



Starfix-StarPack



StarPack is Fugro's answer to increasing market demand for precise, redundant GNSS positioning solutions, including extensive QC and accurate timing, from a single, easy to use platform.

StarPack Unit

A StarPack unit consists of a survey grade GNSS receiver and powerful processor, running Linux multi-tasking operating system. The receiver is capable of tracking all current (GPS, GLONASS) and future (Galileo) systems. A StarPack can be extended with a second receiver (in the same unit) to provide accurate, GNSS derived heading.

The combination of receiver and processor provides for robust multiple simultaneous precise position calculations and extensive QC. For maximum system reliability the internal software is embedded on flash memory configured on the processor. Control and configuration of the system is via the front panel, a web interface or a serial port.

Four serial ports and LAN interface to read multiple correction sources (in addition to the integrated receiver) and to provide multiple outputs to the user are available on the system rear panel.



StarPack Unit



StarPack Web Interface

Documentation

This section describes the various user, installation and technical references for the equipment. The Starpack User Manual contains the specifications and user details.

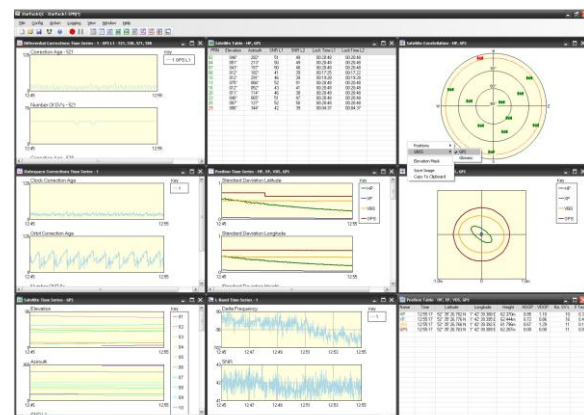
Input Data Formats

Data inputs to the Starpack from a PC are considered advanced CODEC features, and are not supported at this time.

The StarPack can handle two formats: RTCM or "Fugro". Fugro format is the format from the Starfix network, also called SuperCompressed in Starfix.IOWIN.

Output Data Formats

This section describes the various data formats the equipment OUTPUTS to other equipment. These outputs are typically interfaced to Starfix.NG which decodes and consumes the data.



StarPack-QC running in real-time

Starfix-StarPack



Technical Specifications

Type Accuracy

Starfix.XHP Position	0.1m 2DRMS
Starfix.G2 Position	0.1m 2DRMS
Starfix.Plus Position	0.08m 2DRMS
GNSS Position	2.0m 2DRMS
Velocity	0.05m/s RMS

NMEA messages

\$GPGGA	Fugro Proprietary HP Monitor formats
\$GPGSA	\$PFGRPVT
\$GPVTG	\$PFGRHPQ
\$PASHR	



Information may be subject to change without prior notice

Fugro OCEANSISMICA S.p.A.

Viale Charles Lenormant, 268
00126 Rome
Italy
Telephone: +39 06 5219291
Email: oceansismica@fugro.it

More information available at WWW.FUGRO.COM

© Fugro 2012



OmniSTAR 9200-G2 Receiver



The OmniSTAR's G2 is a composite GLONASS/GPS positioning solution available worldwide. By utilizing satellites from both constellations G2 can provide consistent and stable decimetre accuracy.

All in View Receiver

The OmniSTAR 9200-G2 GNSS receiver is a multi frequency (L1/L2/L5/E1/E5) receiver that incorporates GPS and GLONASS capability. In addition, it tracks the Fugro L-Band satellite broadcast of DGNS corrections. As a backup it can receive the DGNS corrections via Internet.

As well as providing increased accuracy, multi frequency operation means that the OmniSTAR 9200-G2 DGNS receiver is well equipped to cope with the effect of the forecast increase in solar activity and interference.

Used in conjunction with the Marinestar® GNSS service, it increases the number of satellites available by accessing the GLONASS satellite constellation in addition to the GPS constellation.

High Performance Service Compatibility

The OmniSTAR 9200-G2 DGNS receiver can be subscribed to the various DGNS services offered by Fugro such as Marinestar® GPS and the integrated Marinestar GNSS service.:

- Marinesta® GPS: GPS orbit and clock solution
- Marinesta® GNSS: Composite GPS/GLONASS orbit and clock solution

The above solutions are dual frequency carrier phase based to achieve decimeter level accuracy.

The receiver can be monitored and configured via the front panel display and keypad, or via a web interface.



OmniSTAR 9200-G2



OmniSTAR 9200-G2 back panel



A mix of navigation satellites can be used



OmniSTAR 9200-G2 Receiver

Technical Specifications

Main Features

L1/L2 GPS receiver	Corrections via internet
L1/L2 GLONASS receiver	Display and keypad
L-BAND DGNSS receiver	Web interface

Power Requirements

9.5VDC to 28VDC 30W at 24VDC
AC input via external AC/DC PSU
or Isolating Data and Power Unit
(IDPU)

Channels

220-channels	SBAS (WMS/EGNOS/MSAS)
GPS – L1 C/A, L1C code	Fugro L-Band service
GPS - L1/L2/L2C full cycle carrier	
GLONASS-L1/L2 full cycle carrier	

Temperature

Operating :	-40 to +65°C (-40 to +149°F)
Storage:	-40 to +80°C (-40 to +176°F)

Position Accuracy Marinestar GPS/GNSS

Horizontal	10 cm. 95%
Vertical	15 cm. 95%

Dimensions (L x W x OJ)

24 CM (9.4 in) x 12 cm (4.7 in) x 5 cm (1.9 in)

Communications

Lemo (serial)	3 wire RS232
Modem 1 serial	Full 9-wire RS232
Modem 2 serial	Full 3-wire RS232
1 PPS	

Weight

1.55 Kg (3.42 lb)

Data Outputs

NMEA messages:	GGA; GST; GSA; VTG; ZDA; GNS; GBS; RMC
----------------	---

Approval

IEC 61108 GNSS performance
IEC 60945 GNSS environmental (IPDU required)
IEC 61162 interface output

Information may be subject to change without prior notice

Fugro OCEANSISMICA S.p.A.

Viale Charles Lenormant, 268
00126 Rome
Italy
Telephone: +39 06 5219291
Email: oceansismica@fugro.it



OCTANS 3000

HIGH-PERFORMANCE SUBSEA GYROCOMPASS AND MOTION SENSOR

OCTANS 3000 is a subsea survey-grade gyrocompass and complete motion sensor for water depths up to 3 000 m. Based on **iXBlue**'s FOG technology it outputs heading, roll, pitch, heave, rate of turn and acceleration. **OCTANS 3000** can be easily upgraded to full INS mode (i.e. ROVINS).

FEATURES

- Complete gyrocompass and motion sensor
- Smart Heave™
- Fiber-optic gyroscope (FOG), unique strap-down technology
- Ethernet, web-based man-machine interface (MMI)
- Titanium made, small, portable plug and play system
- Optional full featured inertial navigation system

BENEFITS

- High-performance real-time outputs of true heading, roll, pitch, heave, surge, sway, acceleration and rate of turn
- No spinning element hence maintenance free
- Lightweight corrosion free housing for water depth up to 3 000 m, easy to integrate and interface, saves valuable mobilization time
- Obtain INS-class system with simple software upgrade

APPLICATIONS • ROV and offshore survey • MBES and sonar motion reference • Dredging • Marine construction



Courtesy of Van oord



Courtesy of Ifremer



Courtesy of Stolt Offshore

OCTANS 3000

TECHNICAL SPECIFICATIONS



PERFORMANCE

Heading	
Accuracy ⁽¹⁾⁽²⁾	0.1 deg secant latitude
Resolution	0.01 deg
Full accuracy settling time (all conditions)	< 5 min
Heave accuracy ⁽³⁾	2.5 cm or 2.5% (whichever is greater)
Roll / Pitch	
Dynamic accuracy ⁽²⁾	0.01 deg
Resolution	0.001 deg

OPERATING RANGE / ENVIRONMENT

Operating / storage Temperature	-20 °C to +55 °C / -40 °C to +80 °C
Follow-up speed	Up to 750 deg/s
Acceleration dynamic range	±15 g
Heading / roll / pitch	0 to +360 deg / ±180 deg / ±90 deg
MTBF (computed/observed)	40 000 hours / 80 000 hours
No warm-up effects, insensitive to thermal shocks	
Shock and vibration proof	

PHYSICAL CHARACTERISTICS

Depth rating (m)	Material	Weight (air / water) kg	Housing dimensions (Ø x H mm)	Connector	Mounting
3 000	Titanium	15 / 6.2	213 x 375	5 x SEACON MI-CON	6 Ø 6.6 holes

INTERFACES

Serial RS232 / RS422 port	5 inputs / 5 outputs / 1 configuration port
Ethernet port ⁽⁵⁾	UDP / TCP client / TCP server
Pulse port ⁽⁶⁾	3 inputs / 2 outputs
Sensors supported	GPS, speed log
Input / output formats	Industry standards: NMEA0183, ASCII, BINARY
Baud rates	600 bauds to 115.2 kbaud
Data output rate	0.1 Hz to 200 Hz
Power supply	24 VDC
Power consumption	< 20 W

(1) secant latitude = 1 / cosine latitude

(2) RMS values

(3) Smart Heave™

(4) All input /output serial ports are available and can be duplicated on Ethernet ports

(5) Input of GPS PPS pulse for accurate time synchronization of OCTANS 3000

(6) Maximum error = 3 or RMS error



HYDRINS

FOG-BASED HIGH-GRADE INERTIAL NAVIGATION SYSTEM
FOR HYDROGRAPHIC AND MULTIBEAM SURVEYS

HYDRINS is a high-performance inertial navigation system optimized for hydrographic surveys using multibeam echosounders. **HYDRINS** comprises a single compact unit and delivers highly accurate real-time position, heading, attitude and speed data. In addition to the real-time options, **HYDRINS** raw data can be post-processed using Delph INS™.

FEATURES

- All-in-one high-accuracy 3D positioning with heading, roll and pitch
- Smart Heave™
- Automatic GPS drop-out / multipath management
- Advanced post-processing software solutions (Delph INS)
- Compact, uses any kind of GPS (single antenna)
- Ethernet, web server (GUI)

BENEFITS

- Motion and heading not affected by GPS outages
- Accurate height compensation with GPS RTK
- A complete solution with easy-to-use yet powerful post-processing tools
- Fast and reliable installation on all vessels
- Network ready, intuitive user interface

APPLICATIONS • Multibeam survey • Hydrographic survey • Harbors and inland waterways

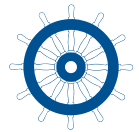


Courtesy of Geoplus



HYDRINS

TECHNICAL SPECIFICATIONS



IMO Certified
N° 19110
N° 19183

PERFORMANCE

Position accuracy real time	
With GPS	Three times better than GPS
No aiding for 1 min / 2 min	0.8 m / 3.2 m (CEP 50)
Position accuracy post-processed	
With GPS	Four times better than GPS
No aiding for 1 min / 2 min	0.2 m / 1m (CEP 50)
Heading accuracy	0.01 deg secant latitude RMS ⁽¹⁾
Roll and pitch dynamic accuracy (no aiding)	0.01 deg RMS
Heave accuracy (Smart Heave) ⁽²⁾	2.5 cm or 2.5% RMS

OPERATING RANGE / ENVIRONMENT

Operating / storage temperature	-20°C to 55°C / -40°C to 80°C
Rotation rate dynamic range	Up to 750 deg/s
Acceleration dynamic range	± 15 g
Heading / roll / pitch	0 to +360 deg / ±180 deg / ±90 deg
MTBF (observed)	80 000 hours

PHYSICAL CHARACTERISTICS

Dimensions (L x W x H)	180 x 180 x 162 mm
Weight	4.5 kg
Waterproof	IP66

INTERFACES

Serial	RS422 or RS232
Ethernet	100 MBit - UDP / TCP server / TCP client / WebGUI
Pulse	PPS, Trigger
Inputs / outputs	Configurable 7i / 5o - Pulse ⁽³⁾ 4i / 2o - Configuration port
Baud rates	Up to 460 kbaud
Data output rate	0.1 Hz to 200 Hz
Power supply / consumption	24 VDC (20 - 32 V) / < 20 W

(1) Secant latitude = 1/cosine latitude

(2) Whichever is greater for periods up to 30 seconds. Smart heave is delayed by 100 s fixed value
Real-time heave accuracy is 5 cm or 5% whichever is greater

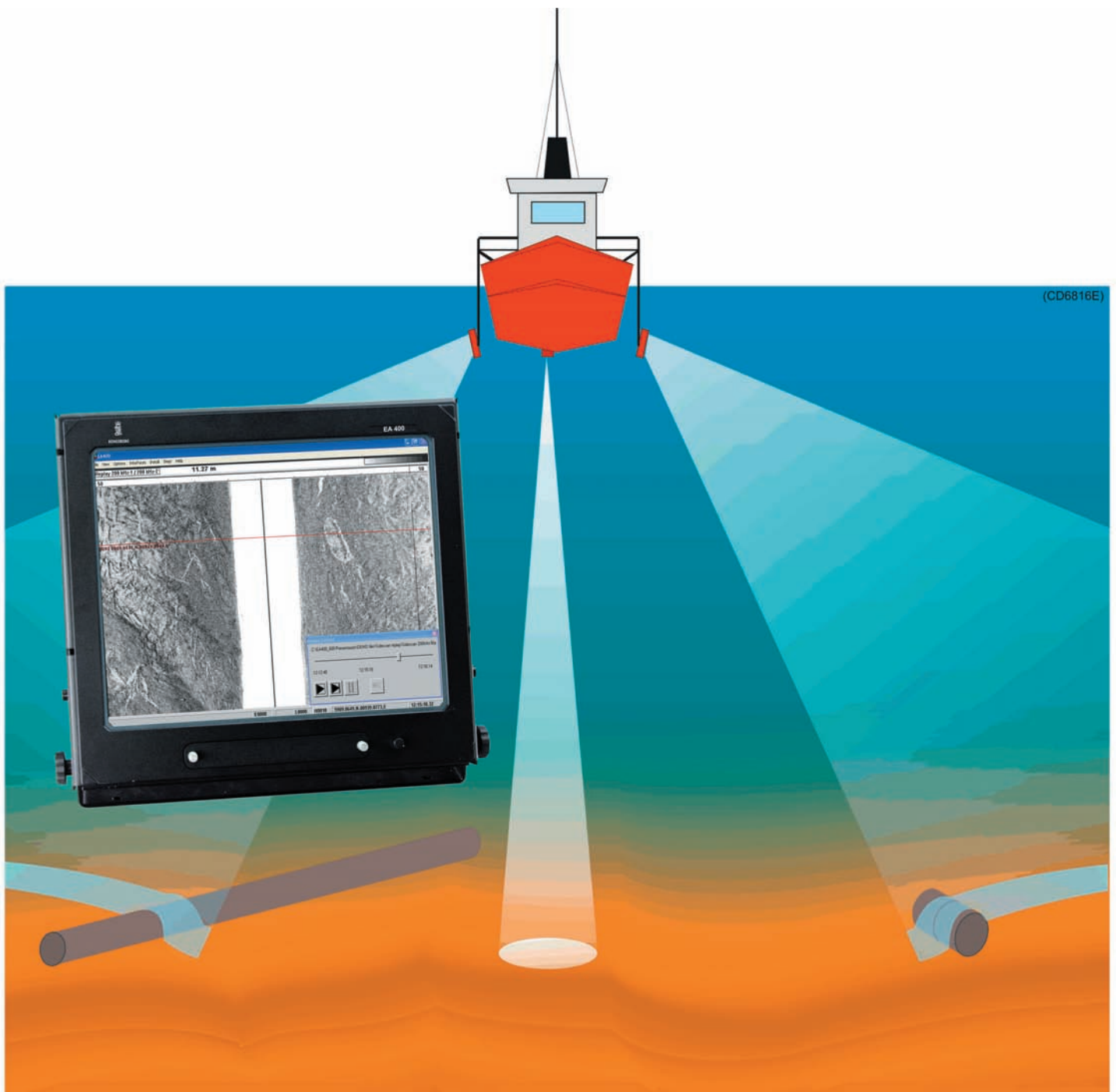
(3) Use GPS PPS pulse for accurate time synchronization of HYDRINS



KONGSBERG

EA 400/600 Sidescan

Echo sounder with combined sidescan and depth soundings



Side-looking image

The side-looking option is available for the EA 400, EA 400P and EA 600 hydrographic echo sounders. Using a sidescan sonar transducer, these echo sounders can produce a side-looking image on the side of the vessel the transducer is located. By employing two transducers (to port and starboard) both sides may be surveyed at the same time.

