Raytheon Anschütz

Operator Unit 130-626

Standard 22 GYRO COMPASS

Operator and Service Manual

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The present manual has been drawn up as a description and reference book.
It will help answer questions and will solve problems in the quickest possible manner.

Before operating the equipment read and follow the instructions and hints in this manual.

For this purpose refer to the table of contents and read the corresponding chapters thoroughly.
If you have any further questions, please contact us on the following address:

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Since errors can hardly be avoided in the documentation in spite of all efforts, we should appreciate any remark and suggestion.
Subject to alterations.

CHANGE HISTORY

Date	Change
February 2015	New Edition
June 2015	Information added in chapter 1.4.2.3 and 3.7

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0 General

0.1 Safety Regulations

The following safety symbols are used in this manual:

WARNING 	Warning statements indicate a hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION 	Caution statements indicate a hazardous situation that, if not avoided, could result in minor or moderate injury or equipment damage.

	Notes indicate information considered important but not hazard related.

0.2 Further Documents

Documentation No.	Title
3963	Configuration Tool AS NB42-232
4201	Gyro Compass Standard 22
3970	Distribution Unit 138-118.NG002
4008	Distribution Unit 138-118 NG003
IEC 61162	Maritime navigation and radiocommunication equipment and systems – Digital interfaces

0.3 List of Abbreviation

Term	Description
BAM	Bridge Alert Management
BNWAS	Bridge Navigational Watch Alarm System
CAM-HMI	Central Alert Management Human Machine Interface
CAN	Controller Area Network
DP System	Dynamic Positioning System
GGMR	Gyro Gyro Magnetic Redundancy
IMO	International Maritime Organization
MC	Magnetic Compass
RoT	Rate of Turn
SEC	Speed Error Correction
TMC	Transmitting Magnetic Compass
VBW Wtr	Water speed
VBW Gnd	Ground speed
VHW	Water speed and heading
VTG	Course over ground and ground speed

1 General Information

1.1 Safety Regulation

CAUTION	
	Only for GGMR application! All manually set values have to be set for both Distribution Units.

CAUTION	
	Alerts from external heading devices (non-Raytheon devices, connected to the Distribution Unit) are not output via the Operator Unit. Only a sensor error would be reported by a timeout.

CAUTION	
	If there are more than one Operator Unit in an application, than all settings and configurations have to be performed for each Operator Unit.

CAUTION	
	After configuration changes the Distribution Unit and the Operator Unit must be reset. Changes must be made for all Distribution Units and Operator Units in a compass system.

1.2 Technical Description

The Operator Unit operates and monitors all devices connected to the CAN-Bus (see chapter 1.6), such as the gyro compass and the magnetic compass.
It is possible to connect more than one Operator Unit to the CAN-Bus. Both Operator Units connected to the system have the same priority.

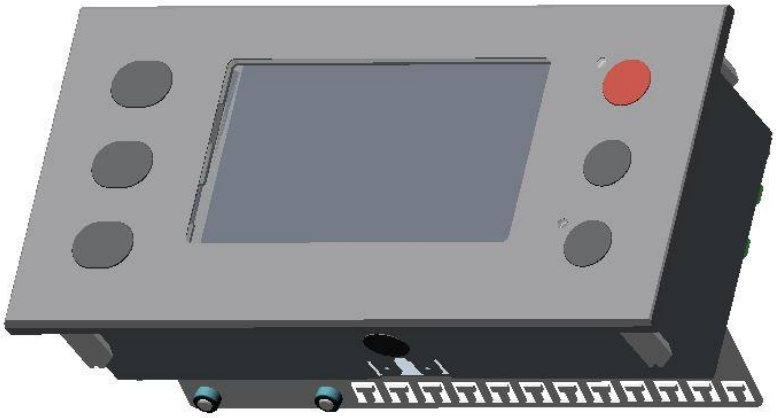


Figure 1-1 Operator Unit (desk-flush mounted)

The Operator Unit is available in two versions - desk-flush mounted, and with angled fixing bracket.
The Operator Unit consists of:

- Front Panel with
  - 6 buttons
  - 2 LEDs
- 2 PCBs
- a transmitter for audible alarms (mounted behind the front panel)

The Operator Unit is designed for a redundant CAN-Bus (CAN1 and CAN2).

1.3 Operation and Display Elements

After the power supply is connected to the Operator Unit the connected devices are indicated on the display unit.

If more than one sensor is connected to the Operator Unit the gyro compass 1 will be displayed as selected sensor by default (if heading available).

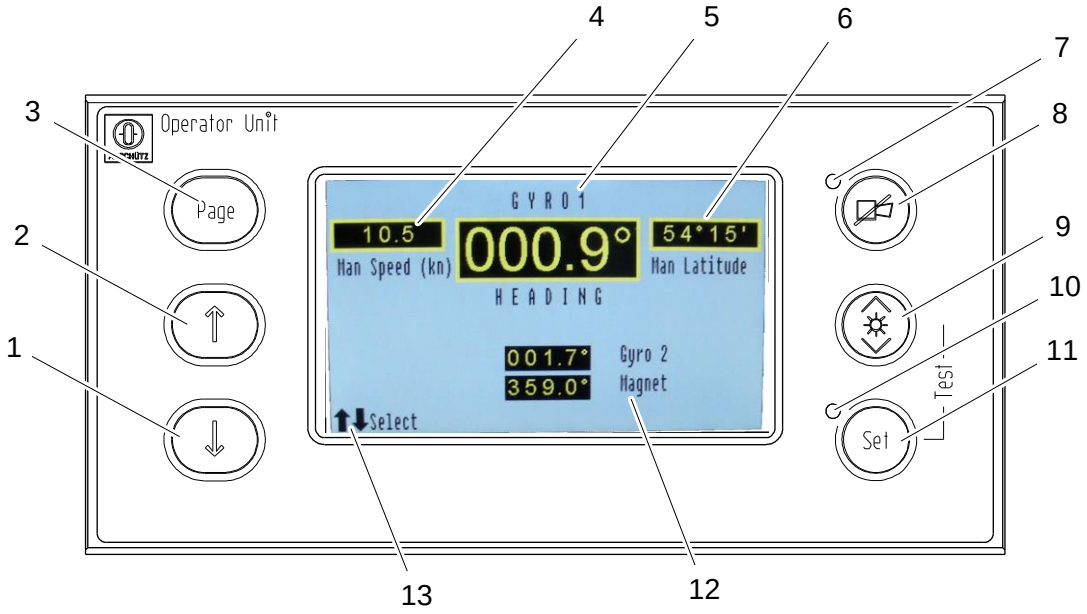


Figure 1-2 Operation and Display Elements, Gyro Compass selected

Pos. No.	Designation	Function
1	Select (Down)	Use the Select (Down) button to navigate through the display.
2	Select (Up)	Use the Select (Up) button to navigate through the display.
3	Page	Use the Page button to navigate through the main pages or to get back to the overview page.
4	Speed	Displays the speed.
5	Selected Sensor	Displays the heading of the selected sensor.
6	Latitude	Displays the latitude.
7	Alert LED	Flashes red when a new alert occurs, illuminates continuously when the alert is acknowledged but not eliminated.
8	Acknowledge	Use the Acknowledge button to open the alert page (only possible, if alerts are available) or acknowledge an alert.

Pos. No.	Designation	Function
9	Brightness	Use the Brightness button to adjust the brightness of the display.
10	Set LED	Flashes whenever an adjustment can be performed.
11	Set	Use the Set button to confirm the selection/adjustment.
12	Unselected sensors	Displays the heading of the unselected sensors.
13	Selection possible	Appears on the display whenever a selection is possible. Use select buttons (1 and 2) to navigate through the display.

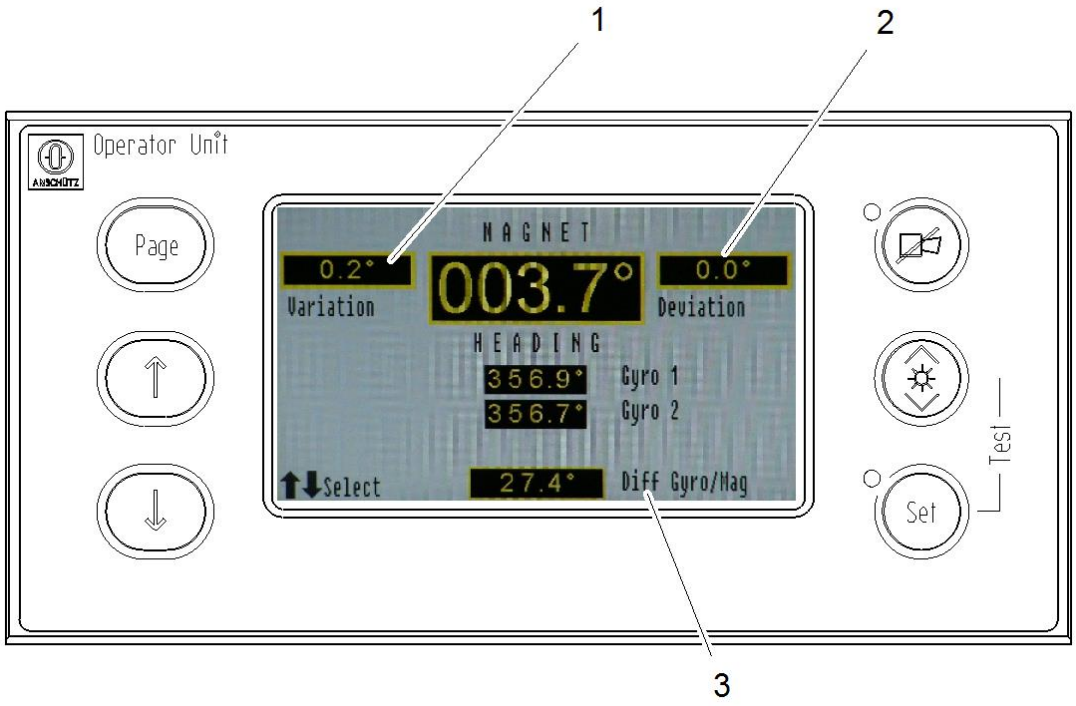


Figure 1-3 Operation and Display Elements, Magnetic Compass selected

Pos. No.	Designation	Function
1	Variation	Shows the deviation in relation to the location.
2	Deviation	Shows the deviation in relation to the ship.
3	Diff Gyro/Mag	Compares the connected sensors and displays the difference of a defined threshold.

CAUTION	
	The selected sensor transfers the heading information to all connected receivers via the CAN-Bus. Make sure that the receivers are allowed to use the heading information from a magnetic compass.

1.4 Main Pages

The Operator Unit provides 4 main pages, which can be selected with the Page button (Figure 1-2/3):

- Overview
- Service
  - Difference Alarm for Gyro/Gyro and Gyro/Magnetic
  - Auto Heading
  - Individual SEC
  - DV-Bus activated
  - Speed Source DU
  - Heading uncorrected
  - Rate of Turn
  - Deviation Table
  - Gyro Data
  - CAN-Devices
  - Software Versions
- Heading and RoT
- Alerts

1.4.1 Overview

This page provides an overview of the connected sensors (see Figure 1-2). Depending on the status of the device, heading information is displayed. If several sensors are connected to the operator unit, the heading data supplied by the gyro compass designated GYRO is displayed as selected sensor. If several gyro compasses are connected, the one designated GYRO 1 will be displayed as selected sensor.

1.4.1.1 Gyro Compass selected

If a gyro or a GPS compass is selected, speed (Figure 1-2/4) and latitude (Figure 1-2/6) are displayed next to the heading information.

Speed
The last selected mode is selected by default. The following modes are available:

- Automatic Speed “Aut Speed”
- Manual Speed “Man Speed”
- Individual Speed “Ind SEC”

To switch-over to “Man Speed”, see chapter 2.5.2.
For information about Individual Speed, see chapter 1.4.2.3.

Latitude
The last selected mode is selected by default. The following modes are available:

- Automatic Latitude “Aut Latitude”
- Manual Latitude “Man Latitude”
- Individual Latitude “Ind Latitude”

To switch-over to “Man Latitude”, see chapter 2.5.3.
For Information about Individual Latitude, see chapter 1.4.2.3.

1.4.1.2 Magnetic Compass selected

If a magnetic compass is selected, variation (Figure 1-3/1) and deviation (Figure 1-3/2) are displayed next to the heading information.

	Variation and deviation are used to determine the True Magnetic Heading and must be checked and updated by the user.

The lower part of the display lists the connected sensors which are not selected (Figure 1-2/12).

1.4.2 Service

WARNING	
	Configuration and changes to the Service page must be performed by well-trained Raytheon Anschütz service personnel only.

	If nothing is changed and no sub-menu is selected, the service page switches back to the overview page after approx. 20 sec.

The service page shows the heading of the selected sensor and a list of the sub-menus for configuration, adjustment and system information (see Figure 1-4).
Every sub-menu of the service page – except from the deviation table – has a timeout function.
Opening a sub-menu the timeout function starts with 120 seconds. The remaining time is displayed on the left hand side of the display. If nothing is changed within this time the service mode is cancelled and it switches back to the main page.

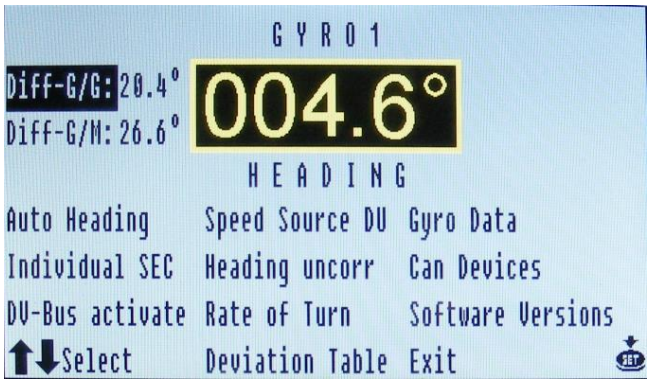


Figure 1-4 Service

For configuration and settings of the service page, see chapter 2.6.

1.4.2.1 Heading Difference

Within the compass system, all connected heading sensors are compared with each other in order to monitor and display the difference of a defined threshold.
If the sensor difference is greater than the user threshold value, an alert “Heading Difference Gyro/Gyro (GPS)” or “Heading Difference Gyro (GPS)/Magnetic” is displayed and has to be acknowledged, see chapter 4.2.

Figure 1-5 Difference Alarm

Pos. No.	Designation	Function
1	Diff-G/M	Shows and enables the setting of the user threshold value for the difference between gyro and magnetic.
2	Diff-G/G	Shows and enables the setting of the user threshold value for the difference between gyro and gyro.

	Gyro compass can be: Compass Standard 22, MINS or other external non Raytheon Anschütz heading devices. Magnetic compass can be: Raytheon Anschütz magnetic probe or other non-Raytheon Anschütz magnetic compasses (Fluxgate).

For setting the threshold value, see chapter 2.6.2.

1.4.2.2 Auto Heading

In case of a failure of the selected heading an automatic switch-over to the next heading sensor can be selected. Gyro, GPS or magnetic compass can be selected.

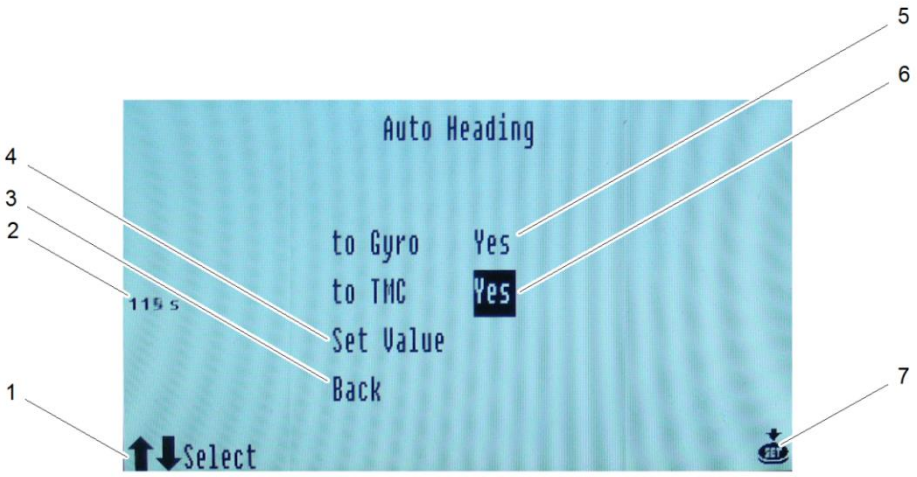


Figure 1-6 Auto Heading

Pos. No.	Designation	Function
1	Selection possible	Appears on the display whenever a selection is possible. Use select buttons (Figure 1-2/1 and 2) to navigate through the display.
2	Remaining Time	Shows the remaining time until it switches back to the overview page.
3	Back	Switches back to the previous page.
4	Set Value	Confirm the settings for auto heading.
5	Gyro Selection*	Decide if an automatic switch-over to the gyro/GPS compass(es) is desired.
6	TMC Selection*	Decide if an automatic switch-over to the magnetic compass is desired.
7	Set	Use the Set button to confirm the selection.

