

# CD110

## COMPASS display



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# **1 Introduction**

This manual contains information about the operation, calibration and installation of the Compass Display 'CD110'.

The following information can be read from the CD110 display:

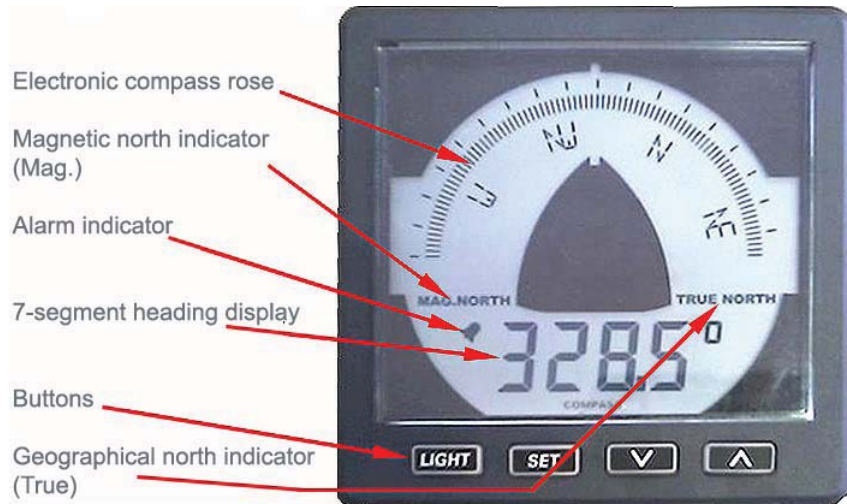
- Heading on electronic compass rose
- Heading on 7 segment display
- True North or Magnetic North
- Damping
- Variation
- Alignment
- Off course alarm

## **1.1 Package contents**

- CD110
- 2 female 6-pole connectors
- 1 female 4-pole connectors
- Mounting seal
- 4 metal rings+ M4 screwnuts
- Drill Template
- Quickstart instruction leaflet

## 2 Working

### 2.1 The display



### 2.2 Summary of operating functions



The unit has four control buttons. These buttons have the following functions:

- **Light** : press the LIGHT button one or more times to change the backlight intensity or when in a menu this works as a reset button.
- **Set** : press the SET button to access the menu.  
Use up/down keys to choose one of the menus and press SET to enter the menu. If you press the SET button for more than 2 seconds you will exit the menu.
- **Down** : on/off setting for the 'off course alarm' or when in a menu it works as a button to select a menu or change settings.
- **Up** : select 'true' or 'mag' north, when in a menu it works as a button to select a menu or change settings.

The function of a button is activated when the button is released, both UP and DOWN buttons have an automatic repeat function. The buttons have a timeout of 1 minute.

#### 2.2.1 Button sound

On the release of a button you will hear a key sound.

This sound can be switched off in the menu 'Key Sound' (ST4).

### 3 Operating

#### 3.1 Switching on

The instrument must be switched on with a separate switch (there is no ON/OFF switch on the instrument itself).

All segments will be shown for 2 seconds. Then four horizontal lines are displayed while the display is waiting for compass data.



#### 3.2 Default view

In the default view the current compass heading is shown.



#### 3.3 Backlight setting

The backlight has 7 settings:

- Level 1
- Level 2
- Level 3
- Level 4
- Level 5
- Remote
- Off

If the remote setting is chosen the brightness of the backlight will be set by a voltage applied to the backlight pin on the connector. See 'Connections' for pin information.



#### 3.4 Off Course Alarm

While in the default view, press the down button to switch the alarm on or off.



Before you can use the alarm you have to set the values. These have to be set by entering the Course alarm menu (ST1). If the alarm is on, the alarm indicator is displayed.

#### 3.5 Select magnetic or true north

While in the default view, press the up button to choose between mag. (magnetic) or true (geographical) north.



For true north indication, the variation has to be set first. This can be done in Variation menu (ST8).

## 4 MENU

### 4.1 Menu functions:

To access the menu you have to press the SET button. Every time the Up/Down button is pressed the next/previous menu item is shown, press SET to enter the menu.

