NORTHROP GRUMMAN

Sperry Marine

NAVIPILOT 4000 Series

Self-Tuning Adaptive Heading Control System

NAVIPILOT 4000 Series

Ensure Safety and Efficiency

The highly reliable NAVIPILOT 4000 ensures continuous self-tuning adaptation for accurate steering and efficient fuel consumption, which is unique to all other autopilots in the marine industry.

The NAVIPILOT 4000 Marine Autopilot uses advanced ship steering control network technology to steer a ship safely and efficiently. The innovative NAVIPILOT 4000 is capable of tuning itself to adapt automatically to the ship's load characteristics and weather conditions.

Benefits

- Fully self-tuning adaptive heading control
- Manual selection of steering strategy to suit weather conditions
- Rate and radius control modes
- EC type approved by Germanischer Lloyd, Germany, to MED 96/98/EC (Wheelmark)
- Meets the requirements of all major classification societies
- Ease of use with logical arrangement of sealed foil keyboard

Configurations

The NAVIPILOT 4000 Series comprises the following system configurations:

- **NAVIPILOT 4000 BASIC** – provides the standard set of system capabilities in accordance with ISO 11674
- **NAVIPILOT 4000 TRACK** – provides additional capabilities for Track Control in accordance with IEC 62065
- **NAVIPILOT 4000 HSC** – provides the capabilities required for High-Speed Craft (HSC) in accordance with ISO 16329
- **NAVIPILOT 4000 TRACK HSC** – provides Track Control capabilities in accordance with IEC 62065 and ISO 16329 for HSC

Standard Features

The following standard features are integrated in all NAVIPILOT 4000 configurations:

- Heading keeping with minimum rudder motion
- Course change control by setting either turn rate or turn radius
- Rudder limit setting (available as an alternative to setting rate or radius)
- Direct RS 422 connection for heading reference or navigation system
- Full alarm complement via the display unit and the alarm contacts

Self-Tuning Adaptive Function

The self-tuning adaptive function is an integral part of all NAVIPILOT 4000 configurations. This feature enables the system to continuously monitor performance and automatically adjust control settings, rudder gain and counter rudder as required to keep the tuning optimized even if the vessel's behaviour is affected by changes in load or trim, or as sea conditions change, to continually provide the best possible steering performance and efficiency.

Track Control

The NAVIPILOT 4000 TRACK and NAVIPILOT 4000 TRACK HSC versions are equipped with the Track Control capability, when interfaced to a Northrop Grumman Sperry Marine Integrated Bridge System or VisionMaster FT ECDIS.

High-Speed Craft Features

The following additional features are provided with NAVIPILOT 4000 High-Speed Craft:

- All standard features
- Fulfills requirements of ISO 16329 for High-Speed Craft
- Jet dead band compensation setting
- Configurable hysteresis setting to provide additional dead zone

Ship Automation Features

- Gyrocompass heading interfaces: two RS 422
- Magnetic compass interfaces: IEC 61162-1, sine/cosine
- Serial interface for track steering via Sperry Marine's VisionMaster FT ECDIS or standard waypoint steering with position receivers
- Additional remote Control and Display Units possible
- Operational data remain stored during power outage
- Clearly arranged graphic liquid crystal display (LCD) with back lighting
- Analogue selection of set heading by means of a cardinal control disk and soft-key selection of all other major parameters
- Analogue output for thruster control, rudder propellers and water jets
- Only serial digital interfaces used

Control and Display Unit

The Control and Display Unit contains a LCD display which permanently indicates the following information:

- Current heading (digital)
- Set heading
- Override status
- Selected heading source
- Steering modes AUTO, NAV or TRACK
- Parameters for
  - Rudder limit or
  - Rate-of-turn or radius (steering mode)
  - Weather
- Preset heading selection
- 1/10° increments of set heading

Additional Displays

- Load condition
- Speed (auto/man.)
- Rudder order
  or
- Actual rudder angle
  or
- Rate of turn
  or
- Cross track error
- Off course alarm
- Heading difference alarm