* Only the connected sensors are shown on the display and can be selected for an automatic switch-over.

The switch-over occurs in a pre-defined order:
Gyro → Gyro → GPS → Magnet

	An automatic switch-back is not possible and has to be performed manually. For changing the current sensor, see chapter 2.5.

To change the settings for auto heading, see chapter 2.6.3.

If an automatic switch-over takes place, the alert “Autom. Switched to *XXX**” is displayed and has to be acknowledged, see chapter 4.2.
There is no message in case of a manual switch-over.

* *XXX* can be Gyro, GPS or Mag.

1.4.2.3 Individual SEC

Speed Error is a physical deviation from the steering heading indicated on the gyro compass (compass heading) from the true heading (chart heading).

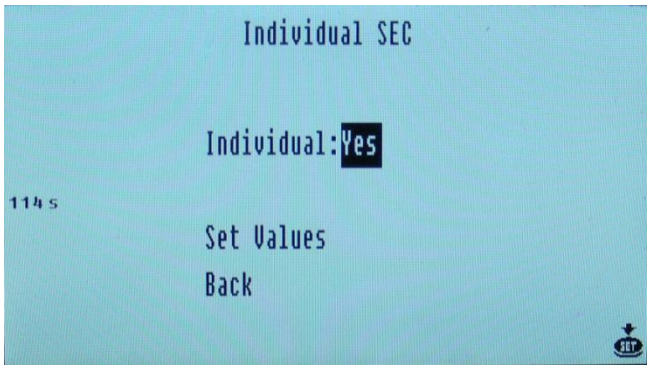


Figure 1-7 Individual SEC

For detailed information about the Speed Error Correction and the Speed Error Correction table, see Manual of the Gyro Compass.
To enable or disable the Individual SEC, see chapter 2.6.8.

Speed and Position Input for Speed Error Correction

The heading of gyro compasses is affected by the speed of the vessel and the latitude where the vessel is operating. These errors are corrected by Standard 22 automatically. It is only required to input speed and latitude/position.

There are 3 ways for speed and position input with Standard 22 gyro compass systems. Please consider the different ways especially for dual and triple Standard 22 gyro compass systems.

1. Manual input of speed and position
   In this application speed and position are manually input via the Operator Unit of the gyro compass. This data is transferred to all connected Standard 22 gyro compasses. Thus, all Standard 22 gyro compasses calculate the speed error with the same data. It is obligatory to input actual speed and position data in order to ensure a correct speed error calculation.

2. Input via Distribution Unit (called “Automatic Speed Error Correction”)
   In this application speed and position are input into the Distribution Unit. The Distribution Unit distributes speed and position via CAN bus to the connected Standard 22. In case of faulty data (e.g. speed or position jump) the speed error correction of all connected Standard 22 calculate the speed error with wrong data,

hence the heading information of all Standard 22 is affected.
Disadvantage: Heading monitoring systems or subsequent systems such as DP systems are not able to detect heading errors caused by wrong speed or position data.

3. Input via Standard 22 Gyro Compass (called “Individual Speed Error Correction” - only available if the system components support this function – starting with Standard 22 type 110-233.NG002 and higher, Distribution Unit type 138-118.NG002 and higher- and if configured)
   In this application speed and position are input to the Standard 22 Gyro Compass from independent sources – meaning e.g. GPS 1 is connected to Standard 22 no. 1 and GPS 2 is connected Standard 22 no. 2 (accordingly for speed). In this application faulty speed or position data affect the heading of only one Standard 22.
   Advantage: Heading monitoring systems or subsequent systems such as DP systems are able to detect heading errors between 2 or more Standard 22 caused by wrong speed or position data.

For Standard 22 gyro compass systems not used in combination with Integrated Navigation Systems (INS):
It is recommended to select “Individual Speed Error Correction” at the Operator Unit. In this application speed and position are input to the Standard 22 Gyro Compass from independent sources – meaning e.g. GPS No. 1 is connected to Standard 22 No. 1 and GPS No. 2 is connected Standard 22 No. 2 (accordingly for speed). In this application faulty speed or position data affect the heading of only one Standard 22.
Advantage: heading monitoring systems or subsequent systems such as DP systems are able to detect heading errors between 2 or more Standard 22 caused by wrong speed or position data.

For Standard 22 gyro compass systems used in combination with Integrated Navigation Systems (INS) such as Synapsis:
It is recommended to select “Automatic Speed Error Correction” at the Operator Unit. In this application the speed and position input from the Distribution Unit is used for Speed Error Correction. Speed and position have been validated by the Consistent Common Reference System (CCRS) of the INS. Thus, it is a task of the CCRS to ensure that only consistent and validated sensor data are available to the compass system.

1.4.2.4 DV-Bus

This sub-menu provides the opportunity to connect a DV-Bus to the Distribution Unit 138-118 and to assign a DV-Bus address.
For a detailed description, see Manual of the Distribution Unit 138-118.

	The address of the Distribution Unit must only be assigned once in the DV-Bus System.

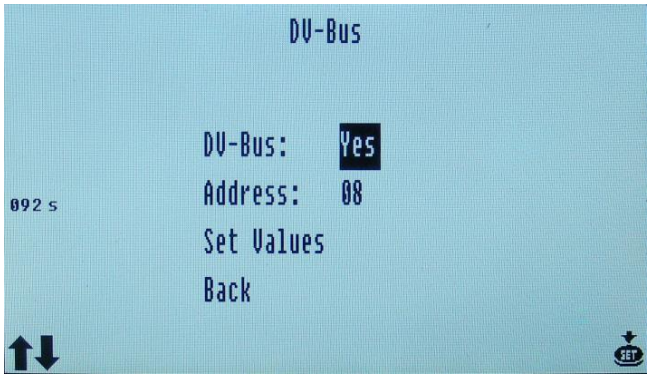


Figure 1-8 DV-Bus

To connect the DV-Bus and to set the address, see chapter 2.6.4.

1.4.2.5 Speed Source DU

The source of the speed and the type of speed – necessary for the speed error correction – can be selected in this sub-menu.
Puls-Log is selected by default.

CAUTION	
	This function cannot be adjusted in DV-Bus operation, because the speed sensor is not connected to the Distribution Unit (Display information by selecting this menu is “Not accepted”). The same happens if no external speed sensor is connected.

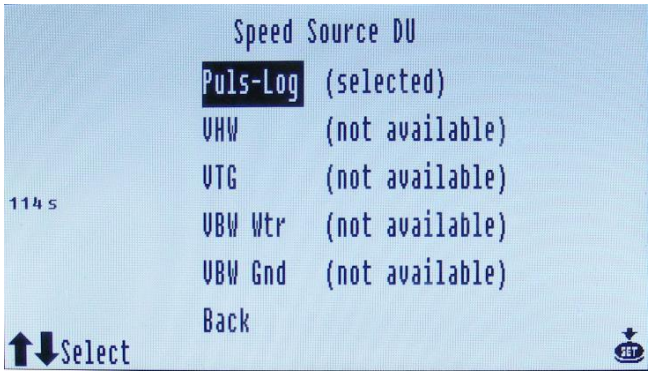


Figure 1-9 Speed Source DU

Table 1-1 Speed Source DU

Display	Description
Puls-Log	
VHW	Water speed and heading
VTG	Course over ground and ground speed
VBW Wtr	Water speed
VBW Gnd	Ground speed
selected	Connected and selected
available	Connected but not selected
not available	Possible but currently not connected

For changing the speed source, see chapter 2.6.5.

1.4.2.6 Heading uncorrected

The uncorrected heading information from the gyro compass and the magnetic compass is displayed.
Correction values of the gyro compass are speed error correction and alignment error.
Correction values of the magnetic compass are variation and deviation.

	Values from external devices, which are connected via a Distribution Unit, cannot be displayed.

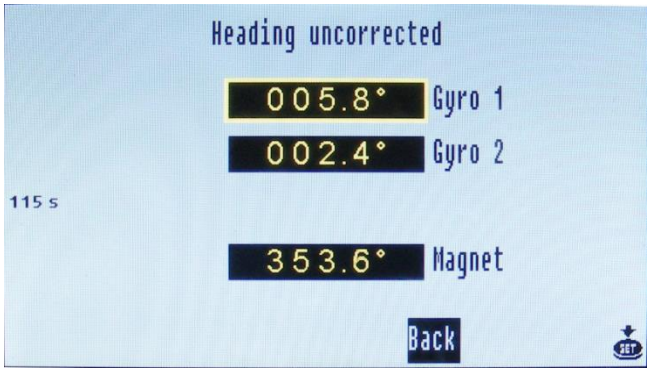


Figure 1-10 Heading uncorrected

1.4.2.7 Rate of Turn

The influence of the sea state to the rate of turn can be damped in this sub-menu. This damping only acts to analogue RoT-devices which are connected to a Distribution Unit. All other RoT data outputs are not damped.

CAUTION	
	RoT-data are displayed unfiltered; selected damp values only act to an analogue output (for example: the output RoT in the Distribution Unit, type 138-118).

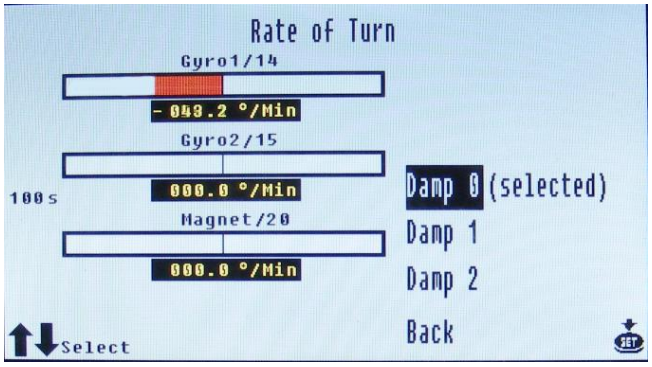


Figure 1-11 Rate of Turn

A positive sign and a green bar stand for a rate of turn to starboard.
A negative sign and a red bar stand for a rate of turn to port side.

Damp 0 = small damping (0 s)
Damp 1 = middle damping (5 s)
Damp 2 = strong damping (10 s)

To select the damping, see chapter 2.6.7.

CAUTION	
	If there is no Rate of Turn indicator connected in the respective application, the rate of turn for connected heading sensors is a tendency indication only. Exception: DV-Bus application shows a rate of turn for magnetic compasses (if selected). For more information about RoT applications, see manual of respective Distribution Unit.

1.4.2.8 Deviation Table

A heading display from a magnetic compass may be affected by permanent magnetic parts of steel, lines with direct current flow or magnetic soft iron parts in that manner, that the heading information is faulty. With correction values (deviation values) this fault can be corrected.
This correction value is entered via the Operation Unit to the Distribution Unit and is used to correct the magnetic heading information.
The deviation table provides correction values which can be set, changed or erased.

	Variation and deviation are used to determine the True Magnetic Heading and must be checked and updated by the user.

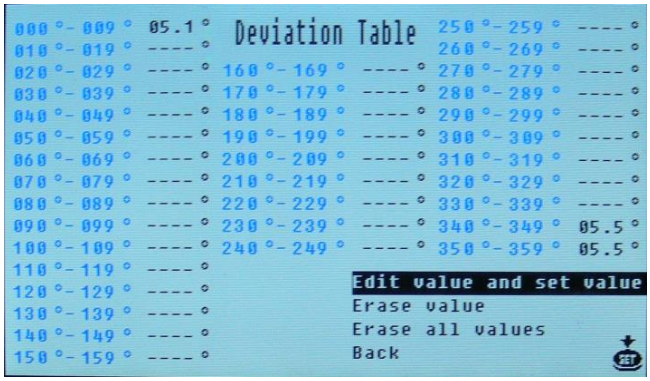


Figure 1-12 Deviation Table

For editing or erasing the value, see chapter 2.6.6.

1.4.2.9 Gyro Data

The important data of the connected Raytheon Anschütz gyro compasses can be displayed in this sub-menu.

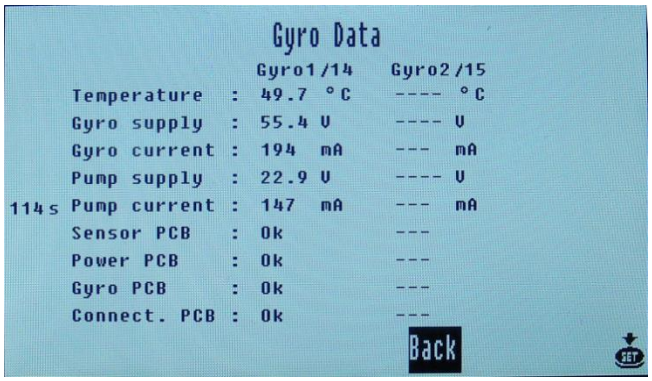


Figure 1-13 Gyro Data

Table 1-2 Gyro Data

Display	Function
Gyro1/14	Displays the designation of the gyro and the CAN-Bus address: Gyro 1/CAN-Bus address 14
Temperature	Temperature of the supporting liquid
Gyro supply	Supply voltage of the gyro sphere
Gyro current	Current consumption of the gyro sphere
Pump supply	Supply voltage of the pump
Pump current	Current consumption of the pump
Sensor PCB	Status of Sensor PCB Ok = no error message of the sensor PCB Failure = Error at sensor PCB
Power PCB	Status of Power PCB Ok = no error message of the power PCB Failure = Error at power PCB
Gyro PCB	Status of Gyro PCB Ok = no error message of the outer sphere PCB Failure = Error at gyro PCB
Connect. PCB	Status of Connection PCB Ok = no error message of the connection PCB Failure = Error at connection PCB
– – – –	Sensor not able to send values (foreign sensors).

1.4.2.10 CAN-Devices

	External devices, which are connected via a serial connection (Distribution Units) are not displayed because in this case the DU is the CAN-Bus device.

The CAN-Devices sub-menu displays the Unit ID and the CAN-Bus status of all devices connected to the CAN-Bus.

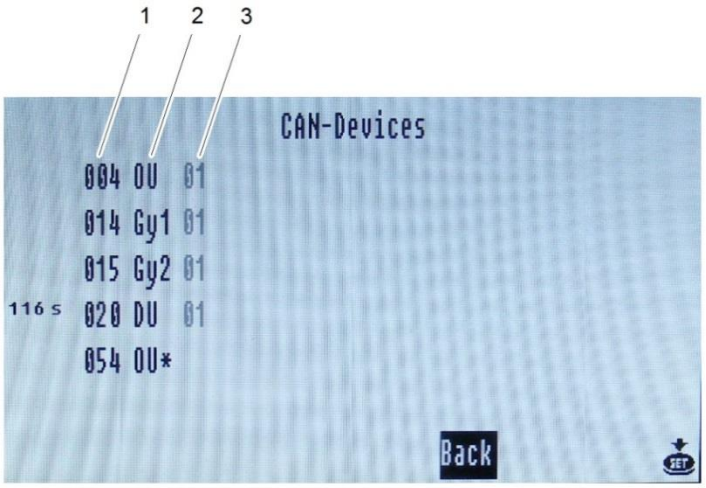


Figure 1-14 CAN-Device

Pos. No.	Designation
1	Unit ID
2	Connected device
3	CAN-Bus status

The first column displays the Unit ID, the second column the connected device and the third column the CAN-Bus status.
Following devices can be shown:

- OU (Operator Unit)
- GY (Gyro Compass)
- DU (Distribution Unit)
- Rep (Repeater)
- Unk (Unknown Device)

The CAN-Bus status has two digits:

First digit = 1. CAN-Bus
Second digit = 2. CAN-Bus

Following CAN-Bus statuses are possible:
0 = No Timeout
1 = Timeout
2 = unknown

* = device itself

For example:
01 = 1. CAN-Bus: No timeout
2. CAN-Bus: Timeout

1.4.2.11 Software Versions

The software versions of the connected Raytheon Anschütz devices (Gyro, Distribution Unit) are displayed in this sub-menu.

	The software versions displayed in Figure 1-15 may vary from the software version at the device.

