

## Research Vessel HEINCKE Operated by the Alfred-Wegener-Institute

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**Abstract:** HEINCKE operated by the Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, is a medium size multipurpose research vessel, which was designed for long-term cruises throughout the North Atlantic up to Svalbard and the adjacent shelf seas. She offers work places and accommodation for 12 scientists and 12 crew members. The operating range of this low noise ship is about 7500 nautical miles (= 30 passage days). Four laboratories (wet, dry, constant temperature controlled and hydroacoustic/CTD) offer almost vibration-free work places. Additionally space is available for special containers. The ship is equipped with several winch systems, cranes, and sonar systems, which allow a wide range of biological, chemical, oceanographic, geological and geophysical research applications. The onboard science support equipment allows working in water depths of up to approximately 2000 meters.

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## 1 Introduction

RV Heincke is a research vessel, commissioned in 1990. It is owned by the Federal Ministry of Education and Research and it is operated by the Alfred-Wegener-Institut and managed by the private shipping company BRIESE in Leer. The homeport is Bremerhaven. The ship is designed for operation in the North Atlantic and its shelf seas like the North and Baltic Sea. RV Heincke is equipped for multidisciplinary use and meets the demands of research in biology, geology, geophysics, chemistry and oceanography. It has four laboratories, including a temperature-controlled laboratory for working under constant temperature conditions. Additional laboratory and other special containers can be stowed on deck and in a special container room. A cold store room and tank capacities to transport sea water are available. The fully automatic weather station is maintained by the German weather service (DWD) in the port in Bremerhaven. Extensive hoisting equipment, such as cranes and winches, is available for the deployment of sampling devices and measuring instruments. RV Heincke is equipped with hydroacoustic echo sounders. The winch capacities and the hydroacoustic systems are designed for a maximum working depth of approximately 2000m water depth. RV Heincke is in average 290 days per year at sea.



Figure 1: Heincke working at sea. Photo: AWI / M.Petrikowski.



Figure 2: Heincke operating at the research platform FINO1, German Bight, North Sea Photo: AWI / AG Schröder.



Figure 3: Heincke in coastal waters of Svalbard (Arctic). Photo: AWI / K. Baer.

## 2 Technical data

RV Heincke is a diesel-electric ship whose three main engines supply the energy for the electric traction motor. The diesel-electric drive system allows an almost vibration-free work on board. A pump-jet in the bow and a Becker rudder ensure a good agility of the ship. The ship's hull is ice-strengthened and has the ice classification E2 of the German classification society "Germanischer Lloyd". A permanent communication and data transfer capacity via satellite is available up to approx. 70°N. To operate in higher latitudes two independent Iridium Systems ensure communication and data transfer.

TECHNICAL DATA	
Length overall	54.56 m
Length between perpendiculars	48.00 m
Breadth max	12.50 m
Draught max	3.89 m
Displacement max	1451t
Power (3 main engines) / diesel electric	3 x 532 KW (Diesel) / 1100 KW (electric motor)
Max. speed in open water	12.0 kn
Max. distance	9600 nm
Max days on sea	33 days
Classification (Germanischer Lloyd)	GL+100A5 M E2 S4D11 research vessel / +MC E2 AUT
SPEED FOR EXPEDITION PLANNING	
Cruising speed in open water	10.0 kn
PERSONEL	
Crew	12
Scientific personnel	12 / 38 during daytrips

Table 1: Technical details.

### 3 Research capacities

RV Heincke has a variety of winches and cables, hoisting equipment, laboratories, and laboratory container space. Since RV Heincke was designed to be a ship that can be used to serve as many scientific disciplines as possible, the lab and container configurations are customised and reorganised according to the needs of the various research groups before an expedition begins.

CRANES	
Crane – starboard	3.0 t
Crane – foreship	0.99 t
Crane – stern starbord	0.99 t
Frame – starboard	3.0 t
Stern A-frame	3.0 t
WINCHES AND CABLES	
2 x Trawling cable for fisheries (18 mm)	2400 m
1 x Fibre optic cable (11 mm)	2000 m
1 x Coax cable (11 mm)	2400 m
1 x Coax cable (8 mm)	3000 m
1 x Steel wire (12 mm)	2000 m
LABORATORIES	
1 x Wet lab	
1 x Dry lab	
1 x Hydroacoustic / CTD lab	
1 x Thermo lab (+1° to +20°C, ±1°)	
1 x Scientific cooling store (+4°C to -20°C)	
<b>Additional place for:</b>	
1 x 20' container in hangar	
2 x 20' container on working deck	
1 x 10' container on afterdeck	
Tank for transportation of sea water	29 t

Table 2: Infrastructure for scientific work on board.

