping of harbors, inland waterways and shipping channels with critical keel clearance Inspection of underwater infrastructure Detection and mapping of debris and other underwater objects Detailed surveys related to underwater construction work or dredging Environmental seabed and habitat mapping Mapping of biomass in the water column

EA 600 – deep water

EA 600 supports lower frequencies than the EA 400 and is suited for deep water operation. The system can have several pulses in the water at the same time, to maintain a high ping rate in deep water environment. It also has functionality for accurate depth tracking of acoustic pingers.
Multibeam echo sounders

EM 3002  
EM 710  
EM 302  
EM 122

Multibeam echo sounders

Multibeam echo sounders map the seafloor by generating several hundred beams over a crosstrack profile for each acoustic transmission cycle. Each beam generates a sounding. While the survey platform sails forward, the seafloor is covered with a dense pattern of soundings. A better quality of mapping is thus achieved, and the area covered per hour increases. Different models are offered, for different water depth/range requirements, and some of the models come in several versions with different resolution capabilities. The MBES sensor gives the submarine personnel more detailed information of the topography they operate in and thereby increase security and tactical benefits. For the Mine Warfare operations MBES from KM also add great value to mine hunting operations, both installed onboard the MCM vessels and in the AUV HUGIN vehicles.

EM 3002 – shallow water depth/short range

The EM 3002 multibeam echo sounder is a high frequency, compact system suited for permanent or portable deployment on smaller survey platforms, even AUV’s and ROV’s. It is a system for short ranges and high resolution surveys, and will map the seafloor from 1m to 200m below the transducer. EM 3002 can be delivered with 1 or 2 sonar heads. With one sonar head the swath width is limited to 130 degrees or about 4 times depth, while with 2 sonar heads the swath width can be up to 10 times the water depth on flat bottom, and the system can also be used for inspection of structures like quay walls almost to the water surface. A horizontal resolution of 20cm can be obtained. In addition to the sounding data, the system produces high resolution seabed imagery as well as raw sonar data for the water column.
**EM 710 – medium water depths**

The EM 710 multibeam echo sounder is a most flexible tool, for water depths between 2m and 2000m. It comes with a choice of beam widths between 0.5 and 2 degrees, and versions are offered with reduced range performance/reduced cost. The swath width which can be obtained is up to 5.5 times water depth or 2000m. The versions with the highest resolution are suited for detection of objects on the seafloor, according to the LINZ and IHO special order requirements. Both the transmit beam and the receive beams are focused in order to obtain high resolution also for short ranges, inside the acoustic near field.

The highest specified versions can generate 2 profiles, each of 400 soundings, for each transmission cycle. Crosstrack resolution is improved by the high density signal processing. In addition to the sounding data, the system produces high resolution seabed imagery as well as raw sonar data for the water column.
EM 3002 – ocean basins

EM 302 is a multibeam echo sounder with focused beams, which can be used from a depth of 10m to beyond the continental rises, including the shallower ocean basins. It operates down to maximum 7000 m depth with swath widths up to about 9000 m. Small transducers and compact electronics make the installation easy, and the system accuracy is generally well within the IHO standards. The EM 302 is a complete system. All necessary sensor interfaces, data displays for quality control and sensor calibration, seabed visualization and data logging are a standard part of the system, as is integrated seabed acoustical imaging capability (sidescan). EM 302 is offered with different array sizes and beam widths. The higher resolution versions offer 2 bottom profiles per ping cycle, thus doubling the sounding density. Crosstrack resolution is improved by the high density signal processing. orithm is used, in order to provide soundings with the best possible accuracy.

EM 122 – full ocean depth

Full ocean depth multibeam echo sounder with high resolution and dynamically focused beams. It is very well suited for detailed seafloor mapping, with water depths from less than 50 meters up to 11000 in the ocean. Use of long chirp waveforms with pulse compression during reception enhances the maximum range performance; up to 30km swath width is now possible. The system performance is stable in foul weather conditions due to its electronic pitch compensation system and roll stabilized beams. The spacing between soundings as well as the acoustic footprints can be set nearly constant over the swath in order to provide a uniform and high detection and mapping performance. The higher resolution versions offer 2 bottom profiles per ping cycle, thus doubling the sounding density. Crosstrack resolution is improved by the high density signal processing.

