

"SONNE": a New Deep-Sea Research Vessel



Klaus von Bröckel
(kvonbroeckel@geomar.de)

GEOMAR | Helmholtz Centre for Ocean Research Kiel



The existent RV SONNE was built in 1969 as a fishing trawler. After 8 years of service in the North Atlantic and adjacent waters it was converted into a research vessel. A further modernisation including a lengthening of the ship took place in 1991. The main operational area still is the Pacific Ocean and the Indian Ocean from the Sea of Okhotsk to Australia and from Bangladesh to Chile. Main scientific fields are geology and seismic, but all other marine disciplines are well served, too. The RV SONNE convinced the scientific community with its seaworthiness, huge working deck, excellent laboratory spaces as well as numerous scientific gears.

The existent RV SONNE is the only privately owned RV chartered by the Federal Ministry of Education and Research (BMBF). As it approaches the 43rd year of its life time a modern multipurpose working platform for all marine research disciplines (physical and biological oceanography, marine geology, marine and atmospheric chemistry, marine geophysics and meteorology) is under construction. It is financed by the Federal Ministry and the five Coastal State Governments. It will be owned by the University of Oldenburg (Institute for Chemistry and Biology of the Marine Environment - ICBM) and will go into service at the end of 2014.

MAIN FEATURES

length	116.0 m
draught	6.4 m
depth to main deck	9.8 m
beam	20.2 m
class	100 A5 E Nav-OC special ship DP1 BWM + MC E AutRP 3 (50 %) "Blue Angle"
max. speed	15 kn
cruising speed	12 kn
endurance	50 days
range	7 500 nm
temperature range - air	-20° - +45° C
temperature range - water	-2° - +32° C
scientists / crew	40 / 36 persons
scientific load	300 t
clean ship	48 hours

BOW FORM



newly developed bow form with 'dent' to prevent 'bubble sweep-down'

MACHINERY

GenSets with	
4 Wärtsilä diesel engines	1620 kW each
2 electrical engines	2350 kW each
1 Schottel pump jet	2990 kW
1 Schottel retractable bow-thruster	860 kW
1 Schottel retractable stern-thruster	860 kW

Installation of machinery (all engines, alternators and pumps) is redundant and strictly kept in two different machine rooms.

NAVIGATION

- 2 GPS
- 2 Radars (X- and S-Band)
- automatic course handling (auto-track-system)
- Electronic Sea Chart (ECDIS)
- Doppler - Log
- EM-Log

SAFETY EQUIPMENT

- 2 Lifeboats on starboard and port each for 80 persons
- Life rafts on starboard and port for 80 persons each side
- 80 survival suits

WASTE TREATMENT

Wastewater will be filtered through micromembranes until it gains fresh-water quality. The remaining sludge will be taken to port. Garbage will be sorted into:

- (1) wet garbage
- (2) dry garbage
- (3) glass and tins

All garbage will either be compressed or frozen and taken to the next port for proper handling

STABILIZATION SYSTEM

During cruising:
Retractable fin stabilization system with active fins
During stations:
Interring anti-rolling tanks

WEATHER STATION

- automatic weather station: Germany National Meteorological Service (Deutscher Wetterdienst, DWD) for air temperature, wind speed, wind direction, humidity, air pressure, radiation, PAR, UV and seawater temperature
- data are transmitted regularly via satellite to the DWDs headquarters
- rain gauge; wave-radar

GENERAL SHIP INSTALLATIONS

- deck workshop, for heavy mechanical work
- electronic workshop, to keep all the electronics running
- machinery workshop, for fine mechanical work
- electric workshop, for all electrics

ACCOMODATION

- 60 single-berth cabins (with shower and WC)
- 8 double-berth cabins (with shower and WC)
- all cabins: data distribution system; telephone; communication
- mess room with lobby, bar and smoking room
- fitness room
- sauna
- library
- laundries on every deck



