PRAXIS
AUTOMATION TECHNOLOGY

Heading Control System

Heading Control System

Features

The Mega-Guard Heading Control System (HCS) automatically controls vessel's heading by calculating and providing a setpoint for the rudder. The Heading Control System fulfills the rules of classification societies and wheelmark. The reliable autopilot supports single rudders and twin independent rudders.

The Heading Control System includes the following modes of operation:

- HCS Control
- Track Control
- Turn by Radius or Rate Of Turn

The HCS interfaces to various NMEA compatible sensors according one of the following standards:

- NMEA-0183 over serial line
- NMEA over Ethernet

Sensors provide the HCS with heading, position, speed, wind and draft data. In addition NMEA input/outputs are available for ECDIS and VDR.

Heading Control Panel

Mega-Guard Heading Control Panel	
Touchscreen	5.0"
Buttons	6 and 1 heading knob
Front	metal or glass
Microprocessor	ARM
Ethernet	4 ports
NMEA over Ethernet	Heading, position, speed wind, draft, rudder position, rudder setpoint and VDR
NMEA-0183 inputs	Heading, ECS/ECDIS
Rudder position (AI)	Potentiometer
Rudder setpoint (DO)	Rudder to Port/STBD
Heading Control Panel	1 master panel and up to 3 slave panels
Power supply	24VDC (-25% ~+30%)

HCS environmental and approvals	
Ambient temperature	-25 ~ 70°C
IMO approval	✓
Class approval	LRS,DNV-GL, ABS RINA, BV, RMRS, CCS, NKK, PRS, KR

System lay-out and operation

The Mega-Guard HCS is built up with the following items:

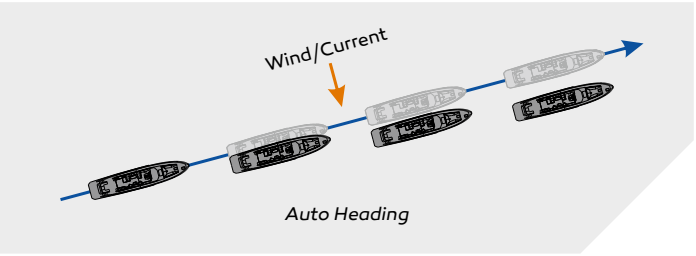
- **Heading Control Panel** for flush panel mounting in bridge console
- **Steering Control System** for bulkhead mounting in steering room

The Heading Control Panel includes a user friendly Heading Knob, a 5"touchscreen and control mode selection pushbuttons. In addition the Heading Control Panel includes advanced software for accurate heading control. Sensor and actuator data is interfaced via the redundant Ethernet network from the Mega-Guard INS and the Steering Control System.
In non IMO applications the sensors and actuator can be directly connected to the Heading Control Panel.

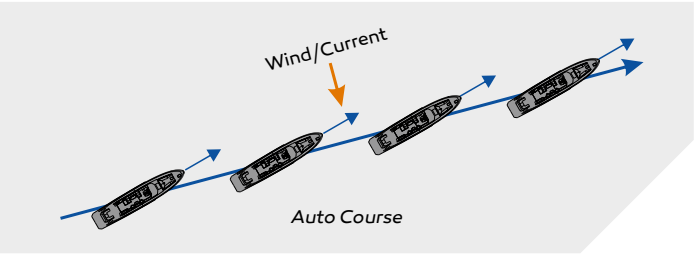
The Steering Control System includes a Steering Controller and Operator Panels for steering operation mode, steering indication, full follow up and non follow up operation. The Steering Control System is available in single and dual rudder configurations.

Heading Controller

The controller of the Heading Control Panel is equipped with a self-learning and adaptive software algorithm for accurate course keeping. The controller dynamically adjusts and stores the control parameters taking into account vessel speed, draft and wind conditions. An extended Kalman filter is applied to filter out wave induced yaw motions. In this way rudder movements are minimized which results in less wear and tear and reduced fuel consumption.
The HCS Control function can be set to either Auto Heading or Auto Course mode through touchscreen buttons. In Auto Course mode the Heading Control Panel steers against a set course over ground. This results in automatic compensation of wind and/or wave induced drift by the Heading Control Panel.



