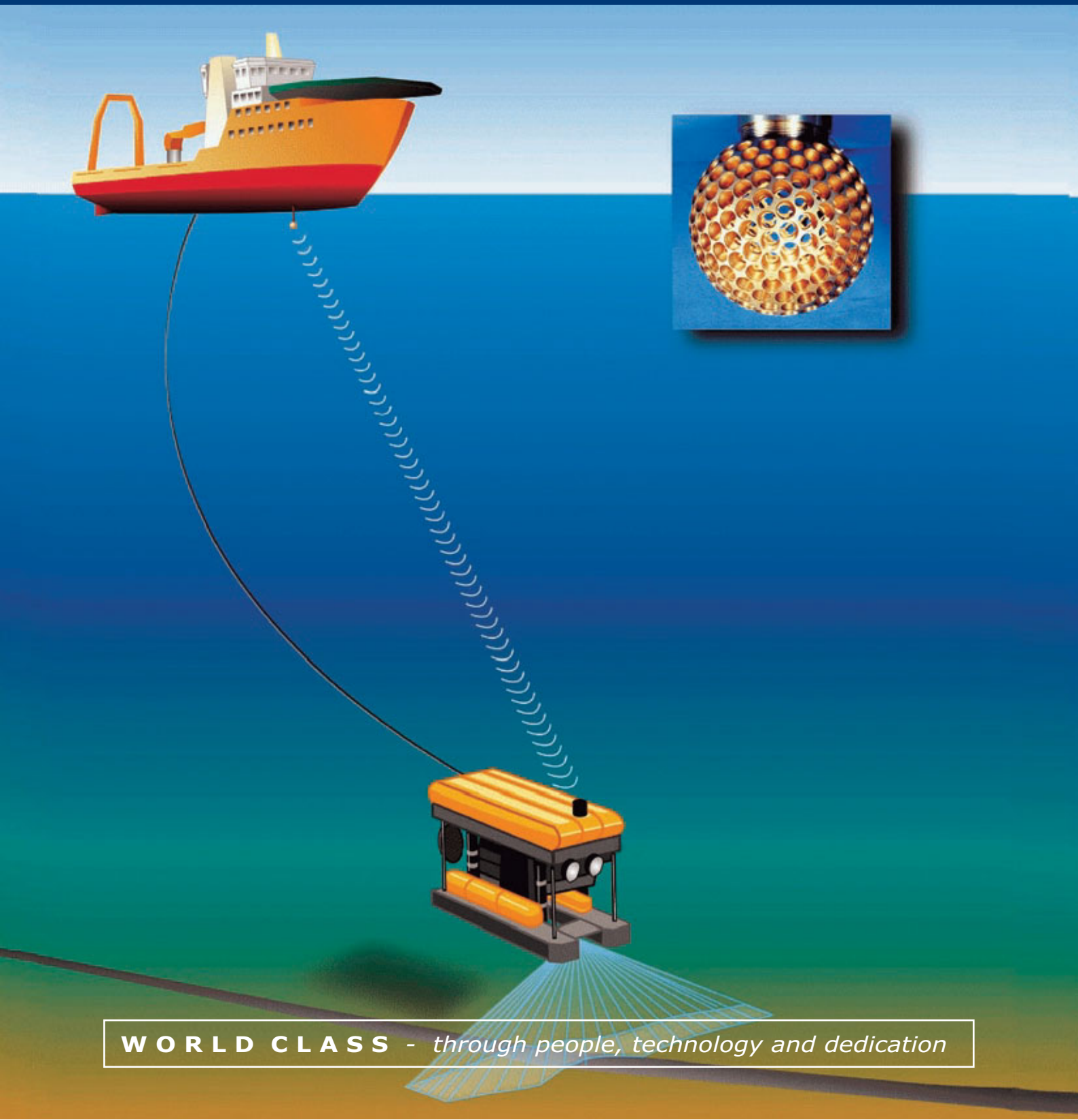
KONGSBERG

HiPAP® 500

High Precision Acoustic Positioning System



WORLD CLASS - *through people, technology and dedication*

Introduction

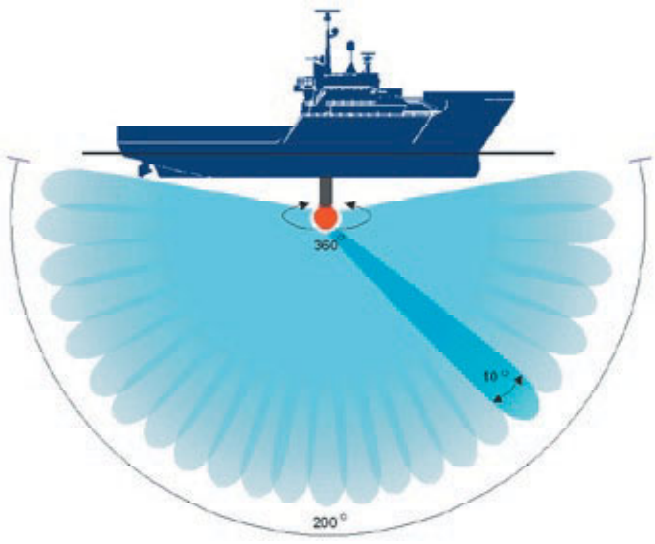
The HiPAP 500 is an underwater positioning system using the Super Short Base Line (SSBL) principle. The main advantage of this principle is that it only requires installation of one hull-mounted transducer and one subsea transponder.

The system design was based on a market requirement of avoiding the Long Base Line (LBL) principle in deep water accurate seabed survey applications. The unique transducer technology and advanced signal processing used in HiPAP 500 was found to be the solution for obtaining the optimal position accuracy required in these deeper waters.

Extreme accuracy - a quantum leap

The HiPAP 500 establishes subsea positioning so accurate that the more complex, but common, LBL principle was made redundant within reasonable depths. Time and cost of survey operations was therefore reduced to a minimum.

The HiPAP 500 system proves to have succeeded the quantum leap in technology with hundreds of elements in the spherical transducer. All these elements also secure an extremely high internal redundancy and reliability. The advanced transducer technology and acoustic signal processing makes the HiPAP 500 the most accurate SSBL system in the world.



