



ALPHAMINICOURSE Mk2 Gyrocompass

Installation and Operation MANUAL



ALPHATRON MARINE B.V. Schaardijk 23 3063 NH ROTTERDAM The Netherlands Tel: +31 (0)10 - 453 4000 Fax: +31 (0)10 - 452 9214

P.O. Box 210003 3001 AA ROTTERDAM

Web: www.alphatronmarine.com www.jrc-world.com

Service request: service@alphatronmarine.com

Technical support request: technicalsupport@alphatronmarine.com

Warranty request: warranty@alphatronmarine.com The information in this Manual is subject to change without notice and does not represent a commitment on the part of ALPHATRON MARINE B.V.

Document : Manual ALPHAMINICOURSE Mk2 Issue : 1.2 © ALPHATRON MARINE B.V.





This installation and operation MANUAL of the ALPHAMINICOURSE model Mk2 (hereinafter "ALPHAMINICOURSE Mk2") is an important part of the gyrocompass that is designed for marine & river vessels or high-speed vessels (including those sailing in high latitudes). It provides measurement of heading and computation of rate of turn for navigation and steering of vessels.

Only authorized personnel may operate the ALPHAMINICOURSE Mk2 after studying this Manual.



CAUTIONARY NOTICES

Please note the following cautionary notices that apply throughout this Manual.

WARNING



The ALPHAMINICOURSE Mk2 weights 12,5 kg. To avoid personal injury, take proper precautions if the equipment is lifted or moved.



CAUTION!

The ALPHAMINICOURSE Mk2 includes precision components and bearings. To avoid damage of any part of the gyro compass/ handle all items with care.

During gyro compass transportation follow the requirements specified in chapter 7.

Retain the original transit cases so they can be used to transport the gyro compass when necessary. One will void the warranty if improper packing during transportation is used.

CAUTION!



It is forbidden to move the switched off gyro compass while rotor is still spinning! Always allow a period of 5 minutes after you power-off the gyro compass for the gyro rotor to stop spinning. Non-observance of this requirement may be the reason of gyro compass damage.

CAUTION!



During operation gyrocompass must remain level within $\pm 45^{\circ}$. If its tilt is more than 45° in any direction, it will 'topple'. Built-in test system will then power-off the gyro rotor and show alarm conditions on the Control Unit. To restore normal operation, level the gyro compass and then restart it.

Do not tilt gyro compass for more than 45° with the gyro rotor spinning or during the gyro compass run-up. Note that the gyro rotor continues to spin for five minutes after you power-off the system.



CAUTION!

If the gyrocompass is placed in an enclosed space, make certain there is sufficient ventilation and circulation of free air to allow effective cooling.



CAUTION!

Do not make any connections to the gyrocompass with power on the supply cable.



CAUTION!

Only certified uninterrupted power supplies shall be used for the gyrocompass operation.



CAUTION!

DO NOT modify this equipment in any way without obtaining a written permission from ALPHATRON MARINE otherwise you will void the warranty.



CAUTION!

One will void warranty for operating the gyrocompass in conditions different from those specified in the chapter 5 and in IEC 60945-2002.



ALPHAMINICOURSE Mk2 Gyrocompass



Contents

1 WARRANTY	5
2 INTRODUCTION	
2.1 Gyro compass Description	
2.1.1 Main Unit of gyro compass ALPHAMINICOURSE.	
2.1.2 Control of int	
2.1.4 Heading Outputs	
2.1.5 Bridge Älert Management (BAM)	9
2.1.6 Rate of turn Sensor (ROTI)	
2.2. Principle of Operation	10
	10
3.1 Unpacking and Inspection	
3.2. Installation and Connection	13
3.2.1 Selection of a suitable location	
3.2.2 Gyrocompass Installation	14
3.2.3 Connection diagram AprianinCourse	
3.2.5 Connecting to Digital Selector Switch	23
3.2.6 Setting of the Gyrocompass Interfaces	24
3.3 Alignment	27
3.4 Final Tests After Installation	
3.5 Installation Drawings	
4.1 Control Features.	
4.1.1 Control Unit display (main operation mode)	
4.1.2 Menu mode	37
4.1.3 Edit mode	
4.2 Power-on	
4.3 Operation	
4.3.2 Speed correction	
4.3.3 Operating mode (gyro compassing GC and directional gyro DG)	40
4.3.4 Emergency Mode	40
4.4 Alert Modes	
4.4.1 Alert Priorities	
4.4.3 Warning Alert	
4.4.4 Caution Alert	
4.4.5 Alert list	43
4.4.6 Loss or corruption of GPS signal	
4.4./ Loss of speed log signal	
4.4.6 Gyro Compass System warmings and randres	
4.5.1 General	47
4.5.2 Operating Limitations	47
4.5.3 Corrections for speed and latitude	
4.5.4 Operation in High Latitudes	
4.5.5 Operation on right Speed Clarts	40
5 TECHNICAL DATA	
5.1 Specifications	50
5.1.1 Power Requirements	50
5.1.2 Performance (definitions from ISO 8728)	
5.1.3 Compensation	
5.1-5 Signal Inouts.	
5.1.6 Signal Outputs	51
5.1.7 Dimensions and Weight	51
5.1.8 Input from the GPS-Receiver or Speed Log	
5.1.9 Data Fransmitters	
5.2 Data Formats	
5.2.1 IEC 61162 Serial Data Formats – General Information	
5.2.2 Inputs	54
5.2.3 Outputs	60
5.2.4 Other Output Formats	68
6 1 AlphaMicOurse Gyrocompass drift adjustment	69 ،
6.2 Gyrocompass self-diagnostic program	
6.3 Fuse Replacement (3.15A 250V)	71
6.4 AlphaMiniCourse Diagrams	<u>7</u> 1
/ IRANSPORTATION	72
7.1 Dual-use youu	2/ رح
8 STORAGE	
9 SERVICE	73
10 RECYLING	73
11 WARRANTY REGISTRATION FORM	
12 UTRU JETTUNUJ REGIJTRATIVIN FURMI.	/5

ALPHATRON Marine



1 WARRANTY

Following the installation of the ALPHAMINICOURSE Mk2 either a copy of the Installation / Commissioning report or the Warranty Registration Form is to be sent to Alphatron Marine in Rotterdam (<u>Alphaline@alphatronmarine.com</u>) within two weeks. Carefully note that the Installation / Commissioning report should cover at minimum the information as requested on the Warranty Registration Form. The Warranty Registration Form can be found in chapter 11. <u>One should obey this procedure to validate the warranty</u>.



Following the installation of the ALPHAMINICOURSE Mk2 a Gyro Settings Registration Form is to be sent to Alphatron Marine in Rotterdam (<u>Alphaline@alphatronmarine.com</u>) together with the Warrant Registration Form. This information is requested for presetting of a reconditioned ALPHAMINICOURSE before it is send to replace the defected ALPHAMINICOURSE Mk2. The Gyro Settings Registration Form can be found in chapter 12.



Warranty will be invalid when the AlphaMiniCourse has suffered from mechanical impacts during operation. Inside the AlphaMiniCourse a shock watch indicator of 10G has been placed and will turn RED when forces above it tolerance had occur.

2 INTRODUCTION

The Gyro compass (GC) AlphaMiniCourse Mk2 is designed for determination of the vessel heading relative to geographic meridian in the gyro compass (GC) mode and the trajectory deviation angle in the directional gyro (DG) mode.

The Gyrocompass performs the following tasks:

- □ Measurement of the heading relative to geographic meridian at sailing speed up to 70 knots.
- □ Storage of heading relative to geographic meridian at sailing speed up to 70 knots.
- □ Computation of the vessel rate of turn.
- Automatic acquisition of speed and latitude signals from the satellite navigation system. (receiver-indicator as IEC 61162-1 message string via RS232 and RS422)
- Automatic acquisition of speed signals from log.
- (pulse/nm as IEC 61162-1 message string via RS232 and RS422)
- Manual input of coordinates and speed.
- □ Communicates with vessel Central Alert Management system.
- □ Interface with electronic aids for navigation of the vessel.

(for example: radar stations, autopilot, integrated navigation systems and direction finders)

Specification of the AlphaMiniCourse Mk2 makes it ideal for installation and operation on vessels of almost any size and various applications.

Among the features of the AlphaMiniCourse Mk2 are:

- □ Short settling time
- □ Operation from 24V DC electrical supply
- □ Maintenance free
- Optional Directional mode
- Easy installation & adjustment
- □ Built-in self-diagnostic

The AlphaMiniCourse Mk2 is designed to meet the Directive 2014/90/EU requirements. Regulations & Standards can be found in chapter 5.1.10.



ALPHAMINICOURSE Mk2 Gyrocompass

Installation and operation of the AlphaMiniCourse are no complex tasks. However, it is necessary to familiarize with the contents of this Manual before you start to install and use the gyro compass. Time spent in identifying the test sequence now will ensure your gyro compass is operational in the minimum time.

WARNINGS

Where appropriate, this Manual includes important safety information highlighted as WARNING and CAUTION instructions. One should obey these instructions:

<u>WARNING</u> instructions alerts one to a potential risk of death or injury to users of the gyro compass.

<u>CAUTION</u> instructions alerts one to a potential risk of gyro compass damage.

For one's convenience, the section Introduction includes all the cautionary notices of this Manual.

All measurements in this Manual conform to SI standard of units unless otherwise indicated.

Before gyro compass installation read sections 2 and 3:

Chapter 2 contains introductory notes, describes standard features and optional orderings

Chapter 3 includes full instructions for safe and proper installation of gyrocompass and its connection to external equipment.

Before you use the gyrocompass read sections 4 and 5:

Chapter 4 describes gyrocompass operation.

Chapter 5 contains gyrocompass specifications and description of data formats.

If you suspect a fault, read section 6:

Chapter 6 contains information on gyrocompass maintenance and diagrams.

Chapter 7 includes requirements for gyrocompass transportation.

Chapter 8 includes requirements for gyrocompass storage.

For service of the manual read section 9:

Chapter 9 contains information on the servicing of the gyrocompass.



2.1 Gyro compass Description

ALPHATRON

Marine

The AlphaMiniCourse comprises the Main Unit with the Control Unit as an integrated part. The Control Unit may be integral or remotely placed.

Figure 2.1 shows the general view of the gyro compass with the integral Control Unit. Due to the physical principles of north-seeking gyro compass, achievable accuracy depends on the operating latitude and the vessel dynamics. To decrease the heading error the AlphaMiniCourse uses information supplied by external equipment, for example a GPS receiver and a speed log, to apply latitude and speed corrections.

2.1.1 Main Unit of gyro compass ALPHAMINICOURSE



Figure 2.1 Main Unit with remote Control Unit

The Main Unit comprises the following subassemblies:

High precision dynamically tuned gyroscope and gimbal suspension.

- □ Power supply board.
- Digital and analog control boards.
- RFI filter.

A Gyrocompass installation is a relatively simple operation and you should be able to accomplish this quickly without the need for specialized personnel or equipment. However, don't forget that the gyrocompass weights 12,5kg and you must take due care when you lift or move it.

Accuracy of alignment of the gyro compass housing with the surveyed fore-aft axis of the vessel will have a direct impact on the accuracy of the AlphaMiniCourse heading measurements. Since the AlphaMiniCourse is the main source of heading information for other systems on board, such as radars, satellite communication antennas, etc., its heading determination error will influence the operation of all ship-borne systems. Therefore you should take care when you install and align gyro compass. Refer to chapter 3 for full instructions on the AlphaMiniCourse installation, connection and alignment.

The only component available for user servicing is a 3,15A fuse. In case of failure, refer to chapter 6 for instructions.





2.1.2 Control Unit

The Control Unit (CU) provides all the functions and indicators necessary to control and operate the AlphaMiniCourse.



The VFD (Vacuum Fluorescent Display) screen can show the following information:

- □ Heading in degrees from 000.0 to 359.9
- □ Latitude from 89S to 89N
- □ Latitude source
- □ Speed in knots from 0 to 90
- Speed source
- □ Failures, operating mode and gyrocompass status information.

Refer to section 4 for instructions to operate the AlphaMiniCourse.



2.1.3 Auxiliary Inputs

Auxiliary inputs may be used for the AlphaMiniCourse speed and latitude correction.

Ideally, the AlphaMiniCourse should accept latitude and speed information from external sources such as a GPS receiver or a speed log. However, you may input this information manually if external sources are not available. The advantage of using GPS or a speed log to provide correction signals is that they allow automatic corrections to be applied without operator intervention.

Chapter 3 includes instructions to connect and configure the external sources of latitude and speed information.

Chapter 4 includes instructions to set latitude and speed manually.

