

# R-R-S

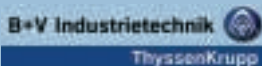
RUDDER ROLL STABILIZATION



# R-R-S

B+V Industrietechnik GmbH, Imtech Marine & Offshore and Becker Marine Systems are all known for their expertise in the engineering and shipbuilding field and have high reputation in their sectors of ship products all over the world.

Jointly BVI, Imtech and Becker offer the latest technology in RRS systems enabling unrestricted operations of all equipment, including weapons and sensors, without using a separate fin stabilizer.



B+V Industrietechnik GmbH (BVI), a ThyssenKrupp Technologies Company, is located in the port of Hamburg. Due to state of the art technical solutions and constant innovations, BVI's ship components have attained a worldwide reputation under the trade name SIMPLEX-COMPACT®. The SIMPLEX-COMPACT® Rotary Vane Steering Gears for RRS are in accordance with GL rules and of proven design in use on NATO naval ships.

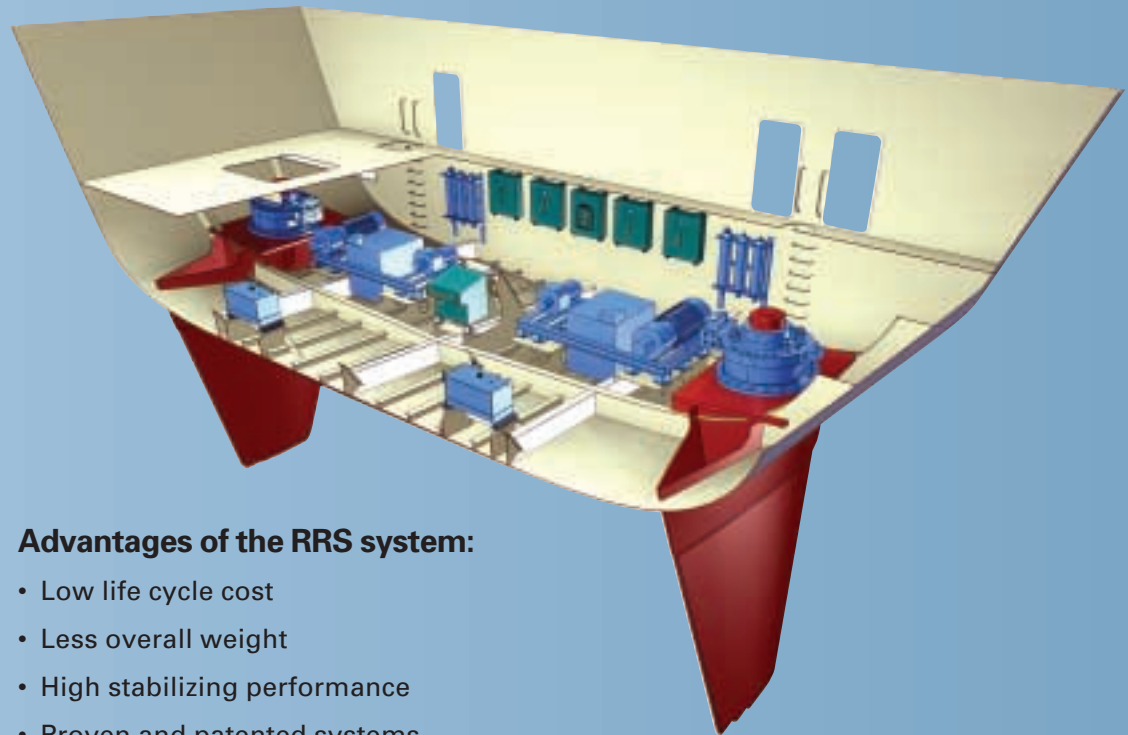


As a leading Platform System Integrator for naval ships, Imtech Marine & Offshore (since 1860) has provided state of the art Integrated Bridge Systems for numerous naval customers all over the world. The Imtech Adaptive Steering and Stabilising Autopilot (ASSA) design for RRS operation is based on a system as delivered for the German Frigate F124 and the Netherlands Navy M-Frigate and Air Defence Command Frigates (LCF).



Becker Marine Systems is specialized in high performance rudder systems. Due to several decades of extensive R&D and practical experience Becker has a very broad know-how about rudders for any application. Manoeuvrability, vibration/noise reduction, propulsion improvement and system stability are some of the special features investigated and optimized by Becker. Today, Becker Marine Systems is the global market leader for rudder development and the largest shipyard-independent rudder supplier offering rudder solutions for any vessel.

The ASSA system is a complex control system, which combines the control signals for course keeping and roll reduction. Thereby the rudder and the steering gear accomplish two functions: steering and stabilization. Stabilization is achieved as the rudder applies a torque against the roll motion, using the same principle as a conventional fin stabilizer, however, without influencing the steering ability. Due to the complexity the RRS system demands an optimization of all components involved to achieve a significant roll reduction.



#### Advantages of the RRS system:

- Low life cycle cost
- Less overall weight
- High stabilizing performance
- Proven and patented systems
- Better propulsion performance
- No additional equipment required
- Space saving arrangement below 1st platform deck
- Less hydrodynamic resistance, no underwater acoustic signature
- Compact design due to high performance steering gear and KSR rudder support

#### Customers experience (1992 – Sea trials on M-class frigates)

Objectives were to prove that ASSA meets navy requirements for roll motion and course control and to prove that all systems are fully operational in rough conditions.

“Significant roll reductions up to 60 % were measured during the trials. Higher reductions could not be expected in given conditions. The ASSA system is fully operational in rough weather conditions, and adapted well to changes in speed and heading. Moderate rudder rates and amplitudes were demanded. Yaw motions and ship speed did not decrease using the Rudder Roll control. The course keeping is well within specifications.” (Royal Netherlands Navy Report SB8749)



1975	Development of KSR rudder support	1990	Successful sea trials with Adaptive Roll Stabilising Autopilot (ASSA) on board first M-class frigate (no tuning required)
1979	First KSR rudder supplied to Norwegian Coast Guard	1992	Successful bad-weather trials conducted by RNIN
1982	Co-operation between Royal Netherlands Navy, Delft University and Imtech	1994	Algorithms ported to PC (new RRS autopilot design)
1983	RRS principle demonstrated on board S-class frigate (RNIN chooses RRS for new M-class frigates)	1995	Successful experiments with new ASSA control system by MARIN for German F124 frigates
1984	B+V Industrietechnik patent on the method for stabilizing a ship with the use of rudders	1995	RRS selected for Dutch LCF and German F124 frigates
1985	Imtech patent on essential part of control algorithms	1999 - 2002	RRS installed on 3 German F124 frigates and 4 Dutch LCF frigates
1985	Design and production of SIMPLEX-COMPACT® Rotary Vane Steering Gears for RRS	2002	SIMPLEX-COMPACT® Rotary Vane Steering Gears developed for pressures up to 240 bar
1986	RRS control algorithms demonstrated at Maritime-Research Institute Netherlands (MARIN)	2003	B+V Industrietechnik, Imtech Marine & Offshore and Becker Marine Systems jointly design a RRS system for installation below 1st platform deck
1987	PhD on control algorithms	2003	RRS pre-selected for Korean KDXIII destroyers
1988-1993	RRS installed on 8 Dutch M-Class frigates	2004	RRS selected for the German K130 corvettes

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