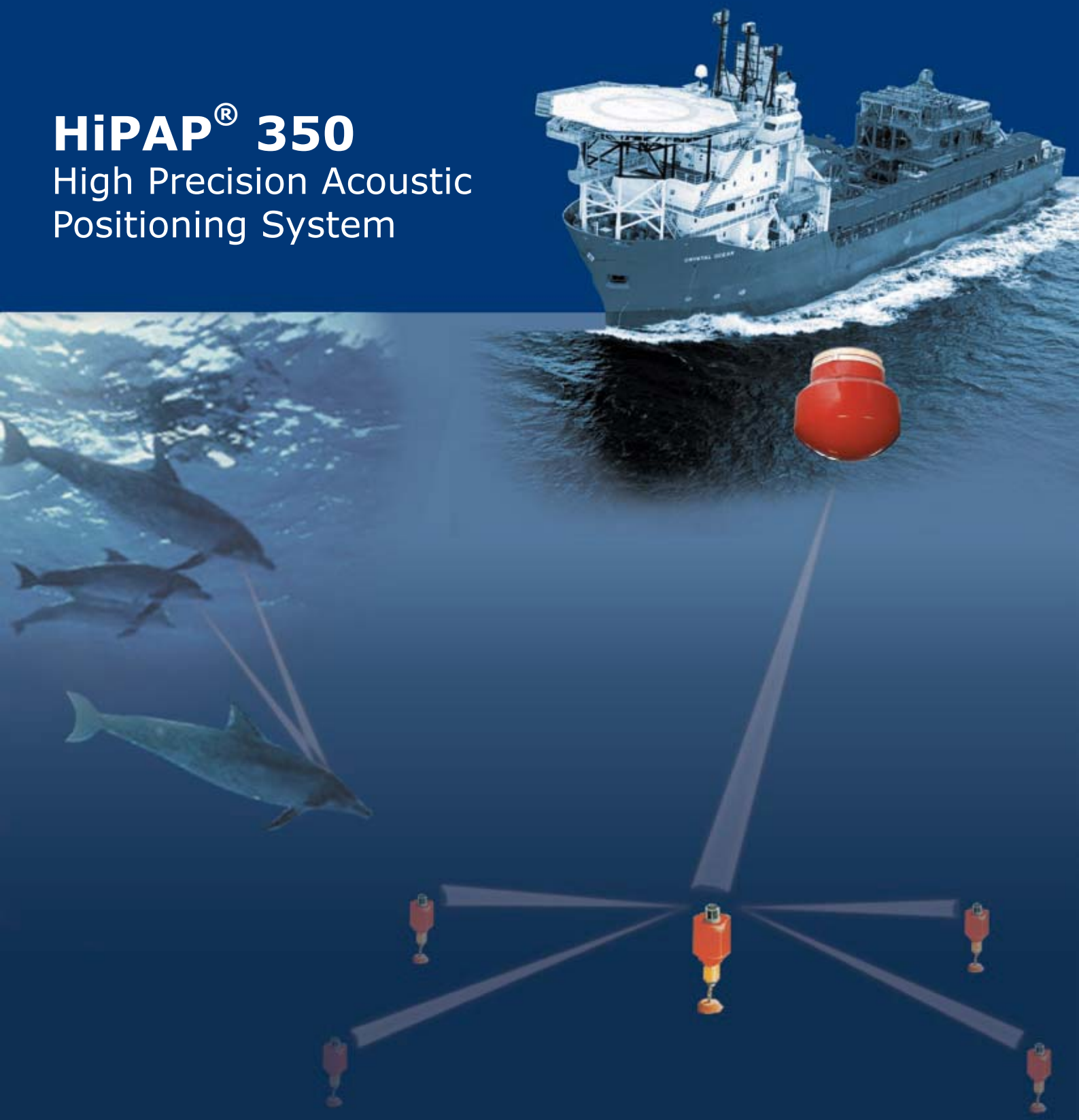
KONGSBERG

HiPAP® 350

High Precision Acoustic Positioning System

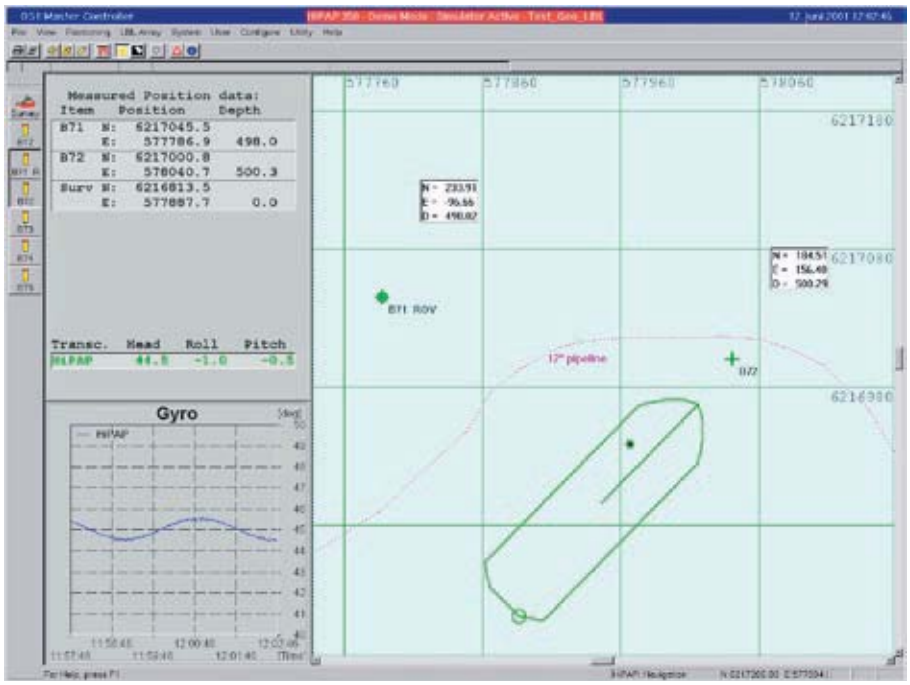


WORLD CLASS - *through people, technology and dedication*

The right system for your application

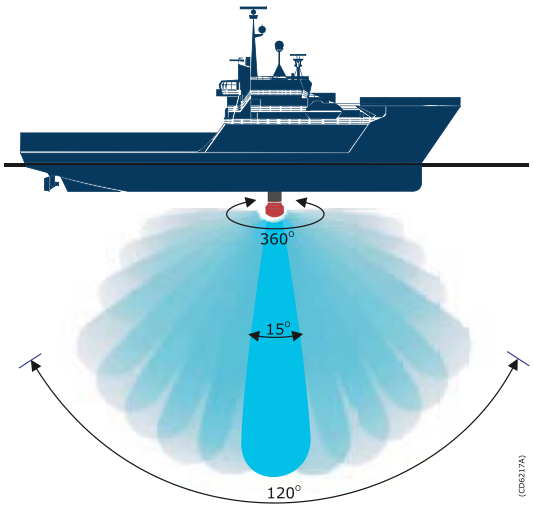
The HiPAP family of underwater positioning systems lets you choose the right system level for your application. HiPAP 350 has been developed to provide the market's best accuracy where HiPAP 500 extreme accuracy and long-range capabilities are not required.

With this unique transducer array, measuring only 320 mm in diameter (and thus smaller than HiPAP 500), the HiPAP 350 can be used with all existing HPR gate valves.



Acoustic beam pointing control

The HiPAP 350 uses the unique technology of *narrow pointing beams*. This minimizes the effect of noise from propellers and thrusters. This technology gives the system maximum Signal-to-Noise ratio, and this is the major key to successful acoustic performance. The curved transducer creates a narrow beam pointed towards the transponder(s) within a large sector below the vessel. Outside this sector, the pointing beam will increase in width. Data from roll, pitch and heading sensors are used to compensate for vessel movements.



Super-Short Base Line functionality

The Super-Short Base Line (SSBL) principle has the obvious advantage that it only requires installation of one hull-mounted transducer and one subsea transponder to establish a three-dimensional position of the transponder. To provide this position, the SSBL system measures both the horizontal and vertical angles, as well as the range to the transponder.

