

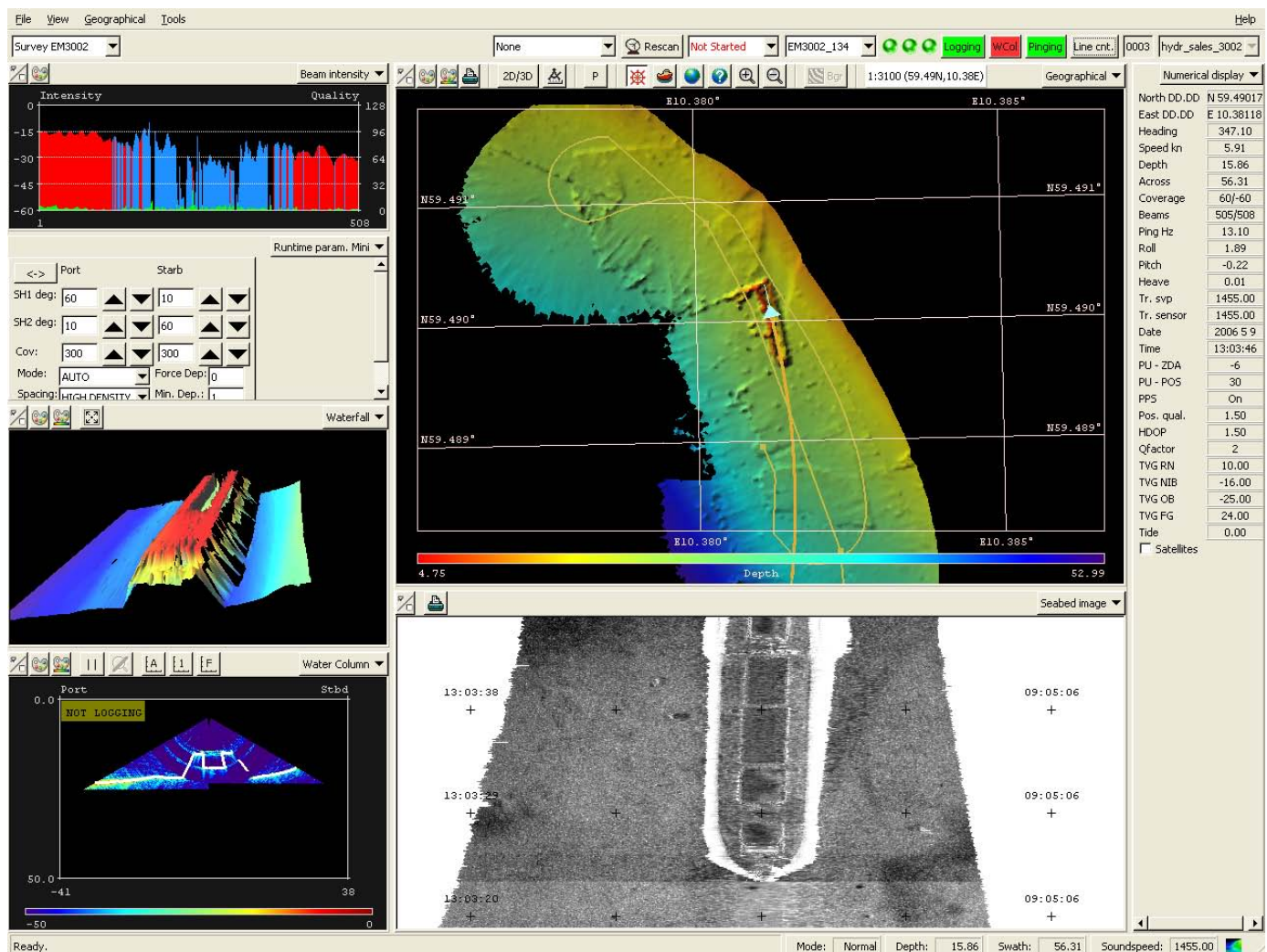


KONGSBERG

# EM 3002

## Multibeam echo sounder

The new generation high performance shallow water multibeam



### Key facts

The **EM 3002** is a new advanced multibeam echosounder with extremely high resolution and dynamically focused beams. It is very well suited for detailed seafloor mapping and inspection with water depths from less than 1 meter up to typically 200 meters in cold oceanic conditions. Maximum depth capability is strongly dependant on water temperature and salinity - up to 300 meters is possible under favorable conditions. Due to its electronic pitch compensation system and roll stabilized beams, the system performance is stable also in foul weather conditions.

The spacing between soundings as well as the acoustic footprints can be set nearly constant over the swath in order to provide a uniform and high detection and mapping performance. Dynamic focusing of all receive beams optimizes the system performance and resolution for short range applications such as underwater inspections.

