

## Operator Manual



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## Safety information



### **Caution!**

Maintenance and repair work should be carried out only by trained and qualified staff who are well versed national regulations relating to machine safety.

After the gyro compass has been switched off it is necessary to wait at least 15 minutes before accessing the interior of the gyro compass. Otherwise the sphere could be damaged.



If no Raytheon repeater compass is connected the warnings and error messages are only displayed visually on the compass.

For this reason it is essential that the digital display on the compass be monitored at all times.

If supplementary audible signalling of error messages is required it is necessary to utilise the relevant contacts in the junction box.



When warnings occur the operation of the gyro compass is not restricted. If the cause of the warning is corrected in good time it may be possible to prevent failure of the equipment.

Please inform the authorised service personnel of any such occurrences.

**Konformitätserklärung des Herstellers**

Artikel Nr. 10 der Richtlinie 96/98/EG

**Manufacturer's Declaration of Conformity**

Article 10 – EC-Directive 96/98/EC

Hiermit wird bestätigt, daß das nachfolgend aufgeführte Produkt dem baumustergeprüften Produkt entspricht und gemäß Qualitätssicherungs-Modul D erfolgreich getestet wurde.

This is to certify that the product identified below has been manufactured in accordance with type approved units and has been successfully tested according to the Quality Assurance Module D.

Produktbezeichnung/  
Product Designation: **Gyrocompass System /  
Gyrocompass System for High Speed Craft**

Typ / Type: **Gyrostar II**  
(Systemkomponenten siehe Anlage/  
system components see attached)

Baumusterprüfung durch/  
Type Examination by: **GL Luxembourg**  
26, place de la Gare  
L-1616 Luxembourg

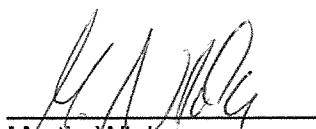
**Benannte Stelle Nr. 0801/  
Notified Body No. 0801**

Baumusterprüfbescheinigungen Nr./ 17063 - 00 Lux, 46014 - 03 Lux  
Type Examination Certificates No.:

Angewendete Normen  
und Richtlinien/-  
Applied Standards and  
Directives: **Directive 96/98EC / Additional Directive 2001/53/EC**  
**Additional Directive 2002/75/EC**  
**EN 61162-1, EN 60945, IEC 60945, IEC 61162-1**  
**EN ISO 8728, ISO 16328**  
**IMO Resolutions A.424 (XI), A.694 (17), A.813 (19)**  
**A.821(19), MSC.64 (67) Annex 4, MSC.97(73)**

Diese Erklärung wird verantwortlich für den Hersteller abgegeben durch/  
This declaration has been made in the name of the manufacturer by:

Kiel, den 19.02.2003

Raytheon Marine GmbH  
Head of Quality ManagementRaytheon Marine GmbH  
Head of Qualification / Certification  
Martin Wleka  
Günther Krappe

**Konformitätserklärung des Herstellers**

Artikel Nr. 10 der Richtlinie 96/98/EG

**Manufacturer's Declaration of Conformity**

Article 10 – EC-Directive 96/98/EC

**Gyro Compass System Gyrostar II**

Aufistung der Systemkomponenten / Listing of the system components:

Gyro Compass	110-231	
Gyrosphere	111-006	
Repeater	133-558	
Connection Box	138-113	
Speed Error Connection Dongle	NB 03-978	1
Quick Settling Dongle	NB 03-979	1
SEC-Operating Unit	130-606 NG001	1
Step-SSC-Module	148-487	1
AC Power Supply	121-058	1

<sup>1</sup>Wahlweise / Optional

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## 1 General

The GyroStar II gyro compass is designed for use as a navigation aid on board ships.

As a sensor, and unaffected by the magnetic earth field, it determines the north bearing, and thus enables a course to be steered in relation to true north.

The GyroStar II gyro compass supplies signal outputs for transmission to repeater compasses and other devices such as radar instruments and plotters, TV antennae or SATCOM antennae. In addition status information can be transmitted to connected external signalling devices.

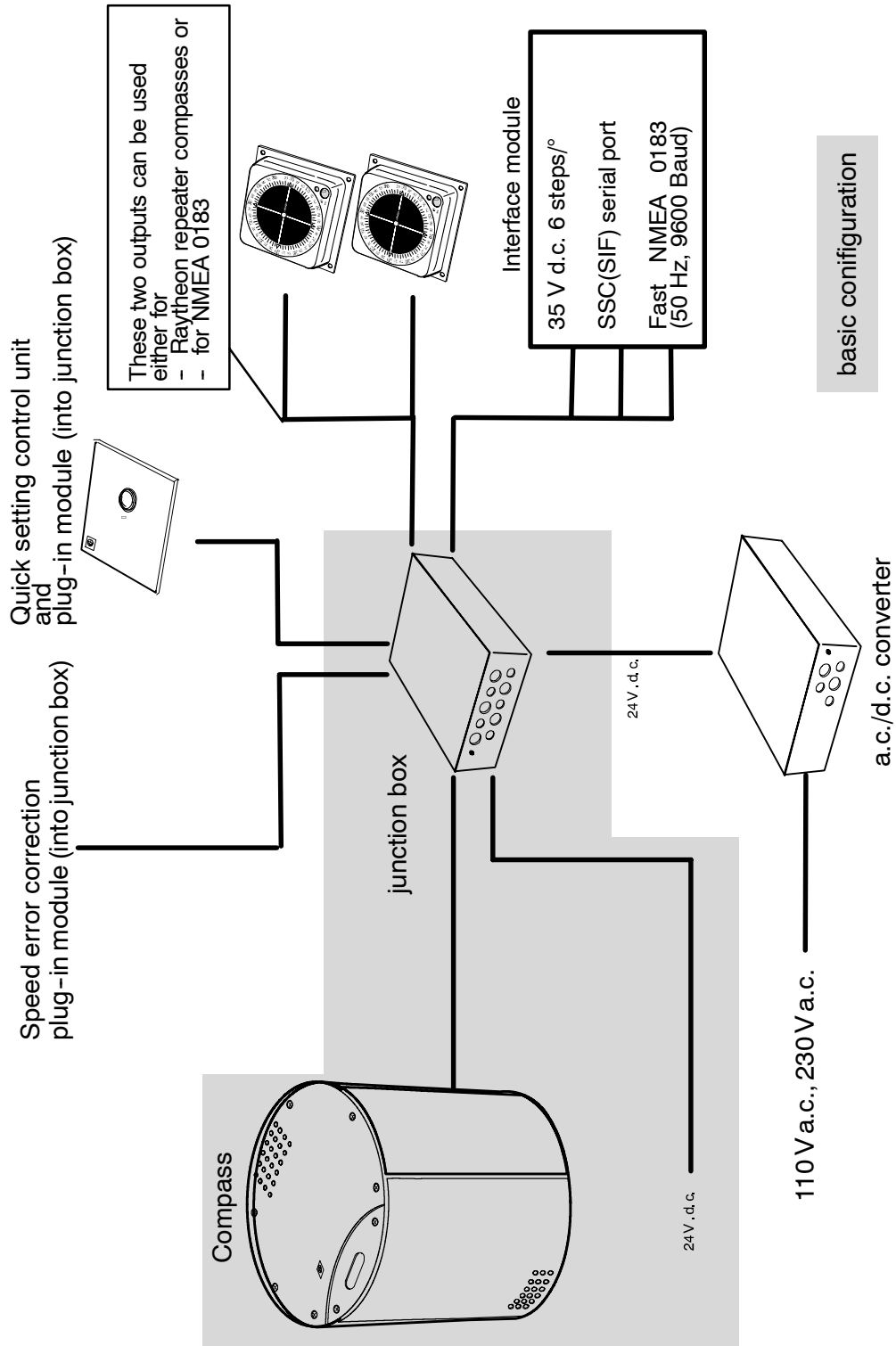
### Speed error correction option

This additional function automatically corrects any speed error on the gyro compass. The gyro compass receives the required information, such as speed and latitude, from the GPS receiver and from the log.

### Quick Settling option

This additional function reduces the gyro compass's settling time from approximately 3 hours to approximately 1 hour.

