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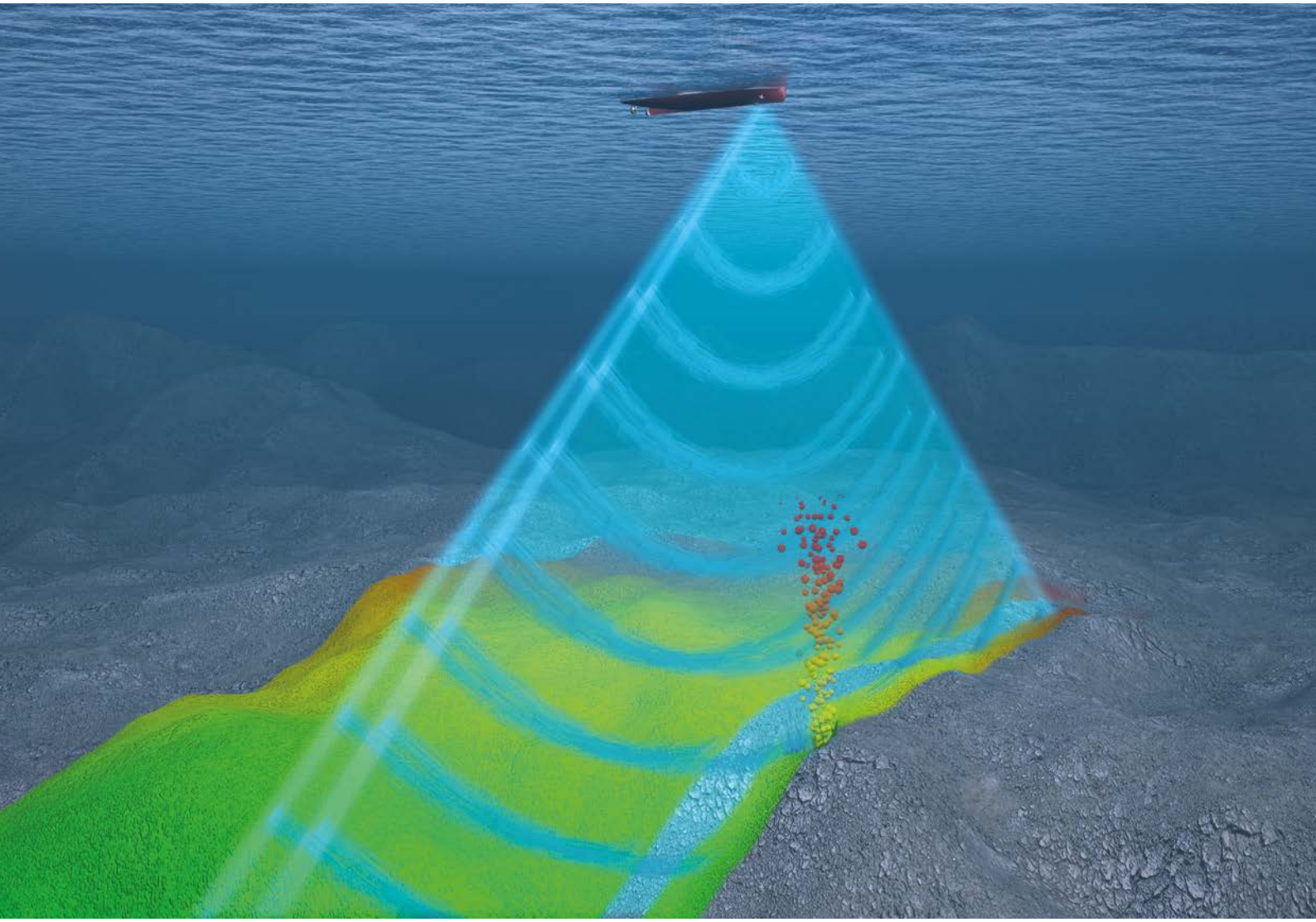
WÄRTSILÄ **Electrical & Automation**

