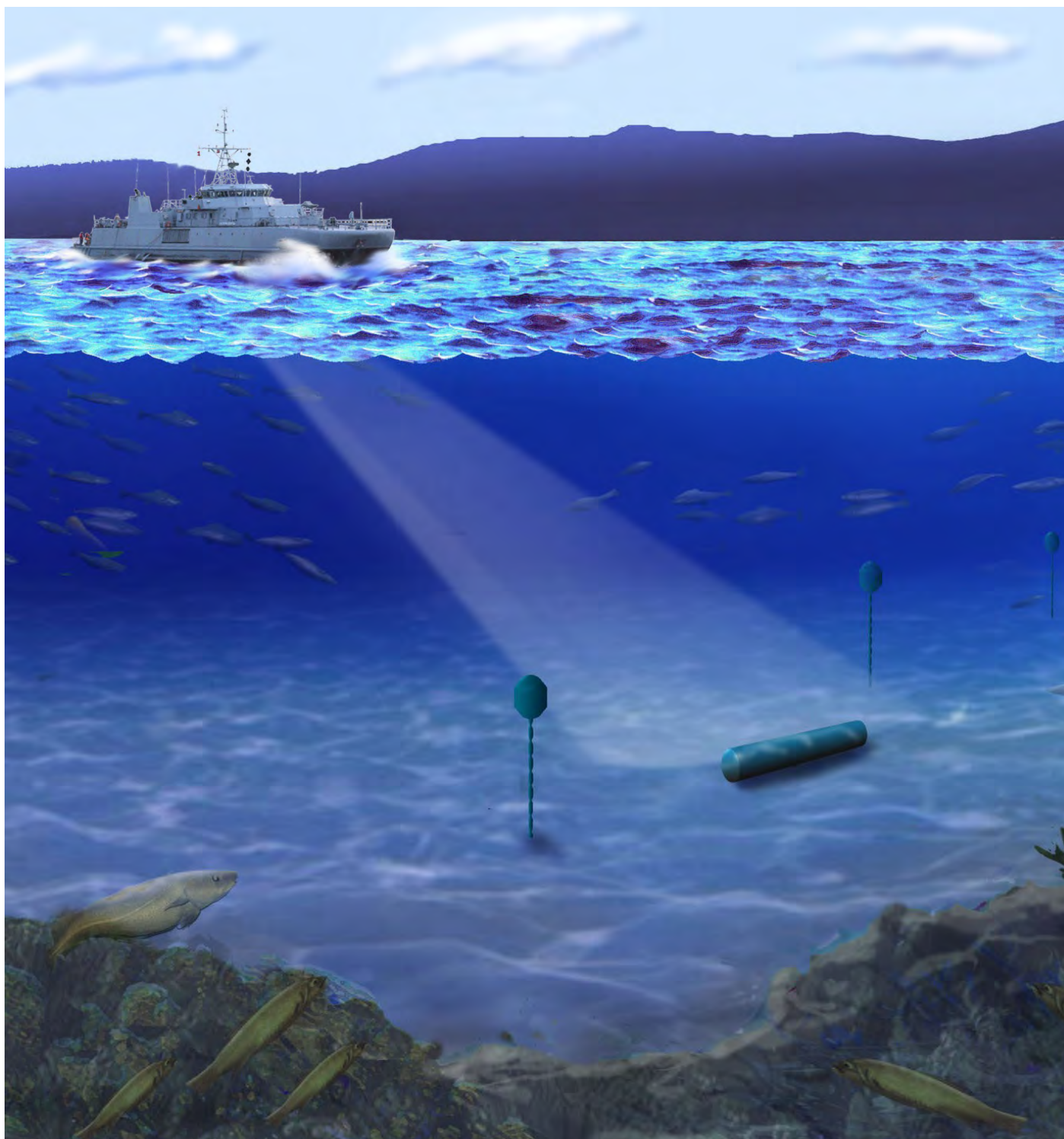


SA9520



KONGSBERG

## Mine and Obstacle Avoidance Sonar for surface vessels



## Concept

The SA9520 MOAS is a high frequency wideband sonar designed with emphasis on detection and early warning of navigation obstacles including mines. The SA9520 uses the newest Kongsberg Maritime (KM) in-house composite transducer technology and is a further development of the widely used SA950.