- Course alarm                      St 1
- Damping                              St 2
- Display layout                      St 3
- Key sound                            St 4
- Contrast                              St 5
- Calibration                         St 6
- Align compass                      St 7
- Variation                             St 8
- Close menu

#### 4.1.1 Off course alarm (ST1)

The Off Course Alarm can be set for a certain course to steer by and a separate boundary on both sides of the course. The buzzer inside the unit will beep when the course is out of the boundary.

- Press SET in the default view to enter the menu, press SET again to enter the Course Alarm Menu (ST1).  
Use the up/down buttons to set the preferred course.
- Press SET and enter the Portside alarm boundary with the up/down buttons. This can be set from 2 to 45 degrees difference.
- Press SET and enter the Starboard alarm boundary with the up/down buttons. This can be set from 2 to 45 degrees difference.

If the "Set course" is 246, the "Limit portside" set to 3 and the "Limit starboard" is set to 2, then the alarm will sound if the course change is smaller than  $246-3 = 243$  and if the course is higher than  $246+2 = 248$  degrees.

Use the down button in the default view to set the Alarm ON/OFF (see 3.4).

#### 4.1.2 Damping (ST2)

Damping allows the user to change the damping level as conditions change. The damping controls the averaging period over which the heading is displayed. Damping does not make the compass less accurate, only slower. Damping levels can be set from Off and 1 up to 7. In normal conditions level 2 is used.

- Press SET in the default view to enter menu. Press the up/down buttons to select the Damping menu (ST2), press SET to enter the Damping menu.  
Use the up/down buttons to change the value.
  - Press SET short to enter the selected value or
  - Press the Light button to reset the value to default (2) or
  - Keep SET pressed for two seconds to exit to the default view.

### 4.1.3 Layout (ST3)

There are three different layouts for the compass rose.

- Press SET in the default view to enter the menu. Press the up/down buttons to select the Layout menu (ST3), press SET to enter the Layout menu.
- Use the up/down buttons to select a layout. A part of the selected layout is shown in the compass rose text field.
  - Press SET short to enter the selected value or
  - Press the Light button to reset the value to default (1) or
  - Keep SET pressed for two seconds to exit to the default view.

Example:   press SET ->           ST1 Course alarm  
          press up 2X ->       ST3 Display Layout  
          press SET ->       Layout 1= N NE E  
          press Up/Down ->   Layout 2= N | E  
          press SET 2 seconds -> Default Display (1)



Layout 1



Layout 2



Layout 3

### 4.1.4 Key sound (ST4)

Press SET and use the up button to select the ST4 menu. Press SET to enter the menu and now you can choose ON or OFF by pressing the up/down buttons.

- Press SET short to enter the selected value or
- Press the Light button to reset the value to default (ON) or
- Keep SET pressed for two seconds to exit to the default view.

### 4.1.5 Contrast (ST5)

Press SET and use the up button to select the ST5 menu. Press SET to enter the menu and now you can choose a value between 0 to 9 by pressing the up/down buttons.

- Press SET short and press the up/down buttons to select a contrast.
- Press the Light button to reset the value to default (0) or
- Keep SET pressed for two seconds to exit to the default view.

### 4.1.6 Calibration (ST6)

This Calibration menu can only be used in combination with the LCS, ECS1 or ECS3 compass.

Press SET and use the up button to select the ST6 menu. Press SET to enter the menu and now you can choose Auto or Manual by pressing the up/down buttons.

#### **4.1.6.1 Automatic calibration**

Function not used

You can switch this function OFF and use the manual calibration command.

#### **4.1.7 Align (ST7)**

Alignment error adjustment should be done by taking a couple of known runs from a chart and compare the magnetic heading with the mag. heading shown on the display. The difference can be compensated by setting the Align value.

- Press SET and up/down to select the Align menu (ST7). Press SET to enter the menu. Use the up/down buttons to set the offset. This can be set in steps of 0.1° up to +/- 99°.

To exit the menu press SET once or keep SET pressed for two seconds to exit to the default view.

#### **4.1.8 Variation (ST8)**

The Variation can be set to compensate the magnetic heading so that the display shows the geographical (True) heading.

- Press SET and up/down to select the Variation menu (ST8). Press SET to enter the menu. Use the up/down buttons to set the offset. This can be set in steps of 0.1° up to +/- 45°.

To exit the menu press SET once or keep SET pressed for two seconds to exit to the default view.