### Typical applications

- Mapping of harbours, inland waterways and shipping channels with critical keel clearance
- Inspection of underwater infrastructure
- Detection and mapping of debris and other underwater objects
- Detailed surveys related to underwater construction work or dredging
- Environmental seabed and habitat mapping
- Mapping of biomass in the water column

### Features

The EM 3002 system uses frequencies in the 300 kHz band. This is an ideal frequency for shallow water applications, as the high frequency ensures narrow beams with small physical dimensions. At the same time, 300 kHz secures a high maximum range capability and robustness under conditions with high contents of particles in the water.

EM 3002 uses a powerful sonar processor unit in combination with 1 or 2 compact sonar heads. The

high computing power of the EM 3002 sonar processor makes it possible to apply sophisticated and exact signal processing algorithms for beamforming, beam stabilisation, and bottom detection. In High Density processing mode the system has close to uniform acoustic footprints and resolution over the whole swath width, and therefore a much improved capability to detect objects and other details on the bottom.

EM 3002 will in addition to bathymetric soundings, produce an acoustic image of the seabed. The image is obtained by combining the acoustic return signals inside each beam, thus improving signal to noise ratio considerably, as well as eliminating several artifacts related to conventional sidescan sonars. The acoustic image is compensated for the transmission source level, receiver sensitivity and signal attenuation in the water column, so that reliable bottom backscatter levels in dB are obtained. The image is also compensated for acoustic ray bending, and thus completely geo-referenced, so that preparation of a sonar mosaic for a survey area based upon data from several survey lines is easy. Objects observed on the seabed image are correctly located and their positions can be readily derived.

### List of options

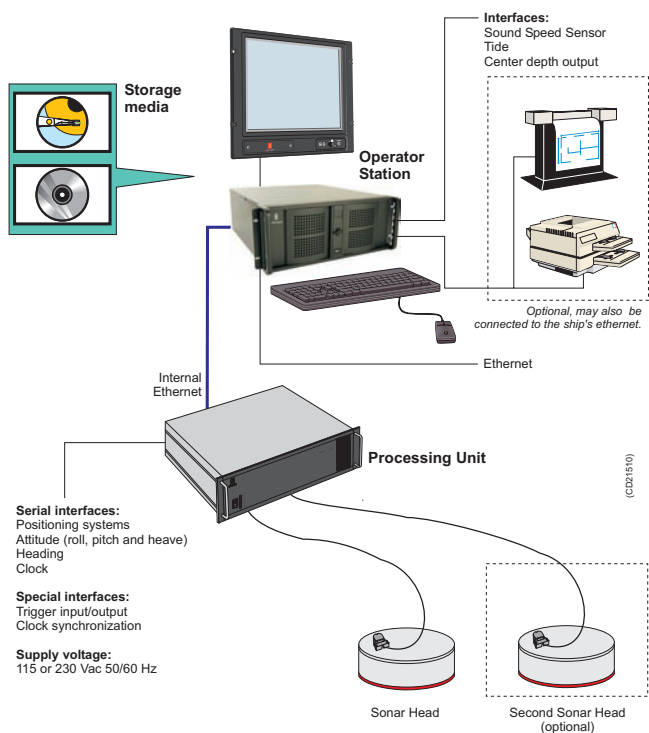
- Dual sonar heads - EM 3002D
- Logging of water column data
- Software for Automatic Calibration
- CUBE terrain modeling SW
- Extended depth rating for transducer(s): 1500 m
- Extended length of transducer cable: 30 or 45 m
- Bracket for portable mounting of sonar head(s)
- Flight case for safe transportation of 1 sonar head w/cable
- Flight case for processing unit and operators workstation

- Full swath width accuracy to the latest IHO standard
- Swath width up to 10 x water depth (EM 3002D) or 200 m (cold oceanic water)
- Depth range from < 1 meter to > 200 meters
- Bottom detection by phase or amplitude
- 100% bottom coverage even at more than 10 knots vessel speed
- Real-time ray bending and attitude compensation
- Seabed image (sidescan) data output
- Sonar heads for 500 or 1500 meters depth rating
- Water column data display window + logging (optional)

