NORTHROP GRUMMAN

NAVIGAT X MK 1

Microprocessor Controlled Digital Gyrocompass System

The Leader in the Advanced Technology Class.

Sperry Marine

DESIGN AND STANDARD FEATURES

With an eye on the fast approaching shipboard navigation and control system technologies of the 21st century, Sperry Marine has created a generation of advanced marine gyrocompasses: NAVIGAT X MK 1
The first of its type to be designed as a single unit and of unparalleled compactness in a polyurethane hard foam housing is of low weight and allows this gyrocompass to be installed on any bridge, from large yachts to the most capacious merchant marine vessels.
Ship's cables are connected directly to terminals within the housing, facilitating installation. All electronic components are plug-in modules, thus providing fast and easy service. Digital heading information is derived as an absolute value from a 12 bit shaft encoder. The NAVIGAT X MK 1 has a control and display unit installed in the front access cover. When required, the control and display unit can be removed from the housing and installed at a location (e.g. bridge console) remote from the gyrocompass.

Standard Features

- Comprises one single unit.
- Control and display unit in front cover with 4-digit heading display and 6 operating keys.
- Easy to install and easy to service.
- High-speed follow-up system 100°/sec.
- Type approved rate-of-turn output.
- Automatic static north speed error correction.
- Integrated TMC interface.
- Compass monitor function.
- Highly accurate digital heading data transmission by shaft encoder.
- Self-synchronizing repeater compasses.
- ±180° electronic alignment error correction in setup program.
- Can be installed at any location.
- Will drive a maximum of 12 analogue repeaters.
- 180° heading offset function for shuttle vessels.
- 7 independent serial outputs RS 422 & IEC 61162-1.
- 2 independent 6 steps/° heading outputs (0.5 A).
- Complies with IMO regulations A.424(IX), A.694(17), A.821(19) - HSC (High-Speed Craft) and ISO 8728.
- Ouputs to Voyage Data Printer:
  - Heading
  - Heading source gyro/magnetic
  - Rudder angles of two independent rudders.
- Complies with NAUT-AW.
- Insensitive to horizontal acceleration.
- Twin rotors and liquid damping system eliminates latitude error.
- High MTBF (mean time between failures) and low power consumption.
- All repeater compasses with serial interface.
- Automatic emergency power changeover and status alarm.
- Gyro system remains north stabilized during power interruptions of up to 3 minutes.
- Single point suspension of the gyrosphere container eliminates the well-known adverse effects associated with gimbals.
- Monitoring and alarm functions for all voltages, gyroscope current and follow-up system.

The unique method of supporting the now enhanced well-proven Sperry Marine gyrosphere by means of mere buoyancy ensures north stabilization during short power failures. For example, after a three minute gyrocompass power failure, no more that two degrees of deviation may be expected. Once power has been restored, the gyrocompass will return quickly to the correct heading without requiring the usual settling period. The combined effect of the twin rotors and the liquid damping system prevent latitude error.
For operation in extremely heavy seas where highly accurate heading information is absolutely essential, the NAVIGAT X MK 1 Mod. 7 gyrocompass, equipped with a special gyrosphere container, is recommended. Here, the unique centering pin retaining arrangement for the gyrosphere is mounted in an additional gimbal system, which allows the NAVIGAT X MK 1 Mod 7 gyrocompass an almost unlimited freedom of roll and pitch (±90°).

NAVIGAT X MK 1 has been type approved in accordance with EC Council Directive 96/98/EC by the German Federal Maritime and Hydrographic Agency (BSH). A special version, NAVIGAT X MK 1 HSC, is available to meet the demands of high-speed craft.
NAVIGAT X MK 1 HSC has been type approved to the High-Speed Craft Code in accordance with EC Council Directive 96/98/EC by the German Federal Maritime and Hydrographic Agency (BSH).
The rate-of-turn outputs of NAVIGAT X MK 1 and NAVIGAT X MK 1 HSC have been type approved by the German Federal Maritime and Hydrographic Ageny (BSH) to EC Council Directive 96/98 EC (Wheelmark) and aslso fulfills IMO resolution A.526(13).

Options and Accessories

- Automatic dynamic north speed error correction.
- Remote control unit Compass Monitor NAVITWIN III for additional operational convenience.
- Magnetic compass with flux gate.
- Analogue and digital repeaters.
- Voyage Data Printer NAVIPRINT.
- Conventional, adaptive and high-speed code autopilots.
- Rudder angle feedback units.
- Electromagnetic speed log.
- Electronic compass with IEC 61162-1 interface.