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**Figure 1 : GyroStar II - summary of components**



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The **basic configuration** of the GyroStar II consists of (see figure 1):

- the compass
- a junction box

The Quick Settling and Speed Error Correction functions can also be integrated into the junction box as **options**.

Other options are:

- repeater compass
- a.c./d.c converter for on-board power supply 85 ... 264 V a.c., 50/60 Hz.

Outputs containing course data are made available via the junction box:

There are 2 standard outputs containing course data. Each of these outputs can be set either to course bus format or NMEA format. In addition "ALARM", "QUICK SETTLING", "SPEED ERROR CORRECTION" and "AVAILABLE" messages can be transmitted to other connected devices via electrically isolated switching contacts.

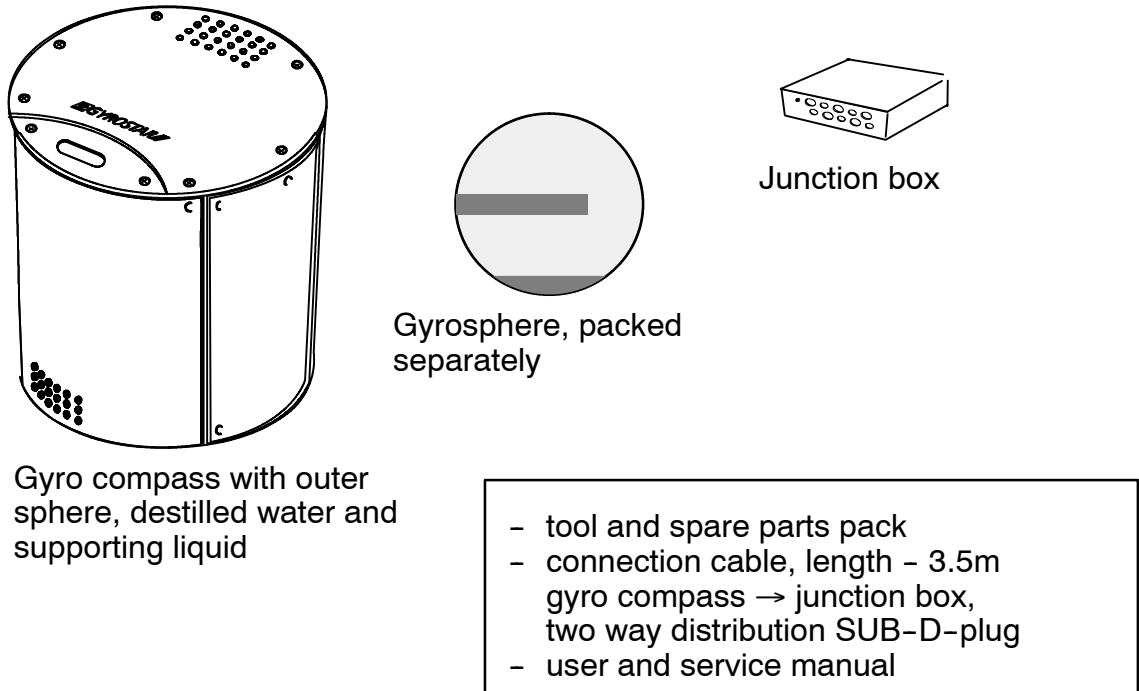
The following output formats can be made available as options for the various external devices:

- a 35 V d.c. Step Interface (6 Steps/° )
- a synchronous serial communication port SSC (SIF)
- a NMEA HS (high speed) 50 Hz, 9600 Baud

In the junction box the following signal inputs are provided for the Speed Error Correction option: PULSLOG, PULSLOG DIRECTION, GPS-NMEA and LOG NMEA (NMEA 0183 2.3).

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## 1.1 Scope of Supply 'GyroStar II'



**Figure 2** : Scope of supply for the “GyroStar II” gyro compass

## 1.2 The tasks of the devices of which the unit consists

- **Gyro compass, type 110 - 231**
  - to determine the course
  - to display the ship's course  
and display the functional status on a digital display unit
  - to transmit the course signal to a repeater compass and/or to the other  
connected devices.
  - to generate status signals to control externally connected  
devices.



- **Junction box, type 138 - 113**
  - to supply the compass, repeater compasses and the junction box itself with the required operating voltage (+24V d.c.)
  - to transmit course information.
  - to accommodate the plug-in module for the Quick-Settling function (option)
  - to accommodate the plug-in module for the Automatic Speed Error Correction (option)
  - to accommodate the "step module" interface (option à interface version extension.
  - to safeguard signal outputs.
  - to provide connections for electrically isolated status signals (e.g. ALARM) for externally connected devices.
  
- **Repeater compass (option) type 133 - 558**
  - to display the ship's course on a 360 ° card with 1° graduations.
  - to display the function status of the compass equipment on a multi-coloured LED.
  - to provide audible and visual output of warnings and alarms.
  - to reset the audible outputs.
  - adjustable illumination for the 360° card.
  
- **a.c./d.c. converter (option), type 121-058**
  - to convert the on-board voltage supply (85 V a.c. ... 264 V a.c. 50/60 Hz) to the 24 V d.c. necessary for the GyroStar II.
  
- **Quick Settling control unit (option), type 130 - 606NG001**
  - this control unit activates the "Quick Settling" function and indicates that Quick Settling is operating.

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## 1.2.1 GyroStar II - technical data

### 1.2.1.1 Mechanical data

#### Compass

Height:	approx. 404 mm
Diameter:	approx. 384 mm
Weight:	approx. 13,5 kg
Type of Enclosure:	IP 23

#### Junction box

Height:	approx. 181 mm
Width:	approx. 256 mm
Depth:	approx. 93 mm
Weight:	approx. 1,8 kg
Type of Enclosure:	IP 23

#### Repeater compass (option)

##### Desk mounting:

Height:	approx. 192 mm
Width:	approx. 192mm
Depth:	approx. 65,5 mm
Weight:	1,2 kg

##### Bulkhead mounting:

Height:	approx. 168mm
Width:	approx. 170 mm
Depth:	approx. 65,5 mm
Weight:	approx. 1,0 kg
Type of Enclosure:	IP 44



## **a.c./d.c. converter (option)**

Height:	approx. 132 mm
Width:	approx. 256 mm
Depth:	approx. 124 mm
Weight:	approx. 2,8 kg
Type of Enclosure:	IP 23

## **Quick Settling control unit (option) desk mounting only**

Height:	approx. 96 mm
Width:	approx. 96 mm
Depth:	max. 40 mm
Weight:	approx. 0,25 kg
Type of Enclosure:	IP 23

## **1.2.1.2 GyroStar II - electrical data**

### **Standard equipment (compass and junction box)**

- ◆ Supply voltage: 24 V d.c. / max.4,0 A (18 V d.c. to 36 V d.c.)
- ◆ Outputs:
  - 2 x either course bus or NMEA 0183 2.3 (1 sec/0.1 sec)
  - electrically isolated "AVAILABLE" contact (24 V d.c./2A)
  - electrically isolated "ALARM" contact (24 V d.c. / 2A)
  
- Ambient temperature for operating -10° C to +55° C

### **"Interface" option (supplementary interface module in junction box)**

- ◆ Step output 35 V/0.2A (6 Steps/°)
- ◆ Synchronous serial interface (RS 422)
- ◆ NMEA (High speed 20 ms) 0183 2.3

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## “Quick Settling” option (plug-in module and additional control unit)

- ▶ Reduces settling stage to 1 hour.
- ▶ electrically isolated “QS” contact (24 V d.c. / 2A)

## ”Automatic speed error correction” option (plug-in module)

- ▶ Pulse log input (200 pulses/Nm)
- ▶ Pulse log - direction - input (+/-) → ”speed ahead” or ”reverse speed” status
- ▶ GPS input (NMEA 0183 2.3)
- ▶ Log input (NMEA 0183 2.3)
- ▶ electrically isolated ”SEC” contact (24 V d.c./2A) → speed error correction in operation.

