

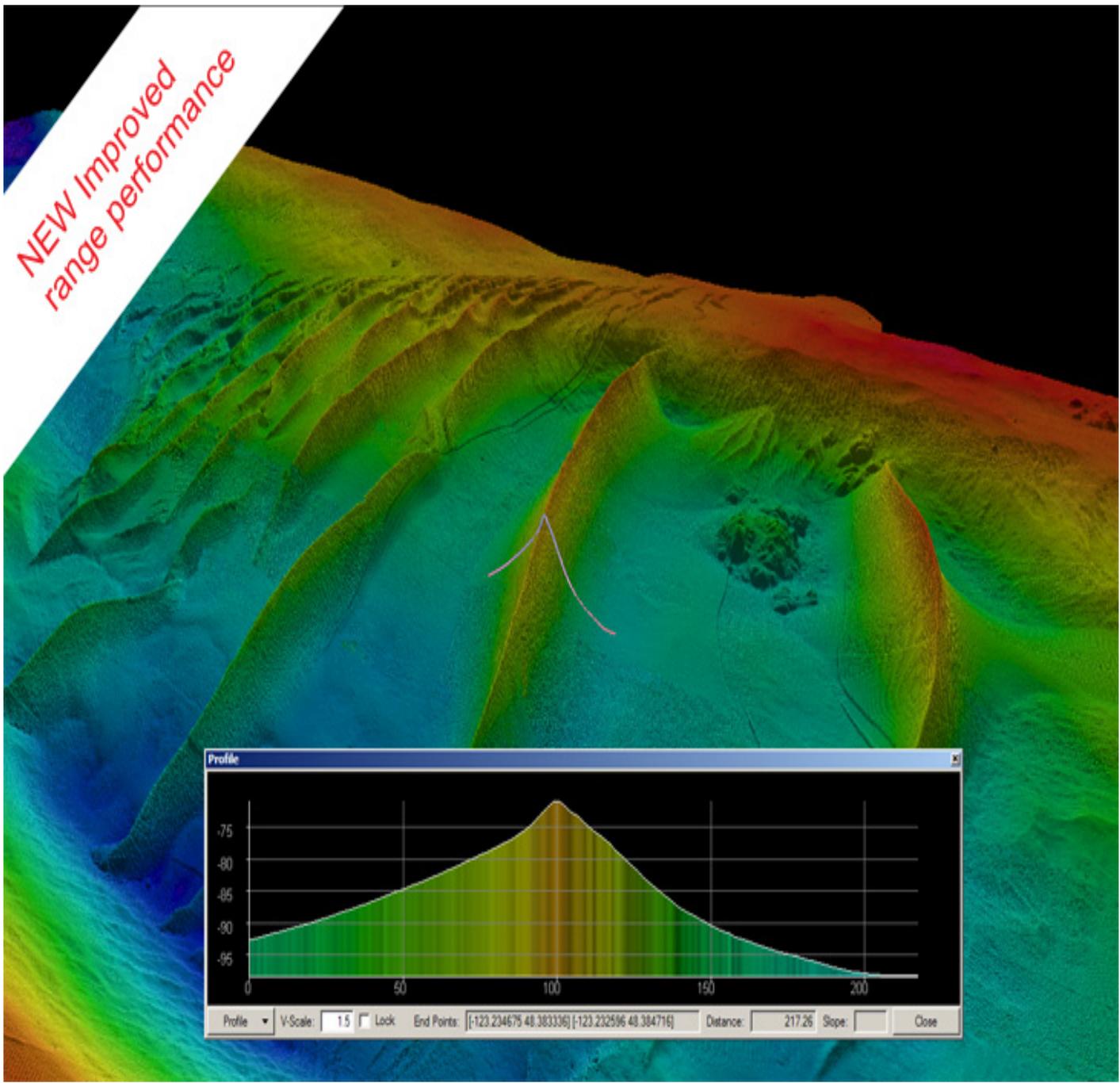


KONGSBERG

EM[®] 710

Multibeam echo sounder

High resolution seabed mapping system



System overview

The EM 710-MK2 multibeam echo sounder is a high to very high resolution seabed mapping system capable of meeting all relevant survey standards. The coverage for EM 710-MK2 is increased by replacing the receiver interface boards with new boards and new transceiver SW. The transducer arrays are the same. The system configuration can be tailored to the user requirements, allowing for choice of beam widths as well as transmission modes. The minimum acquisition depth is from less than 3 m below its transducers, and the maximum acquisition depth is approximately 2800 m, dependant upon array size. Across track coverage (swath width) is up to 5.5 times water depth, to a maximum of more than 3000 m.

