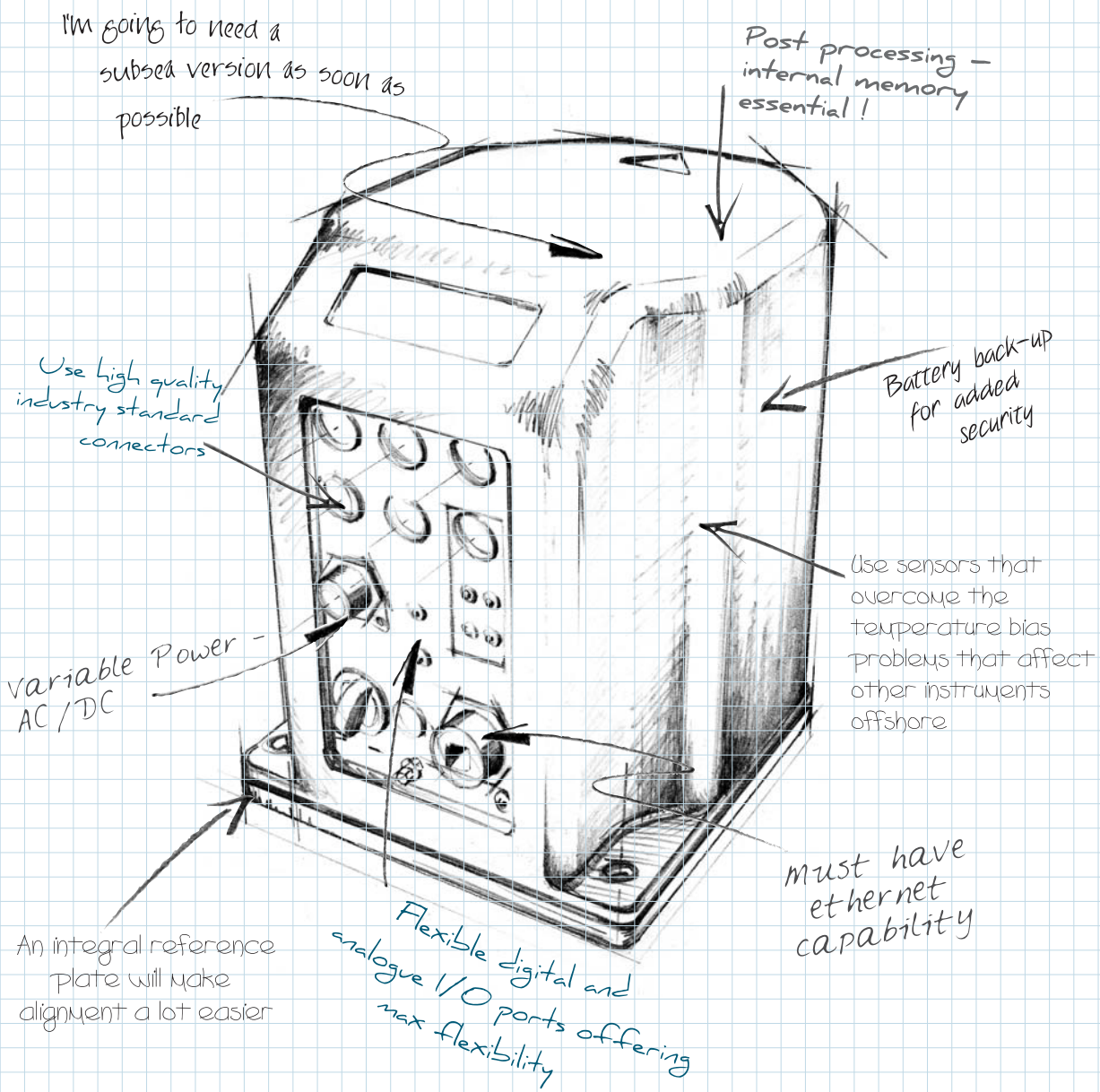
Sonardyne
SOUND IN DEPTH

Lodestar AHRS

Marine Attitude and Heading Reference System

* Easy interface to assist acoustic aiding applications
* 5 minute 'spin up'



* Design systems algorithm IP in-house
* Compatibility with industry standard interfaces is essential
* Direct / Remote configuration and initial set-up to suit any size of vessel

Heading in the right direction...