## ”a.c./d.c. converter” option

- ▶  $AC_{IN} = 85 \dots 264 \text{ V}$ , 50/60 Hz  $DC_{OUT} = 24 \text{ V}/10\text{A}$

## Indicator precision:

- ▶ GyroStar II Digital display, 4-digits  
Resolution =  $0,1^\circ$
- ▶ Repeater compass Resolution =  $1^\circ$   
Reading accuracy =  $0,25^\circ$

## \*\*Course precision:

- ▶ dynamical  $0.4^\circ$
- ▶ statical  $0.1^\circ$

\*\*Precision depends on the latitude (course must be multiplied with  $1/\cos$  latitude)



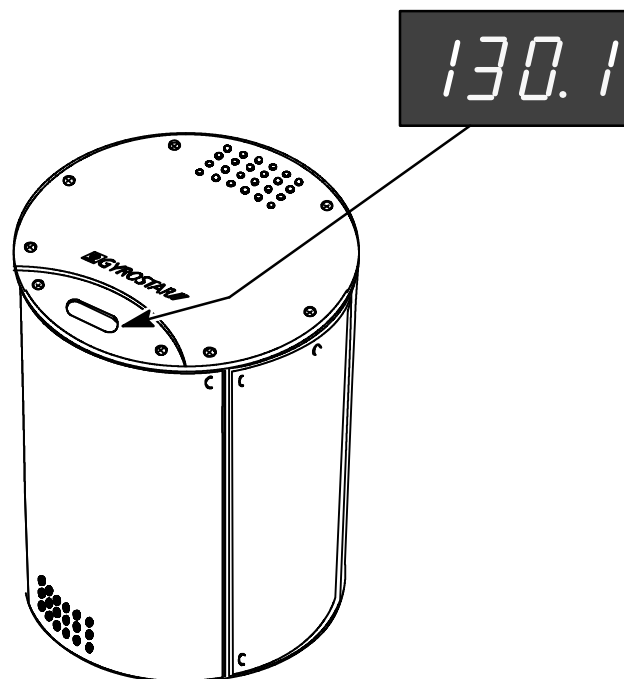
## 2 Controls and indicators on the GyroStar II

### 2.1 Controls and indicators on the compass

Viewed from above

Digital indication of the following :

- compass course
- operating status
- warnings
- error messages



**Figure 3** : The display unit on the compass

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After opening the door of the enclosure

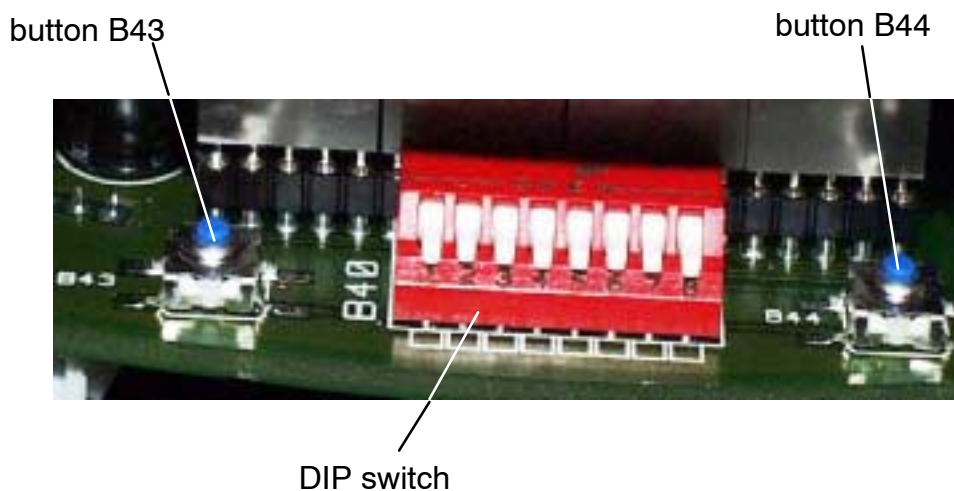


Live parts should not be touched. The DIP switches and buttons are not live.

1 DIP switch (B40) and 2 push buttons (B43 and B44) for setting the following:

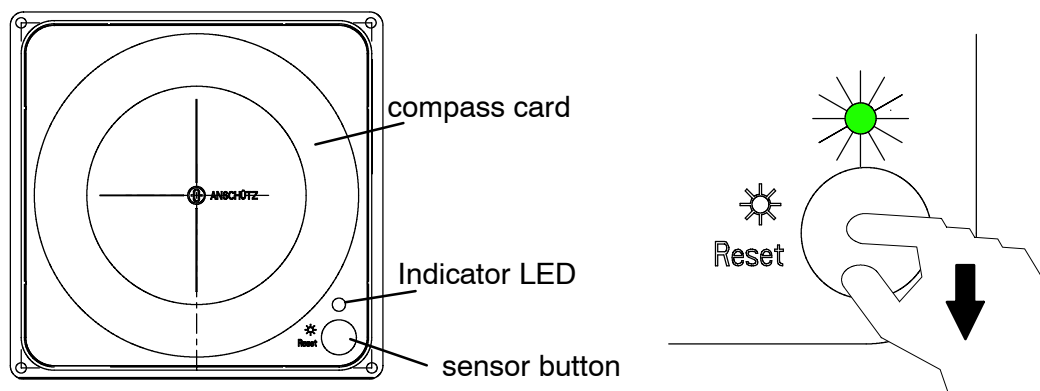
- course and correction data
- settings for functional checks
- system settings such as data formats or transmission speeds.

**System settings should be altered only by the manufacturer!! Please observe the relevant information in the service manual.**



**Figure 4 :** Controls on the compass (compass enclosure door opened)

### 2.1.1 Controls and indicators on repeater compass (option)



**Figure 5 :** Controls and indicators on repeater compass

The repeater compass is fitted with the following controls and indicators:

- ▶ Compass card to indicate the course (true)
- ▶ Indicator LED (multi-coloured) to indicate operating status:
  - green → operating correctly
  - yellow → restricted operation (e.g. during settling stage)
  - red → error message. Operation defective
- ▶ Sensor button
  - to acknowledge any warnings and error messages that occur.
  - to set brilliance of compass card (7 levels  $\uparrow\downarrow$ ).

In addition there is an audible alarm incorporated into the repeater compass that emits an audible alarm in the event of an error message. When the button is pressed the audible signal ceases.

## 2.1.1.1 Controls and indicators on quick settling control unit (option)

The additional "quick settling" function reduces the compass's settling time from approximately 3 hours to approximately 1 hour.

This option is available with software-version E00.03

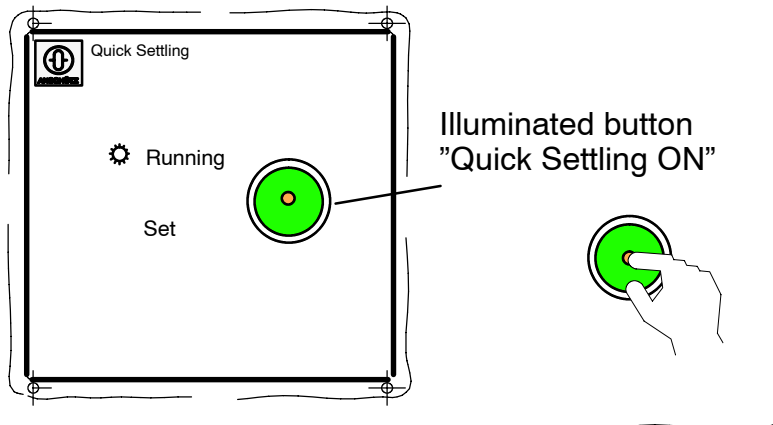
(Display P 1.0.3. see Service Manual) of the Sensor PCB.

When the gyro compass is switched off, the last course is stored in the memory. This value is taken by the compass as the default setting when it is switched on again, and this reduces the settling time.



The Quick Settling function can only be used if the ship's course has not altered between switching the compass off and on again and the compass had been in operation for a minimum of 6h before.

If the course has changed in the time between switching off and on again, the settling process will still take 3 hours (despite the quick settling function).



