

Reference Systems



KONGSBERG



- Absolute vs. Relative
- Types of systems
- Differential GPS
- Underwater positioning
- HiPAP*
- Taut wire
- Laser systems
- Microwave/ Radar systems
- RADius*



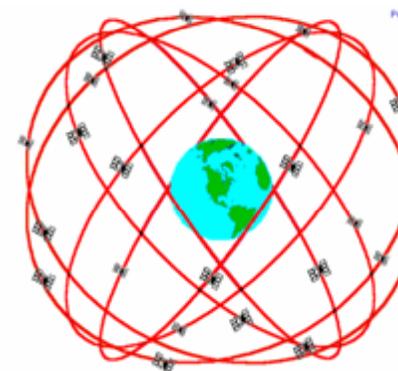


KONGSBERG

Abolsolute vs. Relative

■ Absolute

- Absolute latitude and longitude according to one defined mathematical description of the earth's shape (datum)
- Absolute UTM coordinates with given datum



Peter H. Dana 9/2008



GPS Nominal Constellation
24 Satellites in 6 Orbital Planes
4 Satellites in each Plane
20,200 km Altitudes, 55 Degree Inclination

■ Relative

- Relative range & bearing. A measurement of relative distance and direction to a given target (RADIUS transponder, Fanbeam reflector or HiPAP transponder)
- Relative X & Y. Feet or meters from a sensor to a given target
- Relative angles and a depth (Taut Wire)



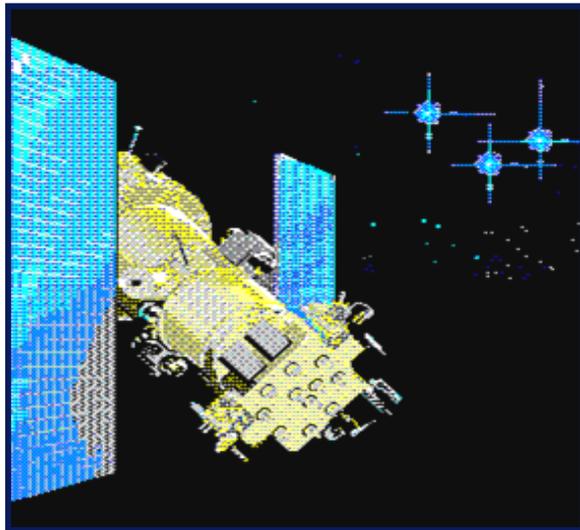
Types of Systems



KONGSBERG

- Satellite systems

- DGPS
- Combined DGPS/ Glonass
- DARPS



- Hydro acoustics

- HiPAP[®] 350/450/500
- HPR 400

- Laser systems

- Fanbeam

- Microwave systems

- RADIUS
- Artemis

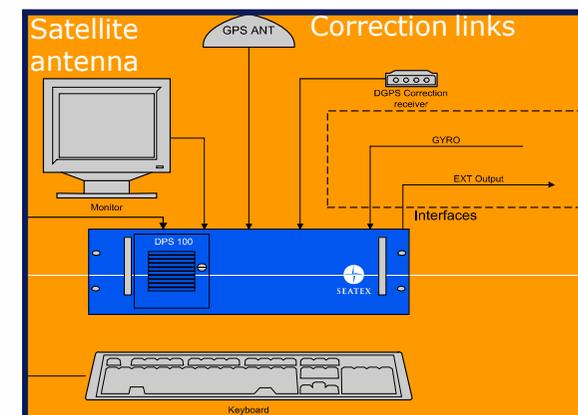
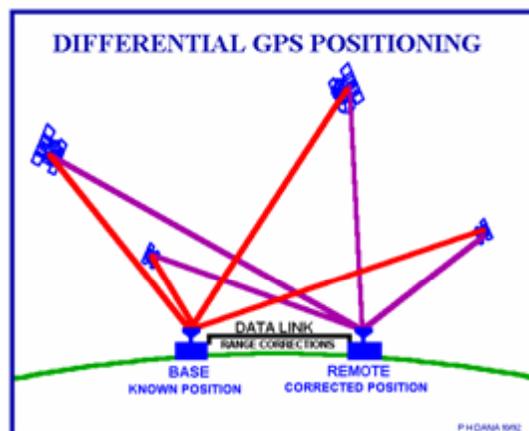
- Taut Wire