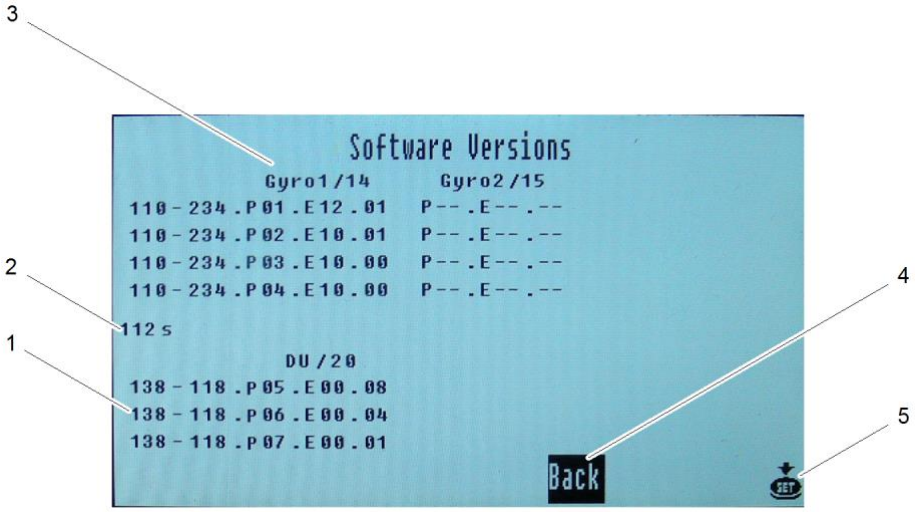


Figure 1-15 Software Versions

Pos. No.	Designation	Function
1	Software Version	110-234 = Gyro Compass 138-118 = Distribution Unit P01 = Program at the sensor PCB P02 = Program at the power PCB P03 = Program for MC 1 at the outer sphere PCB P04 = Program for MC 1 at the outer sphere PCB P05 = Program of the CAN-Bus processor + DV-Bus at the interface PCB P06 = Program of the I/O PCB processor P07 = Program at the I/O PCB Exx = Software Version – – = Sensor not able to send software

Pos. No.	Designation	Function
2	Remaining Time	Shows the remaining time until it switches back to the main page.
3	Connected Device	Gyro1/14 = Gyro 1/CAN-Bus address 14 DU/20 = Distribution Unit/CAN-Bus address 20
4	Back	Switches back to the previous page.
5	Set	Use the Set button to confirm the selection.

	The software versions for the MINS and non-Raytheon devices are not displayed.

1.4.3 Heading and RoT

The heading and the rate of turn of the selected sensor is displayed to provide the possibility to read the heading information from a greater distance.

Figure 1-16 Heading

Pos. No.	Designation	Function
1	Heading	Shows the heading of the selected sensor.
2	Tendency bar	Displays the Rate of Turn value in the tendency bar.
3	RoT value	Displays the Rate of Turn value.

A positive sign and a green bar stand for a rate of turn to starboard.
A negative sign and a red bar stand for a rate of turn to port.

1.4.4 Alerts

The display changes to the alert page and generates an acoustic signal when an alarm or a warning occurs.
The state, the origin and the alert text are displayed.
Switching back to another page is only possible after acknowledgement of the alert. If the alert was acknowledged but not eliminated, the alert LED (Figure 1-2/7) illuminates continuously when switching back to another page than the alert page.

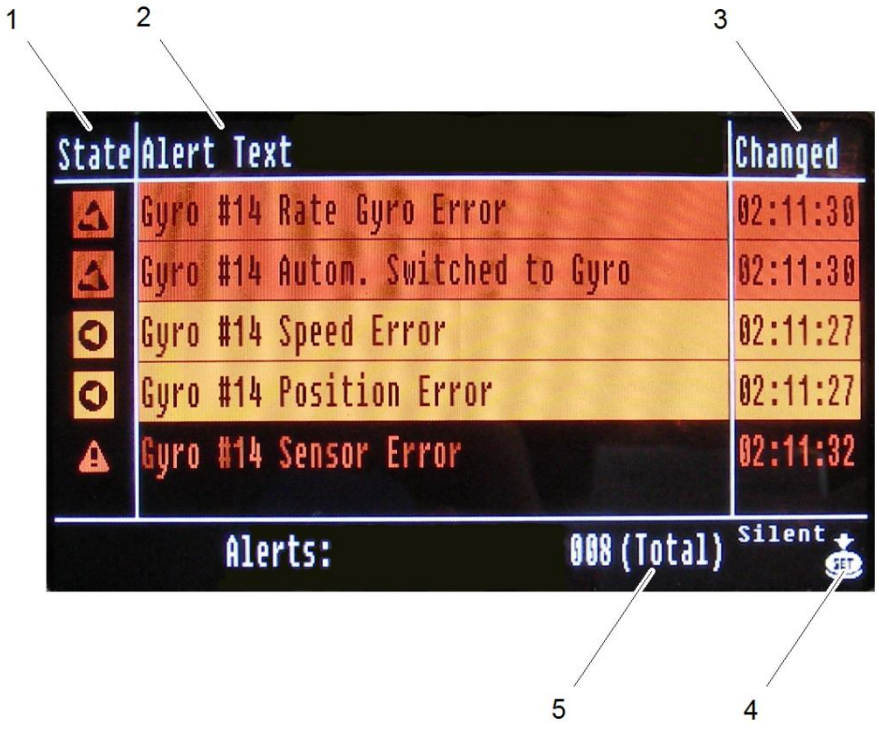


Figure 1-17 Alerts

Pos. No.	Designation	Function
1	State	Shows the priority of the alerts. For detailed information, see chapter 1.7.
2	Alert Text	Shows the device and the Unit ID and the alert message, see Figure 4-1. For detailed information of the alert messages, see chapter 4.2.
3	Changed	Shows the time of acknowledgement.
4	Set	Appears on the display to switch the alert to silence.
5	Total	Amount of alerts in total.

1.5 Dimming

The Operator Unit can be centrally dimmed (depending on the configuration – see configuration tool).
The Operator Unit can also act as a central dimmer, meaning that other devices of NautoSteer AS follow the dimming value of the Operator Unit. Precondition for this function is that the receiver and the transmitter of the telegram are assigned to the same group.
For details of the dimming operation, see chapter 2.4.

1.6 CAN-Bus

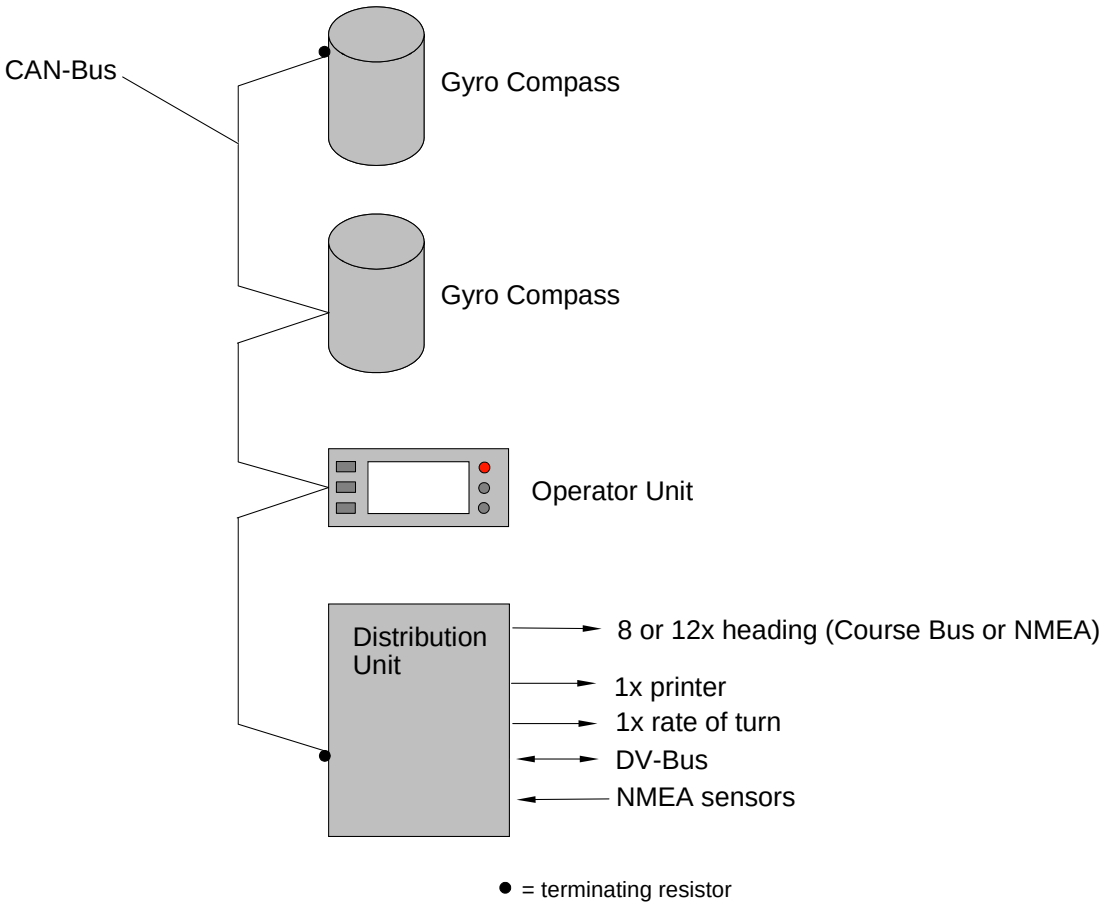


Figure 1-18 Block Diagram CAN-Bus

The CAN-Bus is a Multi-Master-Bus which allows the connection of unlimited devices.
Every bus user gets a unique address which is set within each bus user.
The usable address range is from 01(16) to 3F(16) (address 00(16) is reserved for development purposes).
Each bus user can send and receive data via the CAN-Bus.
The CAN-Bus must be terminated at both ends via an ohmic resistor. This terminating resistor is set by jumpers, switches or cable bridges on the respective PCB.

A redundant CAN-Bus is provided (CAN1 and CAN2).

	The maximum length of a CAN-Bus cabling must not be longer than 400 meter!

1.7 Bridge Alert Management (BAM)

Bridge alert management (BAM) is an overall concept to enhance the handling, distribution and presentation of alerts on the bridge in a consistent manner.

This concept is described in the IMO performance standard “MSC.302(87) Performance standard for Bridge Alert Management”. Equipment related details are defined in other equipment related performance and test standards.

The objective of BAM is to harmonize the priority, classification, handling, distribution and presentation of alerts, to enable the bridge team to devote full attention to the safe operation of the ship and to immediately identify any alert situation requiring attention and/or action to maintain the safe operation of the ship.
Unnecessary distraction of the bridge team by redundant and superfluous audible and visual alert announcements should be avoided. It reduces the cognitive workload of the operator by minimizing the information presented which is necessary to draw attention to and to assess the situation.

On the bridge alerts are presented on the individual equipment and/or on a central alert management human machine interface (CAM-HMI).

Alerts are divided in different priorities:

- Emergency alarm*
  Highest priority of an alert. Alarms which indicate immediate danger to human life or to the ship and its machinery exists and that immediate action must be taken.

- Alarm
  An alarm is a high-priority alert. Conditions requiring immediate attention and action by the bridge team to avoid any kind of hazardous situation and to maintain the safe operation of the ship.

- Warning
  Conditions or situations which require immediate attention for precautionary reasons, to make the bridge team aware of conditions which are not immediately hazardous, but may become so. (Warning may be escalated to alarm)

- Caution
  Lowest priority of an alert. Awareness of a condition which still requires attention out of the ordinary consideration of the situation or of given information.

* The emergency alarm is not used in this device.

Alerts are divided in different categories:

- Category A
  Alerts for which graphical information at the task station (such as Radar or ECDIS) directly assigned to the function generating the alert is necessary, as decision support for the evaluation of the alert-related condition. These alerts can only be acknowledged at the task station.

- Category B
  Alerts where no additional information for decision support is necessary besides the information which can be presented at the CAM-HMI. These alerts can be acknowledged at the task station or at the CAM-HMI.

- Category C
  Alerts that cannot be acknowledged on the bridge but for which information is required about the status and treatment of the alerts (e.g. certain alerts from the engine).

Table 1-3 Alert List – Alarm Symbols

Icon/Symbol	Description
	Active – unacknowledged alarm (flashing)
	Active – silenced alarm (flashing)
	Active – acknowledged alarm
	Rectified – unacknowledged alarm (flashing)

Table 1-4 Alert List – Warning Symbols

Icon/Symbol	Description
	Active – unacknowledged warning (flashing)
	Active – silenced warning (flashing)
	Active – acknowledged warning
	Rectified – unacknowledged warning (flashing)

Table 1-5 Alert List – Caution Symbol

Icon/Symbol	Description
	Caution

Table 1-6 Alert Signaling

Colour	Meaning - visual	Acoustic signals
Red (Alarm) flashing	Alarms (faults and/or dangerous situations)	Three short signals (pulses), every 7 seconds. Continues until acknowledgment.
Yellowish orange (warning) flashing	Warnings	Two short signals (pulses) after the event without repetition.
Yellow (Caution)	Status messages information	There is no acoustic signal for status and global messages.

1.8 General Error Messages

If the Operator Unit has no connection to the CAN-Bus the error message “No CAN connection” (see Figure 1-19) is shown on the display.
For further information and troubleshooting, see chapter 4.2.

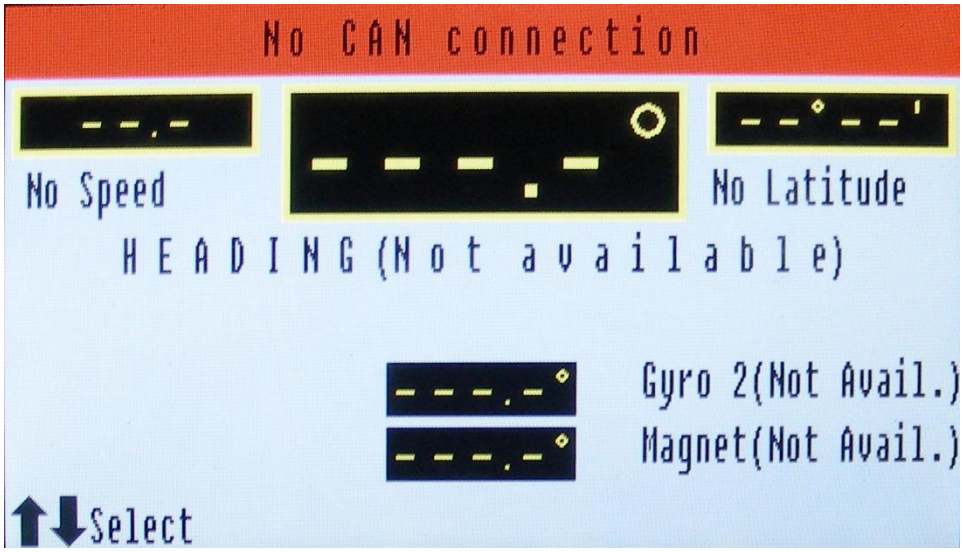


Figure 1-19 No CAN Connection

1.9 Technical Data

1.9.1 Mechanical Data

Dimensions (Height x Width x Depth)	36 x 192 x 82 mm
Weight	1.5 kg
Type of enclosure	IP23 back side IP56 front side (see Dimensional Drawing 130-626.HP005) (higher rating with special casing)

1.9.2 Electrical Data

Supply voltage	24 V DC (18 - 36 V DC) (galvanically isolated)
Power consumption	6 W
Interfaces	- 2 x CAN-Bus - Serial interface for BAM in accordance to IEC 61162 / IEC 61924 - Relay contact for BNWAS

Intentionally left blank

2 Operation

2.1 Safety Information

CAUTION 	After changes in the configuration of the Individual SEC and DV-Bus service page the Distribution Units and the Operation Units have to be reset. Changes have to be performed to all Distribution Units and Operator Units in a compass system.

2.2 Setting into Operation

Precondition:
The Operator Unit has to be configured for CAN-Bus operation with the Configuration Tool AS.

4. Switch on the power supply to switch on the Operator Unit.

2.2.1 Heading Indication from Gyro System after Switching on

	During the first 3 minutes after switching on (heating stage) it is possible to activate the quick settling function (see chapter 2.6.7).

The switching on process is divided in the following stages:

- Heating stage
- Settling stage

Heating Stage

During the heating stage of the gyro system the heading information is not valid, which is indicated by a set of dashes (- - - .- °). The heating stage is displayed below the heading information (see Figure 2-1).
If a second gyro is connected, the heating stage is indicated with “(heating)” next to heading information of the unselected gyro.

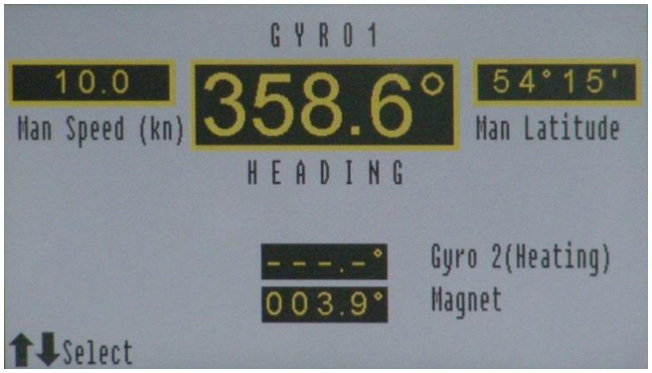


Figure 2-1 Heating Stage

Settling Stage

During the settling stage the gyro heading may be used to a certain extent.
The gyro system is settled after a period of 4 hours (for Raytheon Anschütz Standard 22).
Until then the heading information has a reduced accuracy.
The settling stage is displayed below the heading information (see Figure 2-2).
If a second gyro is connected, the settling stage is indicated with “(settling)” next to heading information of the unselected gyro.