Inputs and Outputs for all Basic Systems

Inputs

- Position lat./lon. in IEC 61162-1*
- Speed in IEC 61162-1 or 200 pulses/nm*
- Rudder angle, analogue.
- Rate-of-turn time constant from external selector.
- Sine/cosine from magnetic compass flux-gate.
- Heading in IEC 61162-1 from electronic compass.
- Steering mode status (auto/man) from selector switch.
- Power supply 115 - 230 VAC and/or 24 VDC.

Outputs

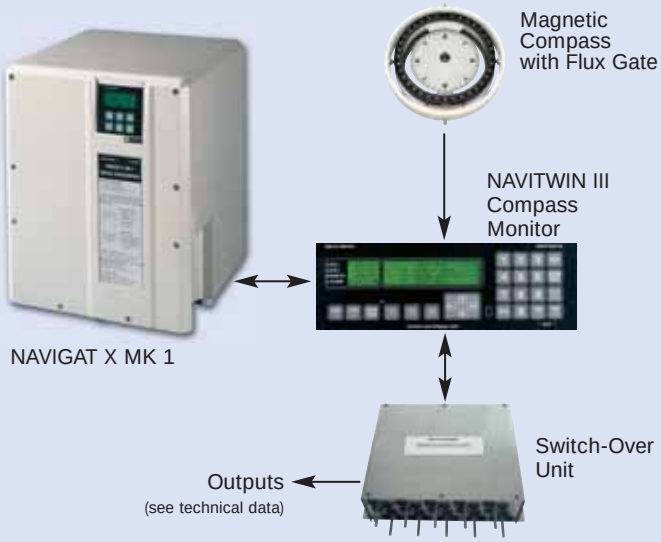
- 12 heading outputs in NMEA 0183 to serial repeaters.
- 2 outputs NMEA 0183 speed, magnetic heading.
- 2 outputs RS 422 gyro heading, ROT, lat./lon.
- 1 output heading, ROT in IEC 61162-1 FAST.
- 1 output heading, ROT in IEC 61162-2 SUPER FAST.
- 1 output status signal.
- 1 rate of turn.
- 1 output RS 422 to Voyage Data Printer with heading, rudder angle, time, lat./lon., steering mode, and speed.
- 1 output status gyro/magnetic.
- 2 6 steps/° heading outputs (0.5 A).

* Required for automatic north speed error correction only.

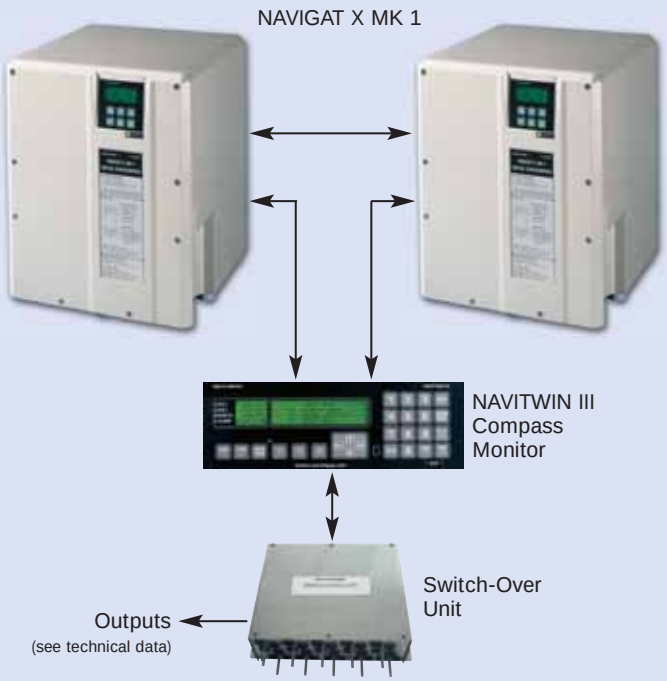
NAVIGAT X MK 1 Digital Gyrocompass System with Automatic Static and Dynamic North Speed Error Correction

Single Gyrocompass System

Single Gyrocompass System with TMC* Function



Dual Gyrocompass System



Dual Gyrocompass System with TMC* Function

* In TMC systems, the Compass Monitor NAVITWIN III provides an independent back-up magnetic heading source for distribution to autopilots, repeaters, radars and other peripheral appliances when required.
In Dual Gyrocompass TMC Systems an additional isolation amplifier is required.