The sonar includes the possibility for extensive information exchange with the Combat Management System (CMS) through open protocols. The Control & Display Unit may be a standalone console from KM or a Multi Function Consol (MFC) from a third party. If the sonar is integrated with an MFC the Human Machine Interface (HMI) will run using remote desktop functionality. The integration approach enables the sonar to interface to virtually any CMS/MFC vendor.

The SA9520 sonar is well suited for all kind of vessels which need to secure themselves from possible threats in the water volume.

The SA9520 enhance shallow water detection capabilities and operation in narrow straits. The sonar operator can optimise the performance by selecting pulse length and shapes, vary source level and choose narrow or wide sector widths. It also has built in capabilities of generating depth profiles ahead of the vessel in selected directions.

## System overview

The SA9520 sonar is constructed to provide navigational protection against obstacles for both naval and merchant vessels.

The SA9520 consists of the following main units:

- Control & Display Unit
- Sonar Processing Unit (SPU)
- Hull Unit with retractable sonar heads

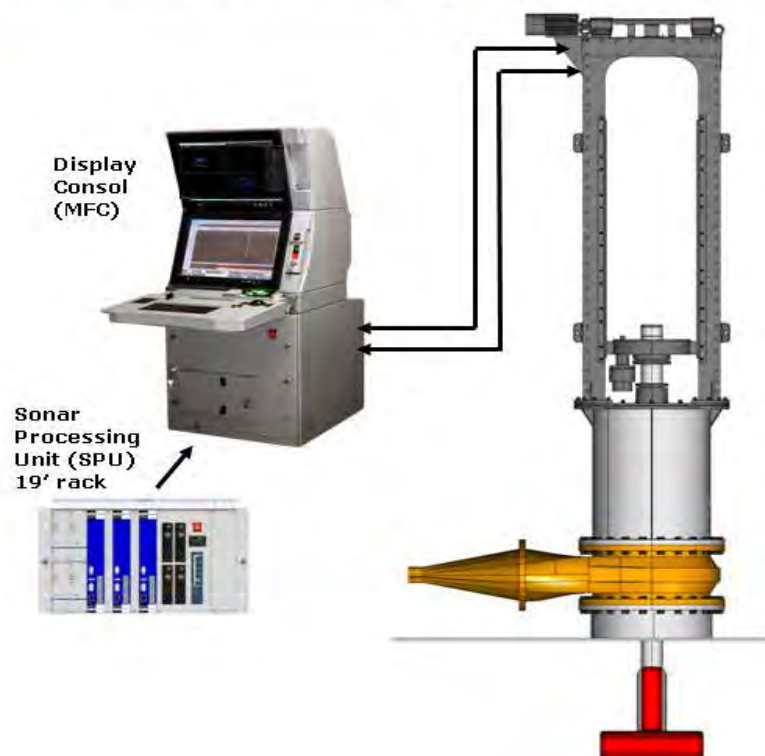
Key issues in the product definition process have been:

- Resolution to enable detection of weak targets also in the presence of surface and bottom reverberation.
- Vertical discrimination for isolation of anchored mines from the surface and bottom reverberation
- Vertical positioning capability
- Prepared for combat and bridge system integration
- Automatic target tracking
- Easy sonar operation including automatic generation of alarms.

## Key Features of the SA9520

- Automatic mine/obstacle warning.
- Automatic target initiation and tracking.
- Vertical resolution which allows for positioning of objects in depth.
- Wide sector coverage area.
- Sound propagation model integrated.
- Anti-grounding and seafloor mapping ahead of vessel.
- Easy integration / information exchange with CC system.
- Operator configuration of sonar parameters and HMI.
- Range of Hull Unit options.
- Built-in Test Equipment (BITE).