Echo sounder models

There are three basic versions of the EM 710-MK2 system, with different range performances:

- EM 710-MK2 - Full performance version.
- EM 710S-MK2 - CW pulse forms only.
- EM 710RD-MK2 - Short CW pulse only.

Choice of beamwidths

The along track beamwidth depends upon the chosen transmit transducer configuration with 0.5, 1 and 2° available as standard. The receive beam width is either 1 or 2° depending on the chosen receive transducer.

Innovative acoustic principles

The EM 710-MK2 operates at sonar frequencies in the 65 to 100 kHz range in shallow waters, and can use frequencies down to 40 kHz to extend coverage in deep waters. The transmit fan is divided into three sectors to maximize range capability, but also to suppress interference from multiples

of strong bottom echoes.

The sectors are transmitted sequentially within each ping, and uses distinct frequencies or waveforms.

EM 710S-MK2 and EM 710RD-MK2 both use CW pulses of different lengths. The full performance version, EM 710-MK2, supports even longer, compressible waveforms (FM sweep).

Fully stabilized and focused beams

The system applies beam focusing to both transmit and receive beams in order to obtain the maximum resolution also inside the acoustic near-field.

During transmission, focusing is applied individually to each transmit sector with a focus point on the range defined by the previous ping, to retain the angular resolution in the near field. Dynamic focusing is applied to all receive beams. The transmit beams are electronically stabilized for roll, pitch and yaw, while the receive beams are stabilized for roll movements.

Controlled, dense and accurate soundings

The beam spacing may be set to be either equiangular or equidistant. The maximum swath coverage may be limited by the operator either in angle or in swath width without reducing the number of beams. A combination of phase and amplitude bottom detection algorithm is used, in order to provide soundings with the best possible accuracy.

The number of beams varies with the beamwidth. The system generates 400 soundings per swath for 1° RX, and 200 soundings for a 2° RX system. (800 and 400 in dual swath mode)

Transducers

The active elements of the EM 710-MK2 transducers are based upon composite ceramics, a design

which has several advantages, in particular increased bandwidth and tighter performance tolerances. The 1x2° and 2x2° versions can be mounted on a pole for portable deployment.

For larger transducer versions are permanent mounting like; flush with the hull, in a blister or in a gondola construction a possible solution.

EM 710-MK2 can also be delivered with ice-reinforced transducer and a strengthen mounting frame for installation on icebreakers.

Transceiver Unit

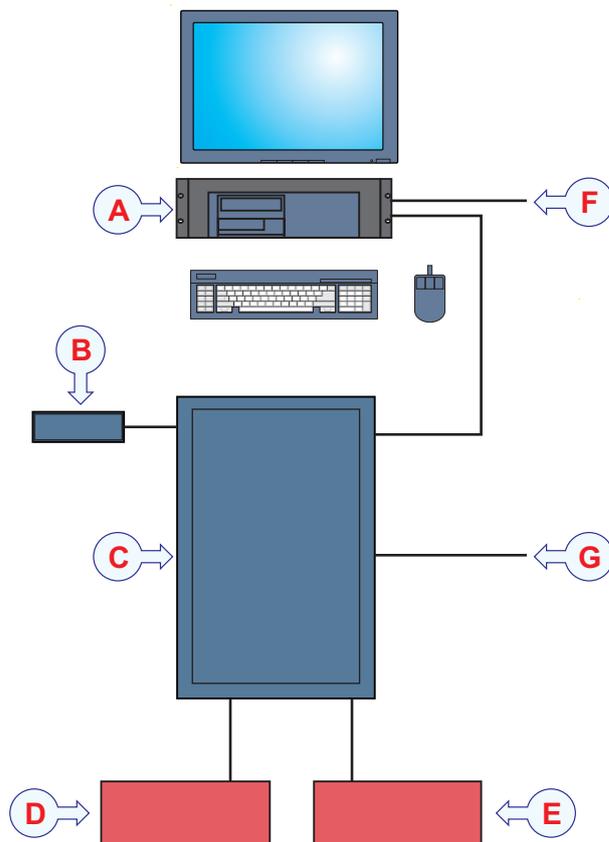
The EM 710-MK2 electronics system is a true wideband design. The transmitter circuits are fully programmable to support any frequency or pulse form. The use of FM sweep as a pulse form allows for more energy per pulse and thus increased range performance, without any sacrifice of range resolution. The non-saturating and low noise receivers and A/D converters are of floating point type, resulting in a dynamic range of more than 140 dB. The conventional TVG compensation is no longer needed. Filters, correlators and beamformers are fully digital implementations, and the beam forming method is by time delays, to allow for the wide frequency band of the system.

