Multibeam SB 3020 ICEBREAKER
Ice Hardened Multibeam Sonar System

Specifications and Technical Data
Multibeam SB 3020 ICEBREAKER at a Glance

Technical Data

<table>
<thead>
<tr>
<th>Operating frequency</th>
<th>20 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>min. depth</td>
<td>50 m below transducers</td>
</tr>
<tr>
<td>max. depth</td>
<td>7,000 m</td>
</tr>
<tr>
<td>Along-ship beam width (-3 dB points)</td>
<td>2° (other beam widths available)</td>
</tr>
<tr>
<td>Across-ship beam width (-3 dB points)</td>
<td>2° (other beam widths available)</td>
</tr>
<tr>
<td>Pulse length</td>
<td>1 ms - 20ms</td>
</tr>
<tr>
<td>Pulse length modes</td>
<td>Manual and automatic</td>
</tr>
<tr>
<td>Acoustical window</td>
<td>Ice resistant up to 20 bar</td>
</tr>
<tr>
<td>max. swath coverage sector</td>
<td>approx. 9,000 m (depending on own noise of the ship and sea state)</td>
</tr>
<tr>
<td>max. swath coverage</td>
<td>Manual and automatic</td>
</tr>
<tr>
<td>max. number of beams</td>
<td>205</td>
</tr>
<tr>
<td>Beam spacing</td>
<td>Equidistance or equiangular</td>
</tr>
<tr>
<td>Depth accuracy (sonar sensor)</td>
<td>In accordance with IHO for depths greater than 100 meters</td>
</tr>
</tbody>
</table>

Interfaces

| Power                | 115 V/60 Hz or 230 V/50 Hz single phase |
| Motion               | RS232 |
| Heading              | RS232 |
| Position             | RS232 |
| Surface sound velocity | RS232 |
| Sound velocity profile | RS232 |

Stabilization

| Roll    | ± 10° |
| Pitch   | ± 7°  |
| Yaw     | ± 5°  |

Physical Specifications

| Hydrophone array 2** | Height (mm) | 523 |
| Hydrophone junction box | Width (mm) | 3,394 |
| Projector array 2**   | 523 |
| Projector junction box | 410 |
| Receiver control unit | 600 |
| Transmitter control unit | 606 |
| Depth (mm) | 1,250 |
| Weight (kg) | 2,800 |

*Dimensions may change due to special installation requirements. Please ask for dimensional drawings.
Multibeam SB 3020 ICEBREAKER
Medium Depth and Deep Water Multibeam System

SeaBeam 3020 ICEBREAKER is the latest generation deep water multibeam bathymetric sonar system from L-3 ELAC Nautik. This advanced system features the patented, revolutionary transmission technique called Swept Beam™, which compensates fully for vessel pitch, roll and yaw motion.

Performance
SeaBeam 3020 ICEBREAKER is a high performance deep sea echo sounder, providing excellent bathymetric, bottom backscatter and side scan data due to its innovative sonar processing. The system operates at 20 kHz in water depths ranging from 50 m to 7,000 m, at survey speeds of up to 12 knots. SeaBeam 3020 ICEBREAKER produces bathymetric data that exceed the requirements of the International Standards Organization (ISO) for depths greater than 100 meters.

Swept Beam™ transmission technique
The main difference between the Swept Beam™ and a classical sector scan (separately steered beams) is that the resulting swath footprints of the swept beams for a series of pings are essentially evenly parallel spaced lines. Instead the sector scan produces a couple of hyperbolic curves with overlapping areas in the across-ship direction. These hyperbolic curves and overlapping areas produce some discontinuities which may generate artifacts in the post-processing.

High density mode
SeaBeam 3020 ICEBREAKER has 205 beams (maximum at equiangular mode). The swath can be decreased. The number of beams will be constant even if the swath width will be decreased until a specific angle is reached.

Transmitter and receiver control units
The transmitter control unit (TCU) supplies the drive signals to the entire projector array. Each output is separately controlled for power level, phase and frequency. This facilitates programmable shading and steering as well as transmit beam stabilization using Swept Beam™.

The receiver control unit controls the overall ping cycle. It contains the receiver circuits for the hydrophones as well as the signal processor for beam forming, bottom detection and data reduction. The control units are interfaced to the operator station via Ethernet.

Transducer array
The transducer array incorporates a projector and a hydrophone array in mills cross configuration. The 20 kHz projector array has an along track beam width of 2°. It consists of 13 identical modules. The projectors use Tonpilz resonators.

The hydrophone array has an athwart ship beam width of 2° normal to the array. It consists of 64 identical staves. The hydrophones use ceramic elements with broadband performance to provide excellent phase uniformity across the array and multi-frequency capability.

Operator station
The operator station, a PC of latest technology, provides a graphical user interface on high resolution TFT monitors for controlling the system using L-3 ELAC Nautik’s HydroStar Online software. It communicates with the sonar electronics via Ethernet both for control and reception of sonar data. It performs the sound velocity correction, heave compensation, navigation merging and data record construction. A variety of real time data displays are available for quality control.

