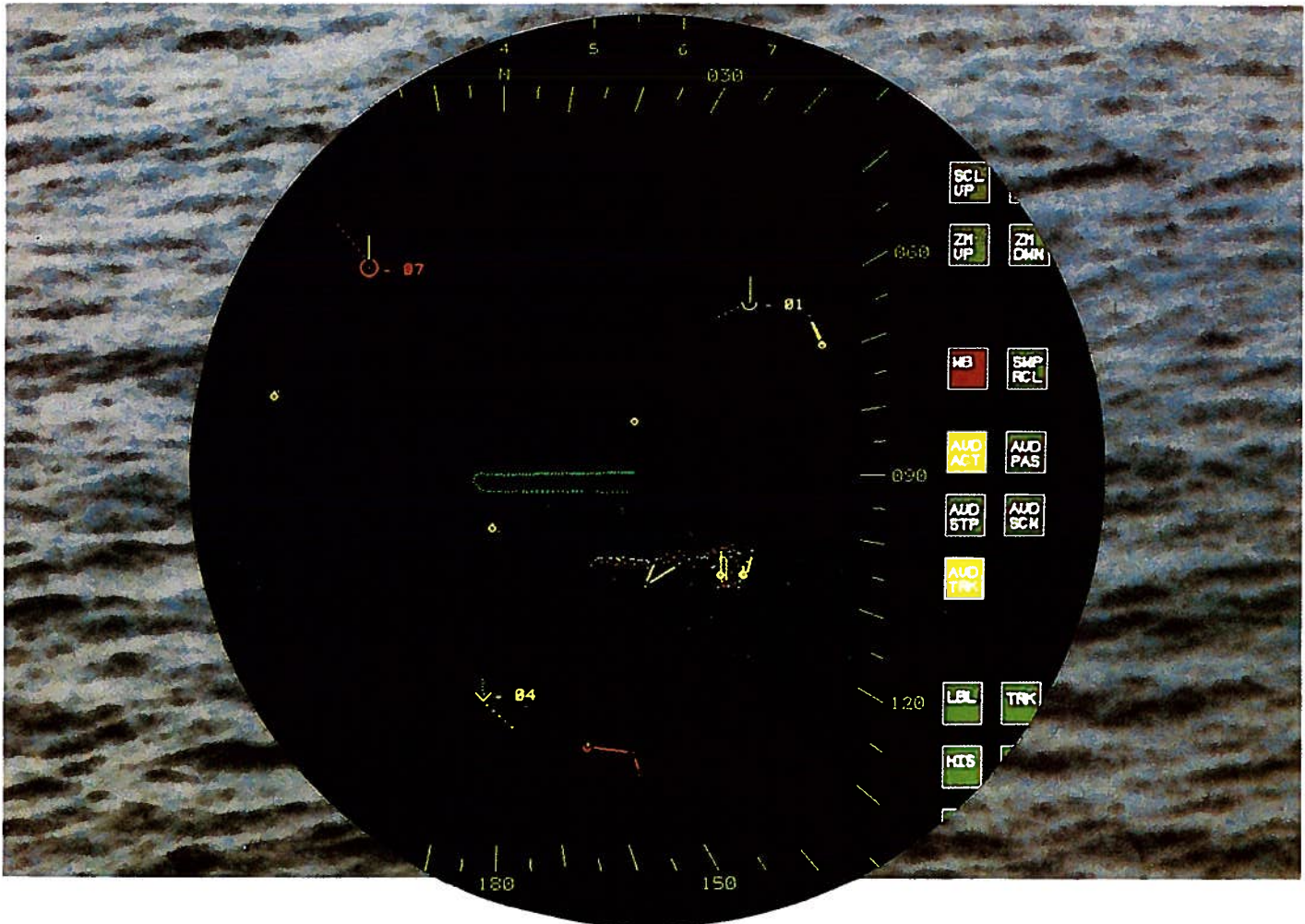




# PHS-36

## Panoramic hull-mounted sonar



### OPERATIONAL FEATURES

Signaal offers the latest innovation in anti-submarine warfare: PHS-36. PHS-36 is a hull-mounted sonar which forms an essential part in detecting submarine threats. In collaboration with the Netherlands National Defence Laboratory TNO and with the Royal Netherlands Navy, Signaal developed, produced, and tested this sophisticated detection device. The test results convinced the RNIN to select PHS-36 for their Multi-purpose (M-) Frigates, where the system will continue to prove its worth.

Operated by one person, the PHS-36 sonar system can handle any threat. It is capable of operation in deep as well as in shallow waters, and can detect slow- as well as fast-moving targets, be they in a surface duct or in deep water. The system performs very well under reverberation-limited and noise-limited conditions.

PHS-36 does all this by computer-aided detection techniques, combined with the

use of three operating modes. The computer-aided detection techniques provide the operator with a comprehensive, noise-free picture. The three modes of operation, which are the active continuous wave (CW) mode, the active frequency modulation (FM) mode and the passive mode, ensure a high detection probability and a low false-alarm rate. Two modes can be used simultaneously. The combination of pulse type and processing effectively suppresses reverberation, noise, and side-lobe effects.

In addition, PHS-36 features various support functions, such as frequency analysis of demodulated noise (DEMON) in a pre-formed beam, as well as range prediction parameter extraction (RPPE). Other functions include signal injection for testing or training purposes, recording and replay for analysis and exercises, and passive or active audio signals on the ship's communication system (AUDIO).

The PHS-36 sonar system has a modular design, which can be assembled into a whole family of sonars. This modular design allows composites to be fitted on vessels of all sizes.

