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Ships and marine technology — Marine magnetic compasses, binnacles and azimuth reading devices

AMENDMENT 1

Navires et structures maritimes — Compas magnétiques marins, habitacles et alidades

AMENDEMENT 1

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Ships and marine technology — Marine magnetic compasses, binnacles and azimuth reading devices

AMENDMENT 1

Normative references

Add the following document as a normative reference:

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test*

Annex F

Add the following sentence at the end of the annex:

See Annex I for practical specifications and requirements of compass safe distance measurements.

Annex I

Add the following annex after Annex H, before the Bibliography:

Annex I
(informative)

Compass safe distance measurement

I.1 General

This Annex gives practical specifications and requirements on implementing compass safe distance measurements as determined in Annex F. It covers general test conditions, test equipment and test procedures for typical test layouts, in accordance with the requirements in Annex F.

I.2 Test conditions

a) Ambient conditions:

The temperature and relative humidity shall be in accordance with the ambient conditions specified in IEC 60945:2002, 5.2.1.

b) Power supply:

Power supply tolerances shall be in accordance with IEC 60945:2002, 5.2.1.

c) Electromagnetic conditions:

The magnetic environment of the test site shall be independent of any ferromagnetic or electromagnetic influences that can disturb the measurement, the test equipment, the EUT or the earth's magnetic field.

NOTE To achieve this, methods can be taken, such as the use of a homogeneous stabilizing artificial magnetic field to minimize negative effects on the measurement caused by the environment.

I.3 Test equipment

Unless otherwise specified, the following applies:

a) magnetic field generator and Helmholtz coils for magnetization [see Annex F b)] shall conform to IEC 61000-4-8:2009, 6.2 and 6.3;

b) equipment used in the test shall not cause additional electromagnetic interference.

I.4 Test methods

I.4.1 General requirements

a) Mounting kits, stands and other options, accessories and fittings which are normally used and provided with the EUT shall be fitted to the EUT during the measurement. If not, each unit of the EUT should be tested.

As it is unclear how cables, hat rails or other relevant parts are installed in ships, it is possible that these parts are not included in the measurement, even though they should be clearly considered as not a part of the vessel or as a part of the EUT.

b) The EUT shall be tested in the position, attitude and the load condition at which the error produced at the measurement sensor is a maximum, i.e. the EUT's strongest pole.

To find out this strongest pole, the EUT shall be rotated. If the EUT has a fixed mounting direction on the vessel, keep this direction unchanged and rotating from other aspects. Other adjustment can be required to peak any magnetic disturbance on the measurement sensor if the EUT has alternate mounting positions.

The EUT's relative height to the measurement sensor shall be adjusted. If no characteristic pole of the EUT is detected, half of the height of the EUT shall be placed at the same height as the sensor.

If there are variants of the EUT, the strongest pole shall be chosen by the laboratory with the help of the manufacturer for the measurement. The other variants may then be fitted with the same compass safe distances as the strongest pole.

c) The requirements for magnetization are in accordance with IEC 61000-4-8:2009, 8.3 a) and b).

The steps of the magnetization procedure are as follows:

1) Place the EUT in the centre of the Helmholtz coils, oriented with its strongest pole direction in line with the axis of the coils.

2) Increase the DC power up to the required values.

3) Increase the AC power to the required value.

4) Decrease the AC power slowly to zero.

5) Reduce the DC power slowly to zero.

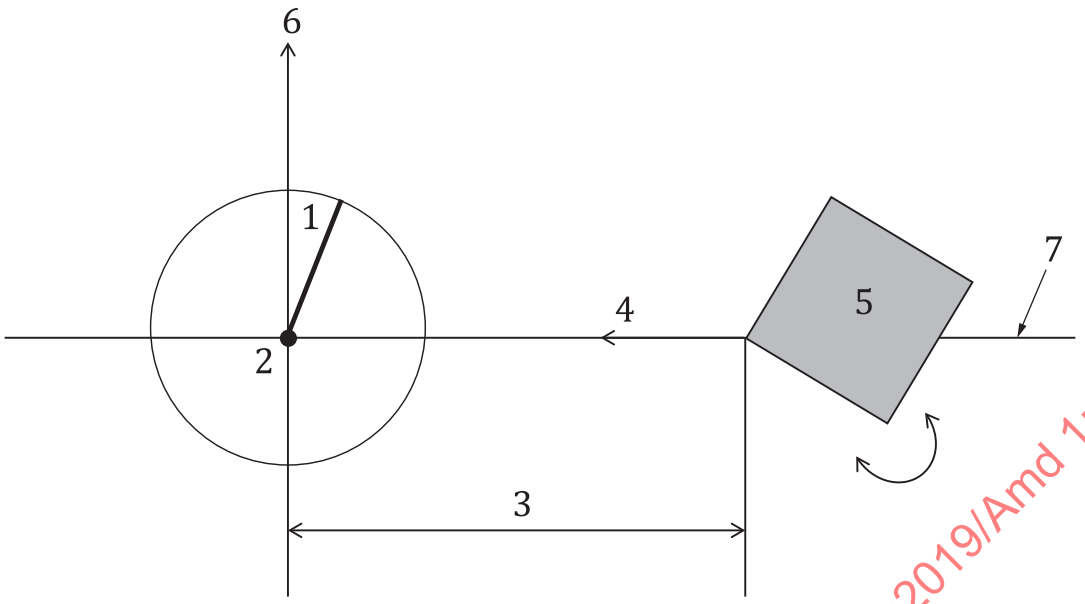
6) Move the EUT to the place of measurement. Do not switch off the power supplies until the EUT is removed from the Helmholtz coils.