Suppression of noise using beam pointing control

The system dynamically controls a 10-degree cone acoustic listening beam. This cone points towards the transponder(s), wherever they are located below the vessel.

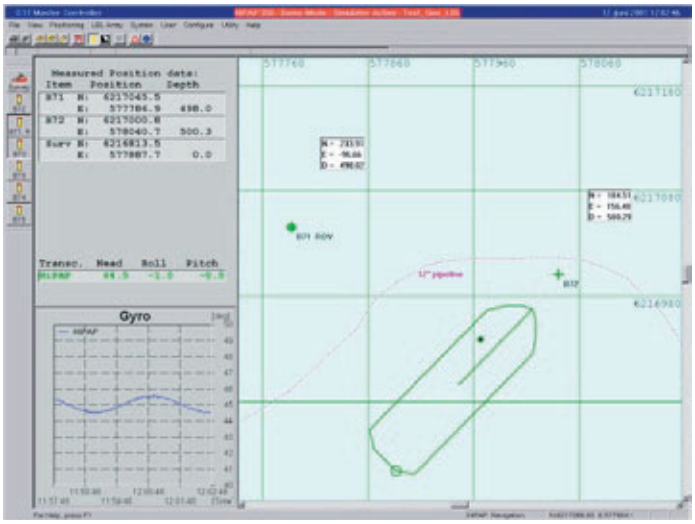
The HiPAP system is so far the only system that can control a focused listening beam towards the transponder(s). This means that noise from other directions is suppressed. This provides a good foundation for further signal processing.

Beam steering is the major key for successful acoustic performance through maximum range and accuracy.

Long Base Line functionality

At some point of range, depending on the application, the SSBL principle will have accuracy limitation. LBL accuracy is independent of range. An LBL system can position more accurately, but only within an array of seabed transponders. The HiPAP with optional LBL features implemented is a very flexible system combining the advantages of both SSBL and LBL.

The HiPAP has better long range performance than traditional wide 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 then become the market leader for supply of LBL and combined LBL/SSBL systems for vessel positioning.