2.1.4 Heading Outputs

The AlphaMiniCourse is a self-contained precision navigation instrument capable of supplying heading reference information simultaneously to a wide range of equipment located on board the vessel. On a typical vessel heading information is used by:

- Autopilot
- □ Radars
- Dynamic Positioning systems
- □ Radio direction finder
- □ Course plotter and course recorder
- □ Satellite communication systems
- □ Satellite television

To support this wide range of equipment, the AlphaMiniCourse can supply heading information simultaneously through multiple channels using any of the common transmission formats.

Refer to Chapter 3 for a description of the available outputs and Chapter 5 for their data formats.

2.1.5 Bridge Alert Management (BAM)

Bridge Alert Management (BAM) is the overall concept for enhancement of handling, distribution and presentation of alerts on the bridge, for provision information to the bridge team and support in its decisions. The BAM purpose is harmonization of priority, classification, handling, distribution and presentation of alerts to enable the bridge team to devote full attention to the operation of the vessel and to immediately identify any alert situation requiring warning and action to maintain the safe operation of the vessel.

To support this demand, the AlphaMiniCourse can supply alert information by a dedicated output. This will allow the Central Alert Management Human Machine Interface (CAM-HMI) to display its alerts on the bridge.

Refer to Chapter 3 for a description of the available output and Chapter 5 for its data format. Refer to Chapter 4 for a description of the available alerts.

2.1.6 Rate of turn Sensor (ROTI)

The AlphaMiniCourse Gyrocompass is certified to be a rate of turn sensor for a rate of turn indicator system. This system consists of the AlphaMiniCourse Gyrocompass and a rate of turn indicator AlphaTurn MFM and will be used for vessels above 50.000 GT.

Refer to figure 3.5.5 in chapter 3 for a installation drawing of AlphaTurn MFM.





2.2. Principle of Operation

In the absence of external influences, a free-spinning gyroscope rotor will try to maintain a fixed orientation in space. The AlphaMiniCourse exploits this property and uses earth gravitational attraction and rotation to align the gyroscope spin axis with the meridian, i.e. in the true north direction.

2.3 Optional Orderings

If I need of additional equipment or items it is possible to order with the aid of below mentioned table 2.3. From repeater till pre-assembled cables.

Table 2.3 – Ordering of additional items

Part number	Description
AlphaMiniCourse Mk2 gyr	o compass
G-007513	AlphaMiniCourse Mk2 gyro compass (maintenance free) incl. connector set
AlphaMiniCourse Digital Se	elector Switch
G-007626	Alphawinicourse Digital Selector Switch consists of a Switch Unit and Controller
G-007635	AlphaMiniCourse Selector Switch, Control Unit
G-00/63/	Alphaminicourse selector switch, switch onit
Alphaline MFS	
G-002741	Alphaline Repeater Display MFS-H grey
G-002742	Alphaline Repeater Display MFS-H black
G-002743	Alphaline Repeater Display MFS-V grey
G-002744	Alphaline Repeater Display MFS-V black
Alphaline MFM	
G-002749	Alphaline Repeater Display MFM grey
G-002750	Alphaline Repeater Display MFM black
G-004561	Alphaline AlphaTurn Rate of Turn Indicator MFM grey
G-004562	Alphaline AlphaTurn Rate of Turn Indicator MFM black
Alphaline MEL	
	Alpha Hooding+ Indicator grou vorsion
G-004535	
G-00751	Alphalica Cangatar Disclay MEL ray
G-002751	Alphaline Repeater Display MFL black
0.002732	
Interfacing materials	
G-002572	NMEA distribution module Mk.2 (1 input/ 4 outputs)
Gyro cabling (pre-assemble	
G-002318	Power supply cable type 3F - 10m
G-002319	Data out cable (1ch) type $4M1 - 10m (max 4)$
G-002320	Data but cable (201) (ype 4mz - 1011 (11az 2)
G-002321	NCU to interswitch cape type /wil - 10m
G-002322	GPS in collar contract cable type 7002 - 1000
G-002323	OG (m/se) / GPS (PS32) calle type 7.1 - 10m
G-002324 G-006689	
G-006690	Data out cable (trab type of 2 20m)
G-006691	Data out cable (2ch) type 4M2 - 20m (max 2)
G-006692	RCU to interswitch cable type 7M1 - 20m
G-006693	RCU to RCU and ROT cable type 7M2 - 20m
G-006694	GPS in & alarm contacts cable type 7F1 - 20m
G-006695	LOG (pulse) / GPS (RS232) cable type 7F2 - L=20m





3. INSTALLATION

To obtain the best performance from the AlphaMiniCourse you must take care when you install and connect it. This section includes all the information and instructions you will need to complete these tasks.

You should read this section carefully and understand the important instructions that it contains before you begin to install or connect the equipment.

3.1 Unpacking and Inspection page 12

Explains the inspection checks that you should perform after unpacking of the AlphaMiniCourse.

3.2. Installation and Connection page 13

Choose the suitable location to install the AlphaMiniCourse. Connect the system to an electrical supply and to external equipment.

3.3 Alignment page 27

The care that you take as you align the AlphaMiniCourse with the fore-aft datum on the vessel will have the direct influence upon its accuracy.



3.1 Unpacking and Inspection

WARNING



The AlphaMiniCourse Mk2 weights 12,5kg. To avoid personal injury, take proper precautions if the equipment is lifted or moved.

CAUTION!

The AlphaMiniCourse Mk2 includes precision components and bearings. To avoid damage of any part of the gyro compass/ handle all items with care.

During gyro compass transportation follow the requirements specified in chapter 7.

Retain the original transit cases so it can then be used to transport the gyro compass when necessary. One will void the warranty if improper packing during transportation is used.

CAUTION!



It is forbidden to move the switched off gyro compass while rotor is still spinning! Always allow a period of 5 minutes after you power-off the gyro compass for the gyro rotor to stop spinning. Non-observance of this requirement may be the reason of gyro compass damage.

After you have received the gyrocompass first of all check all items against the shipping documents. Inspect the unit carefully to check for any damage that may have occurred during transportation. If you find any damage, submit a claim to the carrier and immediately notify ALPHATRON MARINE.

To avoid loss or damage of any component, store all sub-assemblies in the transit case until you need to install them. Follow the storage requirements listed in the chapter 8.

If there is any components shortage in the shipment, notify ALPHATRON MARINE immediately.

You can find the contact details of ALPHATRON MARINE on the title page of this Manual.



3.2. Installation and Connection

3.2.1 Selection of a suitable location

For proper installation of the AlphaMiniCourse carefully note the following requirements:

CAUTION!



During operation the gyrocompass must remain level within $\pm 45^{\circ}$. If its tilt is more than 45° in any direction, it will 'topple'. Safety routines in the gyro software will then power-off the gyro rotor and show alarm conditions on the Control Unit. To restore normal operation, level the gyro compass and then restart it.

Do not tilt the gyro compass for more than 45° with the gyro rotor spinning or during the gyrocompass run-up. Note that the gyro rotor continues to spin for five minutes after you power-off the system.



CAUTION!

If you placed the gyrocompass in an enclosed space, make certain there is sufficient ventilation and circulation of free air to allow effective cooling.

- □ Choose the place where the AlphaMiniCourse will be protected from damages.
- □ Do not install or operate the AlphaMiniCourse where the ambient temperature could fall below -15°C or rise above +55°C, or where rapid changes of temperature can occur.
- Do not install the AlphaMiniCourse close to strong mechanical or electrical noise sources, or in a location susceptible to vibration or shock.
- Minimum allowed distance between the gyrocompass housing and any standard magnetic compass is 1.5 meters.
- □ Choose the place so that there is a convenient access to the AlphaMiniCourse for installation, connection and service. Required spacing is shown in the Figure 3.5.1.



3.2.2 Gyrocompass Installation

The AlphaMiniCourse should be aligned so that its fore-aft axis is parallel to the fore-aft datum of the vessel. Any misalignment between the compass housing and the vessel will decrease the accuracy of heading measurements provided by the gyrocompass.

To install the gyrocompass you will need the following tools and cables:

- Screwdriver 5.5mm x 150mm
- □ Screwdriver 3mm x 75mm
- □ Two adjustable spanners with opening to at least 33mm
- □ Suitable cables for the installation as indicated in the Table 3.1.
- □ Or premade cables as shown in figure 3.2

Table 3.1 – Suitable cable types

Purpose	Suitable cable
Power supply	3 x 1.5 mm ² screened cable
Step output Resolver heading output Ready & Fail output Rate of Turn output RCU output LOG input CAM Communication	3 x 2 x 0.5 mm ² screened cable
Serial data heading output GPS input	2 x 2 x 0.5 mm ² screened cable

Note: maximal cable length for RS232 is 10 meters and for RS422 is 100 meters.

There is no need to remove the gyrocompass cover during installation.

- 1: The AlphaMiniCourse shall be mounted on a rigid metal foundations that is secured to the deck close to vessels center of mass. A Foundation Example can be seen in figure 3.5.1. During installation you must align the AlphaMiniCourse so that its fore-aft axis is parallel with the fore-aft keel line of the vessel. It is not necessary for the gyrocompass to be on the vessel centre line. There are alignment marks on the base of the AlphaMiniCourse that help to achieve correct alignment.
- 2: Three elongated securing holes on the gyrocompass base allow you to adjust the alignment after installation. With the gyrocompass positioned accurately, mark the supporting surface with the center positions for the three securing holes. Dimensions are given in the Figure 3.5.1.
- 3: Remove the gyrocompass and drill three 8.5 diameter holes, using the marks you have just made on the supporting surface.
- 4: Reposition the gyrocompass and align it to the fore-aft datum. Use three M8 bolts with washers and nuts to secure the gyrocompass in position.
- 5: Connect a 24V electrical supply in accordance with the Table 3.2 to the connector "24VDC" (acceptable variation range from 21.6V to 31.2V DC) on the rear side of the gyrocompass base using a 3-pin plug from the assembly set. Figure 3.1 shows the rear panel with connectors.





The connection of the premade Power connector can be seen in figure 3.2 or power cable be made according to below shown table:



6: Connect the ship's safety ground to the earthing stud adjacent to the power connector.







7: Make all necessary input and output signal connections via connectors located on the rear panel of the AlphaMiniCourse in accordance with the Tables 3.3 and 3.4.

The connection of the premade cables can be seen in figure 3.2 or the serial data cables can be made according to below shown table:



ALPHATRON Marine





X5, X6, X7, X8, X13, X14 RCU, X9, X10, X11, X15 GPS, LOG, X12

- 7 Pol. Male connector
- 7 Pol. F.male connector





ALPHAMINICOURSE Mk2 Gyrocompass



e 3F G-002318 G-006689 0:0::::::::::::::::::::::::::::::::::
e 3F G-002318 (10m) (10m) old: 3107.0426 (10m) old: 3107.0428 (10m) old: 3107.0431 (10m) old: 3107.0432 (10m) old: 3107.0434 (10m) old: 3107.0435 (10m) old: 3107.0436 (10m) old: 3107.0438 (10m) o
e 3F e 4M1 e 4M1 e 7M2 e 7M1 e 7M2 e 7M2 e 7M2 e 7F1 e 7F1 e 7F2 e 7F2
Cabl Cabl Cabl Cabl Cabl Cabl Cabl Cabl
belique à fi fistie sol tech mel velo exceptie que sol bezu ed fen teun foiler noitemente idenación e la fistie vel tech mel noitemente idenación e la fistie e la

Figure 3.2 – Connection diagram of premade cables



ALPHAMINICOURSE Mk2 Gyrocompass



3.2.3 Connection diagram AlphaMiniCourse







Table 3.2 - Power supply input

Pin	Description
24VDC/1	Cable shield
24VDC/2	+24V DC
24VDC/3	0V

Table 3.3 - Inputs

Signal description	Signal type	Connector on the rear panel
GPS input	IEC 61162 RS232	GPS/6(+15 V) GPS/2(0 V)
	IEC 61162 RS422	GPS/1(A) GPS/2(V)
Log input	IEC 61162 RS232	LOG/3(+15 V) LOG/2 (0 V)
	IEC 61162 RS422	LOG/1(A) LOG/2(V)
Log input	Pulses with amplitude from 5V to 10V	LOG/6(+15 V) LOG/7(0 V)

Table 3.4 – Input/output of the CU Control Board

Signal description	Signal type	Terminals of Control board
Power supply input	DC voltage	XT/5 (+24V) XT/3(0V)
On/Off output	DC voltage	XT/4(+12V/0V)
Data input/output	RS422	XT/2(S+) XT/1(S-)

Table 3.5 – Inputs/outputs of the RCU connector for connection of the Remote Control Unit to gyrocompass and Digital Selector Switch

Signal description	Signal type	Connector on the rear panel
Power supply input	DC voltage	RCU/5 (+24V) RCU/3(0V)
On/Off input	DC voltage	RCU/4 (+12V/0V)
Data input/output	RS422	RCU/2(S+) RCU/1(S-)