According to Annex F, an exemption from the AC stabilizing field is allowed if damage to the EUT can result, so steps 3) and 4) can be omitted in that case. Any such exemption should be recorded.

I.4.2 Test method using an angle sensitive sensor

I.4.2.1 Description

The typical test layout is shown in Figure I.1.



Key

1 deflection angle $\theta = (X/H)°$, where $(X/H)°$ is $(5{,}4/H)°$ for the standard compass and $(18/H)°$ for the steering compass, H is the horizontal component of the magnetic flux density, in microteslas (μT), actually measured before or after the measurement at the place of testing.

2 sensor

3 safe distance D

4 direction of strongest pole

5 EUT

6 north

7 east–west line

Figure I.1 — Test layout using an angle sensitive sensor

This method uses an angle sensitive sensor that can directly indicate the effect caused by the EUT as an angle.

The safe distance is determined by the distance between the nearest point of the EUT and the centre of the sensor when the indicated angle equals to the maximum deflection angle, as specified in Annex F.

The resolution of the sensor shall be capable of showing angle differences of at least 0,1°, and the accuracy shall be not less than ±0,5°.

NOTE 1 The angle sensitive sensor in this case can be a magnetic compass of Class A with a compass card greater than 165 mm in diameter, with graduations to 0,5°, and of a model type approved according to this document, or an electronic compass sensor which is a model type approved according to ISO 11606. Besides, any instrument that can achieve equivalent or higher measurement accuracy can be used.

NOTE 2 If a magnetic compass is used as a sensor, it is important to show prior to every measurement that there is no friction at its pivot point. If an electronic compass is used as a sensor, it is important to show prior to any measurements that there is no (electronic) damping implemented in the system.

