K-POS

DYNAMIC POSITIONING
OPTIMIZING COMPLEX VESSEL OPERATIONS
MAXIMIZING PERFORMANCE BY PROVIDING
THE FULL PICTURE

OUR MISSION
We shall earn the respect and recognition for our
dedication to provide innovative and reliable marine
electronics that ensure optimal operation at sea.
By utilising and integrating our technology, experience
and competencies in positioning, hydroacoustics,
communication, control, navigation, simulation, and
automation, we aim to give our customers
The Full Picture.

The Full Picture yields professional solutions and global
services that make a difference enabling you to stay ahead
of the competition.

OUR PHILOSOPHY
Our success depends on the success of our customers.
Actively listening to our customers and truly understanding
their needs, and then translating these needs into
successful products and solutions is central to achieving
our goal.

Our people are the key to our success and we empower
them to achieve. Working together in a global network of
knowledge, guided by our values, engenders innovation
and world class performance. Every day we have to think
a little differently, because every client is unique. We aspire
to translate the imagination and dedication of our staff into
successful technologies and solutions. Our commitment is
to add value to your operations by providing you with The
Full Picture.

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KONGSBERG SYSTEM TECHNOLOGY

Individual systems – one solution
KONGSBERG System Technology approaches ship operation more intelligently. With better technology, functionality and life cycle support, KONGSBERG System Technology furthers safe efficient operations, reduces the overall costs of ownership, and is scaleable to suit individual customer needs. With our pledge to total excellence KONGSBERG System Technology is comprehensive, secure, scalable, integrated and completely reliable.

KONGSBERG System Technology yields a distributed and open system design, utilizing a system wide standardized communication network. The network facilitates for easy integration of other vessel systems and free flow of information from all subsystems, with vessel wide information available on multi-functional workstations. Common base technology and user interface provide for a safe and an efficient operational environment, with consistent operation and increased reliability.

KONGSBERG System Technology extends further than a traditional integrated and distributed system. With decades of real life operational experience and knowledge translated into our functionalities, KONGSBERG System Technology enables us to continue providing our customers with system solutions that make a huge difference to operations.

Solutions that make a difference
Applications and functions are always developed in close co-operation with experienced users, with clear business benefits in mind. By integrating high user competence with technological excellence, we provide solutions that make a difference. A wide range of standard and application specific functions are available, all designed to optimize the marine performance.

Added values
KONGSBERG System Technology ensures a uniform, intuitive user interface, enabling operators to develop professional skills in system operation, reducing the risk of human error and thus enhances the operational efficiency. With different functions applied on the same hardware platforms, the amount of onboard spare parts can be reduced and savings made. In addition, excellent maintainability and simple upgrading solutions reduces the all life cycle costs. The KONGSBERG across the board competence means that we can tailor the solution that best meets each individual customer’s specific operational needs.
Decades of experience – optimal solutions

With the introduction of the K-Pos family of dynamic positioning systems, increased performance and reliability have been brought to DP operation. With more than 30 years of experience from close to 1500 DP systems in operation, the K-Pos takes dynamic positioning to a new standard of robustness, flexibility, functionality and ease of operation. The K-Pos includes a complete range of DP systems, ranging from single stand alone solutions to the most complex IMO Class 3 systems and beyond. Interface and supply of our broad range of position reference systems and sensors provides total system transparency and interoperability throughout the system.

In addition to our extensive library of standard modes and functions, a number of tailored functions are available to assist in specific operations. The functionalities covers operations scenarios ranging from work boats to MPV, and from shuttle tankers and FPSO to drilling vessels and drilling rigs to name but a few.

The system is designed with an open system architecture and thus with unique integration qualities. The K-Pos enables the realization of perfectly tailored solutions, scaled to economy and operational needs.

Verified performance

Every detail is optimized for continuous, safe and reliable service with favourable life cycle cost.

The systems are capable of interfacing virtually any propulsion device and positioning sensor in the market.

