

# Horizon MF

Hemispherical Resonator Gyro Compass



# Maintenance-free Gyro Compass Technology

With Horizon MF Raytheon Anschütz presents a new gyro compass based on strap-down technology.

Strapped-down means that angular rate sensors (gyros) and accelerometers are not gimballed but mounted stationary in a housing. The sensors measure angular rates and accelerations in three axes. Based on these measurements heading but also roll and pitch is calculated. Strap-down technology is already well known and proven for many years – mainly in combination with fiber optical gyros (FOGs) or ring laser gyros (RLGs).

Horizon MF uses so-called hemispherical resonator gyros (HRGs) as angular rate sensors. HRGs are vibrating resonator gyros consisting of only few elementary pieces, assembled in a miniature hemisphere uncoupled from the outside: a single piece resonator and electronics for resonator control and pick-off. Together with the simple design this makes it extremely reliable with no wear and tear and no need for maintenance.

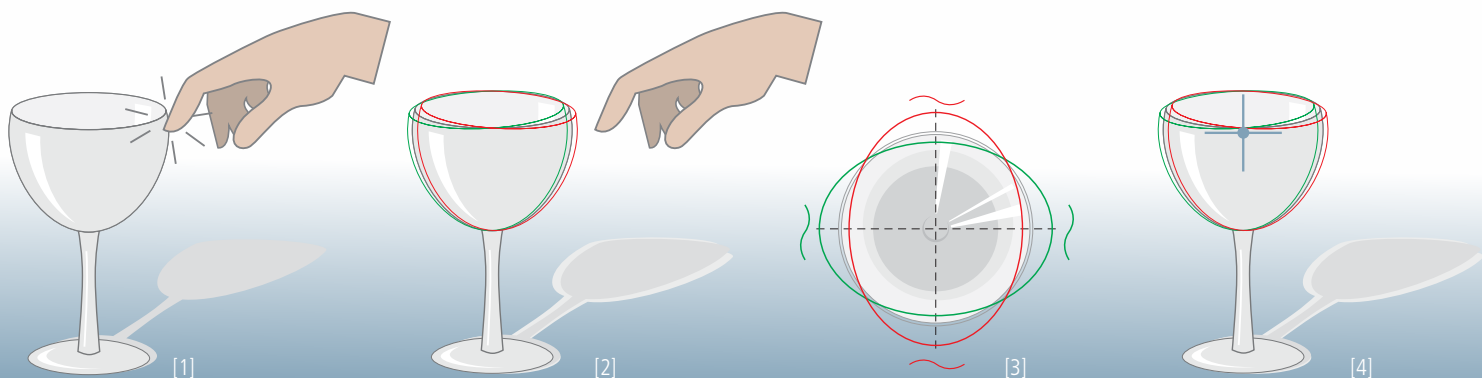
In contrast, fiber optical gyros and ring laser gyros need a stable light source and a controlled vacuum laser cavity, respectively. This certainly is hard to achieve over a long product lifecycle.

Consequently, the mean time between failure (MTBF) value of Horizon MF is more than 100,000 hours which is a multiple of the MTBF values of optical but also classical mechanical gyros bringing forth an outstanding long lifetime and long-term stability gyro compass for seagoing vessels.

Horizon MF is a modular system that was designed to meet the demanding requirements of our customers. It provides roll and pitch data in addition to heading information and additional valuable functions such as a settling time of just one hour. It comes with automatic speed / latitude error correction and provides seven serial interfaces for heading receivers. Horizon MF is maintenance free (MF). Regular maintenance or calibration is not required.

How does the HRG technology work onboard a ship?  
This can be illustrated quite simple using the example of a wine glass.

Electrodes excite the resonator with a certain frequency which results in a stationary vibration pattern. Compared to the example, a finger strike sets the glass into vibration and makes a sound which can even be heard a few seconds later. The vibration pattern can be identified by four points at the ring of the glass that are moving the most – the so-called antinodes. The HRG measures this movement through pick-off electrodes. [1/2/3]



## Your Benefit®

- Maintenance-free
- High accuracy of 0.4 degrees
- Settling time only one hour
- Roll and pitch output
- Automatic speed / latitude error correction
- Heading monitor and selector with automatic switch-over (configurable)
- Independent transmitting magnetic compass (TMC) path
- Individual speed error correction
- Integration of gyro, satellite and magnetic compasses
- Rate-of-turn output
- IMO approved for standard and high-speed crafts
- Modular product range to meet individual requirements – from a single gyro compass to the fully redundant gyro compass system
- Integrates seamlessly into your existing system environment due to a multitude of interfaces and formats