Lodestar AHRS
Attitude and Heading Reference System

Lodestar AHRS – Surface
The surface unit is simple to install and set-up and features an integral reference plate to make alignment with other survey systems easy

DP and AUV Tracking
High accuracy attitude and heading data for dynamic positioning systems and AUV navigation are typical applications for Lodestar

Lodestar AHRS – Subsea
Lodestar is compatible with all of Sonardyne's LBL and USBL acoustic positioning systems

ROV Navigation
The subsea version of Lodestar offers a choice of mounting arrangements and depth ratings to best suit the application and vehicle

Introduction

Sonardyne has a history of success in providing trusted solutions for subsea acoustic positioning, navigation and communications. Applications for our technology are found within the offshore oil and gas exploration, construction, drilling and oceanographic industries.

Through investment in people, processes and technology, we have built a world class team of experts that have allowed us to rise to the challenge of developing a new standard of inertial sensor based marine attitude and heading reference systems.

Lodestar Attitude and Heading Reference System (AHRS) combines the robust cutting edge engineering that developed our latest Sonardyne Wideband™ acoustic systems with proven inertial sensor technology developed to overcome the problems associated with conventional sensor platforms such as temperature shock.

Available in surface or subsea versions Lodestar is a solid state AHRS comprised of six sensing elements, three ring laser gyros and three linear accelerometers. Designed for highly dynamic marine environments the benefits include: industry standard output telegrams, Ethernet interface, battery back-up as standard and internal memory for data storage.

Running a Sonardyne developed gyrocompass algorithm, the unit produces measurements in real time for heading, roll and pitch of the vessel or vehicle. These values, due to the high precision of the sensing elements used, produce a highly accurate solution for each rotation in the x, y and z axis of the AHRS unit.

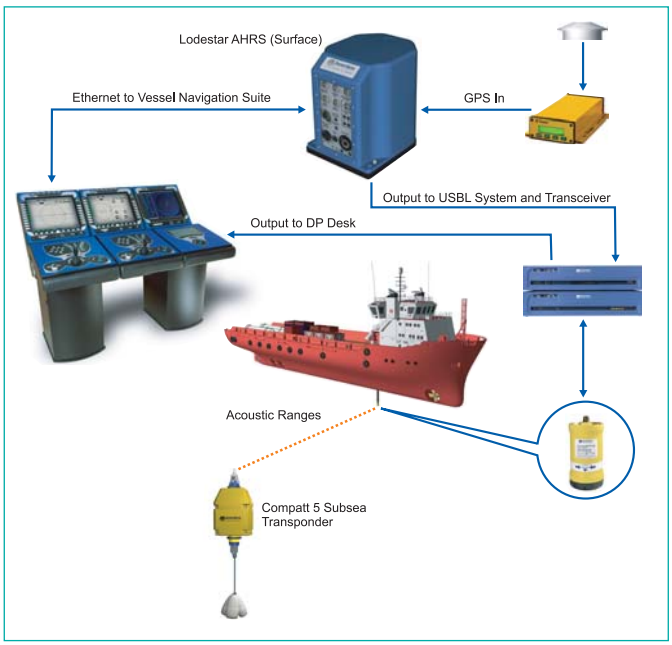
Lodestar also applies a heave algorithm to the vertical motion of the unit resulting in a robust heave measurement solution. As a result, Lodestar is suitable for all applications that require the accurate measurement of heading, heave, roll and pitch in all sea states.

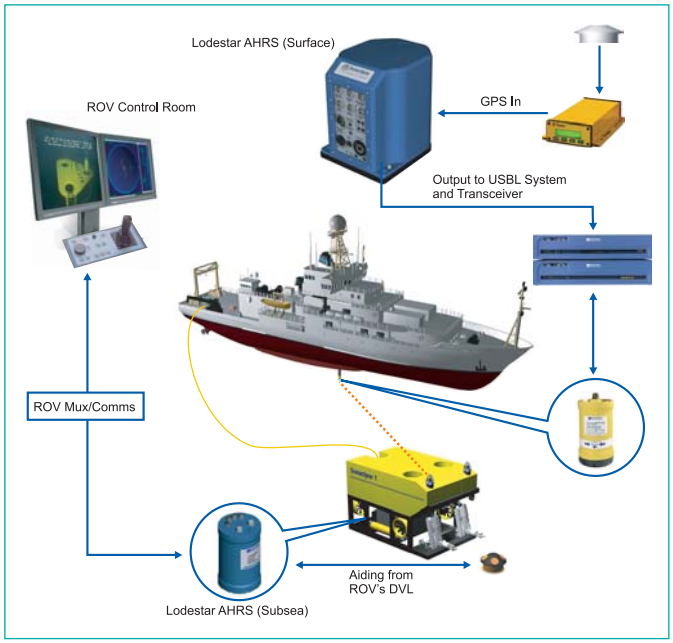
By combining a motion sensor and gyrocompass in the same unit, significant advantages can be gained in relation to system calibration as the heading and motion frame share a common internal alignment axis.

