

# Application Note

Complete portable integrated solution for Laser Scanner (LiDAR 3D)  
and Multibeam Bathymetric Survey System (TOPO-BATHY)



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## Systems integration solutions that inspire innovation

### Technical solution

Kongsberg Maritime is capable of the delivery, installation and set to work of a complete portable, integrated system for topographic and bathymetric measurement, including a high resolution multibeam echo sounder for mapping the seabed and subsea structures, and a marine laser scanner (LiDAR) for mapping shorelines (beaches, cliffs, sand bars, islets, etc.) and marine structures (bridges, dikes, piers, offshore platforms).

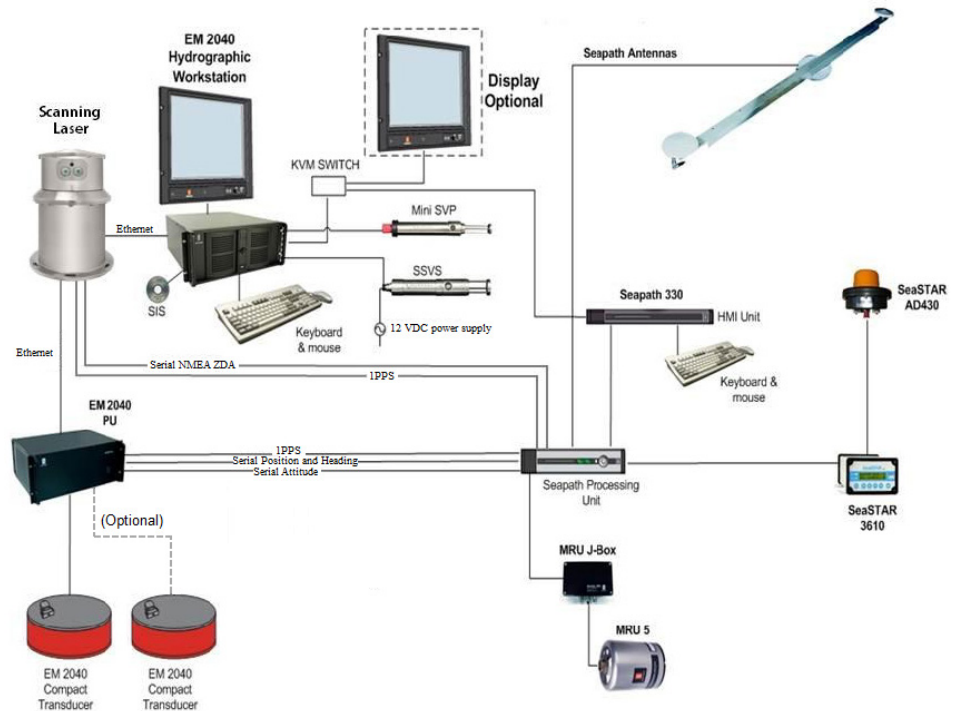
This compact, portable, ruggedized system solution is specifically designed for the marine environment and rapid mobilization and deployment.

### System integration

The system is a turn-key solution ready to perform hydrographic and topographic surveys concurrently, producing a single seamless 3D model of the terrain above and below the water surface, in real time, and referenced to a single common point in time and space.

This solution will convert any vessel (launch) to a fully equipped read-to-go survey vessel with precise positioning, motion reference, heading, laser and multibeam equipment, capable of producing high resolution 3D bathymetry, side-scan and water column data, in real-time. The onboard computers run the very latest industry standard 3D data acquisition and processing software packages. The systems are integrated in such a way that the configuration maintains a fully calibrated and ready to operate state, which means the vessel can be acquiring survey data literally minutes after being on site.

All individual sensors are interfaced to the acquisition software, preferably SIS or QPS QINSy.



*Example of cabling diagram of a proven TOPO-BATHY integration*

### System configuration (See example of connection diagram above)

The integrated system solution comprises a complete package of equipment with all required peripheral sensors, accessories and services. The above example of a system configuration includes the following components:

- HWS – Hydrographic Work Station
- Portable PC - Panasonic Toughbook (Optional)
- EM 2040C – Multibeam Echo Sounder
- Laser Scanner (Support systems: RIEGL, MDL, Optech etc.)
- Seapath 330 – Positioning and Motion Reference Unit
- Fugro SeaStar® 3610 - GNSS Receiver
- Fugro DGNS Service - Differential Global Navigation Satellite Systems
- Valeport miniSVS – Surface Sound Velocity Sensor
- Valeport miniSVP – Sound Velocity Profiler
- Multibeam/Laser Data Acquisition Software (SIS or QINSy)
- Hydrographic Post-processing Software

All of the onboard systems are precisely synchronized in time using the rising edge of the 1PPS (1 pulse per second) signal from the integrated GPS (GNSS) systems

The basic equipment package also includes all of the software and computer systems for survey planning, data collection, data post-processing including merging of the topographic and bathymetric measurements into a seamless XYZ dataset and rendering of 3-D point-cloud images in real-time.

