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Installation Manual

# MGC® COMPASS

Gyro Compass - R-series

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# Gyro Compass - R-series
## Installation Manual

MGC-D-114/408705/14/N

## Document history

| **Document number: MGC-D-114/408705 / Revision** 14/N | | |
|---|---|---|
| Rev. 1 | November 2015 | First issue. |
| Rev. 2 | November 2016 | The operating temperature range on sensor unit and repeater junction box is changed. The DNV GL product certificate is added. The heading resolution on the NMEA output formats HDT and THS is changed to 0.01 degrees. |
| Rev. 3 | January 2017 | The MGC R2 COMPASS product included in this manual |
| Rev. 4 | November 2018 | Description of using neoprene dampers as an option for noise reduction is included. The power and wiring layout drawing have been corrected for incorrect PWR input wiring. |
| Rev. 5 | May 2019 | The heading specification is updated. The MGC-E-JB6 connection box description is included. Updated to correspond with MRC+ version 5.07.00. |
| Rev. 6 | September 2019 | Corrected color code on pin 11 and 12 on the MGC JB6 connection box cable wiring. |
| Rev. 7 | December 2019 | Configuration of analog output from MGC-E-JB6 is described |
| Rev. 8 | January 2021 | Updated to correspond with renewed IMO type approval certificate and JB7 junction box. |
| Rev. 9 | April 2021 | The text for pin 10 and pin 20 on J6 terminal on MGC JB7 has been exchanged. Updated heading specification for MGC R1. |
| Rev. 10 | May 2021 | Added description of the MGC JB7 web configuration program. |
| Rev. 11 | October 2022 | Restructuring of document. Description of LEDs in MGC JB7. Gain calculation for analog Rate-of-Turn corrected. Updated relay description. Updated MGC JB7 configuration program description for JB7 software version 1.00.04. |
| Rev. 12 | February 2023 | Added how to turn on system, grounding information. |
| Rev. 13 | March 2023 | Added Switch Over Unit functionality. |
| Rev. 14 | March 2024 | Added NMEA VER, PSXN 20 and PSXN 23 telegrams. |

## Document information

- Product: MGC® COMPASS
- Document: Installation Manual
- Document part number: MGC-D-114/408705
- Revision: 14/N

## Copyright

## Warning

***The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. You must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.***

***Kongsberg Discovery disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.***

## Disclaimer

*Kongsberg Discovery AS endeavours to ensure that all information in this document is correct and fairly stated, but does not accept liability for any errors or omissions.*

## Support information

If you require maintenance or repair, contact Kongsberg Discovery's support organisation. You can contact us using the following address: support.seatex@kd.kongsberg.com. If you need information about our other products, visit http://www.kongsberg.com/discovery.

# Table of contents

# About this manual

## Purpose of manual

The purpose of this manual is to provide the information, procedures and basic drawings required for the physical installation of the R-series MGC® COMPASS.

## Target audience

The publication is intended for technical personnel such as skilled shipyard and factory workers, electricians, qualified engineers, and naval architects.

## License information

The MGC product requires an export license.

## Software version

This manual and the IMO (International Maritime Organisation) type approval apply to MRU software version 5.06.xx and MRC+ version 5.08.xx.

## Registered trademarks

MGC® is a registered trademark in Norway and Europe.

## Maintenance purposes

This publication is also intended as reference material for the maintenance personnel. Keep this publication for later use.

# MGC® COMPASS

**Topics**



## System description

The MGC® COMPASS consists of the MGC Sensor Unit and the MGC JB7 Junction Box.

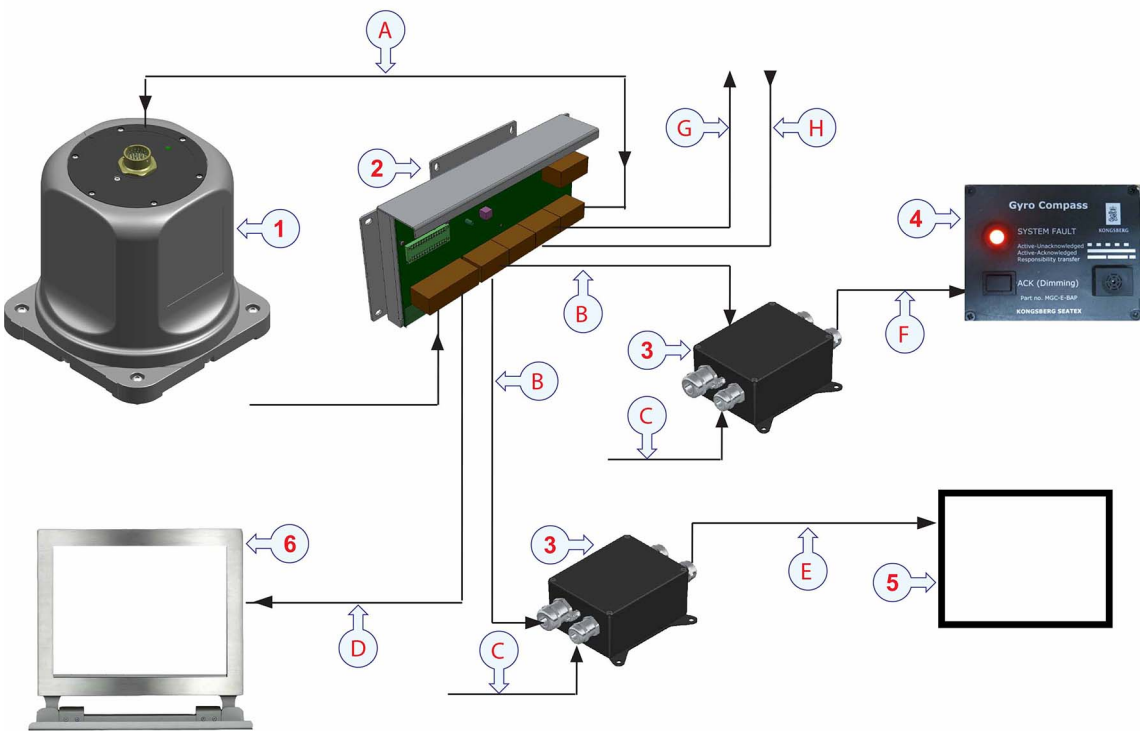
The MGC® COMPASS is type approved by IMO (International Maritime Organisation) as a gyro compass for navigation purposes. It can be used together with a heading and bearing repeater.

The MGC® COMPASS can also be operated as an inertial navigation system. Then it will output position and heading. Linear position and velocity measurements can be output in up to four different points on the vessel.

Special arrangements have been made with regard to mounting of the unit. This makes it easy to align the unit with the vessel axis.

# System diagram

The system diagram identifies the main components of a basic MGC® COMPASS system.




**Main units**

1 *MGC Sensor Unit*

2 *MGC JB7 Junction Box*

3 *MGC JB5 repeater Junction Box*

4 *Bridge Alert Panel*

5 *Data receivers: Heading and bearing repeaters*

6 *Computer with web and MRC+ configuration software*

**Cables**

**A** *Sensor Unit cable (MRU-E-CS8)*

**B** *Repeater data cable*

**C** *Power cable (24 V DC)*

**D** *Ethernet cable (shielded)*

**E** *Data receiver data cable*

**F** *Bridge Alert Panel data cable*

**G** *Data output cable for NMEA messages*

**H** *Data input cable for NMEA messages*

# System units

**Topics**



## Sensor Unit description

The Sensor Unit is a north-seeking gyro compass. It is based on three Ring Laser Gyros (RLG) and three linear accelerometers. The unit can also be operated as an inertial navigation system. Then it will output position and heading.

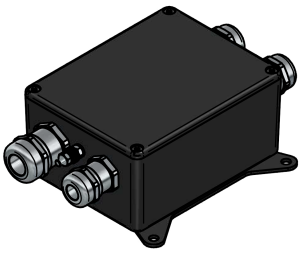

## MGC JB7 Junction Box description

The Junction Box provides extended interfaces between the Sensor Unit and external equipment. The Junction Box is delivered with connectors and pigtail cable(s).

The Junction Box is often mounted inside a cabinet with cable ducts and termination terminals.

## MGC JB5 Repeater Junction Box description

The Junction Box provides connection terminals for the heading and bearing repeater.



## Bridge Alert Panel description

The Bridge Alert Panel is a BAM (Bridge Alert Management) system component. A lamp on the Junction Box and the Bridge Alert Panel will light up if there is a warning. A sound alarm will go off on the Bridge Alert Panel.


# Scope of supply

### Basic items

Observe the basic items provided with a standard MGC® COMPASS delivery.

- 1 ea MGC Sensor Unit

  MGC-R1-COMPASS, MGC-R2-COMPASS, MGC-R3-COMPASS, MGC-R4-COMPASS, MGC-R5-COMPASS.
- 1 ea angle bracket

  For alignment of the Sensor Unit, MGC-M-AB1.
- 1 ea MGC Junction Box

  Junction box with serial communication, Ethernet and DC power input, MGC-E-JB7.
- 2 ea MGC repeater junction boxes

  For Bridge Alert Panel and data receivers, MGC-E-JB5.
- 1 ea MGC Sensor Unit cable

  Heavy-duty screened cable with MGC connector, MGC-E-CS8.
- 1 ea Ethernet cable

  Shielded crossover cable, 1.5 metres, MRU-E-CE2.
- 1 ea Sensor Unit transportation box

  MGC-M-SC51.
- 1 ea MGC configuration software and end user documentation

  Software, calibration file and documentation on USB flash drive, MGC-SW-ED.

### Additional required items

Additional items are required for operation. Additional required items can be purchased from Kongsberg Discovery AS or from a third party supplier.

- Computer for configuration purposes
- Data output cable for NMEA messages

- Data input cable for NMEA messages
- Display

### Additional optional items

The following additional optional items can be used together with the MGC® COMPASS. Additional optional items can be purchased from Kongsberg Discovery AS.

- Sensor Unit adapter base plate
- Cabinet for mounting of MGC Junction Box

# Product restrictions

**Topics**

Restrictions in export, page 14

Restrictions in guarantee, page 14

## Restrictions in export

Export of the MGC component requires an export license.

Important

Notice to customer/importer/end user.

The MGC specified here is shipped from Norway in accordance with the Ministry of Foreign Affairs' Official Notification on Export Control and U.S. Export Administration Regulations (EAR).

The MGC will be subject to restrictions if re-exported from your country, including but not limited to a re-export license from the US Government.

## Restrictions in guarantee

Changes or modifications to the product not explicitly approved by Kongsberg Discovery AS will void the guarantee.

The liability of Kongsberg Discovery AS is limited to repair of this product only under the given terms and conditions stated in the sales documents. Consequential damages such as customer's loss of profit or damage to other systems traceable back to this product's malfunctions, are excluded.

The warranty does not cover malfunctions of the product resulting from the following conditions.

- The Sensor Unit is not shipped in the original transportation box.
- The Sensor Unit has been exposed to extreme shock and vibrations.
- The Sensor Unit housing has been opened by the customer.
- Incorrect power connection.

# Network security

If the MGC® COMPASS product is connected to a local area network, data security is important.

Equipment manufactured by Kongsberg Discovery is often connected to a local area network (LAN). When you connect a computer to a local area network you will always expose the data on that computer. All the other computers connected to the same network may be able to access your data. Several threats are imminent:

- Remote computers can read your data.
- Remote computers can change your data.
- Remote computers can change the behavior of your computer, for example by installing unwanted software.

Usually, two parameters are used to define the threat level:

1 The likelihood that any remote computer will do any of the above.

2 The damage inflicted if a remote computer succeeds doing any of the above.

Kongsberg Discovery has no information about your complete system installation. Products provided by Kongsberg Discovery are always regarded as stand-alone offline systems. They are regarded as stand-alone even though they may be connected to a local area network for sensor interfaces or data distribution.

Note

*No network safety applications are installed on Kongsberg Discovery computers. The computer is not protected against viruses, malware or unauthorized access by external users.*

Securing the MGC® COMPASS system has no meaning unless you have established a policy that secures all the computers on the network. This policy must include physical access by trained and trusted users. The customer or end user of the MGC® COMPASS system is responsible for defining and implementing a security policy and providing the relevant network security applications.

Note

*Kongsberg Discovery will not accept any responsibility for errors or damages caused by unauthorized use of or access to the MGC® COMPASS system.*

# Support information

If you need technical support for your product you must contact a Kongsberg Discovery office. A list of all our offices is available on our website.

- **Company name**: Kongsberg Discovery AS
- **Address**: Havnegata 9, N-7010 Trondheim, Norway
- **Telephone**: +47 33 03 41 00
- **Telephone, global 24h support**:

  Europe, the Middle East and Africa: +47 33 03 24 07

  Asia Pacific: +65 97 11 24 07

  Americas: +15 04 303 5244
- **E-mail address**: support.seatex@kd.kongsberg.com
- **Website**: http://www.kongsberg.com/discovery

### KM-Support App

Kongsberg Discovery support is also available in the KM-Support App. Our support application is available for free in the App Store and Google Play.

# Preparing the installation

**Topics**



## Mechanical drawings

Outline dimension drawings are included in this manual.

Unless otherwise specified, all measurements are in millimetres. The drawings are not to scale.

## Necessary tools and equipment

We assume that you are equipped with a standard set of tools. This tool set must comprise the normal tools for electronic and electromechanical tasks. This includes different screwdriver types, pliers, spanners, a cable stripper, a soldering iron, etc.Each tool must be provided in various sizes. We recommend that all tools are demagnetized to protect your equipment.

Unless otherwise stated, all mounting hardware (such as bolts, nuts, washers, screws etc.) referred to in this document is to be supplied by the customer or the shipyard.

**Special equipment**:

- Torque screwdriver, less than 10 Nm

# Sensor Unit transportation box

The unit is shipped in a specially designed transportation box. Keep the unit stored within the box until everything is ready for installation of the unit.

Note

*After the unit has been installed, please keep the transportation box. The unit must be shipped in this box for maintenance or repair in order to maintain the warranty.*

# Location of hardware units

**Topics**



## Sensor Unit location

Correct location of the unit is important for the system performance. Consider these factors when installing the unit.

- The unit is designed for installation in an indoor environment and for operation within the temperature range.
- Mount the unit with the Forward arrow on the Sensor Unit top pointing in the bow direction and parallel to the centre line of the vessel.
- Mount the unit onto a rigid and stable structure. Mount the unit directly onto the hull structure, if possible.
- Mount the unit away from areas with high frequency vibrations. Such as hydraulic pumps and valves.
- Mount the unit away from the heat of machinery, heaters and air conditioning systems.
- Mount the unit in a location where it is not subject to sea water.

**Be aware of vibrations**

The unit has some sensitivity to vibrations around sequences of 100 Hz (100, 200, 300 Hz and so on). Such vibrations should not exceed 0.5 $m/s^2$ in any direction.

**Be aware of resonance**

Take care when mounting the Sensor Unit to the vessel's hull. This to avoid self-resonance, which in turn can amplify the dithering frequencies of the gyroscopes. Around 600 Hz. A correctly mounted Sensor Unit will typically emit 58 - 64 dBA (1 metre). If not mounted correctly, the sound pressure level may increase to 85 dBA.

**Be aware of temperature changes**

The unit is sensitive to frequent temperature changes. The safest location for the unit is where the temperature is low and the changes in temperature are slow.

**Be aware of corrosion**

The unit must not be subject to an environment which can cause corrosion. For example exposure to sea water.

**Related topics**

Sensor Unit dimensions, page 73
Angle bracket dimensions, page 74
Sensor Unit and angle bracket mounting, page 75
Mounting the Sensor Unit, page 22

## MGC JB7 Junction Box location

Consider these factors when installing the junction box.

- The Sensor Unit cable is 5 metres long. The junction box must be placed within the distance of the 5-metre Sensor Unit cable.
- The junction box can be mounted inside a cabinet or it can be mounted as a stand-alone unit directly on the bulkhead.
- If you mount the junction box within a cabinet, place the cabinet within two meters of the Sensor Unit.
- Make sure that the cabinet door can be fully opened for unrestricted access.

**Related topics**

MGC JB7 Junction Box dimensions, page 76
Cabinet dimensions, page 80
Installing the MGC JB7 Junction Box as a stand-alone unit, page 26
Installing the MGC JB7 Junction Box inside a cabinet, page 27

## Bridge Alert Panel location

Consider these factors when installing the unit.

- The best location is typically on the bridge.

**Related topics**
Bridge Alert Panel dimensions, page 79
Installing the Bridge Alert Panel, page 30

## MGC JB5 Repeater Junction Box location

Consider these factors when installing the Junction Box.

- Place the Junction Box close to the repeater. The distance is determined by the length of the cable.
- Place the Junction Box on the floor or on a wall.
- Place the Junction Box in a location where it is easily accessible.

**Related topics**
MGC JB5 Repeater Junction Box dimensions, page 78
Installing the MGC JB5 Repeater Junction Box, page 29

## Repeater unit location

### Heading repeater

Consider these factors when installing the unit.

- The best location is typically on the bridge.

### Bearing repeater

Consider these factors when installing the unit.

- The best location is typically on the bridge wings.

# MGC® COMPASS power requirements

The MGC® COMPASS must be powered by a clean 24 V DC source. The MGC® COMPASS power lines are galvanically isolated from the signal circuits inside the unit. The maximum isolation voltage inside the MGC® COMPASS is 200 V DC.

*Caution*

*Permanent damage to the MGC® COMPASS may occur if power is applied to the Ethernet or digital conductors. Therefore, it is very important to measure the power voltage at the connector before the MGC® COMPASS is connected. Any damage resulting from incorrect connection or power, is not covered by the Kongsberg Discovery AS warranty.*

**Related topics**

Mounting the Sensor Unit, page 22

# System communication ports description

The MGC® COMPASS has 8 communication lines. The digital communication lines COM1, COM2, COM3, COM4, COM5, COM6, COM7 and COM8 have separate ground (GND). They are isolated from the MGC® COMPASS power system.

The Ethernet connection pins RJ_1, 2, 3 and 6 are isolated from the MGC® COMPASS power system.

### COM 1, 2, 3 and 4

These ports are RS-422 input and output lines. Transmit is on OUT and receive on IN.

### COM 5

This is an RS-422 output line and input line for PPS. The PPS signal is connected to the PPSA- and PPSB+ terminals. The PPS signal shares ground with the COM5 input.

### COM 6, 7 and 8

These are RS-422 output lines with fixed baud rate (4800 baud). These ports are output on selectable replica port (Replica 1–8).

### Ethernet LANs

Three separate LAN ports are available. They are configured through the MGC JB7 web interface.

# Installation

**Topics**



## Mounting the Sensor Unit

A correct installation of the Sensor Unit is important in order to ensure high quality and accurate measurements.

### Prerequisites

You have found a rigid and stable mounting surface for the unit. This is important in order to avoid vibration and resonance.

If your Sensor Unit is a replacement unit, it is useful to have an adapter base plate on which to place the Sensor Unit and the angle bracket.

You can either buy a ready made adapter base plate from Kongsberg Discovery AS or you can make your own adapter base plate. The ready made adapter base plate has holes which fit the Sensor Unit and the base plate for an easier installation.

If your Sensor Unit is a new installation, you do not need an adapter base plate.

### Context

**Sensor Unit base plate**

If you make your own base plate, you can use the provided bolt pattern to mark the holes.

- Place the Sensor Unit and the angle bracket in an orientation where the **Forward** arrow at the top of the unit is pointing in the bow direction.

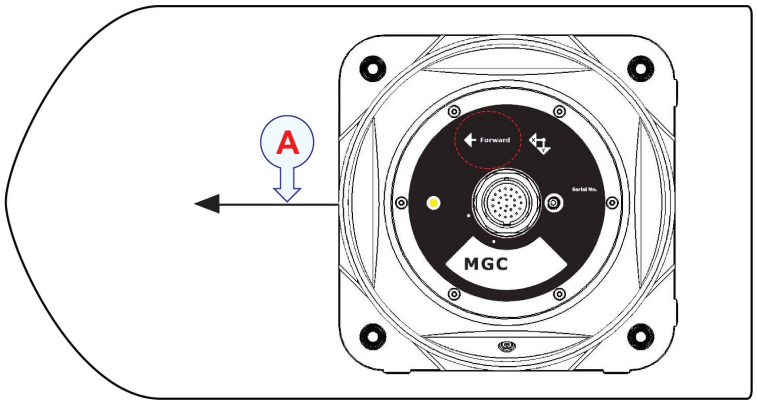
- Mark seven holes in the mounting surface for the Sensor Unit and the angle bracket screws.
- Remove the Sensor Unit and the angle bracket.
- Drill seven M6 holes in the mounting surface for the Sensor Unit and the angle bracket screws.
- Thread seven M6 screw holes with threaded depth minimum 11 mm.

**Sensor Unit angle bracket**

It is optional to use the angle bracket. However, it is very useful if you for some reason have to move the Sensor Unit. Then the angle bracket will remain in place and it will be easy to reinstall the Sensor Unit.

**Sensor Unit mounting orientation**

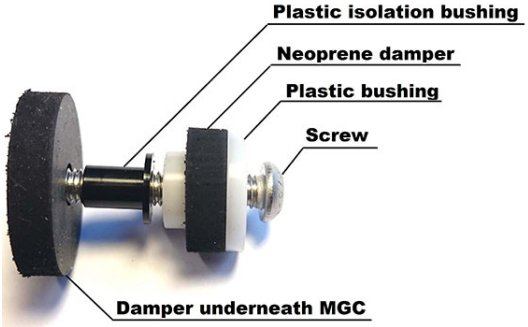
The default mounting orientation for the unit is with the **Forward** arrow at the top of the unit pointing in the bow direction of the vessel.