Table 3.6 – Outputs

Signal description	Signal type	Output	Connector on the rear panel
Heading	IEC 61162-1/2	RS232	X5/3(+15 V), X5/4(0 V)
Channel A		RS422	X5/1(A), X5/2(V)
		RS422	X9/1(A), X9/2(V)
Heading	IEC 61162-1/2	RS232	X6/3(+15 V), X6/4(0 V)
Channel B		RS422	X6/1(A), X6/2(V)
		RS422	X10/1(A), X10/2(V)
Heading	IEC 61162-1/2	RS232	X7/3(+15 V), X7/4(0V)
Channel C		RS422	X7/1(A), X7/2(V)
		RS422	X11/1(A), X11/2(V)
		RS422	X13/1(A), X13/2(V)
		RS422	X14/1(A), X14/2(V)
Heading	IEC 61162-1/2	RS232	X8/3(+15 V), X8/4(0 V)
Channel D		RS422	X8/1(A), X8/2(V)
		RS422	X13/3(A), X13/4(V)
		RS422	X14/3(A), X14/4(V)
		RS422	X15/1(A), X15/2(V)
Heading	Step		X9/3(5 V)
			X9/5(S1)
			X9/6(S2)
			X9/7(S3)
			X9/4(0 V)
Failure		FAIL CC	X12/5
		FAIL NO	X12/6
		FAIL NC	X12/7
Ready		RDY CC	X12/1
		RDY NC	X12/2
		RDY NO	X12/3
Rate of Turn	Analog ±	10 V	X10/5(-10V)
			X10/4(+10V)
			X10/3(0V)
Heading	Resolv	'er	X11/6(10V/400Hz) reference voltage
			X11/7(0V) reference voltage
			X11/4(2V/400Hz) sin
			X11/5(2V/400Hz) cos
			X11/3(0V)
Comm. with	IEC 61162-1	RS422 OUT	X15/4 (A-)
CAM		RS422 OUT	X15/5 (B+)
		RS422 IN	X15/6 (A-)
		RS422 IN	X15/7 (B+)



3.2.4 Remote Control Unit

Marine

There may be applications where you prefer to install the Control Unit at some distance from the gyro compass. For this purpose you may use Remote Control Unit. Housing of RCU into which the CU from the Main Unit is mounted is provided as a mounting kit.

The mounting kit includes the following items:

□ RCU housing

ALPHATRON

- Blanking plate for the Main Unit housing
- □ Fastening parts for mounting
- \square 2m 3x2x0,5mm2 cable



There is no need to remove the gyrocompass cover to install RCU externally:

- 1. Release and remove the four M3 screws at the corners of the CU.
- 2. Lift the CU away from the Main Unit.
- 3. Disconnect the CU cable from corner socket the analog PCB. Instead of it connect the second cable that is located nearby.
- 4. Disconnect the cable from the CU, release the terminal screws.
- 5. You may place the RCU on the table.

Select a location for the RCU:

- □ The mounting surface can be vertical or horizontal according to requirements.
- □ Avoid installing the RCU where it might be exposed to shock or vibration.
- □ Choose a location for the RCU that allows a clear view of the display in all conditions.
- 6. Take the cable for interconnection of the RCU to the Main Unit. Route the cable through the cable gland on the CU housing.

Note:

The cable, run between the gyrocompass and the RCU, must not exceed 100 meters.

7. In accordance with Tables 3.5, and 3.6 connect the cable to the terminals of the CU and to the connector RCU on the rear panel of the Main Unit as shown in below figure.



- 8. Fit the CU into the housing and screw four M3 screws at the corners of the CU.
- 9. Fit the blanking plate to fill the gap left in the cover of the Main Unit after the removal of the CU.





3.2.5 Connecting to Digital Selector Switch

There may be applications where you prefer your AlphaMiniCourse Gyrocompasses to be controlled by a single control unit of the Digital Selector Switch. For this purpose it is needed to disconnect the Control Unit of the AlphaMiniCourse Gyrocompass and replace it with a blanking plate as shown in figure 3.5.3.

Note:

Installation and Operation details of the Digital Selector Switch can be found in its manual that is delivered with the product.

The following items are needed:

- Blanking plate for the Main Unit housing
- □ 10m or 20m 7M2 cable

There is no need to remove the gyrocompass cover to install RCU externally:

- 1. Release and remove the four M3 screws at the corners of the CU
- 2. Lift the CU away from the Main Unit.
- 3.Disconnect the CU cable from the corner socket of analog PCB. Instead of it connect the second cable that is located nearby.
- 4. Take out the CU and store it on a save place
- 5.Connect the 7M2 cable on RCU output of the rear panel from the Main Unit. Route the cable through the cable gland of the Digital Selector Switch Unit.
- 6. Connect 7M2 cable in the Digital Selector Switch Unit as shown in below figure and table 3.6



Note:

If you have more AlphaMiniCourse Gyrocompasses to be controlled by the Digital Selector Switch they can be connected on terminal XT5 (GC2), XT6 (GC3) and XT7 (GC4).

7. Fit the blanking plate to fill the gap left in the cover of the Main Unit after the removal of the CU.



3.2.6 Setting of the Gyrocompass Interfaces

The digital output channels can be adjusted individual or set all the same by following the instruction in paragraph 3.2.5.1. For analog adjustment of its ROT and STEP output it can be set by following the instruction in paragraph 3.2.5.2.

3.2.6.1 Setting of the digital interface in Adjustment mode

To enter the interface Adjustment mode press and hold the buttons " \blacktriangleleft " and " \triangleright " and then switch ON the gyrocompass. On the Control Unit display you will see a Table of digital outputs similar to the one given below:

Chn Baud. Freq. Prec. Chk Message

All	4800	10	.1	On	THS
A		10			
B		10			
С		10			
D		10			

Log type: NMEA LOG_OK:

STEP limit: 06 ROT range: 1200

Six upper lines form a table for adjustment of digital RS232 and RS422 outputs in separate channels. The second line from the bottom refers to the speed log output adjustment. The bottom line only informs about the analog interface adjustments by the DIP-switch settings in accordance with tables 3.8 and 3.9.

The first line of the table of the digital outputs is its title describing its six parameters:

Chn – channel, where All – general tunings (for all channels);

Baud. – transmission speed;

Freq. – transmission rate;

Prec. – heading accuracy;

Chk - checksum;

Message – sentences

Possible values for all parameters are given in below mentioned Table 3.7.

Note:

Empty spaces in the table for channels A....D means that these parameter are similar to the general settings (from the line All).

A cursor on the display has a form of a highlighted rectangular and is moved by the arrow buttons to select a parameter that needs to be changed.

By pressing the button " \downarrow **MENU**" you may select the Edit mode for the selected parameter, in this case the cursor will start flashing. The parameter is changed by the button " \blacktriangle " and " \blacktriangledown ". You should press the button " \downarrow **MENU**" to accept the change or the button "**Esc**" to chancel the change.

By pressing any of these buttons you close the Edit mode and return to the Selection mode. By pressing the button "**Esc**" in the selection mode you will finalize the adjustment and store all changes in the unit's nonvolatile memory. The unit is returned to its usual operation mode.

If you switch off the unit in the Adjustment mode, all changes that were made are lost.



Table 3.7 - Control Unit parameters

Parameter	Value	Function
Baud.	4800 9600 19200 38400	Baud rate 4800 baud (digital output RS232 and RS422)* 9600 baud (digital output RS232 and RS422) 19200 baud (digital output RS232 and RS422) 38400 baud (digital output RS232 and RS422)
Freq.	1 10 20 50	Transmission rate 1 time per second (digital output RS232 and RS422) 10 times per second (digital output RS232 and RS422)* 20 times per second (digital output RS232 and RS422) 50 times per second (digital output RS232 and RS422)
Prec.	.1 .01	Heading decimal place (accuracy) One decimal place (heading digital output)* Two decimal places (heading digital output)
Chk	Off On	Checksum field No checksum transmitted (digital output RS232 and RS422)* Checksum transmitted (digital output RS232 and RS422)
Message	HDT HDT+ROT HDT+VHW VHW+ROT THS THS+ROT THS+VHW All	Output sentences HDT (digital output RS232 and RS422)* HDT + ROT (digital output RS232 and RS422) HDT + VHW (digital output RS232 and RS422) VHW + ROT (digital output RS232 and RS422) THS (digital output RS232 and RS422) THS+ROT (digital output RS232 and RS422) THS+VHW (digital output RS232 and RS422) All Data (digital output RS232 and RS422)**
Log type	NMEA 100 200 400	Log input NMEA log* 100 pulse per nautical mile 200 pulse per nautical mile 400 pulse per nautical mile
LOG_OK	Off On	Disable of RS232 from the log Control is off* Control is on

*factory default settings

**Transmission rate in the mode "ALL Data" is also 1 time per second despite of the frequency setting





3.2.6.2 Setting of the analog interface

DIP-switches on the Digital board are used to set the scale of the analog rate of turn output and the ROT limit for the step signal output.

- 1. DIP-switches are located on the Digital circuit board. Without removing the gyrocompass cover unscrew and remove four securing screws to take the Control Unit out.
- 2. Set DIP-switches on the Digital board carefully for specific requirements of your installation.
- 3. The Scale of the analog rate of turn is selected by setting of three DIP-switches in accordance with the Table 3.8.
- 4. The ROT limit for the step signal is selected by setting of two DIP-switches on the Digital board in accordance with the Table 3.9.
- 5. If needed, Backward running mode can be selected accordance with paragraph 3.2.5.3.
- 6. Refit the Control Unit to its place.

Τ	а	bl	e	3.8	

1	2	3	ROT for 10V
OFF	OFF	OFF	Default 20 °/s $^{(*)}$
ON	OFF	OFF	30 °/min = 0,5 °/s
OFF	ON	OFF	60 °/min = 1 °/s
ON	ON	OFF	90 °/min = 1,5 °/s
OFF	OFF	ON	120 °/min = 2 °/s
ON	OFF	ON	180 °/min = 3 °/s
OFF	ON	ON	300 °/min = 5 °/s
ON	ON	ON	1200 °/min = 20 °/s
(*)Factory settings			



Tab<u>le 3.9</u>

6	7	8	STEP limit
OFF	OFF	ON	Default 6 °/s $^{(*)}$
ON	OFF	ON	maximum 6 °/s
OFF	ON	ON	maximum 12 °/s
ON	ON	ON	No limit
^(*) Facto	rv settinas		

Dip-switches on Digital Board

3.2.7.3 Backward Running Mode

Serial date of **channel D** contains the heading rotated by 180°. If GPS receiver is used as a source of speed, it speeds information becomes negative when vessel is running backward.

Backward running mode is selected by DIP-switch in accordance with table 3.10.

Table 3.10

4	Backward running mode
OFF	Disabled ^(*)
ON	Enabled
(*)Factory settings	





3.3 Alignment

It is very important to align the gyro compass to the fore-aft datum on the vessel accurately. Any misalignment will appear directly as a fixed error in heading measurements. Because measurements from the AlphaMiniCourse Mk2 are used by diverse systems around the vessel, any misalignment between the gyrocompass and the fore-aft datum might have a significant impact on these systems operation.

There are several methods of gyro compass alignment to the vessel fore-aft datum:

Align the gyrocompass to the fore-aft axis using a known reference line, such as surveyed bulkhead or frame member. The marks on the gyro compass base plate are precision indicators of the gyro compass alignment orientation.

To provide perfect speed correction the gyro compass panel with connectors shall be oriented to the vessel bow.

□ Use the direction finder to align the gyro compass precisely with the fore-aft datum on the vessel.

Remove any residual misalignment by making miniscule adjustments to the gyro compass mounting plate. When you have achieved perfect alignment, tighten the securing bolts fully to lock the gyro compass in position.

3.4 Final Tests After Installation

After you have installed the gyro compass and connected power supplies to it, perform the following tests:

- 1. Power-on the gyrocompass by following the instructions in sub-section 4.2. Wait for three hours before you perform the following tests.
- 2. Check the vessel heading against the known reference mark on a chart. Typically this could be the alongside position of the fitting-out dock. Alternatively, accurately survey an object at least five kilometers ahead of the vessel using the fore-aft line as a datum.
- 3. Check the displayed gyrocompass heading at definite intervals to make certain it is consistent with the surveyed vessel heading.
- 4. If there is an error larger than \pm 0.5°, re-check the vessel fore-aft datum to confirm that it is correct.
- 5. Check that all repeaters are accurately aligned with the gyro compass heading and make certain they maintain their alignment at all times while the gyro compass is operating.



