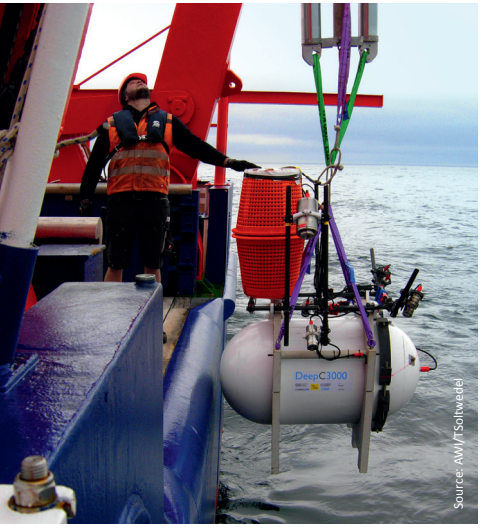

Source: AWI/TSoltwedel

Demo mission

The design was validated successfully up to a pressure of 330 bar in a pressure test in the pressure tank of the Department of Marine Engineering at the University of Rostock. Subsequently, the pressure housing DeepC3000 with an internal volume of 265 dm³ was deployed for a field test at a depth of up to 2,500 m. The pressure housing and the carrier frame have a weight of approx. 800 kg in this configuration.

For this first demo mission the pressure housing was set up as long-term deep-sea mooring to monitor the seafloor with underwater camera systems. The high-performance deep-sea mooring was assembled using the pressure housing as an energy storing unit with lithium batteries providing the energy for long-term high-resolution photo recordings. The unit was deployed in the Arctic in June 2022 and will be recovered after approx. 12 months.

Project partners:

IBB Ingenieurbüro Baustatik Bautechnik

AWI Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung

CARBOCON

sudholt — wasemann

Technische Universität Dresden

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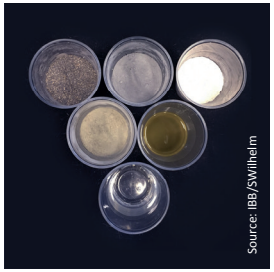
DeepC3000 – CONCRETE PRESSURE HOUSINGS

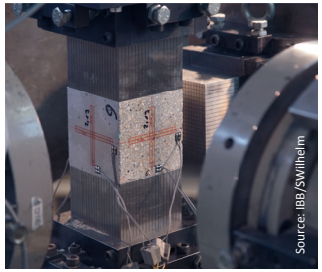
Source: AWI/TSoltwedel

Concrete pressure housings – great volume at great depths

The newly developed underwater pressure housing system DeepC3000 offers great potential for deep-sea applications. The custom-engineered pressure housings are made of a particularly high-strength, durable and impermeable concrete and can be manufactured with diameters significantly larger than those of titanium or stainless steel housings at comparatively low cost. The highly robust, pressure resistant, noncorrosive concrete allows applications at depths of up to 6,000 meters. The production of the housings in the casting process typical for the material concrete allows almost free shaping and the individualization of the pressure housings to specific user requirements. The nonmagnetic material enables the interference-free use of highly sensitive measuring instruments.

UHPC – a high performance material for a challenging environment





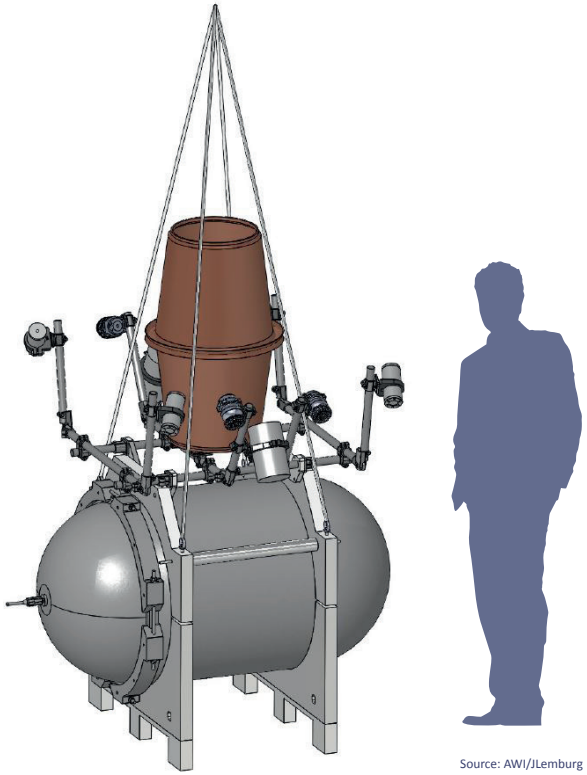
The pressure housings are manufactured using UHPC (Ultra High Performance Concrete) – a material that is characterized by its high compressive strength of over 160 MPa, which currently allows the use of the pressure housings at depths of up to 6,000 meters. The concrete has an extremely dense structure, making the pressure housing watertight even in great depths.

The housings are manufactured in compliance with the highest possible quality standards by processing the concrete with high accuracy and under strict curing requirements.

Pressure housing and carrier frame

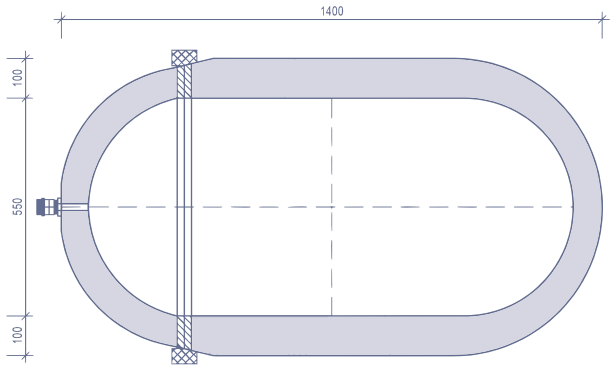
A specifically available carrier frame complements the pressure housings. It is made of compatible UHPC and reinforced with noncorroding carbon reinforcement to meet the high durability requirements of a deep-sea environment and to ensure a slim and lightweight design. Combining the pressure housing with the carrier frame allows flexible and easy transport options, including the handling with a crane, forklift or pallet truck.

The carrier frame comes with extra mounting options that allow fitting the pressure housing system with additional equipment.



Source: AWI/JLemburg

Operational depth and inner volume



Source: IBB/SWilhelm

The standard DeepC3000 system was designed with a constant outer diameter of 750 mm and a length of 1,400 mm. Factoring in a safety factor of 1.65, in this configuration inner volumes between 120 dm³ and 400 dm³ can be realized, depending on the planned operating depth. The system is currently available in the C160 strength. With a higher strength concrete of class C200, which is currently under development, high useful inner volume can be realized at operating depths of up to 6,000 m.

However, the system is not limited to these configurations: due to the use of concrete as material and the associated possibility of variable dimensions, almost unlimited sizes are conceivable.

Source: IBB/SWilhelm