**Figure 6** : Controls and indicators on the Quick Settling control unit

button "Quick Settling ON"

- activates this function
- Flashes, when it is possible to activate this function. Flashes only for 2 minutes.
- lights up when quick settling is running



## 2.1.2 Switching on the GyroStar II

The GyroStar II goes into operation when the +24 V d.c. voltage supply on the on-board power supply is switched on.

For the first half hour (this period depends on the temperature of the supporting liquid) after switching on, no course output is available; the compass is still in the heating stage ("h" is the first character on the digital display and the multi-coloured LED on the repeater compass indicates red). The Gyro Compass internal follow-up-system is switched off.

The Gyro Compass internal follow-up-system is switched on at a temperature of the supporting liquid of 45 ° C - the course is displayed - **but the deviation from actual course can be considerable!**

This setting stage (indicated by an additional dot on the digital display and the multi-coloured LED on the repeater compass indicates yellow) is finished appr.3 h after switching on.

If the "Quick Settling" option is installed, the settling stage is reduced to 1 hour in this case the precision (after 1h) is better than 2°.

The compass course can be used 3 hours after switch on, precision is now better than 2°. The multi-coloured LED on the repeater compass now indicates green, and the digital display unit on the compass now displays the compass course.

5 hours after switch-on the compass is accurate to  $0.1^\circ \times \frac{1}{\cos \text{latitude}}$ .

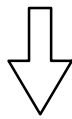
## 2.1.2.1 GyroStar II indications during the heating stage

### ON THE COMPASS

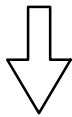


h = heating

● = current temperature

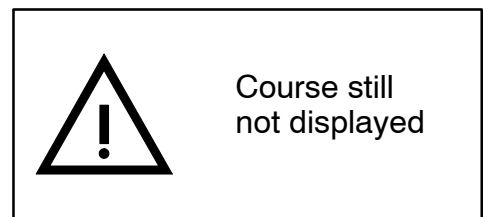
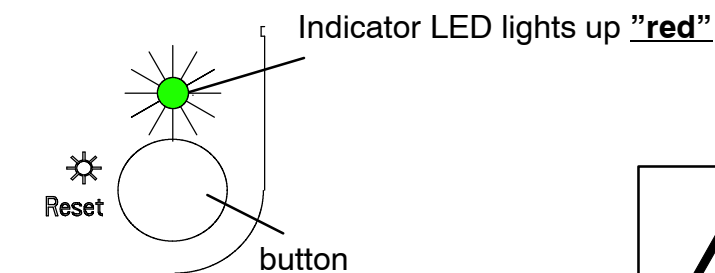


for approximately half an hour until the temperature reaches 45 ° C



Temperature for internal follow-up system to switch on has been reached.

### ON THE REPEATER COMPASS

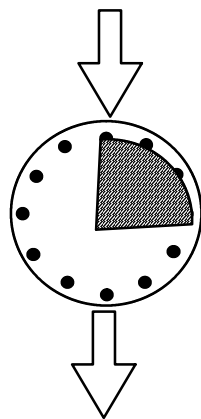
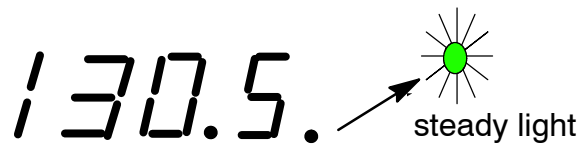


Course still not displayed

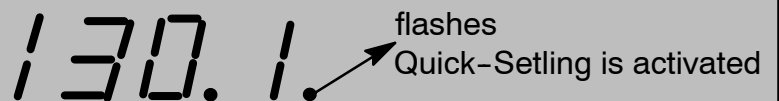
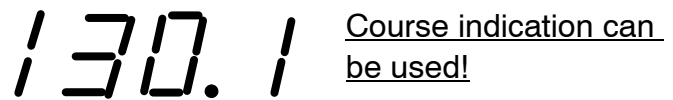
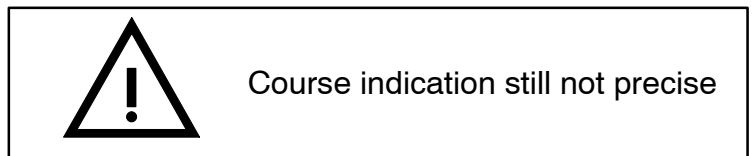
2.1.2.2

GyroStar II indications during the settling stage

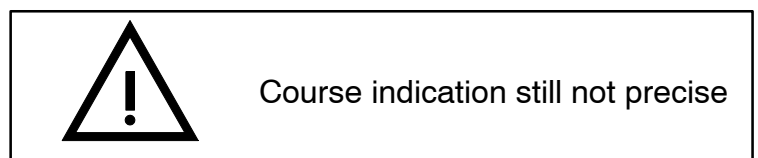
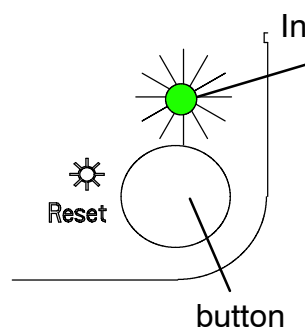
ON THE COMPASS



For approximately 3 hours after switch-on (with Quick Settling this is 1 hour)



ON THE REPEATER COMPASS






After 3 hours the indicator LED lights up **"green"**. The course can be used. (Quick-Settling 1h.)

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## 2.1.3 Summary of indications (digital display) during operation

When the gyro compass is switched on the digital display unit indicates as follows:

Display	Comments, Information
<p>① Heating stage</p>	
	<p>During the heating stage the temperature of the supporting liquid is displayed. For example: <b>h</b> : heating stage <b>28.8</b> : 28.8 °C</p>
<p>② Settling stage</p>	
	<p>The gyro compass is settling in.</p> <ul style="list-style-type: none"> <li>- during the settling in stage, the course is displayed with a lighted dot after the last figure (approx. 3 hours).</li> </ul> <p>The course is still not precise!</p>
<p>③ Course indication</p>	
	<p>When the settling period has ended: Accuracy of course indication:</p> <ul style="list-style-type: none"> <li>- 3 hours after switching on better than 2°</li> <li>- if quick settling is installed, 1 hour after switching on better than 2°</li> <li>- 5 hours after switching on <math>0.1^\circ \times 1/\cos</math> latitude</li> </ul>





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## 2.1.4 Speed error correction

Speed error is a physical deviation from the steering course indicated on the gyro compass (compass course) from the true course (chart course). It depends on the speed of the ship, the course it is steering, and the latitude. The speed error is typically with the range of  $0^{\circ}$  to  $2^{\circ}$ , and with fast ships, it can even reach  $5^{\circ}$  or more.

With automatic speed error correction (option) the compass course is continually corrected using the values shown in the speed error table (see section 2.1.4.1). The digital display on the compass and the connected repeater displays will always indicate the true course.

For automatic speed error correction the ship's speed and the latitude are led into the gyro compass.

**CAUTION** If the speed and latitude are not available to the automatic speed error correction (Log or GPS failure) automatic correction cannot take place. The gyro compass will be showing the uncorrected value.

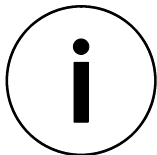
The correction values shown in the table should be added to or subtracted from (according to + or - signs shown) the uncorrected course.

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Example of course calculation	1	2
Compass course	345°	223.7°
Latitude	55°	55°
Speed	16 kn	16 kn
Correction value from table	- 1.7°	+ 1.3°
True cours	$345^\circ - 1.7^\circ = \underline{343.3^\circ}$	$223.7^\circ + 1.3^\circ = \underline{225^\circ}$

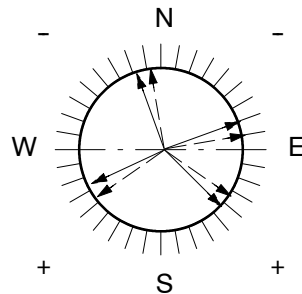
**Example of a bearing:**

Compass course:	255°
Latitude:	55°
Speed:	16 kn
Direction of bearing:	135°
Correction value as per table	+0.5°
True bearing:	$135^\circ + 0.5^\circ = \underline{135.5^\circ}$



The following statement applies:  
 The TRUE COURSE is always to the "west" of the compass course.

