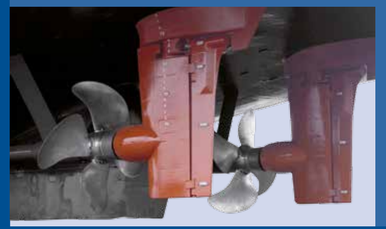
KSR – KING SUPPORT RUDDER

In order to avoid the disadvantages of conventional rudders Becker has developed the KSR (King Support Rudder). With this solution Becker is able to build full spade rudders of unlimited size and slim profile thickness. With this arrangement, the rudder trunk is extended into the rudder blade so that the lower neck bearing is positioned as close as possible to the centre of force acting on the rudder. Due to the shorter lever arm, stresses and bending moments in the rudder stock and trunk are significantly reduced. The reaction forces in the neck and carrier bearings are much smaller, making it a very rigid rudder.

KSR technology is the state-of-the-art solution for rudders of unlimited size, and with only one lower bearing it provides lower maintenance than comparable semi-spade rudders. Becker Rudders do not need any castings such as a rudder horn with a gap to the blade that may cause cavitation problems and is more difficult to install in the ship's hull structure. Furthermore, a KSR rudder offers a larger active steering rudder area and is decreasing the course-keeping angles. It also can be deflected to higher rudder angles to provide highly efficient manoeuvrability. Due to reduced forces with the KSR support, the rudder profile can be designed to be more slender and thus improve efficiency.

RUDDER BULB

Ship rudders are generally situated in complex, highly turbulent flow fields. This offers opportunities for significant power savings by recovering some of the associated flow energy losses through customised design of the propulsion and steering system. The Becker Rudder Bulb provides such an optimised solution.



The streamlined bulb is positioned at the leading edge of the full spade rudder, situated aft of the propeller hub. The gap between bulb and propeller hub is minimised by a common fairing cap/bulb design.

The Becker Rudder Bulb minimises energy losses behind the propeller hub by eliminating flow separation and reducing wasteful fluid turbulence. In addition, careful design of both the bulb geometry and twisted rudder leading edge ensures optimal energy recovery from the propeller slipstream.

The propeller hub fairing is designed to guide flow smoothly over the bulb. Thus, the coordinated design of bulb and hub fairing cap ensures optimal hydrodynamic performance and propulsion efficiency.

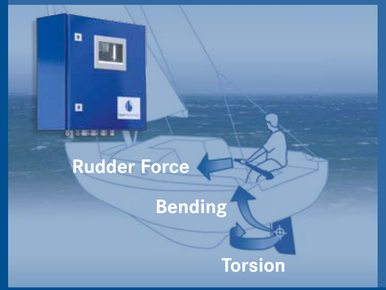
BBMS – BECKER BEARING MONITORING SYSTEM

The Becker Bearing Monitoring System (BBMS) monitors wear on the rudder neck bearing by means of four electrical wear sensors mounted in the neck bearing bush. The sensors are worn out along with the bearing bush, thus enabling precise measurement of the neck bearing clearance. The measured neck bearing clearance is transmitted via a cable connection to the processing unit mounted in the steering gear room. The processing unit incorporates a 3.5″ touch panel to calibrate the system and display the monitored values as well as the wear history of the neck bearing. Via the processing unit, the neck bearing clearances and measurement values can be interfaced to any other monitoring and alarm system aboard the ship. Continuous monitoring enables better service planning and makes underwater inspections of the neck bearing unneccessary.

BIMS – BECKER INTELLIGENT MONITORING SYSTEM

Until now modern navigation and positioning systems have been using rather general output signals for rudder control operation while manoeuvring, because the force generated at specific rudder angles is not available to the navigation system, resulting in less efficient manoeuvring.