Auto Heading



Auto Course

The Mega-Guard HCS can be connected to Mega-Guard INS or a separate ECDIS or ECS for automatic track steering, taking into account the set cross track error, the turn radius and rate of turn.

HCS with Position Hold

The Mega-Guard HCS can also be extended with Position Hold functionality in case all thrusters are controlled by Mega-Guard propulsion, steering and thruster control systems. The dynamic positioning controller of the Heading Control Panel accurately calculates thrust and steering setpoints of all thrusters based upon external induced forces of waves, wind and current and measured data from position, heading and wind sensors.
User friendly heading adjustments can be made with the Heading Knob and a position transfer step can be induced by touching the arrows on the touchscreen in ahead, astern, port and/or starboard direction.

Heading Control with Position Hold

HCS system lay-out

HCS Market segments

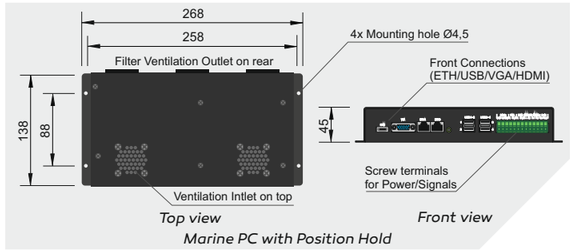
The HCS Heading Control System is applied in all type of ships. Three market segments are distinguished:

- **Commercial ships**
- **Mega yachts**
- **Navy ships**

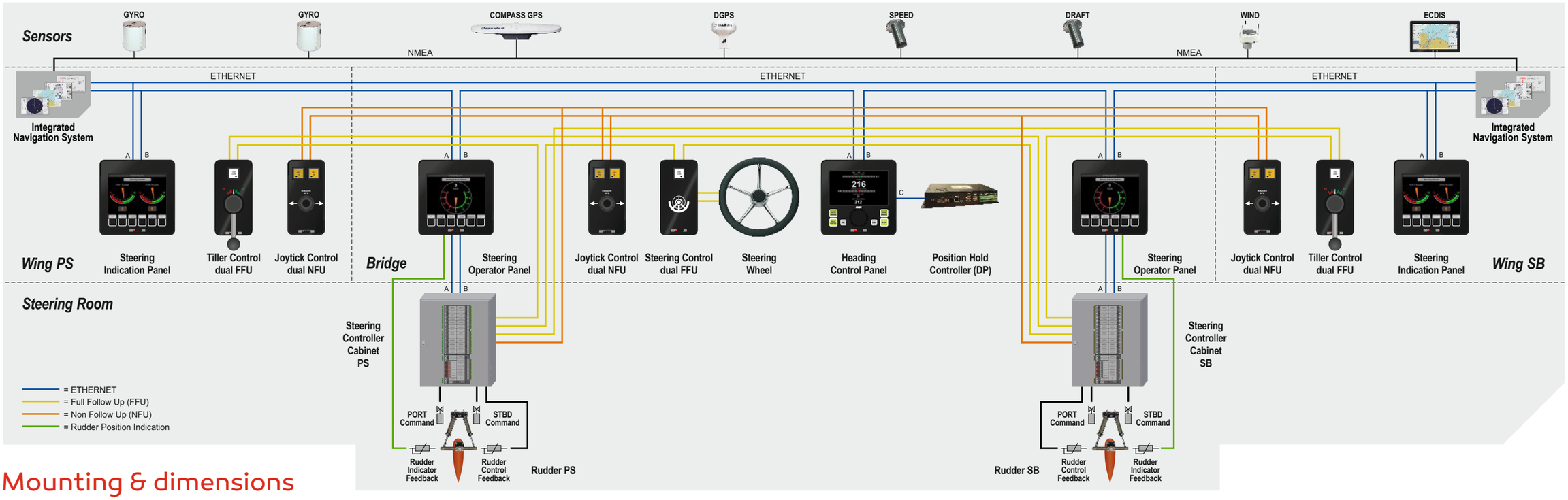
The Heading Control Panel is supplied in a highly esthetic metal front with integrated pushbuttons and stylish Heading Knob with push function to accept the set heading. The Steering Operator Panel has identical styling and dimensions (DIN 144x144mm). In addition, the Full Follow Up and Non Follow Up steering panels are half size (DIN 72x144mm) and fit perfectly next to the Heading Control Panel and the Steering Operator Panel.