---> Compass course  
 ———> true course





## 2.1.4.1 Speed error table

Latitude in °	north		south		Speed in kn											
	Courses in ° sign for correction value				4	8	12	16	20	24	28	32	36	40	44	
	-		+													
0 to 20	0	360	180	180	0.3	0.5	0.8	1.0	1.3	1.5	1.8	2.1	2.4	2.6	2.9	
	15	345	165	195	0.3	0.5	0.8	1.0	1.3	1.4	1.7	2.0	2.3	2.5	2.8	
	30	330	150	210	0.2	0.4	0.6	0.9	1.1	1.3	1.5	1.8	2.0	2.3	2.5	
	45	315	135	225	0.2	0.4	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2.1	
	60	300	120	240	0.1	0.3	0.4	0.5	0.7	0.8	0.9	1.1	1.2	1.3	1.4	
	75	285	105	255	0.1	0.2	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.8	
	90	270	90	270	0	0	0	0	0	0	0	0	0	0	0	
30	0	360	180	180	0.3	0.6	0.9	1.2	1.5	1.7	2.0	2.3	2.6	2.9	3.2	
	15	345	165	195	0.3	0.6	0.9	1.1	1.4	1.6	1.9	2.3	2.6	2.8	3.1	
	30	330	150	210	0.2	0.5	0.7	1.0	1.2	1.5	1.7	2.0	2.3	2.5	2.8	
	45	315	135	225	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.7	1.9	2.1	2.3	
	60	300	120	240	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.3	1.5	1.6	
	75	285	105	255	0.1	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.7	0.8	0.8	
	90	270	90	270	0	0	0	0	0	0	0	0	0	0	0	
40	0	360	180	180	0.3	0.7	1.0	1.3	1.7	2.0	2.3	2.7	3.0	3.3	3.7	
	15	345	165	195	0.3	0.7	1.0	1.2	1.5	1.9	2.2	2.6	2.9	3.2	3.5	
	30	330	150	210	0.3	0.6	0.8	1.1	1.4	1.7	2.0	2.3	2.6	2.9	3.2	
	45	315	135	225	0.2	0.4	0.7	0.9	1.2	1.4	1.6	1.9	2.1	2.4	2.6	
	60	300	120	240	0.2	0.3	0.6	0.7	0.9	1.0	1.2	1.3	1.5	1.7	1.8	
	75	285	105	255	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.9	
	90	270	90	270	0	0	0	0	0	0	0	0	0	0	0	
45	0	360	180	180	0.4	0.7	1.1	1.4	1.8	2.2	2.5	2.9	3.2	3.6	4.0	
	15	345	165	195	0.3	0.7	1.0	1.4	1.7	2.1	2.4	2.8	3.1	3.5	3.8	
	30	330	150	210	0.3	0.6	0.9	1.2	1.6	1.9	2.2	2.5	2.8	3.1	3.4	
	45	315	135	225	0.3	0.5	0.8	1.0	1.2	1.5	1.8	2.0	2.3	2.5	2.8	
	60	300	120	240	0.2	0.4	0.5	0.7	0.9	1.1	1.3	1.4	1.6	1.8	2.0	
	75	285	105	255	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.9	1.0	
	90	270	90	270	0	0	0	0	0	0	0	0	0	0	0	
50	0	360	180	180	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.3	
	15	345	165	195	0.4	0.8	1.1	1.5	1.8	2.2	2.6	3.1	3.4	3.8	4.2	
	30	330	150	210	0.3	0.7	1.0	1.3	1.6	2.0	2.3	2.7	3.1	3.4	3.8	
	45	315	135	225	0.3	0.6	0.8	1.1	1.4	1.7	2.0	2.2	2.5	2.8	3.1	
	60	300	120	240	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	
	75	285	105	255	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	
	90	270	90	270	0	0	0	0	0	0	0	0	0	0	0	

# Operator Manual

Latitude in °	north		south		Speed in kn										
	Courses in ° sign for correction value														
	-		+		48	52	56	60	64	68	72				
0 to 20	0	360	180	180	3.1	3.4	3.7	3.9	4.2	4.4	4.9				
	15	345	165	195	3.0	3.3	3.5	3.8	4.0	4.3	4.7				
	30	330	150	210	2.7	3.0	3.2	3.4	3.6	3.8	4.2				
	45	315	135	225	2.2	2.4	2.6	2.8	3.0	3.1	4.3				
	60	300	120	240	1.6	1.7	1.8	2.0	2.1	2.2	2.4				
	75	285	105	255	0.8	0.9	1.0	1.0	1.1	1.2	1.3				
90	270	90	270	0	0	0	0	0	0	0					
30	0	360	180	180	3.5	3.8	4.1	4.4	4.7	5.5	5.3				
	15	345	165	195	3.4	3.7	4.0	4.3	4.5	4.8	5.1				
	30	330	150	210	3.0	3.3	3.6	3.8	4.1	4.3	4.6				
	45	315	135	225	2.5	2.7	2.9	3.1	3.3	3.5	3.7				
	60	300	120	240	1.8	1.9	2.1	2.2	2.3	2.5	2.6				
	75	285	105	255	0.9	1.0	1.1	1.1	1.2	1.3	1.4				
90	270	90	270	0	0	0	0	0	0	0					
40	0	360	180	180	4.0	4.3	4.6	5.0	5.3	5.6	6.0				
	15	345	165	195	3.8	4.2	4.5	4.8	5.1	5.5	5.8				
	30	330	150	210	3.5	3.7	4.0	4.3	4.6	4.9	5.2				
	45	315	135	225	2.8	3.1	3.3	3.5	3.6	4.0	4.2				
	60	300	120	240	2.0	2.2	2.3	2.5	2.7	2.8	3.0				
	75	285	105	255	1.0	1.1	1.2	1.3	1.4	1.5	1.5				
90	270	90	270	0	0	0	0	0	0	0					
45	0	360	180	180	4.3	4.7	5.0	5.4	5.8	6.1	6.5				
	15	345	165	195	4.2	4.5	4.9	5.2	5.6	5.9	6.3				
	30	330	150	210	3.8	4.0	4.4	4.7	5.0	5.3	5.6				
	45	315	135	225	3.1	3.3	3.6	3.8	4.1	4.3	4.6				
	60	300	120	240	2.2	2.3	2.5	2.7	2.9	3.1	3.2				
	75	285	105	255	1.1	1.2	1.3	1.4	1.5	1.6	1.7				
90	270	90	270	0	0	0	0	0	0	0					
50	0	360	180	180	4.8	5.1	5.5	5.9	6.3	6.7	7.1				
	15	345	165	195	4.6	5.0	5.4	5.7	6.1	6.5	6.9				
	30	330	150	210	4.1	4.5	4.8	5.1	5.5	5.8	6.2				
	45	315	135	225	3.4	3.6	3.9	4.2	4.5	4.8	5.0				
	60	300	120	240	2.4	2.6	2.8	3.0	3.2	3.4	3.6				
	75	285	105	255	1.2	1.3	1.4	1.5	1.6	1.7	1.8				
90	270	90	270	0	0	0	0	0	0	0					