I.4.2.2 Test procedure

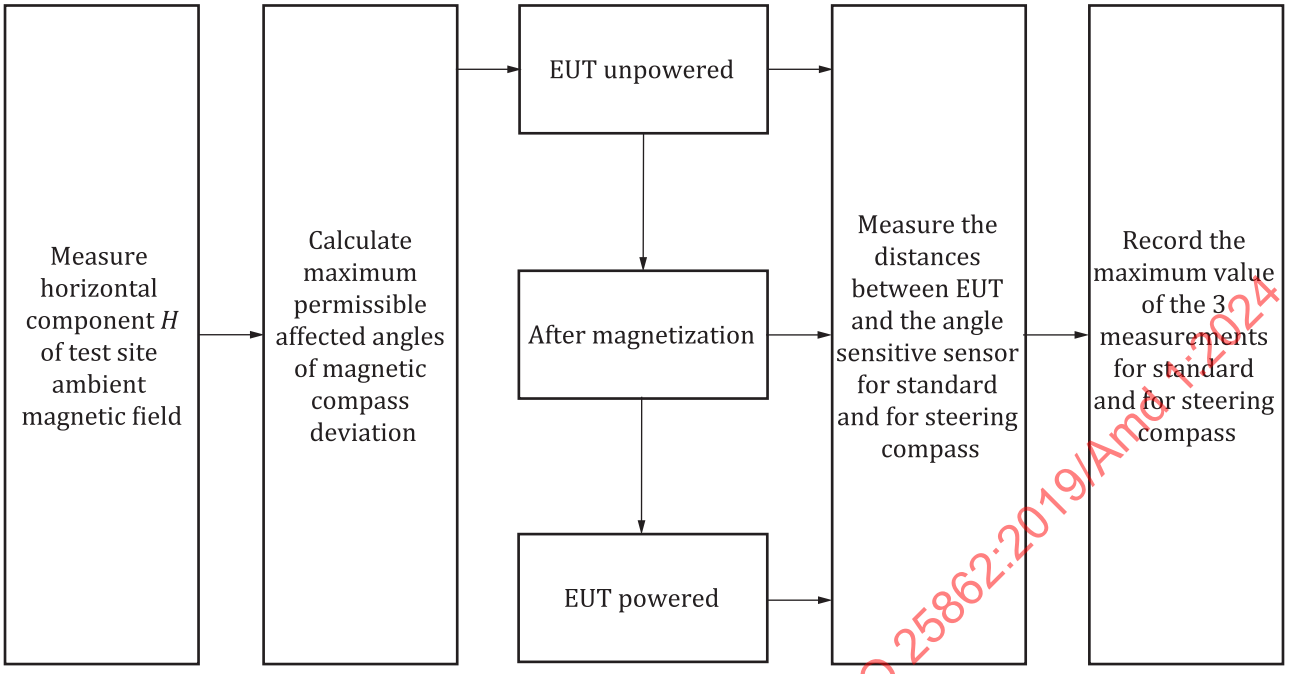


Figure I.2 — Test procedure of method using an angle sensitive sensor

As shown in Figure I.2, the steps of the test procedure are as follows:

a) In absence of the EUT, measure the horizontal component H of the current ambient environmental magnetic field intensity using a suitable magnetometer with the probe fixed at the test position and aligned with magnetic north (0°). Record the value and use it for calculating the permissible maximum deviations $(5{,}4/H)°$ and $(18/H)°$ for test step d).

b) Align the angle sensitive sensor with magnetic north so that the measured deflection is 0. It is also permitted to start from any angle and observe the change from this starting point.

c) Place the EUT on an east–west line passing through the centre of the sensor at a constant distance. With the sensor remaining stationary, re-orient the EUT and adjust its relative height to the sensor respectively until the sensor deflection is maximized. It is also important to perform this in accordance with the requirements in I.4.1 b).

NOTE 1 While performing c) only, methods can be taken to reduce H in the testing site to increase the sensitivity of the angle sensitive sensor for the influence of the EUT, which makes it easier to find the strongest pole of the EUT. An example is a laboratory equipped with a homogeneous stabilizing artificial magnetic field.

d) With the orientation determined by c) unchanged, move the EUT along the east–west line until the beforehand calculated permissible deviation is observed. Record the distance D between the centre of the sensor and the nearest point of the EUT.

e) Repeat the steps c) and d) for each of the two remaining conditions given in Annex F in the order in which they appear.

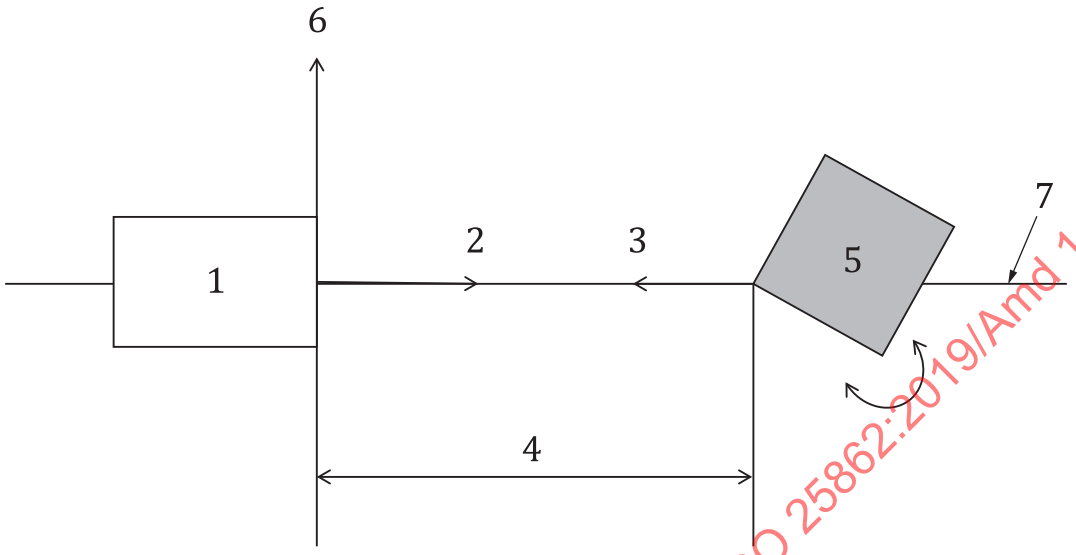
f) The largest D obtained at the three conditions is the safe distance. Round up the values obtained to the nearest 50 mm or 100 mm.

NOTE 2 The procedure above is aimed to give a general example of implementing the measurement. As there can be special cases, special test steps in addition to the procedure can be needed.

I.4.3 Test method using a magnetic sensor

I.4.3.1 Description

The typical test layout is shown in Figure I.3.



Key

1 magnetic sensor
2 sensing direction
3 direction of strongest pole
4 safe distance D
5 EUT
6 north
7 east–west line

Figure I.3 — Test layout using a magnetic sensor

In this method, all measurements are made using a magnetic sensor reading in microteslas (μT), to establish the maximum permissible deviation angle as converted into magnetic field strength (μT) by using the appropriate formula.