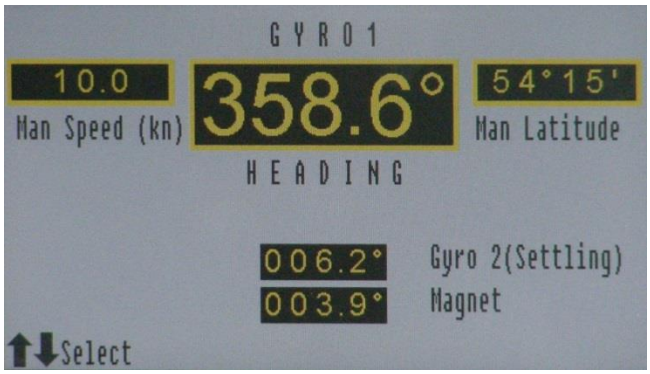


Figure 2-2 Settling Stage

2.3 General Operation

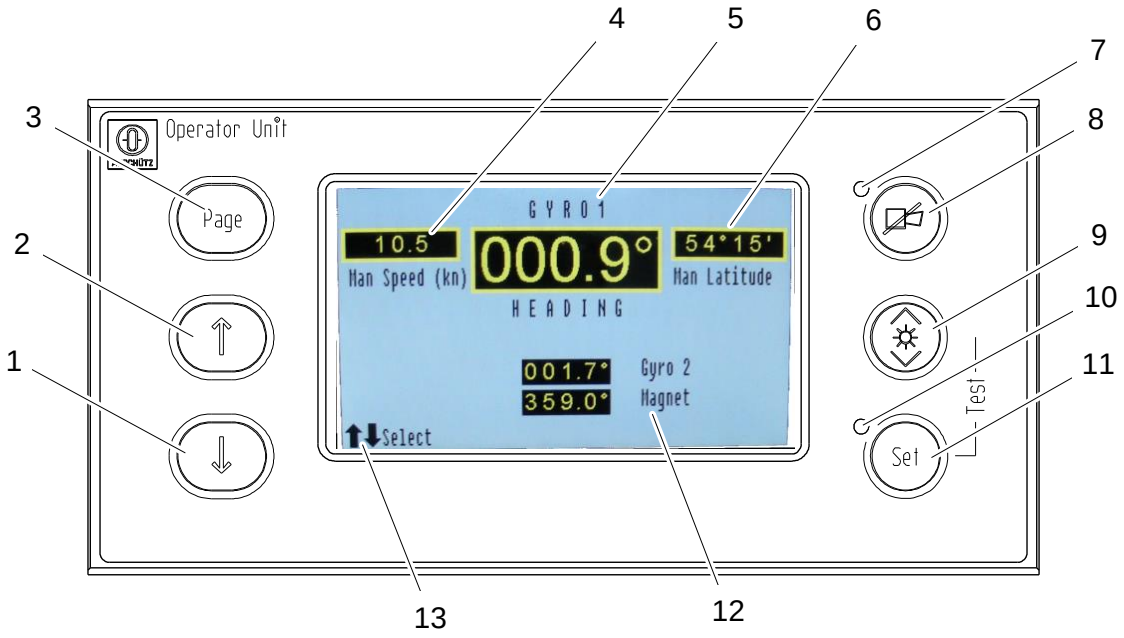


Figure 2-3 Operation and Display Elements, Gyro Compass Selected

Pos. No.	Designation	Function
1	Select (Down)	Use the Select (Down) button to navigate through the display.
2	Select (Up)	Use the Select (Up) button to navigate through the display.
3	Page	Use the Page button to navigate through the main pages or to get back to the overview page.
4	Speed	Displays the speed.
5	Selected Sensor	Displays the heading of the selected sensor.
6	Latitude	Displays the latitude.
7	Alert LED	Flashes red when a new alert occurs, illuminates continuously when the alert is acknowledged but not eliminated.
8	Acknowledge	Use the Acknowledge button to open the alert page (only possible, if alerts are available) or acknowledge an alert.
9	Brightness	Use the Brightness button to adjust the brightness of the display.
10	Set LED	Flashes whenever an adjustment can be performed.

Pos. No.	Designation	Function
11	Set	Use the Set button to confirm the selection/adjustment.
12	Unselected sensors	Displays the heading of the unselected sensors.
13	Selection possible	Appears on the display whenever a selection is possible. Use select buttons (1 and 2) to navigate through the display.

2.3.1 Select a Menu

The Operator Unit provides 4 main pages:

- Overview, see chapter 1.4.1
- Service, see chapter 1.4.2
- Heading, see chapter 1.4.3
- Alerts, see chapter 1.4.4

1. Press the Page button (Figure 2-3/3) to navigate through the 4 main pages.

2.3.2 General Settings

Change the values

Use the Select buttons to navigate through the display and to change values.
In the left corner of the display a selection symbol (see Figure 2-4) is indicated whenever a selection is possible.

Figure 2-4 Selection symbol

Confirm the setting

Use the Set button to confirm settings
In the right corner of the display a setting symbol (see Figure 2-5) is indicated and the Set LED (Figure 2-3/10) flashes whenever a setting is possible.

Figure 2-5 Setting symbol

Timeout function

If no button is pressed for a period of approx. 12 seconds while changing values, the editing mode is cancelled and the display switches back to the previous display.

To change the value, you need to call the function again.

2.4 Adjust Brightness

The Operator Unit can be centrally dimmed (depending on the configuration – see configuration tool).

1. Press the brightness button (Figure 2-3/9).
   - The brightness increases as long as the button is pressed.
2. Press the brightness button again to decrease.
   - The brightness decreases as long as the button is pressed.

	The first operation of the button always increases the brightness.

2.5 Overview Page Settings

Following overview page settings are possible:

- Change the Current Sensor
- Change Speed
- Change Latitude
- Change Variation (if magnetic compass is selected)

2.5.1 Change the Current Sensor

CAUTION	
	Not each heading receiver is allowed to use heading information from a magnetic compass if selected.

After switching on the operator unit, GYRO 1 is selected as the default compass and the heading value is displayed.
All other connected and displayed heading sensors can be selected:

1. Open the overview page.
2. Use the Select buttons (Figure 2-3/1 and 2) to select a sensor.
3. Press the Set button (Figure 2-3/11) to confirm the selection.
    - The selected sensor will be displayed in the upper half of the display.

2.5.2 Change Speed

CAUTION	
	It is recommended to read the information about “Individual SEC” first, before the function “Individual Speed” is applied.

1. Open the overview page, see chapter 2.3.1
2. Select Speed with the Select buttons (Figure 2-3/1 and 2).
3. Press the Set button (Figure 2-3/11) to confirm the selection.

4. Use the Select buttons (Figure 2-3/1 and 2) to switch between “Aut. Speed”, “Ind Speed” and “Man Speed”.
5. Press the Set button to confirm the selection.
6. If “Man Speed” is selected, the value is highlighted and can be changed with the Select buttons.
    - The changed value is displayed italic.
7. Press the Set button to confirm the value.

For information and restrictions to “Individual Speed” or “Individual SEC”, see chapter 1.4.2.3.

2.5.3 Change Latitude

CAUTION	
	It is recommended to read the information about “Individual SEC” first, before the function “Individual Lat” is applied.

1. Open the overview page, see chapter 2.3.1
2. Select Latitude with the Select buttons (Figure 2-3/1 and 2).
3. Press the Set button (Figure 2-3/11) to confirm the selection.
4. Use the Select buttons (Figure 2-3/1 and 2) to switch between “Aut. Latitude”, “Ind Latitude” and “Man Latitude”.
5. Press the Set button to confirm the selection.
6. If “Man Latitude” is selected, the value is highlighted and can be changed with the Select buttons.
    - The changed value is displayed italic.
7. Press the Set button to confirm the value.

For information and restrictions to “Individual Speed” or “Individual SEC”, see chapter 1.4.2.3.

CAUTION	
	Big differences of the latitude value, which may occur while switching over from automatic to manual input, are included into the speed error correction (SEC) calculation not until 2-3 hours

2.5.4 Change Variation

1. Open the overview page, see chapter 2.3.1
2. Select Variation with the Select buttons (Figure 2-3/1 and 2).
3. Press the Set button (Figure 2-3/11) to confirm the selection.
4. Use the Select buttons (Figure 2-3/1 and 2) to switch the value.
   - The changed value is displayed italic.
5. Press the Set button to confirm the value.

After confirmation the values are saved in an internal table so the magnet compass heading is corrected according to interpolation of the set values.
The display switches back to overview page.

2.6 Service Page Settings

Following service page settings are possible:

- Set Heading Difference
- Set Switch-Over Auto Heading
- DV-Bus Settings
- Change Speed Source DU
- Deviation Table
- Select Damping
- Set Individual SEC

2.6.1 Open a Sub-Menu

	If nothing is changed and no sub-menu is selected, the service page switches back to the overview page after approx. 20 sec.

1. Press the Page button (Figure 2-3/3) and navigate to the service page.
2. Use the Select buttons (Figure 2-3/1 and 2) to navigate through the sub-menus of the service page.
   - The selected sub-menu is highlighted.
   - The Set LED (Figure 2-3/10) flashes whenever an adjustment is possible.
3. Press the Set button (Figure 2-3/11) to confirm the selection.
   - The selected sub-menu opens.

2.6.2 Set Heading Difference

All connected heading sensors are compared with each other in order to monitor and display the difference of a defined threshold.
If the sensor difference is greater than the user threshold value, an alert is triggered.

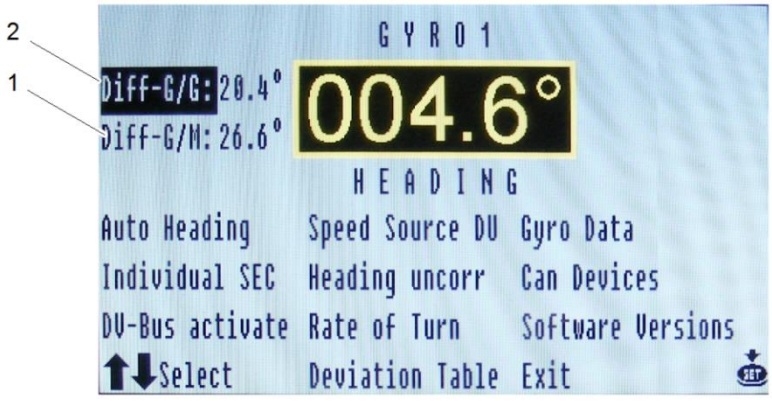


Figure 2-6 Service Page, Difference Alarm selected

Pos. No.	Designation	Function
1	Diff-G/M	Shows and enables the setting of the user threshold value for the difference between gyro and magnetic.
2	Diff-G/G	Shows and enables the setting of the user threshold value for the difference between gyro and gyro.

Set the threshold value for the difference alarm:

1. Open the service page, see chapter 2.3.1.
2. Select the threshold value to be changed (Figure 2-6/1 or 2) with the Select buttons.
3. Press the Set button (Figure 2-3/11) to confirm the selection.
4. Use the Select buttons (Figure 2-3/1 and 2) to change the value.
   For minimum and maximum thresholds, see Table 2-1.
   - The changed value is displayed italic.
5. Press the Set button to confirm the value.

	The confirmation and displaying of the changed value can take up to 5 seconds.

The following table shows the possible settings for a difference alarm.

Table 2-1 Difference Alarms, Settings

Parameter	G/M	G/G
Threshold (min)	3,0°	3,0°
Threshold (max)	30,0°	30,0°
Increment	1/10°	1/10°

2.6.3 Set Switch-Over Auto Heading

In case of a failure of the selected heading an automatic switch-over to the next heading sensor can be selected. Gyro, GPS or magnetic compass can be selected.

	GPS cannot be selected separately – it is included in the “to Gyro” option.

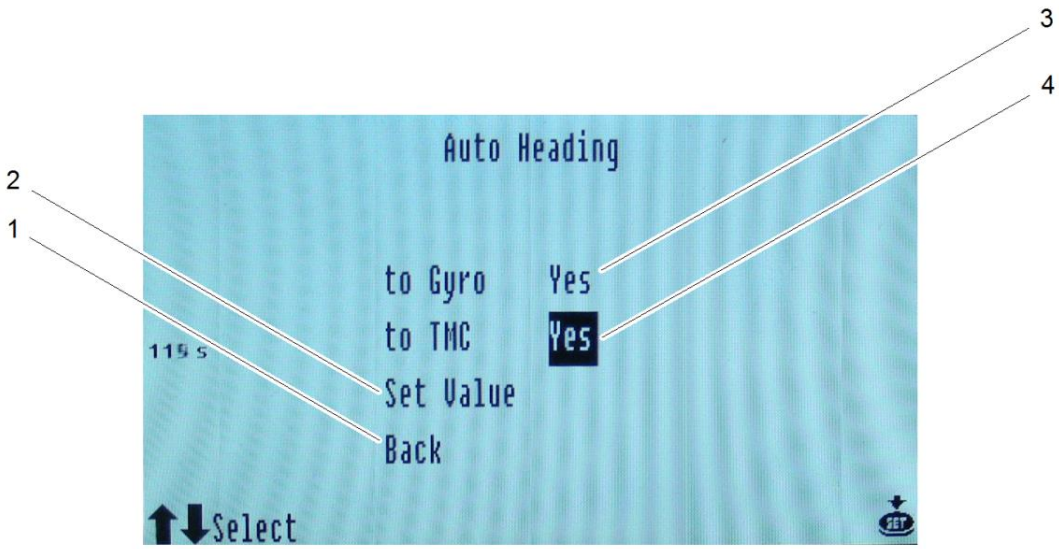


Figure 2-7 Set Switch-Over Auto Heading

Pos. No.	Designation	Function
1	Back	Switches back to the previous page.
2	Set Value	Confirm the settings for auto heading.
3	Gyro Selection	Decide if an automatic switch-over to the gyro/GPS compass is desired.
4	TMC Selection	Decide if an automatic switch-over to the magnetic compass is desired.

1. Open the sub-menu Auto Heading from the service page, see chapter 2.6.1.
   - The sub-menu auto heading opens, see Figure 2-7.
2. Use the Set button (Figure 2-3/11) to navigate through the options.
   - The selected option is highlighted.

3. Change the option to “Yes” or “No” with the Select buttons (Figure 2-3/1 and 2).
   Yes = Automatic Switch-over enabled
   No = Automatic Switch-over disabled
4. Press the Set button to leave the option.
5. Use the Set button to set the value and leave the sub-menu.
   1. Set the value: Select “Set the value” (Figure 2-7/2) and press the Set button to confirm.
   2. Leave the sub-menu: Select “Back” (Figure 2-7/1) and press the Set button to confirm.

	To leave the auto heading sub-menu without any changes press the Page button.

2.6.4 DV-Bus Settings

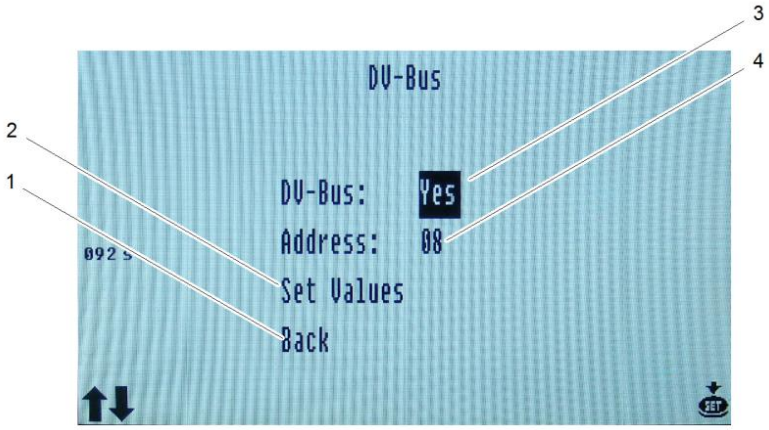


Figure 2-8 Sub-Menu DV-Bus

Pos. No.	Designation	Function
1	Back	Switches back to the previous page.
2	Set Values	Confirm the settings for auto heading.
3	DV-Bus	Decide if a DV-Bus connection to the Distribution Unit is desired.
4	Address	Assign a DV-Bus address.

2.6.4.1 Connect DV-Bus

CAUTION	
	After changes in the configuration of the DV-Bus service page the Operator Units has to be reset.

1. Open the sub-menu DV-Bus from the service page, see chapter 2.6.1.
   - The sub-menu DV-Bus opens, see Figure 2-8.
2. Use the Set button (Figure 2-3/11) to navigate to “DV-Bus” (Figure 2-8/3).
3. Change the option to “Yes” or “No” with the Select buttons (Figure 2-3/1 and 2).
   Yes = DV-Bus enabled
   No = DV-Bus disabled
4. Use the Set button to set the value and leave the sub-menu.

1. Set the value: Select “Set the value” and press the Set button to confirm.
   If values have been changed, the Operator Unit requires a restart.
2. Leave the sub-menu: Select “Back” and press the Set button to confirm.

	To leave the DV-Bus sub-menu without any changes press the Page button.

2.6.4.2 Assign DV-Bus Address

Assign a DV-Bus address if a DV-Bus is connected to the Distribution Unit.

CAUTION 	After changes in the configuration of the DV-Bus service page the Operator Units has to be reset.

	The address of the Distribution Unit must only be assigned once in the DV-Bus System. An address between 1 and 15 is possible.