Specifications

Environment

Ambient temperature range

Operation	-15° C to +55° C
Storage	-25° C to +70° C

Protection grade

Installed	IP 32 to DIN 40050

Environmental testing

To EN 60945 (IEC 945 +A1)

Power Requirements

24 VDC (18 V to 36 V)

Power consumption	10 W max.
Reverse polarity protection	Built-in

Inputs

Rudder angle feedback signal

± 10 V ^= ± 120° max. selectable rudder angle, potentiometer resistance 2 kΩ

External steering system	± 10 V ^= ± 120° max. rudder angle

Flux gate for magnetic compass

Sine/cosine, Sperry Marine product

NAV/TRACK interface

Serial interface for track steering via VisionMaster FT ECDIS or standard waypoint steering with a position receiver

Speed input	200 p/nm or IEC 61162-1
180° turn command	Port and starboard

180° rotation of heading display (for ferries)

Gyro / magnetic selection

Override status

Mute

Status signals	AUTO, NFU, Helm, Remote, Ext. System

Set heading and rudder limit or rate or radius control by joystick or pushbutton

Heading	Two IEC 61162-1
Heading gyro	HEHDT at 10 Hz
Heading magnetic	HCHDT or HCHDM or HCHDG at 10 Hz

Outputs

DC solenoid valves

Outputs	Two for port, two for starboard (solid-state relays)
Type plus or minus switching	
Voltage	12 VDC to 110 VDC
Rating	2.0 A max.
Additional outputs	Optional

or

AC solenoid valves

Outputs	Two for port, two for starboard (solid-state relays)
Voltage	24 VAC to 230 VAC
Rating	1.0 A max.
Additional outputs	Optional

or

Isolated proportional analogue output

Outputs	Two isolated analogue outputs proportional rudder order to proportional rudder error
Voltage	±10V DC, max. 20 mA or
Current	4.20 mA
Additional outputs	Optional

Outputs and Interfaces

CAN in accordance with IEC 61162-3

for remote control and display units and connection to NAVIGUIDE 4000 manual steering system

Central alarm IEC	61162-1 bidirectional input/output
Voyage Data Recorder (VDR)	RS 422 9600 bps
Status and alarm outputs	
System alarm	Potential-free contacts
Off course alarm*	2 A maximum current
Override alarm*	250 V maximum voltage
Gyro/Mag. status*	
Ext. system status*	
Deadman's control*	
Mute*	

* max. 4 outputs selectable

Power failure alarm	
Primary supply	Potential-free contacts
Backup supply	A maximum current 250 V maximum voltage

Steering Control Unit

Dimensions	H 151 mm W 392 mm D 425 mm
Weight	3 kg
Protection grade	IP 32
Magnetic clearance	0.4 m

Control and Display Unit

Front panel dimensions	288 mm x 144 mm to DIN standard
Installation depth	150 mm
Weight	1.5 kg
Front panel	Sealed foil keyboard, illuminated
Display	Graphic liquid crystal, illuminated
Magnetic clearance	0.4 m

The Royal Carribean cruise ship, the Allure of the Seas, equipped with a NAVIPILOT 4000