Latitude in °	north		south		Speed in kn											
	Courses in ° sign for correction value				4	8	12	16	20	24	28	32	36	40	44	
	-		+													
55	0	360	180	180	0.4	0.9	1.3	1.8	2.2	2.7	3.1	3.6	4.0	4.4	4.9	
	15	345	165	195	0.4	0.9	1.3	1.7	2.1	2.6	3.0	3.4	3.9	4.3	4.7	
	30	330	150	210	0.4	0.8	1.1	1.5	1.9	2.3	2.7	3.1	3.5	3.8	4.2	
	45	315	135	225	0.3	0.6	0.9	1.3	1.6	1.9	2.2	2.5	2.8	3.1	3.5	
	60	300	120	240	0.2	0.4	0.7	0.9	1.1	1.3	1.6	1.8	2.0	2.2	2.4	
	75	285	105	255	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.3	
	90	270	90	270	0	0	0	0	0	0	0	0	0	0	0	
60	0	360	180	180	0.5	1.0	1.5	2.0	2.5	3.1	3.6	4.1	4.6	5.1	5.6	
	15	345	165	195	0.5	0.9	1.4	1.9	2.4	2.9	3.4	3.9	4.4	4.9	5.4	
	30	330	150	210	0.4	0.8	1.3	1.7	2.1	2.6	3.1	3.5	4.0	4.4	4.9	
	45	315	135	225	0.4	0.7	1.1	1.4	1.8	2.2	2.5	2.9	3.2	3.6	4.0	
	60	300	120	240	0.3	0.5	0.8	1.0	1.3	1.5	1.8	2.0	2.3	2.5	2.8	
	75	285	105	255	0.2	0.3	0.4	0.6	0.7	0.8	0.9	1.1	1.2	1.3	1.5	
	90	270	90	270	0	0	0	0	0	0	0	0	0	0	0	
65	0	360	180	180	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.7	
	15	345	165	195	0.6	1.2	1.7	2.3	2.9	3.5	4.1	4.7	5.2	5.8	6.4	
	30	330	150	210	0.5	1.0	1.6	2.1	2.6	3.1	3.6	4.2	4.7	5.2	5.7	
	45	315	135	225	0.4	0.9	1.3	1.7	2.1	2.6	3.0	3.4	3.8	4.3	4.7	
	60	300	120	240	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.3	
	75	285	105	255	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.6	1.7	
	90	270	90	270	0	0	0	0	0	0	0	0	0	0	0	
70	0	360	180	180	0.7	1.5	2.2	3.0	3.7	4.5	5.2	6.0	6.7	7.5	8.2	
	15	345	165	195	0.7	1.4	2.2	2.9	3.6	4.3	5.0	5.8	6.5	7.2	7.9	
	30	330	150	210	0.6	1.3	2.0	2.6	3.2	3.9	4.5	5.2	5.8	6.5	7.1	
	45	315	135	225	0.5	1.1	1.6	2.1	2.6	3.2	3.7	4.2	4.7	5.3	5.8	
	60	300	120	240	0.4	0.7	1.1	1.5	1.9	2.2	2.6	3.0	3.4	3.7	4.1	
	75	285	105	255	0.2	0.4	0.6	0.8	0.9	1.2	1.4	1.5	1.7	1.9	2.1	
	90	270	90	270	0	0	0	0	0	0	0	0	0	0	0	
75	0	360	180	180	1.0	2.0	3.0	3.9	4.9	5.9	6.9	7.9	8.9	9.9	10.9	
	15	345	165	195	0.9	1.9	2.9	3.8	4.8	5.7	6.7	7.6	8.6	9.5	10.5	
	30	330	150	210	0.8	1.7	2.6	3.4	4.3	5.1	6.0	6.8	7.7	8.6	9.4	
	45	315	135	225	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	7.7	
	60	300	120	240	0.5	1.0	1.5	2.0	2.5	3.0	3.4	3.9	4.4	4.9	5.4	
	75	285	105	255	0.3	0.5	0.8	1.0	1.3	1.5	1.8	2.0	2.3	2.5	2.8	
	90	270	90	270	0	0	0	0	0	0	0	0	0	0	0	

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Latitude in °	north		south		Speed in kn										
	Courses in ° sign for correction value														
	-		+		48	52	56	60	64	68	72				
55	0	360	180	180	5,3	5,8	6,2	6,7	7,1	7,5	8,0				
	15	345	165	195	5,1	5,6	6,0	6,4	6,9	7,3	7,7				
	30	330	150	210	4,6	5,0	5,4	5,8	6,1	6,5	6,9				
	45	315	135	225	3,8	4,1	4,4	4,7	5,0	5,3	5,6				
	60	300	120	240	2,7	2,9	3,1	3,3	3,5	3,8	4,0				
	75	285	105	255	1,4	1,5	1,6	1,7	1,8	2,0	2,1				
	90	270	90	270	0	0	0	0	0	0	0				
60	0	360	180	180	6,1	6,6	7,1	7,6	8,2	8,7	9,2				
	15	345	165	195	5,9	6,4	6,9	7,4	7,9	8,4	8,9				
	30	330	150	210	5,3	5,7	6,2	6,6	7,1	7,5	7,9				
	45	315	135	225	4,3	4,7	5,0	5,4	5,8	6,1	6,5				
	60	300	120	240	3,0	3,3	3,6	3,8	4,1	4,3	4,6				
	75	285	105	255	1,6	1,7	1,8	2,0	2,1	2,2	2,4				
	90	270	90	270	0	0	0	0	0	0	0				
65	0	360	180	180	7,2	7,8	8,4	9,1	9,7	10,3	10,9				
	15	345	165	195	7,0	7,6	8,2	8,7	9,3	9,9	10,5				
	30	330	150	210	6,3	6,8	7,3	7,8	8,4	8,8	9,4				
	45	315	135	225	5,1	5,5	6,0	6,4	6,8	7,2	7,7				
	60	300	120	240	3,6	3,9	4,2	4,5	4,8	5,1	5,4				
	75	285	105	255	1,9	2,0	2,2	2,3	2,5	2,6	2,8				
	90	270	90	270	0	0	0	0	0	0	0				
70	0	360	180	180	8,9	9,7	10,5	11,2	12,0	12,7	13,5				
	15	345	165	195	8,6	9,4	10,1	10,8	11,6	12,3	13,0				
	30	330	150	210	7,7	8,4	9,0	9,7	10,3	11,0	11,7				
	45	315	135	225	6,3	6,8	7,4	7,9	8,4	9,0	9,5				
	60	300	120	240	4,5	4,8	5,2	5,6	6,0	6,3	6,7				
	75	285	105	255	2,3	2,5	2,7	2,9	3,1	3,3	3,5				
	90	270	90	270	0	0	0	0	0	0	0				
75	0	360	180	180	11,9	12,9	13,9	14,9	15,9	16,9	17,9				
	15	345	165	195	11,4	12,4	13,4	14,4	15,3	16,3	17,3				
	30	330	150	210	10,2	11,1	12,0	12,9	13,7	14,6	15,5				
	45	315	135	225	8,4	9,1	9,8	10,5	11,2	11,9	12,6				
	60	300	120	240	5,9	6,4	6,9	7,4	7,9	8,4	8,9				
	75	285	105	255	3,1	3,3	3,6	3,8	4,1	4,3	4,6				
	90	270	90	270	0	0	0	0	0	0	0				

### 3 Warning signals

All warnings (see also section 3.1) are indicated on the compass by means of a flashing decimal point.

A warning is indicated on the optional repeater compass by the multi-coloured LED changing from green (steady light) to yellow (flashing) and an audible alarm is emitted.

Once the warning has been acknowledged on the optional repeater compass the multi-coloured LED continues to flash yellow and the audible alarm stops.

The warning cannot be acknowledged on the compass itself. The warning (flashing decimal point on the compass and yellow LED on the repeater) remains until the fault that caused the warning has been corrected.

The course indicated on the digital display unit and on the repeater compass is not affected by the warning.

EXCEPT for warning 5 "voltage cut-off"

see section 3.1



The measures indicated for temporarily removing the warning message to some degree restrict the operating safety of the compass (if a door is opened, electrical operating safety, splash-proofing, and electro-magnetic compatibility are all reduced).



When warnings occur the gyro compass equipment continues to function without restriction. Correcting the causes in good time will prevent a failure. The possible causes of the error should be determined from the error code on the digital display and corrected accordingly.

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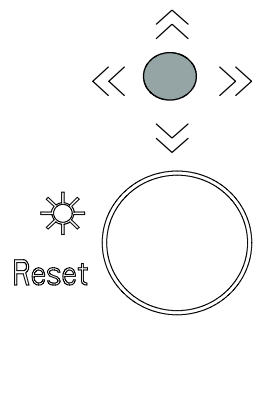
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When a warning occurs the decimal point on the compass's digital display unit flashes for as long as the warning is pending.



Decimal point flashes on the digital display

When a warning occurs the multi-coloured LED on the repeater compass flashes yellow and an audible warning is emitted. When the warning is acknowledged at the RESET button, this LED continues to light up yellow and the audible warning ceases.