1. Open the sub-menu DV-Bus from the service page, see chapter 2.6.1.
   - The sub-menu DV-Bus opens, see Figure 2-8.
2. Use the Set button (Figure 2-3/11) to navigate to “Address” (Figure 2-8/3).
3. Press the Select buttons (Figure 2-3/1 and 2) to change the address.
4. Use the Set button to set the value and leave the sub-menu.
   1. Set the value: Select “Set the value” and press the Set button to confirm.
      If values have been changed, the Operator Unit requires a restart.
   2. Leave the sub-menu: Select “Back” and press the Set button to confirm.

	To leave the DV-Bus sub-menu without any changes press the Page button.

2.6.5 Change Speed Source DU

The source of the speed and the type of speed can be selected in this sub-menu. Puls-Log is selected by default.

CAUTION	
	If “Individual Speed” is selected and active, below mentioned procedure to select the speed source is possible, but it affects only in the automatic mode (”Aut Spd”). In case of “Individual Speed”, the speed source must be adjusted (by DIP-Switches) at the gyro compass itself.

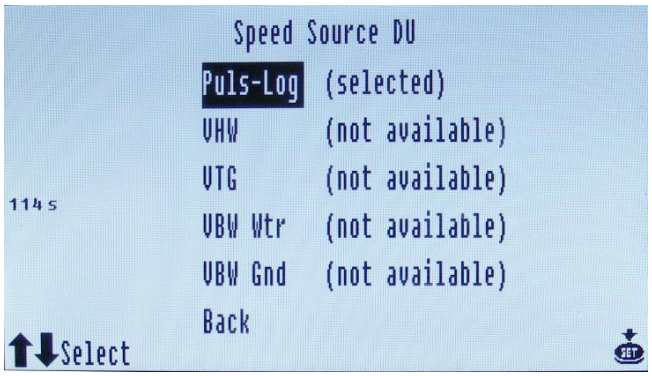


Figure 2-9 Speed Source DU

Table 2-2 Speed Source DU

Display	Description
Puls-Log	
VHW	Water speed and heading
VTG	Course over ground and ground speed
VBW Wtr	Water speed
VBW Gnd	Ground speed
selected	Connected and selected
available	Connected but not selected
not available	Possible but currently not connected

1. Open the sub-menu Speed Source DU from the service page, see chapter 2.6.1.
   - The sub-menu Speed Source DU opens, see Figure 2-9.
2. Use the Select buttons (Figure 2-3/1 and 2) to navigate through the options.

3. Press the Set button (Figure 2-3/11) to select another speed source, if available.
4. Select “Back” with the Select buttons (Figure 2-3/1 and 2) to leave the sub-menu.
5. Press the Set button to confirm leaving.

2.6.6 Deviation Table

Set, edit or erase the correction value to correct the magnetic heading information.

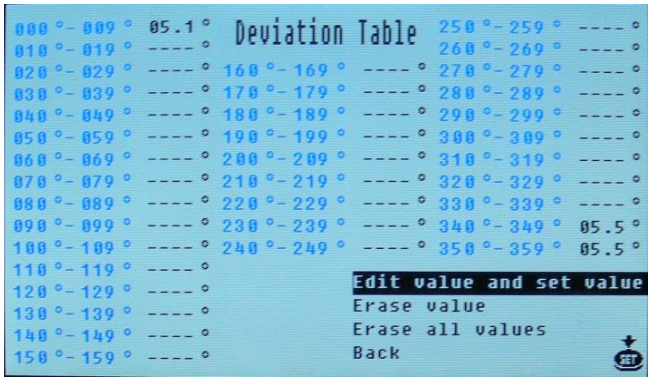


Figure 2-10 Deviation Table

1. Open the sub-menu Deviation Table from the service page, see chapter 2.6.1.
   - The sub-menu deviation Table opens, see Figure 2-10.
2. Use the Select buttons (Figure 2-3/1 and 2) to navigate through the options:
   1. Edit value and set value: A correction value can be edited and/or set.
   2. Erase value: Erases a selected value.
   3. Erase all values: Erases all correction values of the deviation table.
      If this option is selected, the safety question “Are you sure” has to be confirmed with the Set button.
   4. Back: Switches back to the previous page.
3. Press the Set button (Figure 2-3/11) to confirm the selection.
4. Use the Select buttons to navigate through the deviation table.
5. Press the Set button to activate the respective field.
6. Use the Select buttons to enter or edit a value.
7. Press the Set button to confirm the change.

2.6.7 Select Damping of Rate of Turn

	This operation is only possible if the Distribution Unit 138-118 is connected. The damping of the RoT is not possible if the Distribution Unit 138-126 is connected.

1. Open the sub-menu Rate of Turn from the service page, see chapter 2.6.1.
   - The sub-menu Individual Rate of Turn opens.
2. Use the Select buttons (Figure 2-3/1 and 2) to navigate through the options.
3. Use the Set button to select a damping mode.

2.6.8 Set Individual SEC

	This operation is only possible if the connected devices (Gyro compass and the Distribution Unit) are up-to-date.

1. Open the sub-menu Individual SEC from the service page, see chapter 2.6.1.
   - The sub-menu Individual SEC opens.
2. Use the Set button (Figure 2-3/11) to navigate to “Individual”.
3. Change the option to “Yes” or “No” with the Select buttons (Figure 2-3/1 and 2).
   Yes = Individual SEC enabled
   No = Individual SEC disabled
4. Use the Set button to set the value and leave the sub-menu.

2.7 Activate Quick Settling

The “Quick Settling” function reduces the time the compass requires to settle from approx. 4 hours to approx. 1 hour.
The most recent heading is saved when the gyro compass is switch off. When it is switched on the compass uses this value to make a default setting so that the settling time is reduced.

CAUTION 	The Quick Settling function can only be used if the ship‘s heading has not been changed between switching off and switching back on. The Quick Settling function cannot be used: - For first setting into operation - If the ship’s position has been changed between switching off and switching on again. - If the temperature of the gyro supporting liquid is more than 30 °C

Within the first 3 minutes after switching on the compass it is possible to activate the Quick Settling function at the Operator Unit.
By activating the quick settling the heating stage and the settling stage are reduced to 1 hour (in total). After this time a usable heading information is displayed (for the accuracy of the heading information, see Manual of Standard 22).

CAUTION 	Time to activate this function is only for 3 minutes after switching on.

Without activating the quick settling within the 3 minutes, the heating stage and settling stage start according to the procedure described in the Manual of the Standard 22 compass.

	If several (max. 3) gyro compasses should be activated with the quick settling function, it is recommended to switch on the compasses one after another in order not to exceed the three minutes.

After switching-on the selected gyro compass, quick settling is possible.

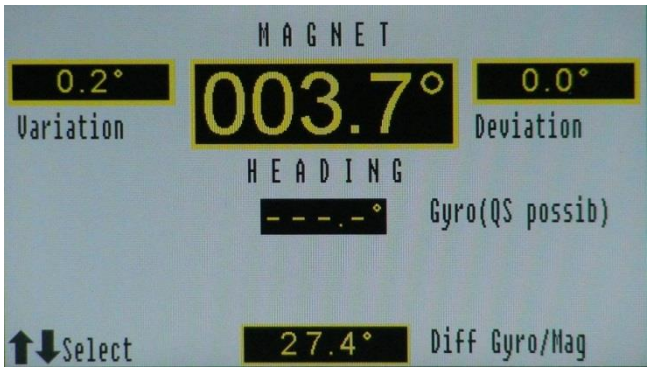


Figure 2-11 QS possible

1. When “QS possib” is displayed (see Figure 2-11), select the Page button.

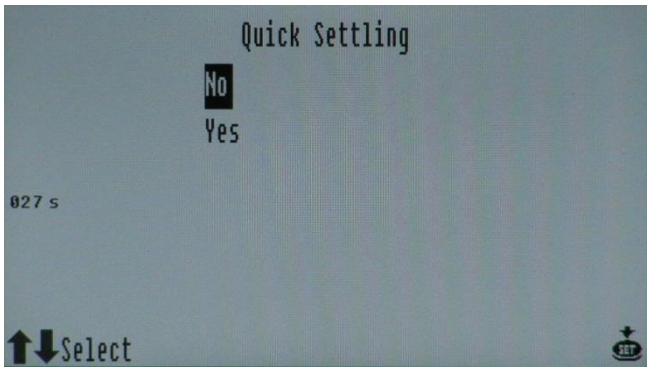


Figure 2-12 Quick Settling Safety Question

2. Select “Yes” to confirm the quick settling process (see Figure 2-12).
   - All gyro compasses, which are available for quick settling, are listed (see Figure 2-13).

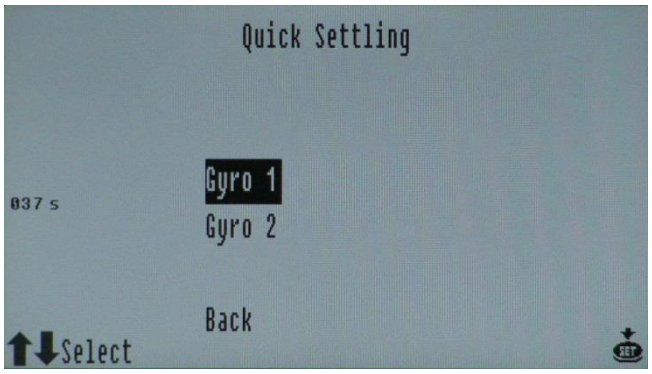


Figure 2-13 Quick Settling, available Gyros listed

3. Select the gyro compass to be quick settled with select buttons.
4. Press the set button to confirm the selection.
   - Confirmation is shown on the display (see Figure 2-14).

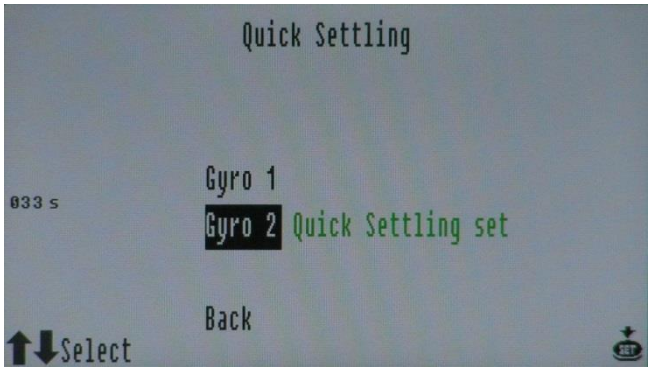


Figure 2-14 Quick Settling set

2.8 Lamp Test

The lamp test is designed to ensure the proper function of operating and display elements at the device.

	A lamp test during an alert is not possible.

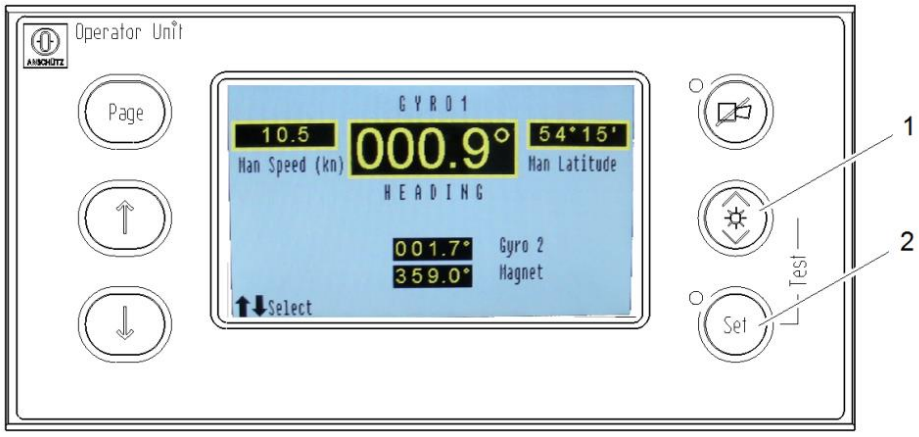


Figure 2-15 Lamp Test

Pos. No.	Designation
1	Brightness
2	Set

1. Press the brightness button (Figure 2-15/1) and the set button (Figure 2-15/1) simultaneously for approx. 3 sec.
   - The LEDs light up and an acoustic alarm occurs.
2. Follow the instructions on the display to check the functionality.

	The software version is shown at the end of the test.

Intentionally left blank

3 Installation

3.1 Safety Information

WARNING 	Installation and setting to operation must be performed by trained and qualified personnel.

WARNING 	The Operator Unit must be supplied with 2 power supplies: Main power and emergency power in accordance with ISO 8728 to be compliant with BAM.

WARNING 	Observe the distance to a magnetic compass when the mounting place is defined (refer to Dimensional Drawing 130-626.HP005).

WARNING 	When establishing cable connections ensure that the cables are disconnected from any power supply. It is essential to ensure that all cables are disconnected from the power supply, if necessary, measure the voltage beforehand and/or disconnect the relevant distributor.

WARNING 	While connecting cables to the equipment, do not bend cables to acute angle, pinch, twist, or impact excessive force. Cracks or damage to the cable coating can cause a fire or electrical shock.

WARNING 	Observe precautions for handling electrostatic sensitive devices (ESD).

3.2 Installation

The installation of an Operator Unit is performed according to appended Dimensional Drawing No. 130-626.HP005 and appended Connection Diagram 130-617.HP008.
Adjustment of DIP-Switches must be performed according to appended Configuration Sheet 130-617.HP010.
The operator unit must be configured before setting into operation.
This configuration can be performed with the Configuration Tool only.
Voltage supply and connections as well as the bus terminations must be performed according to the following sections.
For connecting the cables see also respective system wiring diagrams (part of delivery for a complete CAN-Bus system).

	Do not forget to connect the earthing flat plug at the back side of the housing.

Remove the protection foil from the display after installation.

3.3 Connection

WARNING	
	By applying the supply voltage (24 V DC), the operator unit is set into operation. There is no separate power switch.

WARNING	
	The shielding clamp should not be used to clamp the connected cables mechanically. The cables have to be clamped separately.

1. Strip the cable over a length of approx. 80 - 170 mm.
   - Be careful not to damage the screening.
2. Trim the screening until approx. 15 mm is on the cable.

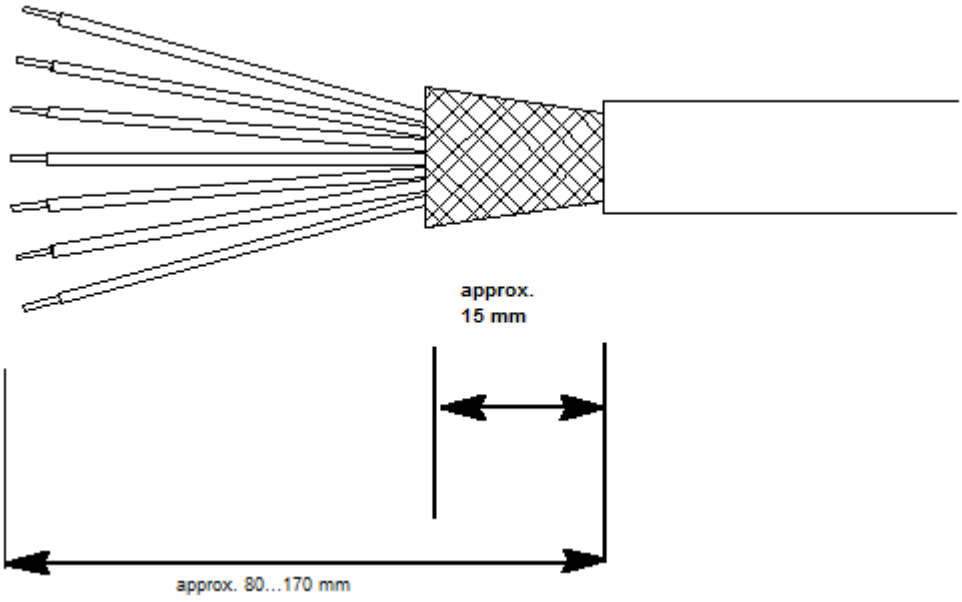


Figure 3-1 Strip off the Cable Connection

	The cable length to strip off must be adapted to the length between the clamp and the terminals.

3. Insert the cable ends into the terminal strip and tighten the terminal screws.
4. Clamp the cable shield by fastening the suitable shielding clamp in the slits of the bent mounting plate. The shielding clamp is available in three sizes.

	Shrinking sleeves must be used. However, do not strip the shrinking sleeve over the screening.