**A** *Bow direction of vessel*

**Neoprene dampers**

As an option you can use neoprene dampers in order to reduce the noise. The dampers are then placed underneath each insulation disk on the Sensor Unit base plate. You can also use the dampers for the angle bracket.



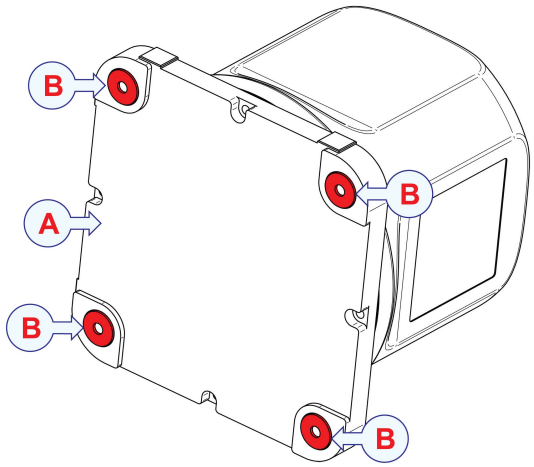
## Procedure

1 Identify the best mounting location for the unit.

2 Make sure that the insulation disks surrounding the four screw holes on the Sensor Unit base plate are in place.

Important

This is important for electrical and mechanical insulation of the unit from the mounting surface due to earthing. It is also important in order to prevent corrosion.




**A** *Sensor Unit base plate*

**B** *Insulation disks surrounding screw holes*

3 Place the base plate for the Sensor Unit on the mounting surface.

4 Place the Sensor Unit on top of the base plate, in an orientation where the **Forward** arrow at the top of the unit is pointing in the bow direction.

5 **Mounting without neoprene dampers**

a Enter a plastic bushing, a washer and an M6 screw for each Sensor Unit screw hole.

b Tighten the screws to fasten the Sensor Unit.

Tighten the four M6 screws for the Sensor Unit in steps in a diagonal pattern. Recommended torque steps is 1.5 Nm, 3.5 Nm and 7.9 Nm.

6 **Mounting with neoprene dampers**

a Assemble the neoprene damper on the M6 screw. Assembly instructions can be found in neoprene damper kit.

Take the screw and place one plastic bushing, the neoprene damper and the plastic isolation bushing on the screw.

It is recommended to apply Loctite 243 glue or equivalent glue on the screws.

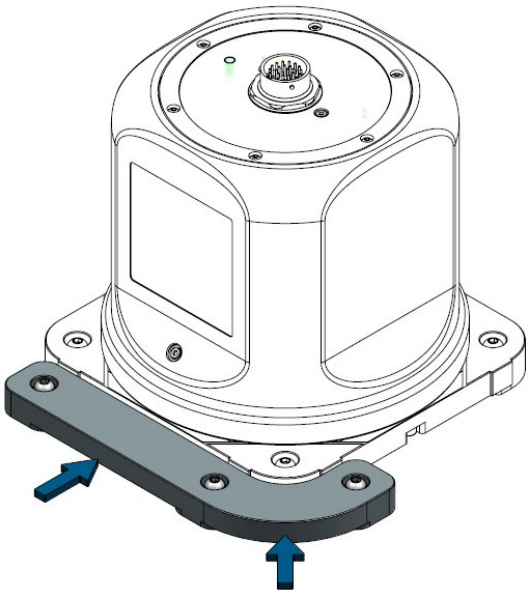
b Place a neoprene damper underneath each of the Sensor Unit insulation disks.

c Tighten the screws to fasten the Sensor Unit.

Tighten the four M6 screws for the Sensor Unit in steps in a diagonal pattern. Recommended torque steps is 1.5 Nm, 3.5 Nm and 7.9 Nm.

d If you are using the angle bracket, repeat the procedure for the three angle bracket screws.

7 Place the angle bracket next to the Sensor Unit.



8 Fasten the angle bracket.

Tighten the three M6 screws in steps while applying pressure to the angle bracket towards the Sensor Unit. Recommended torque steps is 1.5 Nm, 3.5 Nm and 7.9 Nm.

**Related topics**

Sensor Unit location, page 18
Sensor Unit dimensions, page 73
Angle bracket dimensions, page 74
Sensor Unit and angle bracket mounting, page 75
Cabling between Sensor Unit and MGC JB7 Junction Box, page 34
MGC® COMPASS power requirements, page 20

# Installing the MGC JB7 Junction Box as a stand-alone unit

The Junction Box provides extended interfaces between the Sensor Unit and external equipment.

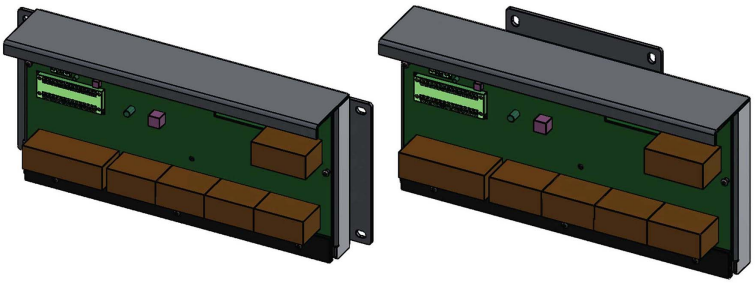
### Prerequisites

The junction box can be mounted as a stand-alone unit directly on the bulkhead.

### Context

The Sensor Unit cable is 5 metres long. Mount the junction box within the distance of the 5-metre Sensor Unit cable.

Two mounting brackets are included in the delivery. They can be placed vertically or horizontally on the junction box.



### Procedure

1 Find a suitable location for the junction box.

2 Attach the mounting brackets to the junction box. Horizontally or vertically.

3 Fasten the junction box with four screws.

4 Secure the screws with washers and nuts.

### Related topics

MGC JB7 Junction Box location, page 19
MGC JB7 Junction Box dimensions, page 76
Relays in MGC JB7 Junction Box, page 33
Connecting IEC 61162:1 and IEC 61162:2 devices, page 33
Cabling between Sensor Unit and MGC JB7 Junction Box, page 34
MGC JB7 Junction Box connections, page 36

# Installing the MGC JB7 Junction Box inside a cabinet

The Junction Box provides extended interfaces between the Sensor Unit and external equipment.

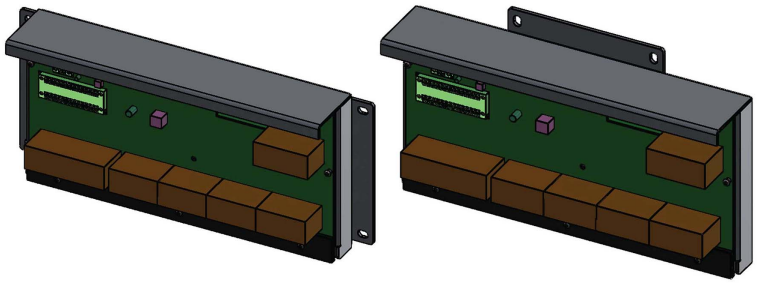
### Prerequisites

The junction box can be mounted inside a cabinet. You can use an existing cabinet or you can buy a new one. Make sure that you have a cabinet which is suitable for the junction box installation.

### Context

The Sensor Unit cable is 5 metres long. The cabinet must not be mounted more than 4 metres away from the Sensor Unit. Make sure that the cabinet door can be fully opened for unrestricted access.

Two mounting brackets are included in the delivery. They can be placed vertically or horizontally on the junction box.



The illustration shows an example of a junction box mounted inside a cabinet. It shows the junction box, cable ducts, power and communication terminals on a mounting plate. The cabinet used here is a RITTAL AX 1050.000 cabinet.


### Procedure

1 Find a suitable location for the cabinet.

2 Attach the mounting brackets to the junction box. Horizontally or vertically.

3 Fasten the junction box with four screws inside the cabinet.

4 Secure the screws with washers and nuts.

### Related topics

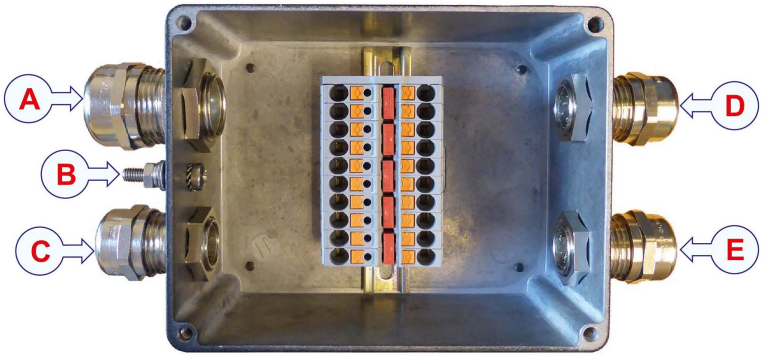
MGC JB7 Junction Box location, page 19
MGC JB7 Junction Box dimensions, page 76
Cabinet dimensions, page 80
MGC JB7 Junction Box wiring inside cabinet, page 81
MGC JB7 power connection inside cabinet, page 82
Relays in MGC JB7 Junction Box, page 33
Connecting IEC 61162:1 and IEC 61162:2 devices, page 33
Cabling between Sensor Unit and MGC JB7 Junction Box, page 34
MGC JB7 Junction Box connections, page 36

# Installing the MGC JB5 Repeater Junction Box

The repeater junction box provides connection terminals for data receivers such as heading and bearing repeaters.

## Context

The mounting bracket is pre-attached to the box. Mount the box where it is easy to run the cables into the box. The terminals within the box must be easily accessible. The box can be mounted on a wall or a horizontal surface.




**A** *Signal cable from MGC JB7 Junction Box*

**B** *Chassis ground*

**C** *Power cable*

**D** *Data receiver no. 1 data cable*

**E** *Data receiver no. 2 data cable*

## Procedure

1 Find a suitable location for the junction box close to the repeater.

2 Fasten the box to the surface with four 5 mm screws.

3 Unscrew and remove the lid.

4 Connect the wires for the signal and power cable input. Through glands A and C.

5 Connect the wires for the signal and power cable output. Through glands D and/or E.

6 Replace the lid and tighten the screws.

## Related topics

MGC JB5 Repeater Junction Box location, page 20
MGC JB5 Repeater Junction Box dimensions, page 78

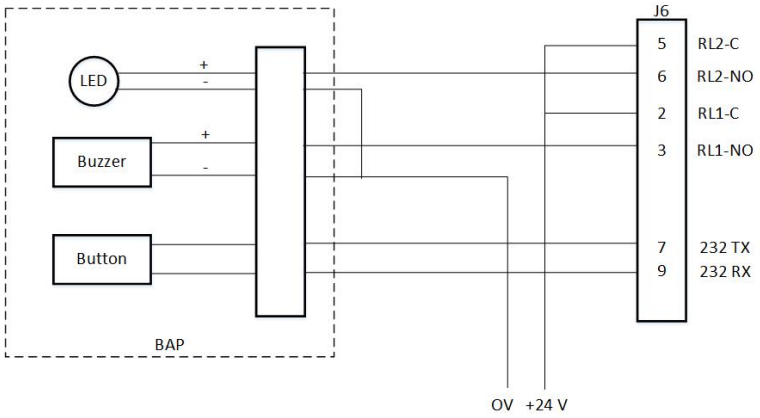
# Installing the Bridge Alert Panel

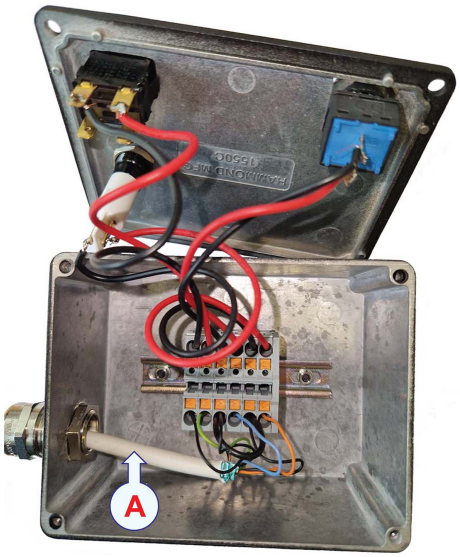
The Bridge Alert Panel is a BAM (Bridge Alert Management) system component. It is to be used when no CAM (Central Alert Management) system is present.

## Context

The mounting bracket is pre-attached to the box. Mount the box where it is easy to run the cables into the box. The terminals within the box must be easily accessible. The box can be mounted on a wall or a horizontal surface.

The schematics for connecting the Bridge Alert Panel (BAP) to the J6 terminal in the MGC JB7 Junction Box is illustrated.




**A** *Power cable from terminal J6 in MGC JB7 Junction Box*

## Procedure

1 Find a suitable location for the Bridge Alert Panel close to the repeater.

2 Fasten the box to the surface with four 5 mm screws.

3 Unscrew and remove the lid.

4 Connect the wires for the power cable.

5 Replace the lid and tighten the screws.

**Related topics**

Bridge Alert Panel location, page 20
Bridge Alert Panel dimensions, page 79

# Cable layout and interconnections

**Topics**



## MGC JB7 Junction Box grounding system

The Junction Box consist of the following two grounding systems:

**Chassis ground (GGND)**

The chassis ground is by design equal to power ground. For systems that require a floating chassis ground with reference to power ground, a standard DC/DC converter must be used to supply the Junction Box 24 V input.

**Communication ground (CGND)**

All the digital communication lines have separate ground (GND) and they are separated from the MGC COMPASS power system. It is important that the ground (GND) for each communication line used is terminated in the junction box. If not, noise on the communication line could occur for baud rates higher than 4800.

**Related topics**

MGC JB7 Junction Box connections, page 36

# Relays in MGC JB7 Junction Box

The junction box has three relays: RL1, RL2 and RL3B. They are 60 Volt, 1 A solid state relays, with form C contacts (NO-C-NC). RL1 and RL2 are for BAM (Bridge Alert Management). The normal state of the relays is inactivated.

- **Relay 1 (RL1)**: Alarm LED. It is activated when heading is invalid.
- **Relay 2 (RL2)**: Alarm Buzzer. It is activated when heading is invalid.
- **Relay 3 (RL3)**: Power Good Indicator. It is activated when only one of the two 24 Volt power inputs are missing.

**Related topics**

Installing the MGC JB7 Junction Box as a stand-alone unit, page 26
Installing the MGC JB7 Junction Box inside a cabinet, page 27

# RS-422 A and B signal definition

Signal state definition according to the IEC 61162-1 standard from the International Electrotechnical Committee.

The idle, marking, logical 1, OFF or stop bit states are defined by a negative voltage on line A with respect to line B. The active, spacing, logical 0, ON or start bit states are defined by a positive voltage on line A with respect to line B. It should be noted that the above A with respect to B levels are inverted from the voltage input/output requirements of standard UARTs and that many line drivers and receivers provide a logic inversion.

# Connecting IEC 61162:1 and IEC 61162:2 devices

Devices mentioned in the IEC 61162-1 standard (International Electrotechnical Commission) do not require a signal ground (Common) connection, and could be connected to the TxA-/TxB+ and RxA-/TxB+ pairs only.

According to the IEC 61162-2 standard, a common signal ground is required between devices, hence the Common signal must be terminated in both ends. The MGC JB7 Junction Box connections do not use the cable shield as a conductor, hence the common signal ground should be connected to a separate conductor. The common connector should be connected to the GND connector on the selected port.

The report rate for the THS message IEC 61162-2 devices should be set to 20 ms/50 Hz to comply with the ISO 8728 standard (International Organization for Standardization). A serial device should be connected to the Tx and Rx pair and GND signal (see 61162-1

description above). For listen only devices, connection to the Tx pair and GND is sufficient.

A cable shield should always be connected to equipment chassis in the sender end.

**Related topics**

Installing the MGC JB7 Junction Box as a stand-alone unit, page 26
Installing the MGC JB7 Junction Box inside a cabinet, page 27

# Cabling between Sensor Unit and MGC JB7 Junction Box

The Junction Box provides extended interfaces between the Sensor Unit and external equipment.

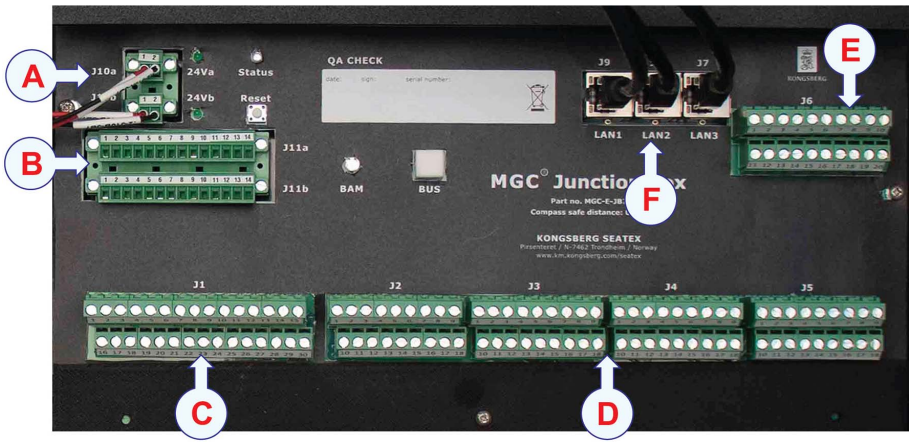
## Context

The Junction Box can be mounted inside a cabinet or it can be stand-alone.

Cables with shield has to be used in order to fulfil the MGC® COMPASS power and EMC requirements. The cable shield must be connected to ground in both ends.

The terminal blocks for the J1 to J6 terminals can accommodate wires of until 2.5 $mm^2$.

The web interface is used for configuration of the output on the replica ports. In the web interface you can select which COM port (COM 1 to COM 8) to be replicated at the preferred replica port. For each replica port, the signal is available on three terminals (RXA, RXB and RXC, where X is the replica port number).



| | | | |
|---|---|---|---|
| **A** | *Power connections* | **D** | *Replica ports* |
| **B** | *Sensor Unit connection* | **E** | *Relay and analog ports* |
| **C** | *COM ports 1 to 5* | **F** | *Network connections* |

## Procedure

1 Connect the connector on the Sensor Unit cable into the connector at the top of the Sensor Unit.

2 Terminate the wires to the J11a and J11b terminals in the junction box.

3 Terminate the power wires into the J10a and J10b terminals.

4 Terminate the wires for RS-422 signal distribution to output on COM 1, 2, 3, 4 or 5 on the J1 terminal.

5 Terminate wires for any other RS-422 input to COM1, 2, 3 or 4 on the J1 terminal.

6 Terminate the wires for PPS input to the J1 terminal.

7 Terminate the wires for network connection, LAN 1, 2, 3 to the LAN ports.

8 Terminate the wires for analog output signals and status signals from relays to the J6 terminal, upper part.

9 Terminate the wires for relay signals and analog output to the J6 terminal, lower part.

10 Terminate the wires for replica output to the terminals J2 to J5.

11 Make sure that the cable shields are in contact with the cable glands for grounding.

12 Fasten the Sensor Unit cable to the wall, cable ladder or cable tray using cable strips or similar.

13 Apply power to the junction box when all cable wires are connected.

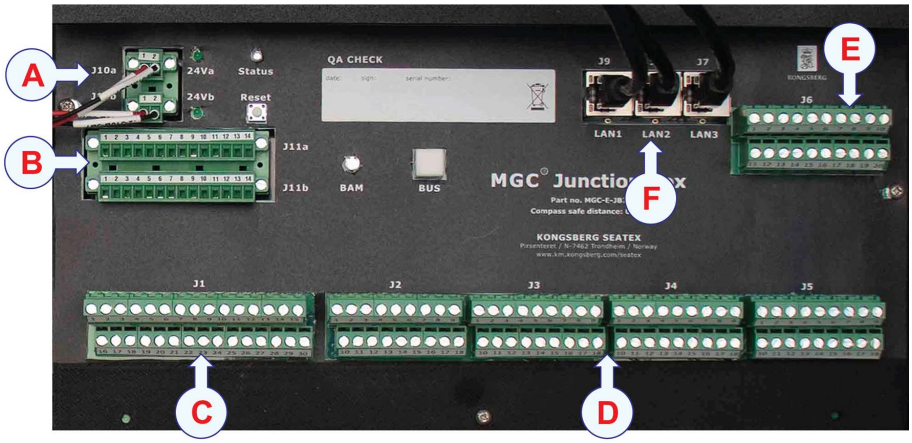
14 Observe the status LED on the Sensor Unit. If the LED is lit, the installation is finished.