The 2 x 2° RD version is delivered with a shorter (portable) transceiver cabinet.

Operator Station

The Operator Station is the HWS high performance PC workstation using Windows®. The HWS is normally supplied with a 24" industrialized LCD monitor. Support for a second monitor is included. A spillproof US keyboard and a standard optical mouse is normally supplied.

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A Hydrographic WorkStation

B Remote Control Unit

C Transceiver Unit

D Receive Transducer (RX)

E Transmit Transducer (TX)

F Interfaces:

- Sound speed sensor
- Tide
- Centre depth output
- Ethernet and serial lines

G Interfaces:

- Positioning system
- Attitude and velocity
- Heading
- Clock
- Trigger input/output
- Clock synchronization
- Ethernet and serial lines

Advanced functions

- Integrated seabed acoustical imaging capability is included as standard. Software to use this data for automatic seabed classification is available from many third-party suppliers.
- A real time display window for water column backscatter is available. Logging of water column data and of raw stave data (before beamforming) is a system option.
- A high density beam processing mode provides up to 400 or 200 soundings per swath. In order to make the soundings independent, a limited range window is set inside each beam for each sounding. In practice this is equivalent to synthetically sharpening the beam width. (Down to 25% in the outer beams)
- The system generates two separate alongtrack swaths per ping. With dual swath the system can produce up to 800 soundings per ping.
- The Operator Station includes the necessary operator controls for setting up and running the system, data logging and system testing.
- The Seafloor Information System (SIS) includes an extensive set of graphical displays for data quality control, as well as system calibration and other tools which are required. SIS supports on-line real-time data cleaning to improve the overall survey efficiency.
- Post-processing software for the EM 710-MK2 is available from many third-party suppliers.

Technical specifications*

Frequency range	40 to 100 kHz
Max ping rate	30 Hz
Swath coverage sector	Up to 140 degrees
Min depth	3 m below transducer

Max depth (approximate values) 0.5 x 1°	EM710-MK2	EM710S-MK2	EM710RD-MK2
	2800 m	1750 m	600 m
CW transmit pulses	0.2 to 2 ms	0.2 to 2 ms	0.2 ms
FM sweep pulse	Max. 120 ms	No	No

Roll stabilized beams	Yes, ±15°
Pitch stabilized beams	Yes, ±10°
Yaw stabilized beams	Yes, ±10°
Sounding patterns	Equiangular
	Equidistant
	High Density

Transducer choices	0.5 x 1°	1 x 1°	1 x 2°	2 x 2°
Availability	Not EM 710RD-MK2	Not EM 710RD-MK2	All models	All models
TX dimensions (L x W x H)	1940 x 224 x 118 mm	970 x 224 x 118 mm	970 x 224 x 118 mm	490 x 224 x 118 mm
RX dimensions (L x W x H)	970 x 224 x 118 mm	970 x 224 x 118 mm	490 x 224 x 118 mm	490 x 224 x 118 mm
Max no. of soundings per ping (Dual swath mode)	800	800	400	400

		0.5 x 1°	1 x 1°	1 x 2°	2 x 2°
Max coverage	winter*	2650	2500	2350	2100
Max coverage	summer*	3050	2850	2650	2450
Max depth	winter*	2650	2500	2350	2200
Max depth	summer*	2800	2700	2550	2400

Transceiver Unit dimensions (W x H x D)	540 x 841 x 750 mm (including shockabsorbers) 540 x 573 x 750 mm - Standard for EM710RD-MK2 2 x 2° version (Bulkhead mounting)
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* Estimated depth and coverage for EM 710-MK2, based on BS= -20dB, NL= 45 dB, f = 40 kHz

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

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