

RoboSail systems BV



ROBOSAIL

THETYS™

Digital, solid-state compass

AN INTRODUCTION

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Abstract

This document describes the new RoboSail Thetys™ solid-state, digital compass. The RoboSail Thetys™ compass is based on state-of-the-art magnetometer chips and accurate motion sensors. The latest 18-bit embedded microprocessors are used to deliver high fidelity compass readings to your display, onboard network or autopilot.

Introduction

The RoboSail Thetys™ Digital Compass was developed by RoboSail systems to fill the gap between cheap inaccurate fluxgate compasses and the expensive, high-end gyrocompasses. The Thetys™ compass marries the ease and cheapness of a fluxgate compass to the performance of an high-end gyro stabilized compass.

The philosophy behind the RoboSail Thetys™ compass is that high-precision compasses should be available for any serious sailor, seasoned or not.

The RoboSail Thetys™ compass is unique in the nautical market; it's outstanding performance and benign price make it ideally suited the demanding sailor.

This document will briefly explain the principles behind the RoboSail Thetys™ compass and how this can benefit you.

The Robosail Thetys™ compass

The RoboSail Thetys™ comes in three different forms:

The standard RoboSail Thetys™ is a stand-alone, plug-and-play device; simply mount it in an environment devoid of heavy radiation of external magnetic influences, and connect it to any NMEA device. It has been calibrated in the factory to ensure reliability.

The Thetys™ DeLuxe compass will be calibrated onboard by an official employee of RoboSail systems BV to ensure your Thetys™ compass is optimally adjusted to your vessel. You will receive an official certificate of calibration and the deviation curve of your compass.

The Thetys™ Pro comes with an additional interface to your onboard personal computer or laptop, and an intelligent software package,

enabling constant monitoring and (re-)calibration of your Thetys™ compass.

How it works

The RoboSail Thetys™ Digital compass is based on state-of-the-art magneto-resistive sensors and the latest micro-machined motion sensors. The magneto-resistive sensors measure the earth's magnetic field, depicted in Figure 1, in all three dimensions.

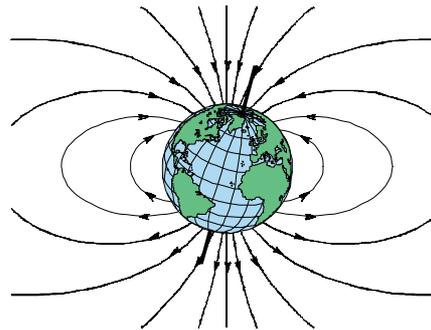


Figure 1: The Earth's magnetic field

At each location on the (apparently flat) surface, the magnetic direction is a vector in three dimensions. This can be measured using a magnetic 3-axis sensor. An intelligent piece of software can then calculate where the magnetic north is.

When a ship is moving, the three magnetic axes vary continuously. The motion sensors sense the movement of the Thetys™ unit relative to the flat surface perpendicular to the Earth's surface (Figure 2).

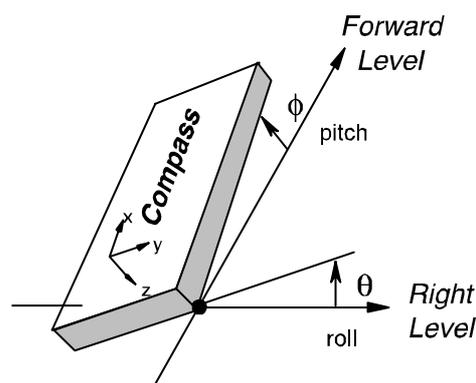


Figure 2: Compensating magnetic heading for tilt relative to the Earth's gravity field

More software was put into the RoboSail Thetys™ compass to compensate for the movement of the ship, however violent, and

thus always¹ obtain a correct heading. Take a look at Figure 3: it shows the errors an ordinary compass generates when the ship is under heel: when heeling just 10° degrees, already the compass is almost 10° degrees off course!

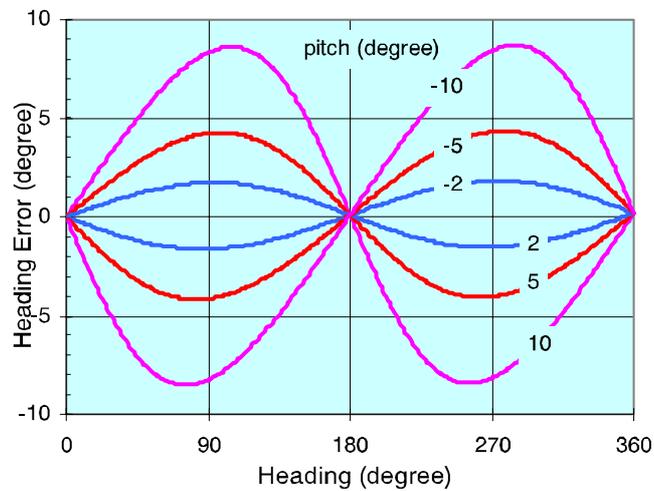


Figure 3: Traditional compass without tilt compensation at various degrees of heel
The RoboSail Thetys™ compass has a maximum deviation of only 1° degree at every tilt up to 60° degrees!