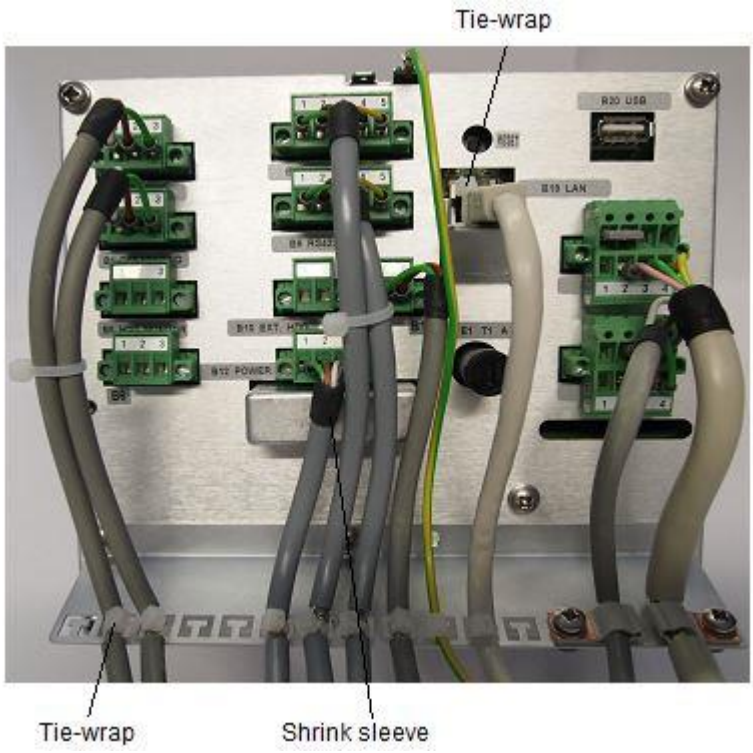


Figure 3-2 Proper Cable Connection, Example only

	It is recommended to fasten the connected cables with tie-wraps to the housing of the Operator Unit (see Figure 3-2).

3.3.1 Connect Supply Voltage at Plug B9

WARNING 	By applying the 24 V DC supply voltage, the Operator Unit is set into operation. There is no separate power switch. When establishing cable connections, ensure that the cables are disconnected from any power supply. It is essential to ensure that all cables are disconnected from the power supply, if necessary measure the voltage beforehand and/or disconnect the relevant distributor.

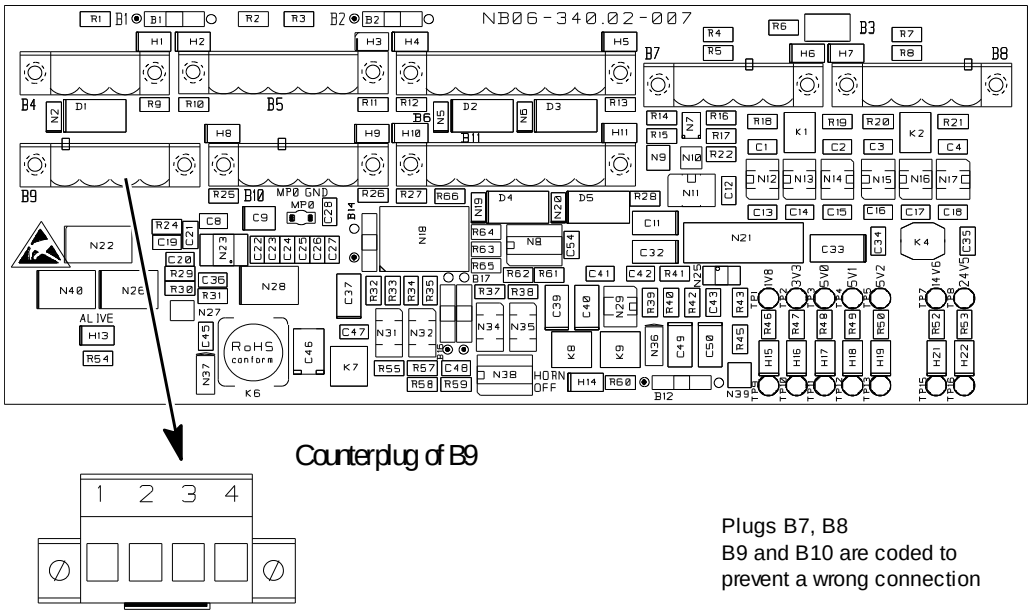
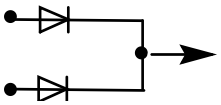
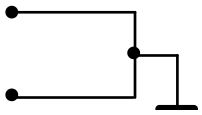


Figure 3-3 Connect Supply Voltage at Plug B9

Table 3-1 Connect Supply Voltage at Plug B9

Plug/terminal	Function	
B9/1		+24 V DC Power
B9/2		
B9/3		GND
B9/4		

3.3.2 Connect CAN-Bus at Plugs B7 and B8

	The termination of the CAN-Bus depends on its application within a steering system.

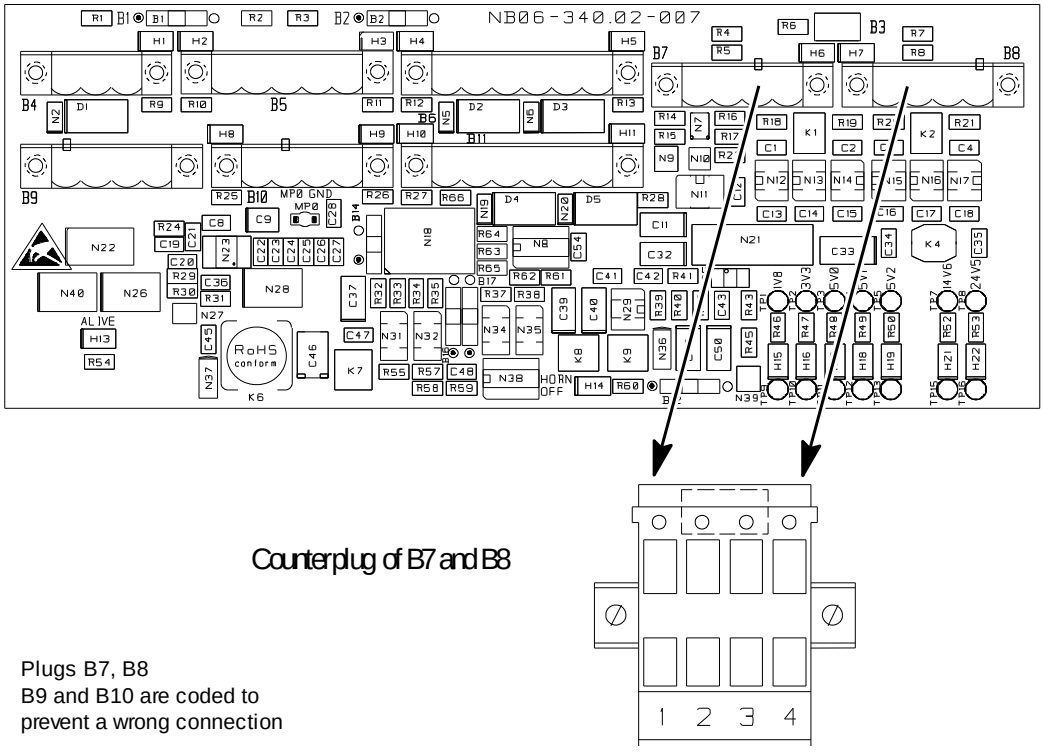


Figure 3-4 Connect CAN-Bus at Plugs B7 and B8

Table 3-2 Connect CAN-Bus at Plugs B7 and B8

Plug/terminal	Remarks
B7/1 B8/1	CAN Termination (jumper between terminal 1 and 2)
B7/2 B8/2	CAN Low (L)
B7/3 B8/3	CAN High (H)
B7/4 B8/4	CAN Ground

3.3.3 Connect Status Output “System Failure” at Plug B4

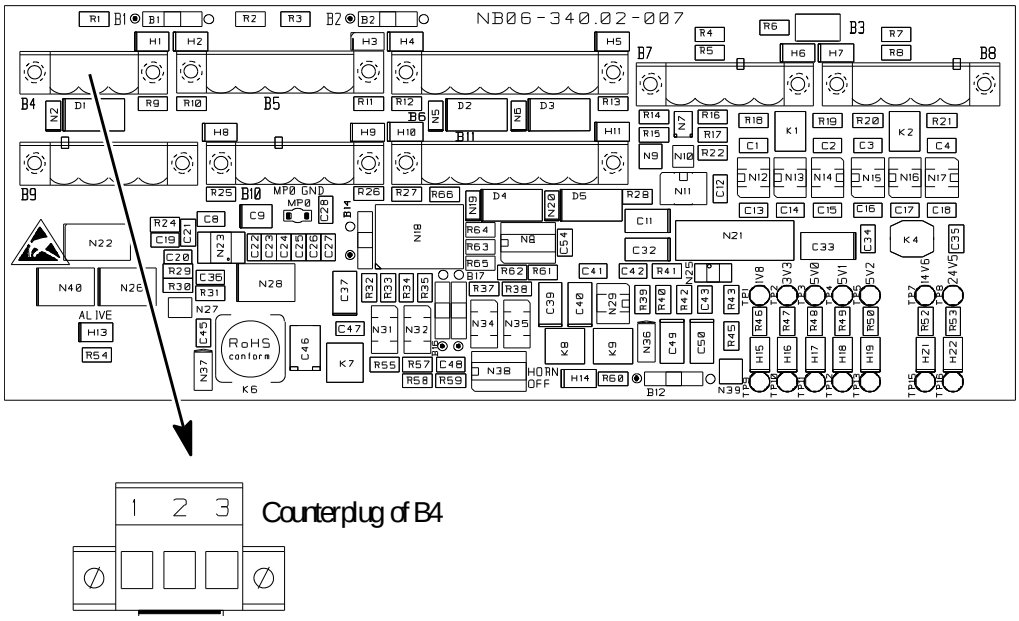
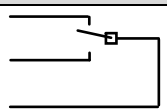


Figure 3-5 Connect Status Output “SYSTEM FAILURE” at plug B4

Table 3-3 Connect Status Output “SYSTEM FAILURE” at plug B4

Plug/terminal	Remarks
B4/1	
B4/3	
B4/2	

	The above shown status displays an error mode.

3.3.4 Connect “Serial In” and “Serial Out” at Plug B5

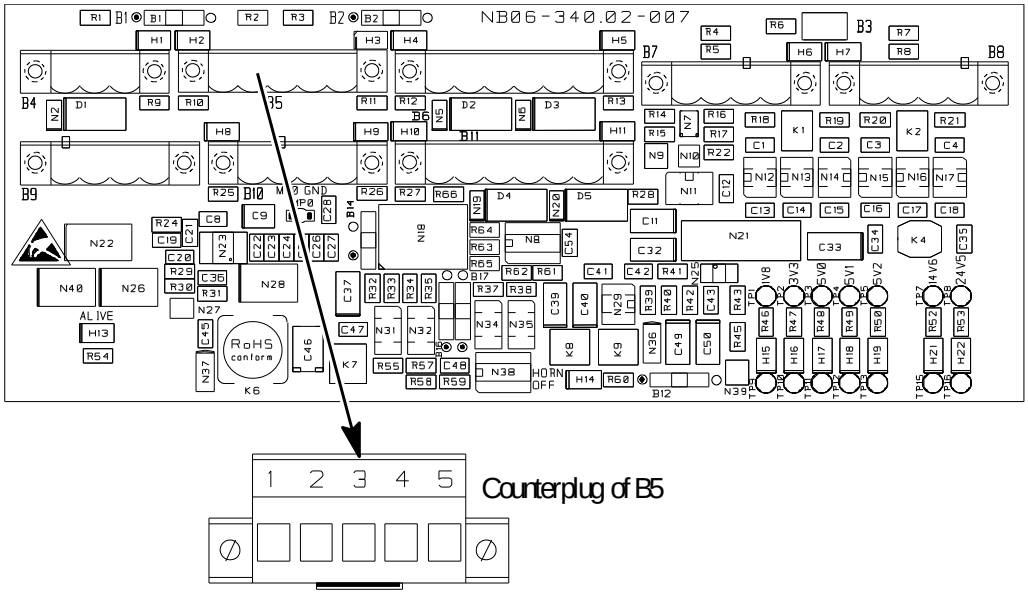


Figure 3-6 Connect “Serial In” and “Serial Out” at Plug B5

Table 3-4 Connect “Serial In” and “Serial Out” at Plug B5

Plug/terminal	Remarks	
	RS422	RS485
B5/1	TX+	B
B5/2	TX-	A
B5/3	Ground	Ground
B5/4	RX-	N.C.
B5/5	RX+	N.C.

	Observe the termination switches B1 (RS422 Out) and B2 (RS422 IN). Observe the switch position of B14, B17 and B16 for RS485 operation.

3.3.5 Connect Relay Switching Outputs 1 to 4 at Plugs B6 and B11

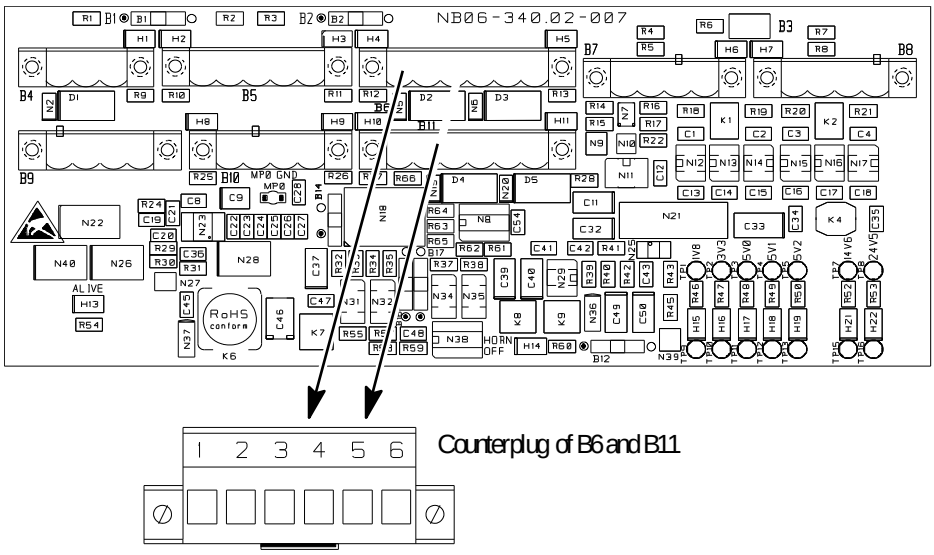
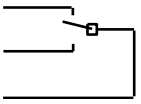
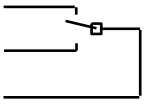


Figure 3-7 Connect Relay Switching Outputs 1 to 4 at Plugs B6 and B11

Table 3-5 Connect Relay Switching Outputs 1 to 4 at Plugs B6 and B11

Plug/terminal	Remarks
B6/1 B11/1 B6/3 B11/3 B6/2 B11/2	 B6 = Output 1 B11 = Output 3
B6/4 B11/4 B6/6 B11/6 B6/5 B11/5	 B6 = Output 2 B11 = Output 4

The above shown status displays the error-free BNWAS case.
For detailed information about BNWAS, see chapter 4.3.

3.3.6 Connect the Digital Inputs 1 and 2 at Plug B10

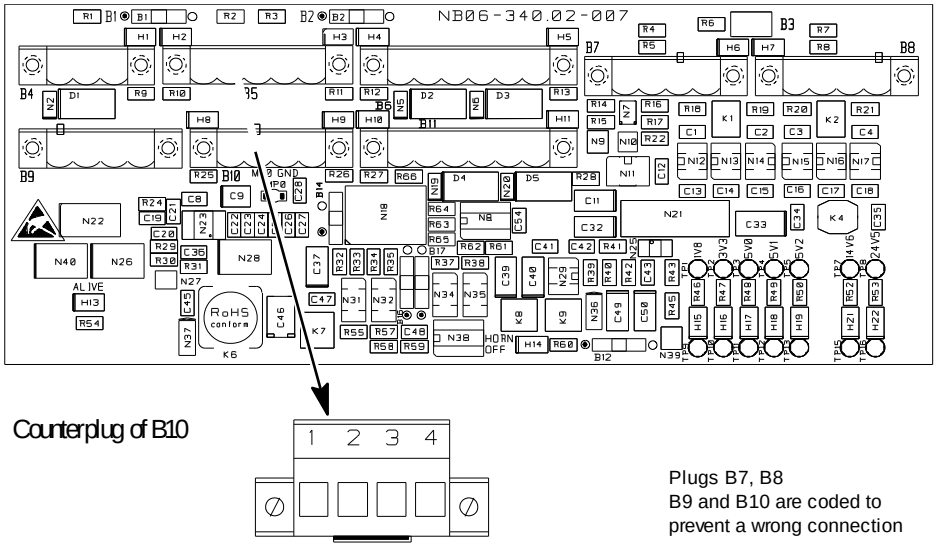


Figure 3-8 Connect the Digital Inputs 1 and 2 at Plug B10

Table 3-6 Connect the Digital Inputs 1 and 2 at Plug B10

Plug/terminal	Remarks
B10/1, B10/3	Digital in +
B10/2, B10/4	Digital in -
Terminals 1 and 2 for Digital in1, terminals 3 and 4 for Digital in2	

3.4 Configuration and Adjustments

Configurable features are:

- Addressable within a CAN-Bus architecture
- System data, for example type number, serial number
- Dimming groups and dimming curve
- Admitted types of NMEA telegrams for serial in and serial out
- Baud rate for serial in and serial out
- Heartbeat telegram on/off
- Type of alert communication (ALR/ACK or ALF/ALC/ACN/ACR)

	A special configuration Tool, type NB42-232 is necessary to configure the Operator Unit. The use of this Configuration Tool is allowed only for Raytheon service personnel.