Wärtsilä ELAC SeaBeam 3050

Mapping the continental slope

50 kHz ● 3,500 m depth performance ● multi-ping ● 4,000 m swath coverage ● WCI

Wärtsilä ELAC SeaBeam 3050 is the latest generation medium-depth multibeam system from Wärtsilä ELAC Nautik, collecting real-time bathymetric data, bottom amplitudes, side scan data and water column imaging (WCI) data. Due to its depth performance, wide coverage and multi-ping operation, Wärtsilä ELAC SeaBeam 3050 is the ideal hydrographic sensor for mapping the continental slope.



Wärtsilä ELAC SeaBeam 3050

Medium-depth multibeam system

Performance
Wärtsilä ELAC SeaBeam 3050 operates in the 50 kHz frequency band in water depths ranging from 5 metres below the transducers to approx. 3,500 metres. It has an across-ship swath width of up to 5.5 times of water depth and provides a maximum of 918 beams for each multi-ping. The data are fully compensated for roll, pitch and yaw motion of the vessel. The depth accuracy of the sonar sensor exceeds the IHO (International Hydrographic Organization) requirements.

Full auto mode
In order to secure a most reliable and easy system operation, Wärtsilä ELAC SeaBeam 3050 provides a full auto mode, enabling a successful quasi-autonomous data acquisition. The full auto mode includes an automatic setting of all relevant system parameters.

Multi-ping mode
In the multi-ping mode, Wärtsilä ELAC SeaBeam 3050 transmits and processes two swaths per ping cycle, allowing higher maximum survey speeds without losing 100% bottom coverage. This is especially important for narrow along-ship beam widths. At a fixed survey speed, a doubled data density increases the target detection and classification abilities.

High-density mode
Wärtsilä ELAC SeaBeam 3050 has 386 beams in equiangular and multi-ping mode. The swath coverage can be decreased down to 60 degrees, leaving the number of reception beams constant.

FM mode
Wärtsilä ELAC SeaBeam 3050 optionally provides a fully automatic FM mode, utilising frequency-modulated (FM) pulses.

Wärtsilä ELAC SeaBeam 3050 – transceiver unit

Key features
Up to 3,500 m depth performance
Up to 4,000 m swath coverage
Multi-ping mode
High-resolution water column imaging (WCI)
Advanced transmission beam steering
Mobile version for beam widths of 1.5° x 2°

Permanent array installation

Mobile bracket

System overview

Compact design for easy integration

Basic transmission technique
Wärtsilä ELAC SeaBeam 3050 uses a transmission technique which fully stabilises pitch and yaw motion of the vessel in order to achieve a uniform coverage under the vessel. The transmit fan is split into several sectors which can be steered individually.

Advanced transmission beam steering
Wärtsilä ELAC SeaBeam 3050 includes an unrivalled functionality for the automatic cyclical steering of the transmitted swaths to bow and stern. An entire volume area under the vessel is automatically insonified, without requiring any movement of the vessel.

This functionality is very useful in order to acquire WCI data for the analysis and detection of wrecks, gas flares, leaks or submarines during stationary vessel operations. The user can specify an angle range and an angular increment, resulting in an automatic periodic oscillation of the transmitted swaths to bow and stern.

Transducer arrays
The projector array and the hydrophone array are arranged in a mills cross configuration. Pre amplifiers are built into the hydrophone array. Each transducer array is split into multiple modules, allowing customisation of the along-ship and across-ship beam widths.

The standard installation of the transducer array is flush with the ship hull. A blister or a gondola installation is also possible. For mobile applications with beam widths of 1.5 x 2 degrees, a transducer bracket for pole installation is available.

Transceiver unit SEE 37
The transceiver unit SEE 37 contains the transmitter and receiver electronics for amplification of the transmit signals, transmit beamforming, amplification and conditioning of the reception signals, receive beamforming, bottom detection and sonar control. Additionally, the transceiver unit provides the interfaces for all external sensor data.