Differential GPS / Glonass

- Space segment
 - 24 GPS satellites (29 per July 05)
 - 13 Glonass satellites (December 05)
 - Needs at least 4 satellites
- Ionosphere disturbances
- Many reference stations
 - Corrections
 - Integrity checking
- Multiple correction links
 - Low power (Inmarsat)
 - High power (Spot beam)
 - IALA
 - SBAS (WAAS, EGNOS)
 - Local radio networks

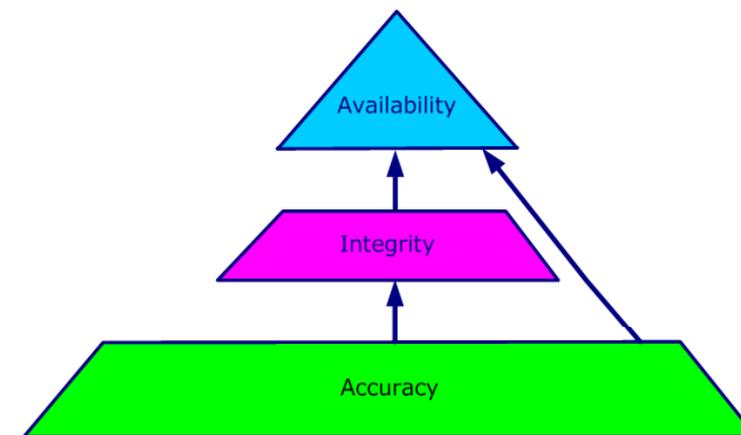


Kongsberg DGPS Products



KONGSBERG

- DPS 20
 - Entry level DGPS, black-box, SBAS, limited functionality
- DPS 116
 - High integrity DGPS+SBAS
- DPS 132
 - High accuracy and integrity DGPS, dual-frequency, SBAS
- DPS 200
 - High integrity and availability DGPS and Glonass
- DPS 700
 - High integrity, accuracy and availability DGPS + SBAS