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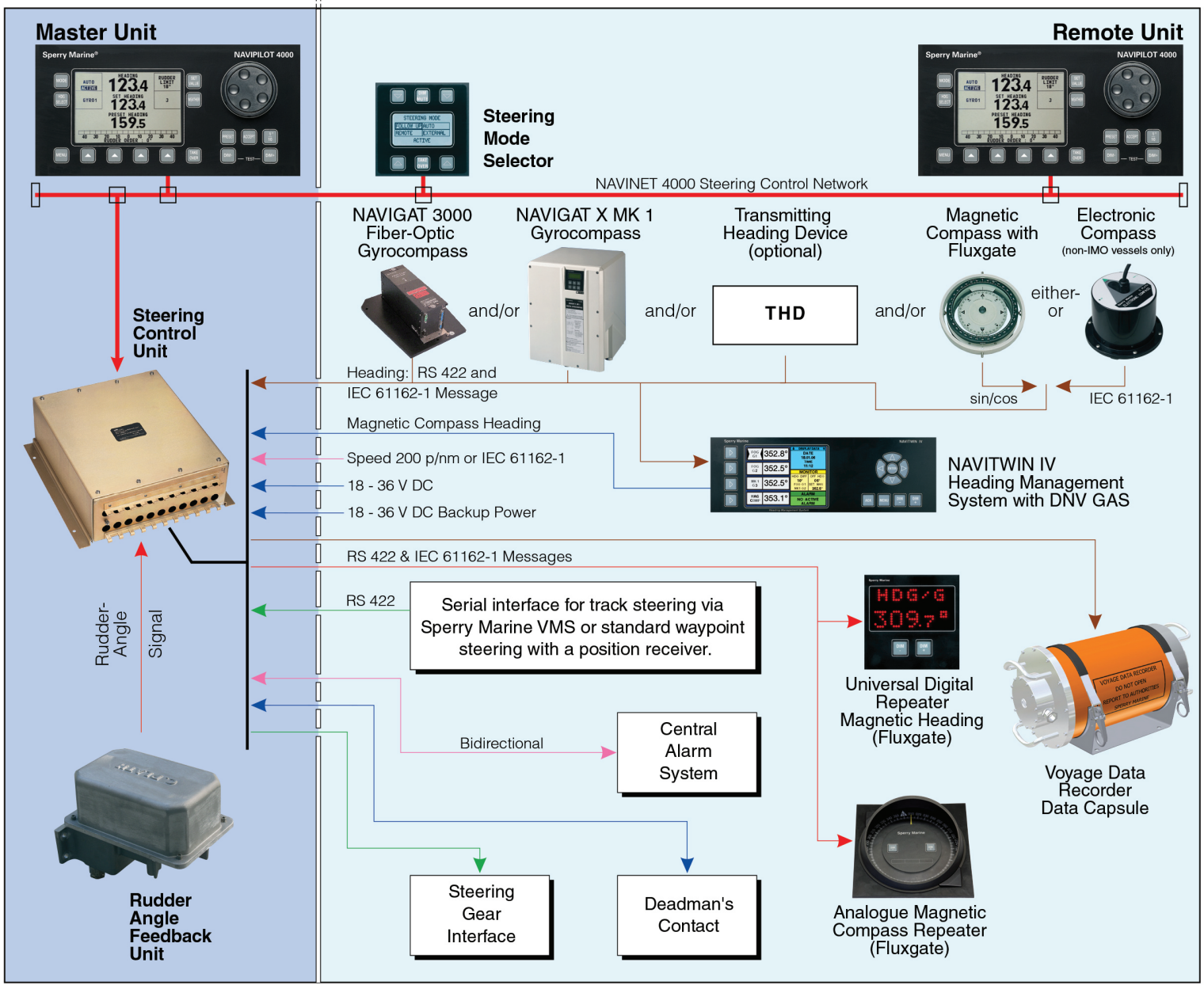
BASIC SYSTEM ⇐ | ⇒ OPTIONAL EQUIPMENT



For more information, please contact:

AMERICAS

New Orleans, LA USA
Tel: +1 504-328-9171

ASIA

China, Shanghai
Tel: +86-21-5179-0199

Hong Kong, Sheung Wan
Tel: +852-2581-9122

Japan, Tokyo
Tel: +81 (03)-3863-7401

Singapore
Tel: +65-6274-3332

South Korea, Busan
Tel: +82-55-544-7458

CANADA

Nova Scotia, Halifax
Tel: +1 902-468-9479

British Columbia, Vancouver
Tel: +1 604-821-2090

EUROPE

Belgium, Antwerp
Tel:+32-3-233-14-33

Denmark, Copenhagen
Tel: +45-77-33-66-33

Germany, Hamburg
Tel: +49-40-299-00-0

The Netherlands, Vlaardingen
Tel: +31 (0)10-4451600

Norway, Bergen
Tel: +47-55-94-94-94

United Kingdom, New Malden
Tel: +44 (0)20 8329-2000

www.sperrymarine.com

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