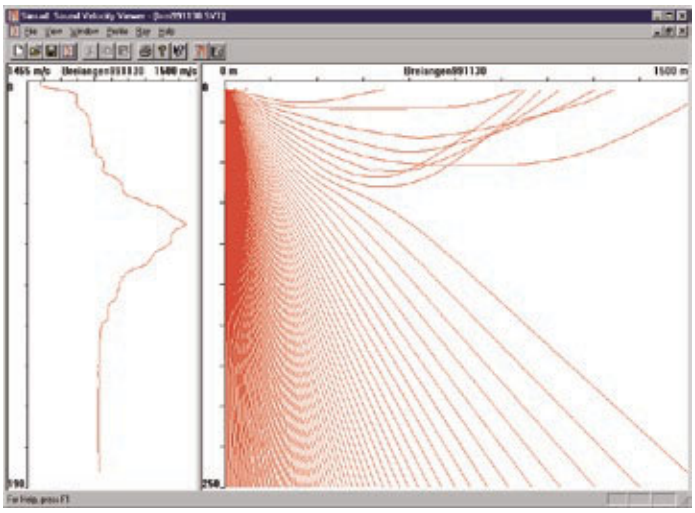
The current LBL systems use intelligent, instrumented transponders, transceivers and transducers. These are all rated for 3000 m water depth, and fulfil any requirements within subsea construction, survey and metrology.

" World Record" in transponder channels

The HiPAP systems can operate with maximum 56 transponder channels, and has transponder telemetry communication for use with transponder release, sensor readings and LBL auto calibration.

Automatic compensation for ray bending and sound velocity errors

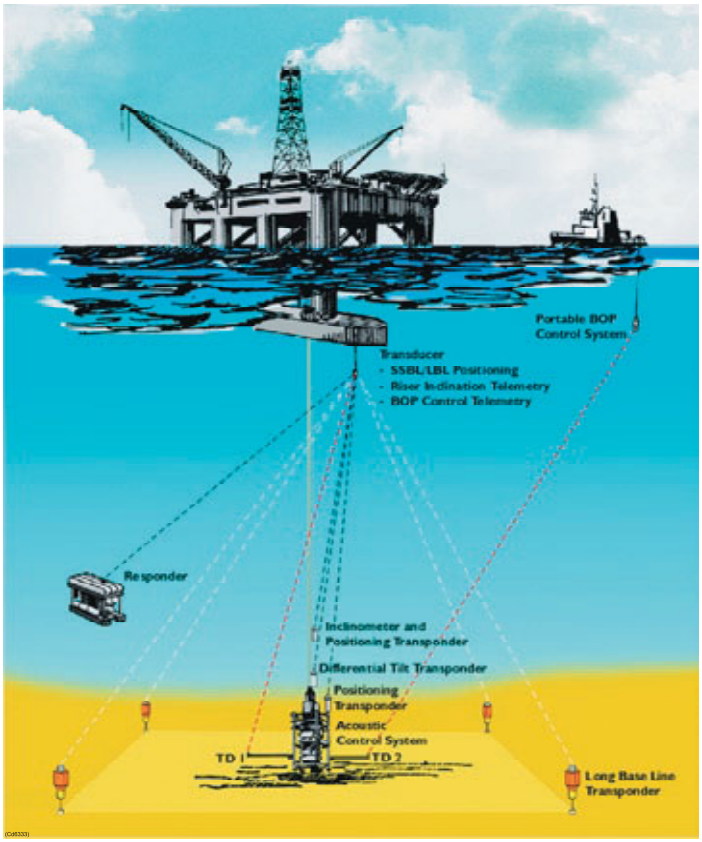
The HiPAP can take input of the sound velocity profile in the water column. Based on this profile, the system will automatically compensate for the error contribution from both wrong angle and range detection.