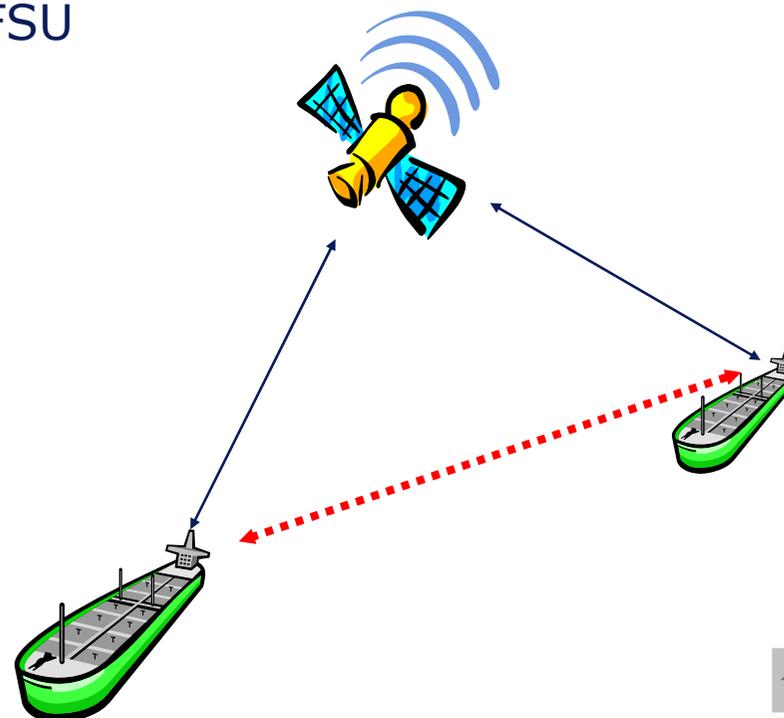




KONGSBERG

DARPS operation-principle

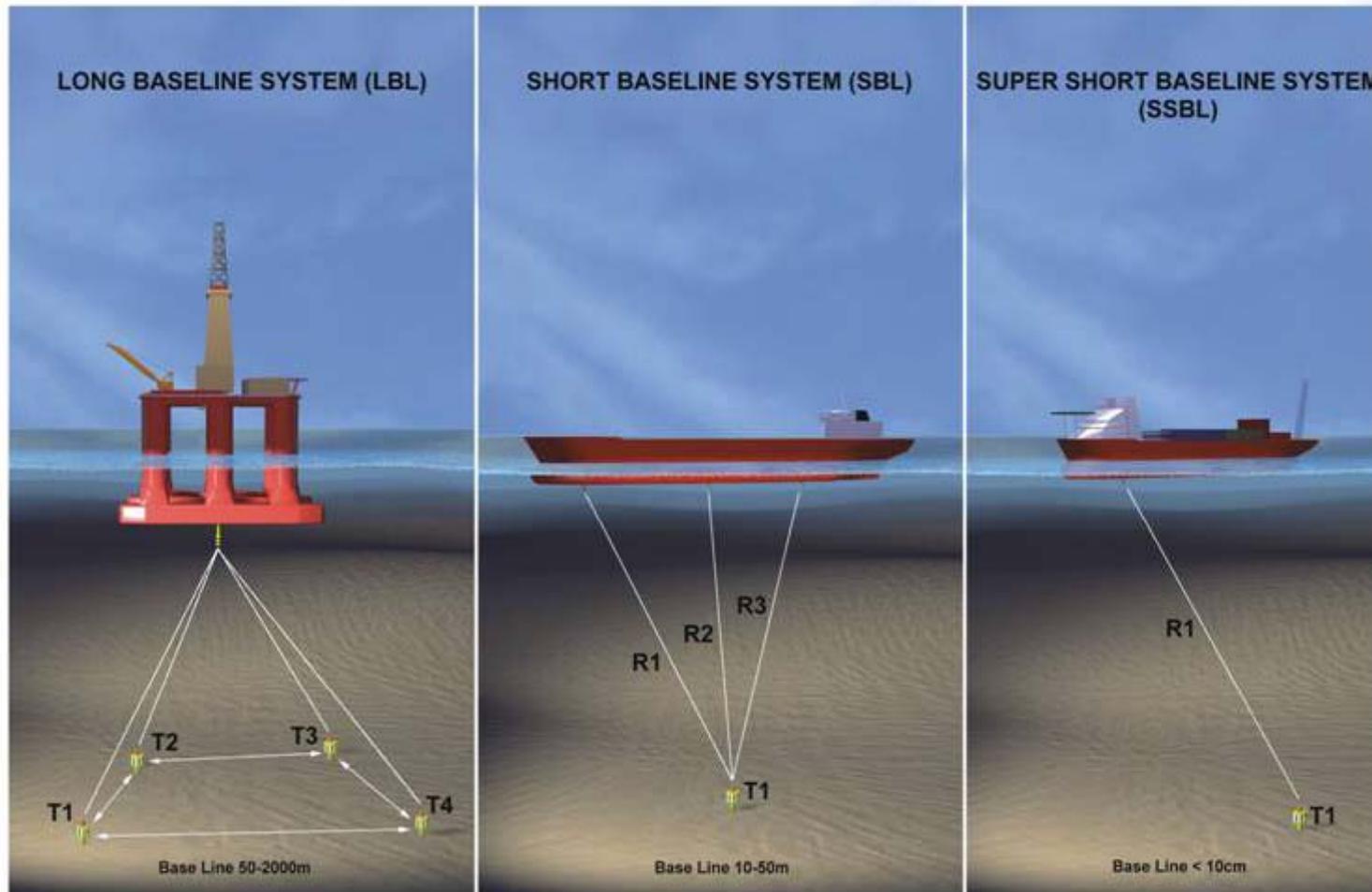
- Kongsberg DARPS 100/200
Differential **A**bsolute and **R**elative **P**ositioning **S**ensor:
- Accurate absolute and relative positioning of two vessels such as a shuttle tanker and a FPSO/FSU
- Transfer of GPS data via radio
- 1 - 2 m relative accuracy
- High reliability