Position Hold

The Position Hold optional function is implemented with a Marine PC including dynamic positioning (DP) software. The Marine PC communicates with the Heading Control Panel via Ethernet network.
The Heading Control Panel fulfills heading control functions and as soon as Position Hold mode is selected, the Marine PC with DP software takes over the control of all thrusters including the rudder to realize the Position Hold functionality.



Marine PC with Position Hold

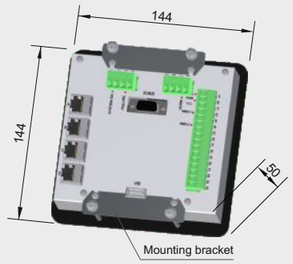


Mounting & dimensions

HCS Operator Panel
5,0" touchscreen metal or glass front


Steering Operator Panel
5,7" touchscreen metal or glass front

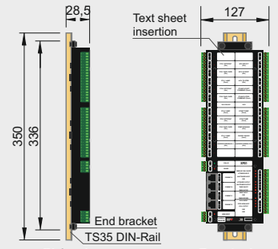

Steering Indication Panel
5,7" touchscreen metal or glass front



Steering Control
FFU

Tiller Control
FFU

Joystick Control
NFU



Side view *Front view*
Steering Controller

Steering Control System

Features

The Mega-Guard Steering Control System (SCS) automatically controls rudder position to a given setpoint as received from the Heading Control System or from the Full Follow Up (FFU) steering panels. The SCS supports back-up and independent operation of the rudder actuators through the Non Follow Up (NFU) Joystick panels as well. In addition, it includes an independent rudder position indication system.

The following rudder configurations are supported:

- single rudder with dual actuator
- dual linked rudder with dual actuator
- dual rudder with dual actuator
- dual rudder with quad actuator

The following rudder actuators are supported:

- bang bang type
- proportional valve type

Mega-Guard Steering Operator and Indication Panel	
Touchscreen	5.7"
Buttons	6 pushbuttons
Front	metal or glass
Microprocessor	ARM
Ethernet ports	4
Number of panels	Up to 12

Mega-Guard |Steering Controller	
Interface to HCS	Ethernet
Steering Controllers	Up to 4
Number of FFU Panels	Up to 3
Number of NFU Panels	Up to 6
Supported actuator	Bang bang or proportional valve

SCS environmental and approvals	
Ambient temperature	-25 ~ 70°C
IMO approval	✓
Class approval	LRS,DNV-GL, ABS RINA, BV, RMRS, CCS, NKK, PRS, KR

Steering Operator Panel

System lay-out and operation

The Mega-Guard SCS consists of the following items:

- **Steering Operator Panels** for flush panel mounting in bridge console
- **Steering Indication Panels** for flush panel mounting in overhead console and/or wings
- **Full Follow Up (FFU) Panels** ; single or dual mounted on bridge
- **Non Follow Up (NFU) Panels** ; single or dual mounted on bridge
- **Steering Controllers** ; mounted in cabinet in steering room or bridge

The Steering Operator and Indication Panels and the Steering Controllers are interconnected by redundant Ethernet network for reliable operation of the rudder actuators and minimizing cabling. In addition, the Mega-Guard Heading Control System is connected to the redundant Ethernet network.

The Steering Operator Panel indicates rudder position and indication of mode of operation: HCS, FFU or NFU control. In addition, the hydraulic or electric pumps for the steering actuators can be operated from the Steering Operator Panel.

Full Follow Up (FFU) panels

FFU panels are either in single or dual configuration and are available as follows:

- external steering wheel
- built-in mini steering wheel
- joystick (proportional)

The panel includes a Take Over pushbutton with lamp indicator.