## SA9520 Mine and Obstacle Avoidance Sonar



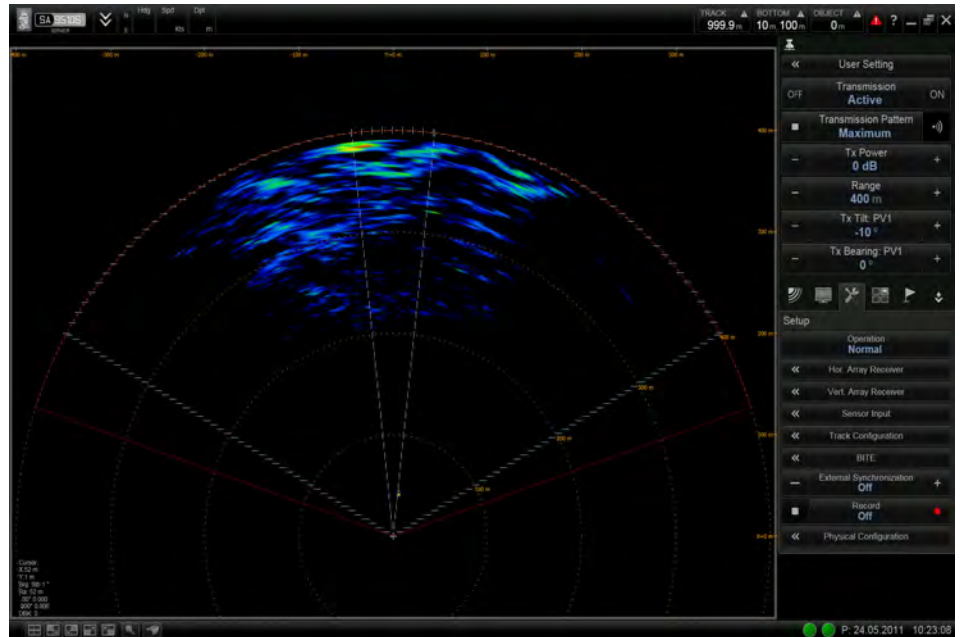
## Display and Control Unit

The Control & Display Unit may be a standalone console from KM or a general purpose Multi Function Console (based on Windows or other operating systems).

The Graphical User Interface (GUI) is based on modern principle of user interaction in applications. All normal sonar operation is performed through the sonar display, roller ball (mouse) and keyboard. The system GUI will be changeable between a day operation mode and a night operation mode that is suited for each environment. The system will provide an audio and a visual alarm if obstacles are closer than a user defined value. The sonar always displays information of own ship's speed, depth, heading, time and position.

The system provides different range scales that can be selected by the operator. The system is able to present a vertical slice of the measured echoes and bottom topography along a selected horizontal beam. The sonar produces a picture of the relative backscattering strength of the sea bottom. The sonar is able to display true bearing, plan range and depth of operator selected points in the display. The available information of the selected point can be stored as a marker by the system when commanded to do this by the operator.

The system is able to generate an unlimited number of unique identifiers for each operator selected point in the display, i.e. each time the operator creates a marker. In addition the system enables the operator to link text information (classification, characterization etc) to markers and targets. Information on sonar targets and markers set by the operator will be stored in an object list during the session. By selecting such an object on the display the operator



can have all textual object information presented.

The operator may edit or add to the text. The sonar has a number of display views. Two examples are the horizontal view that displays the sonar images with bow-up orientation and a situation view that displays the sonar images on top of a geographical map with north-up orientation. Both views can be visible on the screen at the same time. The system has the capability to present data from electronic charts. Depth contours, land contours and point depths may be presented as user controllable layers in the sonar displays.

## Sonar Processing Unit

The Sonar Processing Unit (SPU) is contained in a 19 inch rack and contains a Windows based server. The SPU contains all the hardware and software necessary to run the digital signal processing and prepare the sonar Human Machine Interface (HMI). The sonar has the capability to run the HMI on a third party Multi Function Console (MFC) using Citrix remote desktop functionality.