The adjustments (switches B11, B1, B2, B12, B14, B16 and B17) must be performed according to appended Configuration Sheet 135-617.HP010.

3.5 Operation and Display Elements of the CPU PC Board and the Connection PC Board

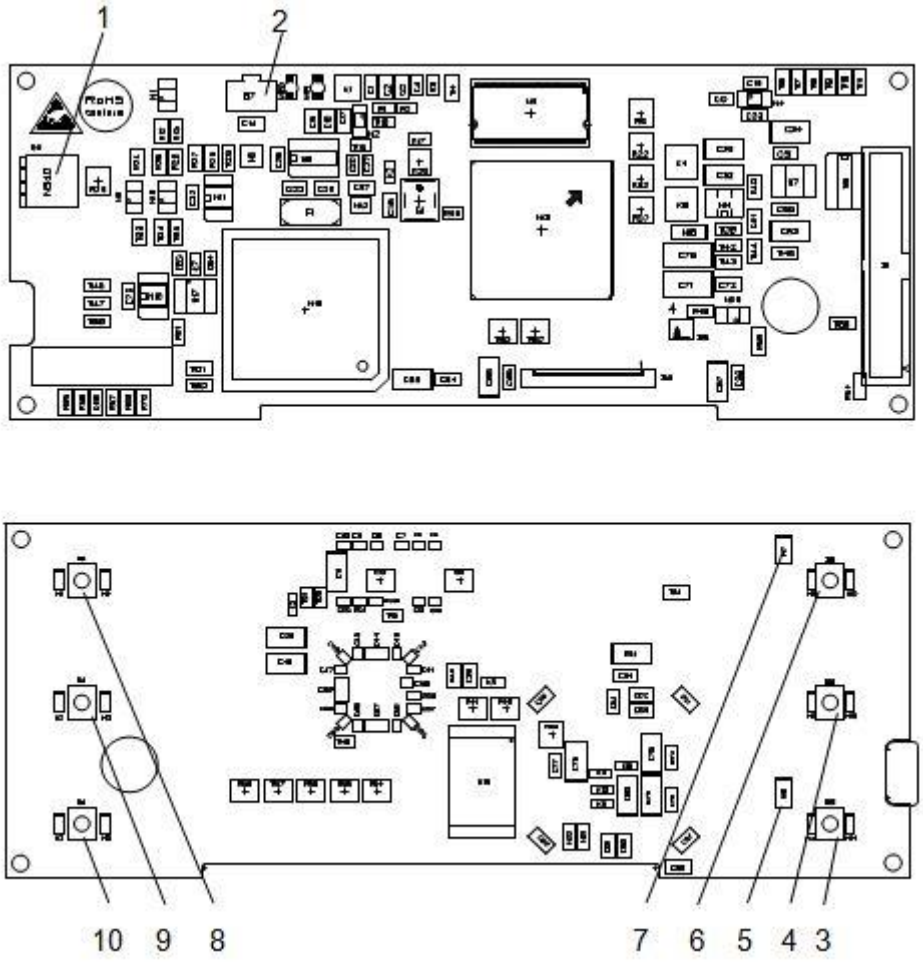


Figure 3-9 Operation and Display Elements of the CPU PC Board

Pos. No.	Designation	Function
1	DIP-Switch B11	Development only.
2	Push button B7	Push button “RESET” to reset the microcontroller.
3	Push button B10 LED H11 LED H14	Push button “SET” with illumination LEDs (white).
4	Push button B9 LED H9 LED H13	Push button “DIM” with illumination LEDs (white).

Pos. No.	Designation	Function
5	LED H10	LED (yellow) “STATUS” requests an operation of push button “SET” to activate a performed change.
6	Push button B8 LED H8 LED H12	Push button “ACK” with illumination LEDs (white).
7	LED H7	LED “ALERT” (red or green) • red means: - flashing: An alert is active and must be acknowledged - constant: An already acknowledged alert is still present • green: currently not used
8	Push button B2 LED H1 LED H4	Push button “Page” with illumination LEDs (white).
9	Push button B3 LED H2 LED H5	Push button “Scroll up” with illumination LEDs (white).
10	Push button B4 LED H3 LED H6	Push button “Scroll down” with illumination LEDs (white).

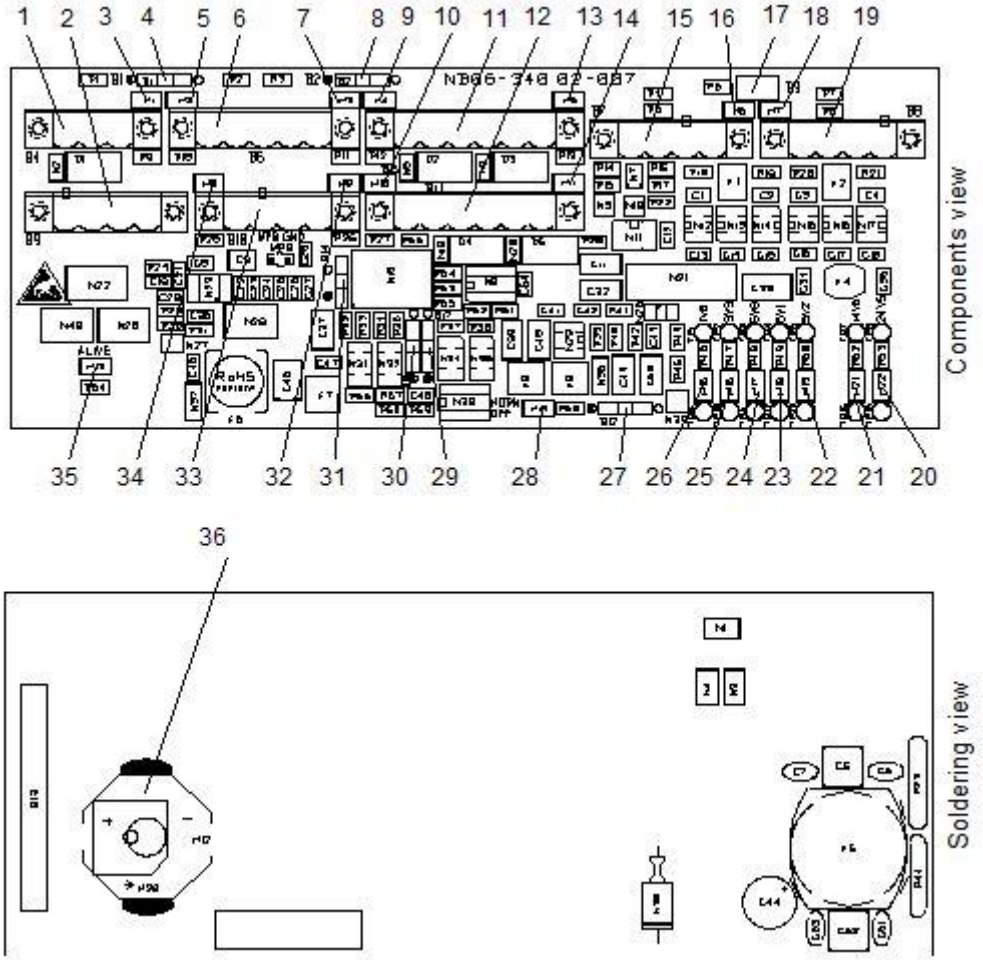


Figure 3-10 Operation and Display Elements at the Connection Board

Pos. No.	Designation	Function
1	Plug B4	Relay Output “System Failure” Interactive relay = system fail Active relay = operation okay
2	Plug B9	24V DC supply voltage input.
3	LED H1	Lights up (red) if “System Fail” is active.
4	Switch B1	Is used to terminate RS422 Out (or RS485) at plug B5.
5	LED H2	Flashes (green) if there is a data transmission via Serial Input at plug B5.

Pos. No.	Designation	Function
6	Plug B5	Serial Input 1 (RS422) and Serial Output RS422 Depending on switches B14, B16 and B17 the contacts for Serial Output are used for a RS485 interface (Data in and out). For Bridge Alert Management (BAM): Set the gyro Operator Unit to RS422.
7	LED H3	Flashes (green) if there is a data transmission via RS422 Output (or RS485) at plug B5.
8	Switch B2	Is used to terminate Serial In at plug B5.
9	LED H4	Lights up (green) if “Relay Switching Output 1” is active.
10	LED H10	Lights up (green) if “Relay Switching Output 3” is active.
11	Plug B6	Relay Switching Output 1 and Relay Switching Output 2 Out 1: Alert to BNWAS. Out 2: Currently not used.
12	Plug B11	Relay Switching Output 3 and Relay Switching Output 4. Out 3, 4: Currently not used.
13	LED H5	Lights up (green) if “Relay Switching Output 2” is active.
14	LED H11	Lights up (green) if “Relay Switching Output 4” is active.
15	Plug B7	CAN1 (of the Dual-CAN-Bus)
16	LED H6	Flashes (green) if there is a data transmission via plug B 7.
17	Plug B3	Development only.
18	LED H7	Flashes (green) if there is a data transmission via plug B8.
19	Plug B8	CAN2 (of the Dual-CAN-Bus)
20	LED H22	Lights up (green) if 24.5V DC for display background illumination is available.
21	LED H21	Lights up (green) if 14.6V DC for signal horn is available.
22	LED H19	Lights up (green) if 5V DC for CAN2 is available.
23	LED H18	Lights up (green) if 5V DC for CAN1 is available.
24	LED H17	Lights up (green) if 5V DC for the internal electronic is available.

Pos. No.	Designation	Function
25	LED H16	Lights up (green) if 3.3V DC for the graphic controller and the graphic bus is available.
26	LED H15	Lights up (green) if 1.8V DC for graphic controller is available
27	Switch B12	Is used to switch horn (H12) ON or OFF (never switch it OFF - according to IMO regulations)
28	LED H14	Lights up (red) if horn (H12) is switched OFF
29	Switch B17	Must be used in simultaneously only: If they are switched, the input “SIN1) (serial in - RS422) is switched off and the output terminals of plug B5 (for RS422 Out) are used for data in out for a RS485 interface. For Bridge Alert Management (BAM): Set the gyro Operator Unit to RS422.
30	Switch B16	
31	Switch B14	
32	LED H9	Lights up (green) if a digital input bridges the terminals 3 and 4 of plug B10.
33	Plug B10	Digital Input1 and Digital Input2: Currently not used.
34	LED H8	Lights up (green) if a digital input bridges the terminals 1 and 2 of plug B10.
35	LED H13	Blinks (green) “ALIVE” if the Operator Unit is in normal operation.
36	Horn H12	Signal horn for acoustical signal

3.6 Serial Interface

The serial interface is designed for communication with CAM in accordance with IEC 61162 and IEC 61924.

CAUTION	
	After a disconnection of interfaces, it takes up to 30 seconds until the correct values are displayed again.

The following telegrams can be used for receiving data:

Interface	Possible Telegrams	Repetition Rate
Acknowledge Alarm	ACK	
Alert Command	ACN	
Date/Time for the Alerts	ZDA[1]	1 s (recommended)

[1] The ZDA telegram is optional. The Distribution Unit is also able to transmit the information to the Operation Units via CAN-Bus.

The following telegrams can be used for transmitting data:

Interface	Possible Telegrams	Repetition Rate
Set Alarm State	ALR	1 s
Alert Sentence	ALF	In the event of changes or on demand
Cyclic Alert List	ALC	20 s or in the event of changes
Alert Command Refused	ACR	Answer to ACN (if request was refused)
Heartbeat Supervision Sentence	HBT	5 s

The following baud rates can be used:

- 4800 Bd
- 9600 Bd
- 19200 Bd
- 38400 Bd

	Only the baud rates 4800 and 38400 are conform to IEC 61162.

Select the following connection settings:

- Data bit: 8
- Parity: no
- Stop bit: 1

The Operator Unit accepts all talker IDs but can only transmit HE.

For information about the BNWAS interface, see chapter 4.3.

3.7 Set the Unit ID, CAN-Group and CAN-Number

The Unit ID, CAN-Group and the CAN-Number must be set via the Service Tool. The table shows the agreements depending on the device CAN settings within a navigation system.

Table 3-7 Recommended CAN Settings according to Devices

Devices	Unit ID	CAN-Group	CAN-Number
Operator Units	01 - 09	2	01 - 09
GPS	10 - 13	2	10 - 13
Sensors (Gyro Compass)	14 - 19	2	14 - 19
Distribution Units	20 - 29	2	20 - 29
Repeaters	30 - …	2	30 - …
Gateway	120 or 121	7	56 or 57
CAN-Bus Distributor	51 - 56	2	51 - 56

Some older devices which are not adjustable by the Service Tool (only by DIP-Switch or Hex-Switch, e.g. Standard 22, Distribution Unit) can only be set to one combined “address” with a fixed CAN-Group. This means, that the configuration has effect to the Unit ID and the CAN-Number (Unit ID = CAN-Number). In this case devices of the compass system have a fixed CAN-Group of “2”.

	Each Unit ID and each combination of CAN-Group and CAN-Number must only be assigned once in the CAN-Bus System.

Explanations:

- a CAN-Group identifies a product group respectively a sub-system (e.g. compass = 2, NautoSteer = 6 - 9)
- a CAN-Number is a unique ID within a CAN-Group
- a Unit ID is a unique ID within a complete CAN-Structure

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4 Troubleshooting

4.1 Safety Information

CAUTION	
	After a disconnection of interfaces, it takes up to 30 seconds until the correct values are displayed again.

	It is possible that an unacknowledged warning becomes an alarm (depending on the cause of the warning).

4.2 Alert Messages

Messages in the table below are arranged in alphanumeric order.
Short messages and long messages are separated with dotted lines.
Short messages shall be used for devices with limited possibility to display the alert text.

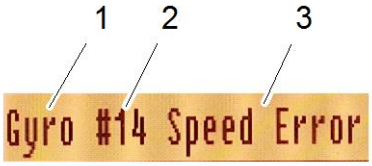

Figure 4-1 Alert Message

Pos. No.	Designation
1	Device
2	Unit ID
3	Alert Message

Alert Message	Possible Cause	Remedy
Autom. Switched to XXX[1] - - - - - - - - - - - - - - - - Sw. to XXX[1]	Sensor error	- Switch- over manually
CAN Bus line X[1] failure - - - - - - - - - - - - - - - - CAN X[1]	Short circuit at CAN line	- Check CAN-Bus
Device Error - - - - - - - - - - - - - - - - Device. Err.	Operator Unit switched off	- Check Operator Unit
Distribution Unit Error - - - - - - - - - - - - - - - - D-Unit Err.	Defect of electronic	- Exchange item or - Switch to other Distribution Unit
Fan Failure - - - - - - - - - - - - - - - - Fan Fail.	Motor defect, blocked – current sensor in control circuit	- Open compass door and cool with external fan, if necessary
Heading Difference XXX/YYY[1] - - - - - - - - - - - - - - - - H-Diff. X/Y[1]	Sensor error	- Check sensor
Heater Failure - - - - - - - - - - - - - - - - Heat Fail.	Heater defect – current sensor in control circuit	- Close compass door and introduce warm air, if necessary.
No CAN connection - - - - - - - - - - - - - - - - No CAN	Loose connection	- Exchange item or - Use other Operator Unit
Operator Unit Error - - - - - - - - - - - - - - - - OU Error	Defect of Operator Unit	- Exchange item or - Use other Operator Unit
Position Error - - - - - - - - - - - - - - - - Pos. Err.	Defect of electronic	- Select other position source with Operator Unit
Rate Gyro Error - - - - - - - - - - - - - - - - RoT Err.	Defect of electronic	- Check RoT sensor and connections
Sensor Error - - - - - - - - - - - - - - - - Sens. Err.	Defect of electronic	- Check sensor and select other sensor, if necessary. - If magnetic is selected, no valid selected sensor in system

Alert Message	Possible Cause	Remedy
Speed Error - - - - - - - - - - - - - - - - Speed Err.	Defect of electronic	- Select other speed source with Operator Unit
Supporting Liquid >60°C - - - - - - - - - - - - - - - - Liq. >60°C	Ambient temperature too high	- Open compass door and cool with external fan, if necessary - Cool down ambient temperature
	Fan error	- Check fan. Replace, if necessary.
Supporting Liquid low - - - - - - - - - - - - - - - - Liq. Low	Supporting liquid level too low	- Check liquid level and perform maintenance task, if necessary.
Voltage Cut Off - - - - - - - - - - - - - - - - Volt. Cut	Loose connection, AC supply out of range	- Check power supply of gyro, distribution unit or AC/DC Converter

[1] *X* or *Y* are used as placeholders

4.3 Bridge Navigational Watch Alarm System (BNWAS)

The operator unit provides an interface to the bridge navigational watch alarm system BNWAS (Alert escalation).

If alarm messages are not acknowledged and the reason for the alert still exists, an emergency call is triggered after 60 sec to the BNWAS interface via the relay B6.

The escalation time to the BNWAS interface is 60 sec.

5 Maintenance and Repair

The Operator Unit is maintenance-free.
In case of malfunction, the Operator Unit has to be replaced completely.
The function test should be performed only if a faulty device is assumed.