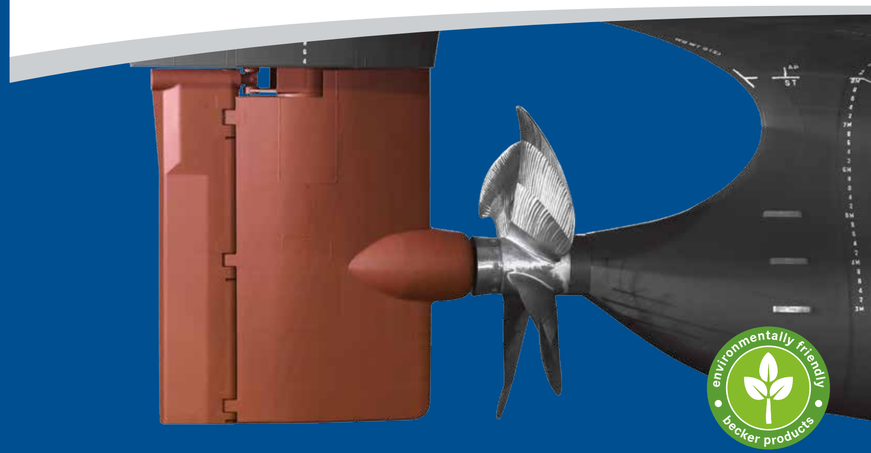
The Becker Intelligent Monitoring System (BIMS) is able to directly measure the rudder force. This information is provided to the ship navigation system and displayed on bridge and/or steering gear room. Improved navigation, precise DP and more efficient AP operation are the highlights of following benefits:



- Determination of rudder lift, drag and torque
- Serial and network interfaces to navigation systems such as autopilot (AP) and dynamic positioning (DP) systems
- Fewer rudder motions during AP and DP operation
- Energy savings and emission reduction through improved efficiency
- Showing rudder force on the bridge and wings makes manoeuvring safer
- Reduced wear and service costs of steering gear and rudder
- GL Type Approval

BIMS is the technology for improving safety and performance by minimising stall conditions and rudder movements.

becker marine systems



RUDDER SYSTEMS

Becker Marine Systems is the leading company in developing high lift rudders with the highest efficiency. The company founder, Willi Becker, was the inventor of the Becker Flap Rudder, now synonymous with all kinds of flap rudder types. For all ships equipped with a conventional propeller-shaft arrangement, the rudder is the most critical equipment for steering the vessel and guaranteeing the safety of passengers, crew, cargo and protection of the environment.
Every Becker Rudder is tailor-made for the specific requirements of the vessel. The main criteria for the rudder layout are:

- Length between perpendiculars
- Draft
- Manoeuvrability requirements
- Propeller diameter
- Ice class
- Efficiency

For all different demands, Becker has the right solution combining operational experience with innovation, quality, efficiency and environmental aspects.

The reduction of emissions and use of environmentally-friendly materials are among the company's most important goals. The latest generation of Becker Rudders minimises servicing and maintenance activities by employing special bearing materials and coatings which allow lubricant-free rudder operation. This solution fully complies with US Coast Guard VGP regulations. It is no longer necessary for the vessel operator to buy expensive bio grease to protect the trunk and shaft from corrosion.

With a variety of electronic options, Becker is able to monitor bearing wear and tear and to report the highest rudder efficiency to the captain by showing him the actual rudder force online.

Manoeuvring Systems
Energy-Saving Devices
LNG Hybrid Concepts
www.becker-marine-systems.com

BECKER FLAP

The Becker Flap Rudder is the ultimate rudder solution when it comes to ship manoeuvrability. Decades of research, development and practical experience make this rudder the most mature design of all flap rudders in the shipbuilding industry. The Becker Flap Rudder guarantees the best manoeuvrability for your vessel at all speeds with the lowest fuel consumption possible.

With a Becker Flap Rudder, captains are able to operate the vessel laterally. Especially in smaller ports or during river operations the Becker Flap Rudder shows its excellent performance. The improved linkage and hinge system reduces wear and tear and maintenance costs. The Becker Flap Rudder is suitable for refits and newbuildings. For refits Becker always tries to keep the existing steering gear/trunk arrangement to minimise investment costs.

Several options for enhanced system stability are available, including the twisted profile for reduced risk of cavitation damage, the King Support Rudder (KSR) bearing and heel pintle support.

