



MM-OFFSHORE

RUDDER SYSTEMS





Our Company

The company MM-Offshore GmbH is one of the major designing and producing ship's equipment supplier in the international shipbuilding market. With our experience of more than half a century in our team of German engineers, we are designing high end class products.

State of the Art German design produced in the international shipbuilding market brings all the benefits to our client as you need it.

Long proofed and reliable partner makes the product to an advantage and profit for the customer at the end. A win-win solution is always our goal. We are looking for a long term partnership with our clients.

With our high qualified engineers we are able to design with modern technology the equipment for your requirements, always improving the technology.

Taylor made products as rudders which always need to be fitted to the type of vessel, bring all the advantage to the customer. Finally our product range is setting standards like our bulker cranes and hydraulic equipment and makes it interesting for shipyards to use with easy handling and built in.

When the vessel is in service after completion our service team will assist you as a ship owner whenever you need us. Feel free to contact us at any time.

MM-OFFSHORE GmbH

info@mm-offshore.com



President of the board



Rudder Systems

MM-Offshore will make sure with innovative technologies and careful application that the rudder system is optimizing the performance of your vessel.

Our design is always best in class und represents State of the Art German Technology.

Together with our clients and partners we are looking with sustainability for economic and ecofriendly solutions for the ship's operation.

Our team of expert assist and support you for the whole life span of the project – from project start, launching to sea trial.

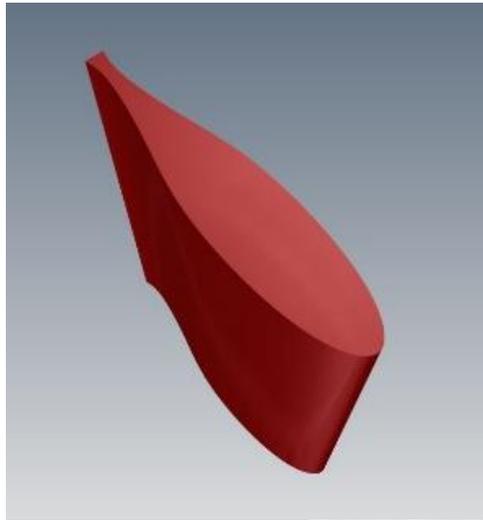
Moreover our experts are available for you 24/7 during the entire operation time of your vessel .

Key Facts:

- Flow- and efficiency optimized rudder
- High maneuvering stability
- Efficiency and/ or energy saving
- Coupling Pin Bearing for minimizing the stresses and forces at rudder blade and stock
- Low maintenance bearing
- Grease free bearing for protection of the environment
- Only forged steel main items, no casted parts
- High life cycle and reliability
- On demand with the feature of heel support for fish trawlers or similar vessels

Additional Options for optimizing:

- Layout with propulsion bulb as extension of the propeller cap
- Combination with all MM-Offshore Rudder Types like the flap rudder with a twisted leading edge to an EMPIRE / KNIGHT– Rudder
- Preparation of efficiency forecast by CFD-analysis with prestigious ship model institutes



„Basic“ PRINCE Rudder

Conventional Full Spade Rudder with fish tail profile

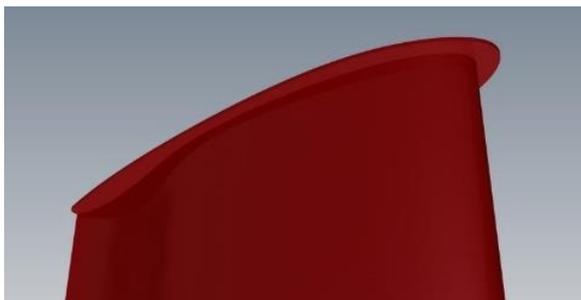
The “base model”, the PRINCE-Rudder provides with its maximum rudder angle and its fish tail profile the application for a large range of ships. Vessels with short distance trips and frequent port operation should be equipped with the PRINCE-Rudder. Furthermore vessels like bulk carrier or VLCC gets their benefits by the high lift of the PRINCE-Rudder.