Water Column Imaging workstation (optional)
The Water Column Imaging (WCI) functionality is utilized via an additional PC workstation that logs Water Column Imaging data and displays real time images of backscatter from the water column and sea floor, both below and to the sides of the vessel. The WCI connects to a SeaBeam 3020 multibeam system via Ethernet, and receives data for each ping from the multibeam.

Key Features
- Ice resistant transducer array up to 20 bar ice pressure (due to acoustical window)
- Patented Swept Beam™ technology
- 7,000 m depth performance
- Compact design for off keel mounting

Ice hardened hydrophone frame: Manufactured in Germany (left) and ready to be installed (right)
Multibeam SB 3020 ICEBREAKER
Medium Depth and Deep Water Multibeam System

SeaBeam 3020 ICEBREAKER is the latest generation deep water multibeam bathymetric sonar system from L-3 ELAC Nautik. This advanced system features the patented, revolutionary transmission technique called Swept Beam™, which compensates fully for vessel pitch, roll and yaw motion.

Performance
SeaBeam 3020 ICEBREAKER is a high performance deep sea echo sounder, providing excellent bathymetric, bottom backscatter and side scan data due to its innovative sonar processing. The system operates at 20 kHz in water depths ranging from 50 m to 7,000 m, at survey speeds of up to 12 knots. SeaBeam 3020 ICEBREAKER produces bathymetric data that exceed the requirements of the International Standards Organization (ISO) for depths greater than 100 meters.

Swept Beam™ transmission technique
The main difference between the Swept Beam™ and a classical sector scan (separately steered beams) is that the resulting swath footprints of the swept beams for a series of pings are essentially evenly parallel spaced lines.

Instead the sector scan produces a couple of hyperbolic curves with overlapping areas in the across-ship direction. These hyperbolic curves and overlapping areas produce some discontinuities which may generate artifacts in the post-processing.

High density mode
SeaBeam 3020 ICEBREAKER has 205 beams (maximum at equiangular mode). The swath can be decreased. The number of beams will be constant even if the swath width will be decreased until a specific angle is reached.

Transmitter and receiver control units
The transmitter control unit (TCU) supplies the drive signals to the entire projector array. Each output is separately controlled for power level, phase and frequency. This facilitates programmable shading and steering as well as transmit beam stabilization using Swept Beam™.

The receiver control unit controls the overall ping cycle. It contains the receiver circuits for the hydrophones as well as the signal processor for beam forming, bottom detection and data reduction. The control units are interfaced to the operator station via Ethernet.

Operator station
The operator station, a PC of latest technology, provides a graphical user interface on high resolution TFT monitors for displaying the sonar data. It performs the sound velocity correction, heave compensation, navigation merging and data record construction. A variety of real time data displays are available for quality control.

Water Column Imaging workstation (optional)
The Water Column Imaging (WCI) functionality is utilized via an additional PC workstation that logs Water Column Imaging data and displays real time images of backscatter from the water column and sea floor, both below and to the sides of the vessel. The WCI connects to a SeaBeam 3020 multibeam system via Ethernet, and receives data for each ping from the multibeam.
Multibeam SB 3020 ICEBREAKER
Ice Hardened Multibeam Sonar System

Specifications and Technical Data
Multibeam SB 3020 ICEBREAKER at a Glance

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating frequency</td>
<td>Power</td>
</tr>
<tr>
<td>min. depth</td>
<td>115 V/60 Hz or 230 V/50 Hz single phase</td>
</tr>
<tr>
<td>max. depth</td>
<td>Motion</td>
</tr>
<tr>
<td>Along-ship beam width (-3 dB points)</td>
<td>RS232</td>
</tr>
<tr>
<td>Across-ship beam width (-3 dB points)</td>
<td>Heading</td>
</tr>
<tr>
<td>Pulse length</td>
<td>Position</td>
</tr>
<tr>
<td>(-3 dB points)</td>
<td>Surface sound velocity</td>
</tr>
<tr>
<td>Pulse length modes</td>
<td>Sound velocity profile</td>
</tr>
<tr>
<td>Acoustical window</td>
<td></td>
</tr>
<tr>
<td>max. swath coverage sector</td>
<td></td>
</tr>
<tr>
<td>max. swath coverage</td>
<td></td>
</tr>
<tr>
<td>Swath coverage modes</td>
<td></td>
</tr>
<tr>
<td>max. number of beams</td>
<td></td>
</tr>
<tr>
<td>Beam spacing</td>
<td></td>
</tr>
<tr>
<td>Depth accuracy (sonar sensor)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrophone array 2**</td>
<td>Height (mm)</td>
</tr>
<tr>
<td></td>
<td>523</td>
</tr>
<tr>
<td>Projector array 2**</td>
<td>Width (mm)</td>
</tr>
<tr>
<td></td>
<td>3,371</td>
</tr>
<tr>
<td>Hydrophone junction box</td>
<td>Depth (mm)</td>
</tr>
<tr>
<td></td>
<td>1,250</td>
</tr>
<tr>
<td>Projector junction box</td>
<td>Weight (kg)</td>
</tr>
<tr>
<td></td>
<td>2,800</td>
</tr>
<tr>
<td>Receiver control unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,751</td>
</tr>
<tr>
<td>Transmitter control unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2,150</td>
</tr>
</tbody>
</table>

*Dimensions may change due to special installation requirements. Please ask for dimensional drawings.