## Related topics

Mounting the Sensor Unit, page 22
Installing the MGC JB7 Junction Box as a stand-alone unit, page 26
Installing the MGC JB7 Junction Box inside a cabinet, page 27

# MGC JB7 Junction Box connections

The Junction Box provides extended interfaces between the Sensor Unit and external equipment.




| | | | |
|---|---|---|---|
| **A** | *Power connections* | **D** | *Replica ports* |
| **B** | *Sensor Unit connection* | **E** | *Relay and analog ports* |
| **C** | *COM ports 1 to 5* | **F** | *Network connections* |

The system has the following communication signals which are to be distributed on:

- 5 COM ports
- 8 replica ports with three outputs each
- 3 network LANs
- 4 analog signals
- 3 relays

### MGC JB7 Junction Box power connections

| J10a terminal | | | J10b terminal | | |
|---|---|---|---|---|---|
| **Pin** | **Signal** | **Description** | **Pin** | **Signal** | **Description** |
| 1 | PWR1+ | Power supply (+24 V) | 1 | PWR2+ | Power supply (+24 V) |
| 2 | PWR0- | Power supply (0 V) | 2 | PWR0- | Power supply (0 V) |

Note

*In order to obtain a floating chassis ground with reference to the power ground, an external standard DC/DC converter must be used to supply the Junction Box terminals J10a and J10b with 24 V input.*

## MGC JB7 Junction Box Ethernet connections

| Ethernet connections | |
|---|---|
| **Port** | **Connection** |
| LAN 1 | PP1 - Data 1 |
| LAN 2 | PP1 - Data 2 |
| LAN 3 | PP1 - Data 3 |

## MGC JB7 Junction Box - Sensor Unit cable connections

*Table 1 Sensor Unit cable connections in the JB7 Junction Box - J11A terminal*

| J11A terminal | | | | |
|---|---|---|---|---|
| **Pin** | **Signal** | | **Pair no.** | **Colour** |
| 1 | MTX1_A- | RS-422A-, output data from MGC | 2b | Orange |
| 2 | MTX1_B+ | RS-422B+, output data from MGC | 2a | White |
| 3 | MRX1_A- | RS-422A-, input data to MGC | 3b | Green |
| 4 | MRX1_B+ | RS-422B+, input data to MGC | 3a | White |
| 5 | MRX2_A- | RS-232, data to MGC | 7a | Red |
| 6 | MRX2_B+ | | 14a | Black |
| 7 | MTX2_A- | RS-232, data from MGC | 7b | Orange |
| 8 | MTX2_B+ | | 14b | Brown |
| 9 | MRX3_A- | RS-422A- or RS-232, input to MGC | 8a | Red |
| 10 | MRX3_B+ | RS-422B+ or RS-232, return to MGC | 8b | Green |
| 11 | MRX4_A- | RS-422A- or RS-232, input to MGC | 9a | Red |
| 12 | MRX4_B+ | RS-422B+ or RS-232, return to MGC | 9b | Brown |
| 13 | DISP0 | Internal control | 12a | Black |
| 14 | DISP1 | Internal control | 12b | Orange |

*Table 2 Sensor Unit cable connections in the JB7 Junction Box - J11B terminal*

| J11B terminal | | | | |
|---|---|---|---|---|
| **Pin** | **Signal** | | **Pair no.** | **Colour** |
| 1 | PWR- | Power supply (0 V) | 1b | Blue |
| 2 | PWR+ | Power supply (+24 V) | 1a | White |
| 3 | RJ-1 | TD+, Ethernet | 4a | White |
| 4 | RJ-2 | TD-, Ethernet | 4b | Brown |
| 5 | RJ-3 | RD+, Ethernet | 6a | Red |
| 6 | RJ-6 | RD-, Ethernet | 6b | Blue |
| 7 | Alert | MGC alert | 5a | White |
| 8 | GND | MGC ground | 5b | Grey |
| 9 | XIN | Signal to MGC | 10b | Grey |
| 10 | CGND | Communication ground | 10a | Red |
| 11 | EOUT | Signal from MGC, 5 Volt level | 11b | Blue |
| 12 | XOUT | Signal from MGC, 5 Volt level | 11a | Black |
| 13 | DISP2 | Internal control | 13a | Black |
| 14 | VDD | 5 Volt out, max. 20 mA | 13b | Green |

## MGC JB7 Junction Box signal distribution connections

*Table 3 J1 terminal in the JB7 Junction Box*

| J1 terminal | | | | | |
|---|---|---|---|---|---|
| Pin | Signal | | Pin | Signal | |
| 1 | TX1_B+ | COM1, RS-422 output | 16 | TX4_B+ | COM4, RS-422 output |
| 2 | TX1_A- | COM1, RS-422 output | 17 | TX4_A- | COM4, RS-422 output |
| 3 | GND1 | COM1, signal ground | 18 | GND4 | COM4, signal ground |
| 4 | RX1_B+ | COM1, RS-422 input | 19 | RX4_B+ | COM4, RS-422 input |
| 5 | RX1_A- | COM1, RS-422 input | 20 | RX4, A- | COM4, RS-422 input |
| 6 | TX2_B+ | COM2, RS-422 output | 21 | TX5_B+ | COM5, RS-422 output |
| 7 | TX2_A- | COM2, RS-422 output | 22 | TX5_A- | COM5, RS-422 output |
| 8 | GND2 | COM2, signal ground | 23 | GND5 | COM5, signal ground |
| 9 | RX2_B+ | COM2, RS-422 input | 24 | RX5_B+ | COM5, RS-422 input |
| 10 | RX2A- | COM2, RS-422 input | 25 | RX5_A- | COM5, RS-422 input |
| 11 | TX3_B+ | COM3, RS-422 output | 26 | TXP_B+ | COMP, RS-422 output |
| 12 | TX3_A- | COM3, RS-422 output | 27 | TXP_A- | COMP, RS-422 output |
| 13 | GND3 | COM3, signal ground | 28 | GND5 | COM5, signal ground |
| 14 | RX3_B+ | COM3, RS-422 input | 29 | PPS_B+ | PPS input |
| 15 | RX3_A- | COM3, RS–422 input | 30 | PPS_A- | PPS input |

*Table 4 J2 terminal in the JB7 Junction Box*

| J2 terminal | | | | | |
|---|---|---|---|---|---|
| Pin | Signal | | Pin | Signal | |
| 1 | R1A_GND | Replica port 1A, RS-422 ground | 10 | R2A_GND | Replica port 2A, RS-422 ground |
| 2 | R1A_TX_A- | Replica port 1A, RS-422 output | 11 | R2A_TX_A- | Replica port 2A, RS-422 output |
| 3 | R1A_TX_B+ | Replica port 1A, RS-422 output | 12 | R2A_TX_B+ | Replica port 2A, RS-422 output |
| 4 | R1B_GND | Replica port 1B, RS-422 ground | 13 | R2B_GND | Replica port 2B, RS-422 ground |
| 5 | R1B_TX_A- | Replica port 1B, RS-422 output | 14 | R2B_TX_A- | Replica port 2B, RS-422 output |
| 6 | R1B_TX_B+ | Replica port 1B, RS-422 output | 15 | R2B_TX_B+ | Replica port 2B, RS-422 output |
| 7 | R1C_GND | Replica port 1C, RS-422 ground | 16 | R2C_GND | Replica port 2C, RS-422 ground |
| 8 | R1C_TX_A- | Replica port 1 C, RS-422 output | 17 | R2C_TX_A- | Replica port 2C, RS-422 output |
| 9 | R1C_TX_B+ | Replica port 1 C, RS-422 output | 18 | R2C_TX_B+ | Replica port 2C, RS-422 output |

*Table 5 J3 terminal in the JB7 Junction Box*

| J3 terminal | | | | | |
|---|---|---|---|---|---|
| Pin | Signal | | Pin | Signal | |
| 1 | R3A_GND | Replica port 3A, RS-422 ground | 10 | R4A_GND | Replica port 4A, RS-422 ground |
| 2 | R3A_TX_A- | Replica port 3A, RS-422 output | 11 | R4A_TX_A- | Replica port 4A, RS-422 output |
| 3 | R3A_TX_B+ | Replica port 3A, RS-422 output | 12 | R4A_TX_B+ | Replica port 4A, RS-422 output |
| 4 | R3B_GND | Replica port 3B, RS-422 ground | 13 | R4B_GND | Replica port 4B, RS-422 ground |
| 5 | R3B_TX_A- | Replica port 3B, RS-422 output | 14 | R4B_TX_A- | Replica port 4B, RS-422 output |
| 6 | R3B_TX_B+ | Replica port 3B, RS-422 output | 15 | R4B_TX_B+ | Replica port 4B, RS-422 output |
| 7 | R3C_GND | Replica port 3C, RS-422 ground | 16 | R4C_GND | Replica port 4C, RS-422 ground |
| 8 | R3C_TX_A- | Replica port 3C, RS-422 output | 17 | R4C_TX_A- | Replica port 4C, RS-422 output |
| 9 | R3C_TX_B+ | Replica port 3C, RS-422 output | 18 | R4C_TX_B+ | Replica port 4C, RS-422 output |

*Table 6 J4 terminal in the JB7 Junction Box*

| J4 terminal | | | | | |
|---|---|---|---|---|---|
| Pin | Signal | | Pin | Signal | |
| 1 | R5A_GND | Replica port 5A, RS-422 ground | 10 | R6A_GND | Replica port 6A, RS-422 ground |
| 2 | R5A_TX_A- | Replica port 5A, RS-422 output | 11 | R6A_TX_A- | Replica port 6A, RS-422 output |
| 3 | R5A_TX_B+ | Replica port 5A, RS-422 output | 12 | R6A_TX_B+ | Replica port 6A, RS-422 output |
| 4 | R5B_GND | Replica port 5B, RS-422 ground | 13 | R6B_GND | Replica port 6B, RS-422 ground |
| 5 | R5B_TX_A- | Replica port 5B, RS-422 output | 14 | R6B_TX_A- | Replica port 6B, RS-422 output |
| 6 | R5B_TX_B+ | Replica port 5B, RS-422 output | 15 | R6B_TX_B+ | Replica port 6B, RS-422 output |
| 7 | R5C_GND | Replica port 5C, RS-422 ground | 16 | R6C_GND | Replica port 6C, RS-422 ground |
| 8 | R5C_TX_A- | Replica port 5C, RS-422 output | 17 | R6C_TX_A- | Replica port 6C, RS-422 output |
| 9 | R5C_TX_B+ | Replica port 5C, RS-422 output | 18 | R6C_TX_B+ | Replica port 6C, RS-422 output |

*Table 7 J5 terminal in the JB7 Junction Box*

| J5 terminal | | | | | |
|---|---|---|---|---|---|
| Pin | Signal | | Pin | Signal | |
| 1 | R7A_GND | Replica port 7A, RS-422 ground | 10 | R8A_GND | Replica port 8A, RS-422 ground |
| 2 | R7A_TX_A- | Replica port 7A, RS-422 output | 11 | R8A_TX_A- | Replica port 8A, RS-422 output |
| 3 | R7A_TX_B+ | Replica port 7A, RS-422 output | 12 | R8A_TX_B+ | Replica port 8A, RS-422 output |
| 4 | R7B_GND | Replica port 7B, RS-422 ground | 13 | R8B_GND | Replica port 8B, RS-422 ground |
| 5 | R7B_TX_A- | Replica port 7B, RS-422 output | 14 | R8B_TX_A- | Replica port 8B, RS-422 output |
| 6 | R7B_TX_B+ | Replica port 7B, RS-422 output | 15 | R8B_TX_B+ | Replica port 8B, RS-422 output |
| 7 | R7C_GND | Replica port 7C, RS-422 ground | 16 | R8C_GND | Replica port 8C, RS-422 ground |
| 8 | R7C_TX_A- | Replica port 7C, RS-422 output | 17 | R8C_TX_A- | Replica port 8C, RS-422 output |
| 9 | R7C_TX_B+ | Replica port 7C, RS-422 output | 18 | R8C_TX_B+ | Replica port 8C, RS-422 output |

*Table 8 J6 terminal in the JB7 Junction Box*

| J6 terminal | | | | | |
|---|---|---|---|---|---|
| Pin | Signal | | Pin | Signal | |
| 1 | RL1_NC | Relay 1, normally closed | 11 | AGND | Analog ground |
| 2 | RL1_C | Relay 1, common | 12 | ANA1 | Analog 1, output |
| 3 | RL1_NO | Relay 1, normally open | 13 | AGND | Analog ground |
| 4 | RL2_NC | Relay 2, normally closed | 14 | ANA2 | Analog 2, output |
| 5 | RL2_C | Relay 2, common | 15 | AGND | Analog ground |
| 6 | RL2_NO | Relay 2, normally open | 16 | ANA3 | Analog 3, output |
| 7 | 232_TX | RS-232, transmit | 17 | AGND | Analog ground |
| 8 | 232_GND | RS-232, ground | 18 | ANA4 | Analog 4, output |
| 9 | 232_RX | RS-232, receive | 19 | RL3_C | Relay 3, common |
| 10 | RL3_NO | Relay 3, normally open | 20 | RL3_NC | Relay 3, normally closed |

## Related topics

Installing the MGC JB7 Junction Box as a stand-alone unit, page 26
Installing the MGC JB7 Junction Box inside a cabinet, page 27
MGC JB7 Junction Box wiring inside cabinet, page 81
MGC JB7 power connection inside cabinet, page 82

# Surveying sensors on vessels

**Topics**



## Vessel coordinate system

The vessel coordinate system is established in order to define the relative physical locations and orientations of systems and sensors. It is a Cartesian coordinate system using three axes: X, Y and Z. X is positive forwards, Y is positive toward starboard and Z is positive downwards.

The coordinate system must be well defined. It is usually established by surveying and documenting coordinates of several points on the vessel. The X axis is in the longitudinal direction of the vessel. The Y axis is in the transverse direction of the vessel. The Z axis is perpendicular to the X and Y axes.

The X and Y axes constitute the reference plane on the vessel. This can be a best-fit plane on the main deck or a best-fit plane through the draught marks on the hull.

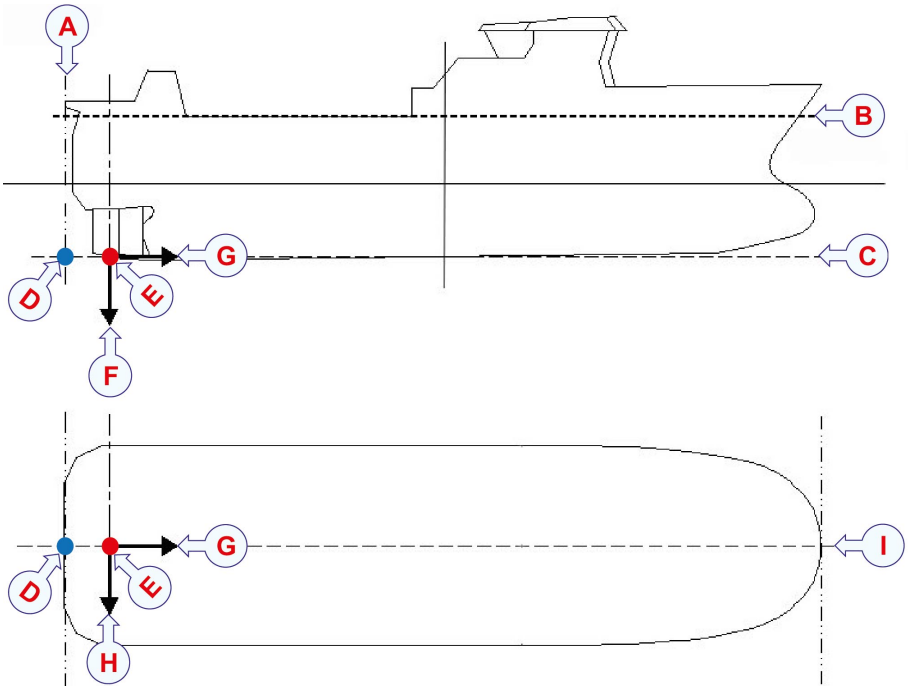
When establishing the vessel coordinate system, the origin can be freely chosen. Typical choices for origin are frame 0 at keel level, the vessel's centre of gravity (CG) or the location of the Inertial Measurement Unit. But any convenient point can be used.

In addition to the coordinate system it is useful to have an approximate X, Y and Z offset from the common reference point (CRP) to origin. The common reference point (CRP) is defined to be the intersection between stern, centre line and keel.

The chosen conventions must be made clear to all parties involved. Both to the survey personnel performing the survey and to the users of the survey results. Any deviation

from the defined coordinate system should be well described in both text and drawings to avoid common misunderstandings.

The illustration shows the definition of origin on the vessel and positive X, Y and Z axes directions.




| | | | |
|---|---|---|---|
| **A** | *Stern* | **F** | *+Z axis* |
| **B** | *Main deck* | **G** | *+X axis* |
| **C** | *Keel* | **H** | *+Y axis* |
| **D** | *CRP (common reference point)* | **I** | *CL (centre line)* |
| **E** | *Origin* | | |

# Surveying the MGC Sensor Unit

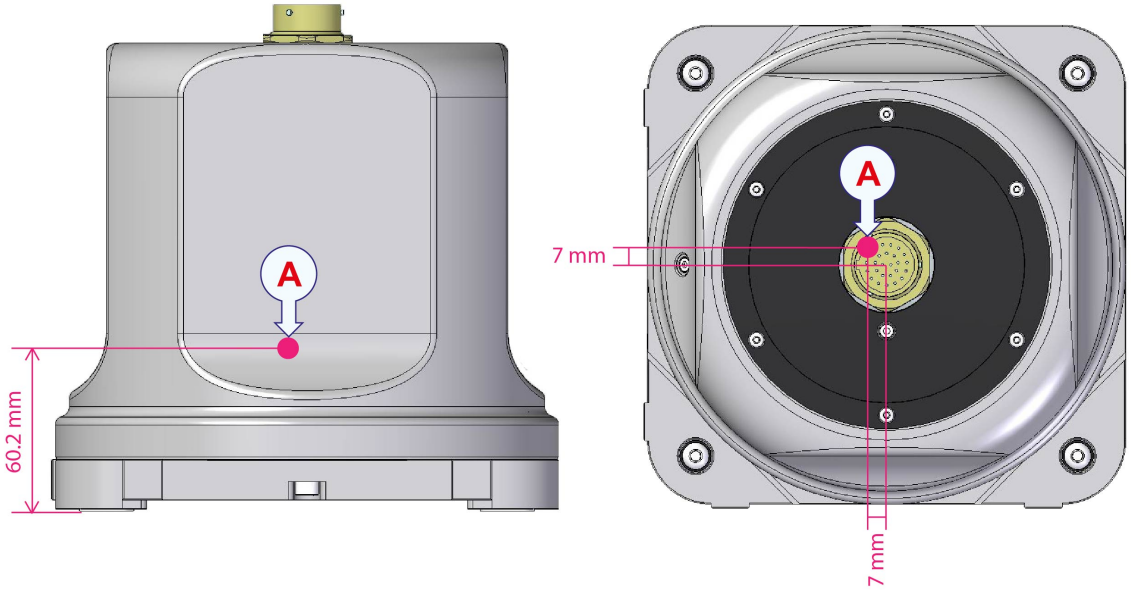
For the MGC (Motion Sensor and Gyro Compass) the following should be surveyed.

- The mounting angles in roll, pitch and yaw (heading).
- The offset between the gyro compass heading and the vessel centre line (CL).

A static gyro compass calibration/verification (heading log) should be done after the gyro compass system is installed and fully operational. This can be performed in dock or alongside a quay.

A dynamic gyro compass calibration/verification and attitude verification (heading, roll and pitch verification) must be performed at sea.

## Sensor point for the MGC

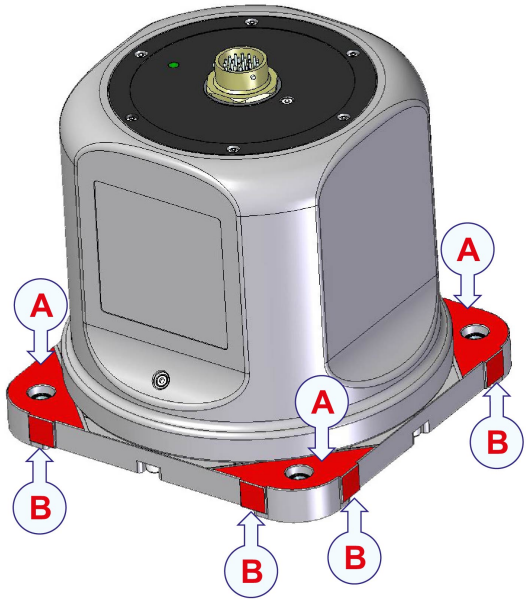



**A** *Sensor point on MGC*

## MGC alignment surfaces

The MGC bottom plate designed with alignment surfaces where you can place prisms for surveying the offset angles in roll, pitch and heading by use of a theodolite.

The illustration shows the alignment surfaces for roll and pitch alignment and heading alignment.

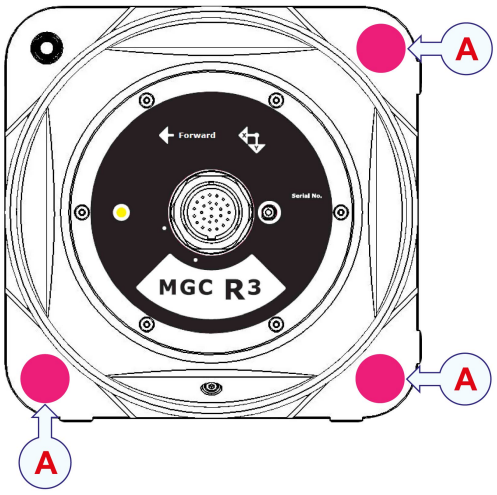



**A** *Alignment surface for roll and pitch*

**B** *Alignment surface for heading*

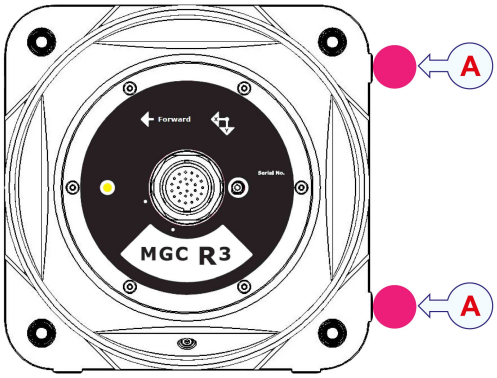
For the roll and pitch alignments, space for prisms is made in three corners of the MGC bottom plate. The surface on these locations is prepared specially to make it flat and aligned (parallel) with the sensors inside the unit.