In line with the increased requirements for verification of safe performance, K-Pos is provided with interface to CyberSea “Hardware In the Loop” (HIL) test system, fully compliant with the DNV standard.
Unmatched performance
The K-Pos system is designed to keep the vessel within specified position and heading limits. In operation the system tolerates transient errors in the thrusters and measurement systems and acts appropriately if a fault occurs. A self adapting Extended Kalman Filter estimates the vessel's heading, position and velocities and the disturbances from sea current and waves. The estimator uses an accurate mathematical model of the vessel. Kalman filtering technique using the model prediction together with real measurements provides unsurpassed filtering quality, robustness and station keeping performance. Several levels of reference system quality checks are implemented to reject incorrect position readings. The Kalman filter automatically adapts to the quality of the reference systems as well as their data rates. All accepted reference systems are used at all times with optimal mix to avoid any discontinuity.

Offshore trials have verified that our special Kalman filtering implementation improves suppression of noise and thus providing a comparatively better station keeping performance with less fuel consumption and reduces the wear and tear on the thrusters.
OPERATIONAL MODES

The K-POS systems allow the vessel to be operated in several different operational modes

**Auto Heading mode**
In the Auto Heading mode, the system accurately controls the heading:
- Present Heading, which maintains the vessel’s current heading
- Change Heading, which rotates the vessel to the specified heading applying specified rate of turn
- Minimum Power Heading, which continuously optimizes the vessel’s heading for the lowest power consumption

**Auto Position mode**
In the Auto Position mode, the system automatically controls the heading and position of the vessel:
- Present Position, which maintains the present vessel position
- Change Position, which moves the vessel to a new position with requested speed and acceleration

**Joystick mode**
In the Joystick mode, the operator controls the vessel using the three-axis joystick. Joystick operation can be combined with automatic heading control or with partial position control to ease e.g. docking. It can also incorporate automatic wind compensation to allow increased operational focus on ship handling.

**Autopilot mode**
Wheel-marked Autopilot can be integrated in the DP system. Speed can be controlled by propulsion levers or system joystick.

**Predictive control**

**Power consumption**
Green Control
The GreenDP® is designed with the objective of further reducing fuel consumption and wear and tear on mechanical parts of the power and thruster system. This sophisticated system employs a control strategy called "Non-Linear Model Predictive Control" that uses the smallest possible thrust vector, and thus power, to keep the vessel inside user defined boundaries of the working and operational area, as opposed to the traditional "bull's-eye" station keeping.
Inside the working area, the controller gives a slowly varying thruster demand that compensates for the average environmental forces acting on the vessel. When the controller predicts that external forces will move the vessel outside the predefined boundaries, demand for more restoring thrust is swiftly issued.
Studies of deep water drilling operations have shown that a minor sacrifice in station keeping accuracy pays off by a fuel reduction of about 20%, with reductions in power variations as much as 50 – 80%.

Follow Target mode
The K-Pos system can command the vessel to follow an ROV during e.g. pipe inspection using hydro acoustic measurements from mobile transponder mounted on the ROV. Similarly it can e.g. make an OSV automatically follow the weather vaning of an FPSO using relative and absolute position measurements.

AutoTrack mode
A track may be the wanted vessel track, as common to survey operations, or the wanted track of a cable or a pipe being deployed. The track can be navigated with different strategies, depending on vessel speed. Special functions are available for operations with restricted crab angle and for step by step advance and stop along the track. The track can be defined by functions within K-Pos, or it can be imported from an external track planning system.
INTEGRATED VESSEL MANAGEMENT

Seamless integration
The Integrated Vessel Management concept supports seamless integration of all vessel control systems. Bridge systems, that is navigation, manoeuvring, propulsion and thruster controls, are linked to machinery and cargo automation and safety systems by means of system-wide communication highway.

The system-wide communication network enables free flow of information within the Integrated Vessel Management System. All operator stations, controllers and interface units are linked together via the redundant communication network. In order to segregate the different parts of the Integrated Vessel Management System, advanced network segmentation switches are applied. These isolate internal data traffic within the segment to avoid overloading, and also isolate electrically the different segments. Each subsystem of the Integrated Vessel Management forms an autonomous system which is not affected by a failure in other subsystems.

Common technology
— prepared for the future
All bridge and automation products share common KONGSBERG System Technology which ensures seamless information sharing, consistent operation environments and reduces spare parts and training requirements.