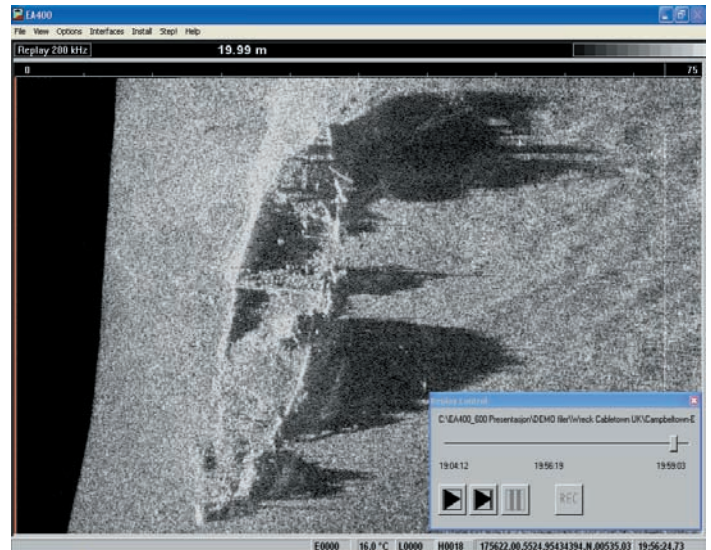
Mounted, not towed

An other very handy solution is to use hull mounted or over-the-side boom mounted sidescan transducer(s) to survey shallow areas such as harbors, rivers and canals. This eliminates the need for a towed sidescan sonar or similar device. Another advantage is that fixing the correct geographic location of detected objects is made much simpler and done more precisely since the uncertainty concerning the position of a towed body has been eliminated.

Side-looking option

The sidelooking option is equally useful when searching for wrecks or surveying navigable channels for obstacles. Sidescan data is captured and stored in a digital format and further data processing to a sidescan sonar mosaic image (by combining data from a number of survey lines) is possible and easy to perform.

Georef output datagram can be exported through network if vertical channel is available.



Sidescan with only starbord TD mounted.

Combining dual sidescan with normal depth sounding

It is also possible to allocate one or two vertical channels to normal echo sounding in addition to dual acoustic imaging. EA400SP is limited to run either dual sidescan or single sidescan with one vertical channel.

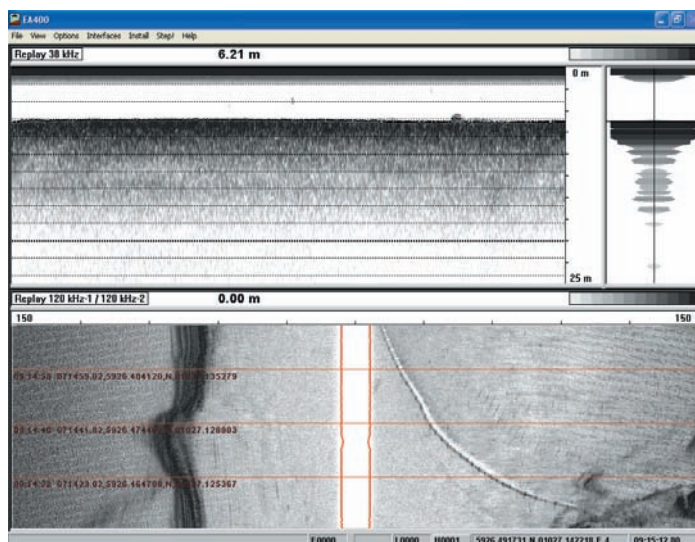
Easy to operate

The presentation of dual sidescan image can easily be changed in the operator menu. The normal echo sounding view(s) can be turned on or off in the menu. The bottom line for third or the fourth channels, can be overlaid on the sidescan presentation (one or both) as a red line.

The sidescan transducers

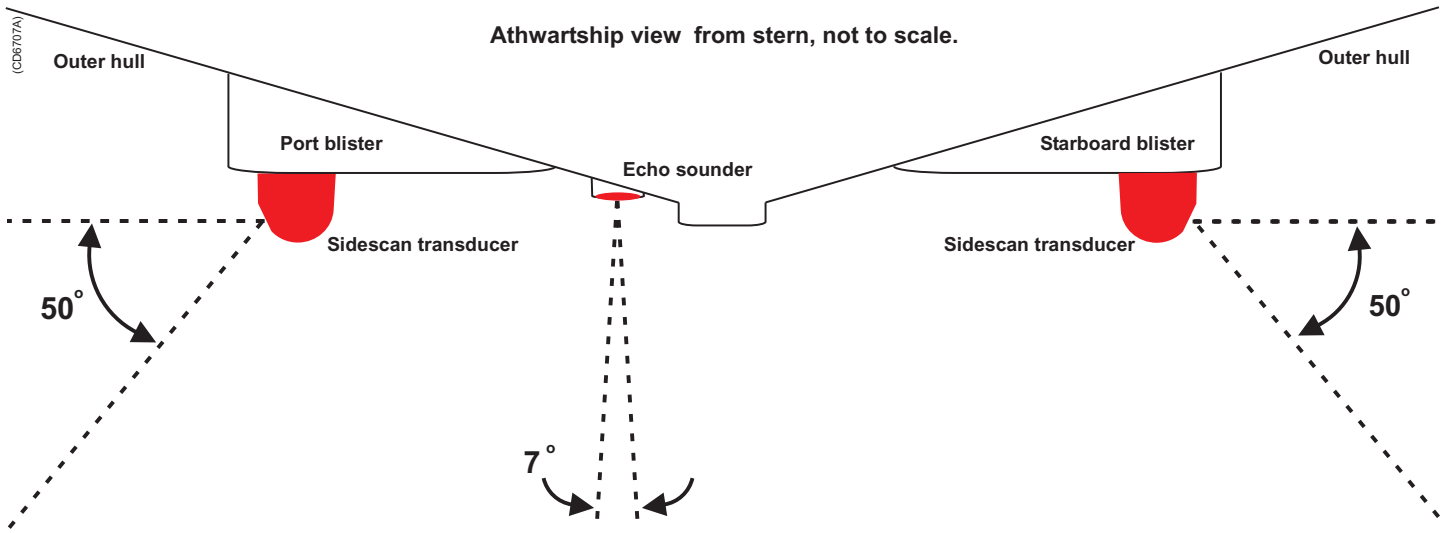
With a working frequency of 120 or 200 kHz, Kongsberg Maritime has combined both high accuracy and resolution with robustness and wide coverage.

The 120-2x50 is a sidescan transducer with a narrow longitudinal beamwidth of 1.9 degrees, and a wide transverse beam of 55.0 degrees. The 200kHz transducer has a longitudinal beamwidth of 0.5 degrees and a transverse beam of 49.0 degrees. Both transducers has a scanning sector narrow enough to reveal the secrets of the seafloor, including small objects and wrecks in great detail, but wide enough to allow faster survey speeds than possible with conventional side-looking units.



Dual sidescan with bottom depth channel.

Hull mounting



Typical hull mounting arrangement

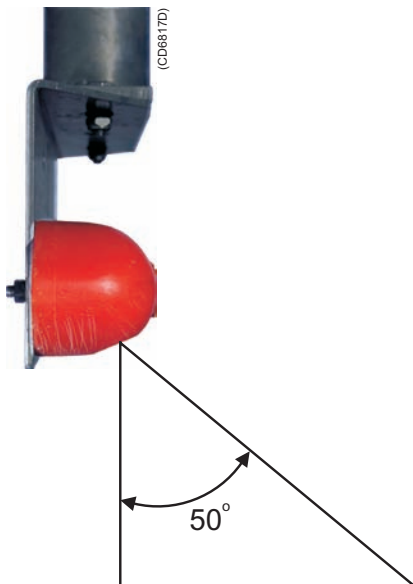
Over-the-side mounting



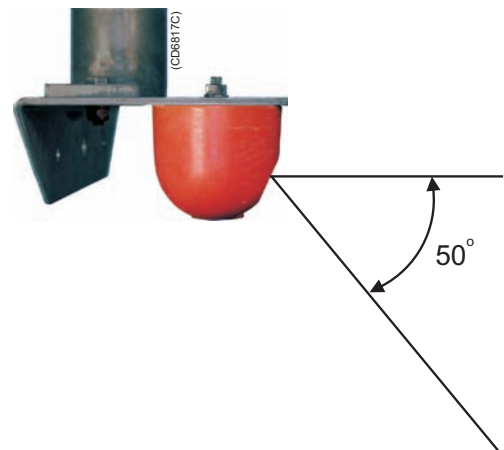
Vertically mounted



Horizontally mounted



Typical vertical installation



Typical horizontal installation (down to 50 m)

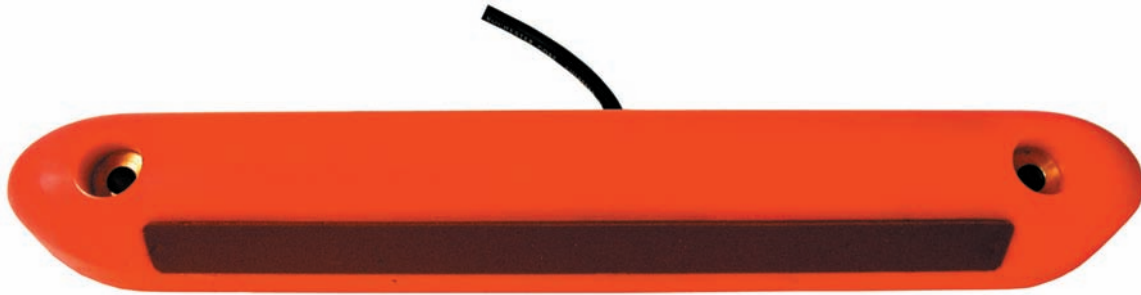
Technical specifications

120-2x50 Sidescan transducer

The 120-2-50 transducer has a narrow longitudinal and a wide transverse beam.

Measuring slant range (approx.)	0 to 300 m
Survey speed (max)	6 - 8 knots
Resonant frequency	120 kHz
Longitudinal beamwidth	1.9 degrees

Transversal beamwidth	55.0 degrees
Maximum pulse power input	1000 W
Maximum continuous power input	10 W
Maximum transducer depth	20 m
Cable length	20 m
Weight with cable	5.5 kg
Storage temperature	+70 to -40 C



200-0.5x49 Sidescan transducer

The 200-0.5x49 transducer has a narrow longitudinal and a wide transverse beam.

Measuring slant range (approx.)	0 to 200 m
Survey speed (max)	6 - 8 knots
Resonant frequency	200 kHz
Longitudinal beamwidth	0.5 degrees

Transversal beamwidth	49.0 degrees
Maximum pulse power input	1000 W
Maximum continuous power input	27 W
Maximum transducer depth	10 m
Cable length	20 m
Weight with cable	8 kg
Storage temperature	+48 to -6 C



Note: The preceding photographs are not representative of the relative size of the two transducers.

Due to the continuous development of its products, Kongsberg Maritime reserves the right to alter the specifications show above without notice. Please contact a sales representative for further information.

Kongsberg Maritime AS

Strandpromenaden 50
P.O.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

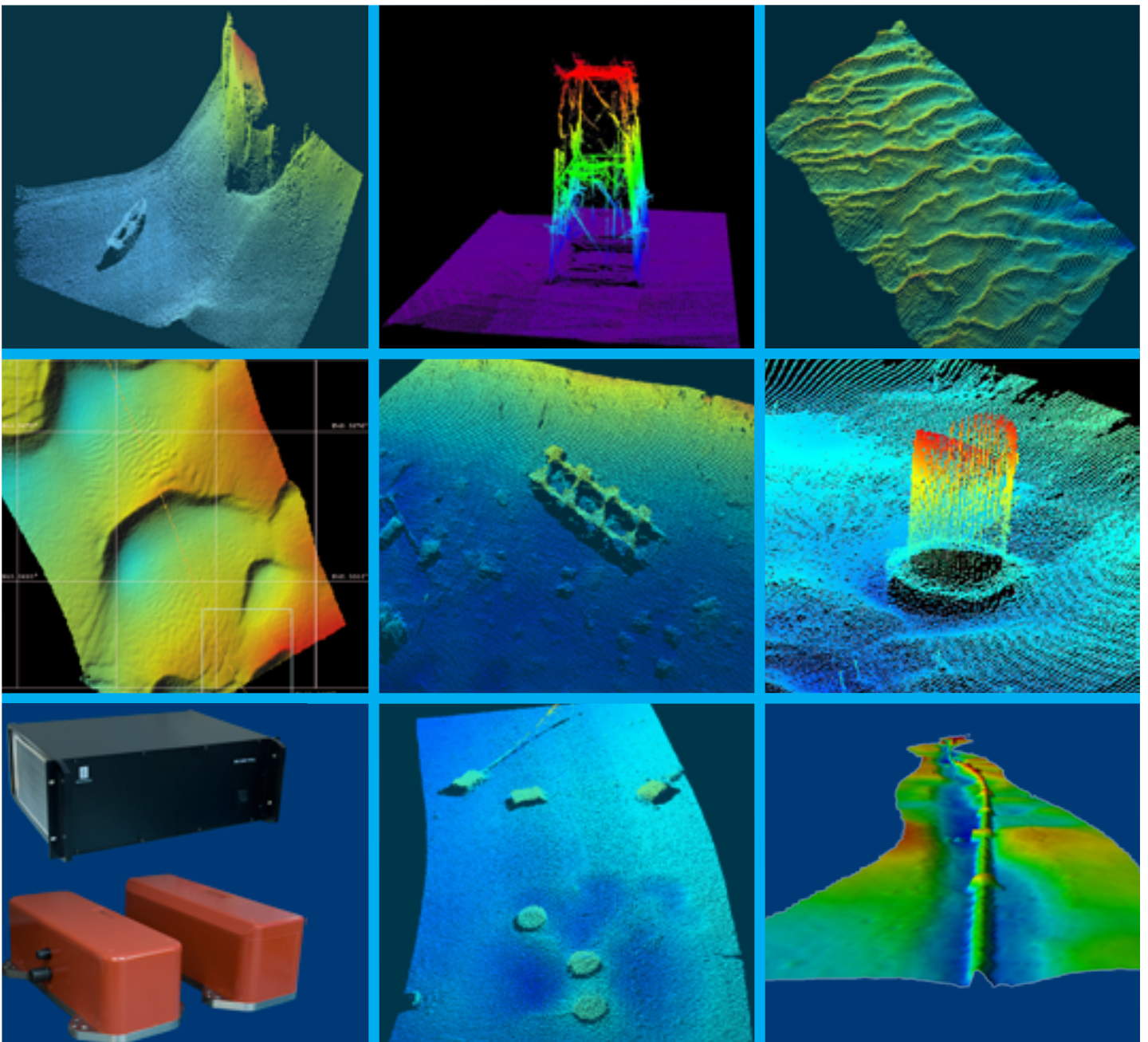


KONGSBERG

EM 2040

Multibeam echo sounder

**True wide band high resolution
multibeam echo sounder**



Key facts

The EM 2040 multibeam echo sounder is the first system to bring all the advanced features of deep water multibeam to the near bottom sounding environment. Important deep water system features included with the EM 2040 are:

- Dual swath per ping to allow a doubling of survey speed
- FM chirp to achieve a much longer range capability
- Complete roll, pitch and yaw stabilization
- Nearfield focusing both on transmit and receive

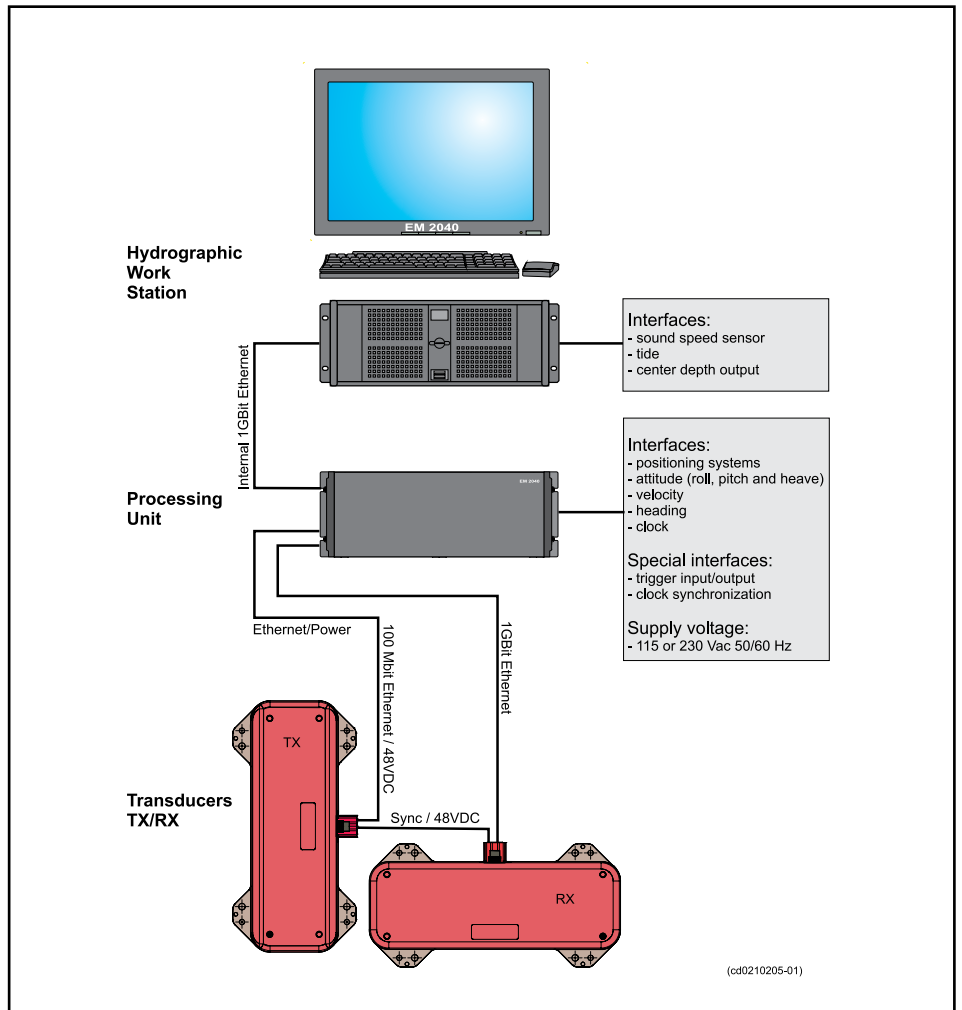
The EM 2040 is modular, allowing the user to tailor the beamwidths to the operational requirements, 0.4 by 0.7 and 0.7 by 0.7 degrees. The transmit fan is divided into three sectors pinging simultaneously at separate frequencies. This ensures a very strong and beneficial dampening of multibounce interference which on simpler systems often is seen at beam angles from 60 degrees and outwards. The EM 2040 has dual swath capability, allowing a sufficient sounding density alongtrack at a reasonable vessel speed.