Lodestar is upgradeable to a full Inertial Navigation System (INS) providing position, velocity, orientation and angular velocity at high update rates.

Lodestar - Origins of the name
"Lode" is an Old English word meaning course or journey. "Lodestone" is a natural magnetic material used in ancient times for making compasses. "Lodestar" is the star that guides, the north pole star "Polaris", and very close to the north celestial pole hence being appropriate for a true north seeking compass

Lodestar AHRS
Attitude and Heading Reference System





Introduction
Developed to provide a highly accurate inertial navigation solution for Sonardyne's family of acoustic positioning systems, Lodestar is equally suited to a variety of other applications where the reliability and accuracy of heading and attitude data is of paramount importance.

Operating as either a stand-alone AHRS or as part of an integrated system, the Lodestar product family is backed up by a world class manufacturing, support and training organisation renowned for providing trusted solutions.

USBL Acoustic Positioning
Ultra Short BaseLine (USBL) systems calculate the position of a subsea target by measuring the range and bearing from a vessel mounted transceiver to an acoustic transponder fitted to the target.

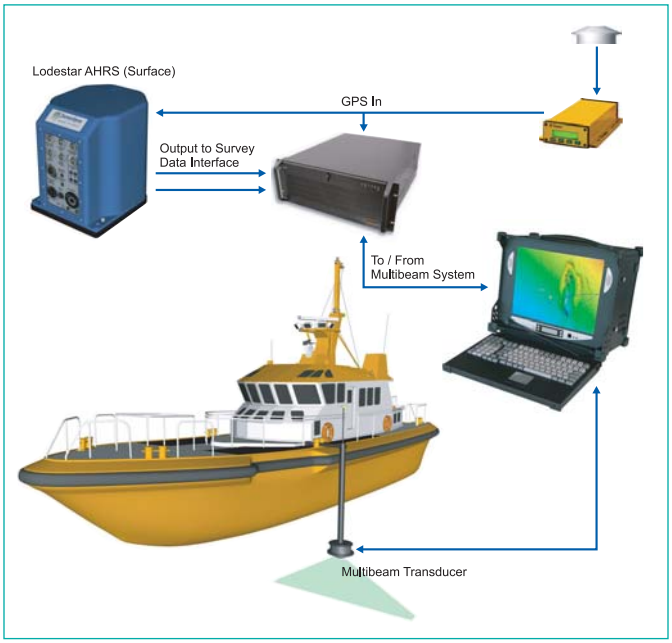
In order to achieve the highest levels of positioning accuracy, Lodestar provides the acoustic system with a precise measurement of the heading, roll and pitch of the transceiver. The USBL system is then able to process these measurements and then compensate for them in the software.

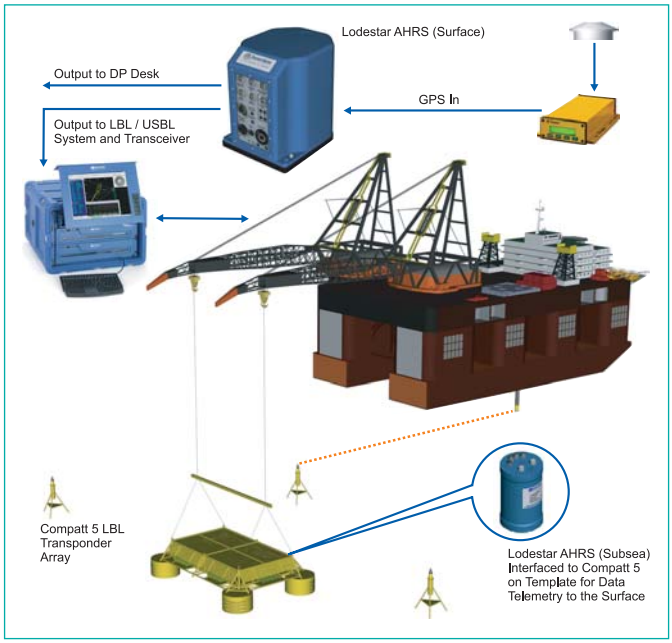
Key Features
- 0.1° heading accuracy unaided
- 0.01° roll and pitch accuracy
- Fast follow up speed of 500° per second
- Single box solution for motion sensor and gyrocompass
- No dedicated GPS string required

Dynamic Positioning
The prime function of a DP system is to allow a vessel to maintain its position and heading despite the effects of the wind, waves and current. Lodestar constantly measures the heading, roll and pitch of the vessel and then outputs this in real time to the DP desk via its RS232 / 485 serial or Ethernet interface.