**A** *Space for prism*




For the heading alignment two sides of the bottom plate has two protruding squared surfaces. Place the prisms against these surfaces when measuring the heading of the MGC towards the vessel axis.

**A** *Space for prism*




**Related topics**
Survey accuracy values, page 45

# Survey accuracy values

The system must be surveyed according to the given accuracy level. If not, the performance of the system will be degraded.

- The MGC heading offset angle with the vessel axis: < 0.01°

**Related topics**
Surveying the MGC Sensor Unit, page 43
Setting MGC Sensor Unit location and mounting angles, page 58

# Setting to work

**Topics**



## Setting to work summary

When all hardware units have been installed, all the cables have been connected the MGC® COMPASS system can be turned on and set to work.

### Prerequisites

- All system units have been installed.
- All system cables are connected.
- All cable connections are made.
- Correct operating power is available.

### Procedure

1 Verify that all hardware and cable installation have been made correctly.

2 Apply power to the Sensor Unit by connecting the Sensor Unit cable (MRU-E-CS8) to the unit.

3 Apply power to the MGC JB7 Junction Box.
The Sensor Unit is powered through the Junction Box.

4 Install the MRC+ application on a computer.

5 Configure the MGC® COMPASS system for operational use.

6 Verify that the MGC® COMPASS system is operational.

**Related topics**

Mounting the Sensor Unit, page 22
Installing the MGC JB7 Junction Box as a stand-alone unit, page 26
Installing the MGC JB7 Junction Box inside a cabinet, page 27
Installing the MGC JB5 Repeater Junction Box, page 29
Installing the Bridge Alert Panel, page 30
Turning on the MGC® COMPASS system, page 47
MGC® COMPASS power requirements, page 20
Installing the MRC+ application, page 52
About configuration methods, page 48
Configuring the MGC® COMPASS for normal operation, page 57

# Turning on the MGC® COMPASS system

When you have verified that all hardware units and cables have been properly installed, and that the supply power is correct, you can turn on the MGC® COMPASS system for the first time.

## Context

The system is turned on when the MGC JB7 Junction Box is connected to a power source. The system will start automatically after power has been applied.

After the initialization phase the heading accuracy is normally approximately 0.5 degrees. Assuming correct latitude and velocity input. The MGC then enters the alignment phase. After approximately 8 to 30 minutes full accuracy is achieved, depending on MGC Sensor Unit model.

Note

*Settling to optimal heading accuracy can take longer than the specified time if the unit is exposed to high accelerations at start-up. For a fast settling of heading, start-up in harbour is recommended. However, under most conditions the heading accuracy will be within 1 degree during five to ten minutes from power-on.*

## Procedure

1 Make sure that the Sensor Unit cable is connected between the MGC JB7 Junction Box and the Sensor Unit.

2 Apply power to the MGC JB7 Junction Box.

The Sensor Unit receives power through the MGC JB7 Junction Box. The unit starts automatically when it receives power and it will remain in operation as long as it is powered.

3 Observe that the LED on top of the Sensor Unit flashes green and that the unit generates a humming sound.

4 From start-up and until the Sensor Unit reaches full accuracy, the unit goes through three phases:

- **Initialization**: This phase lasts for four to ten minutes. Normally four to five minutes.
- **Alignment**: This phase lasts for approximately 8 to 30 minutes from power-on, depending on the MGC model.
- **Fully operational**: This is the normal state.

5 Leave the unit with power on.

### Result

The system is now ready for configuration.

### Related topics

About configuration methods, page 48
Connecting to the web interface, page 51
Configuring the MGC® COMPASS for normal operation, page 57

# About configuration methods

There are two ways in which you can do the setup of the MGC® COMPASS. You can either set up the unit directly from the web interface configuration menu of the MGC JB7 Junction Box or by using the MRC+ application via the LAN connection on the MGC JB7 Junction Box.

An external computer is required to run the web configuration through a browser and to run the MRC+ application.

### Configuration directly through web interface

The web interface consists of a menu with configuration options and a corresponding page for parameter settings. When you click an option, a box with the settings appears. This is where you change the settings.

If you place the mouse cursor over the question mark icon, an explanatory text for that parameter, will appear.

When you have made the changes, they need to be confirmed before the changes take effect. This confirmation is carried out under **Review changes**. Here are all the changes listed. You can edit or revert your changes before you confirm.

When you select **Apply changes**, the changes are written to the MGC JB7 Junction Box setup file. The junction box is then reloaded with the new parameter settings.

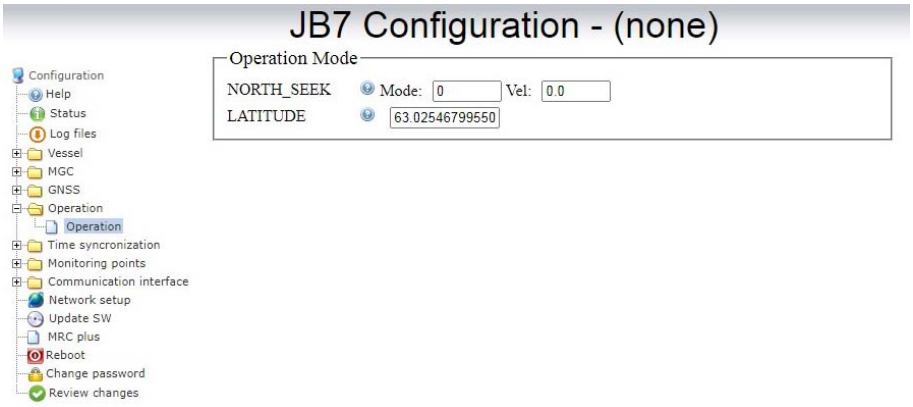
No validation is performed on the values you enter. If you apply incorrect values, the application may malfunction.

The **Network** and **Input/Output** parameters under **Communication interface** can only be set up directly from the web configuration.

You can update the Sensor Unit software directly from the web configuration.

Note

*Setting up the Sensor Unit directly from the web configuration is only recommended for advanced users and service personnel.*




## Configuration with MRC+ application

You can set up the Sensor Unit by use of the MRC+ application. First you have to install the MRC+ application on an external computer. Then you must connect to the MGC JB7 Junction Box web interface and open the MRC+ application from the web interface configuration menu.

The communication between the MGC JB7 Junction Box and the Sensor Unit must be opened by starting a proxy server on the junction box. When you have connected to the Sensor Unit, you can set up the parameters from the **Configuration** tab.

When you have set up the wanted parameters, you download the settings to the Sensor Unit.

The **Network** and **Input/Output** parameters under **Communication interface** cannot be set up via the MRC+ application. They can only be set up directly from the web configuration.

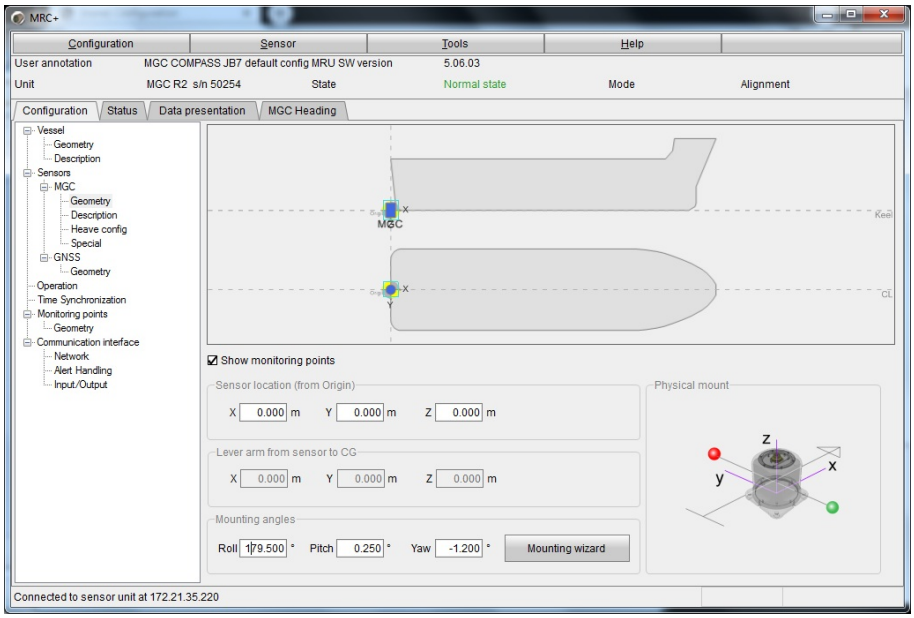
Note

*Setting up the Sensor Unit via the MRC+ application is the recommended way to set up the Sensor Unit, as this method will give you more detailed information about the parameters.*

These configuration parameters are recommended set up via the MRC+ application.

- Vessel geometry and description
- Sensor MGC geometry
- Sensor GNSS geometry
- Operation
- Time synchronization
- Monitoring points geometry

All other changes must be done through the web configuration.




## Related topics

Connecting to the web interface, page 51
Installing the MRC+ application, page 52

# Connecting to the web interface

You must set up certain parameters in order to get a working MGC® COMPASS system. The configuration of the Sensor Unit is done through the MGC JB7 Junction Box web interface on an external computer.

### Prerequisites

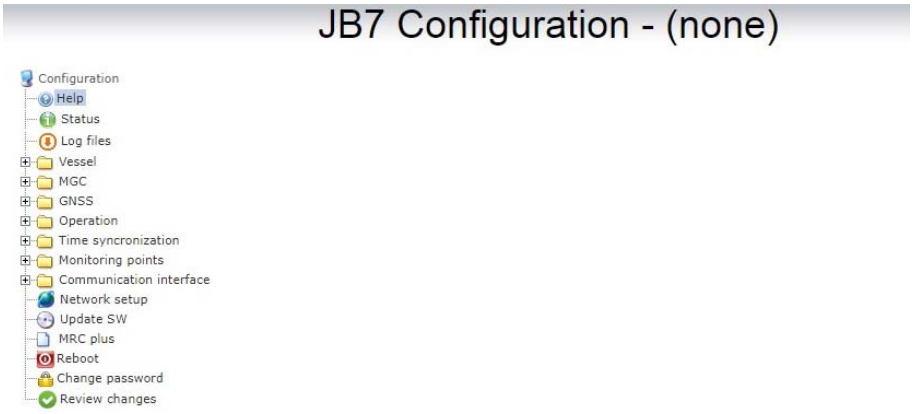
An external computer. Make sure that the external computer is in the same network range as the junction box.

Set up the external computer to use local area connection.

### Context

The default IP address for the MGC JB7 Junction Box is: 172.21.35.220. The external computer must be set up with an IP address in the range 172.21.35.xxx, where xxx may be 100. The network mask is 255.255.255.0.

The network settings in this procedure is for a Windows 10 operating system.




### Procedure

1 Connect an Ethernet cable between the external computer and LAN 1 on the junction box.

2 On the external computer, select **Control Panel → Network & Internet → Network Sharing Centre**

3 Under active networks, select the active network under **Connections** and select **Properties** in the network Status dialog box.

4 Select **Internet Protocol Version 4 (TCP/IPv4) → Properties**.

5 Select **Use the following IP address** and type an IP address in the same range as the junction box, for example 172.21.35.100.

6 Type the subnet mask: 255.255.255.0

7 Select **OK** and exit network settings.

8 Open a browser and type the default IP address of the junction box in the address bar.

9 Type the default login credentials for **User**: `jb7`.

10 Type the default login credentials for **Password**: `1234`.

11 Select **OK**.

The web interface with the configuration menu appears in the display.

**Related topics**

About configuration methods, page 48
Setting up Sensor Unit directly from web interface on MGC JB7 Junction Box, page 53
Setting up Sensor Unit using MRC+, page 55

# Installing the MRC+ application

The MRC+ application is used to set the configuration parameters for the Sensor Unit.

### Prerequisites

You have received a USB flash drive with the MRC+ application software together with the Sensor Unit. The flash drive is included in the Sensor Unit transportation box. If the flash drive is not included in the delivery you must upload it from a customer support server.

### Context

You must install the MRC+ application on a local computer (standard Windows procedure).

After installation the MRC+ icon will appear on your desktop.

### Procedure

1 Insert the USB flash drive with the software into a local computer.

2 Open the Windows File Explorer.

3 Locate the Removable disk drive to which the flash drive is connected.

4 Open the `MRC+ setup.exe` file located in the **SW/MRC** folder.

5 Follow the instructions on the screen in order to complete the installation of the MRC+ application.


6 Select **Run MRC+ now**.

7 Select **Finish**.

8 Close the Windows File Explorer and remove the USB flash drive.

### Related topics

About configuration methods, page 48
Setting up Sensor Unit using MRC+, page 55

# Setting up Sensor Unit directly from web interface on MGC JB7 Junction Box

The communication interfaces have to be configured for the MGC® COMPASS to be able to communicate with external equipment. The configuration is done through the web interface on the MGC JB7 Junction Box.

### Prerequisites

An external computer. Make sure that the external computer is in the same network range as the junction box.

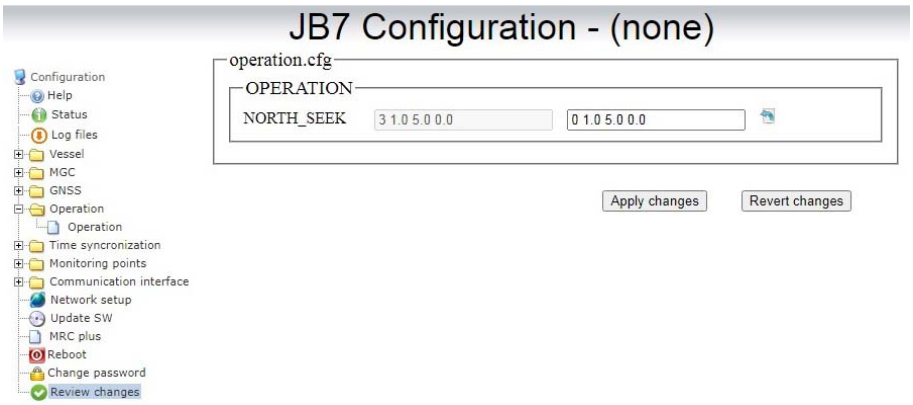
Set up the external computer to use local area connection.

### Context

The default IP address for the MGC JB7 Junction Box is: 172.21.35.220. The external computer must be set up with an IP address in the range 172.21.35.xxx, where xxx may be 100. The network mask is 255.255.255.0.

Note

*No validation is performed on the values you enter. If you apply incorrect values, the application may malfunction.*




## Procedure

1 Connect an Ethernet cable between the external computer and LAN 1 on the junction box.

2 Make sure that the external computer is in the same network range as the junction box.

3 Open a browser and type the default IP address of the junction box in the address bar.

4 Type the default login credentials for **User**: `jb7`.

5 Type the default login credentials for **Password**: `1234`.

6 Select **OK**.

The web interface with the configuration menu appears in the display.

7 Select the wanted configuration option and set the wanted parameters.

You can set or edit all parameters before you confirm your choice.

8 Select **Review changes** to see all the changes you have made.

9 Select **Apply changes**.

The settings are written to the MGC JB7 Junction Box setup files and the junction box is reloaded with the new parameter settings.

## Related topics

Connecting to the web interface, page 51

# Setting up Sensor Unit using MRC+

The MRC+ application is used to set up all configuration parameters, except for the communication interface parameters.

### Prerequisites

An external computer. Make sure that the external computer is in the same network range as the junction box.

Set up the external computer to use local area connection.

The MRC+ application must be installed on the external computer.

### Context

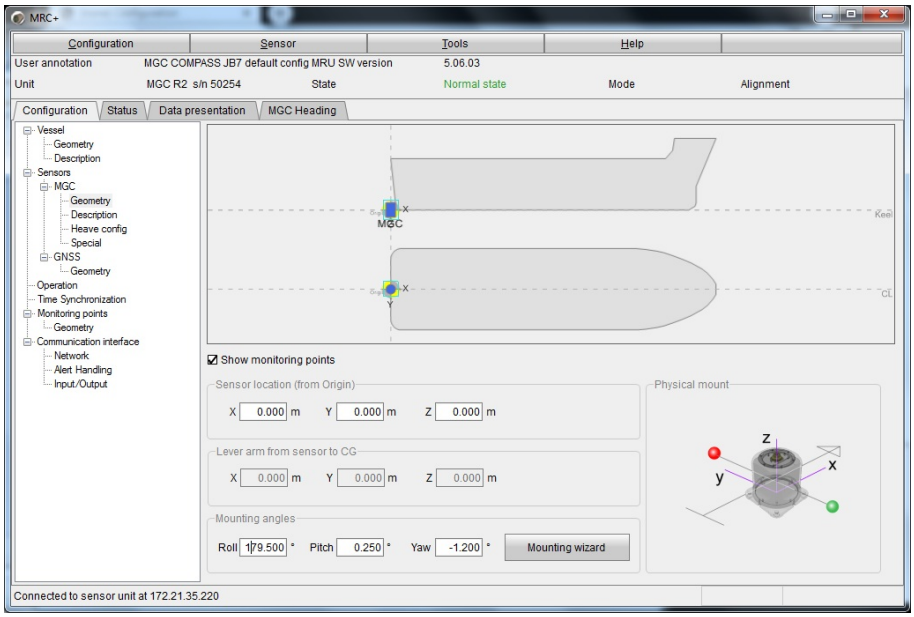
The default IP address for the MGC JB7 Junction Box is: 172.21.35.220. The external computer must be set up with an IP address in the range 172.21.35.xxx, where xxx may be 100. The network mask is 255.255.255.0.

The **Network** and **Input/Output** parameters under **Communication interface** cannot be set up via the MRC+ application. They can only be set up directly from the web interface.

If the MRC+ application should lose contact with the Sensor Unit after download of setup parameters, restart the process from where you start the MRC+ proxy.

These configuration parameters are recommended set up via the MRC+ application.

- Vessel geometry and description
- Sensor MGC geometry
- Sensor GNSS geometry
- Operation
- Time synchronization
- Monitoring points geometry




## Procedure

1 Connect an Ethernet cable between the external computer and LAN 1 on the junction box.

2 Make sure that the external computer is in the same network range as the junction box.

3 Open a browser and type the default IP address of the junction box in the address bar.

4 Type the default login credentials for **User**: `jb7`.

5 Type the default login credentials for **Password**: `1234`.

6 Select **OK**.

The web interface with the configuration menu appears in the display.

7 Select **MRC plus** → **Start MRC+ proxy**.

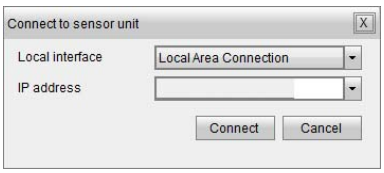
The proxy server will be running unit you stop it by selecting **Stop MRC+ proxy** or the junction box is rebooted.

8 Select **OK** to start the proxy server.

9 Select the MRC+ icon on your desktop to start the MRC+ application.

10 Select the **Sensor** menu → **Connect**.

11 Type the IP address of the junction box interface to which you are connected and select **Connect**.



When the connection is up and running, the configuration parameters appear in the **Configuration** tab.

12 Select the wanted configuration option and set the wanted parameters.

13 Select the **Configuration** menu → **Send to sensor unit** to download the changes to the Sensor Unit.

14 Close the MRC+ application when you have completed the setup.

15 Select **MRC plus** → **Stop MRC+ proxy** → **OK** in the web interface.

**Related topics**

Connecting to the web interface, page 51
Installing the MRC+ application, page 52

# Configuring the MGC® COMPASS for normal operation

**Topics**

## Setting MGC Sensor Unit location and mounting angles

The physical location of the Sensor Unit relative to the origin and its mounting angles is required for the Sensor Unit to be able to calculate position, roll, pitch and heading correctly.

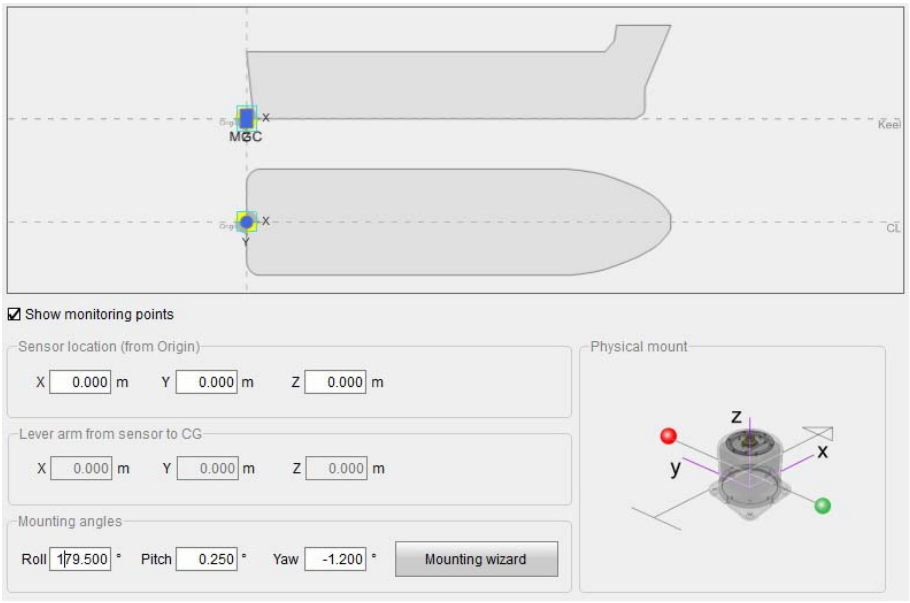
### Prerequisites

For accurate location of the MGC (Motion Sensor and Gyro Compass) a survey has to be carried out.