The operating bandwidth available on the EM 2040 is unprecedented, from 200 to 400 kHz, which is a full octave, and this is achieved with the standard transducers. The operator can thus on the fly choose the best operating frequency for the application, 300 kHz for near bottom, 200 kHz for deeper waters, and 400 kHz for very high resolution inspection.

The bandwidth of the EM 2040 transducers allows the system to effectively operate with very short pulse lengths, i.e. down to 25 microseconds. With 25 microseconds pulse length the raw range resolution ($c\tau/2$) is 18 mm.

The EM 2040 is well suited for surveys meeting the IHO-S44 special order.

The standard depth rating of the



EM 2040 subsea parts is 6000 m. The system is ideal for operation on subsea vehicles such as ROVs or AUVs. All analog electronics are contained in the transducers, and communication to the topside Processing Unit is on standard Ethernet. For more information about the use of EM 2040 on ROVs and AUVs please see the following application notes (document numbers in brackets):

- High Resolution Bathymetry from ROV Mounted EM 2040 [368428]

- High Resolution Bathymetry from ROV Mounted EM 2040 and HAIN Navigation [368429]

Components

The basic EM 2040 has four units, a transmit transducer, a receive transducer, a processing unit, and a workstation. For completeness, data input from a motion sensor and a positioning system is required, as is the sound speed profile of the water

column between the transducers and the bottom. Sound speed at the transducer is an optional input.

The EM 2040 is delivered with a mounting plate with factory aligned guidances. It is recommended that the mounting plate is built into a steel casing and protected by a baffle for multipath reduction. Optionally, the transducers may be delivered mounted on a frame together with the motion sensor and a sound speed sensor, factory aligned for ease of mounting.

The EM 2040 is a modular system, fully prepared for upgrading to cater for more demanding applications. The transmit transducer has an angular coverage of 200° ($\pm 100^\circ$) as standard, allowing a coverage of 5.5 times water depth when matched with a single receive transducer. Adding a second receive transducer allows surveying to the water surface or up to 10 times water depth on flat bottoms. The transducers are separate units with titanium housings.

The transducers are interfaced to a processing unit via Ethernet, 100 Megabit/s to the transmit transducer and Gigabit from the receive transducer. The Processing Unit also supplies power to the transducers. Operator control, data quality inspection and data storage is handled by the hydrographic workstation running the same SIS software as all other Kongsberg multibeam.

Operational modes

The EM 2040 has a frequency range of 200-400 kHz. Three standard modes are available. 300 kHz is used for normal operation, giving an optimum balance between high resolution, depth capability and tolerance of detrimental factors

such as water column sediments. 200 kHz is available for meeting requirements to operate at the standard hydrographic single beam frequency, but also to achieve the best depth capability. 400 kHz is provided for inspection work with the utmost resolution.

The normally recommended survey frequency is 300 kHz. At this frequency the bandwidth used is more than 75 kHz with three angular sectors which are run at separate frequencies. With dual swath six separate frequencies are used. The minimum pulse length is 35 microseconds. The range resolution is then 26 mm. For deep waters FM chirp is employed with a bandwidth of 1.7 kHz. This allows a swath width in the order of

600 m and a depth capability of about 400 m in cold ocean waters.

The 200 kHz frequency mode has the same CW pulse lengths as the 300 kHz mode. The FM chirp pulse length is extended compared to the 300 kHz mode. Normally two sectors are used per swath. At this frequency the absorption in the water is lower than at 300 kHz, resulting in increased swath width and depth capability. In cold ocean waters with FM chirp a swath width of 700 m can be expected, and approximately 500 m depth capability achieved.

The 400 kHz frequency mode is intended for high resolution inspection work. Very short transmit pulses and wide receiver bandwidth is used. The operator may choose between one and three transmit sectors. With a single RX transducer the coverage can be up to 120° ($\pm 60^\circ$), and with dual RX the coverage can be up to 180° ($\pm 90^\circ$). The shortest pulse used is 25 μ s. It is also possible to run dual swath, but not with the shortest pulse length.

Advanced functions

- Frequency range: 200 to 400 kHz
- Dual swath capability, allowing a sufficient sounding density alongtrack at a reasonable survey speed
- FM chirp allowing much longer range capability
- Complete roll, pitch and yaw stabilization
- Nearfield focusing on both transmit and receive
- Operates with very short pulse lengths, down to 25 microseconds
- The depth rating of the subsea parts is 6000 m



Transducer array (Rx/Tx)



Monitor



Hydrographic Work Station (HWS)



Processing Unit (PU)

Technical specifications

- Frequency range: 200 to 400 kHz
- Max ping rate: 50 Hz
- Swath coverage sector: Up to 140° (±70°) (single RX) / 200 ° (±100°) (dual RX)
- Sounding patterns: Equiangular, Equidistant and High Density
- Roll stabilized beams: Yes, +/-15°
- Pitch stabilized beams: Yes, +/-10°
- Yaw stabilized beams: Yes, +/-10°

EM 2040-04	Cold ocean		Cold fresh water	
	Operating frequency	Max depth	Max coverage	Max depth
200 kHz	635 m	890 m	1360 m	1900 m
300 kHz	480 m	740 m	740 m	1120 m
400 kHz	315 m	430 m	430 m	540 m

EM 2040-07	Cold ocean		Cold fresh water	
	Operating frequency	Max depth	Max coverage	Max depth
200 kHz	600 m	850 m	1300 m	1780 m
300 kHz	465 m	705 m	700 m	1060 m
400 kHz	300 m	410 m	375 m	510 m

Pulse lengths	200 kHz		300 kHz		400 kHz	
	CW	FM	CW	FM	CW	FM
Normal mode	70, 200 and 600 µs	3/12 ms	70, 200 and 600 µs	2/6 ms	50, 100 and 200 µs	N/A
Single sector mode	35, 70 and 150 µs	1.5 ms	35, 70 and 150 µs	1.5 ms	25, 50 and 100 µs	N/A

Max no. of soundings per ping (dual swath)	200 kHz	300 kHz	400 kHz
Single RX	800	800	800
Dual RX	1600	1600	1600

Max no. of soundings per ping (single swath)	200 kHz	300 kHz	400 kHz
Single RX	400	400	400
Dual RX	800	800	800

Physical dimensions (excluding connectors and mounting arrangements)					
	200 kHz	300 kHz	400 kHz	Dimensions	Weight
Tx EM 2040-04	0.7°	0.5°	0.4°	727 x 150 x 142 mm (L x H x W)	45 kg
Tx EM 2040-07	1.5°	1°	0.7°	407 x 150 x 142 mm (L x H x W)	24 kg
Rx	1.5°	1°	0.7°	407 x 136 x 142 mm (L x H x W)	23 kg
Processing Unit (4U 19" rack)*				447 x 178 x 345 mm (W x H x D)	15 kg
Hydrographic Work Station (4U 19" rack)				427 x 178 x 480 mm (W x H x D)	20 kg
19" Monitor				483 x 444 x 68 mm (W x H x D)	12 kg

* More than one Processing Unit may be necessary

Kongsberg Maritime is engaged in continuous development of its products, and reserves the right to alter the specifications without further notice.

332644 / Rev.I / October 2012

Kongsberg Maritime AS

Strandpromenaden 50
P.O.Box 111
N-3191 Horten,
Norway

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



KONGSBERG

4200 SERIES

SIDE SCAN SONAR SYSTEM

FEATURES

- Optional Multi-Pulse (MP) technology for high speed surveys
- Crisp, high resolution CHIRP images
- Multiple dual simultaneous frequency sets to choose from
- Stainless steel towfish
- Easily integrates to other 3rd party sensors
- Meets IHO & NOAA Survey Specifications

APPLICATIONS

- Cable & Pipeline Surveys
- Geological/Geophysical Surveys
- Mine Countermeasures (MCM)
- Geohazard Surveys
- Channel Clearance
- Search and Recovery
- Archeological Surveys



The 4200 Series is a versatile side scan sonar system that can be configured for almost any survey application from shallow to deep water operations. The 4200 utilizes EdgeTech's Full Spectrum® CHIRP technology to provide crisp, high resolution imagery at ranges up to 50% greater than non-CHIRP systems; thus allowing customers to cover larger areas and save money spent on costly surveys.

One of the unique features of the 4200 is the optional Multi-Pulse (MP) technology, which places two sound pulses in the water rather than one pulse like conventional side scan sonar systems. This allows the 4200 to be towed at speeds of up to 10 knots while still maintaining 100% bottom coverage. In addition, the MP technology will provide twice the resolution when operating at normal tow speeds, thus allowing for better target detection and classification ability. The addition of the optional MP technology provides the operator with two modes of operation; either High Definition Mode (HDM) or High Speed Mode (HSM). This software-selectable mode of operation provides the operator the ability to select the best configuration for the specific job type.

All EdgeTech 4200 systems are comprised of a topside system and a reliable stainless steel towfish. A choice of dual simultaneous frequency sets are available to the user and topside processors come in a choice of configurations from portable to rack mounted units. In addition, an easy-to-use GUI software is supplied with every unit.



For more information please visit EdgeTech.com

info@EdgeTech.com | USA 1.508.291.0057



4200 SERIES

SIDE SCAN SONAR SYSTEM

KEY SPECIFICATIONS

SONAR SPECIFICATIONS	STANDARD	WITH OPTIONAL MP TECHNOLOGY	
Frequency	Choice of either 100/400, 300/600 or 300/900 kHz dual simultaneous		
Operating Range (meters/side)	100 kHz: 500m, 300 kHz: 230m, 400 kHz: 150m, 600 kHz: 120m, 900 kHz: 75m		
Horizontal Beam Width:	100 kHz: 1.5°, 300 kHz: 0.5°, 400 kHz: 0.4°, 600 kHz: 0.26°, 900 kHz: 0.2°	In High Speed Mode: 100 kHz: 1.26°, 300 kHz: 0.54°, 400 kHz: 0.4°, 600 kHz: 0.34°, 900 kHz: 0.3° In High Definition Mode: 100 kHz: 0.64°, 300 kHz: 0.28°, 400 kHz: 0.3°, 600 kHz: 0.26°, 900 kHz: 0.2°	
Resolution Along Track	100 kHz: 5 m @ 200 m 300 kHz: 1.3 m @ 150 m 400 kHz: 0.6 m @ 100 m 600 kHz: 0.45 m @ 100 m 900 kHz: 18 cm @ 50 m	High Definition Mode: 100 kHz: 2.5m @ 200m 300 kHz: 1.0m @ 200m 400 kHz: 0.5m @ 100m 600 kHz: 0.45m @ 100m 900 kHz: 18 cm @ 50m	High Speed Mode: 100 kHz: 4.4m @ 200m 300 kHz: 1.9m @ 200m 400 kHz: 0.7m @ 100m 600 kHz: 0.6m @ 100m 900 kHz: 26 cm @ 50m
Resolution Across Track	100 kHz: 8 cm, 300 kHz: 3 cm, 400 kHz: 2 cm, 600 kHz: 1.5 cm, 900 kHz: 1 cm		
Vertical Beam Width	50°		
Depression Angle	Tilted down 20°		
TOWFISH	STAINLESS STEEL		
Diameter	11.4 cm (4.5 inches)		
Length	125.6 cm (49.5 inches)		
Weight in Air/Saltwater	48 / 36 kg (105 / 80 pounds)		
Depth Rating (Max)	2,000m		
Standard Sensors	Heading, pitch & roll		
Optional Sensor Port	(1) Serial – RS 232C, 9600 Baud, Bi-directional & 27 VDC		
Options	Pressure Sensor, Magnetometer, Integrated USBL Acoustic Tracking System, Built-in Responder Nose, Depressor, Power Loss Pinger and Custom Sensors		
TOPSIDE PROCESSOR	4200-P	4200	701-DL INTERFACE
Hardware	Portable splash-proof case	19" rack mount computer	19" rack mount interface
Display & Interface	Splash-proof laptop	21" flat panel monitor, keyboard & trackball	Customer-supplied
Power Input	20-36 VDC or 115/230 VAC	115/230 VAC	115/230 VAC
Operating System	Windows® XP Pro		
File Format	Native JSF or XTF		
Output	Ethernet		
TOW CABLE	Coaxial Kevlar or double-armored up to 6,000m, winches available		

For more information please visit EdgeTech.com

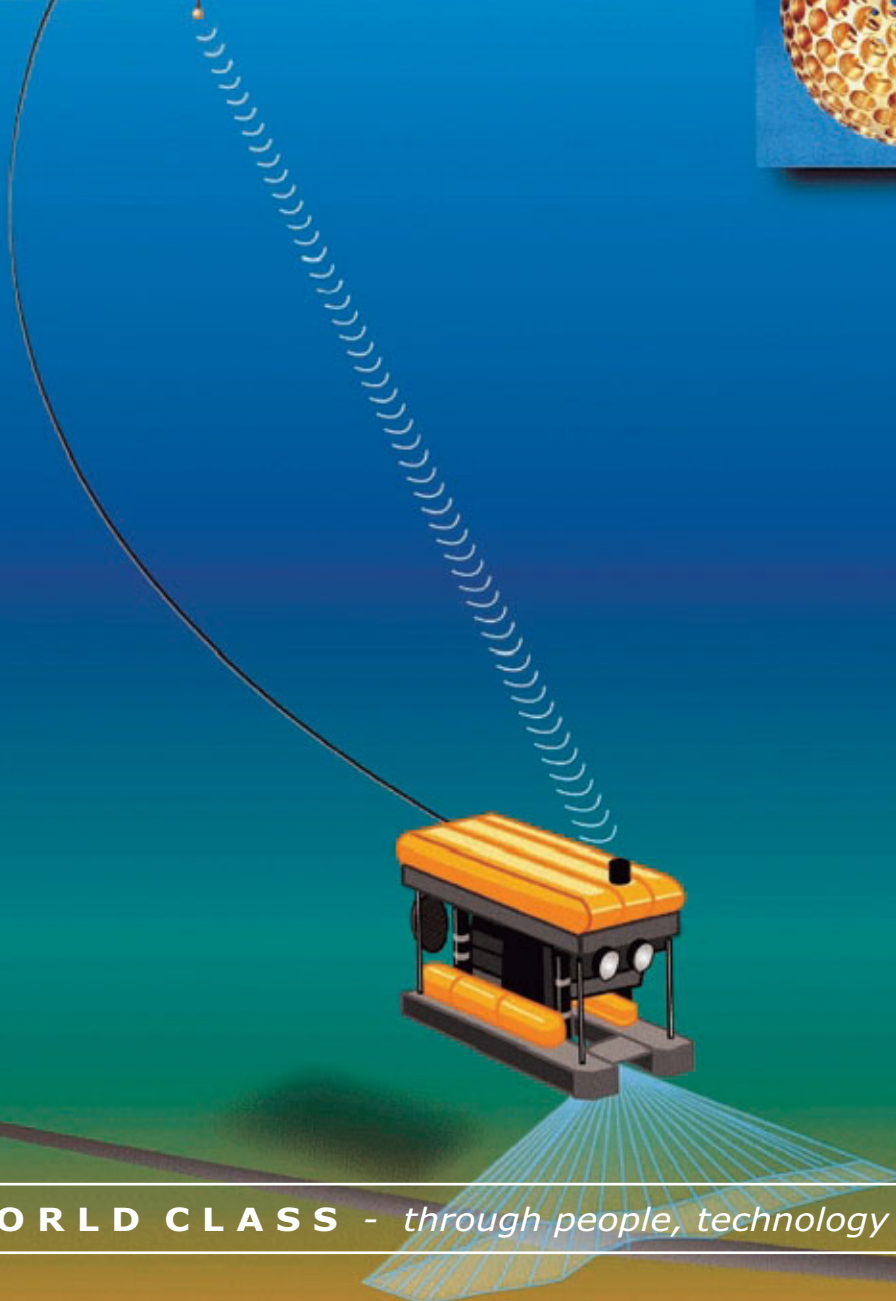
info@EdgeTech.com | USA 1.508.291.0057



KONGSBERG

HiPAP[®] 500

High Precision Acoustic Positioning System



WORLD CLASS - *through people, technology and dedication*

Introduction

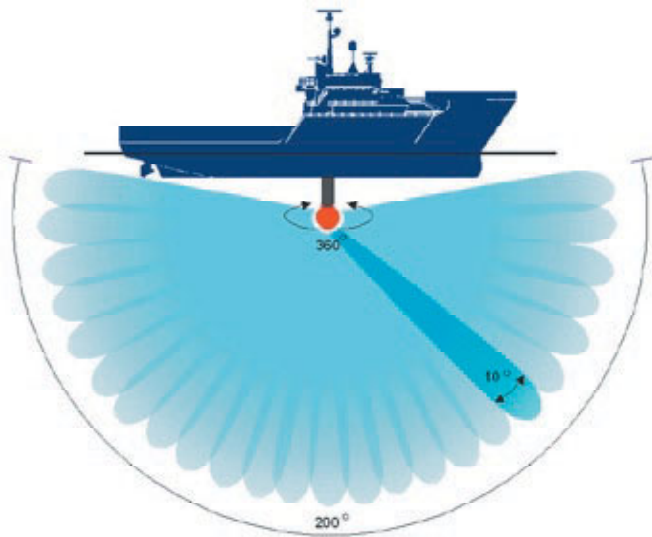
The HiPAP 500 is an underwater positioning system using the Super Short Base Line (SSBL) principle. The main advantage of this principle is that it only requires installation of one hull-mounted transducer and one subsea transponder.

