Retractable Fin Stabilizers
Type S, UHL and Z
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Underway Stabilization, Type S

The ideal solution for a wide range of vessels, such as cruise ships, ferries, yachts, coastguards, offshore patrol and special purpose vessels.
For Low to Medium Speed Stabilization, Type UHL

The optimum solution for low speed maneuvre done at high seas, like helicopter operations. Suitable for a wide range of vessels, such as coastguard, offshore patrol and special purpose vessels.
Underway and Zero Speed Stabilization, Type Z

A solution for mega yachts, cruise ships and special purpose vessels with a demand for stabilization both underway and at zero speed.
Stabilizer Milestones (1/3)

1961
Installation of non-retractable fin stabilizer, Type FK

1972
Installation of retractable fin stabilizer, Type DBA

1983
2nd generation retractable fin stabilizer, Type SK

1991
Anti-vortex-tip fairings

→ Fin stabilizers delivered in the 1960s are still in operation
Stabilizer Milestones (2/3)

- Flow-off recess
- 3rd generation retractable fin stabilizer, Type S
- 1995
- Digital stabilizer control system
- 1996
- Installation of retractable UHL fin
- 1998
- 2000

→ Continuous development and optimization to meet different stabilization demands
Stabilizer Milestones (3/3)

- Proprietary adaptive control system allowing customized solutions
- Development of zero speed stabilizer, Type Z
- Installation of non-retractable zero speed stabilizer, Type FZ
- 2nd generation non-retractable fin stabilizer, Type F
- 2007
- 2007
- 2008
- 2011

Large fin stabilizer portfolio available – made in Hamburg, Germany
Natural ship motions reduce comfort on board

**Pitch**
Stabilizers not effective due to the large damping moment required

**Roll**
Relatively small moments for effective damping required, which can be created by fin stabilizers
Underway Stabilization (1/2)

Lift created per fin:

\[ F_{Lift} = c_{Lift}(\alpha) \cdot \frac{1}{2} \cdot \rho_{Water} \cdot v^2 \cdot A_{Fin} \]

Total available fin roll stabilization moment:

\[ M_{Fin} = 2 \cdot F_{Lift} \cdot h_{Fin} \]
\[ = c_{Lift}(\alpha) \cdot \rho_{Water} \cdot v^2 \cdot A_{Fin} \cdot h_{Fin} \]

A fin moment is created for roll reduction
Underway Stabilization (2/2)

- Available both as 1 or 2 piece fin according to operational demands
- Optimal balancing of fin for underway stabilization to minimize power consumption

±18° working angle and with a proportional moving tail fin

±24° working angle

Advanced fin design for underway stabilization
Stabilization at Zero Speed (1/2)

Stabilization moment created by displacement

No water flow available to create lift
Stabilization at Zero Speed (2/2)

- 1 piece fin with large fin area and working angle
- Optimal balancing of fin for zero speed stabilization

±60° working angle to create an efficient stabilizing moment

Advanced fin design for zero speed stabilization
Scope of Supply

- Bearings Seals and Limit Switches
- Valve Group
- Rotary Vane Motor
- Crux and Bearings
- Bearing and Seals
- Fin Box
- Fin
- HPU

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Range of Fin Areas

Fin stabilizers underway are available from 1.2 m² to 20.0 m²

<table>
<thead>
<tr>
<th>Range of Fin Areas</th>
<th>Max. Lift Force per Fin [kN]</th>
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<tbody>
<tr>
<td>S100</td>
<td>118</td>
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<tr>
<td>S200</td>
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<td>S800</td>
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Completely Retracted Zero Speed Fins

Zero speed stabilizers are available in the range of Z300 to Z600
Crux Bearing - Transmission of Forces

- Highly reliable transmission of forces through form fit
- Simplified design with fewer parts
- Less weight

Force transmission by friction
Crux Lubrication System Based on Grease

- Simplified design
- Less maintenance required - to be greased every 6 months
- Suitable for all well-known greases

Example: upper bearing

Flat type lubricating nipple

4 grease inlets
Accumulator Supported Hydraulic Power System

All hydraulic power units are equipped with accumulators to reduce size of motors and pumps, and still keep the high stabilizing performance.

- Low peak load on power supply
- Low noise level
- High dynamic system response
- Reduced demand on electrical load

Expert selection of reliable high quality components
Sophisticated Adaptive Control System

Each fin has an independent start and stop button on the control panels, located on the bridge as well as in the ECR.

- Customized mode selection
- No manual settings required
- Highly adaptive to changing sea conditions
- Static heel inclination can be compensated for to a certain degree, however, dynamic roll damping has always highest priority

Highly reliable and easy to operate
Control System Diagram  (Type S Example)
Powerful and Compact Hydraulic Actuator

- A rotary vane motor allows an extremely compact design
- Transmits torque direct to the fin without any unbalanced forces
- Avoids additional loads on bearings
- Operating angles of up to ± 60° possible
- Easy maintenance without removal of the fin unit
- High fin movement precision

→ Reliable and correct performance ensured under all conditions
The fin boxes are customized for each individual vessel. A „Mounting of Fin Unit“ drawing is prepared by our naval architect in close cooperation with the customer before approval by the classification society.
Technical Assistance

Each stabilizer system is completely assembled, piped and tested before delivery

FAT:
- Testing of the complete fin unit in our workshop before delivery

Motion Test:
- Check correctness of the welding of the fin box to hull

HAT:
- Commissioning and hand-over to the customer before the sea trial

SAT:
- Fine tuning in accordance with customer wishes and demonstration of stabilizing performance

→ A successful SAT is the final acceptance by customer
Numerical analysis and tank tests are an essential part of our research and development procedure to optimize the design of the stabilizer system with regard to performance and resistance.
Effective Use of Fin Area with Anti-Vortex-Tip Fairings

To maximize effective lift performance of the fin as well as to reduce drag, all stabilizers are equipped with the Anti-Vortex-Tip fairings.

No loss of lift performance through turbulent flow
Tank Tests at Zero Speed

Fins in Active Mode
Exciting Period = 11.0 s
Direction of Fin Box - Aft (1/2)

An aft fin box has obvious disadvantages when extended:

- Creating a cross flow through the secondary flow into the complete fin box
- Additional pressure on the aft wall of the fin box

→ Favorable flow resistance when fins are retracted
Direction of Fin Box - Forward (2/2)

An aft fin box has obvious advantages when extended:

- No secondary flow in the fin box
- Low additional pressure on the aft wall of the fin box
- A flow off recess minimizes any additional pressure on the aft wall of the fin box

Create less resistance when fins are extended and active
References
Blohm+Voss Stabilizer – A Well Considered Solution

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