The system can be delivered fully calibrated and tested so that it is immediately available for survey work. The system will produce data products that are fully compatible for processing and interpretation with standard GIS software such as ARCGIS, AutoCAD Map, MapInfo, CARIS etc.

### EM 2040C Multibeam Echosounder

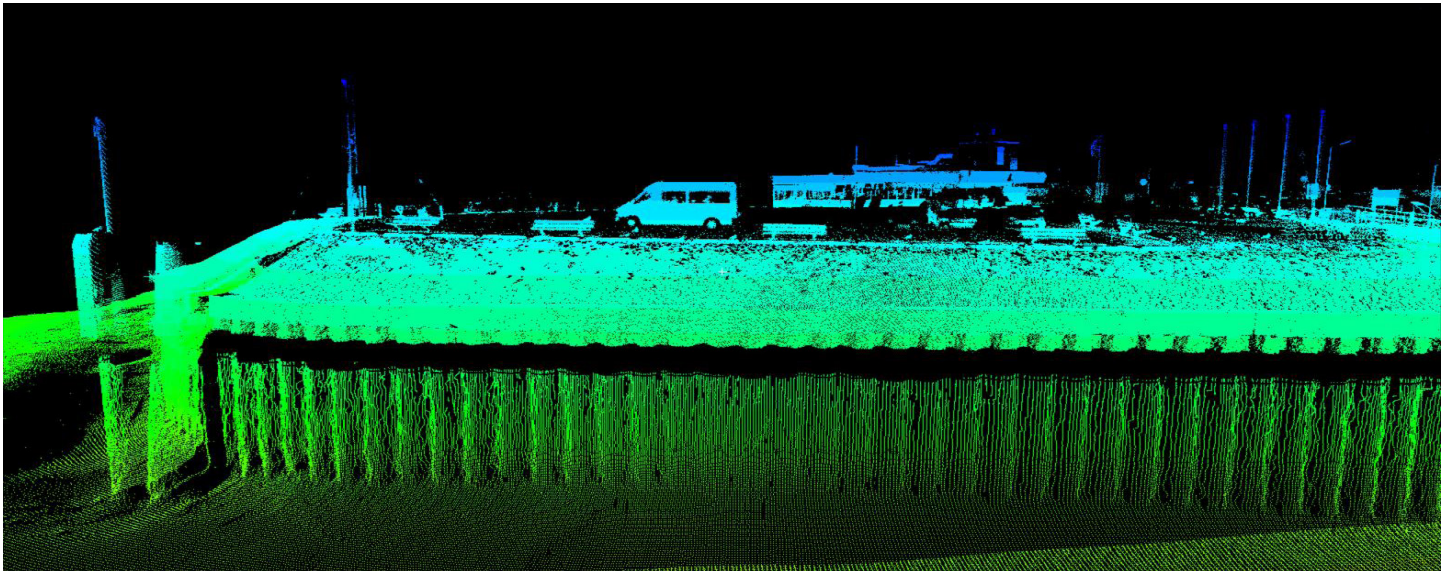
The EM 2040C ('C' stands for Compact) is Kongsberg's newest, most advanced shallow water multibeam echosounder. Like all Kongsberg multibeam echo sounders motion, position and sound velocity measurements are used by the EM 2040 to compensate for these dynamic environmental and platform effects as the data is acquired. In addition Kongsberg employs advanced bottom tracking and data cleaning algorithms during acquisition. These two practices result in extremely clean bathymetry data that requires little or no data cleaning once imported into the post-processing software .

### Laser Scanning System

The onboard Laser Scanner will be used to acquire LiDAR data of 100% of all above the water surface areas. The laser data will provide a high resolution 3D model which will show bridges, riverbanks and any other features in high resolution. The proposed acquisition software is able to interface to most of the laser scanning systems being used in the land survey industry. As with multibeam, it is able to acquire data from multiple laser scanning systems simultaneously to produce a homogenous point cloud on-the-fly.

### Laser Scanning System and EM 2040 Multibeam Bathymetry – Data Examples

The data returned from the scanner is a range and an intensity value off of the hit target. The laser data can be color coded by this intensity. With this option lettering can be made visible as different colors of material will result in a different reflectivity. It is hard to identify material types from the returned intensity as the intensity is also dependent on the angle of incidence and the range from the laser. *(Images below are courtesy of GeoPlus, The Netherlands)*



November 2013

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