Underwater Positioning



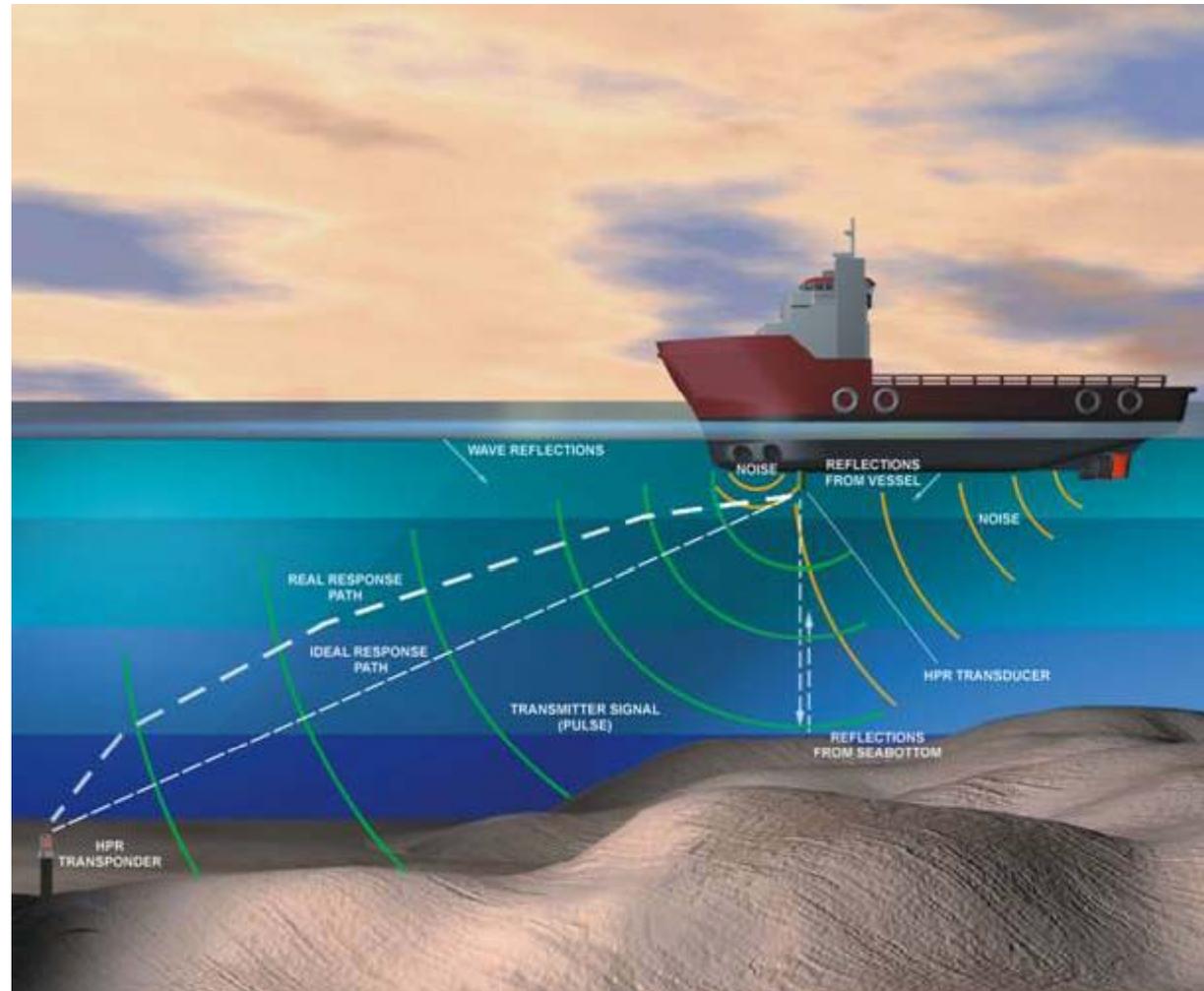
KONGSBERG



Underwater Positioning



KONGSBERG

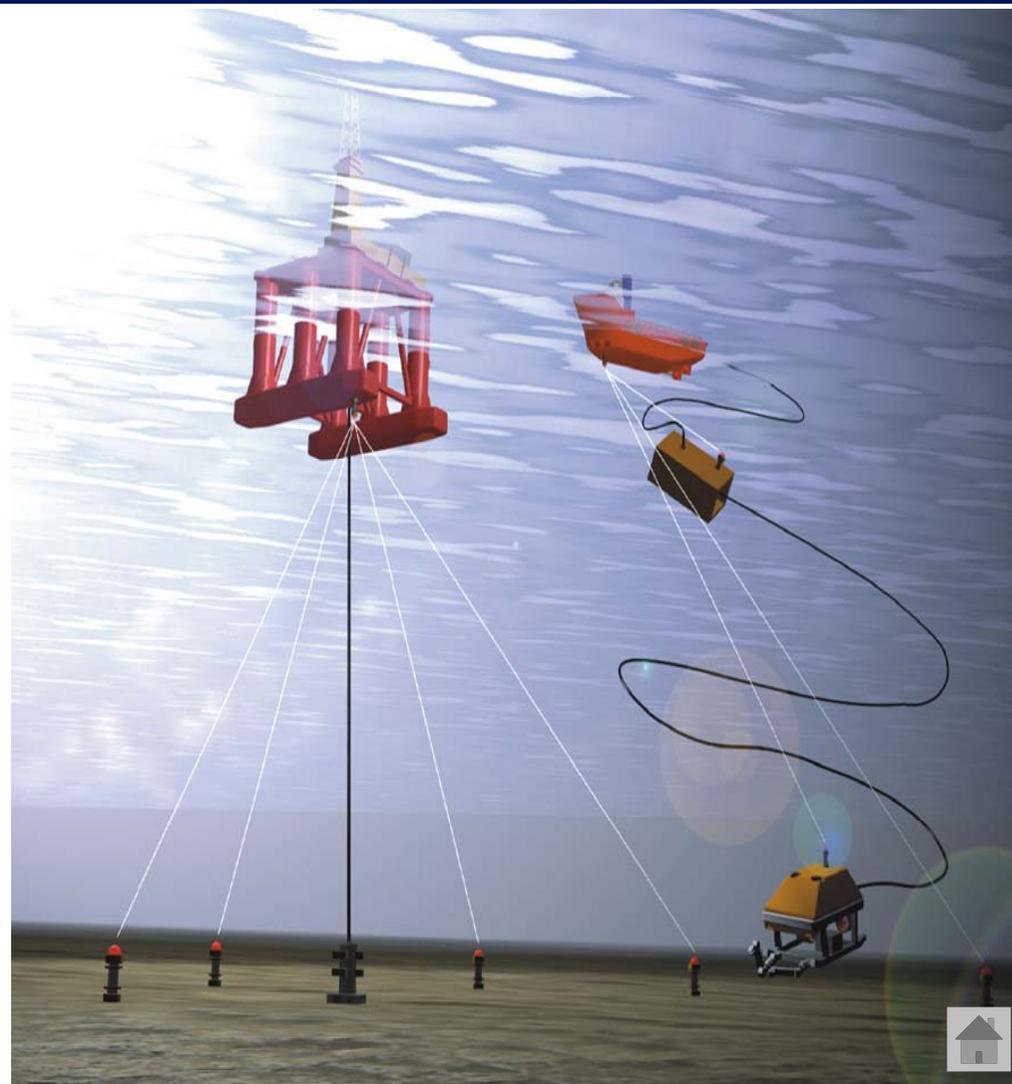




KONGSBERG

HiPAP[®] - High Precision Acoustic Positioning

- Underwater navigation
 - SSBL or USBL
 - LBL
 - Multi-user LBL
- Sensor value monitoring
 - Temperature
 - Depth
 - Inclination
 - Heading
 - Pressure
- Underwater communication
- Tool for metrology measurements