This procedure is done using the MRC+ application.

### Context

The correct sensor unit position is with the connector up and the x-axis pointing towards the bow of the vessel. Use the **Mounting Wizard** to determine the mounting angles.




### Procedure

1 In the MRC+ application, select the **Configuration** tab.

2 Select **Sensors** → **MGC** → **Geometry**.

3 Type the X, Y and Z coordinates in metres from Origin to the sensor unit location.

4 Type the mounting angle values directly:

   a Type the values for **Roll**, **Pitch** and **Yaw**.

   b Select the **Configuration** menu → **Send to sensor unit** to apply your settings.

5 Use the **Mounting wizard** to determine the mounting angles:

   a Select the **Mounting wizard** button.

   b If the sensor unit main orientation is correct, select **Next**.

c Type the offset angles.

d Select **Finish** to close the wizard.

e Select the **Configuration** menu → **Send to sensor unit** to apply your settings.

### Related topics

Survey accuracy values, page 45

## Setting the latitude

You must set the latitude of the location where the Sensor Unit is to be turned on for operational use.

### Prerequisites

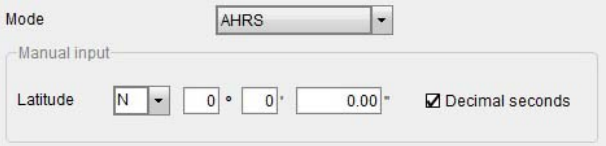
Make sure that you know the latitude of the vessel's position at the time you start to operate the system.

The Sensor Unit may also receive latitude through the NMEA GGA input message.

This procedure is done using the MRC+ application.

### Context

The latitude is used as a backup latitude if the GPS latitude is unavailable at system start-up.




### Procedure

1 In the MRC+ application, select the **Configuration** tab.

2 Select **Operation**.

3 Type the latitude in degrees.

4 Select the **Configuration** menu → **Send to sensor unit** to apply your settings.

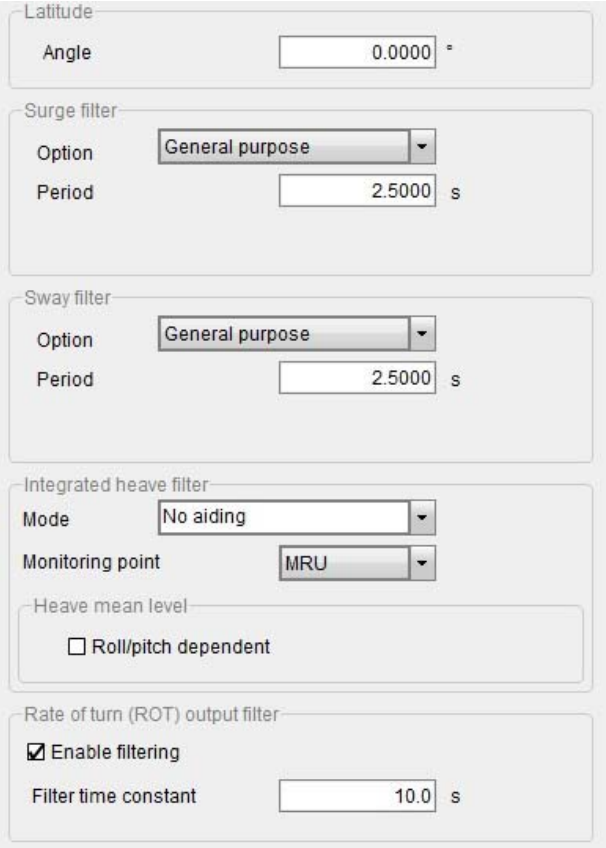
## Setting the ROT filtering constant

The analog ROT output signal can be filtered with a selectable filter constant.

### Prerequisites

This procedure is done using the MRC+ application.

### Context




### Procedure

1 In the MRC+ application, select the **Configuration** tab.

2 Select **Sensors** → **MGC** → **Special**.

3 In the **Rate of turn (ROT) output filter** box, select **Enable filtering**.

4 For the **Filter time constant**, type the value in seconds. Typically 10 seconds.

5 Select the **Configuration** menu → **Send to sensor unit** to apply your settings.

## Setting the time synchronization

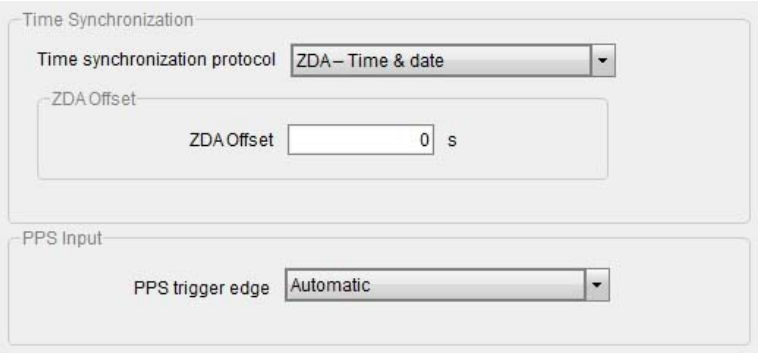
In order to time stamp events and alerts correctly, the Sensor Unit should be time synchronized to an external clock.

### Prerequisites

This procedure is done using the MRC+ application.

### Context

The recommended method is to use ZDA input when the Sensor Unit is used as a compass. This is also the default method.




### Procedure

1 In the MRC+ application, select the **Configuration** tab.

2 Select **Time Synchronization**.

3 Select the preferred time synchronization method.

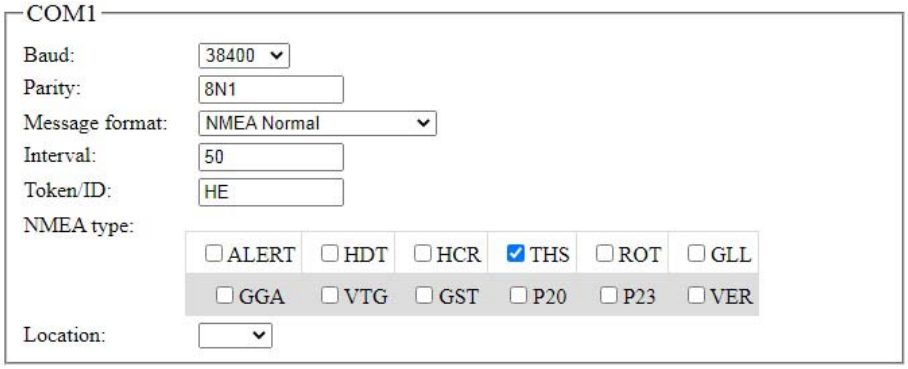
4 Select the **Configuration** menu → **Send to sensor unit** to apply your settings.

## Setting output data to heading repeater junction box

You must set the serial communication parameters for the heading data in order for the heading repeaters to receive heading input from the MGC® COMPASS.

### Context

This procedure is done in the MGC JB7 Junction Box web interface.




### Procedure

1 Enter the **Configuration** menu → **Communication interface** → **Serial ports** → **COM1** (for example).

2 Select the preferred baud rate. Typical 38400.

3 Select **Message format NMEA Normal**.

4 Type the data output **Interval** in milliseconds. Typical value is 50.

5 Type HE as **Token/ID**.

6 Select THS as **NMEA type**.

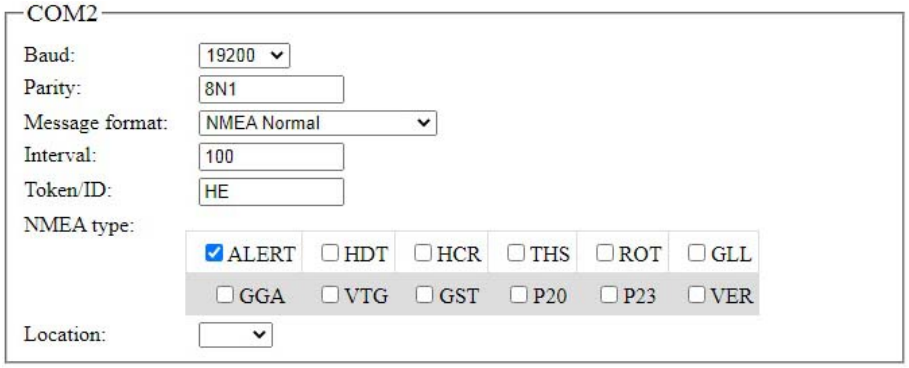
7 Select **Apply Changes** to save your settings.

## Setting communication channel for alert handling

You must set the serial communication parameters for the alert interface in order to receive and transmit alert messages.

### Context

This procedure is done in the MGC JB7 Junction Box web interface.




### Procedure

1 Enter the **Configuration** menu → **Communication interface** → **Serial ports** → **COM2** (for example).

2 Select the preferred baud rate. Typical 19200.

3 Select **Message format NMEA Normal**.

4 Type the data output **Interval** in milliseconds. Typical value is 100.

5 Type HE as **Token/ID**.

6 Select ALERT as **NMEA type**.

7 Select **Apply Changes** to save your settings.

### Related topics

Alert messages, page 99

## Setting the alert handling mode

Alerts are used to announce abnormal situations and conditions which require attention, decisions and/or action.

### Context

Alert handling is done by exchanging messages between the Integrated Navigation System (INS) and the MGC.

The MGC can operate in two different alert handling modes.

- The legacy *ALR* mode, using ALR and ACK sentences.
- The newer, and preferred, *ALF* mode, using ALF, ALC, ACN, and HBT sentences.

The *ALF* mode is the default and recommended mode.

This procedure is done in the MGC JB7 Junction Box web interface.


### Procedure

1 Enter the **Configuration** menu → **Communication interface** → **Alert**.

2 Select **ALERT_MODE**. The default selection is **ALF**.

3 Select **BAMINTERFACE**. The default selection is **LAN1**.

4 Select **Apply Changes** to save your settings.

### Related topics

Alert messages, page 99

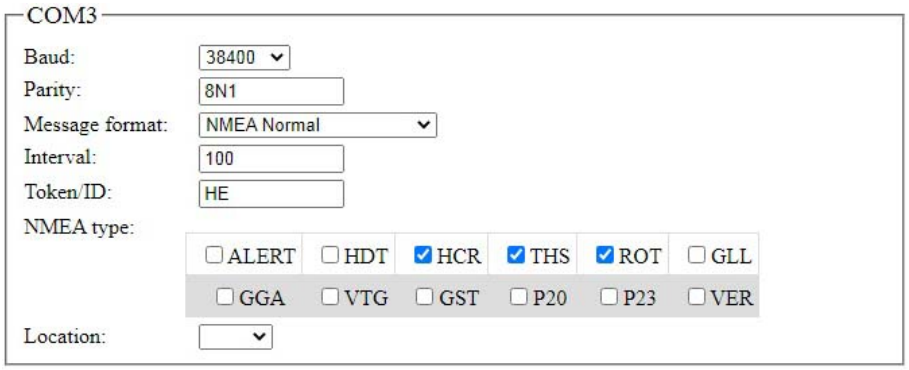
## Setting in and out communication with the INS

You must set up the MGC® COMPASS to output data to the Integrated Navigation System (INS) and to receive data from the INS.

### Context

The MGC® COMPASS outputs heading, rate of turn and heading correction state data to the Integrated Navigation System (INS). For the MGC® COMPASS to work as intended, it requires input of velocity, latitude and time from the INS.

This procedure is done in the MGC JB7 Junction Box web interface.




### Procedure

1 Enter the **Configuration** menu → **Communication interface** → **Serial ports** → **COM3** (for example).

2 Select the preferred baud rate. Typical 38400.

3 Select **Message format NMEA Normal**.

4 Type the data output **Interval** in milliseconds. Typical value is 100.

5 Type HE as **Token/ID**.

6 Select HCR, THS and ROT as **NMEA type**.

7 Select **Apply Changes** to save your settings.

### Related topics

Output formats, page 89
Input formats, page 94

## Setting analog roll and pitch output data

You must define gain and offset to get the correct output voltage for the analog roll and pitch data output.

### Context

Four analog output channels are available from the MGC® COMPASS. The same output variable list is valid for the analog channels as for the digital communication. For each of the analog channels, you must specify the gain and offset. The limit on the output signal is fixed to ±10 Volt.

Gain is set according to this formula:

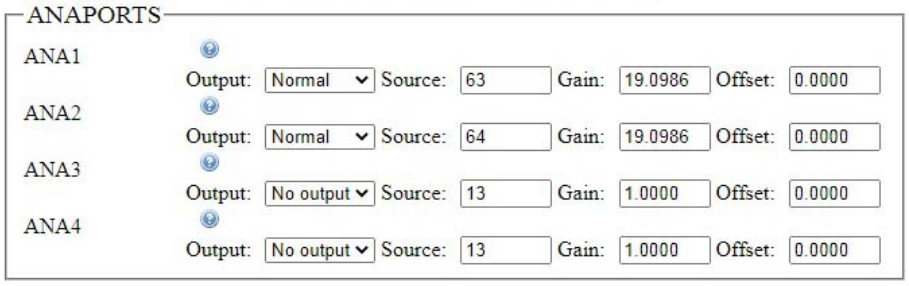
- [Voltage out in Volts] = Gain * [Selected Variable + Offset]

The gain therefore has scaling volts per physical unit (for example volts/degrees). Note that the variables in the Sensor Unit are given in standard SI units.

**Example: Gain calculation for roll/pitch output**

Requirement: ±10 V shall give ±0.5236 radians (±30 degrees). The gain factor must then be; Gain = volts/radians = 10/0.5236 = 19.0986 v/rad.

This procedure is done in the MGC JB7 Junction Box web interface.




### Procedure

1 Enter the **Configuration** menu → **Communication interface** → **Analog ports**.

2 Select the preferred analog channel. For example ANA1.

3 Select **Output**. Values are **No output**, **Normal** and **Fade in**.

4 Type **Source** number. Typically 63 for roll and 64 for pitch.

5 Type the **Gain** value.

6 Type the **Offset** value.

7 Select **Apply Changes** to save your settings.

## Setting analog NMEA ROT output data

You must define gain and offset to get the correct output voltage for the analog rate-of-turn (ROT) data output.

### Context

Four analog output channels are available from the MGC® COMPASS. The same output variable list is valid for the analog channels as for the digital communication. For each of the analog channels, you must specify the gain and offset. The limit on the output signal is fixed to ±10 Volt.

Gain is set according to this formula:

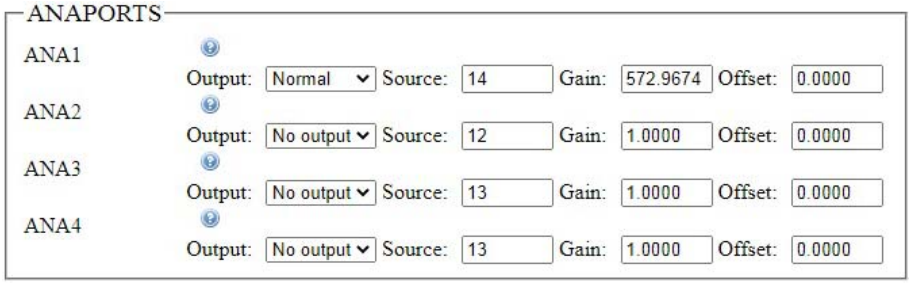
- [Voltage out in Volts] = Gain * [Selected Variable + Offset]

The gain therefore has scaling volts per physical unit (for example volts/degrees). Note that the variables in the Sensor Unit are given in standard SI units.

**Example: Gain calculation for analog rate-of-turn (ROT) indicator**

Requirement: ±10 V shall give ±0.017453 radians/s (±60 degrees per min = 60 deg/60 s = 1 deg/s). The gain factor must then be; Gain = volts/radians/s = 10/0.017453 = 572.9624.

This procedure is done in the MGC JB7 Junction Box web interface.




### Procedure

1 Enter the **Configuration** menu → **Communication interface** → **Analog ports**.

2 Select the preferred analog channel. For example ANA1.

3 Select **Output**. Values are **No output**, **Normal** and **Fade in**.

4 Type **Source** number 14.

5 Type the **Gain** value.

6 Type the **Offset** value.

7 Select **Apply Changes** to save your settings.

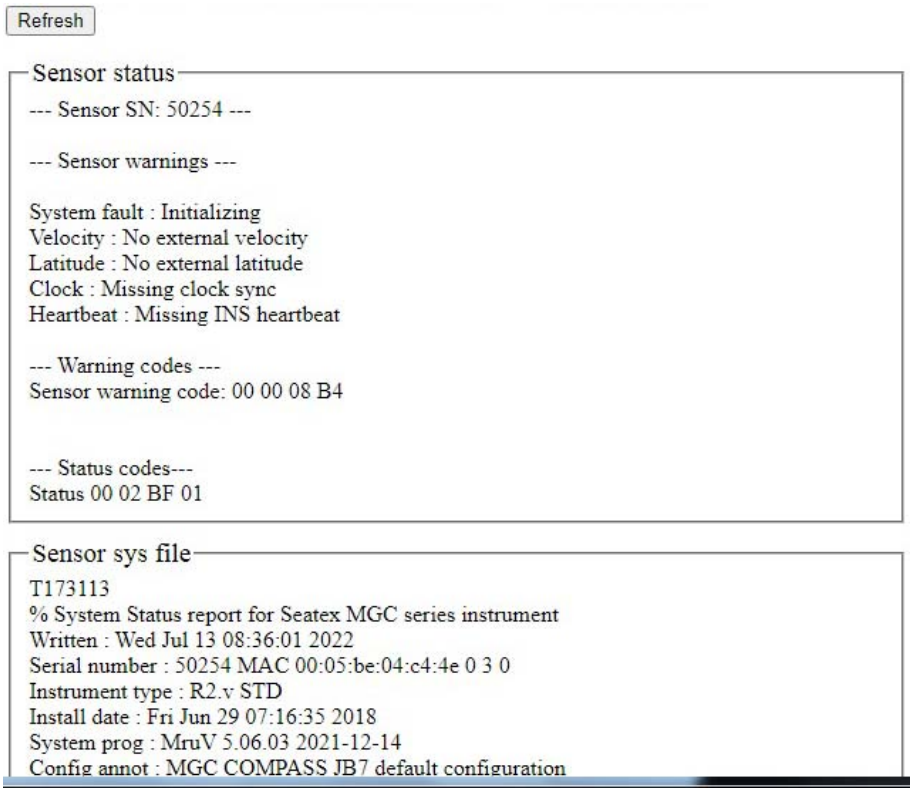
# Verifying that the MGC® COMPASS system is ready for operational use

When the MGC system configuration is completed, you must verify that the system is operational.

### Context

When the MGC® COMPASS and the external equipment are set up according to the described procedures and turned on, it is recommended to make sure that the system status is OK. This can be done in the MGC JB7 Junction Box web configuration **Status** page.

Make sure that the Sensor Unit receives external latitude, external velocity and external time form the Integrated Navigation System (INS) by observing the **Status** page. This can be used to verify that the configuration and the electrical connection to he INS are correct.




## Procedure

1 Enter the **Configuration** menu → **Status**.

2 Observe the **Velocity**, **Latitude** and **Clock** status to verify that the Sensor Unit receives these external inputs.

- **Velocity**: External velocity (code 22)
- **Latitude**: External latitude (code 21)
- **Clock**: Clock sync (code 5)

3 Make sure that **System prog** is the correct software version. The software version must be 5.06.10 or later for the system to work properly.

# Switch Over Unit functionality

**Topics**



## Connecting the replica ports

The replica ports which shall be used in the Switch Over Unit (SOU) functionality context must be daisy chained (wired) together. These replica ports are configured with an **M** in the web configuration interface. The same replica ports must be used on all JB7 Junction Boxes.

The table shows the SOU connection for three JB7 Junction Boxes where REPLICA (R) port number 2 and 3 are used as an example.

In this case, data on REPLICA2 and REPLICA3 will be included in the SOU setup and forwarded to clients.

| JB7 #1 signal | JB7 #2 signal | JB7 #3 signal |
|---|---|---|
| R2A_GND | R2A_GND | R2A_GND |
| R2A_TX_A- | R2A_TX_A- | R2A_TX_A- |
| R2A_TX_B+ | R2A_TX_B+ | R2A_TX_B+ |
| R3A_GND | R3A_GND | R3A_GND |
| R3A_TX_A- | R3A_TX_A- | R3A_TX_A- |
| R3A_TX_B+ | R3A_TX_B+ | R3A_TX_B+ |

# Enabling Switch Over Unit functionality

To be able to use the Switch Over Unit functionality, you must enable the functionality in the MGC JB7 Junction Box web configuration interface.

### Prerequisites

This procedure is done in the MGC JB7 Junction Box web interface.

### Context

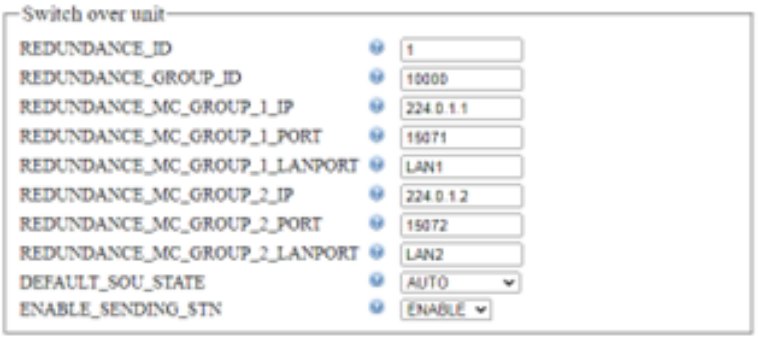
Each of the junction boxes in the Switch Over Unit (SOU) functionality setup must a redundancy identification, **REDUNDANCE_ID**. If you have three gyros in your setup, you must type 1 for GYRO 1 and 2 for GYRO 2 etc.