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.

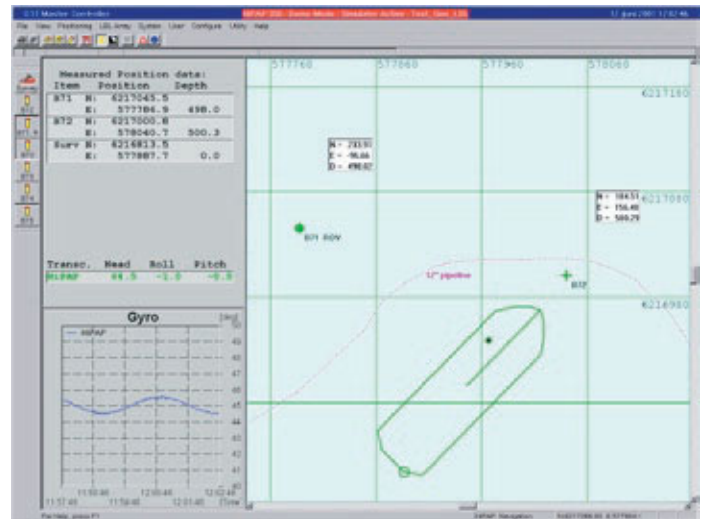
The HiPAP system is so far the only system that can control a focused listening beam towards the transponder(s). This means that noise from other directions is suppressed. This provides a good foundation for further signal processing.

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.

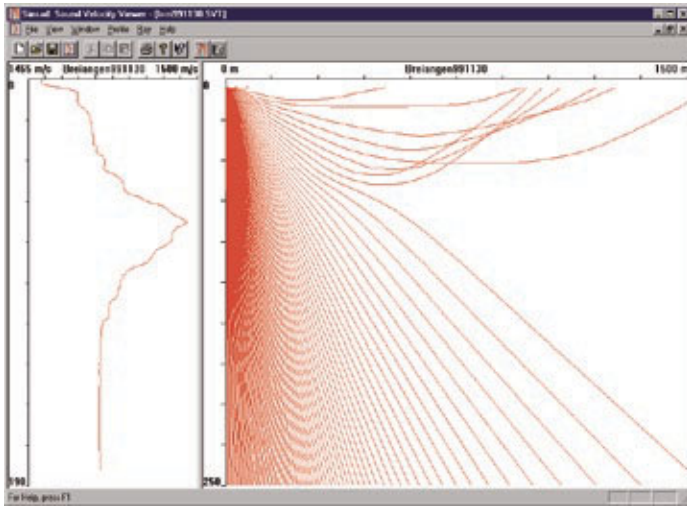
The current LBL systems use intelligent, instrumented transponders, transceivers and transducers. These are all rated for 3000 m water depth, and fulfil any requirements within subsea construction, survey and metrology.

" 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

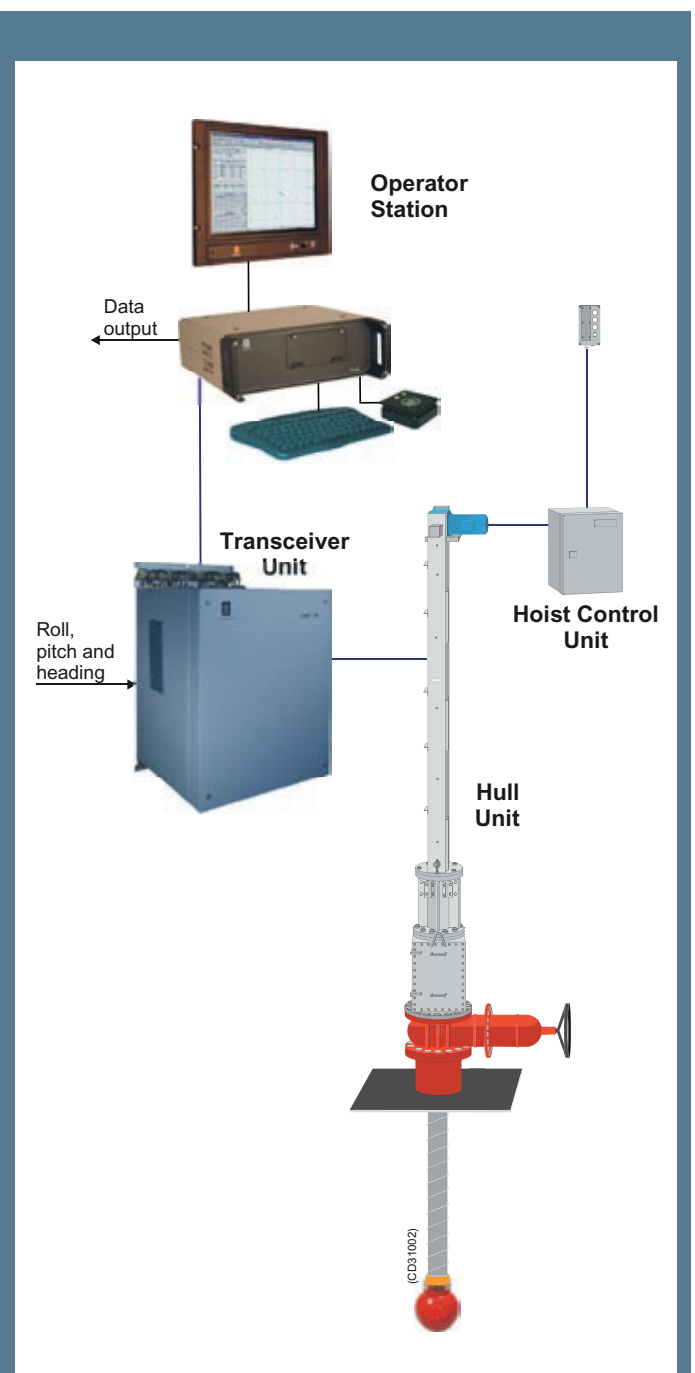
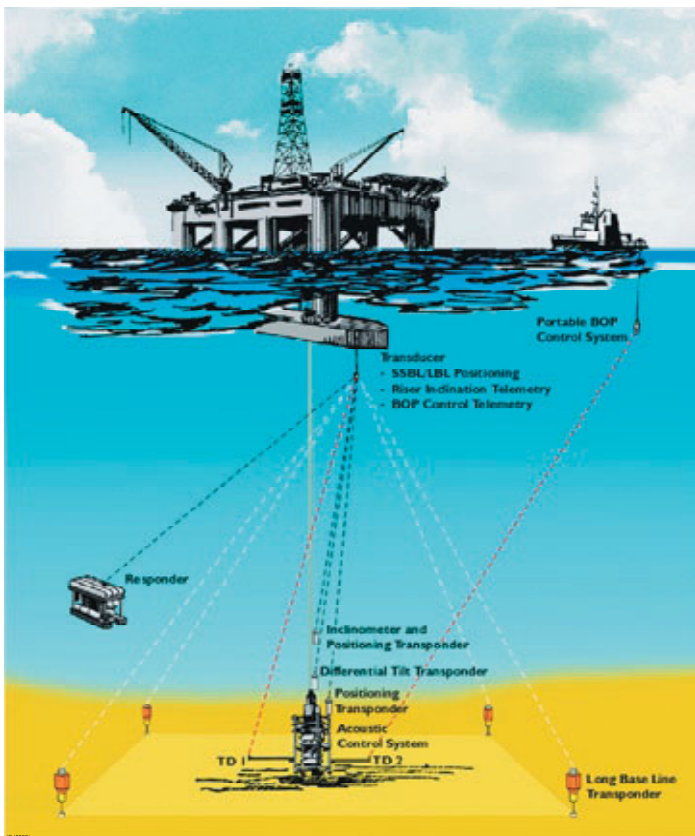
The HiPAP can take input of the sound velocity profile in the water column. Based on this profile, the system will automatically compensate for the error contribution from both wrong angle and range detection.



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 assured 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)

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



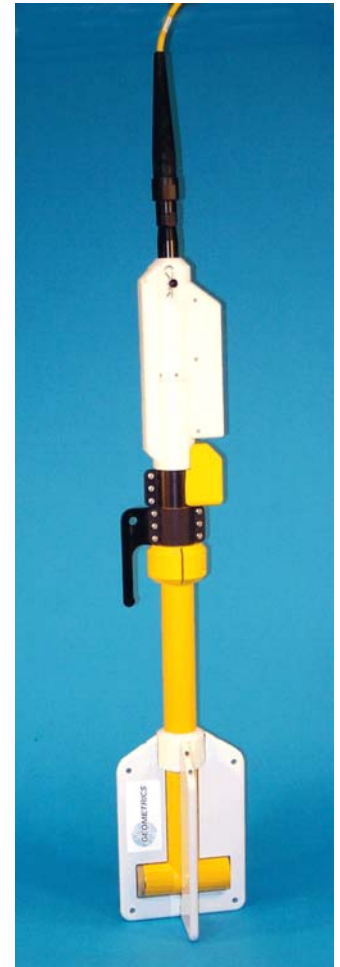


G-882 MARINE MAGNETOMETER

- **CESIUM VAPOR HIGH PERFORMANCE** – Highest detection range and probability of detecting all sized ferrous targets
- **NEW STREAMLINED DESIGN FOR TOW SAFETY** – Low probability of fouling in lines or rocks
- **NEW QUICK CONVERSION FROM NOSE TOW TO CG TOW** – Simply remove a stainless steel locking pin, move tow point and reinsert. New easy carry handle built in!
- **NEW INTERNAL CM-221 COUNTER MODULE** – Provides Flash Ram for storage of default parameters set by user
- **NEW ECHOSOUNDER / ALTIMETER OPTION**
- **NEW DEPTH RATING** – 4,000 psi !
- **HIGHEST SENSITIVITY IN THE INDUSTRY** – 0.004 nT/Hz RMS with the internal CM-221 Mini-Counter
- **EASY PORTABILITY & HANDLING** – no winch required- single man operation, 44 lbs with 200 ft cable (without weights or depressor wing)
- **COMBINE TWO SYSTEMS FOR INCREASED COVERAGE** – Internal CM-221 Mini-Counter provides multi-sensor data concatenation allowing side by side coverage which maximizes detection of small targets and reduces noise

Very high resolution Cesium Vapor performance is now available has been incorporated into a low cost, small size system for professional surveys in shallow or deep water. High sensitivity and sample rates of total field measurements are maintained for all applications. The well proven Cesium sensor is combined with a unique new CM-221 Larmor counter and ruggedly packaged for small or large boat operation. Use your computer and standard printer with our MagLog Lite™ software to log, display and print GPS position and magnetic field data. Model G-882 is the lowest priced - highest performance fully operational marine mag system ever offered.

The G-882 is flexible for operation in small boat, shallow water surveys as well as deep tow applications (4,000 psi rating, telemetry over steel coax available to 10Km). Being small and lightweight (44 lbs net, no weights) it is easily deployed and operated by one man. But add several no-foul weight collars and the system can quickly weigh in at more than 100 lbs. Power may be supplied from a 24 to 30 VDC battery supply or the included 110/220 VAC power supply. The tow cable uses high strength



G-882 with Weight Collar Depth Option

Kevlar and it's length is standard at 200 ft (61 m) with optional cable up to 500m (no telemetry). The shipboard end of the tow cable is attached to a junction box or on-board cable for quick and simple hookup to power and output of data into any IBM PC computer. A rugged fiber-wound fiberglass housing provides selectable orientation of the sensor and therefore maintains operations throughout the world with only small limitations as to direction of survey in equatorial regions.

The G-882 Cesium magnetometer provides the same operating sensitivity and sample rates as the larger deep tow model G-880. MagLogLite™ Logging Software is offered with each magnetometer and allows recording and display of data and position with Automatic Anomaly Detection! Additional options include: MagMap2000 plotting and contouring software and post acquisition processing software MagPick™ (free from our website.)

The G-882 system is particularly well suited for the detection and mapping of all sizes of ferrous objects. This includes anchors, chains, cables, pipelines, ballast stone and other scattered shipwreck debris, munitions of all sizes, aircraft, engines and any other object with magnetic expression. Objects as small as a 5 inch screwdriver are readily detected provided that the sensor is close to the seafloor and within practical detection range. (Refer to table at right).

The design of this special marine unit is directed toward the largest number of user needs. It is not intended to meet all marine requirements such as deep tow through long cables or monitoring fish altitude. Rugged design with highest performance at lowest cost are the goals.

Typical Detection Range For Common Objects

Ship 1000 tons	0.5 to 1 nT at 800 ft (244 m)
Anchor 20 tons	0.8 to 1.25 nT at 400 ft (120 m)
Automobile	1 to 2 nT at 100 ft (30 m)
Light Aircraft	0.5 to 2 nT at 40 ft (12 m)
Pipeline (12 inch)	1 to 2 nT at 200 ft (60 m)
Pipeline (6 inch)	1 to 2 nT at 100 ft (30 m)
100 KG of iron	1 to 2 nT at 50 ft (15 m)
100 lbs of iron	0.5 to 1 nT at 30 ft (9 m)
10 lbs of iron	0.5 to 1 nT at 20 ft (6 m)
1 lb of iron	0.5 to 1 nT at 10 ft (3 m)
Screwdriver 5 inch	0.5 to 2 nT at 12 ft (4 m)
1000 lb bomb	1 to 5 nT at 100 ft (30 m)
500 lb bomb	0.5 to 5 nT at 50 ft (16 m)
Grenade	0.5 to 2 nT at 10 ft (3 m)
20 mm shell	0.5 to 2 nT at 5 ft (1.8 m)

MODEL G-882 CESIUM MARINE MAGNETOMETER SYSTEM SPECIFICATIONS

OPERATING PRINCIPLE:	Self-oscillating split-beam Cesium Vapor (non-radioactive)
OPERATING RANGE:	20,000 to 100,000 nT
OPERATING ZONES:	The earth's field vector should be at an angle greater than 6° from the sensor's equator and greater than 6° away from the sensor's long axis. Automatic hemisphere switching.
CM-221 COUNTER SENSITIVITY:	<0.004 nT/√Hz rms. Typically 0.02 nT P-P at a 0.1 second sample rate or 0.002 nT at 1 second sample rate. Up to 10 samples per second
HEADING ERROR:	±1 nT (over entire 360° spin and tumble)
ABSOLUTE ACCURACY:	<3 nT throughout range
OUTPUT:	RS-232 at 9600 Baud
MECHANICAL:	
Sensor Fish:	Body 2.75 in. (7 cm) dia., 4.5 ft (1.37 m) long with fin assembly (11 in. cross width), 40 lbs. (18 kg) Includes Sensor and Electronics and 1 main weight. Additional collar weights are 14lbs (6.4kg) each, total of 5 capable
Tow Cable:	Kevlar Reinforced multiconductor tow cable. Breaking strength 3,600 lbs, 0.48 in OD, 200 ft maximum. Weighs 17 lbs (7.7 kg) with terminations.
OPERATING TEMPERATURE:	-30°F to +122°F (-35°C to +50°C)
STORAGE TEMPERATURE:	-48°F to +158°F (-45°C to +70°C)
ALTITUDE:	Up to 30,000 ft (9,000 m)
WATER TIGHT:	O-Ring sealed for up to 9000 ft (2750 m) depth operation
POWER:	24 to 32 VDC, 0.75 amp at turn-on and 0.5 amp thereafter
ACCESSORIES:	
Standard:	CM-201 View Utility Software operation manual and ship case
Optional:	Telemetry to 10Km coax, gradiometer (longitudinal or transverse)
MagLog Lite™ Software:	Logs, displays and prints Mag and GPS data at 10 Hz sample rate. Automatic anomaly detection and single sheet Windows printer support

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

4/03

GEOMETRICS, INC. 2190 Fortune Drive, San Jose, California 95131
408-954-0522 • Fax 408-954-0902 • Internet: sales@mail.geometrics.com

GEOMETRICS Europe Manor Farm Cottage, Galley Lane, Great Brickhill, Bucks,
England MK179AB • 44-1525-261874 • Fax 44-1525-261867

GEOMETRICS China Laurel Industrial Co. Inc. - Beijing Office, Room 2509-2511, Full Link Plaza #18
Chaoyangmenwai Dajie, Chaoyang District, Beijing, China 100020
10-6588-1126 (1127..1130), 10-6588-1132 • Fax 010-6588-1162



Massa TR-1075 Sub-Bottom Profiling Transducers

The Massa Model TR-1075 Family consists of rugged high-power underwater transducers designed to operate in the 2.5 to 10 KHz frequency range. They are ideal for use in bottom mapping and sub-bottom profiling applications.