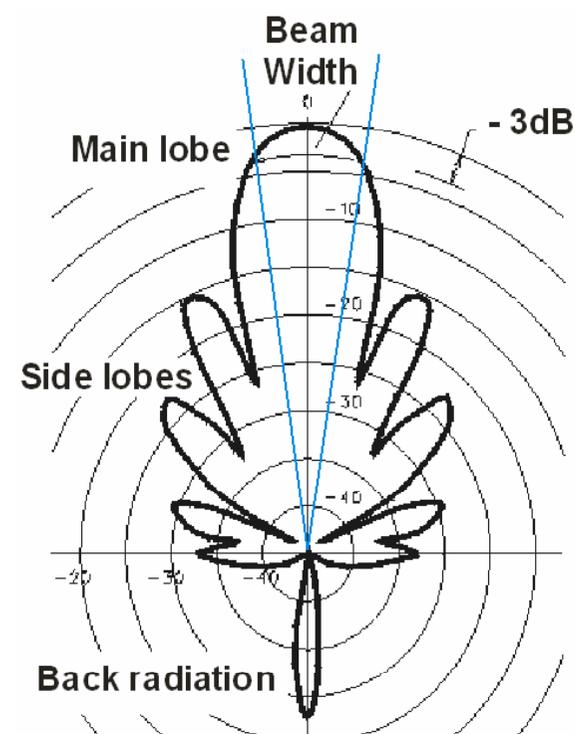




KONGSBERG

HiPAP[®] - High Precision Acoustic Positioning

- The only true omni-directional system
- Automatic narrow beam steering gives better accuracy and longer ranges due to noise suppression
- Real-time ray-bending error compensation
- 56 transponder channels

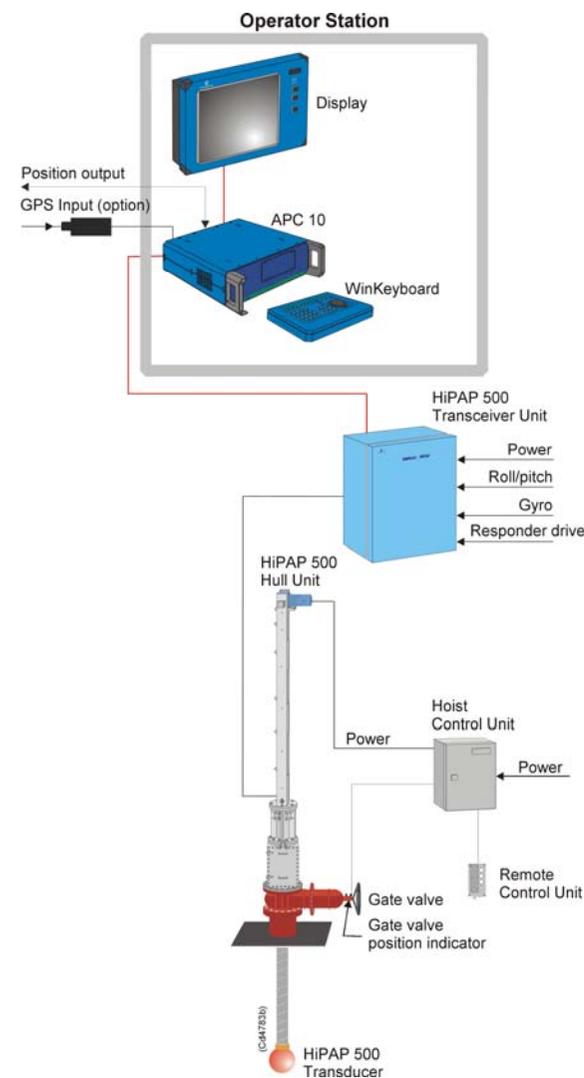




KONGSBERG

HiPAP onboard system units overview

- Display
- Acoustic Positioning Computer
- Transceiver Unit
- Gyro compass
- Vertical reference unit
- Hull unit with Gate Valve
- Transducer
- Hoist and remote deployment control





KONGSBERG

HiPAP family

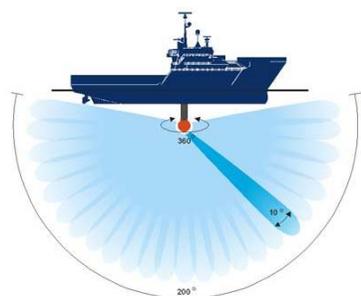


Gate valve
500 mm

392 mm
60 kg

HiPAP® 500

- Acoustic operating area recommended: $\pm 100^\circ$
- Operating range: 4000m
- Range accuracy: $\leq 0.10\text{m}$
- Angle accuracy: $\leq 0.12^\circ$
(0.2% of slant range)