The permanently installed sensors and instruments on board RV Heincke are summarised in Table 3. In addition to the instruments required for standard meteorological observations, a range of instruments for measuring water parameters (temperature, salinity, chlorophyll concentration) are in constant operation and made available to researchers as en route data. Hydroacoustic devices for recording seafloor topography and sediment characteristics, as well as instruments for measurements in the water column are also available. For positioning of devices underwater (ROV, AUV, moorings, etc.), a GAPS system is permanently installed. All incoming data from sensors and instruments, from the weather station, from navigational instruments (ship speed, course, roll and pitch motions, etc.), and ship equipment (e.g. winch parameters) are recorded and stored in a central data logging system (DShip 3) and are available to researchers in each lab in real time. After the expedition, a copy of the data is stored at the Alfred-Wegener-Institut and kept available to scientists even years after an expedition.

<b>METEOROLOGICAL LABORATORY</b>	
Automatic weather station	Maintained by German Weather Service
<b>DEVICES FOR WATER MEASUREMENTS</b>	
Thermosalinograph (Water temperature/salinity)	
Fluorometer (chlorophyll concentration)	
<b>HYDROACOUSTIC DEVICES</b>	
2 x Acoustic Doppler Current Profiler (ADCP)	150 kHz and 600 kHz
Multibeam echo sounder, Kongsberg EM710	70 – 100 kHz
Sediment echo sounder, Innomar SES2000M	100 kHz with dev 5, 6, 7, 8, 10, 12, 15 kHz
Multi frequency sounder, Kongsberg EK60/80	38, 70, 120, 200 kHz
Underwater positioning, IXBLUE GAPS	19.5 – 21.0 kHz
Net sonde, Scanmar	40.8 – 44.8 kHz
Sound velocity sensor (c-keel)	2.5 GHz
Sound velocity profile sonde, Valeport MIDAS SVP	2.5 GHz
<b>DATA MANAGEMENT SYSTEM</b>	
DShip version 3	WERUM

Table 3: Scientific devices and data management systems installed on board Heincke.

#### 4 Applications, use, and access to the infrastructure

The main operation areas of RV Heincke is the shelf areas of the North Atlantic, mainly the North Sea. She operates also in the Baltic Sea, the Irish Sea, Orkneys, Norwegian coast and at the continental slope. In the last years, in ice-free season, Heincke operated several times in the coastal waters of Svalbard.

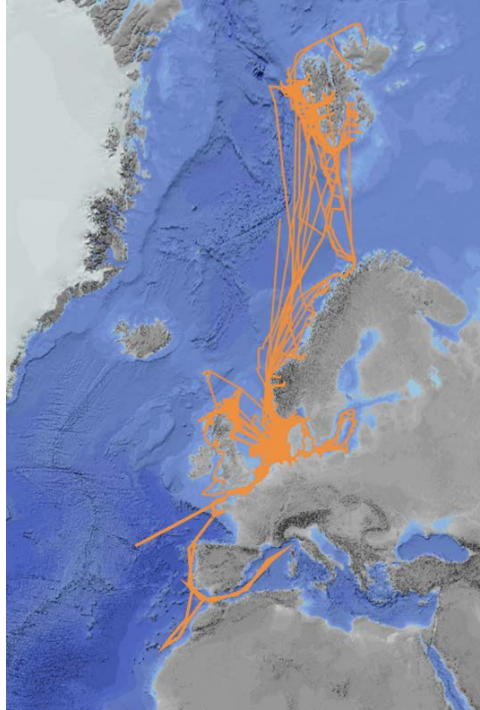


Figure 4: Operation areas of Heincke 1990 - 2017.

Heincke is part of the German pool of medium-sized research vessels serving a wide user community from Helmholtz, Leibnitz, Max Planck Societies, Universities and other institutions. As some of the cruises are within EU funded projects a European wide cooperation is ensured. 3% of the person days per year are used by foreign institutes and universities, 56% by German institutes and universities, 37% by Helmholtz institutes (29% by AWI). Beside the research activities, Heincke is used by university groups for education of students in marine sciences (e.g. Universities of Bremen, Oldenburg, Hamburg, Kiel, the Jacobs University Bremen, Hochschule Bremerhaven). In average 27% of the working days per year are spent for education. (All data based on average 2013 - 2017).

Ship time is granted through a review process that is shared for all large and medium-sized German research vessels. Information on deadlines and the review process is available from a common web portal, which is also used for the submission of applications:

<https://www.portal-forschungsschiffe.de> (in German and English).