The transducers are designed to be driven with a maximum input power of 600 Watts using up to a 30% duty cycle, or 200 Watts maximum for continuous operation. In shallow water, the maximum output is cavitation limited. Minimum water depths of approximately 30 and 100 feet are recommended for input power of 200 and 600 Watts respectively to avoid cavitation.

All of the transducers in the family utilize the same resonant structure containing a circular piston for the radiating source that is $\frac{1}{2}$ wavelength in diameter at 4 KHz. The transducers are designed to be bolted directly through their 4-corner integral shock mounts to a simple frame structure. This modular design allows the transducers to easily be assembled into arrays to achieve any desired beam pattern and source level. Each transducer is terminated with a Massa C1F2 Female Underwater Connector and has a locking ring included. Mating C1M2 Male Connectors can be purchased separately.

The TR-1075E consists of the basic resonator with no electrical tuning. Its nominal frequency of resonance is 3.5 KHz. Massa has fabricated TR-1075 Transducers with a wide variety of different internal tuning networks. They have included transformers to produce different output impedance magnitudes. Transducers have been made with both series and parallel tuning to produce a nominal phase angle of 0 at different frequencies. A separate inductor is required for series tuning, while the inductance of the primary windings of the transformer is used for parallel tuning.

In some cases, damping resistors have been connected across the transducer to lower its Q, which allows the use of a short tone burst excitation pulse with reduced sensitivity for operation when very close to the sea floor. These transducers can be driven with greater input power because some of the energy is dissipated by the resistor. Massa can customize a tuning network to meet any requirement, but one of the standard models will usually meet the needs of most customers.



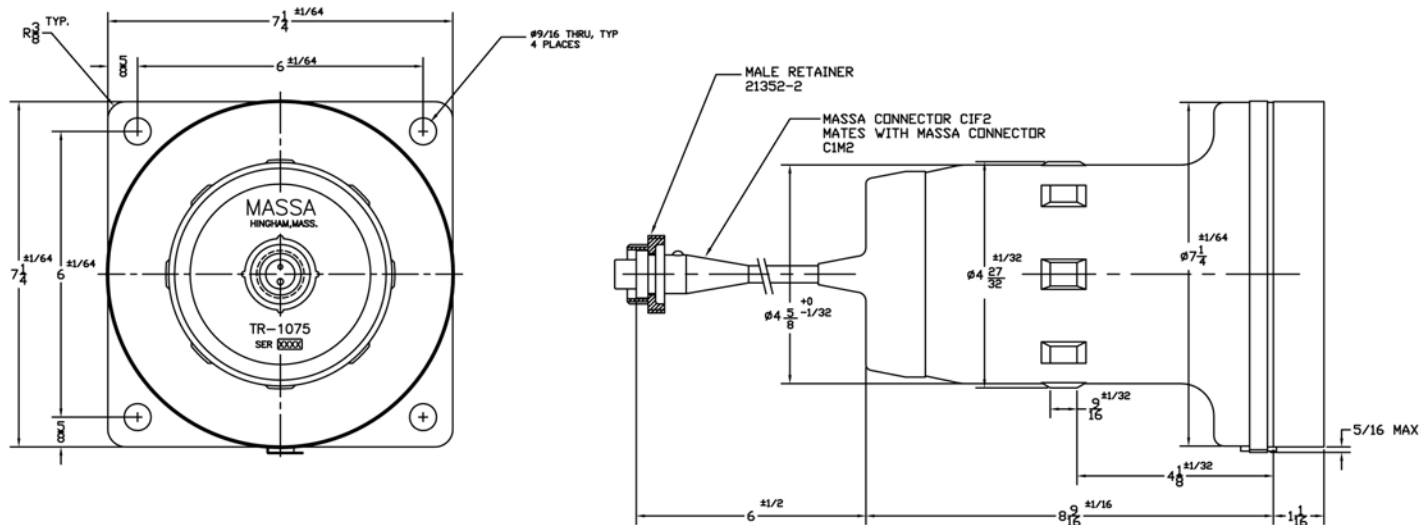
FEATURES

- High Power
 - Up to 600 Watts @ 30% Duty Cycle
 - Up to 200 Watts CW
- Broadband
 - 2.5 to 10 kHz
- Maximum Operating Depth is 2,000 ft.
- True Piston Radiating Source
 - $\frac{1}{2}$ Wavelength Diameter at 4 kHz
 - 80° Conical Beam Angle
- Module Design
 - Shock Mounted
 - Easily Assembled into Arrays
- Weight is 25 lbs.
- Terminated with Proven Reliable C1F2 Underwater Connector
- Mates to Massa C1M2 Underwater Connector

APPLICATIONS

- Sub-Bottom Profiling
- Bottom Mapping

Massa TR-1075 Data



TR-1075 Transducer Family Outline Drawing
(Dimensions in Inches)

Transducer Model Number	Frequency Tuned for 0° Phase (nominal)	Impedance Magnitude (nominal)	Power Rating % Duty Cycle	Tuning Circuit
TR-1075E	No Tuning	4,500 Ohms @ 3.5 kHz	600 Watts @ 30% 200 Watts @ 100%	No Tuning
TR-1075A	4 kHz	100 Ohms @ 4 kHz	600 Watts @ 30% 200 Watts @ 100%	Parallel
TR-1075H	3.5 kHz	250 Ohms @ 3.5 kHz	600 Watts @ 30% 200 Watts @ 100%	Series
TR-1075D	3.5 kHz	200 Ohms @ 3.5 kHz	1,000 Watts @ 30% 335 Watts @ 100%	Series with Shunt Resistor

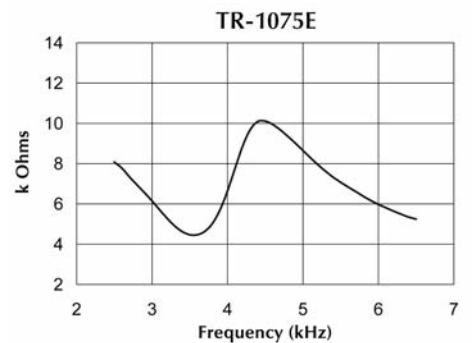
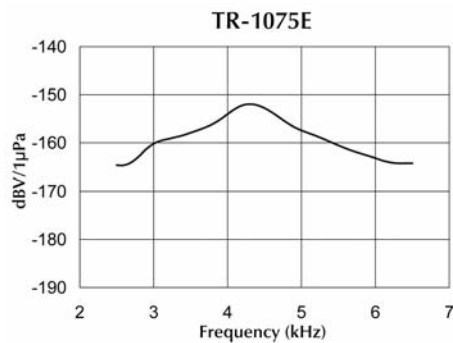
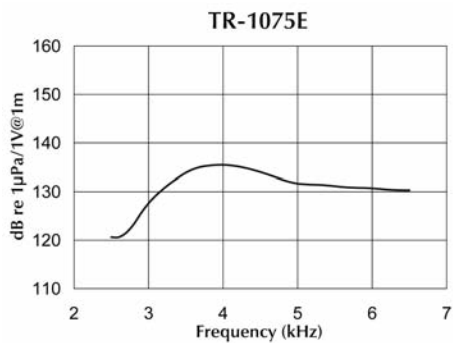
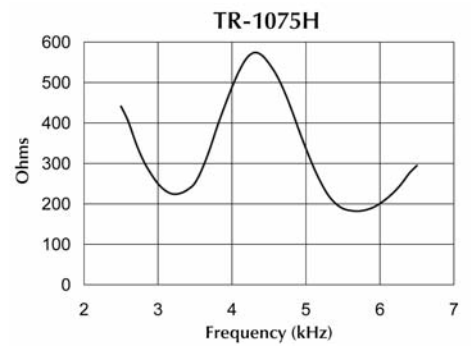
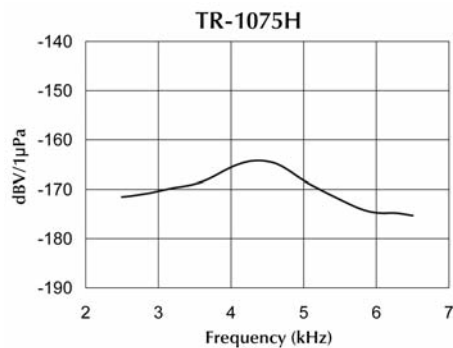
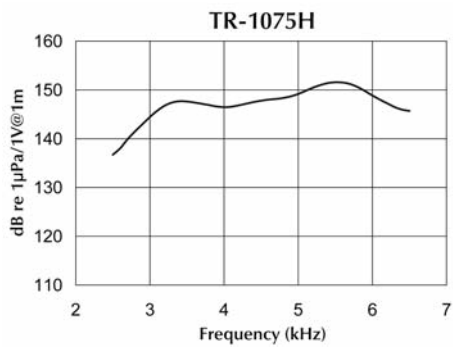
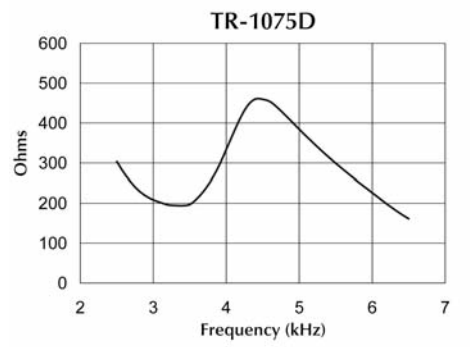
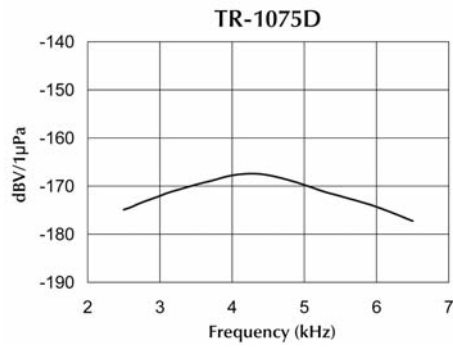
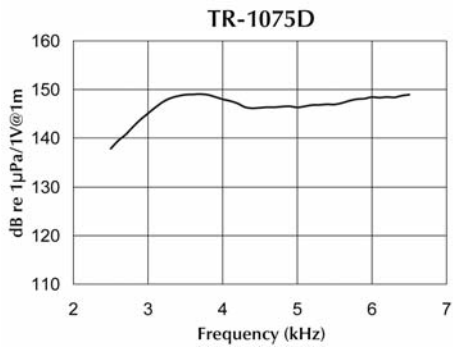
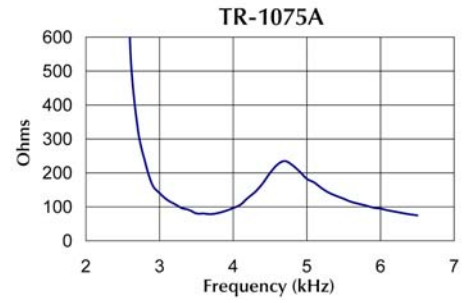
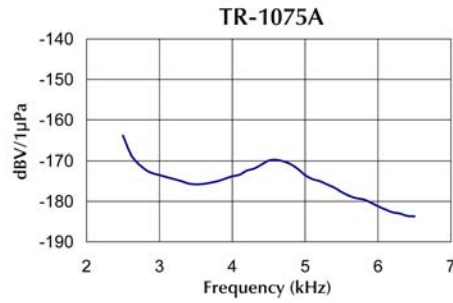
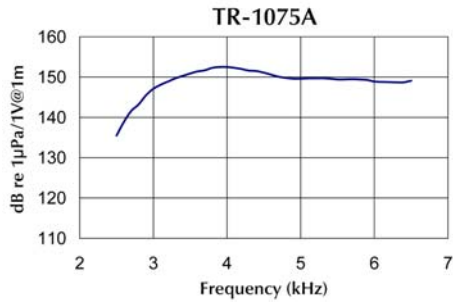
Chart Showing the Tuning Circuits for the Standard Models of the TR-1075 Transducer Family

Massa TR-1075 Nominal Response Curves

Transmitting Voltage Responses

Receiving Voltage Sensitivities

Impedance Magnitudes



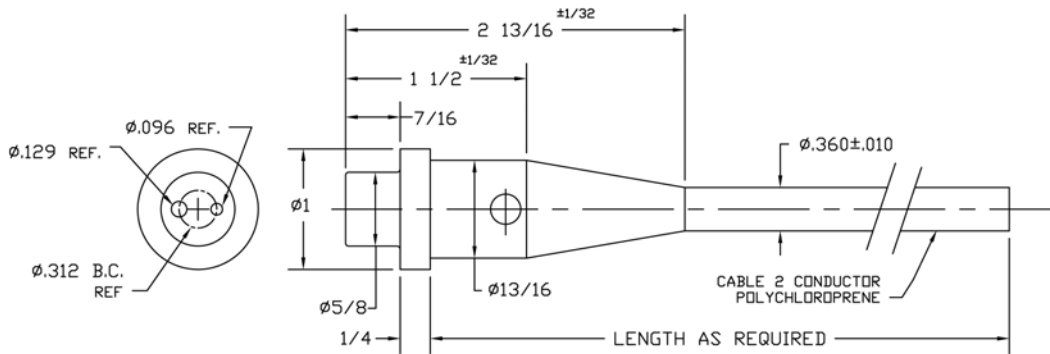
Massa C1M2/C1F2 Underwater Connectors



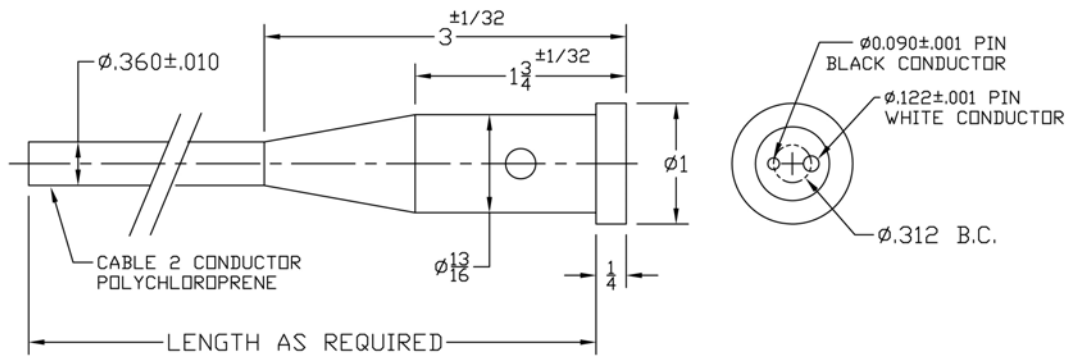
Photograph of C1M2 and C1F2 Connectors with Retaining Rings

Massa C1M2 male and C1F2 female 2-conductor in-line Underwater Connectors were developed for the oceanographic community to provide highly reliable underwater connection. Massa has manufactured and sold over 100,000 connector pairs, and some have been successfully used for over 20 years in the ocean. There has never been a failure of a connector reported to Massa.

Massa typically supplies transducers with C1F2 Female Connectors attached. C1M2 Male Connectors can be purchased separately to complete the mating connection. The standard C1M2 is attached to a 5 foot cable with a retaining ring included, but connectors can be fabricated with any length of cable required.



Outline Drawing of a C1M2 Male Connector for Mating to Massa Underwater Transducers (without retaining ring)



Outline Drawing of a C1F2 Female Connector Supplied on Massa Underwater Transducers (without retaining ring)

MASSA PRODUCTS CORPORATION

280 Lincoln St., Hingham, MA 02043 U.S.A.

Tel: 781-749-4800 Fax: 781-740-2045

Toll Free in USA: 800-962-7543

E-mail: sales@massa.com

Web Site: www.massa.com



DIGITAL SUB-BOTTOM TRANSCIVER

The **Digital Sub-Bottom Transceiver** combines the highly successful Digital Sub-Bottom Transmitter with a fully featured receiver to deliver a fully integrated pinger transceiver system.