Operator station
The operator station is a PC of the latest technology, including an SSD for all software applications and a classical hard disc with very large storage capacity for measurement data. The operator station communicates with the transceiver unit via Ethernet, both for sonar control and acquisition of sonar data.

The Wärtsilä ELAC HydroStar operator software provides all sonar control functions, records bathymetric data and includes various real-time data displays for quality control. It also supports third-party software packages for data acquisition like HYPACK, EIVA or QINSy.

Water column imaging (WCI)
High-resolution WCI data can always be logged as standard. In order to display real-time data from the water column and seafloor, an optional WCI station is required.

The WCI station is a PC of the same type as the operator station. The WCI data are visualised online and offline via the Wärtsilä ELAC WCI Viewer, which includes a wide functional scope:

- online beam stacking and/or ping-oriented sonar data windows
- different scaling and range options
- forward and backward data playback as movies or single pictures
- object and event functionalities

These capabilities are very useful for identifying any kind of objects in the water column or on the bottom like gas flares.

Automatic object detection
An automatic processing of WCI data with respect to object detection can reduce the workload of survey operators significantly. Based upon scientific work elaborated within the German research project SUGAR (Submarine Gas Hydrate Reservoirs), Wärtsilä ELAC Nautik has developed the optional automatic object detector Wärtsilä ELAC AOD, which supports the detection of gas flares in the water column.

Bottom slope data interface
Wärtsilä ELAC SeaBeam 3050 provides bottom slope data via serial interface. These data are calculated via linear regression and are e.g. useful for the automatic steering of a sub-bottom profiler.

Technical data

Wärtsilä ELAC SeaBeam 3050 at a glance

Performance data	
Operating frequency	50 kHz band
Min. depth	5 m below transducer
Max. depth	Approx. 3,500 m (depending upon the own noise of the ship and sea state)
Along-ship beam width	1° / 1.5° / 3°
Across-ship beam width	1° / 2°
Swaths per ping cycle	1 (single-ping) or 2 (multi-ping)
Pulse lengths	0.15 - 40 ms
Max. swath coverage sector	5.5 times of water depth
Max. swath coverage	Approx. 4,000 m (depending upon the own noise of the ship and sea state)
Full auto mode	Automatic setting of all relevant system parameters
FM mode (optional)	Fully automatic utilisation of frequency-modulated pulses
Reception beam spacing	Equidistant or equiangular
Max. number of beams	918 (equidistant, multi-ping) 386 (equiangular, multi-ping)
Max. range sampling rate	10 kHz IQ (in-phase, quadrature)
Depth accuracy (sonar sensor)	In accordance with IHO SP44 special order

Input interfaces	
Power	115 V / 60 Hz single-phase or 230 V / 50 Hz single-phase
Motion	RS232 / RS422
Heading	RS232 / RS422
Position	RS232 / RS422
Surface sound velocity	RS232 / RS422
Sound velocity profile	RS232 / RS422 / USB

Special output interfaces	
Centre depth interface	RS232, ASCII format
Bottom slope data interface	RS232, similar to NMEA 0183

Stabilisation / compensation	
Roll	± 15°
Pitch	± 10°
Yaw	± 5°

Physical specifications				
	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)
Hydrophone array* 1° / 2°	125 / 125	380 / 380	1,581 / 792	50 / 25 (without frames and cables)
Projector array* 1° / 1.5° / 3°	150 / 150 / 150	2,284 / 1,691 / 1,098	450 / 450 / 450	66 / 44 / 22 (without frames and cables)
Mobile transducer bracket (including transducers)	286	1,928	789	< 312 (without cables)
Transceiver unit (for permanent installation)	1,052	607	877	160
PC station(s)	177 (4 HE)	483 (19” rack)	505	14

* Dimensions may change due to special installation requirements. Please ask for dimensional drawings.
The typical tolerance of weights is ± 10 %.

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