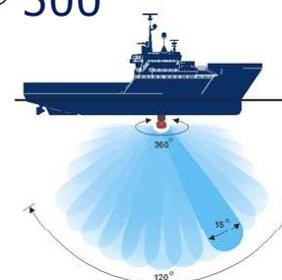
Gate valve
500 mm

392 mm
60 kg

HiPAP® 450

- Acoustic operating area recommended: $\pm 60^\circ$
- Operating range: 3000m
- Range accuracy: $\leq 0.20\text{m}$
- Angle accuracy: $\leq 0.18^\circ$
(0.3% of slant range)

- Upgradeable to HiPAP® 500
 - Rx/Tx boards
 - Software



Gate valve
350 mm

320 mm
30 kg

HiPAP® 350

- Acoustic operating area recommended: $\pm 60^\circ$
- Operating range: 3000m
- Range accuracy: $\leq 0.20\text{m}$
- Angle accuracy: $\leq 0.18^\circ$
(0.3% of slant range)



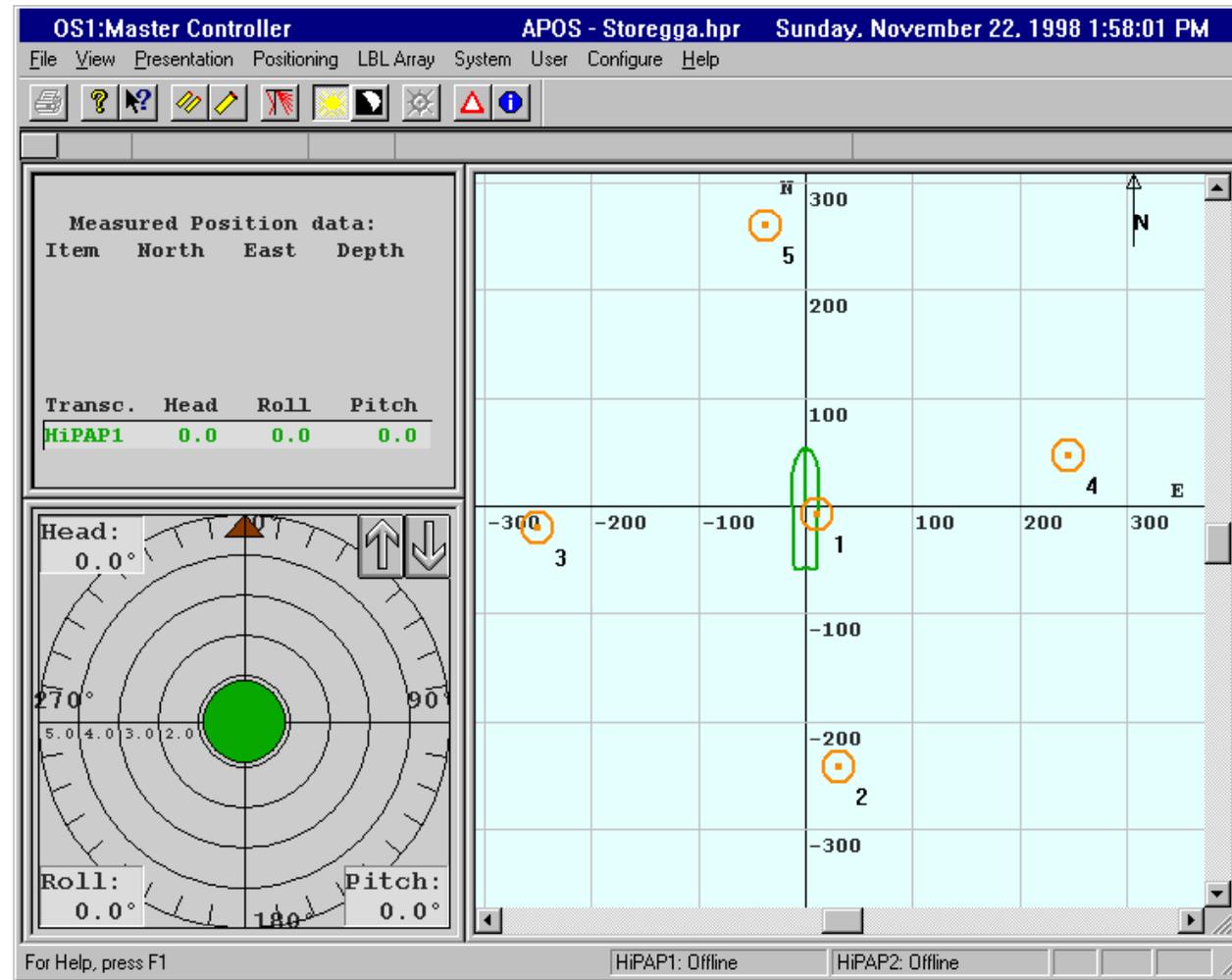
Acoustic Positioning Operating System - APOS