MM-Offshore recommend the PRINCE-Rudder for the following vessel types:

- Medium Speed vessels
- Large vessels like Bulk Carriers or Tankers
- Vessels with short distance intervals and frequent harbor operation

Key Facts:

- Large rudder angles with extremely maneuvering properties
- High Lift properties
- Reducing the induce resistance of the rudder by overhanging top and bottom plate
- High course keeping properties





„Allround-Talent“ QUEEN Rudder

Conventional Full Spade Rudder

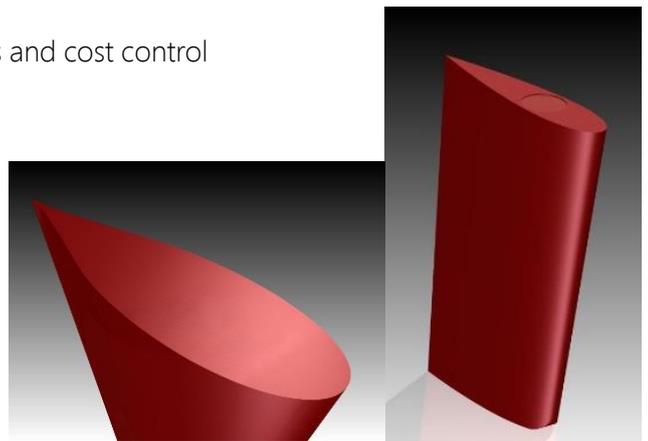
The „Allrounder“, for nearly every type of vessel the QUEEN-Rudder is suitable. This is possible, because at this version all typical rudder profiles can develop their advantages. It offers an excellent compromise of high maneuverability and a reduced hydrodynamic resistance.

MM-Offshore recommend the QUEEN-Rudder for the following vessel types:

- Medium speed vessels
- High speed vessels
- Large container vessels
- Multi – Purpose vessels
- Super Yachts
- In general this type of rudder fits to a wide range of vessels

Key facts:

- Excellent suitable for all standards
- Good compromise of hydrodynamic characteristics and cost control
- All typical rudder profiles usable





„Power Package“ EMPIRE Rudder

Conventional Full Spade Rudder with Flap

The “power package”, the EMPIRE-Rudder provides a large pre-balancing and by the rudder flap an extremely high maneuvering characteristic for low and medium speed. Especially ships with many port operations like feeder vessels or vessels operating in difficult passage ways will show the best in class strength for operation of the vessel. Ships which have less maneuvering properties by large main dimensions like Multi-Purpose Vessels or ferries will achieve optimal operation in the narrow port spaces even by avoiding tug boats.

MM-Offshore recommend the EMPIRE-Rudder for the following vessel types:

- Medium Speed vessels
- Multi-Purpose vessels
- Module carriers
- Ro-Pax and ferries
- Small vessels with high maneuvering properties like AHTS, OSV's, research vessels

Key Facts:

- High maneuvering properties
- Simply installation and disassembly properties
- Low maintenance and water lubricated bearings and moving parts
- Operation angle of rudder blade up to 45°
- Operation angle of flap up to 100°

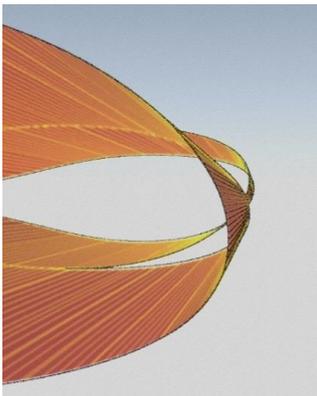




"Pioneer"

KNIGHT Rudder

Full Spade Rudder with Offset-twisted leading edge



The „Pioneer“, the KNIGHT-Rudder is a pathfinder for a better co-operation between propeller and rudder. Through incoming flow to the offset twisted leading edge it generates additionally propulsion components and reduce the loss of power of the propeller. Further it reduce the cavitation problems of propulsion.