Underwater river

Acoustic seabed images of the area south and east of OAHU, obtained with EM 300. Sediment dumping site south of the airport
Sub Bottom Profiler 120/300 (SBP)

The SBP 120/300 Sub bottom profiler is an optional extension to the highly acclaimed EM 120/EM 300 multibeam echo sounder. The receive transducer hydrophone array used by the EM 120/EM 300 is wideband, and by adding a separate low frequency transmit transducer and appurtenant electronic cabinets and operator stations, the EM 120/EM 300 may be extended to include the sub bottom profiling capability provided by the SBP 120/300.

The primary application of the SBP 120/300 is imaging of sediment layers and buried objects. Image quality is influenced by, the spatial resolution of the system, its ability to distinguish objects separated in angle and/or range.

The spatial resolution is given by six separate system properties:
- The angular resolution is given by the array geometry
- The range/time resolution is given by the signal bandwidth
- The ping rate relative vessel speed
- Dense probing along track gives smoother pictures
- The angle of incidence of the transmit beam
- The echoes received are essentially caused by specular reflections at interfaces between layers of different acoustic impedance

Customers reference list:
- EM 710 'Ale', Swedish Maritime Administration, Sweden, 2005
- EM 3002 Dutch Navy Launch, The Netherlands, 2005
- EM 710 HMS 'Endurance', UK Royal Navy, UK, 2004
- EM 3002 H.L. 'Escandallo', Spanish Navy, Spain, 2004
- EM 300 H.V. 'Madaspina', Spanish Navy, Spain, 2004
- EM 1002 HMS 'Roebuck', UK Royal Navy, UK, 2004
The HUGIN AUV concept provides completely new capabilities with respect to data quality and efficiency

HUGIN 1000

The HUGIN 1000 vehicle is capable of performing high-speed survey missions with precise navigation and high resolution payload sensor data. The vehicle can be operated in either operator supervised or fully autonomous mode. The special hydrodynamic shape and overall principles of the original HUGIN AUVs (operating in the North Sea since 1997), combined with the experience from the deep-water HUGIN 3000 vehicles, have been further developed into the HUGIN 1000 design. The additional features of the HUGIN 1000 include minimization in physical size whilst maintaining the ability to carry several different types of survey sensors, including the high resolution HISAS Synthetic Aperture Sonar. The HUGIN concept allows integration of alternative sensors for mine counter measures, environmental assessment, geophysical search and inspection purposes. Sensor implementation is subject to customer demands. HUGIN 1000 is equipped with an advanced Integrated Inertial Navigation System combining navigation data from a range of navigation sensors and positioning systems. From 2008 The HUGIN 1000 vehicles get a new model variant capable of diving to 3000m. This model will be a great advantage in the Offshore Survey and Research market. The first vehicle of that kind is ordered by The Norwegian Defence Research Establishment for delivery in 2008. Early 2008 the first HUGIN 1000MR equipped with HISAS 1030 is planned to be delivered to the Royal Norwegian Navy. That vehicle will bring a new capacity within mine hunting to the Navy. The HUGIN 1000MR to the Finnish Navy will be equipped with a forward looking sonar and capacity to operate under ice.

Final check out before HUGIN 1000 is launched on board KNM Karmøy
HUGIN 3000

The HUGIN 3000, rated to 3,000 m water depth, is 5.3 m long and is powered by a 45 kW aluminium oxygen fuel cell battery, providing a mission endurance of up to 60 hours. For survey operations, the vehicle is integrated with a variety of sensors including Side Scan Sonar, Sub Bottom Profiler, Multibeam Echo-Sounder and CTD. The advanced Integrated Navigation System combines inertial data from an Inertial Measurement Unit with velocity data from a Doppler Velocity Log and position data from the HiPAP SSBL (Super Short Base Line) and GPS. A real time navigation accuracy better than 10 meters, with post-processed accuracy of 3 to 4 m in average obtained in water depths down to 3000 meters. The navigation and control system enables the vehicle to be operated either in operator supervised or autonomous mode. Operations are conducted using a mission plan based on geographic waypoints. Acoustic links for control of the vehicle, reading of sensor data and emergency control is also part of the delivery. During survey operations, 10 per cent of data is transmitted in real-time to the surface for quality assurance. The HUGIN 3000 AUVs have accumulated more than 60 000 survey km for the oil and gas industry (2004).