Long Base Line functionality

At some point of range, depending on the application, the SSBL principle will have accuracy limitation. Long Base Line (LBL) accuracy is independent of range. An LBL system can position more accurately, but only within an array of seabed transponders.

The HiPAP with the optional LBL features is a very flexible system combining the advantages of both the SSBL and LBL principles.

The HiPAP has better long range performance than traditional wider beam systems. This is because the Signal-to-Noise ratio of the detected seabed transponders' replies are higher than when using one wide beam that needs to cover the seabed footprint of a transponder array.

Multi vessel positioning

The Multi-User LBL (MULBL) function enables several individual vessels and ROV units to position themselves using the same seabed transponder array.

LBL for subsea construction

Kongsberg Simrad introduced the LBL system in 1992, and has since become the market leader in supplying LBL and combined LBL / SSBL systems for vessel positioning.

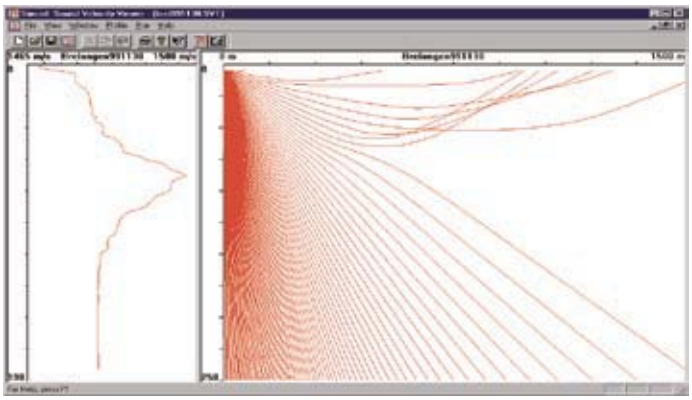
The current LBL systems use intelligent, instrumented transponders and deep water transceivers and transducers. These are all rated for 3000 m water depth, and fulfil any requirements within subsea construction, survey and metrology.

Accuracy a function of transducer size

Accuracy is always dependent on the beam width and the "active surface" of any transducer. The HiPAP 350 will therefore have some reduced performance compared to the more accurate HiPAP 500 which has several more transducer elements.

Automatic compensation for ray bending and sound velocity errors

The HiPAP takes input of the local sound velocity profile, calculates, error compensates and displays the effect of the physical phenomena of sound velocity differences in the water column.



"World Record" in transponder channels

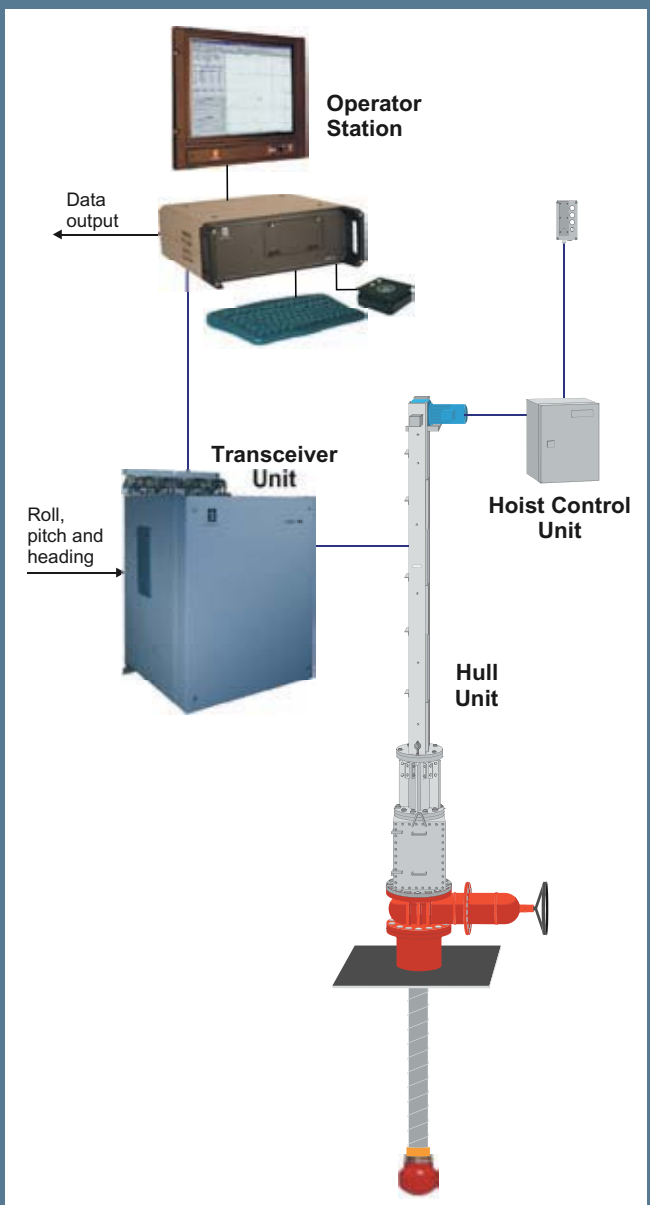
The HiPAP systems can operate with up to 56 transponder channels, and feature transponder telemetry communication for use with transponder release, sensor readings and all LBL functionalities.