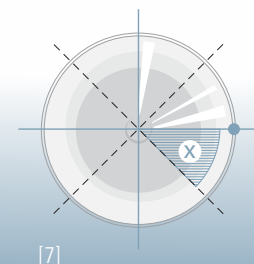
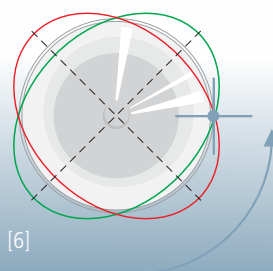
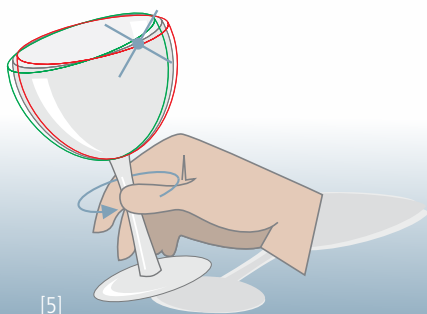
## System Overview

Horizon MF can be extended to a heading management system by using an operator unit and a distribution unit. Anschütz Standard 22 gyro compasses, satellite compasses and magnetic compasses can be integrated. This system then contains all functions of the well-known Raytheon Anschütz compass systems and provides twelve additional serial interfaces for heading receivers, an analog output for the connection of rate of turn indicators and an interface for a heading and rudder angle printer.

## Accessories

- Self-aligning steering repeater with source indication
- Self-aligning bearing repeater with source indication
- Digital repeater
- Repeaters can be configured for 180° turned heading output, e.g. for use on double-end ferries
- Different casings for IP 44 and IP 56
- Course and rudder angle printer
- Course transducers for retrofit solutions (please refer to Standard 22 compact and retrofit solutions brochure)

If the glass is rotated around its axis – observe the reference point – the vibration pattern also rotates, but not as much as the glass does. In other words: The standing wave of the rotation pattern lags behind and the inertness of this pattern is based on the Coriolis force effect. The same shift of the rotation pattern is caused by a movement of the vessel. Note that the vibration frequency is much higher than the frequencies of the vibration spectrum of vessels and thus not affected adversely by the vessel. [4/5/6]



The movement is again measured by pick-off electrodes. This is a very simple and accurate way to sense and measure rotation as the degree of the lag is proportional to the angular rate of the movement of the ship. [7]

## Technical Data

### Accuracy

Heading: 0.4° secLat RMS  
Roll & pitch: 0.2° RMS  
secLat.=1/cosLatitude

### Supply voltage

24 V DC (18 – 32 V DC)

### Power consumption

28 W

### General data

Permissible ambient temperature

Horizon MF

Operation: -20° C to +60° C

Storage: -40° C to +70° C

Settling time: 1h

Permissible roll and pitch angle: ±60°

### Signal outputs

Horizon MF: 7x RS 422 NMEA

Distribution unit: 12x RS 422 Anschütz course bus or NMEA

### Alarms

Built-in alarms: system failure with potential-free relay contact  
Others with ALR/ACK NMEA messages

### In accordance with

IMO A.424(XI), A694(17), A.821(19)

EN/IEC 60945, EN/ISO 8728, ISO 16328, EN/IEC 61162

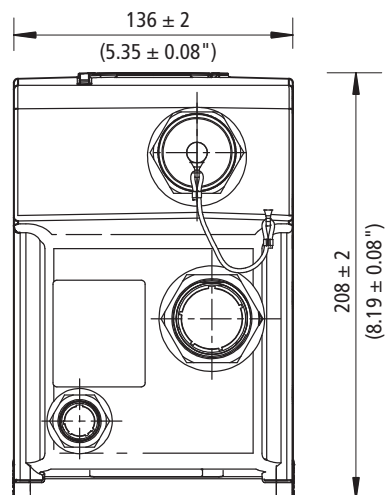
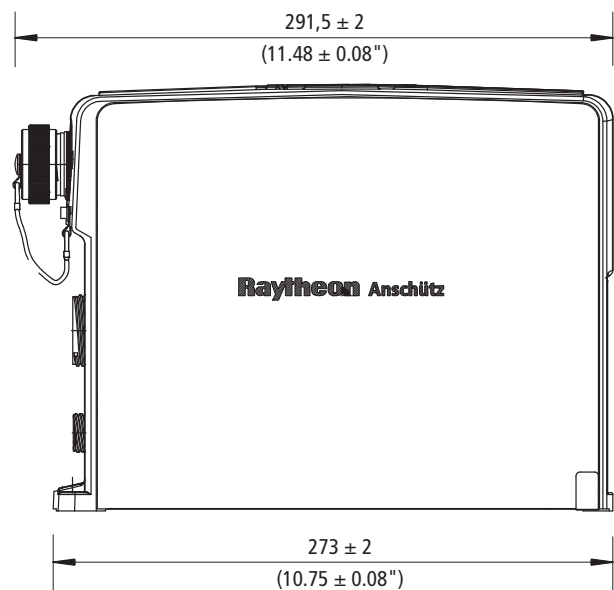
### Weight

Horizon MF: 4,6 kg

### Type of enclosure acc. to IEC/EN 60529

Horizon MF: IP66

Please refer to the Standard 22 brochure for further information about the distribution and operator unit.



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