KEY FEATURES

- Fully featured receiver
- Powerful 60kW output
- Single cycle mode power boost
- Adjustable frequency output
- Automatic impedance matching
- Heave compensation input
- Optional Sub-Bottom Monitor acquisition software

Applications:

- Towed
- Over-the-side mount
- Bespoke hull mount installation

DIGITAL SUB-BOTTOM TRANSCIVER

In addition to the standard features offered by the **Digital Sub-Bottom Transmitter**, the new Digital Transceiver model comes with a software driven front end receiver to provide a wide range of signal gain processing and data optimisation benefits. Enhanced performance in noisy operating environments is achieved by selectable filtering including low pass, high pass and notch filters to remove unwanted out of band noise. A dedicated hydrophone input is provided to offer additional deployment configurations and noise rejection benefits. A selectable full wave envelope detector is included to provide enhanced data display optimisation. The fully isolated output signal is easily integrated to industry standard data acquisitions systems, or when delivered with the Sub-Bottom Monitor acquisition software package, digital acquisition can be performed at source utilising the internal acquisition module. The Sub-Bottom Monitor software provides real time data display and offers data acquisition over an Ethernet network with remote control of transmitter, receiver and acquisition parameters.

SUB-BOTTOM MONITOR SOFTWARE FEATURES

Data Acquisition via Ethernet link and recording in industry formats
Signal gain processing via Autogain or Manual on screen TVG
Signal frequency processing with FFT and spectrum analysis
Bottom tracking function with water column blanking or truncation options
Ethernet remote control of all transmit, receive, gain and filtering functions
Navigation input logging in NMEA, GLL/GGA, CODA and custom formats
Analogue signal output with annotation functions for printed records

TRANSMITTER OUTPUT

60kW single cycle (30kW > 1 cycle)
Average Output Power > 100W
1-18kHz frequency
Up to 35 pings/second (power dependent)
No impedance matching necessary
Transformer free output
Separate or combined TX/RX mode

PULSE CYCLES

1 - 10 cycles

TRANSDUCER MODELS

Massa TR-1075D: 2.5kHz - 10kHz
STR TR-1014A: 10kHz - 14kHz

RECEIVER

TX/RX on standard combined or separate arrays

INITIAL GAIN

-10 to + 30dB gain

TVG

0 - 40 Log Range Control

TVG DELAY

0 to 25mS
20 - 100% Gain Limit Controls
Automatic attenuator for anti-saturation
Selectable full wave envelope display for high frequency operation

FILTERS

Selectable > 9kHz High pass filter
Selectable < 2kHz Low frequency noise rejection filter
3.5kHz to 18kHz Variable Low pass filter
450Hz to 16kHz Dual adjustable notch filters

HYDROPHONE INPUT

+/- 17dB Gain adjustment
Single ended or differential inputs
15VDC output for preamp

SIGNAL OUTPUT

Isolated 10V P-P

HEAVE COMPENSATION INTERFACE

RS232 input, TSS1 data String
9600-19200 baud

SV CORRECTION

1438ms - 1562ms
Up to 35pps

INPUT TRIGGER

3V-30V positive edge pulse
1ms - 10ms pulse
Isolated ground
Internal hardware trigger for test

OUTPUT TRIGGER

5V positive edge pulse
1ms or 10ms pulse
Isolated ground

POWER

85V - 264VAC, 50Hz (160W max)

CONNECTOR

Amphenol DMS3102A-22-34S

DIMENSIONS

19 inch rack mountable 4U
520mm (L) x 430mm (W) x 180mm (H)

WEIGHT

16 kg

All information contained in this brochure may be subject to change without prior notice

CSP-N Seismic Energy Source



The CSP-N seismic energy source is the driving force behind Applied Acoustics' Dura-Spark range of sound sources that have extremely hard wearing electrode sparker tips. This durability is a consequence of the CSP's reverse polarity high voltage charger and unique proprietary thyristor switching.

Featuring all of the standard safety systems and operational functions found across the entire range of CSP energy sources, the CSP-N is also suitable for use with the Applied Acoustics' S-Boom and single plate boomer systems.

Key Features

- Unique dual negative voltage output
- Variable Input Power Circuitry for 'soft start'
- Additional safety/protection features
- All settings externally selectable
- LED fault indicators
- High current and voltage solid state (semi-conductor) discharge method
- Meets EC emissions regulations enabling interference-free field use
- Dual voltage technology allows operator tuning to suit application
- Supplied in robust transit case, with HV junction box (HVJ3001), mains lead and HV connector plug

Technical Specification

PHYSICAL

Size	Transit Case (7U) with cover in place and handles flat: 50cm(H) x 58cm(W) x 74cm(D)
Weight	CSP-N1200, case and cover: 60kg CSP-N2400, case and cover: 63.5kg

ELECTRICAL SPECIFICATION

Mains Input	240Vac 45-65Hz@4.0kVA single phase. 3 pin connector Variable Input Power Circuitry (AVIP) 'soft start' circuitry
Voltage Output	2500 to 3950Vdc, 4 pin interlocked connector Solid state semi-conductor discharge method

CSP-N Technical Specification continued...

Output Energy	Easy switch selectable in increments
	CSP-N1200 50,100,150,200,250,300,350,400,450,500,550,600 700,800,900,1000,1100,1200 Joules
	CSP-N2400 50,100,150,200,250,300,400,500,600,750, 800 900,1000,1250,1500,1750,2000,2250,2400 Joules
Charging Rate	2000J/second for continuous operation at 0-45°C
Capacitance	CSP-N1200 208µF, 10 ⁸ shot life
	CSP-N2400 304µF, 10 ⁸ shot life
Trigger	+ve key opto isolated or isolated closure set by front panel switch BNC connector on front panel and remote box (optional)
Repetition rate	6pps maximum Limited by charge rate, energy level and sound source rating
Earth	M8 stainless steel stud on front panel

SAFETY FEATURES

- Main electronic control circuits and secondary layer of safety circuitry
- Specially designed HV connector with interlock
- High speed dump resistors for high voltage components
- Capacitor bleed resistors
- Open circuit shutdown
- Timer shutdown
- Output current monitor and shutdown
- Over temperature shut-down
- Cover and connector interlocks
- Remote control available for triggering and operation

The unit's internal design has a modular construction for ease of servicing and capacitor replacement. However, for safety reasons, only Applied Acoustics trained engineers should attempt a repair.

COMPATIBLE SOUND SOURCES

CSP-N1200	Dura-Spark 240, 400 AA201, AA251 and AA301 Boomer plates S-Boom System
CSP-N2400	Dura-Spark 240, 400 AA201, AA251 and AA301 Boomer plates S-Boom System



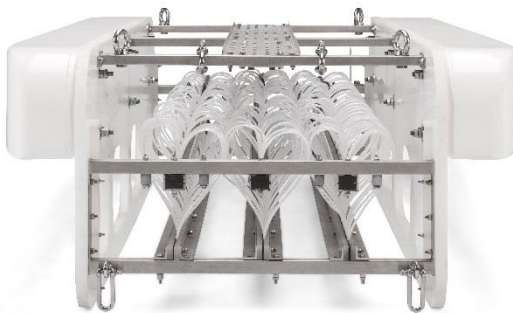
Due to continual product improvement, specification information may be subject to change without notice.
CSP-N1200 Seismic Energy Source/November 2014
©Applied Acoustic Engineering Ltd.



Applied Acoustic Engineering Ltd

T +44(0)1493 440355
F +44(0)1493 440720
E general@appliedacoustics.com
W www.appliedacoustics.com

Dura-Spark, Seismic Sound Source



Key Features

- Long life, durable electrodes
- Pulse stability
- High resolution sub-bottom data, up to 25cm.
- Operator selectable source depth
- Tip array selection from on board junction box

Applications

- High and Ultra-High Resolution geophysical surveys
- Single and multi-channel acquisition
- Water depths of 5 to >1000m

The Dura-Spark has been designed to provide a stable, repeatable sound source for sub-bottom geophysical surveys. The long life, durable electrodes produce a consistent pulse signature and keep operational maintenance to a minimum. This provides increased survey efficiency and equipment reliability as the sparker tips rarely need replacement.

The Dura-Spark is based on the CAT300 catamaran, providing a stable platform whilst under tow. The catamaran has robust solid floatation and is easily deployed from all survey vessels.

The Dura-Spark consists of 3 or 5 arrays of 80 tips allowing the operator to tune the source from the vessel to their application. This flexibility together with selectable source depth allows the source to be used in both shallow and deep waters.

The typical operational bandwidth of the Dura-Spark is 300Hz to 1.2kHz. When coupled with the CSP-N Seismic Power Supply the system offers 2000J/s peak discharge rate, as well as industry leading design and safety standards.

Dura-Spark Technical Specification

PHYSICAL

Dimensions	1700mm (L) 490mm (H) 660mm (W) frame/876mm (W) including floats
Weight	Dura-Spark 240 60kg Dura-Spark 400 70kg
Connector	RMK 1/0 complete with locking collar

ELECTRICAL INPUT

Dura-Spark 240	1000J, 5J per tip to minimise bubble collapse component 1250J Maximum
Dura-Spark 400	2000J, 5J per tip to minimise bubble collapse component 2400J Maximum

SOUND OUTPUT

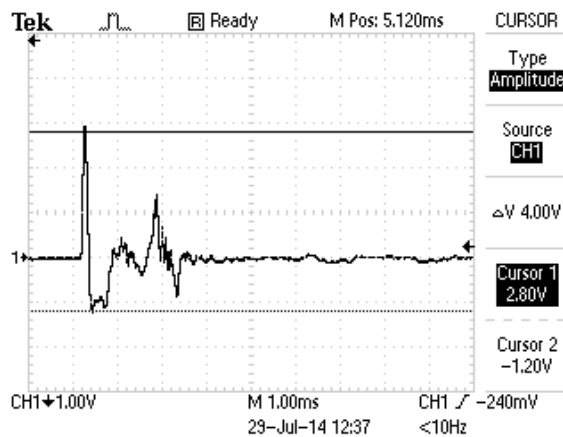
Sound Output	Dura-Spark 240; 223dB re 1uPa at 1m (Typical) Dura-Spark 400; 226dB re 1uPa at 1m (Typical)
Pulse Length	0.5 to 1.5ms depending on power
Number of Tips	240 Max total. 3 x 80 Operator selected; 80 (1 x 80) or 160 (2 x 80) or 240 (3 x 80) 400 Max total 5 x 80 Operator selected; 80 (1 x 80) or 240 (3 x 80) or 400 (5 x 80)

COMPATIBILITY

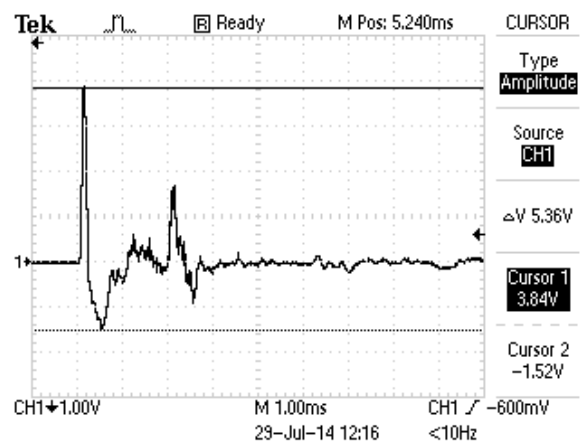
Source	Seismic Power Supply	HV Cable
Dura-Spark 240	CSP-N 1200 Negative	HVC-3500
Dura-Spark 400	CSP-N 2400 Negative	HVC-3500

TYPICAL PULSE SIGNATURES

Dura Spark 240 Typical Pulse Signature at 1000J recorded @ 2m



Dura Spark 400 Typical Pulse Signature at 2400J recorded @ 2m



Due to continual product improvement, specification information may be subject to change without notice.
Dura-Spark/March 2015
©Applied Acoustic Engineering Ltd.



Applied Acoustic Engineering Ltd

T +44(0)1493 440355
 F +44(0)1493 440720
 E general@appliedacoustics.com
 W www.appliedacoustics.com

STD/CTD - model SD204

with multi-parameter & auto range facilities

- *Salinity*
- *Temperature*
- *Sound velocity*
- *Turbidity (auto range)*
- *Conductivity*
- *Depth*
- *Oxygen*
- *Fluorescence (auto range)*



SD204



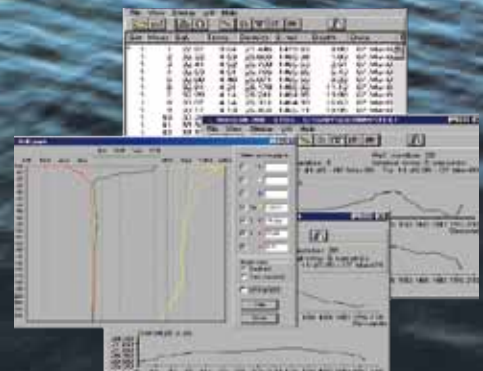
SD204 in transport/storage case



SD204 with optional sensors

Features:

- *Compact & robust design*
- *Long term stability sensors*
- *High memory capacity*
- *Sonar equipment compatibility*
- *Year-long battery capacity*
- *Depth to: 6000 meters*
- *Windows based software*
- *Output in physical units*
- *On-line plotting*
- *Auto range for turbidity & fluorescence*



SAIV A/S *Environmental Sensors & Systems* *Post Office Box 3513*
5845 Bergen, Norway

Tel: +47 56 11 30 66, Fax: +47 56 11 30 69, e mail: info@saivas.com, web: www.saivas.no
Street address: Nygårdsviken 1, 5164 Laksevåg

STD/CTD - model SD 204

The SD204 measures, calculates and records sea water conductivity, salinity, temperature, depth (pressure), sound velocity and water density. Three optional sensors can be added, f. example: dissolved oxygen, fluorescence and turbidity. For optional sensors with several sensitivity ranges, the SD204 has auto range capability. Data are recorded in physical units. The accompanying software, SD200W, contains versatile functions for programming, post- and online data processing and presentations: - multigraph, online plotting, density and depth calculations (weighed profile). The program is continuously extended according to customer's requests. The programmed settings and calibration coefficients are maintained in nonvolatile eeprom, and will not be changed/lost if power is disconnected. Robustness and complete protection from leakage is obtained by vacuum molding the electronic and all other components in solid polyurethane. On/Off-switching is by a magnetic key or from keyboard. A sealed battery compartment contains two replaceable C-cells. In practical operation the battery capacity is sufficient for continuous year-around operation with good margin. The instrument is equipped with a mooring bar with a shackle at each end. Data are recorded in physical units and simultaneously transmitted via an RS232 I/O watertight connector for on-line use.

For remote readout and monitoring, the manufacturer offers several options: Communication Unit CU901, for two-way communication via Iridium satellite, GPRS with embedded web server, GSM and UHF/VHF,



Specifications:

Conductivity: Inductive cell
Range: 0 to 70 mS/cm
Resolution: 0.01 mS/cm
Accuracy: +/- 0.02 mS/cm

Salinity: Calculated from C,T & D
Range: 0 to 40 ppt
Resolution: 0.01 ppt
Accuracy: +/- 0.02 ppt

Temperature:
Range: -2 to +40°C
Resolution: 0.001°C
Accuracy: +/- 0.01°C
Response time : 0.2 sec

Pressure: Specify desired depth range with order
Ranges: 500, 1000, 2000, -- 6000 m)
Resolution: 0.01 dbar (m)
Accuracy: +/- 0.01% FS (-2 to +40°C)
Response time: 0.1 sec

Sound velocity: Calculated from S,T & D
Range: 1300 to 1700 m/s
Resolution: 1 cm/s
Accuracy: +/- 5 cm/s

Dissolved oxygen: (optional)
Sensor type: SAIV205
Range: 0 to 20 mg/l
Resolution: 0.01 mg/l
Accuracy: +/- 0.2 mg/l

Fluorescence: (optional)
Sensor type: Fluorescein/ Chlorophyll/Rhodamine/CDOM
Ranges: 2.5, 7.5, 25, 75 ug/l
selectable/auto range
Resolution: 0.03 ug/l

Turbidity: (optional)
Sensor type: Backscatter
Ranges: 12.5, 62.5, 250, 750 FTU
selectable/auto range
Linearity: < 2%

Real time clock: +/- 2 sec/day
Modes: STD/CTD with/without sound velocity, oxygen and optional sensor.

Intervals: 1 sec to 180 min.

Memory: CMOS SRAM
Capacity: 56000 data sets of STD/CTD

Data output: RS232 ASCII code.1200-9600 baud
1 start, 7 data, 1 stop, even parity or
1 start, 8 data, 1 stop, no parity
selectable via menu

Power: 2 ea. 3.6V lithium C-cells.
Recommended type: SAFT LSH14
(Sufficient for 1.500.000 data sets)

External: 10 – 30VDC

Material: Vacuum molded polyurethane and titanium

Dimensions: Length 400 mm. Diameter 60 mm

Weight: In air: 2 kg. In water: 0,8 kg.