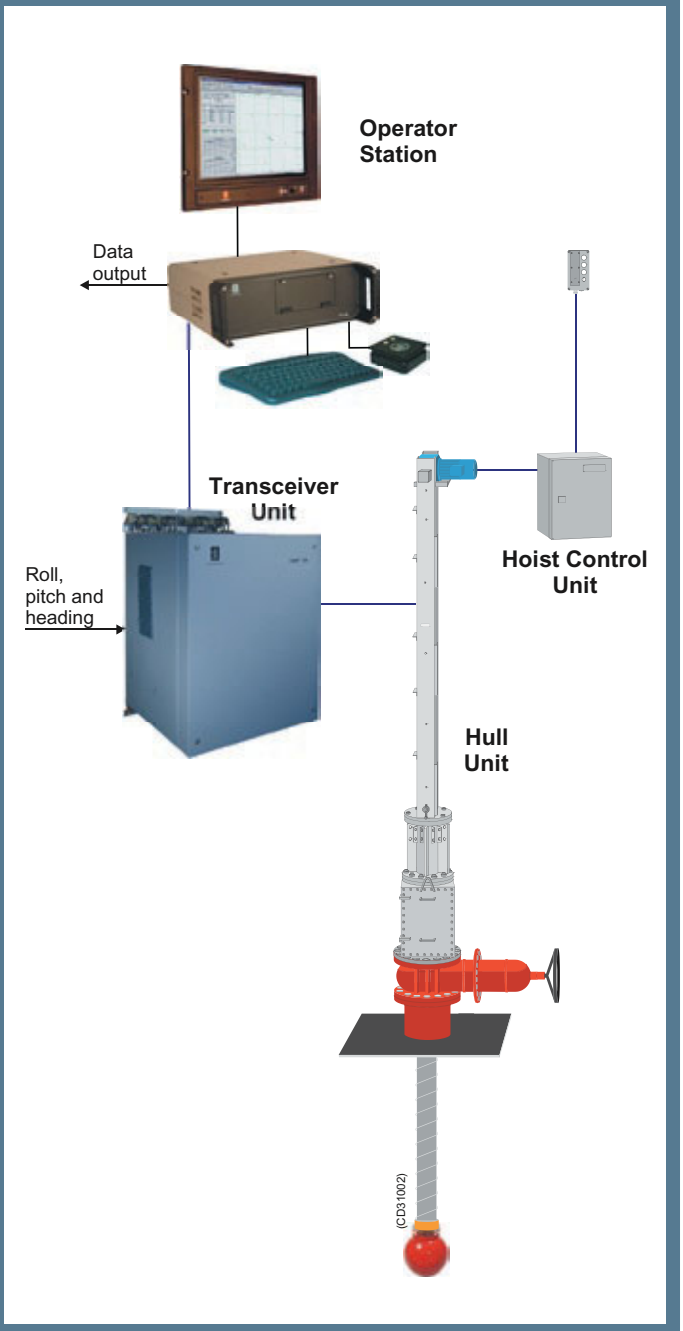


You can also see the ray-trace on the display, which will often explain the reason for “no reply” problems.

Preferred system also for dynamic positioning reference

With its high accuracy, good repeatability and high reliability, HiPAP 500 is the multi-purpose system for any application.





Typical HiPAP® 500 system configuration

The HiPAP 500 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 transmitter, preamplifiers 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 may increase accuracy and redundancy.

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

Technical specifications

HiPAP 500 basic specifications

Gate valve size required:	500 mm (20 inches)
Transducer diameter:	400 mm
Acoustic operating area:	+/- 100° (Recommended)
Number of active elements:	241
Angle accuracy:[1)]	0 dB S/N: 0.30°
	10 dB S/N: 0.18°
	20 dB S/N: 0.12°
Accuracy dual mode option, dual transducer system:[1)]	20 dB S/N: 0.085°
Range detection accuracy:[1)]	< 20 cm
Typical operating range:[1)]	1 to 4000 m
Narrow pointing receiver beam:	+/- 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 assued by using sufficient transponder source level (up to 206 dB dependant on range).

HiPAP 500 standard features

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
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 500 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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Kongsberg Maritime AS
Strandpromenaden 50
PO.Box 111
N-3191 Horten,
Norway

Telephone +47 33 02 38 00
Telefax +47 33 04 47 53
www.kongsberg.com
E-mail: subsea@kongsberg.com

KONGSBERG