ALPHATRON Marine

- 3.5 Installation Drawings
- Figure 3.5.1 Gyrocompass installation
- Figure 3.5.2 Control Unit installation table mount
- Figure 3.5.3 Example Digital Selector Switch configuration
- Figure 3.5.4 Installation AlphaMiniCourse steering repeater AlphaHeading+
- Figure 3.5.5 Installation AlphaMiniCourse AlphaTurn (ROTI)
- Figure 3.5.6 Installation AlphaMiniCourse Bearing repeater AlphaCourse B



ALPHAMINICOURSE Mk2 Gyrocompass









ALPHAMINICOURSE Mk2 Gyrocompass





Figure 3.5.2 – Control Unit installation – table mount



Figure 3.5.3 – (Example) Digital Selector Switch configuration





Figure 3.5.4 – Installation drawing AlphaMiniCourse steering repeater AlphaHeading+

The AlphaHeading+ is the steering repeater in the AlphaMiniCourse gyro system. The installation drawing is as follows:







Figure 3.5.5 – Installation drawing AlphaMiniCourse AlphaTurn (ROTI)

The Rate of Turn Indicator system consist of the AlphaMiniCourse Gyrocompass as rate of turn senor and the AlphaTurn Rate of Turn Indicator (ROTI). The installation drawing is as follows:







Figure 3.5.6 – Installation drawing AlphaMiniCourse Bearing repeater AlphaCourse B

The AlphaCourse B is the bearing repeater in the AlphaMiniCourse gyro system. It consist of an separate junction box with a bearing repeater that can be mounted into a bracket. The installation drawing is as follows:







NOTES:





4 PRESTARTING PROCEDURES AND OPERATION

This section explains how to power-on and operate the AlphaMiniCourse after installation. Data formats relevant to the system are given in section 4.

4.1 Control Features	page 35

The CU provides all the controls you will need to operate the AlphaMiniCourse as well as 4character display panel that shows the heading and any alarm messages and error codes.

4.2 Power-on page 37 _____

Explains how to power-on the AlphaMiniCourse after installation and describes the initialization sequence.

4.3 Operation

page 38 _____

Explains how to select the latitude and speed correction sources, and how to set the latitude and speed manually if necessary.

4.4 Alert Modes

page 40 _____

Identifies the system error modes. Use these indicators to identify a possible fault condition.

4.5 Operating instructions page 43

Includes general advice for operating the AlphaMiniCourse on a vessel.





4.1 Control Features

On the front panel of the CU all the operator controls for the AlphaMiniCourse Mk2 are located.





Table 4.1 – CU control and indication functions

Control	Function
	System ON/OFF . Hold for at least 1 seconds to switch the system off.
	UP Selection. Press to increase display brightness, to select the parameter or to move the cursor in Menu Mode.
\odot	DOWN Selection. Press to increase display brightness, to select the parameter or to move the cursor in Menu Mode.
	LEFT Selection. Press to move the cursor in the Menu Mode
lacksquare	RIGHT Selection. Press to move the cursor in the Menu Mode
	ALERT indication. Priority alerts Caution, Warning and Alarm are displayed when generated.
4	MENU Button. Press to enter the Menu Mode or to insert the changes of parameters that were made.
Esc	CANCEL Button. Press to quit from the Menu Mode or to cancel the changes that were made in parameters.
	Press to acknowledge and silence the audible alarm in case of warning. When the GC is switched on while this button is pressed, the Emergency mode is activated.




4.1.1 Control Unit display (main operation mode)



Figure 4.1.1 - Main operation mode

Table 4.2 Operating modes

System	GC – gyrocompass mode (p. 4.3.3)
operating mode	DG – heading storage mode (Directional Gyro) (p. 4.3.3)
	E – Emergency mode (p. 4.3.4
State of the GC	START – the unit switching ON ← DO NOT MOVE the GC in this mode
	ALIGN – alignment or operation in the DG mode from the start-up
	READY – readiness [*]
	STOP – accelerated gyroscope run-out after the unit switching off
Latitude input	MAN – manual
mode	GPS – from GPS receiver (p. 4.3.1 and p. 4.3.2)
Speed input	MAN – manual
mode	GPS – from GPS receiver (p. 4.3.1 and p. 4.3.2)
	LOG – from speed log (p. 4.3.2)

* indicator **READY** appear only in the gyrocompass operating mode, it will be flashing when DG mode is automatically activated for some period of time

4.1.2 Menu mode

You may enter the Menu mode by pressing the button ", **MENU**". You will see a cursor in the form of a highlighted rectangular on one of the items on the display. The Cursor can be moved by arrow buttons to select the parameters that has to be changed.

4.1.3 Edit mode

You may change the selected item in the Edit mode that is activated by pressing the button "→ **MENU**", the cursor will start flashing. The parameter is changed with the help of the buttons "▲" and "▼". You should press the button "→ **MENU**" to accept the change or the button "**Esc**" to cancel the change. By pressing any of those buttons you close the Edit mode and return to the Menu mode.

To quit from the Menu mode, press the button "**Esc**".





4.2 Power-on

The gyrocompass starting cycle is fully automatic. To initialize the gyro compass operation you shall do the following:

- 1. Check that there is a nominal 24V DC electrical supply available to the gyro compass. The acceptable supply range is 21.6 VDC to 31.2 VDC. To ensure continuous operation, the power supply for this unit should have 100W power rating.
- 2. To start the AlphaMiniCourse press the power switch when on the CU.
- 3. On the CU display the indicator 'MAIN UNIT TEST' appears.
- 4. The CU will enable the audible alarm for about 1 second. The display will show the current gyro compass dial heading and the 'READY' indicator won't appear until the gyro compass has settled. In case the indicator "MAIN UNIT LINK FAILED" appears on the display and the alarm is enabled, it means that the unit doesn't pass testing or there is no connection with the CU.
- 5. Set the source of latitude information on the CU by following the instructions of p.4.3.1.
- 6. Set the source of speed information on CU by following the instructions of p. 4.3.2, if GPS is not selected as data source.
- 7. Use buttons \blacktriangle , \checkmark to adjust the CU illumination level to a comfortable setting.
- 8. Wait for the gyro compass to settle. This will occur automatically and will take from 30 minutes to 2 hours depending on initial heading offset and sea conditions. The AlphaMiniCourse signifies its settled condition by the indicator **READY** in the right-hand corner of the display.
- 9. If necessary, you can view the software versions of the Main Unit and the Control Unit by pressing the button "↓ **MENU**". In bottom of the display you will view a line:

MU: XXXX-Y.YY RCU: vZZZ

Where XXXX – conventional letters of gyro compass type, e.g. gvka; Y.YY – version of the Main Unit software vZZZ – version of the Control Unit software

After you quit from the Menu mode (button "**Esc**") this line will disappear.





4.3 Operation

The AlphaMiniCourse will settle automatically after power-on. To perform the specified accuracy, the system requires latitude and speed correction, applied manually or from external sources.

Ideally, the AlphaMiniCourse should accept latitude and speed information from external sources such as GPS or a speed log, which allows the system to apply corrections automatically.

4.3.1 Latitude correction

- 1. Enter the Menu mode as described in paragraph 4.1.2.
- If necessary, change the latitude input mode as described in paragraph 4.1.3. Set the desired correction mode (from external GPS receiver «GPS» or manual «MAN»). If you set the latitude input from GPS, the speed input will be automatically set to GPS in case log input is not selected.
- 3. Use buttons ▲ and ▼ to set the local latitude manually. The latitude changes with increment of 1 degree in the range 89°N to 89°S, for example, *70N*.

If there is no valid input from GPS receiver, the display will indicate the alarm *NO GPS* in 10 seconds.

If the input is not recognized or is invalid during 10 seconds, in the right-hand bottom corner of the display you will see the alarm ???? GPS (input format is not recognized) or ERROR GPS (input checksum is invalid).

4. Quit from the Menu mode by the button "Esc"

Note: The latest set latitude and operating mode are preserved in the gyro compass software and are restored after switching on.

If operating latitude is selected manually, remember to change the setting when necessary.

In medium latitudes, a 10° error in setting the operating latitude will result in compass error of approximately 0.5° .





4.3.2 Speed correction

- 1. Enter the Menu mode as described in paragraph 4.1.2.
- If necessary, change the speed input mode as described in paragraph 4.1.3. Then set the desired correction mode (From GPS receiver «GPS», LOG receiver «LOG» or manual «MAN»).
- 3. Use buttons \blacktriangle and \triangledown to set the speed manually in the range from 0 to 90 knots.

If there is no NMEA signal from log, the display will indicate the alarm NO LOG in 10 seconds.

If input is not recognized or invalid within 10 seconds, in the right-hand bottom corner of the display you will see the alarm ???? LOG (input format is not recognized), ERROR LOG (input checksum is invalid).

4. Quit from Menu mode by the button "**Esc**".

Note: The latest set speed and operating mode are preserved in the gyro compass software and are restored after switching on.

If the vessel speed is selected manually, remember to set the average vessel speed and to change the setting when necessary. On completion of the voyage return the setting to zero. For a vessel steaming along the meridian, a 5-knot error in speed setting will generate an error of approximately 0.5°.

4.3.3 Operating mode (gyro compassing GC and directional gyro DG)

- 1. Enter the Menu mode as described in paragraph 4.1.2.
- 2. Change the operation mode as described in paragraph 4.1.3. Then set the desired operation **«GC**» (default) or **«DG**».

In the GC mode the gyrocompass operates as a North-seeking unit. In the DG mode it stores the direction. In this mode you may use the gyrocompass as a direction indicator all the up to the poles. If the gyrocompass was settled on North immediately prior to entering the DG mode, it will continue to provide a useful indication of the northerly direction for a period, but will not continue to seek North. The length of time that the direction indication remains valid depends entirely on the gyro drift characteristics.

3. Quit from the Menu mode by the button $``{\rm Esc}''$

Note:

The latest set operating mode is preserved in the gyro compass software and is restored after switching on. Gyro compass will not seek north while operating in the DG mode.

4.3.4 Emergency Mode

When the gyrocompass is switched ON while **L** is pressed, the Emergency mode is activated.

Its gyroscope does not spin-up and the heading is translated from the GPS receiver. The heading is transmitted to the control unit and to the outputs RS232, RS422 and STEP.

Note:

GPS receiver must be connected in order to operate in Emergency mode.





4.4 Alert Modes

Due to gyrocompass design, the AlphaMiniCourse does not provide a multifunctional display (warnings category, priority, state, number, etc.) and thus requires a connection to the CAM, where its own alerts are presented at the CAM-HMI. All necessary data is incorporated in the ALF sentence that is translated to the bridge alarm management system in case of failure. The back-up of the CAM-HMI shall be provided to prevent a critical situation in case of CAM failure.

4.4.1 Alert Priorities

There are different priorities of alerts:

a) Emergency Alarm:

Alarm which indicates that immediate danger to human life or to the vessel and vessels machinery exists and that immediate action shall be taken. It has the highest priority.

b) <u>Alarm:</u>

A condition requiring immediate attention and action by the bridge team to avoid any kind of hazardous situation and to maintain the operation of the vessel.

c) Warning:

A condition or situation which require immediate attention for precautionary reasons, to make the bridge team aware of conditions which are not immediately hazardous but may become so.

d) Caution:

An awareness of a condition which still require attention out of the ordinary consideration of the situation of given information. It has the lowest priority.

Note:

Emergency alarm and Alarm are not used in the AlphaMiniCourse.

4.4.2 Alert Categories

Alerts are separated into different categories:

a) Category A:

Alerts of category A appear on the task stations such as RADAR and ECDIS systems with information about the emergency situation and additional data required to take the decision on its removal. Such alerts shall be acknowledged only on the task stations.

b) Category B:

Alerts of the category B appear on the CAM-HMI (bridge) with information about the emergency situation. No additional information for decision support is required. Such alert shall be acknowledged either on the AlphaMiniCourse or on the CAM-HMI.

c) Category C:

Alerts of the category C appear on the CAM-HMI (bridge) with information about the status of the alert and recommendations for its treatment. No acknowledgement is required for category C alerts.

Note:

Categories A and C are not used in the AlphaMiniCourse. All alerts are of the category B.



4.4.3 Warning Alert

State and presentation of Warning alert are given in table 4.4.3.

Table 4.3 Warning Alert

State of Warning	Visual Presentations of Warning	Audible Annunciation
Active - unacknowledged		2 short audible signals
Active - silenced	Yellowish orange flashing	
Active – acknowledged		
Active – responsibility transferred	Yellowish orange steady	No audible signal
Rectified -	Yellowish orange flashing	
Normal	None	

Note:

There are no warnings for which the gyrocompass will acknowledge (accept) the request for responsibility transfer (state "active – responsibility transferred") using the ACN sentence. The gyrocompass always rejects responsibility transfers by ARC sentence to the external BAM compliant equipment that requested the transfer of responsibility.

