

## Additional information: Compass adjustment

Compass adjustment is needed to minimise the influence of the ship to the magnetic compasses ability to seek the earth's magnetic north. The ship as a whole is a magnet of it's own and has, on location of the magnetic compass binnacle, a certain direction and strength. This causes the compass not to show the actual magnetic north and, more importantly, reduces the compasses ability to seek the magnet north (magnetic moment). That's why ships needs compass adjustment; to reduce the residual deviation to a minimum and have a properly working compass which can be used for navigation when all other means of navigation are not available. After all, the magnetic compass is all that's left if electric power supply is not available. Note that it's not the compass itself that is being adjusted for, but the ship's magnetism on location of the magnetic compass.

Today, Datema employs four qualified compass adjusters in both Rotterdam and Delfzijl. ISO standard 25862 defines design criteria as well as type- and individual testing criteria for marine magnetic compasses. It also states when compasses need adjustment.

Magnetic compasses should be adjusted by a qualified compass adjuster when:

- a) they are first installed;
- b) they become unreliable;
- c) repairs or structural alterations have been made to the ship that could affect it's permanent and/or induced magnetism;
- d) electrical or magnetic equipment close to the compass is added, removed or altered;
- e) the recorded deviations are excessive or when the compass shows physical defects; or
- f) at any other time deemed necessary by the master for the safety of navigation.

All magnetic compasses shall be swung and adjusted no less often than

- every two years;
- after dry docking; or
- after significant structural work.

To establish whether the liquid filled compass itself is in proper condition, one can test this by placing a magnet near the compass, deflect the compass card by 90 degrees and then remove the magnet. The time it takes for the compass to return to within 1° to the magnetic meridian depends on the ship's location on earth, but should not exceed 56 seconds in the Netherlands. If this is not the case, the compass needs to be re-calibrated and certified in our workshop. If your ship is experiencing a lot of pitching and vibration, chances are that the sapphire in which the compass pin rotates, is damaged. Usually, this wear is negatively effecting the compass after a period of 2 year. Depending on whether the ship is experiencing a lot of pitching and vibration, this period can be even shorter. Another important indication for the need to have the compass re-certified is the presence of air bubble(s) inside the compass liquid. If there's an air bubble inside the compass greater than 25-30 mm in diameter, the compass needs to be re-filled and checked in our workshop prior to compensating.

The actual compass adjusting is done on board of the vessel while it's under way in actual operating conditions. After you've made an appointment, the adjuster comes on board, and you run courses on different headings while the adjuster takes bearings on predetermined landmarks with a pelorus. This way he compares true bearing information with the compass readings. Based on these observations, the adjuster moves, adds to, removes, or repositions the compensating elements to correct the compass readings. Then another round of courses is run to see if further adjustments are needed. When the compass has been compensated down to a minimal amount of residual deviation, the adjuster records the remaining deviation readings on a deviation table. This table should be kept on the ship's navigation bridge so you can correct your steering course to a true course.

Some Flagstates have a different view on the requirement for compass adjusting. The Maritime Coastguard Agency Also, local laws and regulations may ask for an increased frequency of compass adjusting (e.g. Panama Canal)

## FAQ:

1. Does the compass adjuster also refill, check and re-certify the compass on board before compensating?
2. How often does a liquid filled compass need to be checked and re-certified?
3. What are the various views of different Flag states on the requirements for compass adjustment?
4. Can Datema also perform the compass adjustment of electronic compasses?

## Answers:

- 1) No; the ship needs to check the state in which the compass is and establish whether re-certification is needed, using the following criteria:
  - a) After deflection of the compass card with a magnet of 90 degrees, the compass should return to the same heading within 56 seconds in the Netherlands. If the compass does not return to the heading as shown before deflecting the compass, the compass needs to be re-certified in our workshop;
  - b) If there's an air bubble inside the compass, greater than 25-30 mm, the compass needs to be recertified in our workshop
  - c) The compass should be clean and clearly readable;
  - d) The certificate of the compass should not be too old (see 2);
- 2) There's no normative reference for the interval between servicing a magnetic compass. It is the general advice of makers of professional marine liquid-filled compasses to re-certify the compass every two years. Due to the ship's motion at sea (pitching and / or vibrating) the sapphire and compass pin are suffering from wear, causing too much friction for the compass to function correctly. On average, this wear is negatively effecting the compass after 2 years;
- 3) We refer to ISO standard 25862 for the testing criteria for re-certification and for the requirement for compass adjustment. This ISO standard applies to all ships to which SOLAS 1974 applies (ships of gross tonnage > 150 t, engaged on international voyages and ships of gross tonnage > 500 t, not engaged on international voyages). ISO standard 25862 requires the compass to be swung and adjusted every 2 years, or if any of the other aforementioned criteria applies. We know of some Flag states who have their own view on compass adjustment, as well as some local authorities:
  - a) Isle of Man: for ships sailing the Flag of Isle of Man we refer to Manx shipping notice MSN 007. This notice states that as long as the measured deviations agree with those shown on the deviation curve, there's no requirement to re-adjust the compass, until such time as the record of measured deviations show that the original curve is no longer valid;
  - b) United Kingdom: for ships sailing the Flag of the United Kingdom, we refer to the Annex 13 of the MCGA (UK). This is an interpretation of SOLAS Ch V and more or less corresponds to ISO 25862. One difference is that the UK Flag state relates the necessity for compass adjustment to the deviations that are observed by the ship's crew. If the recorded deviations are not excessive and when no physical defects show, there's no need for compass adjustment. In the UK, all adjustments should be made by a compass adjuster who holds a Certificate of Competency as Compass Adjuster issued by the UK government;
  - c) Panama Canal: ships passing the Panama Canal should carry a deviation table, issued by a recognised calibration authority, that is not older than 12 months.
- 4) Yes we can; electronic compasses are usually steering compasses. If the ship carries a standard (bearing) compass, we would first perform the compass adjustment of the standard compass and then use this compass as a reference for the adjusting of the electronic magnetic compass. If the ship has no other compass but the electronic steering compass (often seen on inland ships) we can use our own reference compass to perform the compass adjustment.