### MAIN CHARACTERISTICS

- 360° coverage
- Automatic tracking of up to 12 targets
- Coherent FM and CW signal processing for maximum probability of detection
- High-resolution colour display
- Variety of pulse lengths
- Variable vertical beam widths
- Integration of operator training facility
- Audio channel

## FUNCTIONAL ASPECTS

PHS-36 features FM and CW pulses for optimal detection of all targets within the doppler range of -40 to +40 kts. The sonar system operates in two frequencies around 7 kHz, for active operation, and in two frequency bands around 2.5 and 7 kHz, for passive operation.

### The transmitter part.

In the active mode, the transmitter generates the output power for the transducer array. The energy for the transmitter is supplied by the sonar energy store to minimize the load on the ship's power system. The mode switch unit controls the energy for transmission and reception. It also controls the vertical beam width of the sonar (wide/narrow). This feature is used in combination with computer-coordinated transmissions under adverse weather conditions, and for maintaining close contact (MCC).

### The sonar processor cabinet.

Received signals are routed to the sonar processor cabinet. This cabinet has two identical processing paths, each capable of the following:

- True time delay beam forming
- Own doppler correction

- FM processing by pulse compression or:
- CW processing by Fast Fourier Transform or:
- Passive processing by broadband energy detection or:
- Passive processing by narrowband target noise analysis.

These paths each provide an output, which is subsequently subject to alarm extraction and tracking processing. The processing results are sent to the operator console, for presentation. The system can extract environmental data from received signals, which can serve as input for a range prediction model. Sonar signals can also be made audible via the ship's communication system. Finally, for testing and training purposes a test signal can be injected (recording and replay).

### The operator console.

This can be a combat system multi-function console (connected via a data bus system Ethernet®), or a stand-alone dedicated sonar console.

## PERFORMANCE DATA

### Transmission:

Frequencies : two frequencies around 7 kHz  
 Pulse type : CW  
                   FM  
                   FM+CW (a sequential transmission per interval)  
 Pulse length : varying from 75 to 1200 ms depending on range-scale/pulse-type selections  
 Source level : 230 dB directional transmission (DIR)  
                   220 dB omni-directional transmission (OMNI)

### Reception:

Preformed beams : 32  
 Bandwidth passive mode : **band I** 1.5 - 3.5 kHz  
                                   **band II** 5.8 - 10.5 kHz  
 Target doppler speed Measurement : -40 to +40 kts  
 Computer-aided detection : automatic ping-to-ping association to display a max. of 100 traces  
 Autotracking : max. 12 traces

### Accuracy:

Standard deviations  
 Range : CW (300ms) < 70 yds, FM < 20 yds  
 Bearing : < 2°  
 Doppler speed : CW (300ms) < 0.2 kts

## TECHNICAL DATA

### Transducer array

Number of staves : 32  
 Number of transducer elements per staff : 6  
 Vertical beam width : narrow beam 13°  
                           wide beam 24°

### Transmitter cabinet

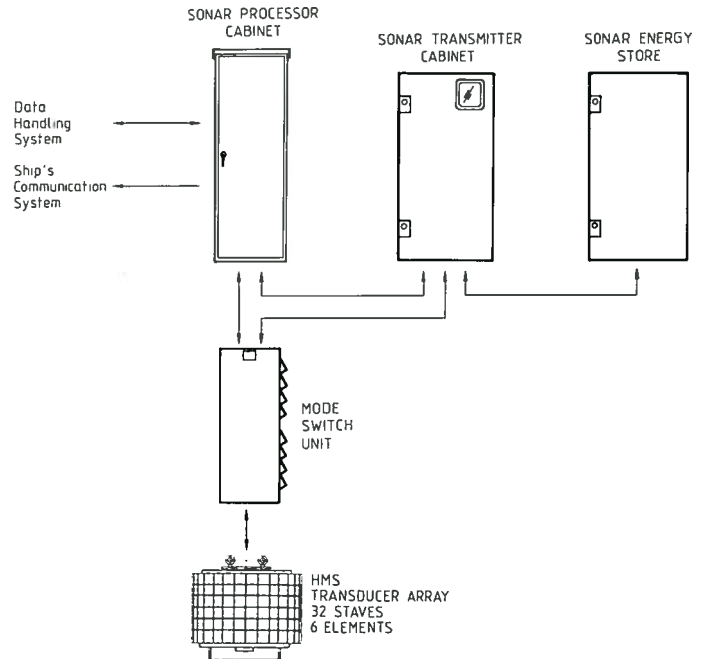
Number of output modules : 32  
 Transmission pattern : DIR, OMNI, DIR + OMNI  
 Modulation : shaded CW, hanning (cosine square)  
                   FM with smoothed edges  
 Range scales : 2, 4, 8, 12, 16, 24, 32 kyds

### Processor cabinet

Processing paths : 2  
 Preformed beams : 32  
 Preformed beam width (horizontal, at 7 kHz) : 16° (2  $\Theta$ , -3dB)  
 FFT channels (maximum) : 1024

### Operator console

Resolution : 1280 x 1024 pixels  
 Palette : 4096 colours



## POWER REQUIREMENTS

115 V 60 Hz 3-phase: 6.2 kVA  
 115 V 60 Hz 1-phase: 1.2 kVA

## DIMENSIONS AND WEIGHTS

	Height	Width	Depth	Weight
Sonar processing cabinet	1922	611	765	300
Sonar transmitter cabinet	1583	870	613	350
Sonar energy store	1583	870	613	250
Mode switch unit	1466	510	360	150
Transducer array <sup>1)</sup>	720	∅1050	-	2000
Operator console	1278	760	1251	350

<sup>1)</sup> Values may vary with array configuration.

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