MM-Offshore recommend the KNIGHT-Rudder for the following vessel types:

- Medium speed vessels
- High speed vessels
- Large container vessels
- Special vessels like cruise liner and other ferries
- In general this type of rudder fits to a wide range of vessels



Key facts:

- Offset twisted leading edge for reducing the resistance of whole hull
- Optimized "teamwork" between propeller and rudder
- Noise reductions in the aft end section of vessel
- Outstanding maneuvering and course keeping properties
- Cavitation inhibiting properties



„Topmodel“ EMPRESS Rudder

Full Spade Rudder with Full-twist leading edge

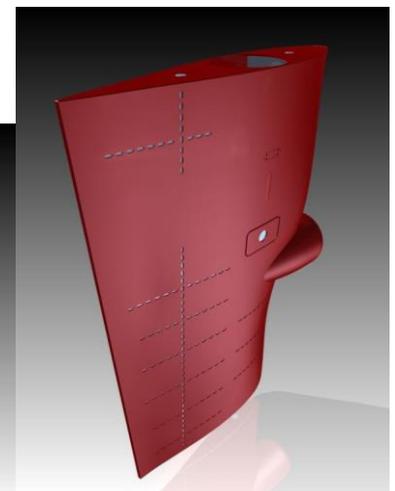
The „Topmodel“, because of its full-twist leading edge the EMPRESS-Rudder provide an optimum performance and efficiency. The wake-field based design of the rudder enable the highest level of power and fuel savings. The result of this optimized co-operation is the achievement of requested power savings. A further reduction of cavitation is possible with the EMPRESS-Rudder, which is positive for the durability and sustainability of the rudder and the whole vessel.

MM-Offshore recommend the EMPRESS-Rudder for the following vessel types:

- Medium & high speed vessels
- Large container vessels
- Naval/Military vessels
- Special vessels like cruise liner and other ferries
- In general this type of rudder fits to a wide range of vessels

Key facts:

- Full-twist leading edge for reducing the resistance of whole hull
- Outstanding „performance partnership“ between propeller and rudder, caused by the wake-field based optimization
- Noise reductions in the aft end section of vessel
- Outstanding maneuvering and course keeping properties
- Cavitation reduced to a minimum
- Power & Fuel savings on highest level



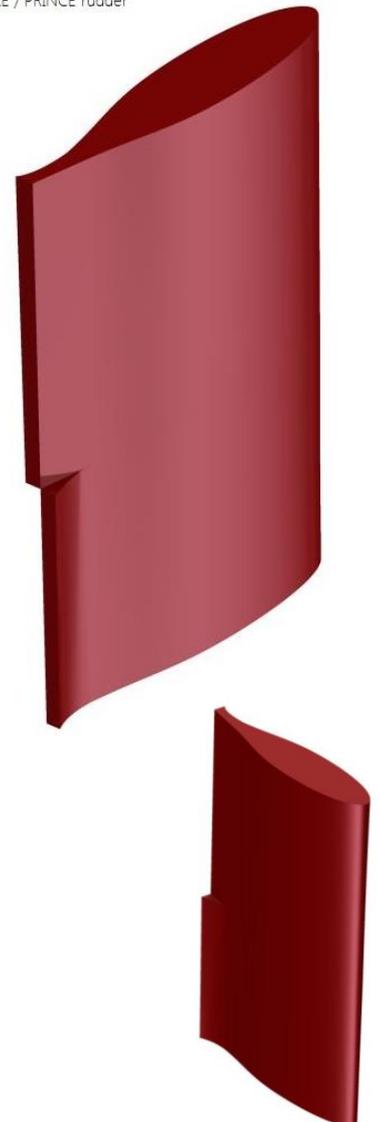


“Enhanced brilliance” DUKE Rudder

Full Spade Rudder with twisted trailing edge

The „Enhanced brilliance“, the DUKE-Rudder find the best compromise between propulsion efficiency and high lift operation. Through the flow optimized profiles the DUKE rudder reduce the power consumption of the vessel. Further it raises the lifting power of rudder blade due to the aft end bended design.