#### **4.1.9 Error messages**

No data input : The CD110 has not received data for more than 5 seconds,  
Please check the connections

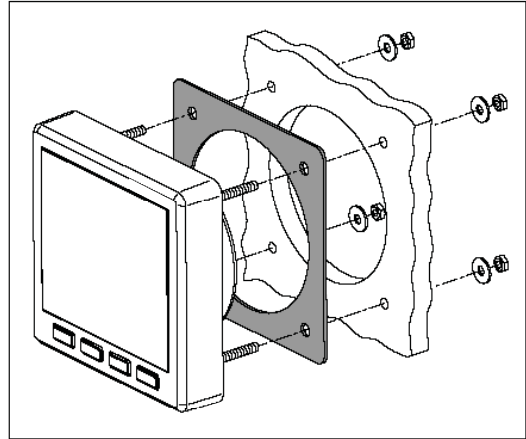
No response : No response after send a command:

- Check the connections or another not fully compatible compass is connected.

## 5 Installation

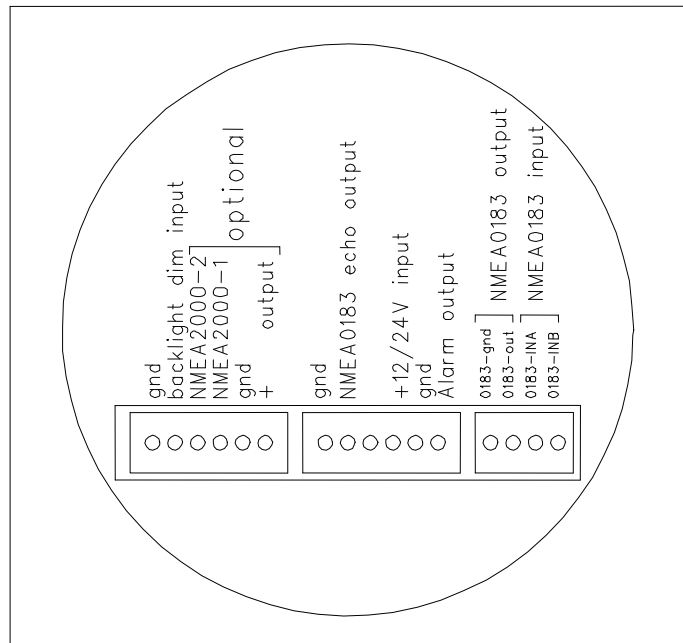
### 5.1 Mechanical

For dimension see chapter 7.  
Using the template provided, cut out openings in the instrument panel or bulkhead. Attach the meter using the 4 threaded rods and nuts provided.  
Ensure that the seal fits correctly between the meter and the panel or bulkhead.



### 5.2 Connections

For wiring diagram see chapter 8.  
Connect the cable from the compass sensor as shown in the diagram. If you need to cut and rejoin the cable be sure to connect colour to colour.  
The CD110 display is suitable for both 12 and 24 Volt DC.  
Connect the power supply as per diagram.  
See chapter 8 for the optional connections.



## 6 CD110 Specifications

### 6.1 Hardware

Resolution 0.5 deg.

Adjustable backlight : 5 brightness levels, off and external input

Reverse battery protection

Interface options :

- NMEA 0183 (Standard)
- NMEA 2000 (Optional)
- Bluetooth (Class 1)

The interface options are not user installable.

Power supply :	40mA @ 12V, 20mA @ 24V
Backlight current max. :	40mA (extra)
Bluetooth current max. :	100mA (extra)
NMEA2000 current max. :	100mA (extra)
Operating temp. range :	-20 to +70 °C
Dimensions :	110 x 110 x (24,5 + 31,5mm)
Weatherproof Sealed:	according to IP66
Alarm Output:	Open collector, max. 100mA

### 6.2 NMEA0183 messages

The CD110 uses standard NMEA0183 messages but also some special calibration commands and messages.

Receive standard message:

\$HCHDg,X.X,Y.Y,v,Z.Z,Q\*CC<13><10>

X.X = compass heading

Y.Y,v = not used

Z.Z = variation

Q = variation available (a) or invalid (v)

CC = Checksum field

<13> = carriage return

<10> = line feed

Checksum = The checksum is the last field in a message and follows the checksum delimiter character “\*”. The checksum is the 8-bit exclusive OR (no start or stop bits) of all characters in the message, including “,” delimiters, between but not including the “\$” and the “\*” delimiters.