The flexibility is not only characterized by the open system architecture, horizontal/vertical integration and communication, but also by the software structure and data exchange interfaces. Thus, KONGSBERG System Technology can easily be combined with components from other vendors, and integrated into existing infrastructures.
The distinct part of the integrated solution
The real-time DP control itself is carried out by the DP Controller which also takes care of all interfacing to sensors, power plant and thrusters. The controller can be installed in any suitable location, e.g. in an instrument room or void space. The DP Operator Stations handles all operator interactions. In addition to ordinary operator stations, indoor and outdoor joystick terminals may be added.

K-Thrust Thruster control
When thruster control is supplied, the thruster interfacing and local monitoring and control are provided by separate controllers providing one autonomous system for each thruster. Manual levers are hooked up to the thruster controllers with separate lever buses. These buses connect all levers, panels and indicator instruments needed in the bridge area, hence simplifying cabling. Command responsibility transfer between command locations is built into the thruster controllers as a common resource for both DP and thruster control, securing simple and uniform operation.

DP / Manoeuvring
APPLICATIONS TAILORED TO YOUR OPERATION

Special applications
In addition to the standard operational modes and functions, various tailored functions are available to optimize vessel operation for a wide range of applications and vessels. The following applications are but a few of the special applications available for our customers:

- Offshore loading
- Cable laying
- Pipe laying
- Heavy lifting
- Trenching Dredging
- Drilling
- Cruise manoeuvring
- Yachting

We also supply tailored functions for many other special application areas and have the competence to support our customers with new applications as their requirement evolves.

Your working conditions require reliable solutions.
In position with reduced fuel consumption
The weather vane operation mode is used for offshore loading, making it possible to reduce the thruster force required to retain the vessel's position relative to the offshore loading buoy or FPSO. The weather vaning utilizes the stabilizing effect of the environmental forces acting on the vessel's hull. Weather vaning is available for all modes of offshore loading, e.g. SPM, OLS, SAL and tandem loading (FPSO).

Optimal deep water drilling
The Riser Management System (RMS) assists in all phases of the drilling operation. From the planning of riser make up through drilling in changing environmental conditions, the RMS ensures safe and efficient operation through extensive monitoring and supervisory features. Optimal vessel positioning during drilling operation is enabled by taking into account riser angles, tension and the specific riser characteristics. The RMS is available with a signal processing module, providing back-up for position reference signal to the DP. 

Pipe laying on track
During pipe laying operations, the DP system controls the vessel's movement and the pipe tension is compensated to ensure optimum performance. The function covers flex pipe laying as well as rigid pipe laying for both S-lay and J-lay configurations. The auto track function allow the vessel to follow a defined track or for the pipe to be laid along a defined pipe track. Similar special functions are also available for e.g. trenching, dredging and cable laying.

The yachtPos and electronic anchoring
The KONGSBERG yachtPos is a dynamic positioning and joystick system specially developed to meet the manoeuvring and station-keeping (electronic anchoring) requirements of the Mega Yacht market. The system offers advanced wind compensated joystick control with automatic heading control, advanced full automatic position control as well as auto piloting. The Electronic Anchoring – Green control is designed for maximum onboard comfort and minimum fuel consumption and wear and tear on the propulsion equipment.
Optimal bridge environment
We design our systems and operator stations with people in mind. Armed with the full picture of how mariners interact with their environment, we have developed the best possible design for maximum efficiency and safe operation. Our ergonomic design blends the best abilities of the operators and the computer user interface for optimum performance.

Our well designed work stations and operators stations ensures that operators perform their jobs in optimal comfort, without experiencing the unnecessary physical and mental fatigue that can slow work performance, reduce accuracy, or cause accidents.

K-Bridge
The K-Bridge integrated navigation system is based on our sophisticated bridge system technology. All operator stations, controllers and interface units are linked together via a dual data network. The network connects the navigation and DP systems with the other subsystem onboard, constituting a ship-wide data highway, easily allowing for e.g. NAUT-AW and NAUT-OSV compliance.

Navigation and manoeuvre
The design and location of the workstations enables the vessel to be navigated and manoeuvred safely and efficiently by one navigator in ocean areas and coastal waters under normal operating conditions, as well as by two navigators in close co-operation when the workload exceeds the capacity of one person.