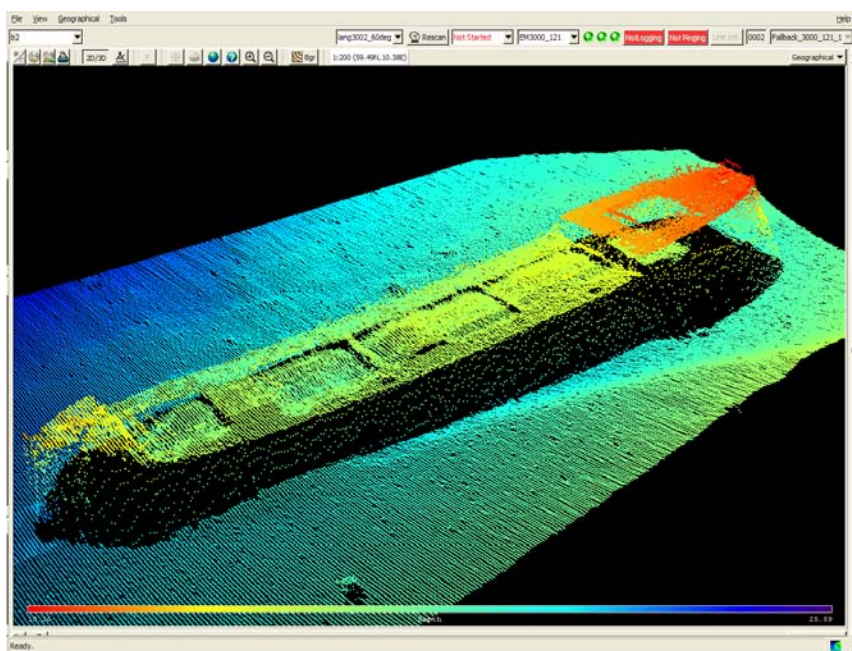
## Operator Station

The Operator Station is a rugged zed PC workstation running on either Linux<sup>®</sup> or Microsoft Windows XP<sup>®</sup>. The Operator Station software, SIS, has extensive functionality such as 3D graphics, real-time data cleaning and electronic map background.

The EM 3002 can be set up to use other operational software than SIS, for example “QINCY<sup>®</sup>” or Costal Oceanographics “HYPACK<sup>®</sup> Max”, and is also supported by software from Triton Elics International, EIVA and others.



*Typical system configuration with desktop Operator Station, Processing Unit and one or two Sonar Heads.*



*The image of a sunken wreck at 20 m depth.*

Note that Kongsberg Maritime AS does not take any responsibility for system malfunction caused by third-party software.

## Advanced functions

- Bottom detection uses a combination of amplitude and phase processing in order to provide a high sounding accuracy over the whole swath width.
- All beams are stabilized for pitch and roll movements of the survey vessel, by electronically steering the transmit beam as well as the receive beams.
- Dynamic focusing of the receive beams is applied in order to obtain improved resolution inside the acoustic near-field of the transducer.
- Swath coverage with one sonar head reaches 130 degrees, but can be manually limited while still maintaining all beams inside the active swath. For deeper waters the swath width will be reduced due to reduced signal-to-noise margin. The system will automatically re-locate all beams to be within the active swath.
- With two sonar heads the swath width will reach 200 degrees to allow for inspection of constructions up to the water surface, as well as for efficient mapping of beaches, rivers and canals. On a flat shallow seabed the swath-width can be about 10 x depth.
- Operator controlled equidistant or equiangular beam spacing.



## Operational specifications

Frequencies .....	293, 300, 307 kHz
Number of soundings per ping:	
Single sonar head .....	Max 254
Dual sonar heads .....	Max 508
Maximum ping rate.....	40 Hz
Maximum angular coverage:	
Single sonar head .....	130 degrees
Dual sonar heads .....	200 degrees
Pitch stabilisation .....	Yes
Roll stabilisation .....	Yes
Heave compensation .....	Yes
Pulse length.....	150 µs
Range sampling rate.....	14, 14.3, 14.6 kHz
Depth resolution.....	1 cm
Transducer geometry.....	Mills cross
Beam spacing .....	Equidistant or equiangular
Beamforming:	
• Time delay with shading	
• Dynamically focused receive beams	

## Seabed image data

- Composed from beamformed signal amplitudes
- Range resolution 5 cm.
- Compensated for source level and receiver sensitivity, as well as attenuation and spherical spreading in the water column.
- Amplitude resolution: 0.5 dB.

## External sensors

- Position
- Heading
- Motion sensor (Pitch, roll and heave)
- Sound velocity profile
- Sound velocity at transducer.
- Clock synchronisation (1 PPS)

## Environmental and EMC specifications

The system meets all requirements of the IACS E10 specification. The Operator Station, LCD monitor and Processing Unit are all IP22 rated.

## Dimensions and weights

### Sonar head:

Shape .....	Cylindrical
Housing material .....	Titanium
Diameter .....	332 mm
Height .....	119 mm
Weight .....	25 kg in air, 15 kg in water
Pressure rating .....	500 m (1500 m option)
transducer cable length.....	15 m

### Sonar Processing Unit:

Width .....	427 mm
Depth .....	392 mm
Height .....	177 mm
Weight .....	14.5 kg

### Operator Station:

Width .....	427 mm
Depth .....	480 mm
Height .....	127 mm
Weight .....	20 kg

### 19" industrial LCD monitor:

Width .....	483mm
Depth .....	68 mm
Height .....	444 mm
Weight .....	12 kg
Resolution.....	1280 x 1024 pixels

All surface units are rack mountable. Dimensions exclude handles and brackets.

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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