LIFTING DEVICES

A-frame	
Aft A-frame with auxiliary winches	(1 with SWL 10 t; 2 with SWL 5 t)
SWL	30 t
height	10 m
width	7.5 m
range	7.4 m behind stern to 12.5 m inboard
Large sliding beam	
Large sliding beam (SWL 25 t) at the front part of the working deck with crane function (max. height 13 m, coverage 90°)	
SDL	25 t
as crane SWL	16 t
height	5.6 to 13 m above deck
range	4 m inboard to 3 m outboard
Small sliding beam	
Small sliding beam (SWL 7 t) inside hangar	
SDL	7 t
height	ca. 5 m
range	4 m inboard to 4 m outboard
Cranes	
4 cranes cover the working deck area	
in-shore SWL	12 t
off-shore SWL	7 t
range and height	ca. 12 m
2 small cranes	SWL 1.5 t each

Scientific winches

All scientific winches are installed inside the ship. All cables entering will be rinsed with fresh water and dried. All winches are electrical driven and electronically steered. For changes of cables and wires on board a rewind winch exists. One friction winch will serve as a damping function (up to sea-state 5).
2 friction winches (150 kN)
2 storage winches (8,000 m; 18 mm Ø) for glassfibre-hybrid-cable or one conductor cable or wire
2 cable winches (40 kN; 8,000 m; 11 mm Ø) for glassfibre-hybrid-cable or one conductor cable or wire
1 serial winch (25 kN) (6,000 m; 8 mm Ø) for serial wire
1 capstan (50 kN) portable
2 auxiliary winches (100 kN) (50 m; 22 mm Ø)
rewind winch
transportable fishing and seismic winches

Other lifting gear

- 1 suspension crane (SWL 1.5 t) inside hangar
- 2 crane crabs (scientific store room; hangar)
- 1 lift (1 t Euro-pallets) between scientific store room and laboratories

GENERAL SCIENTIFIC INSTALLATIONS

Laboratories (general)

- multi-disciplinary usage
- minimal permanent installations
- free wall areas
- data distribution system (LAN network)
- power supply (230 V + 400 V); stabilized power supply (230 V);
- fresh water (warm/cold); seawater; clean seawater and distilled water
- C-bars on all walls, ceilings and tabletops with movable 8 mm screws
- 8 mm screw socket grid on floors
- communication (telephone, speaking system)

Laboratories (specific)

- observation room (20 m² - monkey island)
- 4 dry labs (32 + 21 + 21 + 21 m² - main deck) (digesters + several fridges)
- 2 climate labs (22 + 20 m² - main deck) (adjustable temperature >0 °C)
- hydro-acoustic centre (40 m² - main deck)
- pulsarstation (11 m² - main deck)
- data centre (23 m² - main deck)
- hangar (120 m² - main deck)
- 2 wet labs (60 + 41 m² - main deck) (digester and heavy sorting table)
- electronic lab (16 m²)
- salinometer room (12 m² - store deck), constant temperature
- gravimeter room (12 m² - store deck), constant temperature
- cold-room (29 m² - store deck)
- Other scientific rooms**
- meeting room (29 m² - main deck)
- scientific store room (155 m² - store deck)
- deep-freeze store (18 m² - store deck)
- winch room (290 m² - machine deck)
- 2 gas bottle stores + 3 stores for dangerous substances (upper deck)

Working deck

- area about 550 m²
- wooden coverage
- screw-socket grid (M24)
- container grid (35 10'-containers)
- for AUVs and ROVs: 400 kW

Container space

- 47 10'-normal containers (working + upper + forecastle deck + top)
- 10 20'-lab containers (water system; power supply; data distribution and communication system); of these 4 inside the ship

SPECIFIC SCIENTIFIC EQUIPMENT

- removable airgun array (midships or ship sides)
- seismic compressors (4 x 12 m³/min)
- coring device for cores of max. 24 m length
- 4 hydrographic wells (2: 1,20 m x 1,20 m; 2: Ø 300 x 300 mm)
- 'flying cable system' for easy installations through the whole ship
- hydro-acoustic systems:
 - 2 multibeam echo sounder: deep + shallow waters
 - sub-bottom profiler
 - 2 ADCP
- data management system

ACKNOWLEDGEMENTS

The experiences and advices of numerous persons represent the solid base for the "SONNE", many thanks to all of them and specially to the members of the 'Scientific-Technical Advisory Committee', the Bundesanstalt für Wasserbau (BAW), Hamburg and, naturally, to the Federal Ministry of Education and Research as well as to the Coastal States