The visual indication for a warning alert will be shown on the Control Unit by a yellowish orange LED. It will be flashing or steady depending on the state of the warning alert. See figure 4.4.3.



Figure 4.4.3 – Visual indication of a Warning.

4.4.4 Caution Alert

State and presentation of Caution alert are given in table 4.4.4.

Table 4.4 Caution Alert

State of Warning	Visual Presentations of Warning	Audible Annunciation
Active	Yellow	
Normal	None	no audible signal

The visual indication for a caution alert will be shown on the Control Unit by a steady lighting yellow LED. See figure 4.4.4.



ALPHAMINICOURSE Mk2 Gyrocompass





Figure 4.4.4 – Visual indication of a Caution.

4.4.5 Alert list

Warnings on emergency situations with indication of their priority, category and refence are listed in table 4.4.5.

Note:

Unique alarm number (identifier at alarm source) - «3062»

Table 4.5 List of AlphaMiniCourse Alerts

Alert (alert Instance)	Cause of Alert	Category of Alert	Priority of Alert
SERVO (1)	Failure of a servo system	В	Warning
DSP (2)	Failure of signal processor	В	Warning
RDC (3)	Failure of heading convertor	В	Warning
Vref (4) +15V (4) -15V (4) +24V (4) +40V (4) POWER (4)	Failure of Power Board	В	Warning

Note: Information on the warning due to power down is transmitted in the form of «POWER» alert in the ALF sentences (independent of the power failure mode), the rest warnings: «Vref», «+15V», «-15V», «+24V», «+40V» are not transmitted in the ALF sentence. At the same time all warnings are displayed on the gyrocompass screen. The advanced list of power failure warnings is needed only for the specialist of the manufacture.

NO GPS (5)	Loss or distortion of the GPS signal	В	Warning
??? GPS (5)	GPS signal (format) is not recognized	В	Warning
ERROR GPS (5)	Invalid GPS signal (invalid checksum)	В	Warning
NO LOG (6)	Loss or distortion of the LOG signal	В	Warning
??? LOG (6)	LOG signal (format) is not recognized	В	Warning
ERROR LOG (6)	Invalid GPS signal (invalid checksum)	В	Warning
-	Conversion to manual input of LATITUDE. Latitude is invalid (aged data).	В	Caution
-	Conversion to manual input of SPEED. Latitude is invalid (aged data).	В	Caution

Refer to chapter 4.4.6 till 4.4.8 for removal of various causes of alerts and alert rectification.





4.4.6 Loss or corruption of GPS signal

This error mode can occur when you have selected GPS as the source of speed or latitude and the signal corrupts or becomes lost for a period of 10 seconds. You can recognize this condition by the following indications:

- □ When GPS data are lost or invalid the display shows NO GPS or ERROR GPS in the right-hand bottom corner of the display.
- □ The audible alarm will sound.
- □ The alert priority will be shown



By pressing the **L** button the warning is acknowledged and the audible alarm will be silenced.

- 1. The gyrocompass will use the last valid speed and latitude values.
- 2. The control unit will continue to show the alarm message until a valid input is re-established or a different input source is selected.

If valid input has not been established within 30 minutes the audible alarm will be enabled.

4.4.7 Loss of speed log signal

This error mode can occur when you have selected speed log as the source of speed information and the signal corrupts or becomes lost for a period of 10 seconds. You can recognize this condition by the following indications:

- □ When the selected source of NMEA information is lost the display shows NO LOG or ERROR LOG in the right-hand corner of the display.
- □ The audible alarm will sound.
- □ The alert priority will be shown.



By pressing the button the warning is acknowledged and the audible alarm will be silenced.

- 1. The gyrocompass will use the last valid speed value.
- 2. The control unit will continue to show the alarm message until a valid input is re-established or a different input source is selected.

If valid input has not been established within 30 minutes the audible alarm will be enabled.





4.4.8 Gyro compass System Warnings and Failures

The AlphaMiniCourse has a built-in system that monitors operation of the gyro compass. This system checks two categories of functions:

- □ Warnings
- Failures

<u>Warnings</u>

If the gyrocompass detects a warning condition, it will inform you about it using the following:

- □ The display shows a <message>.
- □ The audible alarm will sound.
- □ Alert priority will be shown

By pressing the LSS button the warning is acknowledged and the audible alarm will be silenced.

Table 4.3 – Gyro compass warning codes

<message> on CU screen</message>	Definition of warning code
"MAIN UNIT LINK FAILED" on a dark screen	Loss of communication link with the CU

Note:

When communication link with the CU is lost the heading display is not renewed and

the CU buttons do not function (except 📥 button).

The CU will continue to show the alarm message until the warning condition has been removed. If the warning condition has not been removed within 30 minutes the audible alarm will be enabled.

Note:

To rectify the fault condition, refer to the Table 6.1 of the chapter 6.2. If necessary, contact ALPHATRON MARINE or an approved local service agent.

<u>Failures</u>

If the gyrocompass detects a failure condition, it will use six methods to alert you:

- The display shows the failure message.
- □ The audible alarm will sound.
- □ Alert priority will be shown
- □ No "Gyro Ready" signal on the connector X12 if the servo system fails.
- □ The "Gyro Fail" signal will be activated on the connector X12.
- □ Serial output will not transmit sentences.
- □ Stepper output will not transmit the heading.

By pressing the Low button the warning is acknowledged and the audible alarm will be silenced.



Table 4-4 – Gyro compass failure codes

<message> on the CU screen</message>	Definition of failure code
SERVO	Failure of the servo system in Gyro Unit or Analog board
RDC	Failure of the resolver-digital converter on digital board
DSP	Failure of the processor on analog board
POWER Vref	
+15V	Failure of the Power Supply board
-15V	
+24V	
+40V	

These failures are considered unrecoverable, possibly due to a component failure.

In case servo system fails, the gyro motor and the servo system will be de-energized.

The gyro compass will be disabled until the operator resets it. Refer to the section 4.2 before restarting the gyrocompass.

Table 4.5 – Detection of failure and warning conditions

«Gyro compass Failure output» (X12/7)	«Gyrocompass Ready output» (X12/5)	Output Sentence	Type of Failure Alarm
yes	no	no	SERVO or the unit is switched off
yes	yes	no	RDC





4.5 Operating Instructions

4.5.1 General

□ The AlphaMiniCourse Mk2 shall be running continuously that provides establishment of the gyroscope normal operating conditions and partial compensation of its errors. The system should be powered-off only during long periods of lay-up, for example during vessel dry-

docking. To power-off the AlphaMiniCourse Mk2, press the button with and hold it during 1 second until you see the flashing indicator «STOP» in the right-hand top corner of its display. In a few seconds the front panel will switch off.

- If you intend to disable the gyro compass for a long period of time you should arrange to run the gyro compass for a period of at least thirty minutes at intervals of not more than six months.
- □ The AlphaMiniCourse Mk2 is fully protected against interruption of its electrical supply. It will re-start and align itself automatically on restoration of electrical power.

The gyrocompass will show the accurate heading, when the indicator «READY» appears on the right-hand top corner of its Control Units display

- Monitor the performance of the gyro compass AlphaMiniCourse Mk2 regularly. When functioning correctly, and provided the correct Speed and Latitude compensations are applied, the heading error in latitudes up to 60° and for speeds up to 25 knots will normally be less than 0.75° regardless of the vessel maneuvers.
- □ Never move the gyro compass when the gyro rotor is spinning and the servo system is switched off during 1 minute after power-on and during 5 minutes after power-off.

4.5.2 Operating Limitations

It is not allowed to operate the gyrocompass in the following conditions;

- □ When DC supply voltage is higher than 31.2V or lower than 21.6V.
- □ When ambient temperature is lower than minus 15°C or higher than 55°C
- □ When tilt is greater than 45°

It is not allowed to put any foreign items on the top of the gyrocompass

4.5.3 Corrections for speed and latitude

- □ Gyro compass operational accuracy largely depends on the accuracy of speed and latitude corrections.
- Most users find it the most convenient to apply speed and latitude corrections automatically, via signal inputs from GPS and/or ships logs.
- □ However, the users should be aware that if the input signal contains the wrong information, then the wrong corrections would be applied. For instance, it has been noted that some GPS installations, under certain circumstances, may output a "valid" signal with the speed and latitude fields set to all zeros indicating that the vessel is stationary on the equator.
- An incorrect input of speed and/or latitude will cause the gyro compass to indicate an incorrect heading and in the case of extreme errors could cause, in certain circumstances, the gyro compass to produce high pendulum signal.



4.5.4 Operation in High Latitudes

ALPHATRON

- □ While the latitude becomes higher (to the North or to the South) the value of the horizontal component of earth rotation is decreasing proportionally to the latitude cosine. Hence, the higher the latitude, the less efficient is the gyro compass operation as a north-seeking device.
- In latitudes higher than 85° it is recommended to use the gyro compass in the Directional Gyro mode.

4.5.5 Operation on High Speed Crafts

- The gyro compass gravity control gives the rise to errors whenever the gyro compass accelerates or decelerates along the north-south line that is whenever the northerly speed or course changes. These errors are caused by the inertia of the pendulous element of the gyro compass, which produces a torque about the horizontal axis and therefore a precession in azimuth. This effect, called ballistic deflection, causes an increase in error during acceleration.
- □ The precession in tilt that arises from the damping component of gravity control is called ballistic tilt. The combined effects of ballistic tilt and ballistic deflection cause the gyro compass to tilt downwards. Because of the factors that guide the behavior of a damped gyroscope, the gyro spin axis will return to the settled position by the normal anticlockwise spiral after the acceleration has ceased.
- In the AlphaMiniCourse the gravity control comes from an accelerometer (pendulum), which generates an electrical signal related to the tilt of the gyro spin axis. This signal is heavily damped and the range of output is restricted to a small angle. The use of accelerometer damping by the AlphaMiniCourse is of prime importance in the reduction of a particularly serious form of ballistic error called intercardinal rolling error. This type of error occurs most noticeably when the vessel steams on an intercardinal heading while rolling simultaneously through a significant angle.

If the gyro compass is installed at some distance above the vessel center of roll rotation, as is usually the case on commercial vessels, the resulting lateral acceleration components along the east-west and north-south axes of the gyro compass combine to build an error in the northerly settle point.

If the effect persists for long enough, this error might become as large as several degrees. However, by damping the accelerometer using a time constant several times larger than the vessel-rolling period, intercardinal rolling errors are significantly reduced.

- □ Another form of ballistic error arises from north-south accelerations generated by vessel maneuvers. Such accelerations can arise from changes in speed and/or course. By limiting the angular output of the accelerometer, the AlphaMiniCourse reduces the error typically to less than one degree.
- □ It is also possible to eliminate acceleration effects by temporarily operating the gyro compass in the DG (Directional Gyro) mode. In this mode gravity control is used for tilt corrections only, so that ballistic effects would cause negligible heading error during short-term acceleration periods. The DG mode can be selected manually from the Control Unit (p. 4.3.3).
- □ The AlphaMiniCourse complies with all requirements of IMO Resolution A.821(19), Performance Standards for Gyro compasses for High-Speed Craft.



4.5.6 Safety Provisions

Only personnel Familiar with the AlphaMiniCourse design and operation principle described in this manual is allowed to operate the gyrocompass.

The units that constitute the gyrocompass and are installed on the vessel shall be grounded to the hull in the shortest possible way. The successive grounding is not allowed.

Shields of the interconnected cable shall be electrically connected with the housings of the units that, in their turn, shall be reliably connected with the vessels hull.

When the gyrocompass is operating, the covers of all its units must be locked.

Installation, wiring, replacement if the gyrocompass units and troubleshooting as well as cable connection and disconnection are carried out only when the gyrocompass is de-energized.

Rating of the fuses shall correspond to those indicated on the units. Replacement of the fuses is made only when the gyrocompass is switched off.

The gyrocompass operating conditions shall meet the existing requirements for protection of ICs and semiconductor devices from static electricity.





5 TECHNICAL DATA

5.1 Specifications

5.1.1 Power Requirements

Voltage:	24V DC (acceptable range 21.6 VDC to 31.2 VDC)
Power consumption:	50 W at start-up (duration 70 s) 25 W in the steady-state mode

CAUTION!



To comply with the requirements of IMO Resolution A.821(19), Performance Standards for Gyro compasses for High-Speed Craft, the gyrocompass shall be powered by an uninterruptible power supply.