DUKE / PRINCE rudder



MM-Offshore recommend the DUKE-Rudder for the following vessel types:

- Medium speed vessels
- Slow speed vessels
- Large vessels like Bulk Carriers or Tankers
- Vessels with combined requirements like high rudder lift forces and low maintenance or long sea time interval.

Key facts:

- Optimized “teamwork” between propeller and rudder
- Outstanding maneuvering and course keeping properties for low speed operation
- High lift force at reduced power consumption
- Low maintenance
- Suitable and available for all rudder and profile types

“Efficiency extension” EMPEROR Module

Twisted Leading Edge Module



With the EMPEROR-Module to an “Efficiency extension” of your vessel:

The economic and environmental restrictions are challenging the shipping industry:
Saving as much fuel as possible is the key word.

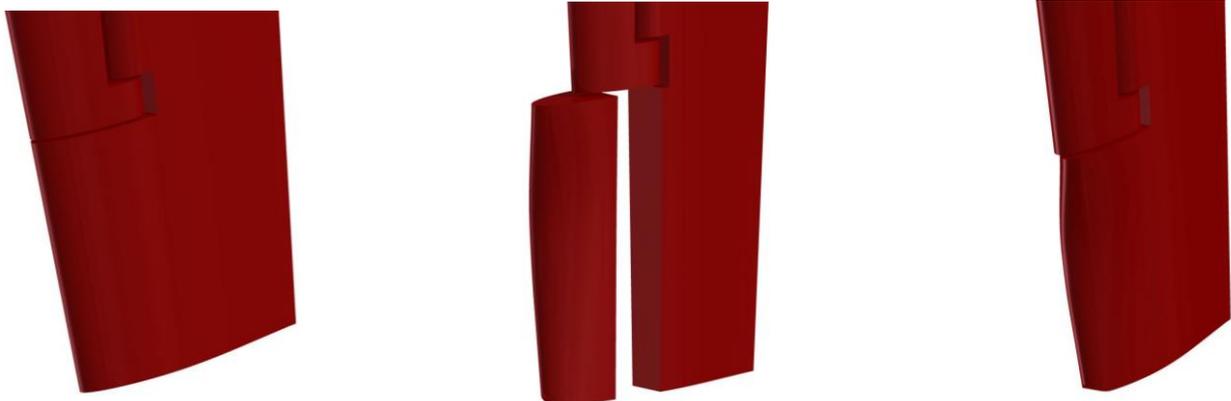
The emperor module is developed for Semi-spade rudders, in order to minimize cavitation on rudder horn and special rudder areas. Due to the Semi-spade design, the new emperor module will make the best of energy saving what you can get. This new technology enables your existing fleet for the highest efficiency and extend the lifetime of your rudder system.

MM-Offshore recommend the EMPEROR-Module for the following vessel types with semi spade rudder:

- Medium speed vessels
- High speed vessels
- Large container vessels
- Multi – Purpose vessels
- In general the EMPEROR-Module fits to a wide range of vessels

Key facts:

- Maximum energy savings with lowest efforts
- Minimizing the cavitation
- Easy and quick installation with pre-fabricated module
- Worldwide conversion possible
- Tailor made design on the existing vessel and rudder system
- Suitable and available for all rudder and profile types
- Also available for full spade rudder modification





Steering gear METEOR

Ram-Type Steering Gear

The MM-Offshore METEOR Steering gear distinguishes itself by its exceptional design. By the modular conception and arrangement this steering gear is suitable for every kind of vessel. Even for the case of service it is possible to change single modules without exchanging the complete steering gear.

