

Purpose:

The e-learning module is designed for theoretical training of navigators at operational level in accordance with Chapter II of the STCW Convention in the part concerning of earth's magnetic field and its use in navigation.

What is an e-learning module?

E-learning module is the electronic textbook on one or more sections. Theoretical materials can be accompanied by drawings, diagrams, photos, animations and videos. There is a test for assessment of knowledge gained at the end of each section.

Contents:

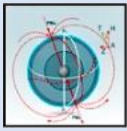
- Earth's magnetic field. Magnetic meridian.
- Magnetic declination. Isogon. Agon.
- The concept of a magnetic compass.
- Magnetic compass deviation.
- Compass points. Magnetic compass error.
- Determination of magnetic compass deviation.
- The use of the terms "conversion of the points" and "correction of the points".

Target groups

Deck - Operational

Ship types

Generic

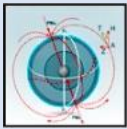


Regulations

Table A-II/1 STCW Code

Competence:

Plan and conduct a passage and determine position



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Section 2. Magnetic declination. Isogon. Agon.

Magnetic declination (d) - the angle of mismatch of the northern parts of the magnetic and true meridians at a given point. It is counted from the true meridian to E (+d) and to W (-d) - Fig.3.

The magnetic declination varies between $0^\circ - 180^\circ$. So, on the meridian of the north magnetic pole $\lambda = 100^\circ$ W at a point with $\varphi = 75^\circ$ N, the magnetic declination is $d = 0^\circ$, the directions to the poles are true and magnetic, and at points between the poles, for example, at $\varphi = 77^\circ$ N, magnetic declination $d = 180^\circ$, i.e. the directions to true and magnetic plus are opposite.

Figure 3

Figure 4

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Section 3. The concept of a magnetic compass.

In Fig. 8, the compass binnacle is made of silumín - an alloy of silicon with aluminum - and consists of three parts: 1 - upper base; 2 - housings; 3 - lower base.

The compass binnacle with a cardan ring is placed in the upper base. The base is also adapted for the installation of soft iron in it, with the help of which the quarter deviation is destroyed. In the body of the binnacle there is a deviation device in the form of a hollow brass pipe with two movable carriages of the same design.

Figure 8

The direction finder is used to find the direction of objects and celestial bodies in order to determine the position of the vessel, identify the compass correction and solve other navigational tasks. With the help of a direction finder, the heading angles of objects are also determined.

The direction finder consists of a base - 7, far - 2 and azimuth - 4 vanes, deflector cup - 6, reflector vane - 1, triangular prism - 5, two shade glasses - 3.

Figure 9

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Section 4. Magnetic compass deviation.

On fig. 10 shows that the hull is magnetized in such a way that the ship's magnetic field forms its own field strength vector N m S m, shown by the small vector Oa . Interacting with the Earth's magnetic field (shown by the large vector ON_m), the ship's magnetic field forms the resultant vector ON_k (shown in dotted line in Fig. 10), along which the magnetic system of the compass is installed on this course. Its orientation deviates from the direction of the magnetic meridian at a given point by an angle δ , called the deviation of the magnetic compass (Fig. 10).

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Section 5. Compass points. Magnetic compass error.

Section 5. Compass rhumbs.
Magnetic compass error.

Navigation parameters measured with a magnetic compass include compass course, relative bearing, and compass bearing (or back compass bearing).

Formulas (72 - 78, in Fig. 13) reflect the relationship of parameters related to the magnetic compass. Some of the parameters are shown in fig. 12.

Fig. 12

The compass course (CC) is the angle between the Nordic part of the compass meridian and the course line (the bow of the ship's ML), measured by direct observation of the reading from the compass card along the heading line.

Compass bearing (CB) is the angle between the north part of the compass meridian and the line of sight of some landmark.

The back compass bearing (BCB) reports from the CB at 180° . It is obtained by taking a reading from a card through

Fig. 13

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Section 6. Determination of magnetic compass deviation.

On each of the eight MCs (with fixed CCs), the values of δ obtained by formula (80) are plotted on a graph (Fig. 16). Degrees CC (MC) are plotted along the abscissa axis, degrees δ are plotted along the ordinate axis. Then, a consonant deviation curve is carried out using a pattern.

After plotting the curve, every 10° compass courses, the values of δ are taken, writing them down in the working table of the residual deviation of this compass. In order to select δ from the deviation table for a specific CC, it is necessary to interpolate between its adjacent values in a 10-degree interval. The corresponding calculations are shown in example 1.

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Section 6. Determination of magnetic compass deviation.

Example 1. Using the deviation table: determine δ at $CC = 73^\circ$.

- From the table, select for $CC = 70^\circ \delta = -1.5'$ for $CC = 80^\circ \delta = -2.0'$.
- Thus, when the CC changes by 10° , δ changes by $(1.5' - (-2.0')) = (2.0' - (-0.5'))$, and when it changes by 1° - by $(0.05')$. Then, when the CC changes by 3° , the change $\delta = (0.05 \times 3 = -0.15' = -0.2')$
- Summ, $CC = 73^\circ \delta = -1.5' + (-0.2') = -1.7'$.

Answer: $\delta = -1.7'$

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