5.1.2 Performance (definitions from ISO 8728)

Settle point error Static error Dynamic error	 ± 0.2° sec φ ± 0.2° sec φ ± 0.3° sec φ (Scorsby and Intercardinal motion tests)
Settle point repeatability Follow-up speed Time to settle within 0.7°	: $\pm 0.2^{\circ}$ sec ϕ : 200°/s : <45 minutes with a $\pm 30^{\circ}$ initial heading offset
5.1.3 Compensation	
Latitude compensation range Speed compensation range	: 89°N to 89°S : 0 to 90 knots
5.1.4 Environment	
Operating environment	: IEC60945-2002 designated category "weather protected"
Operating temperature Storage temperature	: -15°C to +55°C : -60°C to +70°C





5.1.5 Signal Inputs

Latitude Speed	:	IEC 61162 RS232 or RS422 from GPS pulse at 100, 200 or 400 per nautical mile from log IEC 61162 RS232 or RS422 from GPS or log
Central Alert Management (CAM)	:	IEC 62923-1/2 ; IEC 61162-1:2016
5.1.6 Signal Outputs		
S-type heading	:	1 x step-by-step, 6 steps/degree (5V TTL level) Update 6°/s, 12°/s, unlimited
Resolver heading	:	1 x 8V 400Hz (max.2V per phase), sector value 360°
Analogue rate of turn	:	1 x ROT ± 20°/s (±10V) ±30°/min;±60°/min;±90°/min;±120°/min;±180°/min; ±300°/min; ±1200°/min (selected by customer)
Serial data outputs	:	Channel A : 1 x RS232 ; 2 x RS422 ; Channel B : 1 x RS232 ; 2 x RS422 ; Channel C : 1 x RS232 ; 4 x RS422 ; Channel D : 1 x RS232 ; 4 x RS422 ;
Serial data formats	:	IEC 61162-1/2:2016
Serial data transfer rate	:	4800 baud ; 9600 baud ; 19200 baud ; 38400 baud
Serial data transfer frequency	:	1Hz (1sec) ; 10 Hz (100msec) ; 20 Hz (50msec) 50 Hz (20msec)
Failure Status/Readiness	:	NO relay/NC relay NO relay/NC relay
Central Alert Management (CAM) status/alerts	:	IEC 62923-1/2 ; IEC 61162-1:2016
5.1.7 Dimensions and Weight		
Dimensions	:	288mm (H) x 240mm (W) x 329mm (D)
Weight AlphaMiniCourse Mk2	:	12.5 kg
Weight AlphaMiniCourse Mk2 (packed)	:	15.5 kg
CU size (external mounting)	:	96mm (H) x 192mm (W) x 108mm (D)
CU weight	:	3.0 kg



5.1.8 Input from the GPS-Receiver or Speed Log

The gyrocompass input load is 2mA for all serial data inputs.



Figure 5.1 – Gyrocompass Input RS232



Figure 5.1a – Gyrocompass Input RS422

5.1.9 Data Transmitters

Output current data of 26C31 type (interface RS422) have the maximum output current 150 mA.

5.1.10 Standards

The AlphaMiniCourse is designed to meet the requirements of the following:

- □ Regulations of the Russian Maritime Register of Shipping
- □ Commission Implementing Regulation (EU)2021/1158
- □ EU Marine Equipment Directive 4.65 Gyrocompass (Standard and HSC)
- □ EU Marine Equipment Directive 4.9 Rate of Turn Indicator
- □ IMO Resolution A.424 (XI): Performance Standards for Gyro compasses Standard Craft
- □ IMO Resolution A.821 (19): Performance Standards for Gyro compasses for High-Speed Craft
- □ IMO Resolution A.694: General requirements for nav. equipment aids forming part of GMDSS
- □ MSC.191(79): Standards for navigation-related information on navigation displays
- □ MSC.302(87): Adoption of performance standards for Bridge Alert Management
- □ MSC.36(63):
- □ MSC.97 (73):
- □ IEC 60945: incl. Corr.1, General Requirements Methods of testing and required test results
- □ IEC 62288 (2014): General Requirements Methods of testing and required test results
- □ ISO 8728 (2014): Ships and marine technology, Gyro compasses for Standard Craft
- □ ISO 16328 (2014): Ships and marine technology, Gyro compasses for High-Speed Craft
- CE marking
- □ Electromagnetic Compatibility (EMC) Directive
- □ The Marine Equipment Directive 2014/90/EU
- □ IEC 61162-1/2 (2016): Low and High speed serial data protocol
- □ IEC 62923-1 (2018): Bridge Alert Management Operational and Performance requirements
- □ IEC 62923-2 (2018): Bridge Alert Management Alert and Cluster identifiers





5.2 Data Formats

Set the DIP-switch and adjust the channels using the Control Unit in accordance with your specific input and output requirements. Instructions are given in the sub-section 3.2.6

Inputs – Refer to sub-section 5.2.2.

Acceptable input formats:

- □ Latitude information using serial IEC 61162 GNS, RMC, GLL or GGA sentences.
- Speed information using serial IEC 61162 VBW, RMC, VTG or VHW sentences. The sentences can contain speed information in knots and/or km/h. The AlphaMiniCourse will use the speed in knots if available, in preference to speed in km/h.
- □ If an RMC sentence is used, it must contain both speed and latitude information.
- □ Pulsed speed input (5V to 10V).
- □ CAM communication using IEC 61162 ACN and HBT sentences.

Outputs – Refer to sub-section 5.2.3

-

Serial output formats:

The AlphaMiniCourse transmits information through RS232 and RS422 serial lines using the IEC 61162 format. The serial transmission rate can be either 4800, 9600, 19200 or 38400 baud, with updates occurring at 1, 10, 20, 50 Hz as defined by the setting of the DIP-switch.

The AlphaMiniCourse transmit Central Alert Management information through RS422 serial lines using IEC 61162-1 format.

Other Outputs – Refer to sub-section 5.2.4

- Resolver Heading Output
- Stepper S-code Heading Output
- \square Rate of Turn output using bipolar analogue voltage in the range +10V / -10V.

The following sub-sections describe each of the formats supported by the AlphaMiniCourse.





5.2.1 IEC 61162 Serial Data Formats – General Information

The AlphaMiniCourse accepts and transmits asynchronous serial data through RS232 and RS422 lines using 8 data bits, 1 stop bit and no parity. In each packet the least significant bit goes the first. The most significant bit of the 8-bit character will always be zero.

Start D0 D1 D2 D3 D4 D5 D6 D7=0 Stor

Baud rate = 4800 Data bits = 8 (bit D7 is always zero) Parity = none Stop bits = one

Figure 5.2 – Serial data format

All data is interpreted as ASCII characters that form IEC 61162 sentences split into individual fields. All fields, including null fields, are separated by commas.

The IEC 61162 format supports an optional checksum, if included. The checksum occurs as an additional field immediately before the carriage return line-feed characters. It consists of an asterisk (*) followed by a checksum derived by exclusive OR-ing the eight data bits of each valid character preceding the asterisk, but excluding the \$ symbol, in the sentence. The absolute value of the checksum is transmitted in ASCII characters representing the value in HEX. IEC 61162 sentences are transmitted ten times a second.

5.2.2 Inputs

5.2.2.1 IEC 61162 CAM Input Signals

The AlphaMiniCourse will accept sentences in data formats: IEC 61162-1:2016 coming from the Central Alert Management system. Th CAN sentence with command of temporary silencing puts off escalation (double beep audible signal and release of ALF sentence is postponed) that should occur during silencing period (t= 30s). After the end of the temporary silencing, the escalation of warnings is continued until their rectification.

\$HEACN, hhmmss.ss, aaa, X.X, x.x, c, a [CRLF]

Hhmmss.ss = Time Aaa = Manufactory mnemonic code X.X = Alert Identifier (3062) x.x = Alert Instance c = Alert Command, A(Acknowledge) Q(request/repeat information) O(responsibility transfer) S(silence)

a = Sentence status flag (This indicates a command, a sentence without a C is not a command

For the HBT sentence to figure 5.22 of this chapter.

5.2.2.2 IEC 61162 Input Signals

The AlphaMiniCourse will accept sentences in both data formats: IEC 61162-1:2016 and NMEA 0183 version 2.1. In the following descriptions of input sentences, the AlphaMiniCourse uses the data fields marked 'XXX' in IEC 61162 sentence. The gyrocompass does not use the fields marked '???' and their descriptions are included here for completeness only. The gyrocompass will recognize the arriving sentence format and automatically extract the required data from it.





GPS Interface

The AlphaMiniCourse can accept speed, latitude, date and time inputs from GPS in IEC 61162 format using GNS, RMC, GLL, GGA, VTG, VHW sentences. Refer to table 3.3 for connection details.

Start character Talker identifier (anv characters)
Mnemonic of recommended min GNSS data
UTC of position (hhmmss.ss)
Latitude (ddmm.mm)
Mnemonic for North or South
Longitude (dddmm.mm)
Mnemonic for East of West
Mode indicator
Total number of satellites in use (0-99)
Horizontal dilution of precision
Antenna altitude relative to mean sea level
Geoidal separation
Age of differential data
Differential reference station ID
Checksum field
Carriage return Line-feed characters

Figure 5.3 – IEC 61162 GNS input sentence structure

Figure 5.4 - IEC 61162 RMC input sentence structure





\$??GLL,XXXX.XX,X,???????????????X,X[CRLF]

Figure 5.5 - IEC 61162 GLL input sentence structure

<u>\$???GGA,??????,XXXX,XX,X,X,???????,?,X,??,?,?,?,?,?,?,?,?,?,????[CRLF]</u>

Start character
Talker identifier (any characters)
Mnemonic for GPS fix data
UTC of position (hhmmss.ss)
Latitude (ddmm.mm)
Mnemonic for North or South
Longitude (dddmm.mm)
Mnemonic for Fast or West CDS audity, indicator
Number of satellites in use (00-12) Horizontal delution of precision
Antenna altitude relative to mean sea level
Mnemonic for meters Geoidal separation
Mnemonic for meters
Age of differential GPS data
Differential reference station (0000-1023)
Carriage return Line feed characters

Figure 5.6 - IEC 61162 GGA input sentence structure





\$?? VTG, ?.?,?,?,?,X.X,X,X,X,X,X,X,X[CRLF]

Start character	Mnemonic for ground course and speed	Course in degrees and tenths	Mnemonic for True heading	Course in degrees and tenths	Mnemonic for Magnetic heading	Speed in knots	Mnemonic for knots	Speed in km/h	Mnemonic for km/h	Mode indicator	Carriage return Line-feed characters
		Mnemonic for ground course and speed	Mnemonic for ground course and speed Course in degrees and tenths	Mnemonic for ground course and speed Course in degrees and tenths Mnemonic for True heading	Mnemonic for ground course and speed Course in degrees and tenths Mnemonic for True heading Course in degrees and tenths	Mnemonic for ground course and speed Course in degrees and tenths Mnemonic for True heading Course in degrees and tenths Mnemonic for Magnetic heading	Mnemonic for ground course and speed Course in degrees and tenths Mnemonic for True heading Course in degrees and tenths Mnemonic for Magnetic heading Speed in knots	Mnemonic for ground course and speed Course in degrees and tenths Mnemonic for True heading Course in degrees and tenths Mnemonic for Magnetic heading Speed in knots Mnemonic for knots	Mnemonic for ground course and speed Course in degrees and tenths Mnemonic for True heading Course in degrees and tenths Mnemonic for Magnetic heading Speed in knots Mnemonic for knots Mnemonic for knots	Mnemonic for ground course and speed Course in degrees and tenths Mnemonic for True heading Course in degrees and tenths Mnemonic for Magnetic heading Speed in knots Mnemonic for knots Mnemonic for knots	Mnemonic for ground course and speed Course in degrees and tenths Mnemonic for True heading Course in degrees and tenths Mnemonic for Magnetic heading Speed in knots Mnemonic for knots Mnemonic for knots Speed in km/h Mode indicator

Figure 5.7 - IEC 61162 VTG input sentence structure

Start character
Talker identifier (any characters)
Mnemonic for vector heading and water speed
Heading in degrees and tenths
Mnemonic for True heading
Heading in degrees and tenths
Mnemonic for Magnetic heading
Speed in knots
Mnemonic for knots
Speed in km/h
Mnemonic for km/h
Carriage return Line-feed characters

Figure 5.8 - IEC 61162 VHW input sentence structure

ALPHATRON Marine



Log Interface

The AlphaMiniCourse can accept speed inputs at the log interface in IEC 61162 format using VBW, VTG and VHW sentences. Refer to table 3.3 for connection details.