ESPECIALLY SUITED FOR:
- Container feeders
- Shuttle tankers
- General cargo carriers/ heavy lifters
- Car carriers
- ConRo/RoRo
- Ferries
- Cruise liners
- OSV/PSV
- AHTS
- Push boats
- Research vessels
- Fishing vessels
- Dredgers (HERACLES)

ADVANTAGES:
- Optimised profile
- Reduced size
- No cast parts
- Improved manoeuvrability
- Highest possible lift
- Flap angle up to 100°
- Crabbing
- Improved course keeping with reduced rudder angles
- DP functionality
- Reduced tug assistance
- Best propeller coverage

Options:

BECKER FLAP WITH CLOSED LINKAGE (HERACLES)

The closed and hydrodynamically optimised flap linkage offers excellent protection against mud and sand for the Becker Flap Rudder. The friction clutch prevents any damage to the flap. Due to its flap angle of up to 100° the equipped vessel is highly manoeuvrable with less resistance and excellent course keeping capabilities.
The Becker Flap Rudder with closed linkage is the perfect solution when it comes to high demands in manoeuvrability and toughness in harsh operation environments.

BECKER SCHILLING®

The Becker Schilling® Rudder is a high-lift rudder with a specially developed fishtail profile offering improved manoeuvrability for vessels of all sizes and types. With its special design the Becker Schilling® combines the highest lateral forces with the best course stability. The rudder forces optimised by the fishtail design guarantee improved safety and efficiency. It is available as a full spade rudder with optional KSR (King Support Rudder).

With its special shape the Becker Schilling® Rudder will minimise the rudder "hunting" under autopilot operation.

Combined with a steering gear which is suitable for higher rudder angles up to 70°, the Becker Schilling® can be used for crabbing and DP operations. Due to its specific design, the Becker Schilling® has no wear and tear parts, which also minimises servicing and maintenance costs.

ESPECIALLY SUITED FOR:
- Shuttle tankers
- General cargo carriers/ Heavy lifters
- AHTS
- OSV/PSV
- Push boats
- Research vessels
- Fishing vessels
- Dredgers
- Icebreakers

ADVANTAGES:
- Optimised profile
- Reduced weight
- No cast parts
- Highest possible lift
- Crabbing
- Improved course keeping
- DP functionality
- Reduced tug assistance
- Reduced wear and tear
- Best propeller coverage

Options:

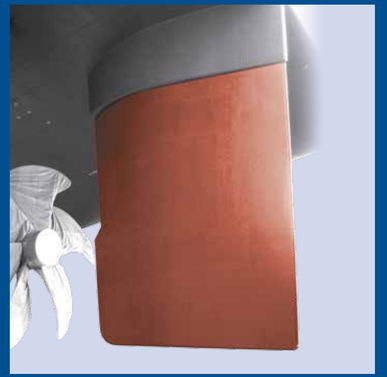
TWISTED TRAILING EDGE (TT)

The Becker Twisted Trailing Edge (TT) Rudder is the combination of a high-lift Schilling® profile and a twisted profile. This combination assures very good manoeuvrability with the advantages of the Schilling® profile, but with lower drag. Due to the asymmetric trailing edge, the Becker TT guarantees better course keeping and minimises rudder "hunting".
Assuring reduced maintenance and safe manoeuvring, also in ice, this rudder type is the best compromise of manoeuvrability and efficiency.

BECKER TWIST

Conventional rudders are placed behind the propeller with a symmetric rudder leading edge. However, this arrangement does not consider the fact that the propeller induces a strong rotational flow impinging on the rudder blade. This results in areas of low pressure on the blade, inducing cavitation and causing erosion damage to the rudder blade.

Becker Marine Systems has enhanced the development of the Becker Twist Rudder. The Becker Twist reduces rudder drag and improves the propulsion efficiency of the vessel. Additionally, the twisted profile allows higher rudder angles at higher speed without cavitation. With the Becker Twist Rudder solution cavitation and gap cavitation are prevented, resulting in lower service and maintenance costs. In addition, the Becker Twist Rudder reduces noise caused by cavitation.



ESPECIALLY SUITED FOR:
- General cargo carriers/ Heavy lifters
- Container vessels
- ConRo/RoRo
- Cruise liners
- Ferries
- Car carriers
- LNG/LPG carriers

ADVANTAGES:
- Optimised profile
- Reduced weight
- No cast parts
- Improved course keeping
- Power savings
- Reduced wear and tear

Options:

The Becker Performance Package: A Becker Rudder in combination with a Becker Mewis Duct® or Becker Mewis Duct® Twisted