

# TOTAL STEERING SYSTEMS

Provides reliability, safety and outstanding functional range

Northrop Grumman Sperry Marine provides a full range of steering control systems to accommodate many types of vessels and yachts. Through modular design many different requirements can easily be met, from pleasure boats to mega-yachts and vessels with multiple rudders. All components of the steering control system are connected via reliable CAN-bus technology.

## Steering System Key Benefits:

- Designed for straightforward and simple operation
- Modular in design for easy installation and flexible integration with further steering controls
- High quality components and vane pumps for long life and reliability
- Built in reliability with CAN bus technology
- Comfortable operation with take-over or give-over function of steering control positions

The modular concept of configuration for the Total Steering Systems uses standard components configured in almost any required arrangement, such as:

- **Mechanical Rudder Interface** - There are various methods of the mechanical rudder interface
- **Manual Hydraulic Steering** - This configuration consists of a manually driven hydraulic pump, directly connected to the steering wheel or helm
- **Single Electric-Hydraulic Steering System** - This configuration provides electronic control of the hydraulic system, offering accurate control of the rudder(s). Multiple rudders in this case are mechanically coupled and driven by one or two hydraulic cylinders
- **Dual Electric-Hydraulic Steering System** - This configuration provides electronic control of the hydraulic system, offering fail-safe operation in case of a single rudder, or fully independent control of multiple rudders without mechanical coupling

With the added benefit of multiple steering positions and autopilots, the advantages of a Hydraulic Steering system are plentiful.

## Flexible Architecture

Northrop Grumman Sperry Marine's Total Steering System is a sophisticated steering control system that provides reliability, safety and an outstanding functional range. The advanced steering control system consists of modular system architecture and fulfils individual customer requirements. It can be used for all vessels with single and dual rudders and on vessels with fore and aft bridges or fore and aft workstations.

## Easily Integrated with Self-Adaptive Autopilot

The adaptive autopilot reduces rudder activity depending on weather and sea state conditions. Less rudder activity results in less fuel consumption for a more cost-effective solution.

For non-rudder steering gear systems, such as azipods and waterjets, requiring special control signals, Northrop Grumman Sperry Marine can supply the adaptive and easy to integrate autopilot NAVIPILOT 4000.

## Customised Console Frames

Northrop Grumman Sperry Marine offers customised console frames in different sizes and configurations. These frames are pre-wired, configured and fully tested in order to reduce installation costs and commissioning time. We allow fast, simple and cost efficient installation on board, therefore the Northrop Grumman Sperry Marine solutions are perfectly suited for both, newbuilding and retrofit projects.

# Steering Gear Features

## Total Steering Systems

### General Features

- Applicable to all types of vessels and yachts, ranging from 15 to 100 meters, 5000 GMT
- Applicable to all steering configurations: single, multiple rudder, Voith-Schneider
- Interfaces with complete range of autopilots
- Meets standards of all major classification societies
- Easy to install
- Minimum maintenance

### System Features

- Cylinders with spherical bearings
- Split or non-split helms
- Rudder angles to 60 degrees
- Low-noise vane pumps

### Optional Features

- Proportional valves
- Dual or multi-flow fast steering response
- Adjustable pumps
- Servo hand pumps
- All control systems
- Control panels

## Meets Major Classification Approvals

All system components are designed and manufactured to meet with major classification standards:

- LRS
- ABS

- BV
- GL
- USCG
- DNV
- IMO
- SOLAS
- SI

# Steering Control Systems

## Total Steering Systems

### Non-Follow-Up

A non-follow-up system actuates the solenoid valves by controlling the steering actuator. Upon a steering request the valve(s) open completely, resulting in full force being applied to the rudder as long as input is given. Upon removal of the steering request the valve(s) closes again (time dependent control).

### Full Follow-Up

A full follow-up system applies position feedback. The required rudder position is set on the steering control(s), upon which the solenoid valves are opened to control the steering actuator.

The actual position and requested position are continuously compared, resulting in automatic closure of the valves upon reaching the desired position (position dependent control).

## Types of Solenoid Valves

### Bang-Bang (black/white) Solenoid Valves

Bang-Bang solenoid valves are only capable of opening and closing completely. Once opened, full available force is applied to the rudder. Once closed, the rudder-applied force is terminated promptly.

This results in a fast response type of characteristic.

### Proportional Solenoid Valves

Proportional solenoid valves are capable of opening and closing gradually. This results in a smooth increase of force being applied to the rudder. Upon closure of the valves, power is gradually reduced to zero resulting in a deceleration of the actuator. This results in smooth and accurate steering characteristics.

# Rudder Angle Indicators

## Total Steering Systems

Northrop Grumman Sperry Marine provides all components for ship-specific rudder angle indicator systems. A rudder angle indicator system consists of a feedback unit, a rudder angle calibrator and rudder angle indicators. This includes indicators with different dimensions, different scales, three-face rudder angle indicators and special indicators to meet Panama regulations. All indicators can be dimmed and are available with different protection grades.

## Rudder Angle Indicators in Every Size

The rudder angle indicators are characterized by a diversity of different indicators to fulfil individual customer needs. Instruments in different sizes, scales, type of installations and protection grades. In addition three-face rudder angle indicators with a 270° panoramic indication and indicators according to Panama Canal Regulations are offered.

The Rudder Angle Calibrator is the central unit of the system to provide feedback calibration and adjustments on up to 6 indicators.

The Rudder Angle Indicator System is fully type approved and fulfils the latest normative references.

## Key Benefits of Rudder Angle Indicators:

- Three-face rudder angle indicator with 270° panoramic indication
- Rudder angle indicators with different dimensions
- Different rudder scales depending on the rudder angle
- Internal or external dimming control
- Different protection grades
- Rudder angle amplifier for the connection of multiple indicators