Special commands:

\$IIElP,CAL,ECS,STRT*CC<13><10>	// Start calibration command
\$IIElP,CAL,ECS,STOP*CC<13><10>	// Stop calibration command
\$IIElP,CAL,ECS,AUTO*CC<13><10>	// Auto calibration command
\$IIElP,CAL,ECS,MANU*CC<13><10>	// Disable auto calibration command
\$IIElP,CAL,ECS,VARI,X.X*CC<13><10>	// Variation value command
\$IIElP,CAL,ECS,ALIG,X.X*CC<13><10>	// Align value command
\$IIElP,CAL,ECS,SFWR*CC<13><10>	// Software version command

Response message:

```
$IIELP,CAL,ECS,DONE*CC<13><10> // message "Done"  
$IIELP,CAL,ECS,FAST*CC<13><10> // message "Fast"  
$IIELP,CAL,ECS,SLOW*CC<13><10> // message "Slow"  
$IIELP,CAL,ECS,STRT*CC<13><10> // message "Start"  
$IIELP,CAL,ECS,STOP*CC<13><10> // message "Stop"  
$IIELP,CAL,ECS,SFWR,X.X,Y,Z*CC<13><10> // X.X: Software version.  
Y:1=ECS1; 2=ECS2; 3=ECS3; 4=LCS  
Z: 1=NMEA0183;  
2=NMEA2000  
3=Bluetooth
```

### 6.3 Bluetooth (optional)

Class-1 compliant: Up to 100 meter range (free field)  
Antenna: Integrated  
Carrier frequency : 2402Mhz to 2480Mhz  
Output power: 14dBm typ.  
Messages: NMEA0183 format (see 7.2)

### 6.4 NMEA2000 (optional)

Update rate : 10 cycles per second  
PGN 126208 : Request/ Command/ Acknowledgment Group function  
PGN 59392 : Acknowledgment  
PGN 59904 : Request  
PGN 60160 : Transport Protocol, Data Transfer  
PGN 60416 : Transport Protocol, Connection Management  
PGN 60928 : Address Claim  
PGN 126996 : Product information  
PGN 126464 : Transmit/ Receive PGN List Group Function  
PGN 127250 :  
1. SID Sequence ID INT8 unsigned  
2. Heading Sensor Reading INT16 unsigned  
3. Deviation INT16 signed Not used  
4. Variation INT16 unsigned  
5. Heading sensor reference 2 bits 0=True  
1=Magnetic  
2=Error  
3=NULL  
6. Reserved bits variable

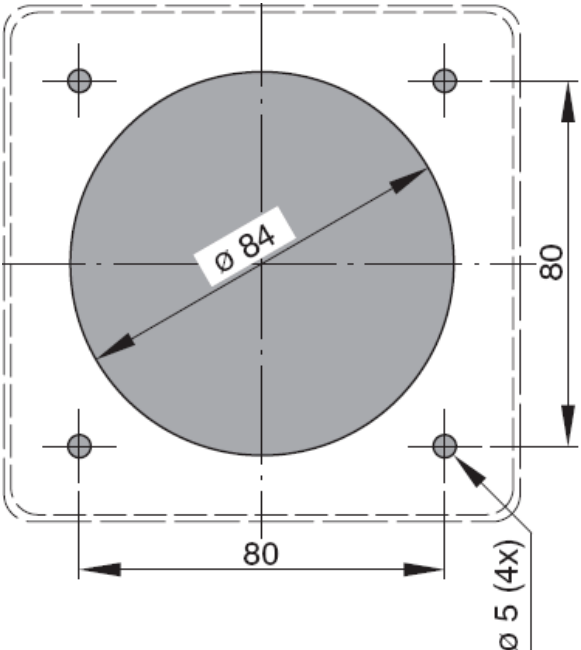
### 6.5 Certifications

Maritime Navigational and Radiocommunication  
Equipment & Systems : according to IEC 60945  
EMC : Conducted/Radiated Emmission : according to IEC 60945-9  
Conducted/Radiated Immunity : according to IEC 60945-10  
Safety : Dangerous voltage, etc. : according to IEC 60945-12