HUGIN 4500

HUGIN 4500 is a new 4500 meter depth rated version of the HUGIN AUV family. The HUGIN 4500 takes advantage of the well proven HUGIN 3000 technology and extensive field experience. The main difference is found in an extended depth capability, extended battery capacity and more advanced and higher resolution payload sensors. The first HUGIN 4500 will be in operation by 2006.
HISAS -Synthetic Aperture Sonar System

HISAS 1030 is high resolution interferometric synthetic aperture sonar capable of producing acoustic images with a resolution better than 5x5cm over a very wide swath. The sonar is specially designed for Autonomous Underwater Vehicles used for demanding military applications such as mine detection and classification.

The system consists of four main units:
• A set of transducers fitted to each side of the AUV each comprising a 0.27m long/0.18m high transmitter array and two 1.27m long and 0.11m high receiver arrays.
• A pressure container for the HISAS electronic system which is interfaced to and uses signals from the AUV’s integrated inertial navigation system.
• A pressure container for hard disks used for recording of raw data during an AUV mission.
• A FOCUS post-processing system.

The sonar is tightly integrated with the inertial navigation and motion sensing platform systems onboard the AUV and enables the high fidelity recording of position and attitude required for SAS imagery. High resolution SAS images are produced after a run, by post-processing of data collected during the AUV mission. Dynamically focused side-scan sonar imagery and relative bathymetry suitable for rapid environmental assessment (REA) and wet end processing is available in real time. The software suite used for processing of SAS data is named FOCUS and is used to produce full swath streaming high resolution SAS images. FOCUS incorporates integrated SAS micro navigation and inertial navigation, time and wave number domain beam forming, phase gradient auto focus (PGA) and seafloor height estimation by cross-correlation and interferometry. FOCUS processes the complete data stream to SAS strip-map imagery, or one can process the data in spot-mode imagery for selected smaller areas. The imagery is precisely positioned and free from geometric artefacts due to the CO-registered bathymetric data. Currently, SAS processing is performed after AUV recovery. Depending on the desired strip-map imagery resolution and the available space and power in the AUV, HISAS 1030 can also be delivered with real-time wet-end SAS processing capability.
Anti Submarine Warfare (ASW) Operations

The range of Sonars for use aboard Naval vessels can be divided into: Anti Submarine Warfare Sonars for Patrol Boats, Coast Guard and Corvettes. This range consists of a Variable Depth Sonar and a Hull mounted Sonar.

Hull mounted sonar and variable dept sonar detecting a submarine

The sonar technology is based on in-house COTS technology used in different commercial products such as fishery sonars. These products are sold in large numbers world wide, which secure an optimal world wide support when you need it. The sonars have a multifrequency band from 20 to 30KHz, and features moder Sonar functionality. The new operating system WINSON allows for future expansion and lifetime upgrades. The products are already in use in several navies around the world.

ST 2400 with MFC
Mine and Obstacable Detection and Avoidance

Sonar for mine sweepers, submarines and other vessels with the need of detecting and avoiding mines and other object on the sea floor or in the water column. Hull mounted high frequency and high resolutions sonar in the frequency band 80 kHz to 100 kHz. The transducer can be mounted directly on the vessel hull or on a retractable hull unit. The sonar can also be fitted with a mechanical tilt and train unit for full hemispherical surveillance capability below the vessel.

Submarine Active Sonar Suite

The product range of Naval Sonars is based on utilizing the technology from the hydrographic and fishery range of products. Added values for naval operations are optimal. However the mandatory Naval qualifying environmental tests and Integrated Logistic Support system will be included in the supply of these Sonars.
Anti Submarine Warfare (ASW) Operations

Requirements for fleet protection at anchor and protection of fixed installations are addressed by the DDS 9000 series of diver detection sonar. DDS systems can be adapted to ship borne, fixed and mobile deployments, and readily converted from one role to another. System reliability has been established with an earlier mark, the SM2000, having approximately forty systems in use. Customers include the US Navy, US Coast Guard Service and other navies.

Automatic detection, classification and tracking capability is combined with target track data output and audible and visible alarms. Systems can be operated independently or linked to C4ISR systems.

Models with a 200° field of view or 360° field of view are available. Telemetry options include fibre optic and electrical transmission. Standard or custom data output formats are provided. A range of accessories for field operation and deployments are available.