\$ <u>??</u>	<u></u> ,	<u>?.?</u> ,	<u>?.?</u> ,	? ,	<u>X.X</u> ,	<u>?.?</u> ,	X , ⊤	<u>?.?</u> ,	? , ⊤	<u>?.?</u> ,	?	* hh[(CRLF]	
Talker identifier (any characters)	Mnemonic for ground speed/water speed	Longitudinal water speed in knots	Transverse ground speed	Status: water speed, A=valid, V=invalid	Longitudinal ground speed in knots	Transverse ground speed in knots	Status: ground speed, A=valid, V=invalid	Transverse water speed of stern in knots	Status: water speed, A=valid, V=invalid	Transverse ground speed of stern in knots	Status: stern ground speed, A=valid, V=invalid	Checksum field	Carriage return Line-feed character	

Figure 5.9 - IEC 61162 VBW input sentence structure

	Start character Talker identifier (any characters) Mnemonic for ground course and speed Course in degrees and tenths
	Mnemonic for True heading
	Mnemonic for Magnetic heading
	Mnemonic for knots
	Speed in km/h
· · · ·	Mnemonic for km/h
· .	Carriage return Line-feed character





				-		-	•	•			•
E n n n n n n n n n n n n n n n n n n n	Talker identifier (any characters)	Mnemonic for vector heading and water speed	Heading in degrees and tenths	Mnemonic for True heading	Heading in degrees and tenths	Mnemonic for Magnetic heading	Speed in knots	Mnemonic for knots	Speed in km/h	Mnemonic for km/h	Carriage return Line-feed character

\$?? VHW,???.?,?,???.?,XX.X,X,XX.X,X[CRLF]

Figure 5.11 - IEC 61162 VHW input sentence structure

5.2.2.3 Pulsed Input Signal

The AlphaMiniCourse can accept a speed input in the form of pulses occurring at a frequency of 100, 200 or 400 per nautical mile dependent of the Control Unit settings.

The gyrocompass determines the vessel speed by reference against the microprocessor timing circuits. The speed pulses do not need a particular mark/space ratio, but they should have amplitude from 5 to 10 Volts.





5.2.3 Outputs

The AlphaMiniCourse can output serial data through RS232 and RS422 serial lines in IEC 61162-1/2:2016 format. Dependent on the settings, the output may contain either:

- 1. Heading as described below, OR
- 2. Heading and Rate of turn as described below, OR
- 3. Heading and Speed as described below.
- 4. Speed and Rate of Turn
- 5. All Data
- 6. Central Alert Management
 - □ For <u>Heading</u> information, the HDT, THS and HCR format sentence is used. In the Control Unit settings, you may set the resolution for the output to one or two decimal places. Refer to Figure 5.13 till 5.15 for a description of their output format sentences.
 - □ For <u>Rate of Turn</u> the ROT format sentence is used. Refer to Figure 5.16 for a description of this output formats.
 - □ <u>Speed</u> information is transmitted in VHW format sentence, if the gyrocompass is configured for manual or log input. VHW sentence also contains the heading that is inserted with the resolution as set by Control Unit settings. Refer to Figure 5.17 for a description of this output format.
 - If the <u>All Data</u> mode is selected sentences HDT, ROT, THS and additional sentences with coordinates and speed are transmitted. The Data package is transmitted with frequency 1 Hz despite of the transmission channel settings.
 - □ If the <u>CAM</u> output is used sentences ALR, ALF, ALC and HBT are transmitted. Refer to Figure 5.19 till 5.22 for a description of their output format sentences.

5.2.3.1 IEC 61162 Output Signals

If the GPS mode is on, sentences received from GPS are transmitted as additional: RMC, RMA, GLL, GGA, GNS, ZDA, VBW, VHW, VTG. Talker identifier (that follows the symbol `\$') is changed for "HE". Presence of checksums in transmitted sentences is determined by their presence in received sentences despite of transmission channel settings.

In GPS mode additional sentences look as follows:

\$HEGLL, xx00, x,,,, A, M[CRLF] | | Mnemonics for North or South Latitude (dd)

\$HEVTG, xxx.x, T,,, x . x, N, x . x, K, M[CRLF]

Heading

Figure 5.12 - IEC 61162 additional sentence structure





Accuracy of heading and presence of checksums is determined by transmission channel settings.

\$HEHDT,XXX.X,X[CRLF]

Start character
Talker identifier (any characters)
Mnemonic for True heading present
Heading in degrees and tenths
Mnemonic for True heading
Carriage return Line-feed character

Figure 5.13 - IEC 61162 HDT output sentence structure

In accordance with the standard IEC 61162-1:2016 for the digital heading transmission it is recommended to use the THS sentence instead of HDT.

\$⊦ 	IETI 	HS ,	XXX. 	X, a	a[Cl 	RLF]
Start character	Talker identifier (any characters)	Mnemonic for True heading present	Heading in degrees and tenths)	Mode Indentifier ¹		Carriage return Line-feed character

¹Mode identifier

A = autonomous

E = computed (accurate trajectory calculation)

M = manual input

S = simulation mode

V = data not valid (including idle mode)

Figure 5.14 - IEC 61162 THS output sentence structure





\$HEHCR ,X.X, a, a, X.X [CRLF]

Start character	כנמור מומכנמ	Talker identifier (any characters)	Mnemonic for Heading Correction Deport	Heading in degrees 1	Mode Indentifier2		Correction state ³	-	Correction value ⁴	

¹Value of heading for which this HCR is referenced. This value is not replacing heading value from the THS sentence. This value is used for synchronization between high data rate of THS sentence and low data rate or HCR sentence.

²Mode identifier

- A = autonomous
- E = computed (accurate trajectory calculation)
- M = manual input
- S = simulation mode
- V = data not valid (including idle mode)

³Correction state

- 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

⁴Value of correction in heading. Degrees $\pm 180,0^{\circ}$ with one decimal. Null field indicate correction state N (no corrections) or V (not available).

Figure 5.15 - IEC 61162 HCR output sentence structure





\$HEROT,X.X,	X[CRLF]
\top \top \top \top \top	\top \frown \frown

Figure 5.16 - IEC 61162 ROT output sentence structure

Start character
Talker identifier (any characters)
Mnemonic for vector heading and water speed
Heading in degrees and tenths
Mnemonic for True heading
Heading in degrees and tenths
Mnemonic for Magnetic heading
Speed in knots
Mnemonic for knots
Speed in km/h
Mnemonic for km/h
Carriage return Line-feed character

\$?? <u>VHW</u>,???.?,?,?,?,?,<u>XX.X</u>,<u>X</u>,<u>XX.X</u>,<u>X</u>[CRLF]

Figure 5.17 - IEC 61162 VHW output sentence structure





5.2.3.2 IEC 61162 Sentence with Checksum

If the optional checksum is to be sent with any of the above IEC 61162 sentences, it is added as an extra field before the carriage return character as shown in Figure 5.16.

\$HEHDT ,XXX.X, T*hh [CRLF] | Checksum

\$HETHS ,XXX.X, a*hh [CRLF] | Checksum

Figure 5.18 - IEC 61162 sentence with optional checksum

The checksum consists of an asterisk followed by the checksum calculated by exclusive OR-ing the eight data bits of each valid character preceding the asterisk in the sentence but excluding the \$ symbol. The AlphaMiniCourse transmits the absolute value of the checksum in ASCII characters representing the value in HEX.

5.2.3.3 IEC 61162 CAM Output Sentences

The gyro compass alerts and status are transmitted by through output X15 for communication with CAM. This dedicated output will transmit ALC, ALR, ALF and HBT sentences as following:

\$	HEA 	NLC	,xx, 	xx, 	xx, 	x.x	, aaa	a,x.: 	x,x.: 	x,x.: 	×,		., aaa, x.x, x.x, x.x*hh [CRLF]
Start character	Talker identifier (any characters)	Mnemonic for Cyclic alert list	Total number of sentences for this message ^{1}	Sentence number, 01 to 99 ¹	Sequential message identifier 01 to 99 ²	Number of alert entries ³	Manufacturer mnemonic code ⁴	Alert identifier ⁴	Alert instance ⁴	Revision counter ⁴	Additional Alert entries ⁴	Alert entry n ⁴	

¹The first field specifies the total number of sentences used for this messages. The second field identifies the order of sentence in this message. These cannot be null fields.

²Relates all sentences that belong to a group of multiple sentences.

³Contains the number of alerts entries transported within this sentences.

⁴Alert entry 0 – n: Each alert entry consist of four fields: Manufacture Identifier, Alert Identifier, Alert Identifier, Alert instance and Revision Counter (see ALF sentences).

Figure 5.19 - IEC 61162 ALC sentence structure



ALPHAMINICOURSE Mk2 Gyrocompass



	\$HI 	EA	LF I	,x, 	x, : 	x,hh I	nmms 	s.s	s,a	, a, 	a, a 	aa, 	x.x,	x.x 	, x.> 	κ, x, ∣	с 	-c*hh[CRLF]
Start character		Talker identifier (any characters)	Mnemonic for Alert Sentence	Total number of sentences for this message ¹	Sentence number, 1 to 2 ¹	Sequential message identifier 0 to 9 ²	Time of last change		Alert Category, A, B or C ³	Alert priority E, A, W or C ⁴	Alert state, A, S, N, O, U or V ⁵	Manufacturer mnemonic code	Alert identifier ⁶	Alert Instance, 1 to 999997	Revision counter, 1 to 99	Escalation counter, 0 to 9	Alert text ⁸	

¹The first field specifies the total number of sentences used for this messages. The second field identifies the order of this sentence in the message. These cannot be null fields.

²Relates all sentences that belong to a group of multiple sentences.

³Contains Category A, B or C Alerts (the AlphaMiniCourse has only B category Alerts).

4Alert P	riority:	E = Emergency Alarm W = Warning	A = Alarm $C = Caution$	
⁵Alert S	tate	V = active – unacknowledge A = active – acknowledged U = rectified – unacknowled	d S or active C ged N	5 = active – silenced 5 = active – responsibility transferred 1 = normal

⁶Alert identifier is 3062 for the AlphaMiniCourse.

⁷Alert Instance identifies the current instant of an alert to distinguish alerts of the same type (Alert identifier (see table 5.1)).

⁸This field is used for additional alert textual description (see table 5.1)

Figure 5.20 - IEC 61162 ALF sentence structure

Table 5.1 – Failure codes and textual descriptions

Alert Instance(⁷)	Alert Text (⁸ & ³)	Description
1	SERVO	Servo System failure
2	DSP	Signal processor failure
3	RDC	Angle-to-digit convertor failure
4	POWER	Failure of internal power supply
5	GPS	No GPS signal or invalid data
6	LOG	No LOG signal or blockage



ALPHAMINICOURSE Mk2 Gyrocompass



\$HEALR ,hhmmss.ss, xxx, A, A, c--c*hh[CRLF]



 ${}^{1}A$ = threshold exceeded V = not exceeded

 $^{2}A = acknowledged$ V = unacknowledged

³Textuel description of alert (see table 5.1).

Figure 5.21 - IEC 61162 ALR sentence structure

\$H 	HEH	IВТ, 	x.x,	A, 1	x*h 	h[CRLF]
Start character	Talker identifier (any characters)	Mnemonic for Heartbeat supervision	Configured repeat interval ¹	Equipment status ²	Sequential sentences identifier ³	

¹Configured autonomous repeat interval in seconds.

²Equipment in normal operation A = yes V = no³Provides a message identification number from 0 to 9, after 9 is used the count will reset to 0.

Figure 5.22 - IEC 61162 HBT sentence structure





5.2.3.4 IEC 61162 CAM Output Sentences example

When the AlphaMiniCourse is operating with a manual set GPS source it will generate a Caution Alert. Output sentences to CAM will be transmitted as following:

\$HEALC,01,01,00,0*hh \$HEALR, , , V,V,*hh

When the AlphaMiniCourse is operating with a set GPS source and the GPS source is lost it will generate a Warning Alert. Output sentences to CAM will be transmitted as following:

Warning Alert not acknowledged:

\$HEALR, , 3062,A,V,GPS*hh \$HEALF,1,1,0,,B,W,V,3062,5,06,0,GPS*hh \$HEALC,01,01,00,1,,3062,5,06*hh &HEHBT,30,A,9*hh

Warning Alert is acknowledged:

\$HEALR, , 3062,A,**A**,GPS*hh \$HEALF,1,1,0,,B,W,**A**,3062,5,06,0,GPS*hh \$HEALC,01,01,00,1,,3062,5,06*hh

When the Warning is resolved by changing GPS source to manual GPS it will transmit as follow:

\$HEALR, , 3062,A,**A**,GPS*hh \$HEALF,1,1,0,,B,W,**N**,3062,5,06,0,GPS*hh \$HEALC,01,01,00,1,,3062,5,06*hh

\$HEALR, , , V,V,*hh \$HEALC,01,01,00,0*hh \$HBT,30,A,0*hh



5.2.4 Other Output Formats

5.2.4.1 Resolver Output (option)

The resolver heading output is available continuously at X11 connector on the rear panel when the gyro compass is powered-on. The connection details are given in the Table 3.4. This output with the maximum voltage 2V per phase is taken from a 1:1 resolver where it comes directly from the gyrocompass azimuth gimbal. The resolver reference voltage is 10V, 400Hz.

