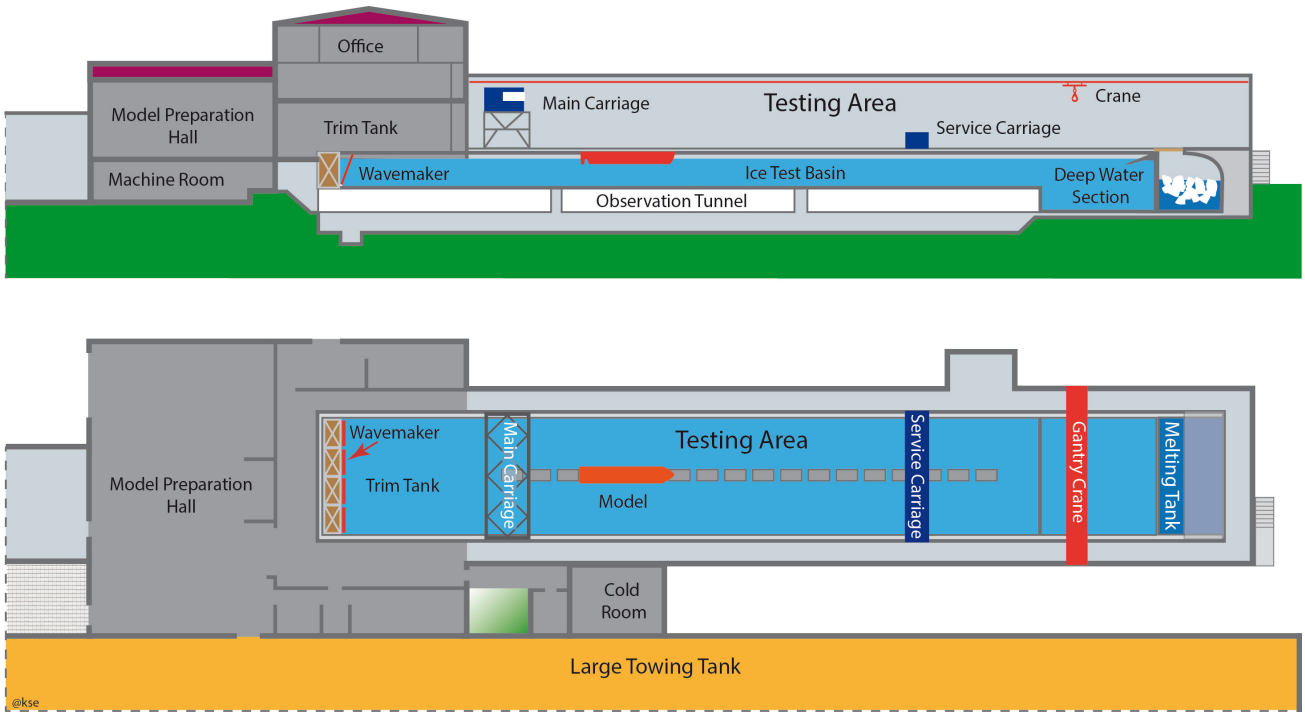
The Hamburg Ship Model Basin

Setting the Standard in Ship Optimisation

ICE TANK



Tank length:	78.00 meters
Tank breadth:	10.00 meters
Tank depth:	2.50 meters
Ice freezing rate:	2 mm/hour
Shallow Water Bottom :	Adjustable over length and depth

Towing Carriage:

Speed range:	1 mm/s <-> 3000 mm/s
Towing capacity:	50 kN

Transverse Carriage:

Static Load capacity (horizontal):	5 kN
Static Load capacity (vertical):	10 kN

Transverse Carriage:

Load aplication on vertical lever:	up to 1.2 m
Maximum driving force :	3 kN, at speeds up to 0.5 m/s

The Hamburg Ship Model Basin (HSVA) has been operating ice research facilities for more than 25 years. The main feature is the 78 m long, 10 m wide and 2.5 m deep ice model tank. At the end of the ice tank a deep water section of 12 m x 10 m x 5 m is available. A shallow water bottom covering the entire ice basin can be adjusted to simulate shallow water conditions or inland waterways. An air forced cooling system generates air temperatures as low as -20°C, by which the NaCl-doped water freezes at a rate of about 2 mm/hour. The mechanical ice properties of the model ice are correctly scaled in order to simulate the natural icebreaking processes. An advanced technique to improve the mechanical ice properties was developed and patented by HSVA. A motor-driven carriage carriage the width of the tank and runs up to 3 m/s and provides a towing force of 50 kN.

A new transverse carriage is installed as a sub-carriage to the main ice tank carriage. Both carriages together make it now possible to run offshore structures or floating vessels in a combined and computer-controlled x-y-motion (planar motion) through the ice sheet. The new device gives us the opportunity to simulate, for instance, ice drift scenarios with slow or rapid ice drift direction changes, whereby the model ice sheet is kept stationary.

The transverse carriage has a maximum static load capacity of 5 kN in any horizontal direction, and a load capacity of nearly 10 kN in vertical direction. The horizontal load can be applied on a vertical lever of up to 1.2 m length. A maximum driving force of about 3 kN is applied to the transverse carriage at speeds of up to 0.5 m/s by a geared electric motor.

Service carriages above water as well as underwater are available to carry experimental equipment, measuring devices e.g. a variety of load cells, dynamometers, accelerometers, and video cameras (both above water and below water). Direct observation of the model tests is also possible through windows in the tank bottom. According to Froude's and Cauchy's model laws the following ice conditions can be simulated in the tank:

- Level ice
- Rafted ice
- Pressure ice ridges
- Broken ice
- Rubble ice pack ice
- Snow covered ice

The mechanical properties of these ice conditions are either determined in-situ or with special equipment in the ice mechanics laboratories.

Several kinds of model test are commonly performed in the Large Ice Model Basin:

Icebreaking ships:

- Resistance tests
- Self-propulsion tests
- Manoeuvring tests
- Ice management in rivers and inland waterways

Structures in Ice

- Ice forces on fixed structures (vertical or conical shaped)
- Mooring forces on floating structures
- Global ice forces on artificial islands
- Ice forces on offshore loading terminals
- Ice accumulation and ice pile-up on artificial islands and arctic harbours

HSVA Hamburgische Schiffbau-Versuchsanstalt GmbH
Bramfelder Straße 164 | D-22305 Hamburg
Phone: +49 (0)40 69 203-0 | Fax: +49 (0)40 69 203-345
info @ hsva.de