MGC® maintenance & operation modes

KONGSBERG

When to service the MGC®

The MGC® (Motion Sensor & Gyro Compass) is an IMO type-approved gyro compass designed for maintenance-free operation, requiring no field maintenance or recalibration.

Operational modes

The MGC operates in two distinct modes: INS mode and AHRS mode, each serving different applications with specific operational requirements.

- **AHRS mode**
  When functioning as a gyro compass, the MGC defaults to AHRS (Attitude Heading Reference System) mode, providing precise heading data along with roll, pitch and heave information which you get from an MRU.

- **INS mode**
  For advanced applications requiring position and velocity calculations, the MGC operates in INS (Inertial Navigation System) mode. It utilizes input data such as latitude and velocity, typically from a GNSS receiver, which is essential for accurate heading determination. Additionally, accurate time input and a 1PPS pulse are required for INS mode operation.

Calibration and service

- **AHRS mode**
  Unlike INS mode, AHRS mode does not support automatic sensor calibration. Consequently, static performance in roll, pitch and heading may decrease over time. Customers requiring high static accuracy can opt for recalibration services, which include a comprehensive system checkup and updates. Dynamic roll/pitch performance is not degraded over time.

- **INS mode**
  The MGC autonomously calibrates its internal sensors, eliminating the need for periodic recalibration. However, regular verification of optimal system performance is recommended.

The table to the right shows the estimated static roll/pitch accuracy over time and the influence it has on the heading accuracy over years, depending on the latitude. The ”L” in the table is the latitude.”.

MGC R1 unaided

	2 years	4 years	6 years
Roll/pitch	0.05°	0.15°	0.30°
Heading	1/cos(L)*0.25°	1/cos(L)*0.25° abs(tan(L)*0.15°)	1/cos(L)*0.25° abs(tan(L)*0.30°)

MGC R2 unaided

	2 years	4 years	6 years
Roll/pitch	0.02°	0.05°	0.09°
Heading	1/cos(L)*0.15°	1/cos(L)*0.15° abs(tan(L)*0.05°)	1/cos(L)*0.15° abs(tan(L)*0.09°)

MGC R3 unaided

	2 years	4 years	6 years
Roll/pitch	0.01°	0.02°	0.03°
Heading	1/cos(L)*0.08°	1/cos(L)*0.08° abs(tan(L)*0.02°)	1/cos(L)*0.08° abs(tan(L)*0.03°)

MGC R4 unaided

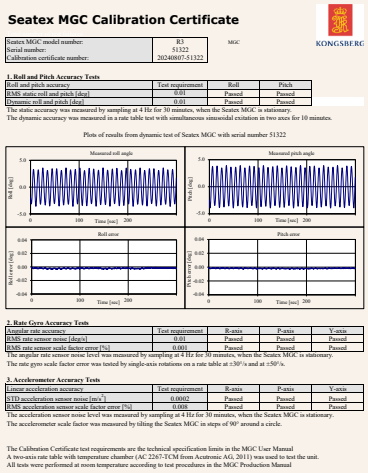
	3 years	6 years	9 years
Roll/pitch	0.008°	0.015°	0.020°
Heading	1/cos(L)*0.04°	1/cos(L)*0.04° abs(tan(L)*0.015°)	1/cos(L)*0.04° abs(tan(L)*0.020°)

MGC R5 unaided

	3 years	6 years	9 years
Roll/pitch	0.008°	0.015°	0.020°
Heading	1/cos(L)*0.02°	1/cos(L)*0.02° abs(tan(L)*0.015°)	1/cos(L)*0.02° abs(tan(L)*0.020°)

Validity of MGC® calibration certificate

An individual Calibration Certificate is generated for each manufactured MGC. The certificate confirms performance for the MGC compared with test requirements valid for the specific type of MGC. The calibration date is printed on the Calibration Certificate. The certificate does not include an expiry date as the MGC will still be working even if there has been a long time since the last calibration.



Seatex MGC Calibration Certificate

Seatex MGC model number:	R3	MGC
Serial number:	51322	
Calibration certificate number:	20240807-51322	

1. Roll and Pitch Accuracy Tests

Roll and pitch accuracy	Test requirement	Roll	Pitch
RMS static roll and pitch [deg]	0.01	Passed	Passed
Dynamic roll and pitch [deg]	0.01	Passed	Passed

The static accuracy was measured by sampling at 4 Hz for 30 minutes, when the Seatex MGC is stationary.
The dynamic accuracy was measured in a rate table test with simultaneous sinusoidal exitation in two axes for 10 minutes.

Plots of results from dynamic test of Seatex MGC with serial number 51322

2. Rate Gyro Accuracy Tests

Angular rate accuracy	Test requirement	R-axis	P-axis	Y-axis
RMS rate sensor noise [deg/s]	0.01	Passed	Passed	Passed
RMS rate sensor scale factor error [%]	0.001	Passed	Passed	Passed

The angular rate sensor noise level was measured by sampling at 4 Hz for 30 minutes, when the Seatex MGC is stationary.
The rate gyro scale factor error was tested by single-axis rotations on a rate table at ±30°/s and at ±50°/s.

3. Accelerometer Accuracy Tests

Linear acceleration accuracy	Test requirement	R-axis	P-axis	Y-axis
STD acceleration sensor noise [m/s^2]	0.0002	Passed	Passed	Passed
RMS acceleration sensor scale factor error [%]	0.008	Passed	Passed	Passed

The acceleration sensor noise level was measured by sampling at 4 Hz for 30 minutes, when the Seatex MGC is stationary.
The accelerometer scale factor was measured by tilting the Seatex MGC in steps of 90° around a circle.

The Calibration Certificate test requirements are the technical specification limits in the MGC User Manual
A two-axis rate table with temperature chamber (AC 2267-TCM from Acutronic AG, 2011) was used to test the unit.
All tests were performed at room temperature according to test procedures in the MGC Production Manual

MGC® dispatch procedure

If a recalibration of an MGC is required, please follow these steps to ensure an efficient and smooth recalibration process:

1. Contact your local Kongsberg Discovery or Kongsberg Maritime office or directly to Kongsberg Discovery AS, Seatex. Email: support.seatex@kd.kongsberg.com. Phone: +47 815 73 700. Please inform about the MGC model and serial number of the unit you want to recalibrate. If you need a spare MGC during recalibration, please ask for a quote.
2. You will receive an RMA (Return Material Authorization) number. This number should follow your shipment.
3. Place the MGC in its original transportation box, or similar hard-shell quality box, to secure safe transportation. Contact local authorities to check if you will need an export license.

MGC® recalibration turnaround time

- In general, the turnaround time for MGC calibration service is three weeks after reception.
- The calibration may uncover the need for service that does not appear during static testing on arrival and thus delays should be expected. The unit must then undergo service followed by a new calibration cycle. The delivery time will be extended accordingly.

Specifications subject to change without any further notice.

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