Wipe the display unit with dry cloth, if necessary.

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6 Disposal

The Operator Unit or components of it can be disposed according to the respective national regulations for electronic waste without harmful material (according to 2002/96 EC WEEE – disposal for Waste Electrical and Electronic Equipment).

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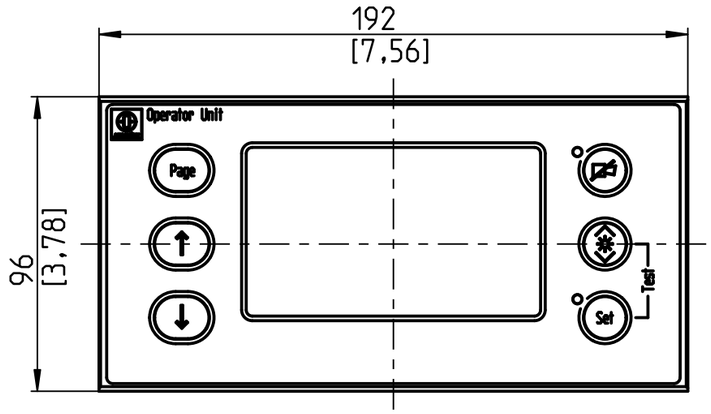
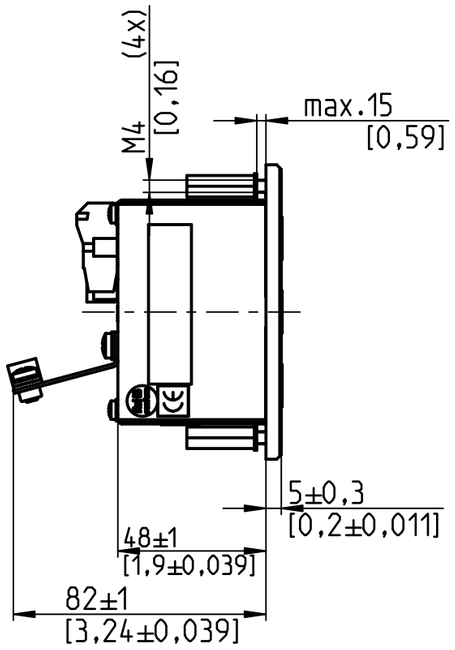
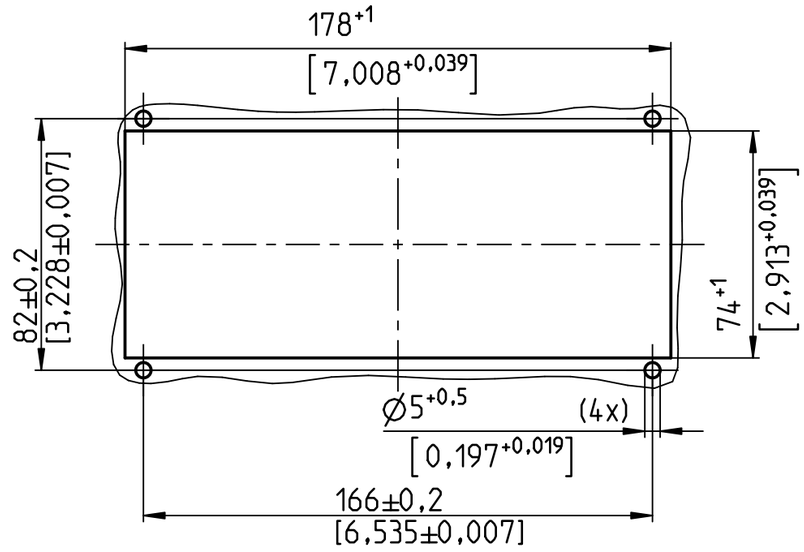
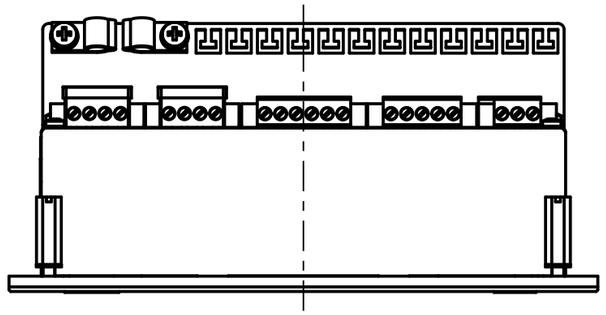
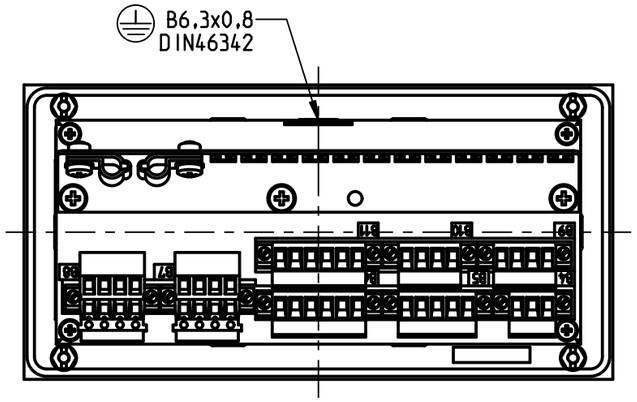










DIMENSIONS WITHOUT TOLERANCES ARE MAXIMUM DIMENSIONS

TYPE OF ENCLOSURE: EN 60529 IP23/IP56 FRONT-SIDED
EVENNESS OF MOUNTINGSURFACE < 0,1mm

DISTANCE FROM MAGNETIC COMPASS

STANDARD TYPE: 0,65 m STEERING TYPE: 0,35 m

VER.	REVISIONS	DATE OF ISSUE	NAME
00	500000039022	26.08.14	Zm

mm (inch)

CREATED BY Zm

APPROVED BY Lü

Raytheon Anschütz

CAD: Pro/E

ID.NO. 5026339

SCALE -

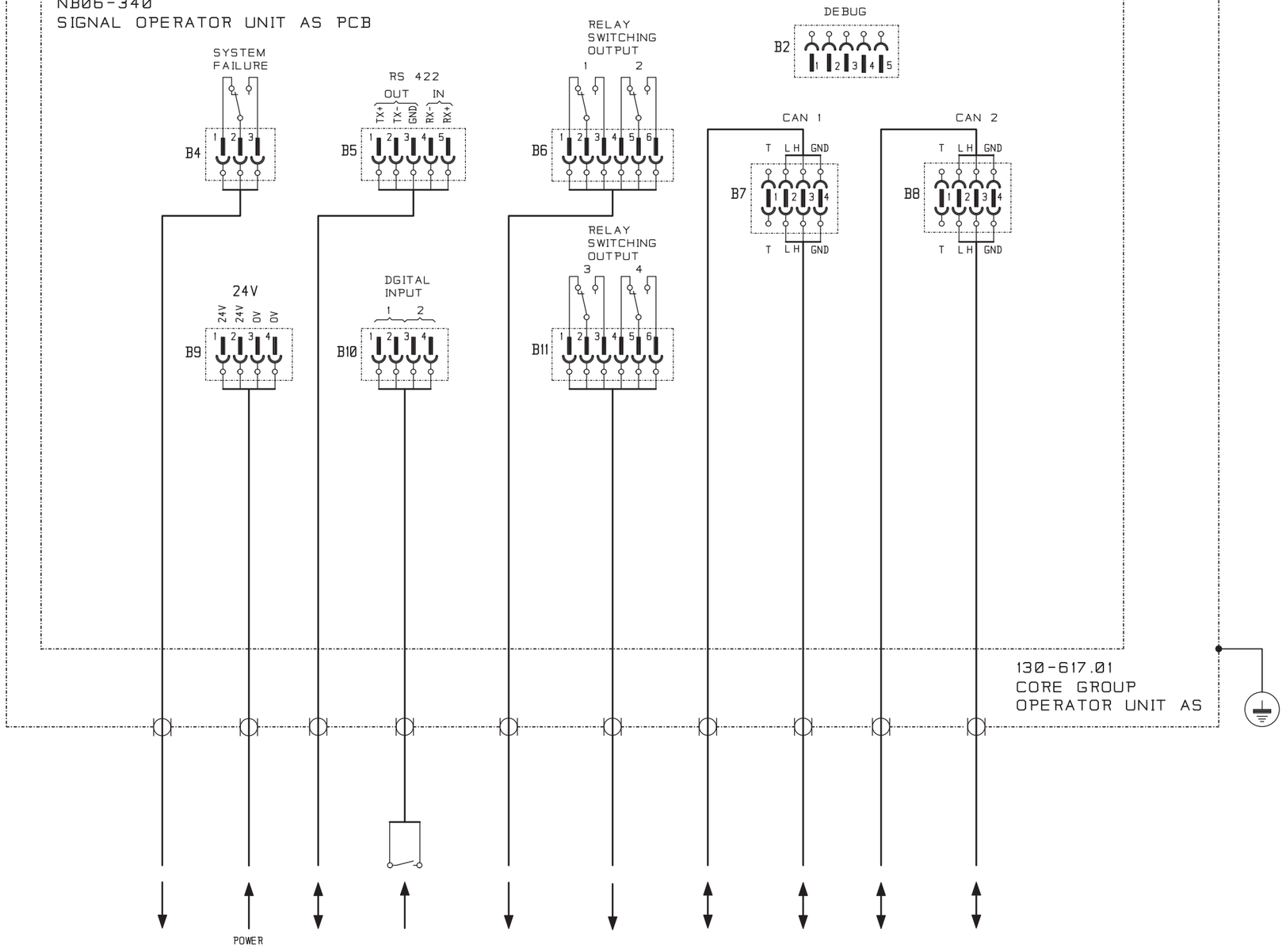
WEIGHT ca. 1,5 Kg

DRAWING TITLE
Operator Unit Gyro
DIMENSIONAL DRAWING

DRAWING NO. 130-626.HP005

SHEET 1 OF 1

NB06-340
SIGNAL OPERATOR UNIT AS PCB



ID.-NR.: 5021736

				CAD B 4788 C		
				ALLGEMEINTOLERANZ ISO 2768 - mK		
					DATUM	NAME
				BEARB	22.04.09	RAMM
				GEPR	22.04.09	STOFFER
				NORM	09.09.10	Ludzuweit
				FREIG	15.09.10	
B	1100816	10.08.11	RM	Raytheon Anschütz		
A		08.09.10	STE			
ZUST	ANDERUNG	DATUM	NAME			

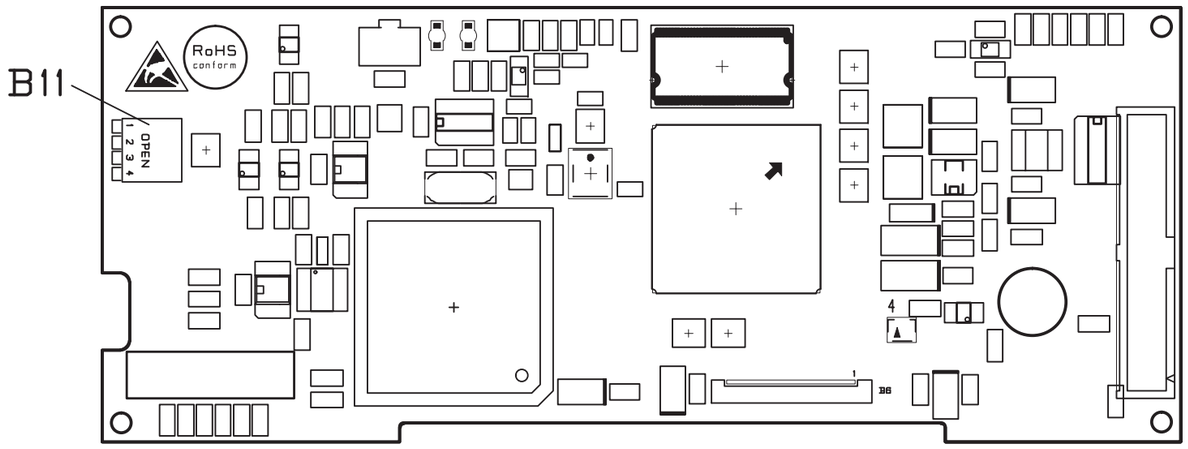
BENENNUNG
STAMMGRUPPE / CORE GROUP
OPERATOR UNIT AS
ANSCHLUSSPLAN / CONNECTION DIAGRAM

ZEICHNUNGSNUMMER
130-617.HP008

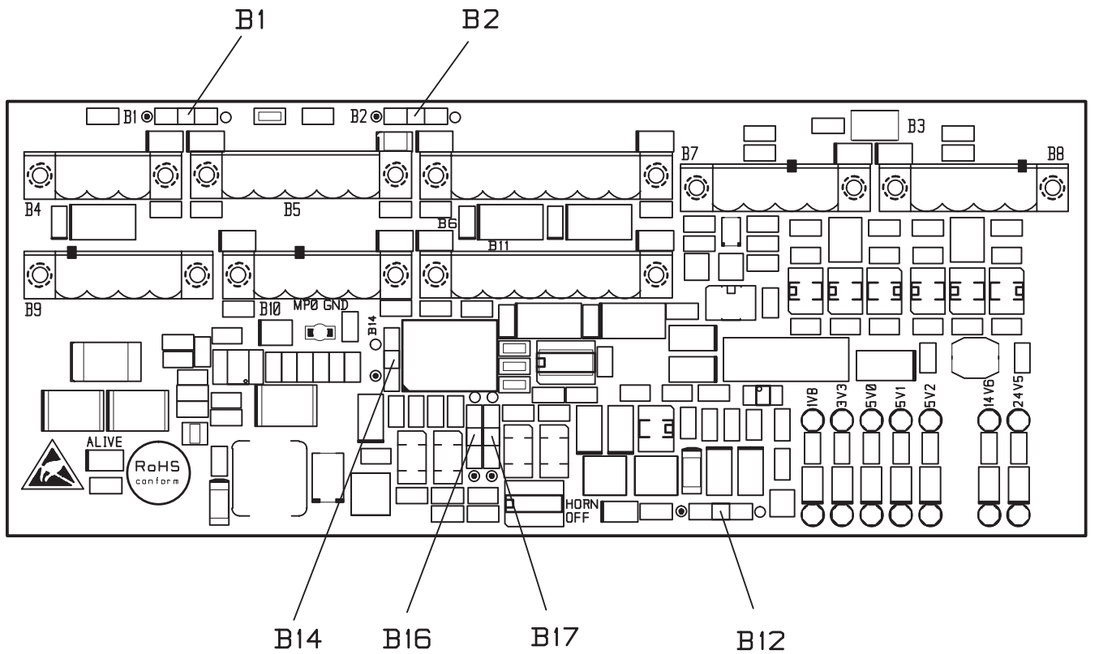
BL. 1
VON 1

ERS.FOR | ERS.DURCH

SIGNAL OPERATOR UNIT CPU AS PCB / NB06-340 EXX



SIGNAL OPERATOR UNIT CONN AS PCB / NB06-340.02 EXX



DIP SWITCH ON = ●
DIP SWITCH OFF = PANELS NOT FILLED IN

SETTINGS DEPENDING ON ORDER = x
STANDARD SETTINGS = x

DIP SWITCH		B11 A 1	B 2	C 3	D 4
NORMAL MODE	x				
FOR FACTORYTEST ONLY		●	●	●	●

SCHALTERSTELLUNG VON B1
SWITCH POSITION OF B1

● = SWITCH ON
○ = SWITCH ON

SETTINGS DEPENDING ON ORDER = x
STANDARD SETTINGS = x

CHANGE-OVER SWITCH			B1	B2	B12	B14	B16	B17
SERIAL OUT	NOT TERMINATED		○					
	TERMINATED	x	●					
SERIAL IN	NOT TERMINATED			○				
	TERMINATED	x		●				
BUZZER	OFF				○			
	ON	x			●			
✱ SERIAL IN/OUT	RS 422 ENABLED	x				○	○	○
	RS 485 ENABLED					●	●	●

✱ NOTE:
B14; B16; B17 HAVE TO BE ALL SHWITCHED OFF OR ALL SWITCHED ON

ID.-NR.: 5023414

ACHTUNG
VORSICHTSMASSNAHMEN
BEI HANDHABUNG
ELEKTROSTATISCH
ENTLADUNGSGEFAEHRDETER
BAUELEMENTE
BEACHTEN

RoHS conform

ACHTUNG
ROHS CONFORM
GEFERTIGT
NACH WN 246

ZUST	ÄNDERUNG	DATUM	NAME
A		14.09.10	STE

CAD HP 5115 1B
ALLGEMEINTOLERANZ
ISO 2768 - mK

M 1:1

	DATUM	NAME
BEARB	31.08.10	STOFFER
GEPR	08.09.10	KUHL
NORM	09.09.10	LUDZUWEIT
FREIG	15.09.10	

Raytheon Anschütz

BENENNUNG
STEERING MODE
OPERATOR UNIT AS

KONFIGURATIONSBLATT / CONFIGURATION SHEET

ZEICHNUNGSNUMMER
130-617.HP010

BL. 1
VON 1

ERS.FÜR | ERS.DURCH