## Sonar Heads with transducer arrays

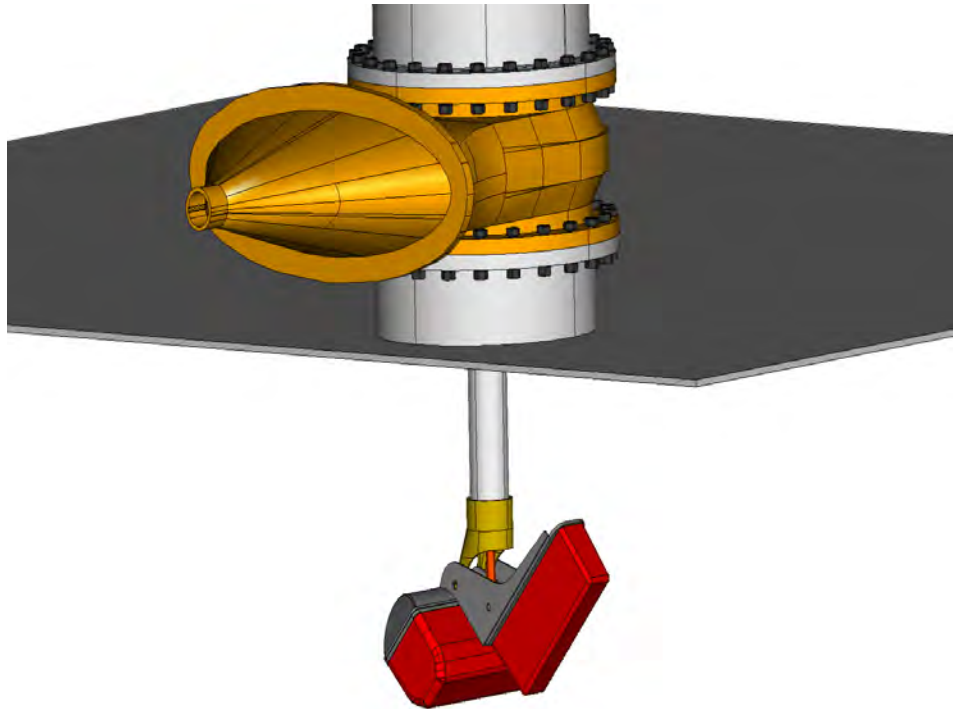
The basis of the sonar are the sonar heads that include one 2D horizontal transducer array and one 2D vertical transducer array. The sonar heads also contains the front-end electronics with very high dynamic range. The sonar has the possibility to transmit and receive on both the vertical and the horizontal transducer array. The vertical array provides resolution which allows for positioning of objects in depth and to discriminate targets vertically as bottom, volume or surface targets. The horizontal array is capable of forming narrow single beams put together in a wide horizontal sector giving large coverage. The narrow single beams in the horizontal plane give very good position accuracy in bearing.

The SA9520 covers instantly a sector of 120 degrees horizontally and at the same time a sector of 90 degrees vertically. This provides a large search area for simultaneously mine seeking and navigation in one ping.

Combined with backscatter measurement the SA9520 provides the “Full Picture” as a Mine and Obstacle Avoidance Sonar.

The sonar heads are installed on a hoist able Hull Unit with mechanical train and tilt. This gives the transducer arrays sufficient depth beneath the hull and provides full sub water coverage. The sonar heads are hoisted and stored completely inside the hull when not in use.

As an option the hull unit may be delivered with gate valve for easier service and maintenance of the transducer heads



*Figure: Sonar heads tilted downwards*

### Technical specifications:

• Operating frequency range:	70 to 100 kHz
• Horizontal sector coverage:	Selectable: 15°/30°/60°/90°/120°
• Vertical sector coverage:	Selectable: 15°/30°/60°/90°
• Bearing angle accuracy:	0.5° (at centre)
• Elevation angle accuracy:	0.5° (at centre)
• Range resolution:	7 cm
• Range accuracy:	< 2 % of range
• Target Tracking:	3D tracking – Automatic and Manual
• Target bearing separation horizontal:	1.4°
• Target bearing separation vertical:	2.0°
• Detection range:	1000 m (@ 85kHz, TS=±20 dB, Salinity=35ppt, T=10°C)
• Detection range:	2600 m (@ 85kHz, TS=±20 dB, Salinity=7ppt, T=10°C)
• Pulse types:	HFM / LFM / CW
• Alarm:	Audio and visual
• Electronic charts:	Yes
• Recording and Replay:	Yes
• Sound Propagation Modeling:	Yes
• Single ping:	Yes – Controlled by operator
• Bottom profiling:	Yes – ahead of submarine
• Integration with Multi Function Consol (MFC):	Remote desktop - Single screen / Two screens
• Sound Speed Profile:	Yes
• Transmission control:	Yes