The **REDUNDANCE_GROUP_ID** parameter is default set to 10000. This needs to be incremented if there are more than one SOU system in the same network. This scenario does not happen very often, so the parameter is rarely changed.

The Multicast parameters, **REDUNDANCE_MC_[X]**, for communication between the junction boxes are default. Do not change these parameters.

The **DEFAULT_SOU_STATE** parameter is default set to **MANUAL**. When a gyro is installed in a SOU functionality setup, it must be changed to **AUTO**. If you do not change this parameter to **AUTO**, the SOU functionality will start up in *Manual* mode.

The **ENABLE_SENDING_STN** parameter is by default set to **DISABLED**. Set this parameter to **ENABLE**. This parameter enables transmission of the NMEA sentence with the redundancy identification number for the junction box, **REDUNDANCE_ID**.




### Procedure

1 Enter the **Configuration** menu → **SOU** → **Redundancy**.

2 Type the identification number for the gyro, **REDUNDANCE_ID**.

3 Set **DEFAULT_SOU_STATE** to **AUTO**.

4 Set **ENABLE_SENDING_STN** to **ENABLE**.

Leave the rest of the parameters as they are.

5 Select **Apply Changes** to save your settings.

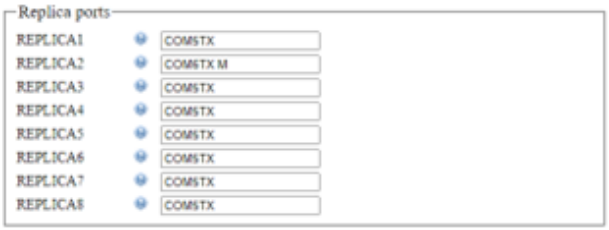
# Selecting monitoring ports for Switch Over Unit functionality

When you install the gyros and enable the Switch Over Unit functionality, the gyros are interconnected via replica ports. Ports which shall be included in the SOU functionality need to be interconnected (wiring) and selected in the web interface.

### Context

In the web interface, add the letter **M** to the **REPLICA** ports which are to be monitored.

The illustration shows monitoring added to **REPLICA2**. Other ports which shall be monitored must be selected as well.




### Procedure

1 Select the **Configuration** menu → **Communication interface** → **Replica ports**.

2 Type the letter **M**, with space in front, behind the wanted replica port.

3 Select **Apply Changes** to save your settings.

# Connecting the 7" Switch Over Unit display

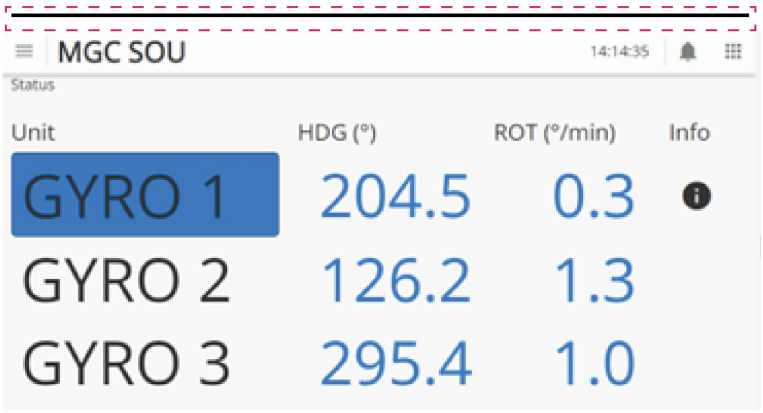
When you have installed the display and connected power and network, you must connect the display to the gyro system.

### Prerequisites

The physical installation of the 7" Multi Function Display is described in a separate manual, *MFD 7" Installation Manual*.

### Context

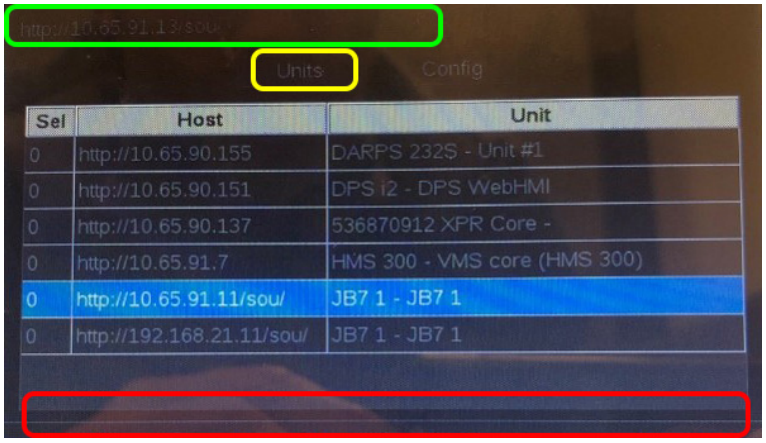
The Kongsberg Network Protocol (KNP) is used to identify units.




## Procedure

1 Press the horizontal soft button at the top of the display (dotted red rectangle).

A window opens which shows available units in the network.




2 Select **Units** (yellow rectangle) to open a list of available units.

3 Select the gyro system you want to connect to.

The selected gyro will be marked (√) in the **Sel** column to the left.

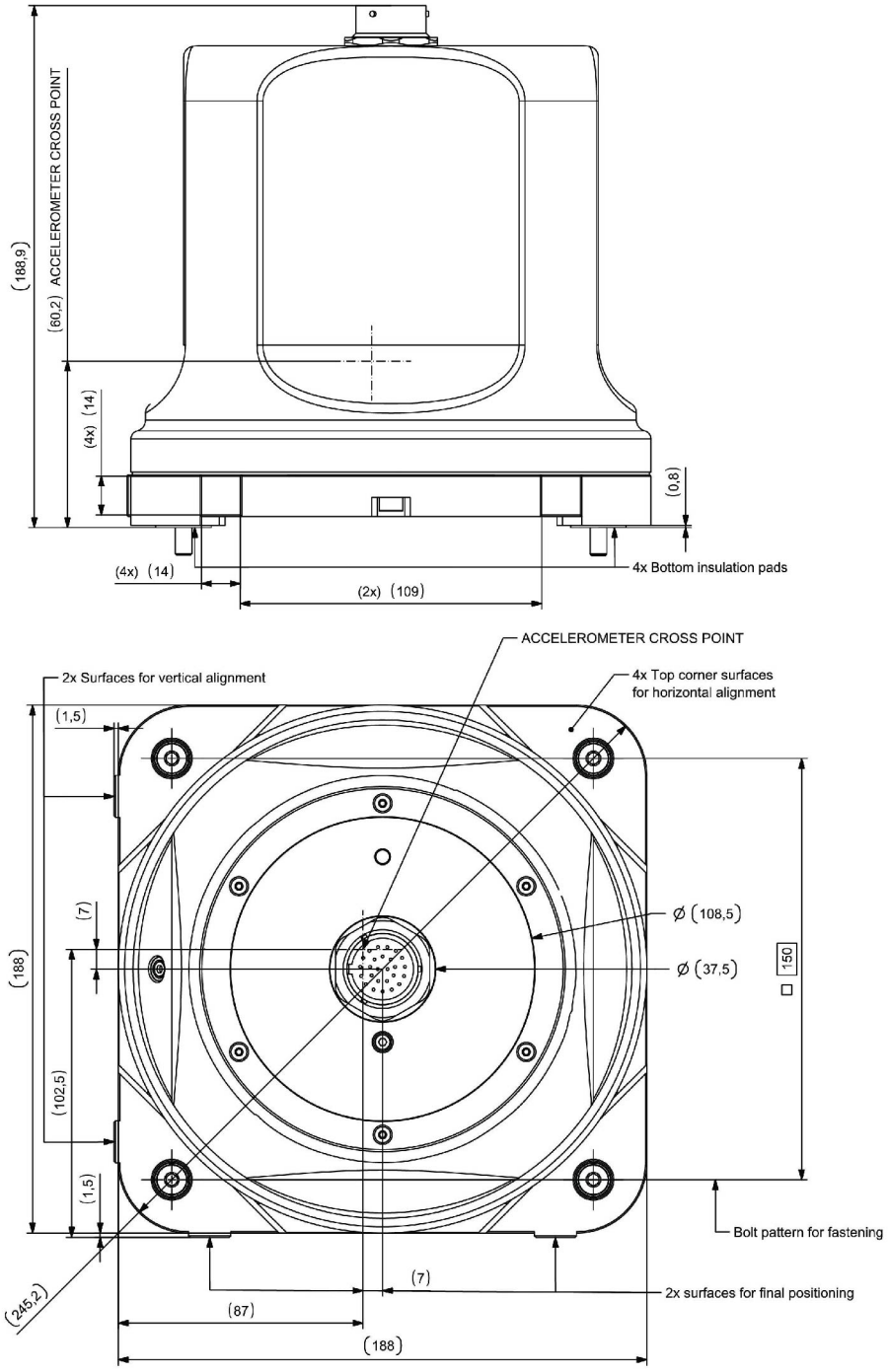
The display will automatically connect to the **Master** gyro. The address to which gyro the display is connected, is shown in the address bar (green rectangle) at the top of the window.

4 Close the window by pressing the bottom of the window (red rectangle).

# Drawings

**Topics**

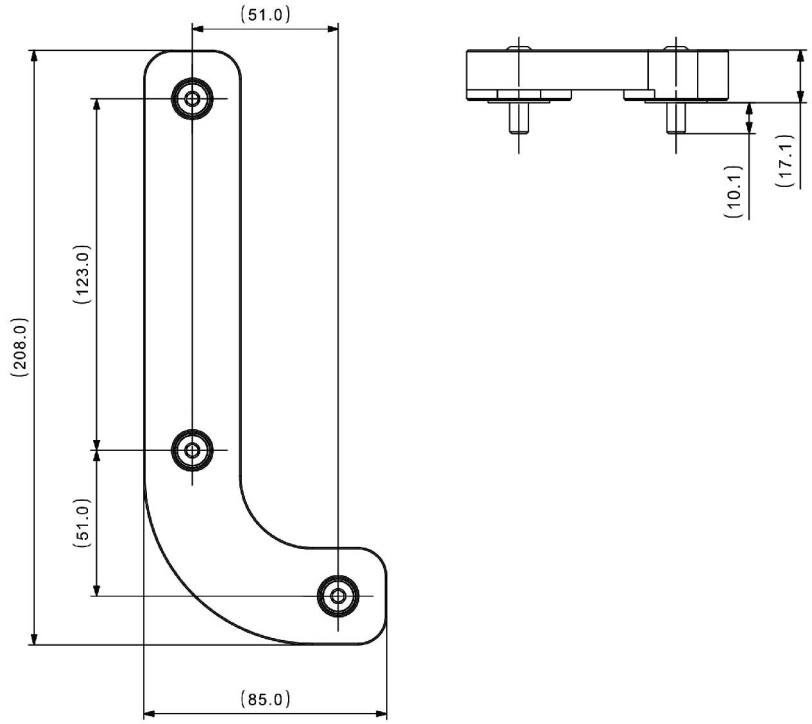
# Sensor Unit dimensions

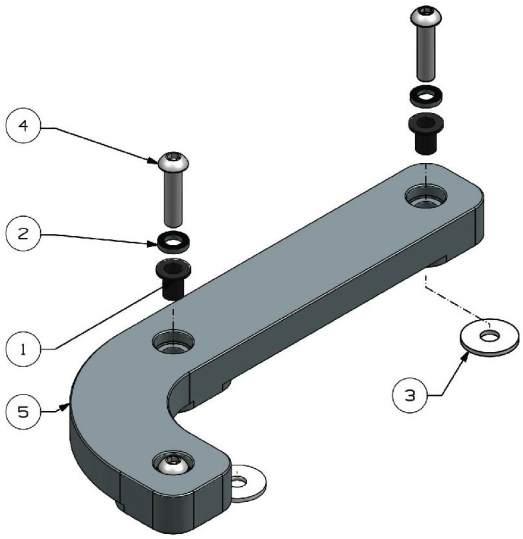



All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

3800-MA-411 Rev.07

# Angle bracket dimensions




1) Insulation sleeve 6.2 x 7.2 x 10, Nylon-6 + 25% glass fibre, ELRA AS 3120827 599 35

2) Nordlock washer NL6ss, NordLock AS, art. nr. 1080

3) Ceramic washer 20.1 x 6.6 x 1.6 (M6), Al2O3, QuickOhm 5032-00061

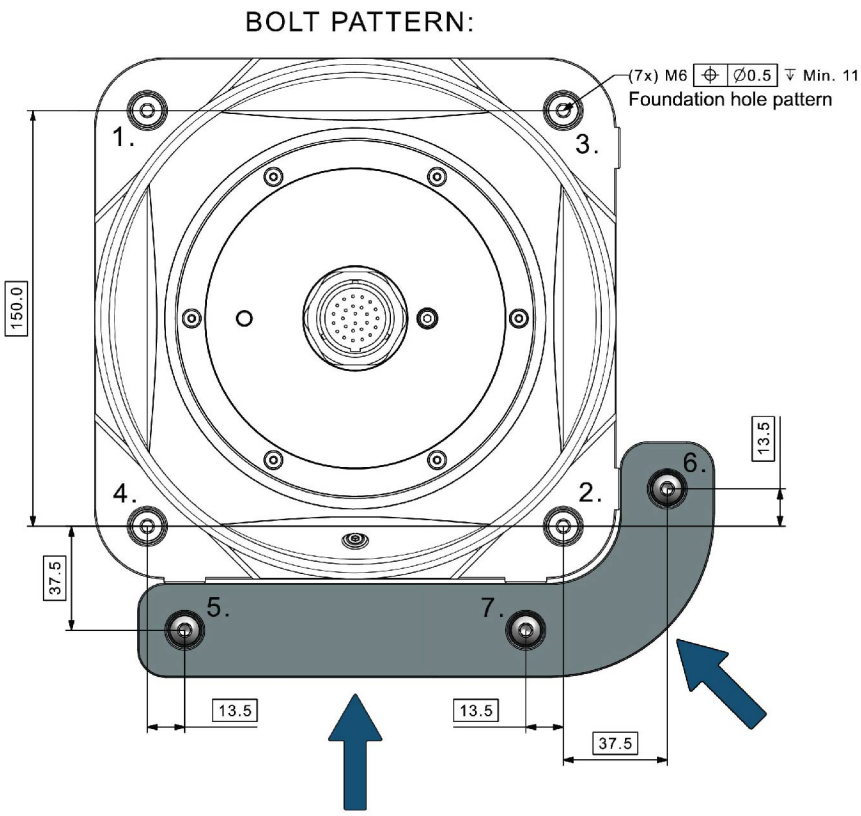
4) Hex button head screw M6 x 25 A4 Grade 70 ISO 7380