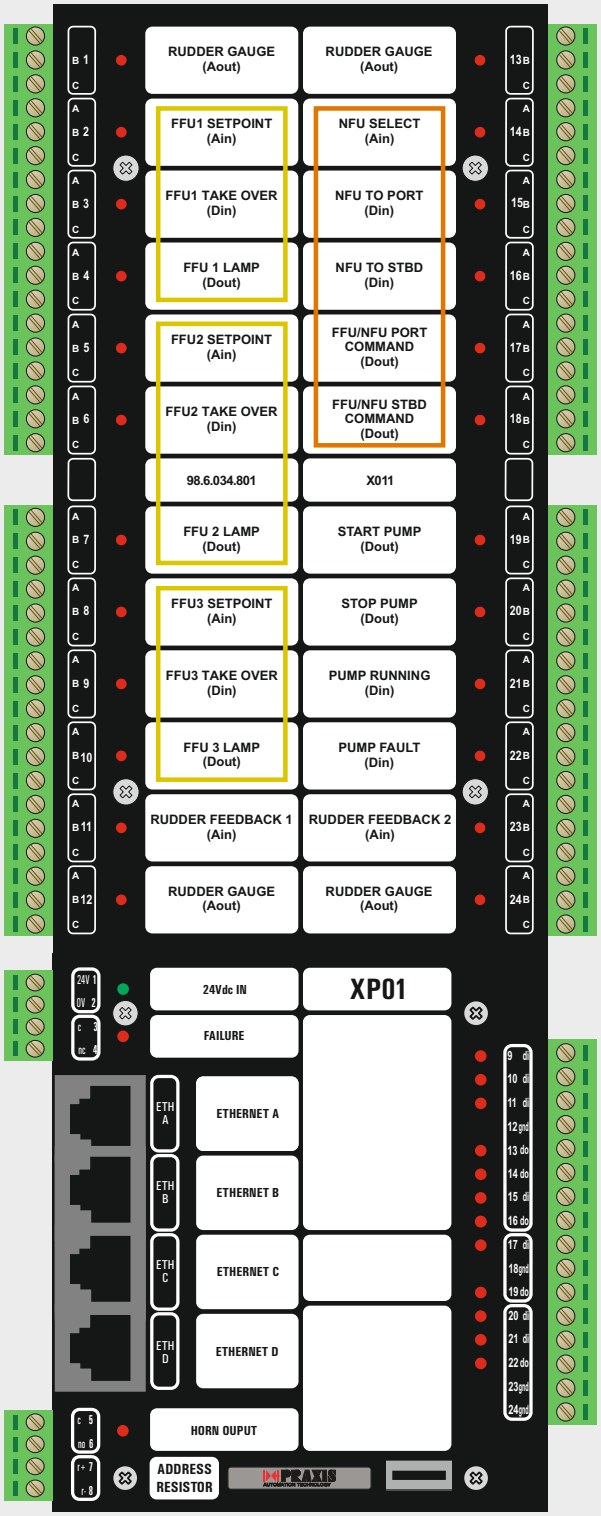
Non Follow Up (NFU) panels

NFU panels are either in single or dual configuration and are available as follows:

- joystick (moveable to portside and starboard side direction)
- pushbuttons (To Port and To Starboard)

The panel includes a Take Over pushbutton with lamp indicator. Dual panels include dual Take Over pushbuttons for independent take-over of port side rudder and starboard side rudder.

Joytick Control dual NFU



Steering Controller

PRAXIS
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Vessel Management System

Power Management System

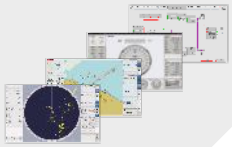
Fire Alarm System

CCTV Video Distribution

Ship Performance Monitor

Fleet Management System

Integrated Navigation System



Heading Control System

Propulsion Control System

Dynamic Positioning System

BNWAS Watch Alarm System

Navigation Light Control

Wiper Control System

Energy Management System

Electric Propulsion Motor

Electric Steerable POD

High Power Inverter

DC bus Generator

Electric Energy Storage

Electric Fin Stabilizer

Ship automation, navigation and electric propulsion

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