KONGSBERG

Easy to Operate

Online Help Menu



Light Weight Taut Wire



KONGSBERG

- Accuracy 0.2% of water depth
- Remote control from bridge
- Operational limits
 - 300 (500) m depth
 - $\pm 20^\circ$ angle (35% of water depth)



Fanbeam



KONGSBERG

- Easy installation
- Simple to operate
- Passive reflective targets
- Automatic tilt
- Range: 1000m
(Optional 2000 - 3000 m)
- Range accuracy: 0.2m
- Bearing accuracy: 0.1°

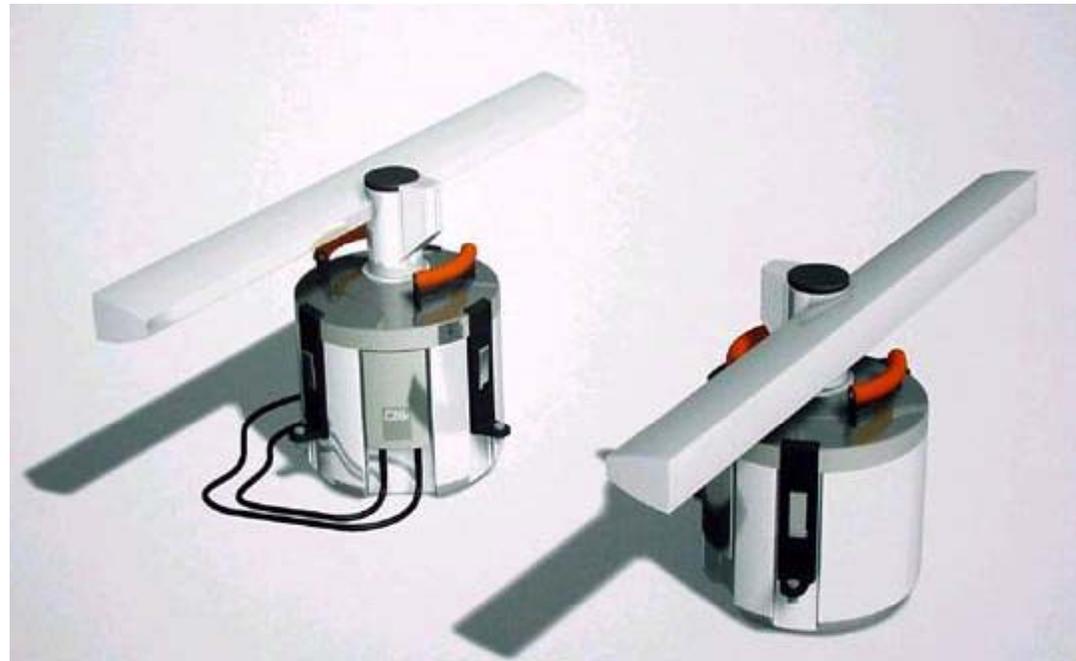


Artemis



KONGSBERG

- Artemis Mk5 is an accurate microwave position-reference system that determines range and bearing of a mobile object from a reference position
- Range: 10 - 5000 m
- Range accuracy: 1m
- Bearing accuracy: 0.02°



RADius



KONGSBERG

- Radar technology based range and direction sensor
 - No moving parts
 - Operates in all weather conditions
 - Complementary to existing GPS Positioning reference System
 - Multi-user
 - Multiple transponder capability
 - Operates in license free frequency area
- Range: up to 1000 m
- Operating sector: 90°
- Accuracy: typically 1 m (200 m range)



RADius modules



KONGSBERG

RADius Interrogator



RADius Workstation

RADius Transponder



RADius operating range



KONGSBERG