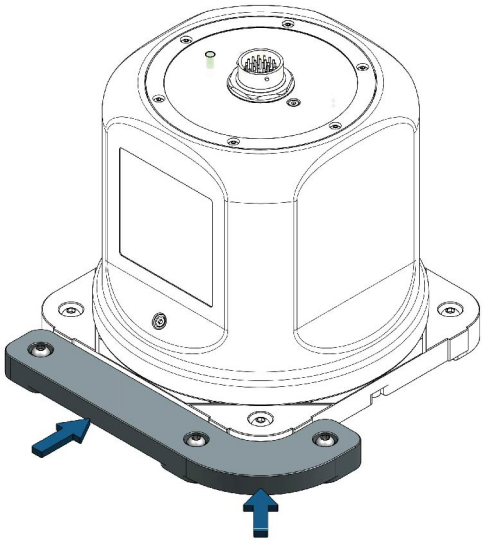
5) Angle bracket

All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

3800-MA-427 Rev.0

# Sensor Unit and angle bracket mounting



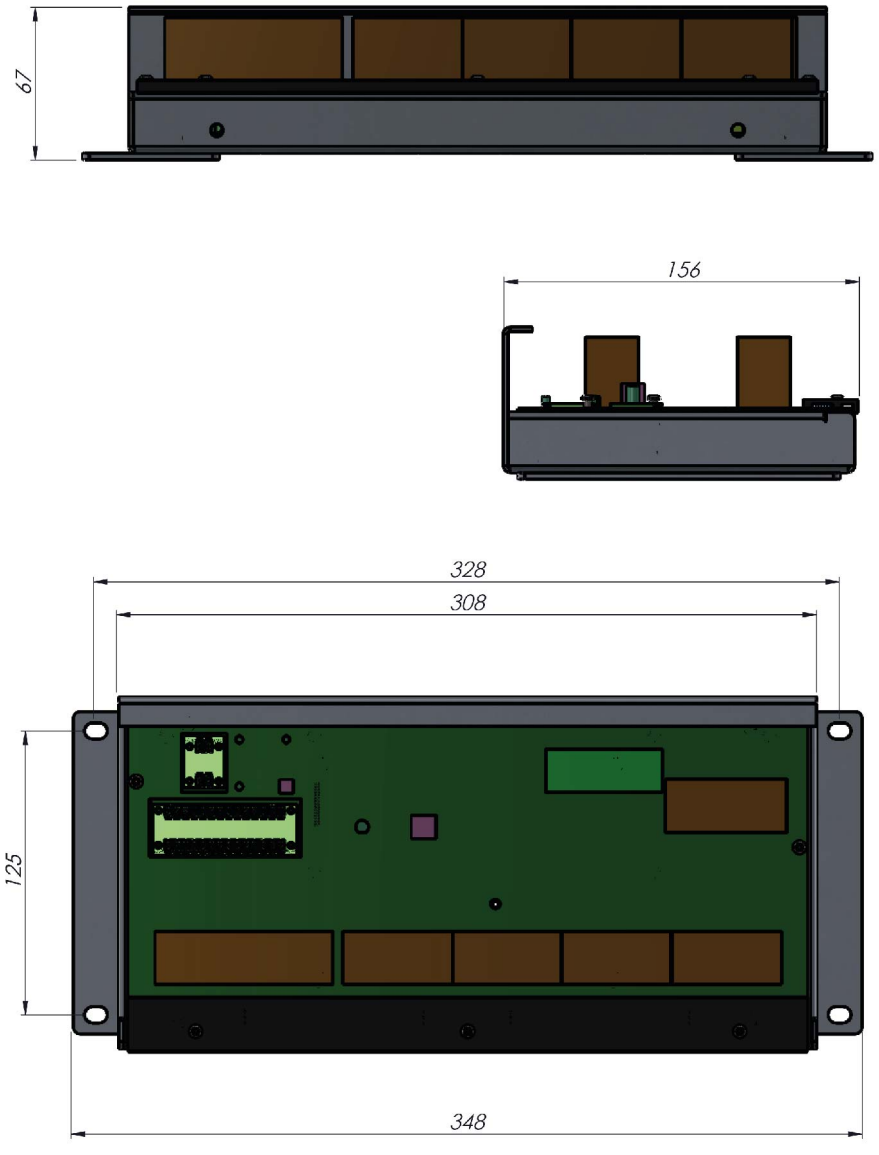



All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

3800-MA-427 Rev.0

# MGC JB7 Junction Box dimensions

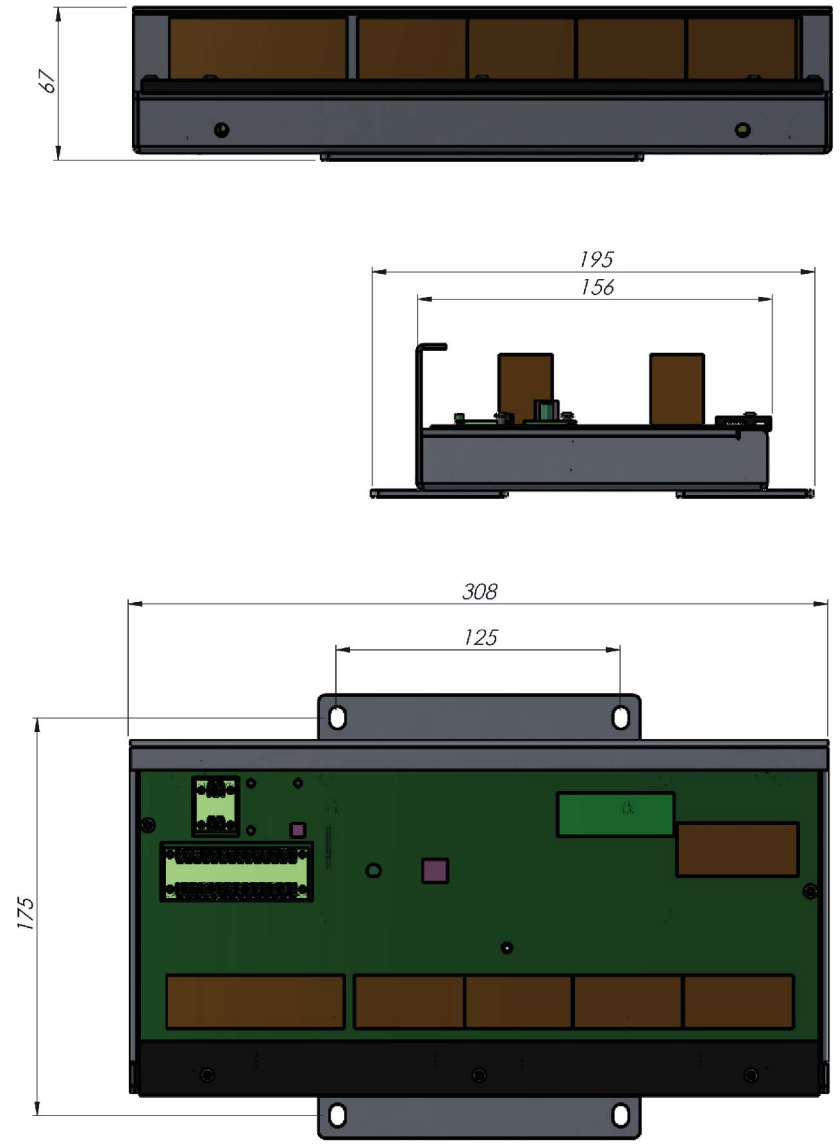
Horizontal mounting bracket




All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[117004-A10] Rev.2
AI

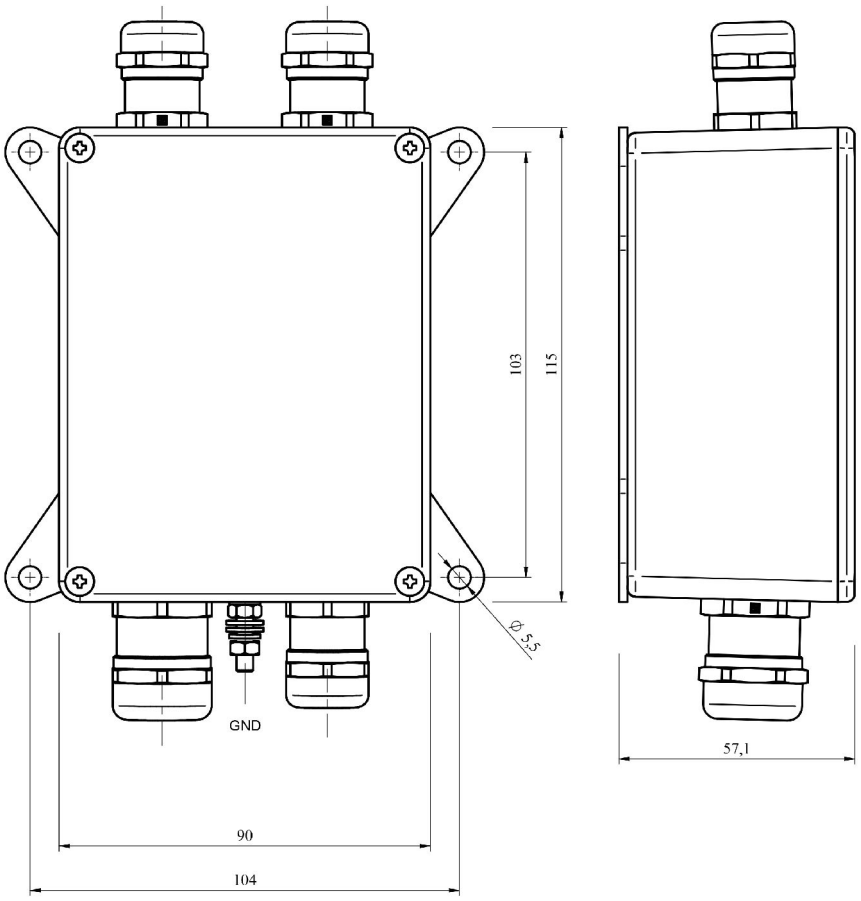
## Vertical mounting bracket




All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[117004_A10] Rev.2
AI

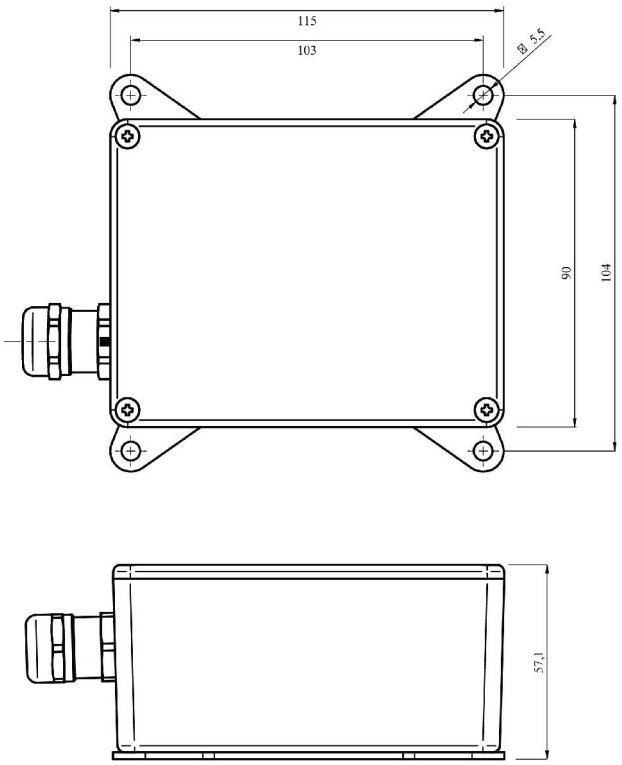
# MGC JB5 Repeater Junction Box dimensions




All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[3800-MA-464] Rev.0
MGC JB5

# Bridge Alert Panel dimensions

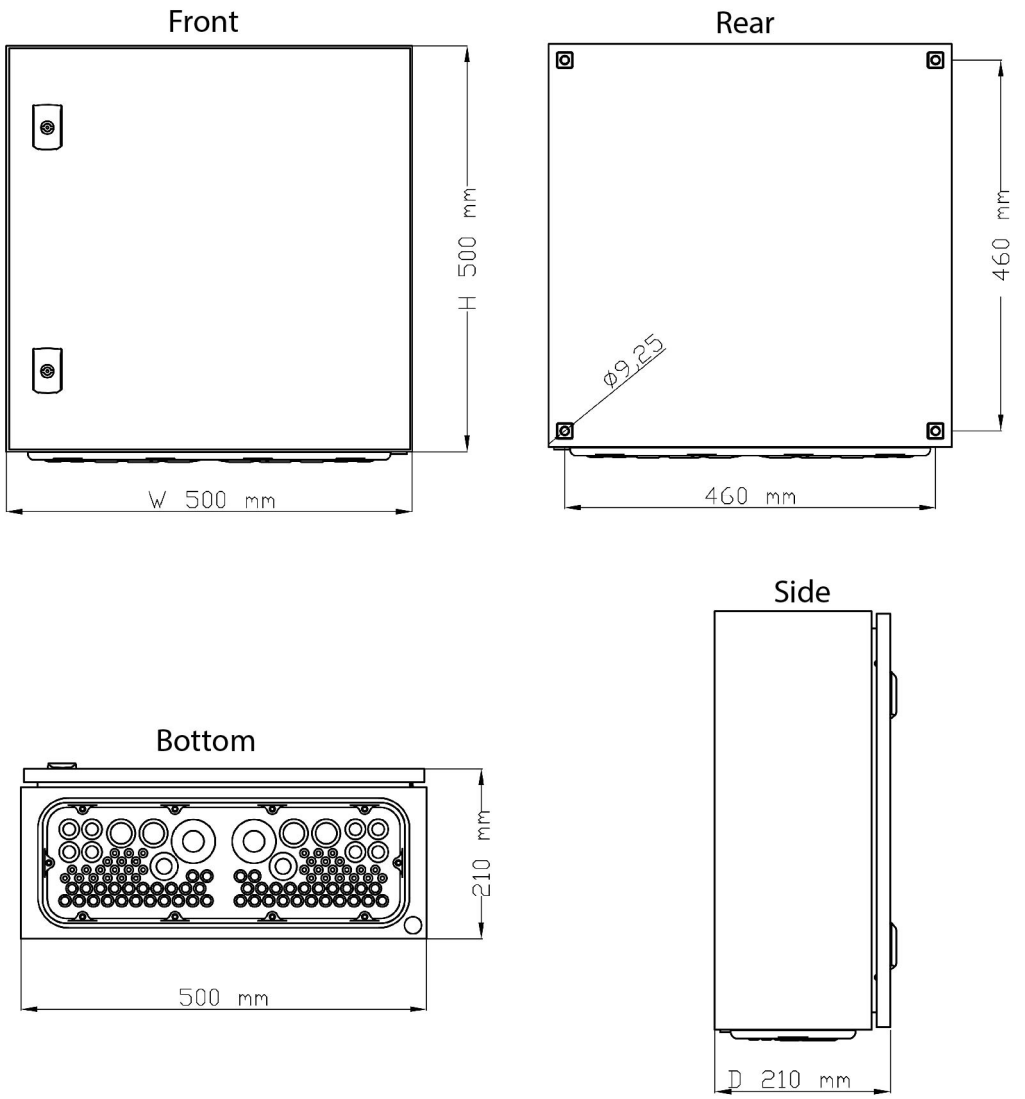



All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[3800-MA-464] Rev.0
AI

# Cabinet dimensions

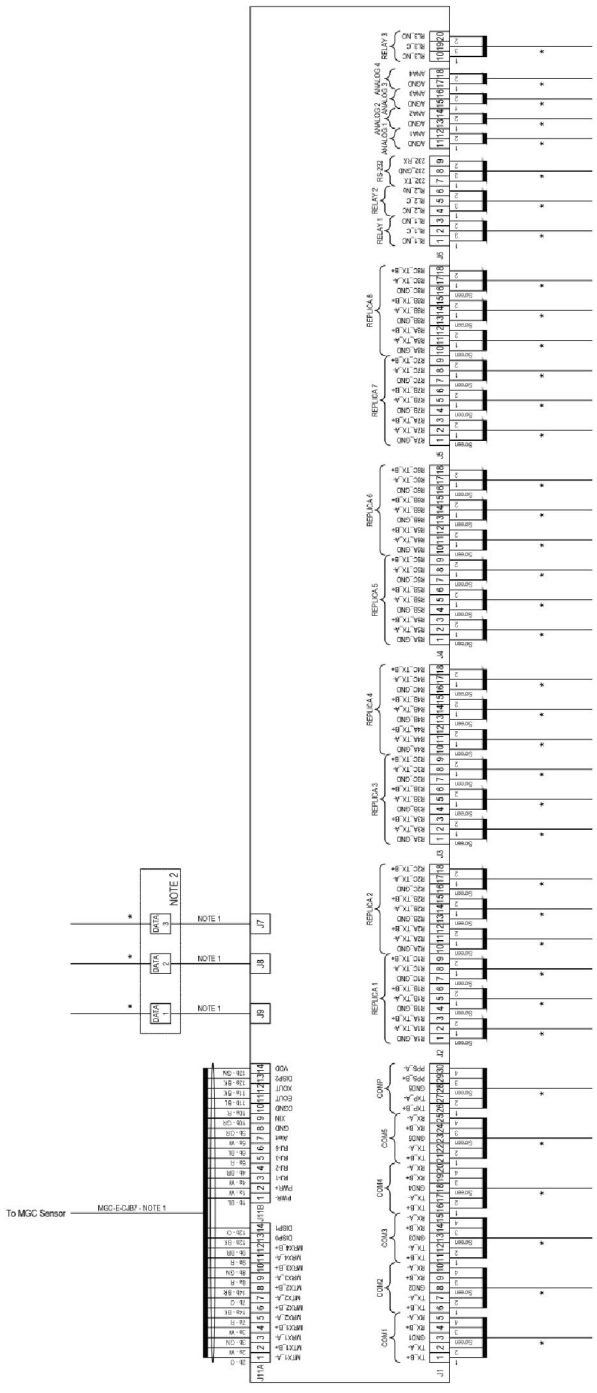
Rittal AX 1050.000




All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[N/A] Rev.0

# MGC JB7 Junction Box wiring inside cabinet




Note 1: Cable delivered by vendor

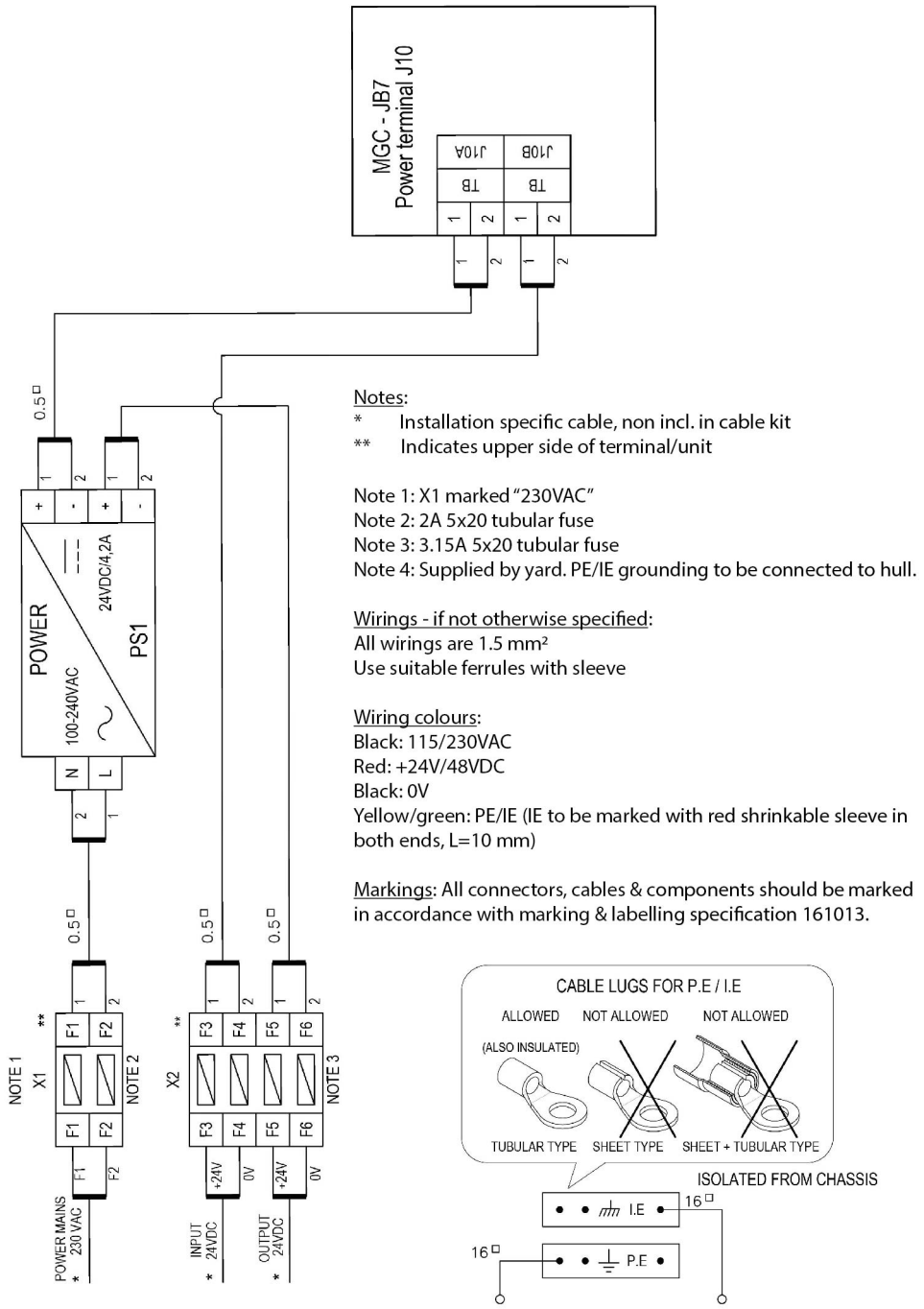
Note 2: External connections in Interface Cabinet

*) Installation specific cable, not included in cable kit

All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[MGC-IF-55-JB7/468350] Rev.B
AI

# MGC JB7 power connection inside cabinet




Notes:
* Installation specific cable, non incl. in cable kit
** Indicates upper side of terminal/unit

Note 1: X1 marked "230VAC"
Note 2: 2A 5x20 tubular fuse
Note 3: 3.15A 5x20 tubular fuse
Note 4: Supplied by yard. PE/IE grounding to be connected to hull.

Wirings - if not otherwise specified:
All wirings are 1.5 mm²
Use suitable ferrules with sleeve

Wiring colours:
Black: 115/230VAC
Red: +24V/48VDC
Black: 0V
Yellow/green: PE/IE (IE to be marked with red shrinkable sleeve in both ends, L=10 mm)

Markings: All connectors, cables & components should be marked in accordance with marking & labelling specification 161013.

All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[MGC-IFC-55-JB7] Rev.B
AI

# Technical specifications

**Topics**



## Performance specifications

### Heading output

- **Output range**: 0 - 360°
- **Resolution**: 0.01°

#### MGC R1

- **Heading accuracy (speed aided)**: 0.25° secant latitude RMS
- **Heading accuracy (GNSS aided)**: 0.2° secant latitude RMS
- **Heading settling time to data available**: <5 minutes from start-up (typical)
- **Heading settling time to full accuracy**: 30 minutes from start-up (typical)

#### MGC R2 & R3

- **Heading accuracy (speed aided), MGC R2**: 0.15° secant latitude RMS

- **Heading accuracy (speed aided), MGC R3**: 0.08° secant latitude RMS
- **Heading accuracy (GNSS aided), MGC R2**: 0.1° secant latitude RMS
- **Heading accuracy (GNSS aided), MGC R3**: 0.04° secant latitude RMS
- **Heading settling time to data available, MGC R2 & R3**: <5 minutes from start-up (typical)
- **Heading settling time to full accuracy, MGC R2 & R3**: 17 minutes from start-up (typical)

### MGC R4 & R5

- **Heading accuracy (speed aided), MGC R4**: 0.04° secant latitude RMS
- **Heading accuracy (speed aided), MGC R5**: 0.02° secant latitude RMS
- **Heading accuracy (GNSS aided), MGC R4**: 0.02° secant latitude RMS
- **Heading accuracy (GNSS aided), MGC R5**: 0.008° secant latitude RMS
- **Heading settling time to data available, MGC R4 & R5**: <5 minutes from start-up (typical)
- **Heading settling time to full accuracy, MGC R4 & R5**: 8 minutes from start-up (typical)

## Roll and pitch output

- **Output range**: ±90°
- **Resolution**: 0.001°
- **Roll/pitch accuracy (unaided), MGC R1**: 0.05° RMS
- **Roll/pitch accuracy (unaided), MGC R2**: 0.02° RMS
- **Roll/pitch accuracy (unaided), MGC R3**: 0.01° RMS
- **Roll/pitch accuracy (unaided), MGC R4 & R5**: 0.008° RMS

## Heave motion output

- **Output range**: ±50 m

### MGC R1

- **Heave accuracy for 0 to 18 s motion periods (real-time)**: 10 cm or 10% whichever is highest (RMS)

### MGC R2, R3, R4 & R5

- **Heave accuracy for 0 to 25 s motion periods (real-time)**: 10 cm or 10% whichever is highest (RMS)

- **Heave accuracy for 10 s motion periods (real-time)**: 1 cm or 3% whichever is highest (RMS)
- **Heave accuracy for 0 to 50 s motion periods (delayed)**: 2 cm or 2% whichever is highest (RMS)

## Position output

### MGC R2 & R3

- **Free inertial (GNSS aided), MGC R2**: 5 nm/h
- **Free inertial (GNSS aided), MGC R3**: 2 nm/h

### MGC R4 & R5

- **Free inertial (GNSS aided), MGC R4**: 0.4 nm/h
- **Free inertial (GNSS aided), MGC R5**: 0.25 nm/h DRMS
- **Free inertial (GNSS aided), MGC R5**: <20 m/15 minutes DRMS

## Internal processing

- **Main processing cycle frequency**: 200 Hz

# Weights and outline dimensions

### Sensor Unit

- **Outline dimensions**:
  - **Length**: 189.5 mm
  - **Width**: 189.5 mm
  - **Height**: 188.9 mm
- **Weight**:8 kg
- **Connector type**: Souriau 851–36RG 16–26S50 (MIL spec.)

### MGC JB7 Junction Box

- **Outline dimensions**:
  - **Type**: MGC-E-JB7
  - **Length**: 308 mm
  - **Width**: 155 mm

  - **Height**: 67 mm
- **Weight**: 1.5 kg

### MGC repeater junction box

- **Outline dimensions**:
  - **Type**: MGC-E-JB5
  - **Length**: 115 mm
  - **Width**: 104 mm
  - **Height**: 57.1 mm
- **Weight**: 0.5 kg
- **Cable glands (clamping range)**: 4.5 mm - 9 mm, 7 mm - 12.5 mm

### Bridge Alert Panel

- **Outline dimensions**:
  - **Type**: MGC-E-BAP
  - **Length**: 115 mm
  - **Width**: 104 mm
  - **Height**: 57.1 mm
- **Weight**: 0.5 kg
- **Cable glands (clamping range)**: 4.5 mm - 9 mm, 7 mm - 12.5 mm

## Power specifications

### MGC® COMPASS (JB7 Junction Box)

- **Input voltage 1**: 24 V DC nominal (18 - 32 V DC)
- **Power consumption**: Max. 20 W
- **Power rise speed**: Not critical
- **Uninterruptible power supply (UPS)**: Not integrated. Connection to UPS recommended. UPS required for high-speed craft.