Multi-coloured LED on repeater compass, audible warning





## 3.1 Warnings, their causes, and what to do

There are five different warnings (numbered 1 to 5).

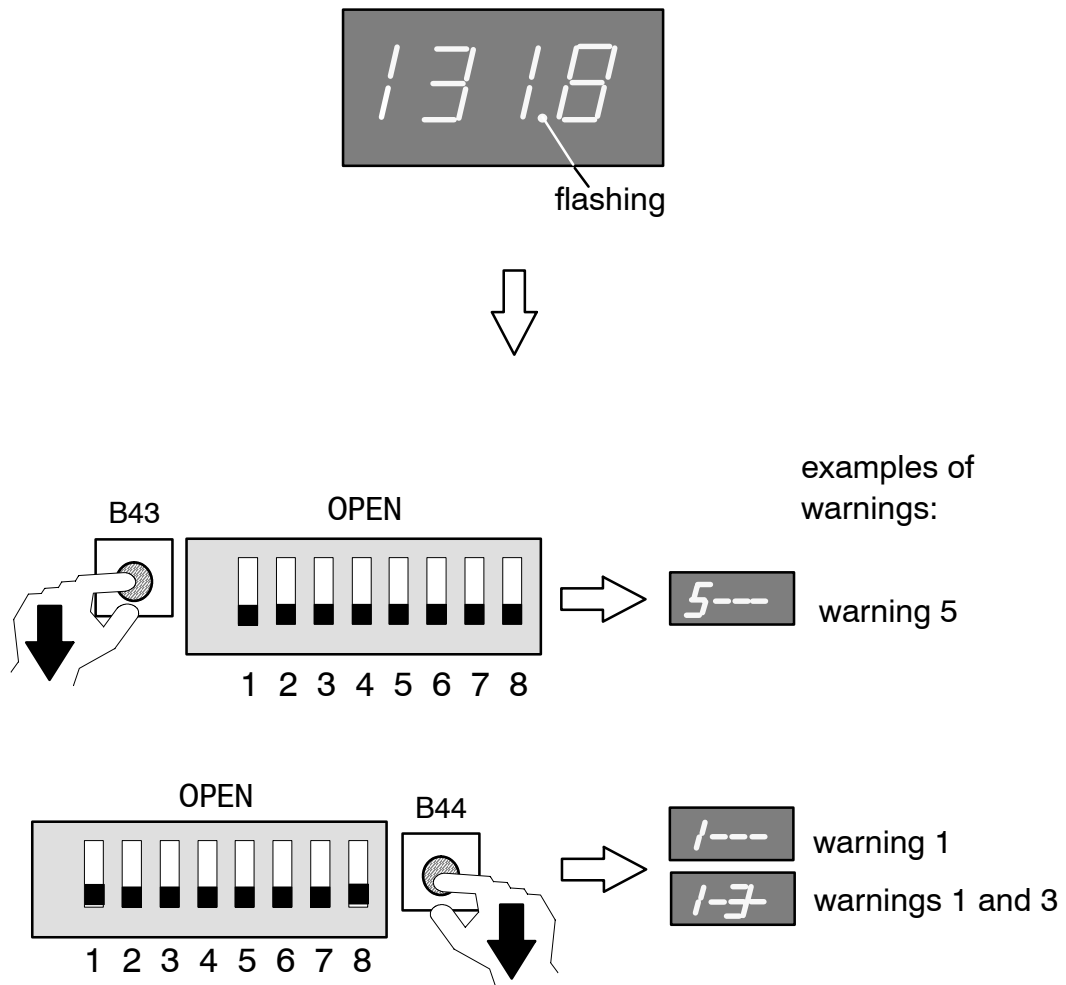
These warnings are displayed on the compass's digital display after the B43 and/or B44 button have been pressed once. Warnings 1 to 4 are displayed when button B43 is pressed, and warning 5 is displayed when button B44 is pressed (warnings 6 to 8 are reserved).

If several warnings occur at the same time, all the warnings are displayed (see figure 7).

The warnings are as follows:

1 = fan failure	}	button B 43
2 = heater failure		
3 = supporting liquid temperature is higher than 60° C		
4 = temperature controller failure		
5 = voltage cut-off	}	button B 44
6 = not connected		
7 = not connected		
8 = not connected		

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**Figure 7 :** How to display the warning messages.



---

## 3.1.1 Warning 1 "Fan failure"

This warning is generated if the fan does not switch itself on as a result of the temperature of the supporting liquid (it should switch on when the supporting liquid reaches 51 °C ).

Whether the fan is operational or not is registered from the fan's current consumption; it therefore follows that the fan is defective if this warning is displayed. To prevent overheating as a result of the fan failure, the following action is recommended:

- check to see if the fan vent screen is covered over and check to see that air can enter the enclosure unhindered at the base of the enclosure.
- open the doors on the compass
- if necessary cool the outer sphere using an external fan.

Continue thus until warning 1 stops.

**It is essential that the fan be replaced at the earliest opportunity (see service manual)**

## 3.1.2 Warning 2 "Heater failure"

This warning is output when the heater (within the range of 48 °C to 45 °C ) has failed.

Compass operation is not restricted. To prevent the supporting liquid from cooling further, it is recommended that you do the following:

- close the doors to the compass - or
- introduce warm air

These measures should be continued until warning 2 ceases.

**It is essential that the heater be replaced at the earliest opportunity (see service manual)**

## 3.1.3 Warning 3 "Supporting liquid > 60°C "

This warning is output if the temperature of the supporting liquid goes above 60 °C .

To prevent the temperature from rising any further, the following measures are recommended:

- open the door on the compass.
- if necessary cool the outer sphere using an external fan.
- check the ambient temperature, if the ambient temperature is higher than 55 °C steps should be taken to cool it down.

Continue with these measures until warning 3 stops.

**If warning 3 is displayed in combination with warning 1, the fan must be replaced at the earliest opportunity (see service manual).**



---

## 3.1.4 Warning 4 "Temperature controller failure"

This warning is output if the temperature controller fails. The failure is detected by a voltage error on the temperature controller. The temperature is no longer being controlled. The temperature deviation warning (e.g. "heater failure" or "supporting liquid > 60 °C) will no longer be output.

This warning has no significant effect on compass function.

**It is essential that the temperature controller (upper cover of outer sphere) is replaced at the earliest opportunity (see service manual).**

## 3.1.5 Warning 5 "voltage cut-off"

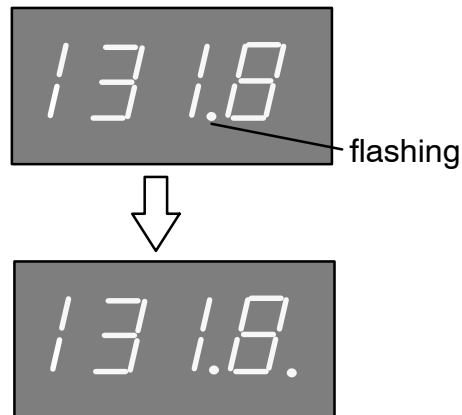
This warning is output if the supply voltage is cut off for a short time. The cut-off period is determined by the fall in supporting liquid temperature. If the temperature falls below 45 °C the compass recognises that the voltage supply has been switched off in the conventional way.

In the case of a voltage cut-off (supporting liquid temperature does not fall to below 45 °C ) and the voltage supply has been restored, the settling stage is indicated again (see also section 2.1.2.2 "GyroStar II indications during the settling stage").

This warning continues in the same way as the indications during the settling stage.

# Operator Manual

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If voltage cut-offs occur often, the following measures should be carried out:

- check on-board power supply
- check cable connection between on-board power supply and junction box
- check cable connection between on-board power supply and optional a.c./d.c. converter
- check cable connection between junction box and compass.