Electrical loading specifications:

- □ not less than 5 kOhms between X11/4 and X11/3, X11/5 and X11/3;
- \square Not less than 1 kOhm between X11/6 and X11/7.

5.2.4.2 Stepper Output

Stepper S-code output is available continuously at X9 connector on the rear panel while the gyro compass is powered-on. See the connection details in the Table 3.4.

The stepper output is a TTL compatible S-code signal with a 10mA sink capacity.

5.2.4.3 Rate of Turn (option)

The ROT output is calculated by the internal processor updated at 20 Hz and made available continuously at connector X10 on the rear panel while the gyrocompass is powered-on. Refer to the Table 3.4 for connection details.

The ROT output is an analogue voltage in the range $\pm 10V$ that represents the rate of turn: ± 30 °/min; ± 60 °/min; ± 90 °/min; ± 120 °/min; ± 180 °/min; ± 300 °/min; ± 1200 °/min. Particular value is set by a DIP-switch in accordance with sub-section 3.2.5.3. Positive rates of turn are to starboard.





6 MAINTENANCE

CAUTION!



Inappropriate tampering with the internal controls and components of the gyrocompass can lead to damage or serious performance degradation.

NEVER open the gyro compass cover or make any adjustments inside the gyrocompass unless one is a fully Alphatron Authorized Service Agent.

There is little need for user maintenance on the AlphaMiniCourse and one should never need to remove the cover.

Gyrocompass maintenance includes inspection of the AlphaMiniCourse external appearance, security of attachment, condition of cables and reliability of their connection. If the gyrocompass is not used for a period of 6 months and more (e.g. the vessel is laid up for repair), the compass should be run for 30 minutes at intervals not less than 6 months.

6.1 AlphaMiniCourse Gyrocompass drift adjustment

Periodic maintenance of the gyrocompass including drift adjustment is carried out once a year after its installation on the vessel as well as after repair or a long idle time. Drift compensation is made when the vessel is moored to the berth.

Switch on the gyrocompass in accordance with the procedure of the paragraph 4.2 of the Manual. On the control panel set the speed 0 knots and the local latitude manually or use the GPS mode. In 12 hours take the reading of the current heading Hg from the control panel. By taking the bearing determine the gyrocompass correction value Δ H:

 $\Delta H = Hb - Hg ,$

where Hb – the vessel heading received as a result of direction finding,

Hg – the current heading of the vessel in accordance with gyro compass.

Switch off the gyro compass. In 5 minutes set the GC into the drift adjustment mode by pressing

at first the buttons " \blacktriangle " and " \checkmark ". and then the button \square . In this mode the gyro compass and the servo system are de-energized. The display will show:

Unit number 000000	 Gyrocompass serial number
Operating time, h = 000000	 Full running time (in hours)
Drift correction, °/h = 0.000	 Automatically calculated drift compensation
Heading correction, °/h = +0.0	 Gyrocompass correction

With the help of " \blacktriangle " and " \checkmark " buttons set the value of correction $\triangle H$. The input range is from minus 9.9 to 9.9 degrees. Pressing the button " \lrcorner **MENU**" sets the gyrocompass to standard operation mode with the new value of the horizontal drift. Pressing of the button "**Esc**" or switching the unit off do not lead to any correction of the gyrocompass. After the adjustment the gyrocompass shall operate in the GC mode not less than 5 hours and then the gyrocompass correction value $\triangle H$ should be determined once again. The value of correction shall not exceed 0.2°, otherwise the adjustment should be repeated.



6.2 Gyrocompass self-diagnostic program

The AlphaMiniCourse performs a self-test routine during the initialization sequence and monitors its status continually during normal operation. Any deviation from normal operation appears as an error message with the indication of cause on the display.

A list of messages including two warning codes and five failure codes that are delivered by the built-in diagnostic program in case of the gyrocompass fault is given in paragraph 4.4. Its display will show one of the failure messages and the alarm will sound.

If the self-diagnostic program detects a fault, use the table 6.1 to investigate the cause.

Failure Code	Probable Cause	Remedy
SERVO	Gyroscope or servo system failure	The failure is due to component damage and cannot be corrected in the field; is to be sent to the manufacturer or to an approved service center
RDC	Resolver-digital converter failure	The failure is due to component damage and cannot be corrected in the field; is to be sent to the manufacturer or to an approved service center
DSP	Failure of a signal processor on the analog board	The failure is due to component damage and cannot be corrected in the field.
POWER Vref +15V -15V +24V +40V	Failure of the power supply board	The failure is due to component damage and cannot be corrected in the field. In some cases replacement of power supply board is possible.
NO GPS	Loss or distortion of GPS receiver signal	Check the link and polarity of connection. Use manual correction if case the correct operation of GPS cannot be provided.
ERROR GPS	Invalid GPS signal (invalid checksum)	The link may be not standard. Use manual correction if case the correct operation of GPS cannot be provided.
??? GPS	GPS signal (format) is not recognized	Adjust the GPS receiver for transmission of the sentences acceptable to the gyrocompass.
NO LOG	Loss or distortion of the log signal	Check the link and polarity of connection.
??? LOG	Log signal (format) is not recognized	Adjust the log for transmission of the sentences acceptable to the gyro compass.
ERROR LOG	Invalid log signal (invalid checksum)	The link may be not standard.
MAIN UNIT LINK FAILED	Loss of communication link with the Control Unit or doesn't pass the self-diagnostic	Check connection between control unit and gyrocompass or this failure is due to component damage and cannot be corrected in the field; is to be send to manufactory or the to an approved service center

Table 6.1 – List of failure messages





6.3 Fuse Replacement (3.15A 250V)

You can easily replace the fuse, this procedure do not require any special skills. The fuse is located on the gyrocompass base from the rear side. You should take it out of the receptacle and replace.

6.4 AlphaMiniCourse Diagrams



Figure 6.1 – The Gyro compass Block Diagram



Figure 6.1 – Gimbal assembly functional diagram





7 TRANSPORTATION

7.1 Dual-use good

The AlphaMiniCourse Gyrocompass is classified as a dual-use good: They can be used for nonmilitary and military applications. As consequence the products are subjected to dual-use goods export control procedures:

- □ Alphatron Marine can be delivered the AlphaMiniCourse freely to The Netherlands or any country of the European Union.
- Alphatron Marine can export NEW AlphaMiniCourse Gyrocompasses under its own Community General Export Authorization EU001 to the following countries: Australia, Canada, Japan, New Zealand, Norway, Switzerland (including Liechtenstein) and United States of America.
- Alphatron Marine can export repaired AlphaMiniCourse Gyrocompasses under its own Community General Export Authorization EU003 to the following countries: Albania, Argentina, Bosnia and Herzegovina, Brazil, Chile, China (including Hong Kong and Macao), Croatia, The former Yugoslav Republic of Macedonia. French Overseas Territories, Iceland, India, Kazakhstan, Mexico, Montenegro, Morocco, Russia, Serbia, Singapore, South Africa, South Korea, Tunisia, Turkey, Ukraine, Unites Arab Emirates.
- □ The AlphaMiniCourse can be exported to other countries but only through the preliminary issuance of an individual export license by the Dutch authorities.

7.2 Transport

- □ The gyrocompass is packed into an special designed Alphatron carton box and can be transported by any means of transportation to any distance.
- **□** Transportation boxes with the gyrocompass set shall be protected against atmosphere
- precipitation and shall be fastened to prevent fall, jumps, movements and mutual collision of units. The boxes should be handled with care during transportation, carriage and loading in accordance with the inscriptions made on the boxes.
- Ambient temperature during transportation shall be within the range from -60° C to $+70^{\circ}$ C.
- □ All Gyrocompasses leaving Alphatron are secured on an pallet and marked with shockwatch indicators. If the shockwatch indicators are red after transportation, please contact Alphatron.
- Clients who have received a replacement Gyrocompass need to use its special designed Alphatron Marine box to transport there defected Gyrocompass back to Alphatron Marine.
 Places are below pictures how to pack.

Please see below pictures how to pack.


ALPHATRON Marine



8 STORAGE

- The gyro compass shall be stored in a lockable heated space equipped with humidity and temperature indicators. The maximum relative humidity in the storage area is 85%.
- □ The indoor temperature shall be within the range +5°C to +30 °C. The distance to the heaters shall prevent their direct influence on the gyro compass.
- □ If the gyro compass is stored in the package, it should be positioned in accordance with the inscriptions on the box.
- □ In and near the storage area there must be no alkali, acids or other aggressive substances.
- □ The gyrocompass storage time without the re-preservation is three years.

9 SERVICE

9.1 Self Service

As mentioned on page 61 there is little need for user maintenance on the AlphaMiniCourse and one should never need to remove the cover. The gyrocompass cover may only be opened by fully Alphatron Authorized agents to make any adjustments or repairs to prevent loss of warranty.

Please keep in mind that drift adjustment as periodic maintenance of the AlphaMiniCourse gyrocompass should be carried out every year after its installation on the vessel as well as after repair or a long idle time.

Drift compensation can be performed when the vessel is moored to the berth, for the operating procedure please use page 61.

9.2 Exchange Program

Alphatron Marine offers a service exchange program for AlphaMiniCourse. This exchange program gives a refund for the used AlphaMiniCourse gyrocompasses that has past its assigned life cycle or the assigned service period and options to handle service situations.

In order to provide the best advice regarding your options the <u>serial number</u> of gyrocompass and if possible a gyro settings registration form needs to be send to Alphatron Marine.

10 RECYLING

The AlphaMiniCourse gyrocompass doesn't contain any radioactive, poisonous, reactive, aggressive substances which are dangerous for life, health and environment.

On expiry of the assigned life cycle or the assigned service period until discarded the unit is to recycling for the secondary use of nonferrous metals which are contained in it. Therefor you are able to use Alphatron Marine exchange program for your AlphaMiniCourse, please see sub-section 9.2 for more information.



ALPHAMINICOURSE Mk2 Gyrocompass



11 WARRANTY REGISTRATION FORM

JRC Telephone: 4 Telefax Site Email Install. Com Telephone: Email: Adress:	+31(0)10-4 +31(0)10- www.alpl alphaline pany*:	4534000 4534030 hatronmarine.nl @alphatronmarine.c	P.O. Box 21 3001 AA Ro The Nether	LOO3 otterdam ·lands			ALPHATRON Marine
Harbour:							
Vessel Name	»*:						
Vessel Type:							
Technician:				Installation Date*:		DD / MM / YY	
System*:				Type*:			
- /				. 16- 1			
		Consisting off*			Serial num	iber*	
Compated							
Connected to	0:						
Remarks:							
NOTE:	To validate the warranty of this product, send this card via e-mail, fax or						
post within t	two week	s after installation.					
Clanatu					Dat-*		NANA / YOU
Signature:					Date*:	/ 00	/ YY



12 GYRO SETTINGS REGISTRATION FORM

	Settings of A	lphaMiniCourse M	lk2 digital interfac	e in Adjustment N	lode	
Channel	Baudrate	Frequency	Precision	Checksum	Message	
ALL	4800 □ 9600 □ 19200 □ 38400 □	1 10 20 50	.1 🗌 .01 🗌	Off □ On □	HDT HDT+ROT HDT+VHW VHW+ROT THS THS+ROT THS+VHW ALL	
Channel	Baudrate	Frequency	Precision	Checksum	Message	
А	4800 9600 19200 38400	1 10 20 50	.1 .01	Off 🗌 On 🗌	HDT HDT+ROT HDT+VHW VHW+ROT THS+ROT THS+VHW ALL	
Channel	Baudrate	Frequency	Precision	Checksum	Message	
в	4800 □ 9600 □ 19200 □ 38400 □	1 10 20 50	.1 🗌 .01 🗌	Off □ On □	HDT HDT+ROT HDT+VHW VHW+ROT THS THS+ROT THS+VHW ALL	
Channel	Baudrate	Frequency	Precision	Checksum	Message	
с	4800 9600 19200 38400	1 10 20 50	.1 🗌 .01 🗌	Off 🗌 On 🗌	HDT HDT+ROT HDT+VHW VHW+ROT THS THS+ROT THS+VHW ALL	
Channel	Baudrate	Frequency	Precision	Checksum	Message	
D	4800 □ 9600 □ 19200 □ 38400 □	1 10 20 50	.1 🗌 .01 🗌	Off □ On □	HDT HDT+ROT HDT+VHW VHW+ROT THS THS+ROT THS+VHW ALL	
			LOG input setting			
LOG Type	NMEA	100	200	300	400	
		D	isable of RS232 from L	DG		
LOG OK						

DIP-switch settings on Digital Board								
	1	2	3	4	5	6	7	8
ON								1
OFF								