Typical applications

The HiPAP 350 has been developed for use in situations where positioning is within a sector of +/-60 degrees below the vessel, but will also perform outside this sector at some reduced accuracy and range capability. This level of functionality makes the HiPAP 350 ideal for drill-rigs, ROV tracking and dynamic positioning reference. It is also ideal for other operations where the underwater positioning is relatively directly below, and where extreme accuracy, shallow water horizontial positioning and ultra deep performance are not required.

HiPAP 350 - ideal for HPR upgrades

The HiPAP 350 system is without question the ideal solution for upgrade of older HPR systems. With its small diameter, the HiPAP 350 transducer can be used with all HPR system gate valves, and may also be installed on the existing hull units to replace the HPR transducer. The upgrade is limited to a minimum of cabling and work.



Typical HiPAP® 350 configuration

The HiPAP® 350 system operates with the transducer mounted on a hull unit. Several hull unit models are available, these enable the transducer to be lowered approximately 1.5 to 5.5 m below the keel. A Transceiver Unit containing the transmitter, preamplifier and beamforming electronics is mounted close to the hull unit. The system can be configured with one or two hull mounted transducers. The use of two transducers will increase accuracy and redundancy.

The system operation is performed on a Windows XP® based operator station.

Technical specifications

HiPAP 350 basic specifications

Gate valve size required:	350 mm (14 inches)
Transducer diameter:	320 mm
Acoustic operating area:	+/- 80° (Recommended)
Number of active elements:	46
Angle accuracy:[1)]	0 dB S/N: 0.40°
	10 dB S/N: 0.23°
	20 dB S/N: 0.18°
Range detection accuracy:[1)]	< 20 cm
Typical operating range:[1)]	1 to 3000 m
Narrow pointing receiver beam:	+/- 7.5°

Note that the technical specifications are subject to change without prior notice.

1) The specifications are based on; Line of sight from transducer to transponder, no influence from ray bending, Signal to Noise ratio as specified in water in the 250 Hz receiver band, no error from heading / roll / pitch sensors, and use of correct sound velocity. Operating ranges are typical and conservative, and are assumed by using sufficient transponder source level (up to 206 dB dependant on range).

HiPAP 350 standard features

56 transponder channels
Hull unit for transducer deployment
Windows XP® based operating 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
Position and angle alarm limits
Responder mode
Telegram output to dynamic positioning system
Telegram output to survey system
Transponder Telemetry for full utilization
DGPS Interface

HiPAP 350 optional features

Beacon Mode
Compass Transponder Mode
Depth Sensor Transponder Mode
Inclinometer Transponder Mode
Long Base Line (LBL) functionality
Geographical LBL Calibration
Multi-User LBL functionality (MULBL)
Operator Station Master / Slave function
Blow Out Preventer (BOP) telemetry function
Offshore Loading Telemetry function
Submerged Turret Loading function
Fast LBL Transponder Positioning mode *
LBL Accurate Metrology mode*
(standard in LBL function)*

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