Signals from the DDS 9000 sonar heads are processed by a MS 9000 Sonar Processor and a Defender II Tactical Processor. Both processors are configured using standard COTS components and are interchangeable.

Product training and technical support is provided by Kongsberg. All components in the system are covered by a full 24 month warranty.
PNTCS
Portable Navigation, Tracking & Communication System

The Kongsberg Maritime PNTCS is an integrated system incorporating both above and below water navigation, tracking and communication systems used during submarine rescue operations.

PNTCS provides an operational toolset to facilitate:
• Disabled submarine (DISSUB) localisation, establishment of communications and rapid environmental assessment of the locality.
• DISSUB survey, debris removal and Emergency Life Support Stores (ELSS) supply operations to DISSUB personnel.
• Efficient extraction of DISSUB personnel and transfer of rescuees to the Mothership (MOSHIP).

The containerised system comprises commercial off-the-shelf components configured to provide the operator with a comprehensive planning capability as well as an operational and tactical support system for submarine rescue deployments. The system displays surface and sub-surface navigation, tracking and environmental data provided from integral (or external) sensor packages to present the user with an intuitive and flexible picture within a standard Windows® network environment. The master/slave network provides navigation and tracking information as required to other surface vessels and submersible rescue vehicles (SRVs). The network also facilitates a message handling system.
Underwater Navigation and Machinery Space Video

Underwater Video cameras improve confidence and enhance operational safety when deploying towed arrays and communications buoys from submarines. They can also assist in situational awareness during training and provide an additional confidence check when undergoing manoeuvres in proximity to other vessels. Navigation cameras need to operate in low ambient light with the possibility of high contrast and awkward viewing conditions. Several types of monochrome camera are available for this task.

Long term immersion and the requirements of extended mission duration mean that modifications to seals and housing materials are required. Special mounting brackets to ensure retention during non-contact underwater explosion complete the package of adaptation from standard underwater cameras. Multiple fixed cameras or a single dome camera like the TRZ are better suited to the tight space constraints of under casing viewing than a pan & tilt director because they eliminate any chance of cables tangling with machinery. Carefully planned lighting is essential in enclosed compartments. Recently developed, high reliability LED illuminators or wet/dry lamps are best suited for this application. Our engineers can advise on location, cabling, materials and compatibility issues.

Vessel CCTV

Vessel CCTV is essential on the modern warship or support vessel for conduct of flight operations, deployment and recovery of equipment, close quarter manoeuvring and docking. It can also provide additional security when alongside or whilst the vessel is not fully crewed.

A range of colour, monochrome and thermal cameras designed for the maritime environment for both vessel and offshore applications allows the correct selection of camera for any part of the ship. Complete systems are available using analogue or networked digital transmission. Recorders and remote control options are available to suit any installation.

Kongsberg has many years of experience in providing full military solutions for CCTV and now offers a commercial range of equipment built to the same high standards and offering improved performance and value.
**We are always there, wherever you need us**

Kongsberg customer services organisation is designed to provide high-quality, global support, whenever and wherever it is needed. We are committed to providing easy access to support and service, and to responding promptly to your needs. Support and service activities are supervised from our headquarters in Norway, with service and support centres at strategic locations around the globe – where you are and the action is.

As part of our commitment to total customer satisfaction, we offer a wide variety of services to meet individual customers’ operational needs. **Kongsberg support 24** is a solution designed to give round-the-clock support. For mission-critical operations, Kongsberg support 24 can be extended to include remote monitoring. We can adapt the level of support needs by offering service agreements, on-site spare part stocks and quick on-site response arrangements.

**Global and local support**

We provide global support from local service and support facilities at strategic locations world wide. Service and support work is carried out under the supervision of your personal account manager, who will ensure that you receive high-quality service and support where and when you need it. Your account manager will ensure continuity and work closely with your personnel to improve and optimise system availability and performance. Under the direction of your account manager, and with a local inventory of spare parts, our well-qualified field service engineers will be able to help you quickly and effectively.

**Solid competence reduces cost**

We have always recognised the importance of supporting our products and systems with professional training. A wide range of courses are therefore offered to ensure that you achieve the goal of full system utilisation with safe and efficient operation.

**Upgrading that pays**

Product and system upgrades can improve your vessel’s operations and reduce your overall maintenance costs. We will ensure that existing products and systems can be extended or upgraded based on standard upgrade kits.

**Support 24**

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