Packing: Suitcase (534x427x157 mm)
Grossweight 5,5 kg

Accessories: On/Off magnetic key,
(included) PC communication cable 2,5m,
MINISOFT SD200W program
Operating Manual

Warranty: Two years against faulty materials
and workmanship



Description

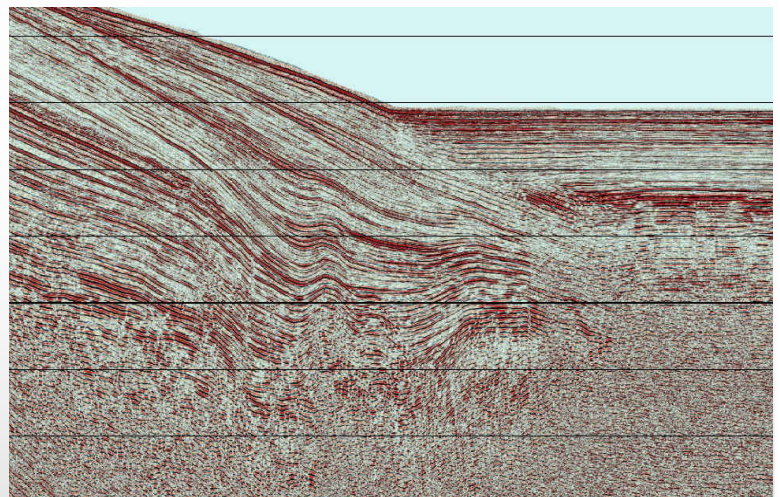
Introducing the ultimate in marine seismic fidelity: the **GeoEel Solid™** from Geometrics. Built on our experience and success with the popular GeoEel™ digital streamer, the GeoEel Solid combines superior electronics with a patented solid active section design that delivers higher-quality data than ever before.

The GeoEel Solid digital hydrophone streamer is the smallest diameter solid design available. At only 44.5 mm, the GeoEel Solid is easy to deploy, easy to transport and easily shipped by air. The 100% solid construction, coupled with our proprietary polymer hydrophone design, eliminates bulge waves and other cable-borne noise, yielding very low towing noise at lower frequencies than any liquid streamer.

The GeoEel Solid communicates via 100 mbs Ethernet with the Geometrics CNT-2 controller, running field-proven acquisition software that is used on over 70 installations worldwide. And the GeoEel Solid is designed by Geometrics, known for over 40 years as an industry leader in rugged, reliable and well-supported instrumentation.

Features & Benefits

- **Light and easy to handle:** only 44.5 mm diameter, up to 240 channels in 8-channel sections. **Hand-deployable up to 400m.**
- **100% solid construction:** bulge waves are a thing of the past
- **Digital sections:** better quality data, less time deploying and troubleshooting
- **Full-featured yet simple:** no 30-day training program required
- **Wide bandwidth for more applications:** samples at 1/8 to 2 ms for petroleum, engineering or sub-bottom profiling
- **Environmentally friendly and non-flammable:** solid polyurethane, easily ships by air, **no oil to spill**
- **Free software upgrades forever:** no yearly licensing fees
- **No costly topside hardware required:** uses any PC and standard Ethernet



Data courtesy Fugro Consultants, Inc.

GeoEel Solid™

Digital Solid Streamer

A/D Converter Modules

Channels: 8 per A/D module
Sample intervals: 1/8, 1/4, 1/2, 1, 2 ms
Programmable gain: 0 dB, 8 dB, 18 dB, 30 dB, 42 dB
Anti-alias filter: Set by sample interval, down 135 dB at stop-band
Maximum input range: 1.59V_{rms}
Resolution: 24 bits including sign
Input impedance: 126.8K Ohms, paralleled by 2.4 nF
Dynamic range: 120dB Typical @ 1ms
Common mode rejection: >110 dB
Record length: Up to 30,000 samples
Dead time: Up to 256 samples
Continuous recording mode: Available, with GPS synchronization
Noise floor: 0.3 µV at 2 ms
QC tests: Leakage and capacitance of hydrophone elements, noise, offset, harmonic distortion and gain similarity
Power consumption: 600 mW/channel
Calibration oscillator: 100 Hz, 0.3 µV to 600 mV_{rms}
Dimensions: 44 mm diameter x 330 mm long
Weight: 900 g
Packaging material: Titanium
Connectors: 38-pin custom Glenair

Hydrophone Sections

Number of channels: 8 per section
Group interval: 1.5625, 3.125, 6.25, or 12.5m
Hydrophones per group: 4-6 (typical; up to 12 upon request)
Group sensitivity: -194 ± 1.5 dB re 1 V/mPa
Low cut filter: 10 ± 0.5 Hz (100 and 50m)
 15 ± 1 Hz (25m and 12.5m)
Hydrophone type: Proprietary polymer
Bird coil: ION Model-578 compatible
Operation depth: 30 m
Diameter: 44.5 mm
Weight: ~156 Kg / 100m
Strain member: Zylon
Working load: 560 Kg
Minimum bend radius: 1 m

GEOMETRICS INC.

2190 Fortune Drive, San Jose, California 95131, USA
Tel: 408-954-0522 Fax: 408-954-0902
Email: sales@geometrics.com

GEOMETRICS EUROPE

20 Eden Way, Pages Industrial Park, Leighton Buzzard LU7 4TZ, UK
Tel: 44-1525-383438 Fax: 44-1525-382200
Email: chris@geomatrix.co.uk

GEOMETRICS CHINA

Laurel Technologies, Ste 1807-1810, Kun Tai Int'l Mansion, #12B, Chaowai St., Beijing 100020, China
Tel: 86-10-5879-0099 Fax: 86-10-5879-0989
Email: laurel@laureltech.com.cn

www.geometrics.com



GEOMETRICS

Innovation • Experience • Results

TECHNICAL SPECIFICATIONS

Tow Cable

Weight: 0.5 Kg/m
Strain member: Kevlar
Working load: 900 Kg
Diameter: 18.5 mm

Stretch and Vibration Isolation Sections

Length: 10, 25 or 50 meters
Diameter: 41 mm (stretch) or 44.5 mm (isolation)
Ballast fluid: Gel (stretch only)
Stretch ratio: 15% (stretch only)
Bird coil: ION Model-578 compatible (vib section only)
Working load: 560 Kg
Strain member: Zylon (isolation), Vectran (stretch)

Streamer Power Supply Unit

Power Requirements: 115/230 VAC, 3/1.5 Amp max, 50/60 Hz
Voltage to Streamer: 36-60 VDC
I/O Communications: I/O Communications: 100Base TX Fast Ethernet, IEEE 802.3 compliant
Trigger Requirements: Isolated input, positive or negative TTL
Testing: Cable leakage and resistance
Optional Auxiliary Inputs: 8 analog channels with 24-bit resolution
Ethernet Connection: RJ-45
Trigger Connection: BNC



Photo courtesy JAMSTEC, Yokosuka, Japan

Controller

PC-based, running Geometrics CNT-2 software. Multiple shot and gather windows, bar graph noise displays, windows for shot timing, gun energy, brute stack, tape status, spectral analysis. Auto-switching between storage devices, dual tape writing. Supports multiple printers. Full log kept of all parameter changes. Integrates navigation, gun, and bird data into SEG-D or SEG-Y header.

cNODE® Transponders

Maxi, Midi and Mini



KONGSBERG

Introduction

cNODE® is a family of transponders for underwater acoustic positioning and data link. The transponders operate together with both HiPAP®, HPR and cPAP® transceivers.

cNODE® utilises Cymbal® acoustic protocol and is compatible with the HiPAP®/HPR 400 channels and telemetry.

cNODE® is designed to cover a large range of applications and this is made possible by the modular design and a variety of different transducers, internal and external sensors, housing materials and other add-on functions.

cNODE® is easy to set-up, operate and maintain. Both new configuration and software can be downloaded from TTC 30 without opening the transponders. The floating collar and release design make the launch/recovery operation safe and easy. Spare parts for cNODE® are based on the main modules.

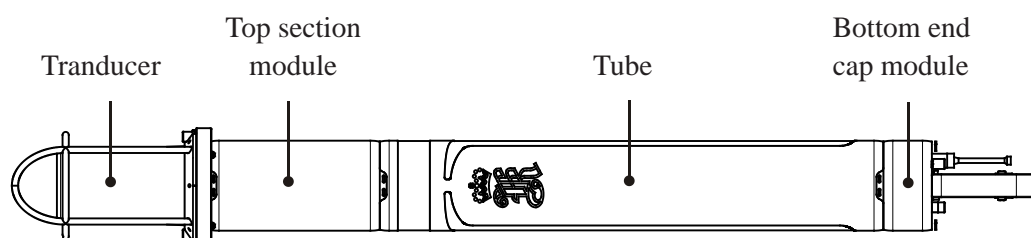
The cNODE® transponder family consists of the models Maxi, Midi and Mini.

Common for all cNODE® transponders

- Operates together with HiPAP®, HPR and cPAP® transceivers.
- Compatible with both Cymbal® acoustic protocol for positioning and data link, and HiPAP®/HPR 400 channels and telemetry.
- SSBL positioning.
- LBL positioning.
- Range accuracy of 0,01 m between transponders.
- Acoustic data link for command and data transfer.
- Both transponder and responder functions.
- Internal tilt sensor $\pm 90^\circ$.
- Pressure relief valve and vent screw (safety devices).
- External connector for transponder configuration and software update via serial line (TTC 30).
- Modular design such that the transducer, transponder electronics, battery pack and optional add-on's can be replaced individually.



*cNODE® Family:
Maxi 34-30V30H-R (Left)
Midi 34-180 (Middle)
Mini 34-180 (Right)*



cNODE® modular design

Maxi/Midi - Models and standard features

Examples of models:

	Maxi		Midi
Depth rating - MF models:	4000 m	34-180	34-180
Operating temperature:	- 5 °C to + 55 °C	34-30V30H-R	34-30V
		34-30V30H-Dx-R	34-30V30H
		34-30V-Si	34-S-R
		34-30V-I-St	
		34-30V-II-St	
		34-30V-St	
		34-30V30H-R-St	

Transducers

TD180



Frequency band:	Medium Frequency (MF)
Beam width:	180°
Receiver sensitivity:	100 dB
Source level - max:	190 dB
Material:	Aluminium/Stainless steel

TD30V



Frequency band:	Medium Frequency
Beam width:	30° vertical
Receiver sensitivity:	85 dB
Source level - max:	206 dB
Material:	Aluminium/Stainless steel

TD30V30H



Frequency band:	Medium Frequency
Beam width:	30° vertical/30° horizontal
Receiver sensitivity:	85 dB
Source level - max:	206 dB/190 dB
Material:	Aluminium/Stainless steel

Top end caps

Top section modules

Split transducer (S)



Material: Aluminium
Cable length: 6 m

Depth sensor (Dx)



High accuracy depth sensor
Accuracy: 0.01% FS
Material: Aluminium

Multi Sensor Module (Msm)

The module includes the following high accuracy sensors:

- Depth: 0,01% FS
- Inclinator: 0.05°
- Sound velocity: ± 0.02 m/s

Material: Aluminium

Bottom end cap modules

Basic end cap



Material: Aluminium/
Stainless steel

Release mechanism (R)



Safe working load: 500 kg
Material: Aluminium/
Stainless steel

Sensor interface (Si)



Interface external sensors
Number of sensors: 3
Serial line: RS-232/-485/-422
Material: Aluminium

Inclinometer (I)



Internal X and Y inclinometer
Range: ± 60°
Accuracy: 0.25°
Material: Stainless steel

Tubes

Maxi



Material: Aluminium/
Stainless steel
Coating: Polyurethane

Midi



Material: Aluminium
Coating: Polyurethane

Batteries

Maxi



Type: Lithium, non-rechargeable
Battery lifetime

- **Quiescent:** 2.5 years
- **No. of replies:** 0.7 to 11.5 millions

Midi



Type: Lithium, non-rechargeable
Battery lifetime

- **Quiescent:** 1.25 years
- **No. of replies:** 0.35 to 5.75 millions

External sensors

External Inclinometer (II)



- To be used together with Inclinometer (I)

External X and Y inclinometer

Range: ± 60°

Accuracy: 0.25°

Material: Stainless steel

Examples of other external sensors:

- Sea current sensor
- Temperature sensor
- Pressure sensor
- Heading sensor
- Doppler Velocity Log
- Environmental sensors

Floating collar



Max. operation depth: 4000 m

Safe working load on release unit: 500 kg

Minimum anchor weight: 60 kg

Mini - Models and standard features

Examples of models:

Depth rating - MF models:	4000 m		
Depth rating - LF models:	7000 m	34-180	17-180-St
Operating temperature:	- 5 °C to + 55 °C	34-40V	31-80V-D-St

Transducers

TD180



TD40V



TD80V



TD180LF



Frequency band:	Medium Frequency	Medium Frequency	Medium Frequency	Low Frequency (LF)
Beam width:	180°	40° vertical	80° vertical	180°
Receiver sensitivity:	100 dB	90 dB	85 dB	100 dB
Source level - max:	190 dB	203 dB	188 dB	188 dB
Material:	Aluminium	Aluminium	Stainless steel	Stainless Steel
			Depth rating: 1000 m	

Top section modules

Tubes

Bottom end cap modules

Depth Sensor (D)



Accuracy: 0.1% FS
Material: Stainless steel



Material: Aluminium/Stainless steel
Coating: Polyurethane



Material: Aluminium/Stainless steel

Battery

Battery charger

Power AC/DC unit



Type: NiMH, rechargeable
Battery lifetime:

- Quiescent:** 60 days
- No. of replies:** 40.000 to 750.000



Battery charger, NiMH



Input: 110/230 Vac
Output: 15 Vdc/300 W
Material: Aluminium

Accessories

TTC 30 - Transponder Test and Configuration unit*

Frequency band: MF

The unit comes with:

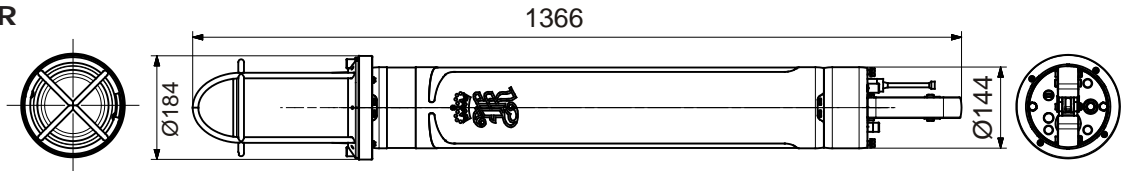
- Test Transducer
- Serial Line Cable
- Mains Power Cable



* See separate TTC 30 Product Specification for more information.

Maxi outline drawings

Maxi 34-30V30H-R

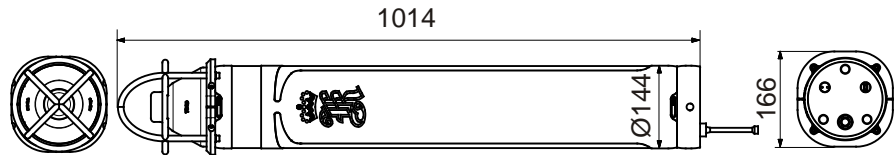


Tube length: 805 mm

Weight in air: 30 kg

Weight in water: 13 kg

Maxi 34-180



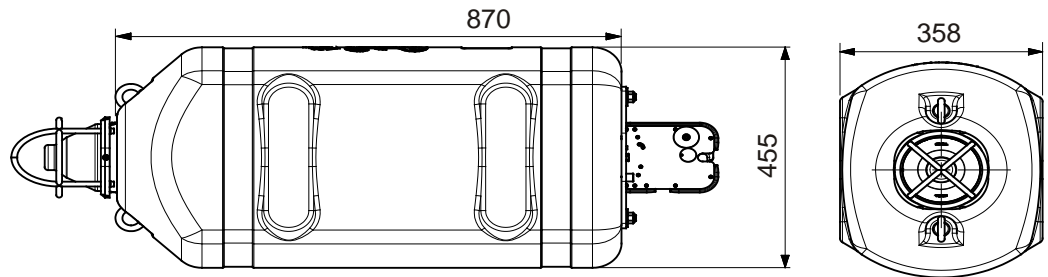
Weight in air: 28 kg

Weight in water: 12 kg

Floating collar outline drawing

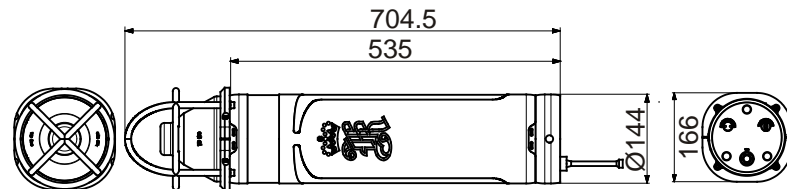
Weight in air: 70 kg

Nominal Buoyancy: 30 kg



Midi outline drawing

Midi 34-180



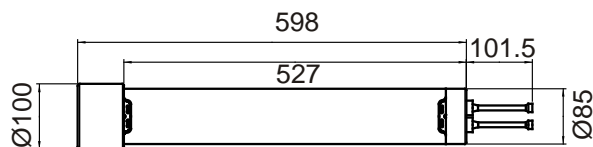
Tube length: 495 mm

Weight in air: 16.5 kg

Weight in water: 8.5 kg

Mini outline drawing

Mini 34-40V



Tube length: 496 mm

Weight in air: 6.7 kg

Weight in water: 3.4 kg

(Cd302048)