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Performance

Linear mean settle
point error < 0.1° secant latitude
Static error < 0.1° secant latitude
Dynamic error < 0.4° secant latitude
Performance in accordance with IMO A. 424(XI), A.694(17), IMO A. 821(19) and ISO 8728

Freedom of Roll and Pitch

NAVIGAT X MK 1 Mod. 7 ±90°
NAVIGAT X MK 1 Mod. 10 ±40°

Power Requirements

24 VDC (18 V to 36 V)
and/or 115/230 VAC ±10% 50 Hz / 60 Hz
The single-unit gyrocompass includes automatic switch-over to 24 V emergency power supply in accordance with GMDSS Rules for INMARSAT/SES Terminals.

Data Outputs

NMEA TTL	12	outputs of gyrocompass heaing, magnetic compass heading, rate of turn, heading reference status to repeaters, radar, navigation systems.
Sensor data RS 422	4	outputs of gyrocompass heading, magnet. compass heading, ROT, position, speed, hdg. ref. status.
IEC 61162-1 Fast	1	output of gyrocompass heading, magnetic heading, rate of turn, heading reference status.
RS 422 Superfast IEC 61162-1 or IEC 61162-2, selectable	2	outputs of gyrocompass heading, magnetic compass heading, rate of turn, heading reference status.
RS 422	1	output to Voyage Data Printer: heading, rudder angles, hdg. ref. status, hdg. diff. alarm threshold, north speed error corr., mag. variation, steering mode, date/time, speed, position.
6 steps/°	2	outputs of heading. Internal supply 24 VDC, 18 W; external supply 12 VDC to 70 VDC; min.
Rate of turn	1	selectable output of ± 30°, 90° and 300°/min., or customized ±0.1 to 999.9 mV/°/min. (± 10 V, 10 mA max.).
Status signals	1	each for: Gyro 1, Gyro 2, Magnetic, AC power, DC power,
Alarm signals	1	each for: watch alarm, hdg. diff., max. ROT exceeded, power failure & general device error.

Data Inputs

Position	1	IEC 61162-1
Speed	1	IEC 61162-1 or 200 pulses/nm
Rudder angle	2	analogue from feedback unit.
Rate-of-turn time constant	1	from external selector.
Heading from 2nd gyro	1	IEC 61162-1, C.PLATH format
Magnetic compass heading:		
from flux-gate	1	sine and cosine.
or		
from electronic compass	1	IEC 61162-1
Steering mode status	1	Man/Auto from selector.
External heading source status	1	Gyro/Mag; G1/G2 from selector.

Operational Data

Ambient temperature range	operation -10°C to +55°C storage -25°C to +70°C (without supporting fluid)
Settling time	≤ 3 hours (0.7°)
Maximum deviation after a power interruption of 3 min.	≤ 2°
Gyrocompass follow-up rate	100°/sec.
Heading display	digital with 4 digits
Power failure alarm	visible and audible and potential-free contact, max. current 2 A, max. voltage 250 V
Mean time between failure	40 000 hours (MTBF)

North speed error correction:
standard: static, input IEC 61162-1, or manual.
optional: dynamic, input IEC 61162-1, or manual.
Built-in test equipment standard

Power Consumption

	DC	AC
Start-up	80 W	125 VA
Operation	45 W	75 VA
Each analogue repeater	7 W	7 VA
Each universal digital repeater	7 W	7 VA

Protection Grade

Gyrocompass IP 23
in accordance with DIN 40050

Environmental Requirements and EMC

in accordance with EN 60945 (IEC 945 + A1)

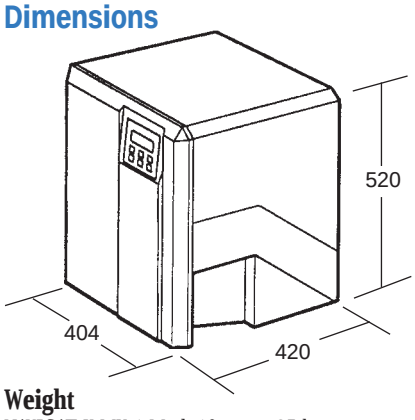
Magnetic clearance to

standard magnetic compass	0.6 m
steering magnetic compass	0.4 m

Reduced magnetic clearance to

standard magnetic compass	0.3 m
steering magnetic compass	0.3 m

Dimensions



Weight

NAVIGAT X MK 1 Mod. 10	25 kg
NAVIGAT X MK 1 Mod. 7	28 kg

Sperry Marine, with worldwide headquarters in Charlottesville, VA, and major engineering and support offices in Melville, NY, New Malden, England, and Hamburg, Germany, is part of the Northrop Grumman **Electronic Systems** sector.

BR-0104 · 06/05 · Printed in Hamburg, Germany

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