Operation
The design of the aft workstations enables safe and efficient positioning and manoeuvring of the vessel during operation, with operation specific controls within easy reach.
Controller HW
K-Pos systems pursue the well known KONGSBERG principles for segregation and redundancy for robustness and system availability. The controller unit is a unique design based on the common KONGSBERG Technology, specially engineered for use in DP control systems. This is particularly reflected in its scalable module concept which corresponds to the overall architecture of a DP system. The controller can be equipped with one, two or three processor units, supporting single, dual and triple redundant DP control systems. The processors are synchronised on a dual network inside the controller cabinet. This network is separated from the process network, which is reserved for communication with other segments of a KONGSBERG vessel system. The solution ensures that the DP controller will continue operation even if there is a system failure at a higher level.

Each controller communicates with a single or a dual IO bus, corresponding to the level of processor redundancy. Field signals are connected to IO blocks attached to the bus. Each thruster is totally segregated. There is one block per thruster unit and no common single points. Combined with processor and IO bus redundancy, the operational effect of a single failure inside a redundant controller will never exceed the effect of an external equipment failure. The scalability of the concept is ensured by the modular architecture. A hardware upgrade to a higher redundancy level involves additional processor(s) and connections to the IO bus. The controller cabinets are provided with free space intended for such extensions.
UPGRADING THAT PAYS

Position reference systems
KONGSBERG offers the complete range of position reference system solutions to any DP operation:
- The DPS and DARPS family of DGPS products for professional offshore use
- The HiPAP, the most advanced and versatile underwater acoustic positioning system
- The RADius, the new radar based high precision short range system
- The Riser Position Reference system utilising the drilling riser and sophisticated signal processing to its instrumentation for backup positioning
- Laser based short range system
- Light weight taut wire

From the wide range of available reference systems suitable combinations can be interfaced to the DP system to meet the special application and DP class requirements.

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.

New operational requirements can be met and at the same time lower maintenance costs and improved operation will justify the investment. Our product renewal programme ensures that you will have competitive products and systems throughout the lifetime of your vessels.

What we do and what you get
We remove the existing computer, I/O cards, monitor and controllers and refurbish the existing sensors and positioning reference systems. We install new computers, I/O units, power supply, operator panels and flat screen monitors. You get updated and improved versions of your existing functionalities, an easy to use Windows based operating environment, and reduced maintenance costs and extended lifetime of the equipment.

Kits for upgrade
Upgrade kits are ready available for KS503/311, ADP100 and ADP70X. Upgrades can take place during docking of the vessel, however and more so often, hot upgrade is available when time is of essence for you operation.

The DP system onboard Navion Akarita was upgraded with our newest dynamic positioning technology without installation of any extra cabinet or external cables. All existing sensors and reference systems were reused.
LIFE CYCLE SUPPORT

Designed to purpose – maintained to last
Our life cycle management service will assist our customers throughout all the phases, from design to commissioning and during the operational life time.

Solid in-house competence, both in system design and user competence enables us to provide solutions that are fit to purpose and thus yields efficiency in operation. Our common base technology provides robust designs, with few and reliable parts, an excellent foundation to maximize the output at competitive costs.

The distributed and open system design employs an industry standard communication network. Standard hardware components used for various applications and the open network approach results in:
- Increased reliability
- Competitive life-cycle support
- Easy up-grade solutions

Evergreen
We offer continuous hardware and software upgrade to keep your vessel at maximum efficiency. Our system is designed with consistent boundaries between individual systems and control segments. This design strategy makes it easy to add new functionality or complete new control segments thus enable us to offer up-grades step by step to keep your system evergreen.

Training
Qualified personnel are one of your major assets in efficient and safe operations. Thus, we offer modular training courses for all major subjects – from operator training to technical training that keeps your crew fit on the job.

PLANNING & DESIGN
PROJECT ENGINEERING & DEVELOPMENT
INSTALLATION & COMMISSIONING
OPERATION & MAINTENANCE
MODERNISATION

Supported by professionals
Our systems are easy to install and maintain – supported by professionals either on-site or through remote connectivity. They are designed for optimal operational availability and allow for favourable lifecycle expenditure.
We are always there, wherever you need us. KONGSBERG customer services organisation is designed to provide high-quality, global support, wherever and whenever 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. Global support 24/7 is a solution designed to give round-the-clock support. For mission-critical operations, Global support 24/7 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 wellqualified field service engineers will be able to help you quickly and effectively.

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