The single groups of modules are:

Mechanical Part

- Tiller
- Hydraulic nut
- Connection bolts
- Thrust bearing
- Stopper bank

Hydraulically Part

- Twin Pump Power Unit
- Rams (cylinders)

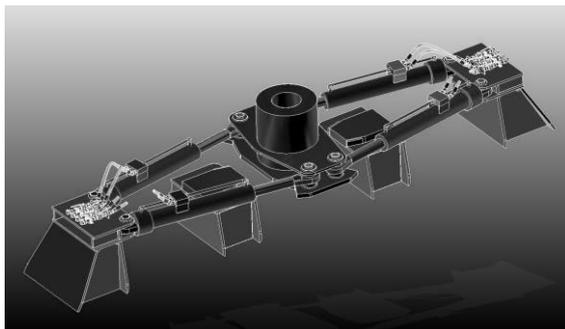
Electrical Part

- Control and operation cabinets
- Angle Indication System (optional)

The ideal usability of the MM-Offshore METEOR steering gear for small machinery rooms and other limited spaces is another advantage of the modular conception. In combination with one of our rudder systems you get the complete maneuvering equipment from a single source.

Key facts:

- Optimized space utilization (especially MM-Offshore METEOR -2C)
- Processing of high rudder forces and moments (especially MM-Offshore METEOR -4C)
- Ideal interface between rudder stock and steering gear
- Savings of freight costs; no extra dispatch of steering gear to fabrication of rudder vendor
- Only one point of contact for maneuvering equipment