343339 / Rev. B / May 2011

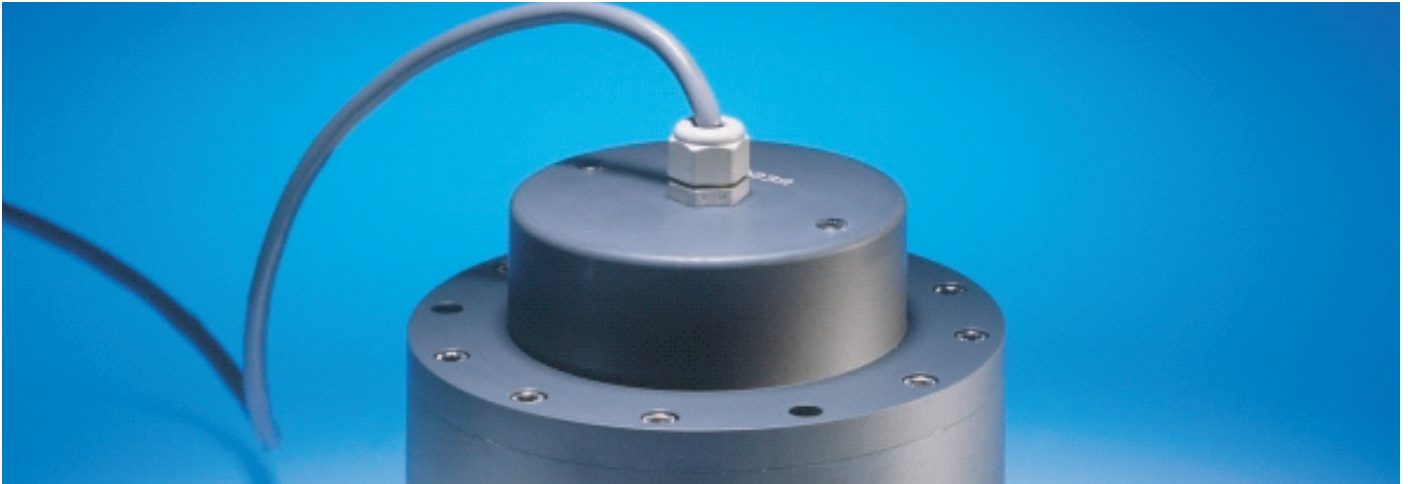
Kongsberg Maritime AS

Strandpromenaden 50
P.O.Box 111
N-3191 Horten,
Norway

Telephone: +47 33 03 41 00
Telefax: +47 33 04 47 53
www.kongsberg.com
subsea@kongsberg.com



KONGSBERG



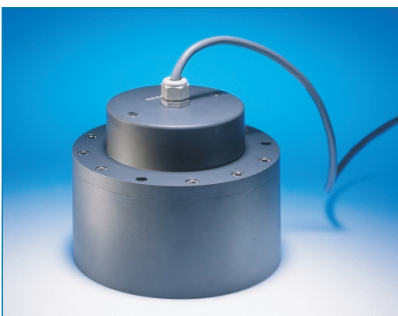
- Narrow beams
- High acoustical performance
- Compact design
- Compatible with ATLAS SW60/28/6029 housing.
- Electrical compatible with most 33kHz and 200kHz echosounders.

TC2122

Model TC2122 is a 33kHz and 200kHz dual frequency transducer ideal for navigation and hydrographic echosounder systems. The transducer has excellent piezoceramic elements which will ensure the highest reliability and quality in echosounding. The transducer will fit ATLAS SW 60/28/6029 housing and RESON steel housings.

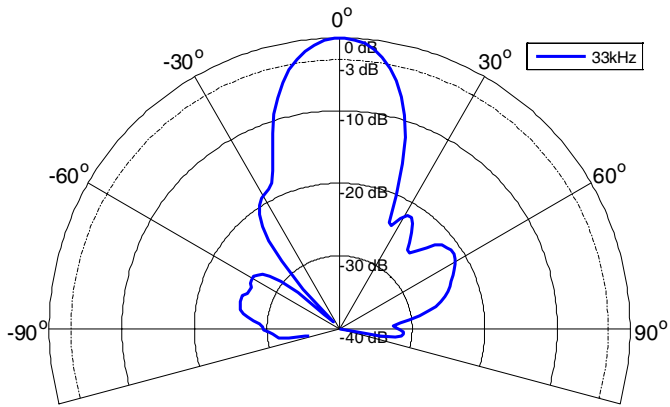
TECHNICAL SPECIFICATIONS

Resonant Frequency:	33kHz ±2kHz 200kHz ±5kHz
Transmitting sensitivity:	168dB ±3dB at 33KHz 174dB ±3dB at 200KHz (re 1µPa/V at 1m)
Receiving Sensitivity:	-177dB ±3dB at 33KHz -187dB ±3dB at 200KHz (re 1µPa/V)
Impedance:	80ohm ±24ohm at 33kHz and 200kHz
Beam width:	22°±2° at 33KHz 9,5°±1° at 200kHz
Beam shape:	Conical
Max input power:	1000W at 33kHz 450W at 200kHz (at 1% duty cycle)
Operating depth:	30m
Survival depth:	50m
Operating temperature range:	-2°C to +35°C
Storage temperature range:	-30°C to +50°C
Weight in air, with cable:	5kg
Housing:	PVC
Cable (length and type):	33m FALMAT Type FM088095-7, 4x1 (2 x twisted pair) PUR Jacket, WATER BLOCK, Kevlar Braid 800lbs breaking strength (O.D. 11mm) - pigtail

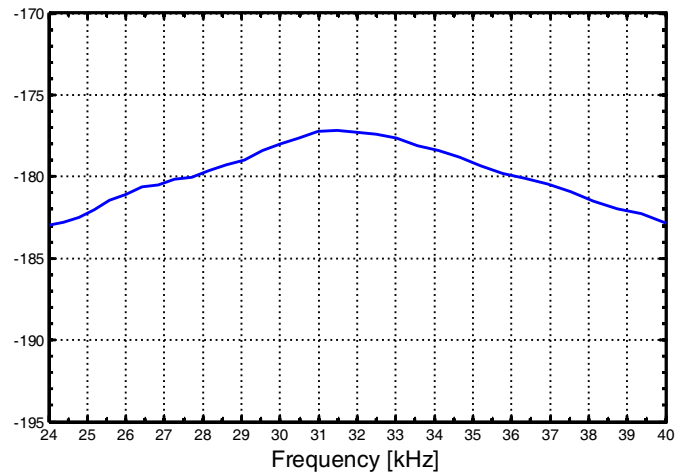


Typical graphs 33kHz

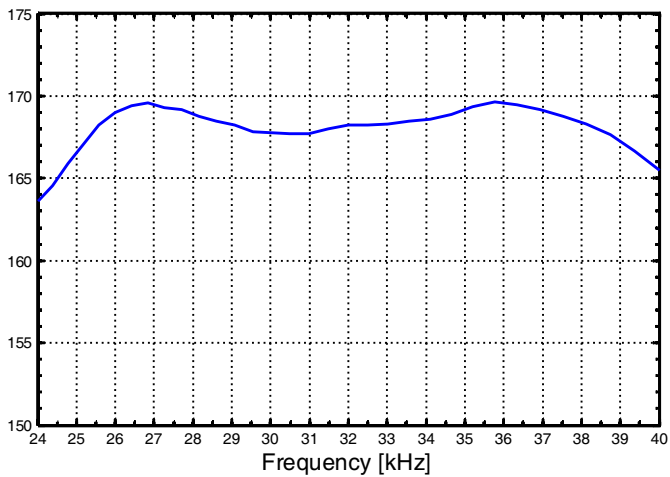
Horizontal Directivity Pattern



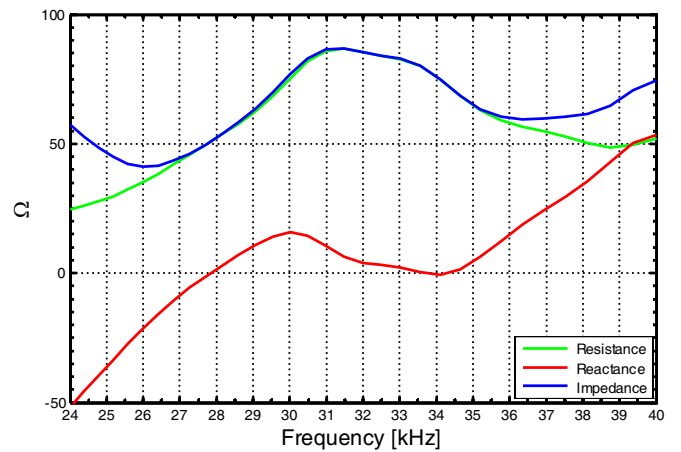
Receiving Sensitivity [dB re 1V/μPa @ 1m]



Transmitting Sensitivity [dB re 1μPa/V @ 1m]

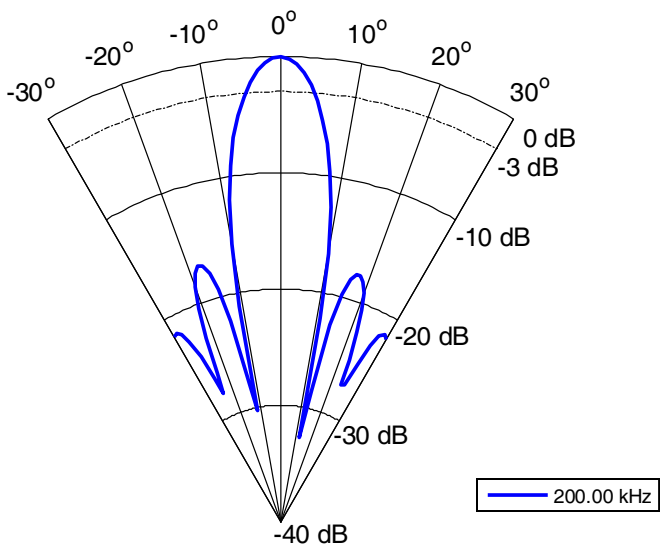


Impedance

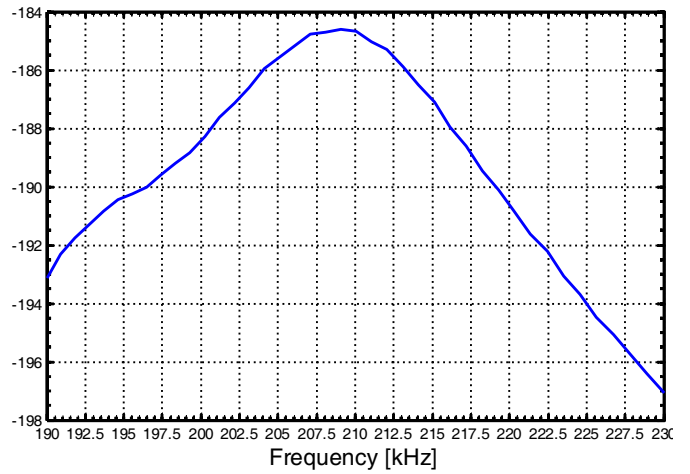


Typical graphs 200kHz

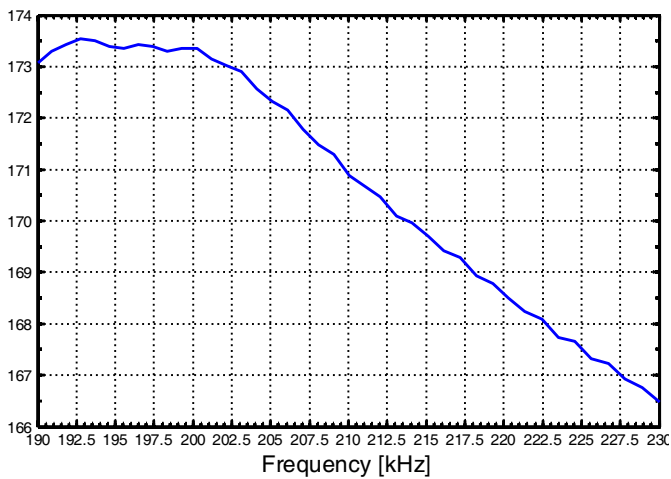
Horizontal Directivity Pattern



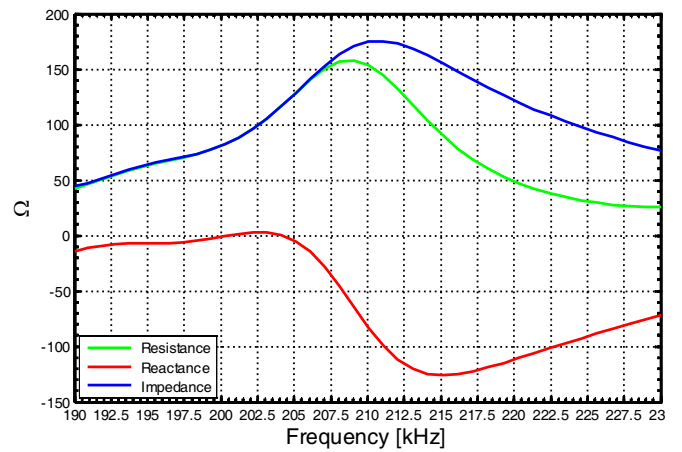
Receiving Sensitivity [dB re 1V/ μ Pa @ 1m]



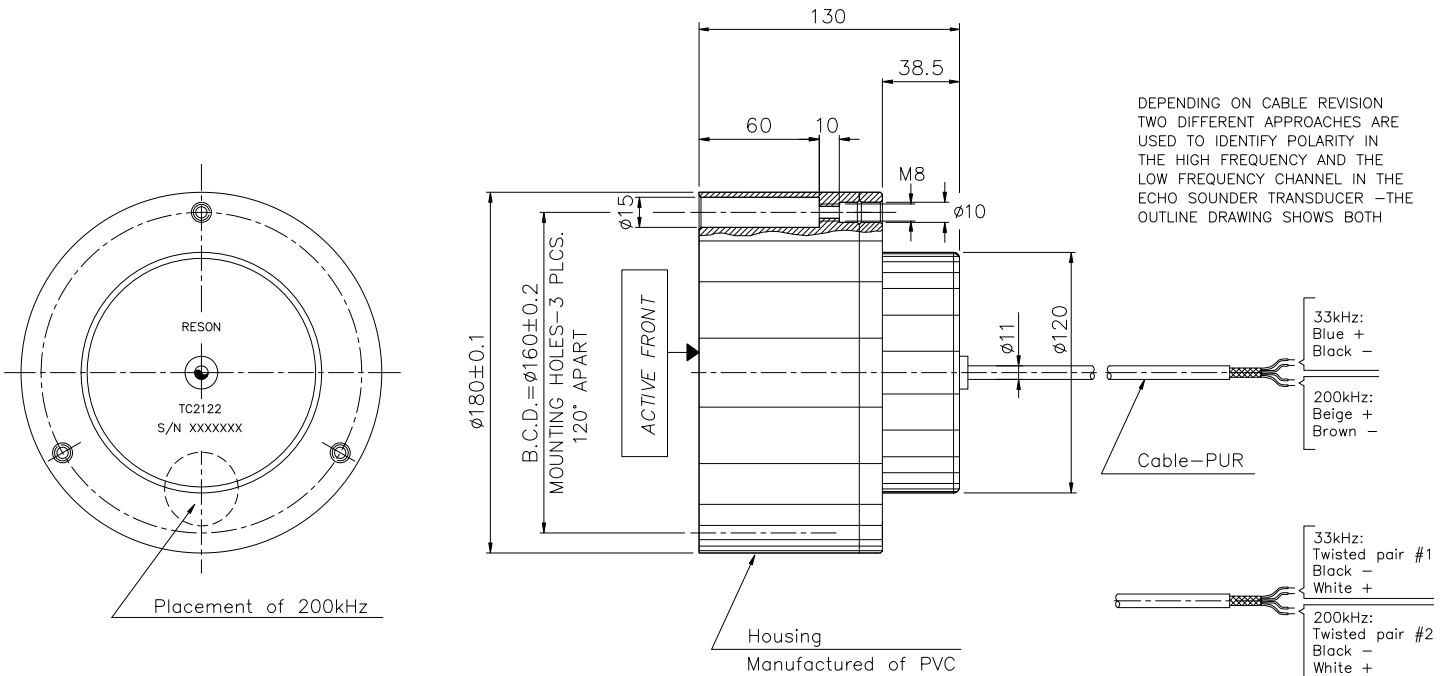
Transmitting Sensitivity [dB re 1 μ Pa/V @ 1m]



Impedance



Outline Dimensions



RESON reserves the right to change specifications without notice. © 2006 RESON A/S
For Acoustical Measurement Accuracy please refer to www.reson.com or contact sales.

RESON A/S
Denmark
Tel: +45 4738 0022
E-mail: reson@reson.com

RESON Inc.
USA
Tel: +1 805 964-6260
E-mail: sales@reson.com

RESON Offshore Ltd.
United Kingdom
Tel: +44 1224 709 900
E-mail: sales@reson.co.uk

RESON GmbH
Germany
Tel: +49 431 720 7180
E-mail: reson@reson-gmbh.de

RESONB.V.
The Netherlands
Tel: +31 (0) 10 245 1500
E-mail: info@reson.nl

RESON (Pte.) Ltd.
Singapore
Tel: +65 6725 9851
E-mail: sales@reson.com