## Environmental specifications

### Sensor Unit

- **Operating temperature**: -15 °C – 55 °C
- **Storage temperature**: -35 °C – 70 °C

- **Storage humidity**: Sealed
- **Ingress protection (IP) code**: IP66
- **Enclosure material**: Anodised aluminium
- **Max shock non-operational**: 1000 m/s$^2$ (10 ms peak)
- **MTBF (hours)**: 50000 h (computed)
- **MTBF (hours)**: 100000 h (service history based)

### MGC JB7 Junction Box

- **Type**: MGC-E-JB7
- **Operating temperature**: -15 °C - 55 °C
- **Storage temperature**: -35 °C - 70 °C
- **Ingress protection (IP) code**: IP52
- **Enclosure material**: Aluminium

### MGC repeater junction box

- **Type**: MGC-E-JB5
- **Operating temperature**: -15 °C - 55 °C
- **Storage temperature**: -35 °C - 70 °C
- **Ingress protection (IP) code**: IP54
- **Enclosure material**: Aluminium

### Bridge Alert Panel

- **Type**: MGC-E-BAP
- **Operating temperature**: -15 °C - 55 °C
- **Storage temperature**: -35 °C - 70 °C
- **Ingress protection (IP) code**: IP54
- **Enclosure material**: Aluminium

### Related topics

Storage, page 104

## Cable specifications

### Sensor Unit cable

- **Type**: MGC-E-CJB7, Heady duty screened, 14 x 2 x 0.25 mm$^2$
- **Length**: 5 m

- **Diameter**: 13.5 mm
- **Weight**: 0.27 kg/m
- **Flame retardation**: IEC 60332-1
- **Insulation**: PP (conductors), PUR (outer cover)
- **Screen**: Cu-braid

### Data cable

Specification for cables connected to the communication interface ports.

- **Clamping range, max.**: 0.08 $mm^2$ - 1.50 $mm^2$
- **Cable types**: 0.50 $mm^2$ - 1.50 $mm^2$Solid H05(07) V-U, Stranded H07 V-R, Flexible H05(07) V-K, Flexible with ferrule, Ferrule with plastic collar
- **Stripping length**: 6.0 mm

## Interface specifications

- **COM 1 - COM 4**: Serial port, bidirectional RS-422 (IEC 61162)
- **COM 5**: Serial port output RS-422 and PPS port input RS-422
- **Baud rate**: 115200 baud, max.
- **COM 6 - COM 8**: Serial port output RS-422 with fixed baud rate, 4800 baud
- **Ethernet**: 3 x 10/100 Mbps
- **UDP/IP ports**: 5 outputs (user configurable), 1 input (static)
- **Data output variables (for each output)**: 24, max. (serial line or Ethernet port)
- **Data output rate**: 200 Hz, max.
- **Analog output**: 3 user configurable channels, ±10 Volts
- **Timing accuracy**: 1 ms
- **Data delay**: Typical 3.5 ms plus transmission delay
- **Data output**: Cyclic output of data or by request from host computer
- **Fanout**: Typical 10
- **Input impedance**: Open-ended/120 Ohm (optional)

## Data input specifications

- **Input formats**: NMEA sentences. Available formats GGA, GLL, VTG, VBW, ZDA.

# Telegram specifications

**Topics**



## Output formats

**Topics**



### NMEA HCR

The NMEA HCR sentence is used to inform about the state and value of the heading correction included in the heading which is reported by the THS sentence when the heading source can apply correction.

Fixed output rate for the HCR sentence is 1 Hz.

Note

*The HCR sentence will send correction status N when the compass has no velocity input, or if the heading status is invalid, or when the compass in the realignment phase after a long velocity outage.*

### Format

```
$HEHCR,x.x,a,a,x.x*hh
```

### Description

1 **x.x**: Heading, degrees true.

Value of heading for which HCR is referenced. This value does not replace heading value from the THS sentence. This value is used for synchronization between the high data rate of the THS sentence and the low data rate of the HCR sentence.

2 **a**: Mode indicator.

A = Autonomous

E = Estimated (dead reckoning)

M = Manual input

S = Simulator mode

V = Data not valid (including standby)

3 **a**: Correction state. This field should not be null.

A = Both speed/latitude and dynamic correction included in heading.

D = Dynamic correction included in heading.

S = Speed/latitude correction included in heading.

N = No correction included in heading.

V = Not available, reporting device does not know about correction state.

4 **x.x**: Correction value.

Value of correction included in heading. Degrees +/- 180,0° with one decimal. Null field indicates correction state N (no correction included) or V (not available).

5 ***hh**: Checksum

## NMEA HDT

The NMEA HDT sentence contains the actual vessel heading in degrees true produced by any device or system producing true heading.

Note

*This is a deprecated sentence which has been replaced by THS.*

### Format

```
$--HDT,x.x,T*hh<CR><LF>
```

### Description

1 **x.x**: Heading, degrees true.

2 **T**: Heading, degrees true.

3 ***hh**: Checksum

## NMEA ROT

The NMEA ROT sentence contains rate of turn and direction of turn information.

### Format

```
$--ROT,x.x,A*hh<CR><LF>
```

### Description

1 **x.x**: Rate of turn, °/min, "-" = bow turns to port.

2 **A**: Status.

A = Data valid.

V = Data invalid.

3 ***hh**: Checksum

## NMEA THS

The NMEA THS sentence contains the actual vessel heading in degrees true produced by any device or system producing true heading.

This sentence includes a "mode indicator" field providing critical safety related information about the heading data.

Note

*This sentence replaces the HDT sentence.*

### Format

```
$--THS,x.x,a*hh<CR><LF>
```

### Description

1 **x.x**: Heading, degrees true.

2 **T**: Mode indicator. This field should not be null.

A = Autonomous

E = Estimated (dead reckoning)

M = Manual input

S = Simulator mode

V = Data not valid (including standby)

3 ***hh**: Checksum

## NMEA VER

The NMEA VER sentence provides identification and version information about a device. This sentence is produced as a reply to a query sentence.

The sentence is as specified in NMEA standard 0183, version 4.0.

### Format

```
$--VER,x,x,aa,c--c,c--c,c--c,c--c,c--c,c--c,x*hh
```

### Description

1 **x**: Total number of sentences needed, 1 - 9

2 **x**: Sentence number, 1 - 9

3 **aa**: Device type

4 **c--c**: Vendor identification

5 **c--c**: Unique identifier. Max 15 characters.

6 **c--c**: Manufacturer serial number. Max. 32 characters.

7 **c--c**: Model code (product code). Max. 32 characters.

8 **c--c**: Software revision. Max. 32 characters.

9 **c--c**: Hardware revision. Max. 32 characters.

10 **x**: Sequential message identifier. Message identification number from 0 - 9.

11 ***hh**: Checksum

## PSXN20

The proprietary PSXN20 NMEA sentence contains quality indicators for roll, pitch, heading and position.

The sentence destination is positioning reference systems.

The sentence is based on NMEA sentence format.

### Format

```
$PSXN,20,x,x,x,x*hh<CR><LF>
```

### Description

1 **$**: Start character.

2 **PSXN**: Seatex ID.

3 **Message number**: 20.

4 **x**: horiz-qual - Horizontal position and velocity quality.

0 = Normal

1 = Reduced performance

2 = Invalid data

5 **x**: hgt-qual - Height and vertical velocity quality.

0 = Normal

1 = Reduced performance

2 = Invalid data

6 **x**: head-qual - Heading quality.

0 = Normal

1 = Reduced performance

2 = Invalid data

7 **x**: rp-qual - Roll and pitch quality.

0 = Normal

1 = Reduced performance

2 = Invalid data

8 ***hh**: Checksum.

9 **<CR><LF>**: End of sentence.

## PSXN23

The proprietary PSXN23 NMEA sentence contains attitude and heave data calculated in the MGC system.

The sentence destination is PRS monitoring systems.

The sentence is based on NMEA sentence format.

### Format

```
$PSXN,23,x.x,x.x,x.x,x.x*hh<CR><LF>
```

### Description

1 **$**: Start character.

2 **PSXN**: Seatex ID.

3 **Message number**: 23

4 **x.x**: Roll in degrees. Positive with port side up.

5 **x.x**: Pitch in degrees. Positive with bow up.

6 **x.x**: Heading, degrees true.

7 **x.x**: Heave [m]. Positive down.

8 ***hh**: Checksum (delimiter and field).

9 **<CR><LF>**: End of sentence.

# Input formats

### Topics

## About input formats

The MGC® COMPASS will accept several NMEA 0183 sentences, and extract valuable information. With reference to *Maritime navigation and radiocommunication equipment and systems – Digital interfaces Part 1: Single talker and multiple listeners*, IEC 61162-1 2010-11, edition 4.

All fields must be non-empty, unless stated otherwise.

## NMEA GGA

The NMEA GGA sentence transfers the time, position and fix related data from a global positioning system (GPS).

The sentence is as specified in NMEA standard 0183, version 3.0.

### Format

```
$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh
```

### Description

1 **hhmmss.ss**: UTC of position (Hours, minutes and seconds)

2 **llll.ll**: Latitude (Degrees, minutes and fractions of minutes)

3 **a** : Latitude sector, North/South

4 **yyyyy.yy**: Longitude (Degrees, minutes and fractions of minutes)

5 **a** : Longitude sector,

6 **x**: GPS quality indicator. This shall not be a null field.

0 = Fix not available or invalid

1 = GPS/GLONASS, Fix valid

2 = DGPS/DGLONASS, Fix valid

5 = Float RTK fix

7 **xx**: Number of satellites in use, 00 - 12

8 **x.x**: Horizontal dilution of precision (HDOP)

9 **x.x**: Altitude, ref: mean-sea level (geoid)

10 **M**: Altitude unit, M = Metres

11 **x.x**: Geoidal separation

The difference between the WGS-84 earth ellipsoid surface and mean-sea-level (geoid) surface.

12 **M**: Geoidal separation unit, M = Metres

13 **x.x**: Age of differential GPS data

Time i seconds. Null field if DGPS is not used.

14 **xxxx**: Differential reference station ID

15 ***hh**: Checksum

### Requirements for MGC® COMPASS

- **Item 6 - GPS quality**: Must be > 0.
- **Items 7, 8, 11, 12, 13, 14**: Not used.

## NMEA GLL

The NMEA GLL sentence transfers the latitude and longitude of vessel position, the time of the position fix and the current status from a global positioning system (GPS).

The sentence is as specified in NMEA standard 0183, version 3.0.

### Format

```
$--GLL,llll.ll,a,yyyyy.yy,a,hhmmss.ss,A,a*hh
```

### Description

1 **llll.ll**: Latitude (Degrees, minutes and fractions of minutes)

2 **a** : Latitude sector,

3 **yyyyy.yy**: Longitude (Degrees, minutes and fractions of minutes)

4 **a** : Longitude sector,

5 **hhmmss.ss**: UTC of position (Hours, minutes and seconds)

6 **A**: Status

A = The data are valid.

V = The data are not valid.

7 **a**: Mode indicator

A = Autonomous

D = Differential

N = The data are not valid.

8 ***hh**: Checksum

### Requirements for MGC® COMPASS

- **Item 6 - Status**: Must be A.
- **Item 7 - Mode indicator**: Not used

## NMEA VTG

The NMEA VTG sentence transfers the actual course and speed relative to the ground. The sentence is as specified in NMEA standard 0183, version 3.0.

### Format

```
$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh
```

### Description

1 **x.x**: Course over ground, Degrees (True)

2 **T**: Course over ground, marker

3 **x.x**: Course over ground, Degrees (Magnetic)

4 **M**: Course over ground, marker

5 **x.x**: Speed over ground, knots

6 **N**: Speed over ground, knots

7 **x.x**: Speed over ground, km/h

8 **K**: Speed over ground, km/h

9 **a**: Mode indicator. This shall not be a null field.

A = Autonomous

D = Differential

N = The data are not valid.

10 ***hh**: Checksum

### Requirements for MGC® COMPASS

- **Items 1 and 2 - True course over ground**: Used if present.
- **Items 3 and 4 - Magnetic course over ground**: Not used
- **Items 5 and 6 - Speed in knots**: Used if present.
- **Items 7 and 8 - Speed in km/h**: Used if present. Preferred over knots.
- **Item 9 - Mode indicator**: Must be A or D.

## NMEA VBW

The NMEA VBW datagram contains water- and ground-referenced vessel speed data.

### Format

```
$--VBW,x.x,x.x,A,x.x,x.x,A,x.x,A,x.x,A*hh<CR><LF>
```

### Description

1 **x.x**: Speed relative to water, Longitudinal (knots)

2 **x.x**: Speed relative to water, Transverse (knots)

3 **A**: Status, Speed relative to water,

A = The data are valid.

4 **x.x**: Speed relative to ground, Longitudinal (knots)

5 **x.x**: Speed relative to ground, Transverse (knots)

6 **A**:Status, Speed relative to ground

**A** = The data are valid.

7 **x.x**: Speed relative to water, Stern, Transverse (knots)

8 **A**: Speed relative to water Status, Stern,

**A** = The data are valid.

9 **x.x**: Speed relative to ground, Stern, Transverse (knots)

10 **A**: Status, Speed relative to ground, Stern,

**A** = The data are valid.

**V** = The data are not valid.

11 ***hh**: Checksum

Note

*Transverse speed: " – " = port. Longitudinal speed: " – " = astern.*

### Requirements for MGC® COMPASS

- **Items 1, 2 and 3 - Water speed in knots**: May be empty.
- **Items 4, 5 and 6 - Ground speed in knots**: May be empty. Preferred over water speed.
- **Items 3 and 6 - Status**: Must be A if used.
- **Items 7 - 11**: Not used

## NMEA ZDA

The NMEA ZDA sentence contains the universal time code (UTC), day, month, year and local time zone.

The sentence is as specified in NMEA standard 0183, version 3.0.

### Format

```
$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh
```

### Description

1 **hhmmss.ss**: UTC of position (Hours, minutes and seconds)

2 **xx**: Day UTC, 01 - 31

3 **xx**: Month UTC, 01 - 12

4 **xxxx**: YearUTC

5 **xx**: Local time zone, hours, 00 - ±13 hrs

6 **xx**: Local time zone, minutes, 00 – +59

7 ***hh**: Checksum

### Requirements for MGC® COMPASS

- **Items 5 and 6:**Not used.

# Alert messages

### Topics



## About alert handling messages

All alert handling in the Junction Box JB7/MGC Sensor Unit is based on reference IEC 62923-1 , edition 1.0, 2018-08.

The Junction Box JB7/MGC Sensor Unit will issue warnings using ALF and ACN messages. The mode is selected in the user configuration setup.

Alerts are used to announce abnormal situations and conditions requiring attention, decision and/or action. Two priorities are used: warnings and cautions. For a description of alert types, see the *MGC COMPASS R-series Operator manual*. Alert handling is carried out by exchanging messages between the CAM and the MGC. A message consists of 1 or more sentences.

For the received sentences ACN and HBT, see *Maritime navigation and radiocommunication equipment and systems - Integrated navigation systems - Part 2:*

*Modular structure for INS - Operational and performance requirements, methods of testing and required test results*, IEC 62923-1, edition 1.0, 2018-08.

## NMEA ACN

The NMEA ACN sentence is used for alert handling. The sentence is used for acknowledge, silence, responsibility transfer and to request repeat of alert details.

The ACN message is sent by the CAM to issue commands to the Junction Box JB7/MGC Sensor Unit.

### Format

```
$HEACN,hhmmss.ss,aaa,x.x,x.x,c,a*hh<CR><LF>
```

### Description

1 **hhmmss.ss**: Time.

2 **aaa**: Manufacturer mnemonic code. Always null.

3 **x.x**: Alert identifier. 3062 for system fault.

4 **x.x**: Alert instance, 1 to 999999. Unique within the life cycle of distributed alert.

5 **c**: Alert command, A, Q, O or S.

6 **a**: Sentence status flag.

7 ***hh**: Checksum

## NMEA ALC

The NMEA ALC sentence is used for alert handling. The purpose of the sentence is to satisfy the needs for a safe and consistent data distribution with a minimum of data traffic.

The ALC sentence is transmitted by the Junction Box JB7 once each 30 seconds as a minimum.

### Format

```
$HEALC,xx,xx,xx,x.x,aaa,x.x,x.x,x.x,......,aaa,x.x,x.x,x.x*hh<CR><LF>
```

### Description

1 **xx**: Total number of sentences for this message, 01 to 99.

2 **xx**: Sentence number, 01 to 99.

3 **xx**: Sequential message identifier, 00 to 99. Identifies sentence belonging to group of sentences.

4 **x.x**: Number of alert entries. 0-n if all alerts in normal state.

5 **aaa**: Manufacturer mnemonic code. Null if alert identifier = 3062 (system fault).

6 **x.x**: Alert entry 1 - Alert identifier. 3062 for system fault.

7 **x.x**: Alert entry 1 - Alert instance, 1 to 999999. Unique within life cycle of distributed alert.

8 **x.x**: Alert entry 1 - Revision counter, 1 to 99. Unique for each instance of alert.

9 **…...**: Additional alert entries

10 **aaa**: Manufacturer mnemonic code - See ALF manufacturer identifier

11 **x.x**: Alert entry n - Alert identifier - See ALF Alert identifier

12 **x.x**: Alert entry n - Alert instance - See ALF Alert instance

13 **x.x**: Alert entry n - Revision counter - See ALF Revision counter

14 ***hh**: Checksum

## NMEA ALF

The NMEA ALF sentence is used for alert handling. It is used to report an alert condition and the alert state of the device.

An ALF message shall be published for an alert each time the alert information in this sentence changes and on alert request.

### Format

```
$HEALF,x,x,x,hhmmss.ss,a,a,a,aaa,x.x,x.x,x.x,x,c--c*hh<CR><LF>
```

### Description

1 **x**: Total number of ALF sentences for this message, 1 to 2. This message = 2.

2 **x**: Sentence number, 1 to 2.

3 **x**: Sequential message identifier, 0 to 9.

4 **hhmmss.ss**: Time of last change. Last time the data within the alert message has changed, UTC.

5 **a**: Alert category, A, B or C. Category = B.

6 **a**: Alert priority, E, A, W or C. Priority = W for id 3062 system fault.

7 **a**: Alert state, A, S, N, O, U or V.

8 **aaa**: Manufacturer mnemonic code. Null if alert identifier = 3062 (system fault).

9 **x.x**: Alert identifier.3062 for system fault.

10 **x.x**: Alert instance, 1 to 999999.

11 **x.x**: Revision counter, 1 to 99.

12 **x**: Escalation counter, 0 to 9.

13 **c--c**: Alert text.

14 ***hh**: Checksum

## NMEA ARC

The NMEA ARC sentence is used for alert handling.

The ARC sentence is transmitted by the Junction Box JB7/MGC Sensor Unit to notify the CAM about refused commands.

### Format

```
$HEARC,hhmmss.ss,aaa,x.x,x.x,c*hh<CR><LF>
```

### Description

1 **hhmmss.ss**: Time.

2 **aaa**: Manufacturer mnemonic code. Always null.

3 **x.x**: Alert identifier. 3062 for system fault.

4 **x.x**: Alert instance, 1 to 999999. Unique within the life cycle of distributed alert.

5 **c**: Refused alert command, A, Q, O or S.

6 ***hh**: Checksum

## NMEA HBT

The NMEA HBT sentence is intended to be used to indicate that equipment is operating normally, or for supervision of a connection between two units.

In responsibility transfer mode the Junction Box JB7 could receive a heartbeat sentence, HBT, at 60-second intervals as a minimum. If heartbeat is missing for 120 seconds, normal alert handling is resumed.

### Format

```
$HEHBT,x.x,A,x*hh<CR><LF>
```

### Description

1 **x.x**: Configured repeat interval.

2 **A**: Equipment status. Equipment in normal operation = A (yes) or V (no).

3 **x**: Sequential sentence identifier. 0 to 9.

4 ***hh**: Checksum

# Equipment handling

**Topics**



## Taking delivery

When the equipment arrives at its destination:

- Perform an inspection immediately to register any damage that may have occurred in transit.
- If you find any damage, both the insurance company and the shipping agent must be informed immediately.

## Unpacking and handling

Care should be taken when unpacking and handling the equipment. A visual inspection should be made to check that the equipment has not been damaged during shipment and that all components and parts are present according to the packing list.

The equipment contains delicate electronic components – handle with care and avoid shocks.

The equipment can be lifted by hand.

# Storage

After the equipment in the boxes has been inspected and it has been verified that no damage has occurred, the equipment must be stored in its original packaging until the time of installation. The storage premises must be dry and well protected.

**Sensor Unit transportation box**

The unit is shipped in a specially designed transportation box. Keep the unit stored within the box until everything is ready for installation of the unit.

Note

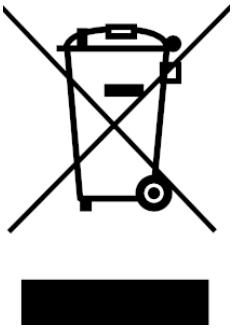
*After the unit has been installed, please keep the transportation box. The unit must be shipped in this box for maintenance or repair in order to maintain the warranty.*

**Related topics**

Environmental specifications, page 86

# Disposal

At the end of the product lifetime, all parts and products must be disposed of in an environmentally-friendly way.



All electrical and electronic parts and components must be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or local authorities. The correct disposal and separate collection of your old appliance will help prevent potential negative consequences for the environment and human health. This is a precondition for reuse and recycling of used electrical and electronic equipment. For more detailed information about disposal of your old appliance, please contact your local authorities or waste disposal service.

All disposal of mechanical, electromechanical, electronic and chemical waste - including all types of batteries - must take place according to national and international rules and regulations. Observe the relevant Waste Electrical and Electronic Equipment (WEEE) regulations.

The equipment can be returned to Kongsberg Discovery AS if there is no local WEEE collection. The equipment is marked with this waste pictogram.

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