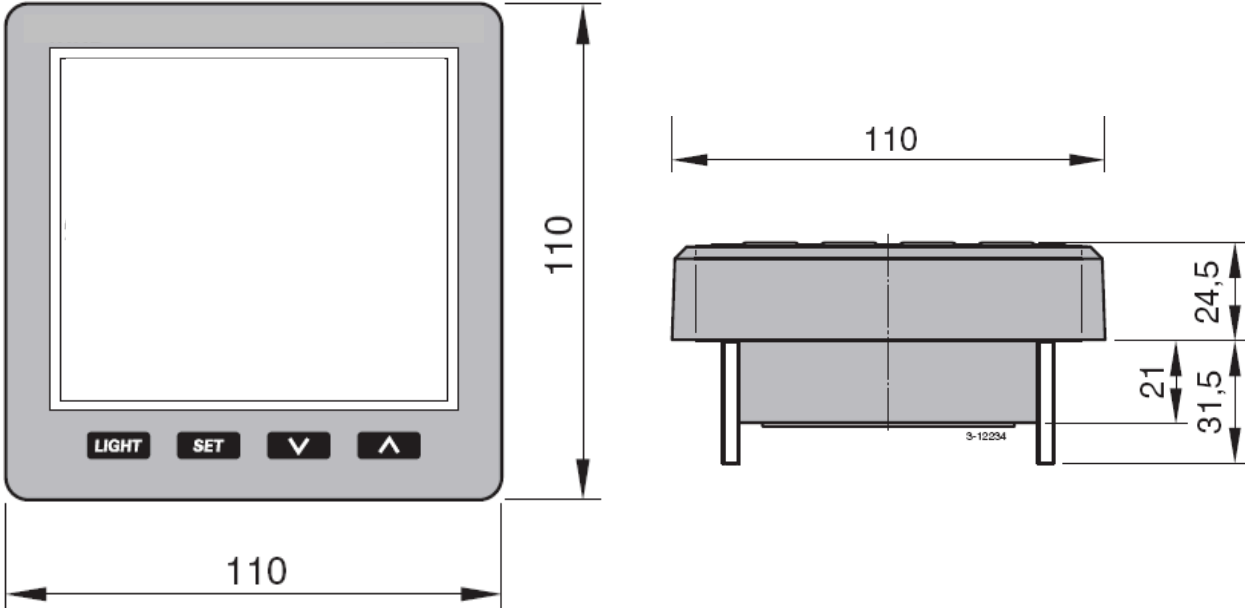


# 7 Overall dimensions

## 7.1 Drill pattern (included on separate sheet)



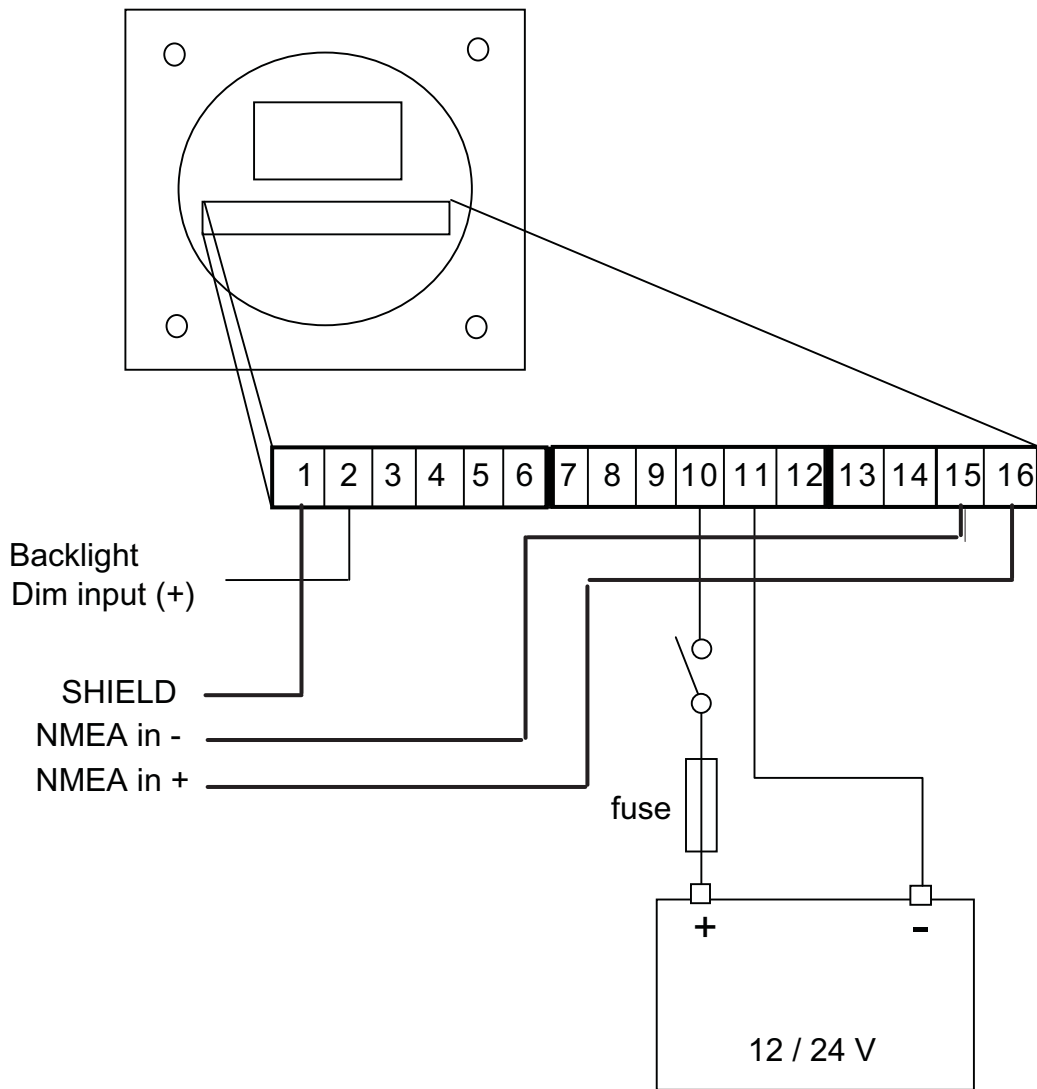
## 7.2 Outside dimensions



# 8 Wiring diagrams

## 8.1 pin assignments

- 1 GND shield
- 2 Backlight dim input (0 to 12V or 0 to 24V, autosense)
- 3 NMEA2000-2 (optional)
- 4 NMEA2000-1 (optional)
- 5 GND
- 6 +12V/+24V Compass power output
  
- 7 GND
- 8 NMEA0183 echo of NMEA input (pin 15 and 16)
- 9 Not used
- 10 +12V/+24V Battery power input (use power switch and 500mA fuse)**
- 11 Battery GND**
- 12 Alarm output (max. 100mA open collector)
  
- 13 NMEA0183-gnd } OUTPUT
- 14 NMEA0183-out } OUTPUT
- 15 NMEA0183-INA } INPUT
- 16 NMEA0183-INB } INPUT



## **8.2 optional connections**

### **8.2.1 Backlight**

The backlight input is an autosense input which means that the applied voltage is relative to the battery voltage. If the battery voltage is 12V the backlight setting is maximum when the applied voltage to pin 2 is 12V. If the battery voltage is 24V and the applied voltage to pin 2 is 12V the brightness will be dimmed.

**PIN 2 Backlight dim input (0 to 12V or 0 to 24V, autosense)**

### **8.2.2 NMEA0183 echo**

The NMEA echo pin is used for connecting other devices who also need the NMEA messages from the compass sensor.

**PIN 8 NMEA0183 output, in combination with GND pin 7**

### **8.2.3 Alarm output**

The Alarm output is used for connecting an external warning device such as a buzzer. If more than 100 mA is needed a small relay should be used.

**PIN 12 Alarm output, in combination with the battery + pin**

## **8.3 Service menu**

To enter the service menu you have to press SET when you switch the power on.

### **8.3.1 Display info**

Press set to view: Display type, interface, software version.

### **8.3.2 Compass info**

Press set to view: Compass type, interface, software version.

### **8.3.1 Display reset**

Press SET to reset the display to factory settings.

### **8.3.2 Compass reset**

Press SET to reset the compass to factory settings.

### **8.3.2 Close menu**

To exit the service menu press SET.

COMPASS  
INDICATOR  
CD110