## 4 Alarm signals

Alarms are indicated on the compass as follows:

### **The course is not displayed!**

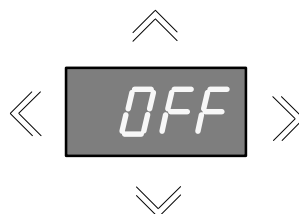
An alarm signal is indicated on the digital display by means of a flashing E (for Error) and a figure or a flashing "OFF". For example:



Possible errors are as follows:

- E1- Operating voltages in compass faulty
- E2- Gyrosphere supply faulty
- E3- Encoder faulty/CAN bus faulty
- E4- Gyrosphere current faulty
- E5- Gyro Compass internal Follow-up system faulty
- E6- Temperaturesensor faulty
- E7- Pump operation faulty
- E8- Heater failure

EEPr EEPROM at the Sensor PCB defect

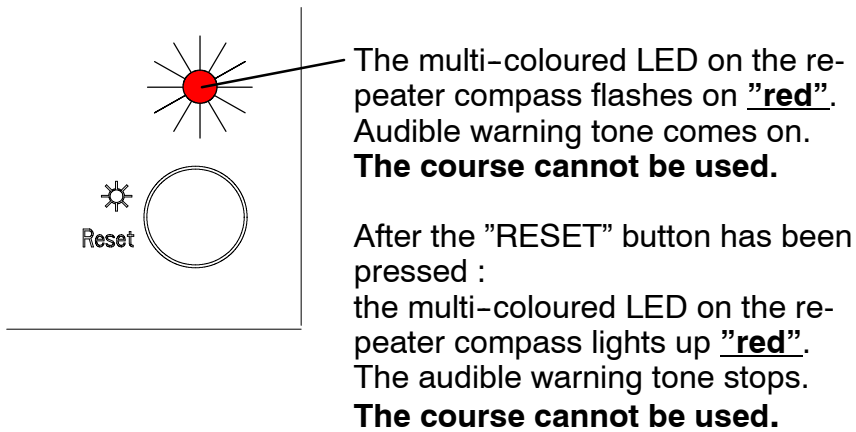


- OFF-: Supply voltage more than 10 V d.c./less than 12 V d.c.

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Alarms are displayed on the repeater compass as follows:



More detailed information about these errors and how to correct them can be found in the service manual.



## 5 Faulty (inaccurate) course indication

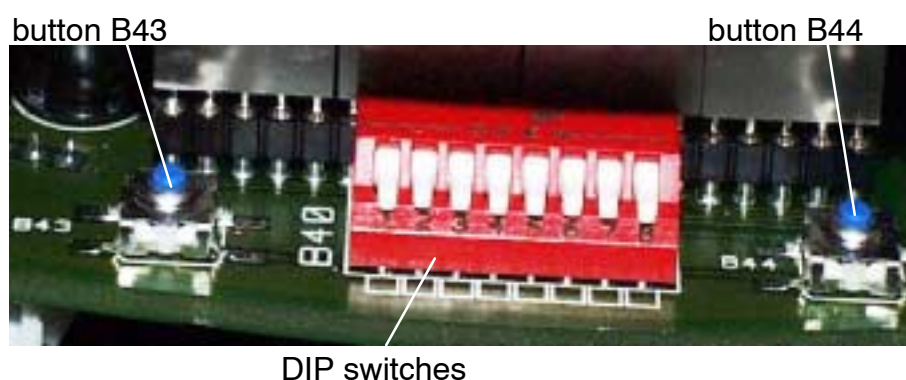
When the course indication is faulty and no error message or warning is displayed, it is necessary to carry out a compass zero setting (see also service manual, entering reference course).



The value used to set compass zero must be taken from reference bearings (landmarks) while at sea.

**The compass must be in operation at least 5 h.**

### 5.1 Zero setting procedure



**Figure 8** : arrangement of controls in compass

- 1) Open the compass doors
- 2) Switch DIP switch B40, position (1) to OPEN.
- 3 ) The digital display indicates "ALER" = alignment error
- 4) Press button B43 or B44.

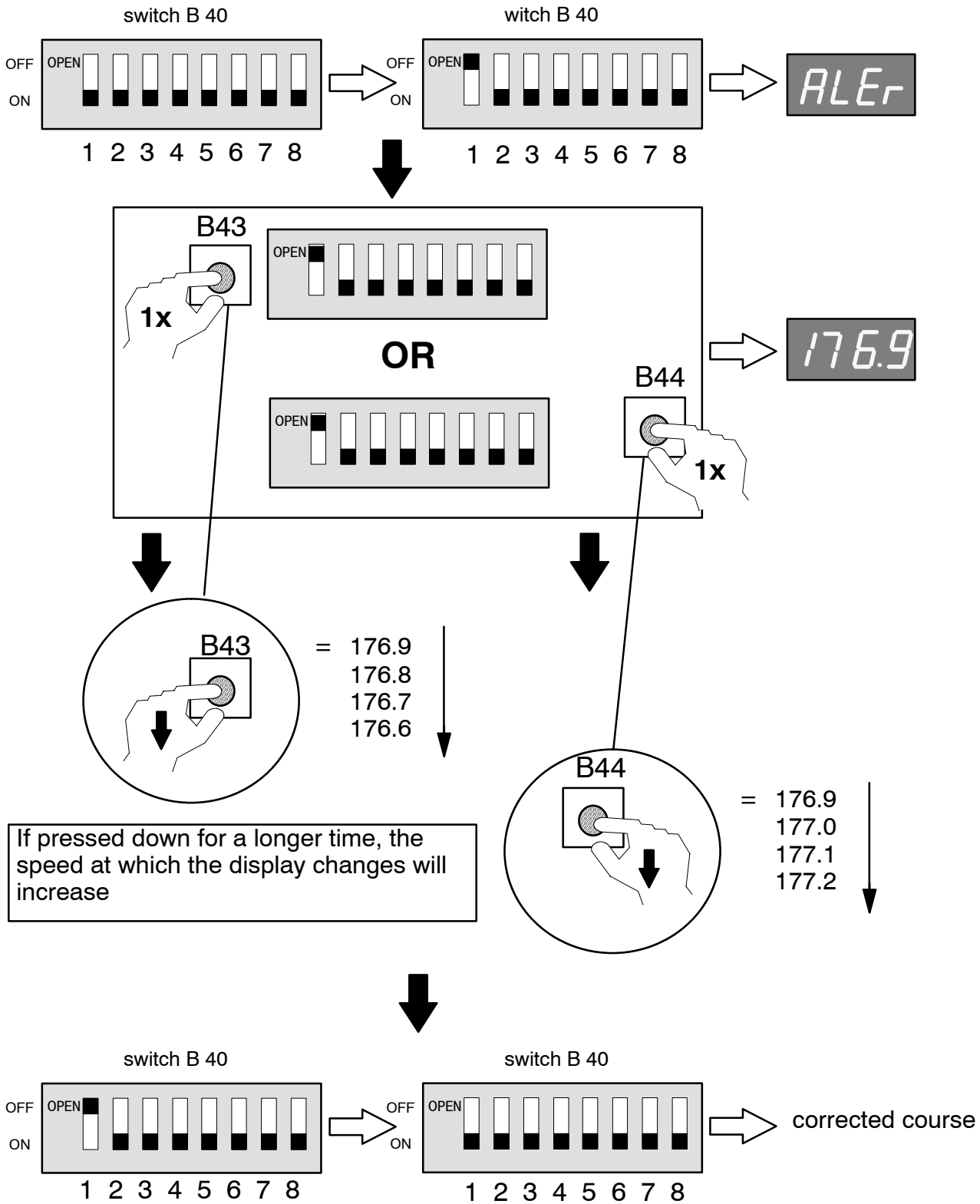
As they are pressed the course indication alters

(B43 counts downwards and B44 counts upwards)

If pressed down for a longer time, the speed at which the display changes will increase.

- 5) Switch DIP-switch B40, position (1) to OFF.

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## 6 Switching off the gyro compass

The gyro compass ceases to operate when the 24 V voltage supply is switched off.



### Caution!

- Maintenance and repair work should be carried out only by trained and qualified staff who are well versed in national safety regulations.
- After the gyro compass has been switched off it is necessary to wait at least 15 minutes before accessing the interior of the gyro compass. Otherwise the gyro system could be damaged.

## 7 Maintenance

GyroStar II components are maintenance-free

The supporting liquid and distilled water should be replaced every 3 years. Instructions for carrying out this operation are given in the service manual.

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