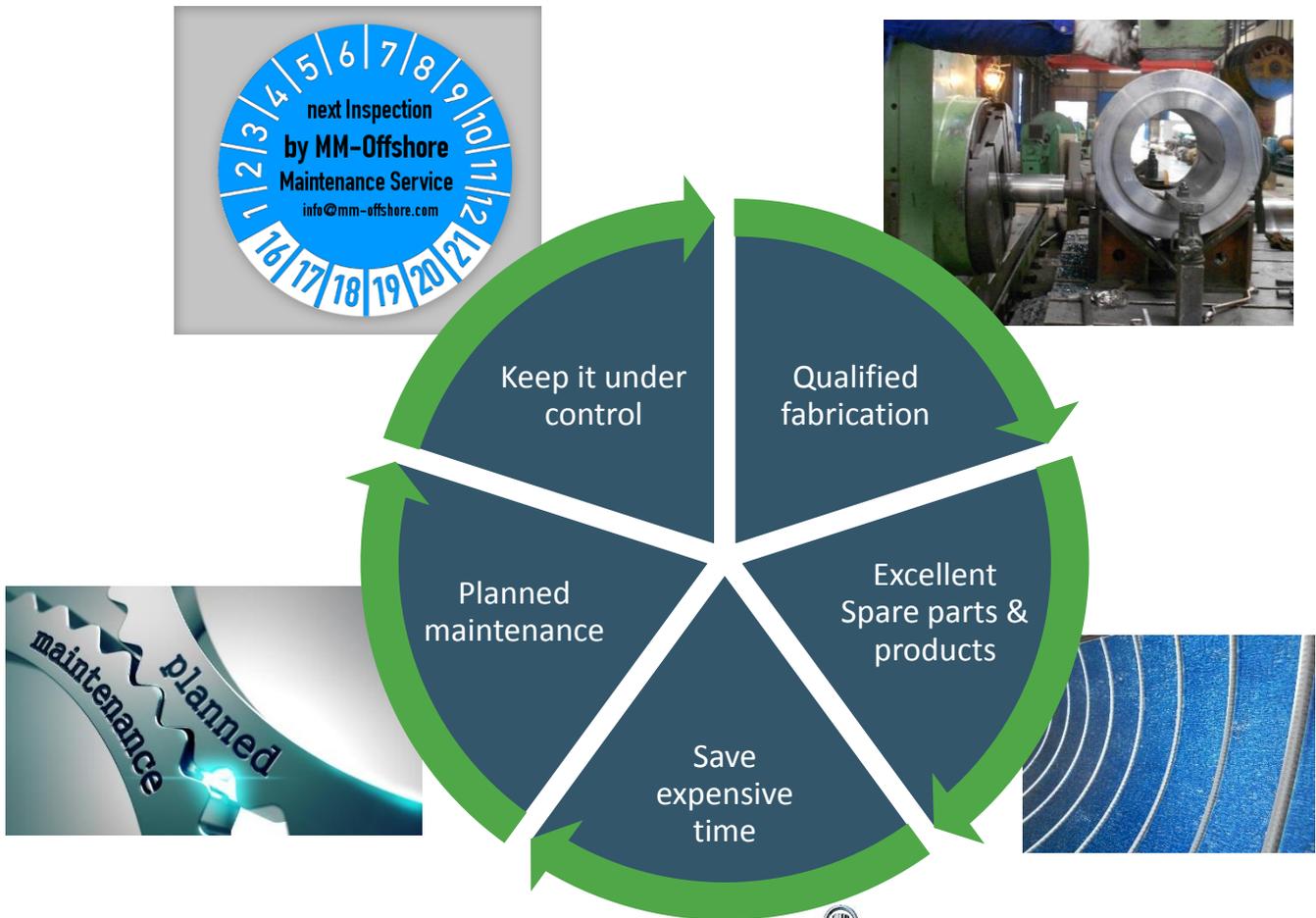
Steering gear - METEOR

Ram-Type Steering Gear

| | Rating | Rudder angle | Working torque [kNm] | Design torque [kNm] |
|--|-----------------|-----------------|----------------------|---------------------|
| Meteor MMO-2C Ram type steering gear with two (2) rams | 20 | 35° / 45° / 65° | 20 | 25 |
| | 30 | 35° / 45° / 65° | 30 | 38 |
| | 50 | 35° / 45° / 65° | 50 | 63 |
| | 65 | 35° / 45° / 65° | 65 | 82 |
| | 80 | 35° / 45° / 65° | 80 | 100 |
| | 100 | 35° / 45° / 65° | 100 | 125 |
| | 125 | 35° / 45° / 65° | 125 | 157 |
| | 150 | 35° / 45° / 65° | 150 | 188 |
| | 200 | 35° / 45° / 65° | 200 | 250 |
| | 240 | 35° / 45° / 65° | 240 | 300 |
| | 315 | 35° / 45° / 65° | 315 | 394 |
| | 400 | 35° / 45° / 65° | 400 | 500 |
| | 500 | 35° / 45° / 65° | 500 | 625 |
| | 625 | 35° / 45° / 65° | 625 | 782 |
| | 750 | 35° / 45° / 65° | 750 | 938 |
| Meteor MMO-4C Ram type steering gear with four (4) rams | 875 | 35° / 45° / 65° | 875 | 1094 |
| | 950 | 35° / 45° / 65° | 950 | 1188 |
| | 1100 | 35° / 45° / 65° | 1100 | 1375 |
| | 1450 | 35° / 45° / 65° | 1450 | 1813 |
| | 1700 | 35° / 45° / 65° | 1700 | 2125 |
| | 2000 | 35° / 45° / 65° | 2000 | 2500 |
| | 2500 | 35° / 45° / 65° | 2500 | 3125 |
| | 3000 | 35° / 45° / 65° | 3000 | 3750 |
| 3500 | 35° / 45° / 65° | 3500 | 4375 | |



Service



MM-Offshore assists you to keep the course:

Our service offers all facets of different solutions - from the fabrication of tailor-made spare parts up to the planned maintenance - which you need to ensure a smooth flow of your vessel in service.

The MMO network of experts will help you for the execution of maintenance inspections and provide you the spare parts -24/7.



Key facts:

- High quality spares
- Maintenance inspections
- Planned reliability in vessels service
- Overview and control
- 24 / 7 service time worldwide





Germany

MM-Offshore
Germany

Werftweg 15
26135 Oldenburg
Germany

Phone: +49 (0) 441 92 01 01
Fax: +49 (0) 441 92 01 144
Mail: info@mm-offshore.com

China

MM-Offshore
China

Shanghai
China

Phone: +86 137 6114 0542
Mail: info@mm-offshore.com