The safe distance is determined by the distance between the nearest point of the EUT and the centre of the sensor when the indicated value equals to the maximum permissible field strength calculated by Formulae (I.1) and (I.2).

The magnetic sensor shall be capable of a reading accuracy of at least 0,1 μT.

I.4.3.2 Test procedure

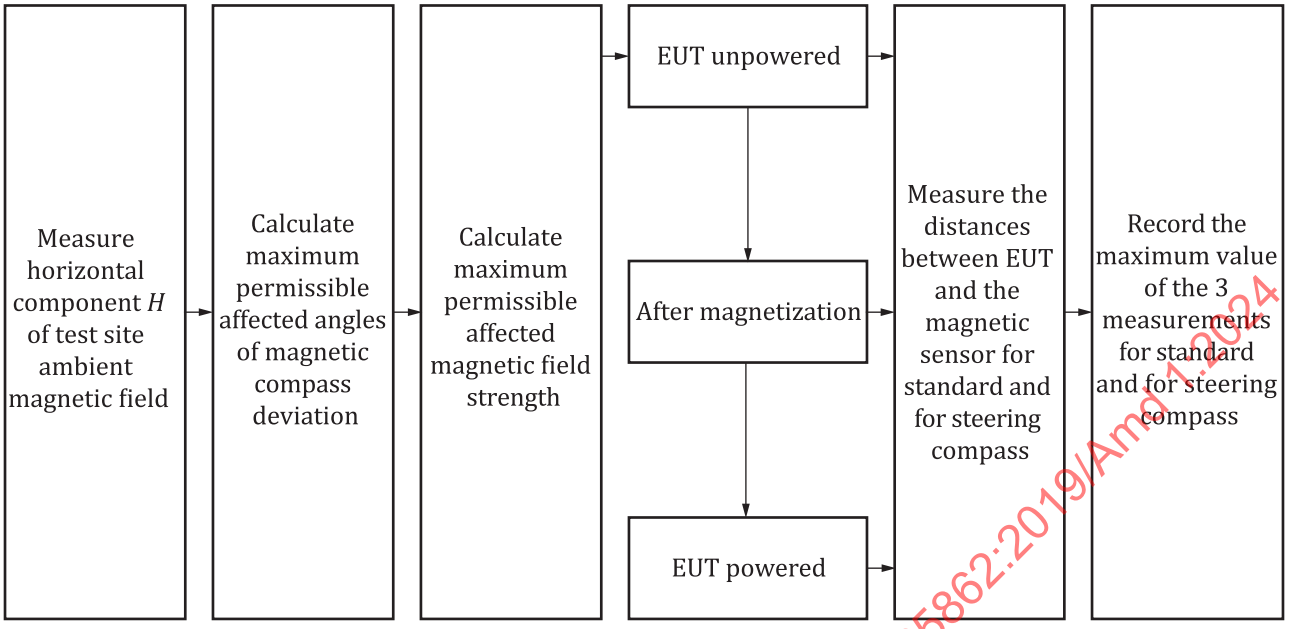


Figure I.4 — Test procedure of method using a magnetic sensor

As shown in Figure I.4, the steps of test procedure are as follows:

a) In absence of the EUT, measure the horizontal component H of current ambient environmental magnetic field intensity using a suitable magnetometer with the probe fixed at the test position and aligned with magnetic north (0°). Record the value and use it for calculating the permissible maximum deviations $(5{,}4/H)°$ and $(18/H)°$ for test step c).

b) Calculate the maximum permissible field value H_{EUT} using Formulae (I.1) and (I.2):

$$\theta = (X/H)° \quad \text{(I.1)}$$

$$H_{EUT} = H \times \tan\theta \quad \text{(I.2)}$$

c) Place the magnetic sensor's sensing direction perpendicular to north so that its reading is 0. Alternatively, the sensor can have an initial reading H_i but it shall be cancelled out in the following step e).

d) Place the EUT on the magnetic sensor's sensing axis at a constant distance. With the sensor remaining stationary, re-orient the EUT and adjust its relative height to the sensor respectively until the sensor reading is maximized. It is also important to perform this according to the requirements in I.4.1 b).

e) With the orientation determined by d) unchanged, move the EUT along the axis until the sensor's reading reaches H_{EUT}, or $H_{EUT} + H_i$ if the sensor has an initial reading H_i. Record the distance D between the magnetic sensor and the nearest point of the EUT.

f) Repeat the steps d) and e) for each of the two remaining conditions given in Annex F in the order in which they appear.

g) The largest D obtained at the three conditions is the safe distance. Round up the values obtained to the nearest 50 mm or 100 mm.

NOTE The procedure above is aimed to give a general example of implementing the measurement. As there can be special cases, special test steps in addition to the procedure can be needed.