All data is fed to a high-speed 18-bit microprocessor which calculates the current heading, regardless of the ship's motion. Figure 4 shows the principle of the Thetys™ compass at work.

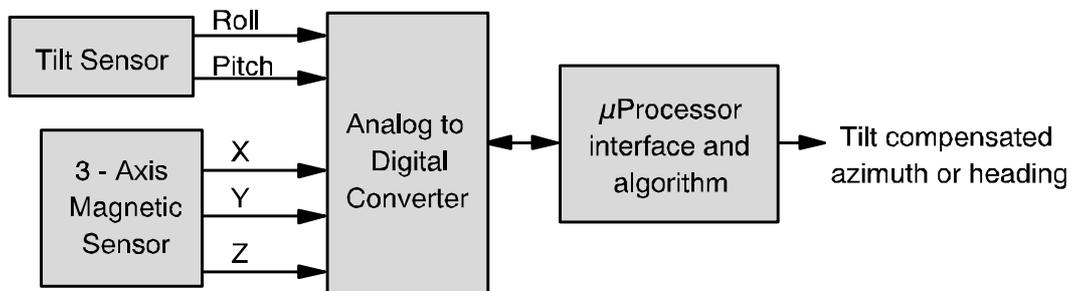


Figure 4: Processing data for accurate heading sensing

The RoboSail Thetys™ compass contains no expensive and hard-to-maintain gyroscopes, is no large and bulky box that's always in the way. It's small, energy-efficient and very accurate, it can withstand the harshest of conditions; what more do you want in a compass?

Calibrations

Every RoboSail Thetys™ compass has been tested and hand-calibrated before they leave the manufacturing plant. This

¹ The RoboSail Thetys™ compass can sense tilt up to 60 degrees in all directions

calibration has been programmed into the onboard microprocessor. The Thetys™ Deluxe Compass can also be calibrated at sea-side by certified personnel of RoboSail systems BV. The Thetys™ Pro comes with an additional interface to an onboard computer, allowing constant monitoring of the status of the compass and alteration of the deviation curve.

Manufacturer's calibration

RoboSail systems is dedicated to bringing you the best possible compass for the most enduring circumstances. To this end, every Thetys™ compass is tested and calibrated by hand to ensure optimal reliability.

Sea-side calibration (only for RoboSail Thetys™ Pro)

Sea-side calibration with the RoboSail Thetys™ Pro compass is as easy as it gets. Start the calibration procedure, sail a 360° degree circle and the compass will indicate the quality of the calibration and ask if you want the new calibration to take effect. That's it!

The software that comes with the RoboSail Thetys™ Pro allows you to manually tweak the calibration, store and load deviation curves and print them.

More information on installation- and calibration procedures can be found in the RoboSail Thetys™ manual.

Installation

Installing the RoboSail Thetys™ compass is easy. For the standard RoboSail Thetys™ compass, it's as easy as mounting the sensor unit in a magnetically safe location (i.e. away from any metal objects) on the ship's heart line. Connect the 4-wire cable to the receiving unit, and the power connectors to the ships power circuit – the factory calibration will ensure correct operation.

The RoboSail Thetys™ Deluxe compass will be calibrated for you by an employee of RoboSail systems, or a RoboSail-certified expert.

The RoboSail Thetys™ Pro can be manually calibrated and maintained from an onboard PC.

Contact

This concludes this introduction to the RoboSail Thetys™ compass.
If you would like to know more, please contact us!

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Appendix I: Specifications

Heading Accuracy:	< 1° deg
Display Accuracy:	0. 1° deg
Maximum pitch	+/- 60° deg
Maximum roll	+/- 60° deg
Operating voltage	7-15V
Power consumption	< 100mA
Temperature range	-25...75°C
Size (l x h x w)	138 x 54 x 88 (mm)
Weight	400 gram
Degree of protection	IP66
Output(s) ²	NMEA-0183 NMEA-2000 (Thetys Pro) Sine/Cosine ³

² There is a different Thetys compass available for each output.

³ Through optional NMEA to sine-cosine converter