In this application, Lodestar is an ideal replacement for the vessel's separate motion reference unit and gyrocompass due to its capability in highly dynamic marine environments and its fast spin-up time.

Key Features
- <5 minute settling time
- All industry standard telegrams supported
- Ethernet interface
- MTBF RLG >100,000 MTBF Lodestar >50,000
- Low life cycle cost
- IMO approval pending





Subsea Vehicle Navigation

Lodestar has been designed for a wide range of stand-alone subsea applications including installation on AUVs, towfish and ROVs where it may assist with automatic depth and heading reference.

Available in three depth ratings, the subsea Lodestar provides roll, pitch and heading of a vehicle with high accuracy and high output data rates. To further aid navigation, the unit can be interfaced to the vehicle's DVL to provide velocity updates.

Lodestar is linked to the survey control room via the vehicle's MUX which provides power and communications. For AUV applications, Lodestar is connected to the AUV's own navigation system and onboard power supply.

Key Features

- Flexible mounting arrangements
- Low current draw on start-up
- Choice of 1,000, 3,000 and 5,000 metre depth ratings

Multibeam Compensation

Systems such as multibeam echo-sounders, side scan sonars and synthetic aperture sonars require extremely accurate measurement of vessel dynamics in real-time.

Lodestar is designed to meet this demanding requirement by providing the survey system with high accuracy heading, heave, roll and pitch observations. This enables users to maintain the quality of their survey data under all operating conditions by compensating for vessel motion during data collection.

Depending on the application, users can select between surface or subsea versions of Lodestar. These options allow the optimal installation arrangement to be achieved on all types of vessel, ROVs and towfish.

Key Features

- 5cm / 5% heave accuracy
- Robust heave algorithm
- Data output via RS232 / RS485 serial interface or Ethernet

Subsea Construction Survey

For complex subsea construction tasks such as the installation of large subsea templates on the seabed in deep water, Lodestar can be interfaced to a Long BaseLine acoustic positioning system.

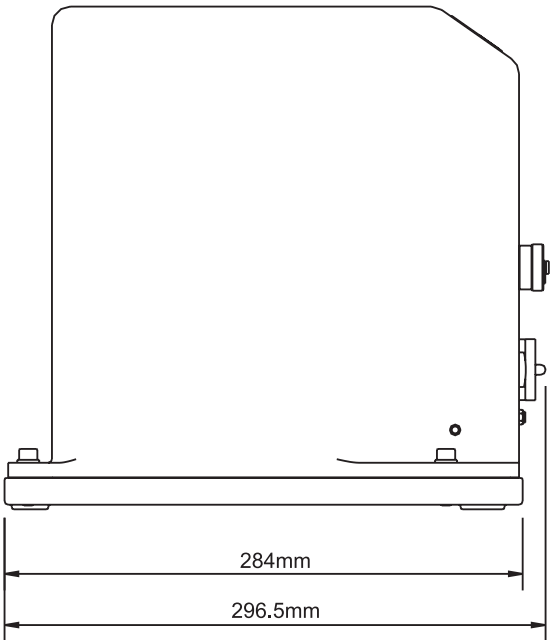
By interfacing the Lodestar to a subsea transponder such as a Compatt 5, its motion data can be reliably telemetered to the surface without the need for a cable connection from sensors on the template to the surface.

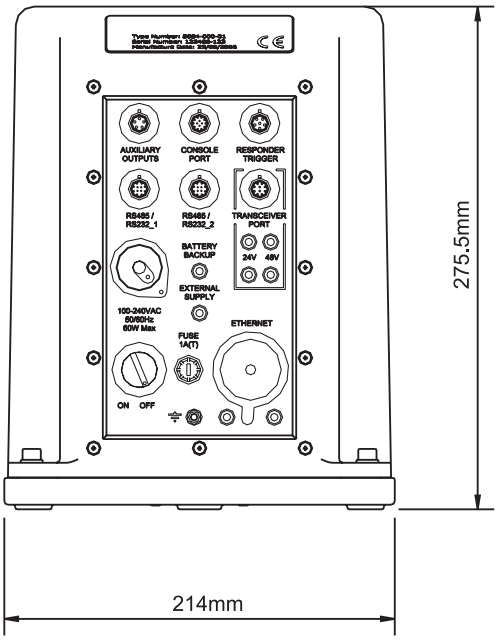
Lodestar provides a real time display of structure attitude and heading with a fast update rate giving an accurate representation of the movement of the structure as it is lowered to the seabed.

Key Features

- On board 4GByte memory
- Battery back up as standard
- Compatible with all Sonardyne LBL and USBL products
- INS Ready

Lodestar AHRS – Surface
Specifications

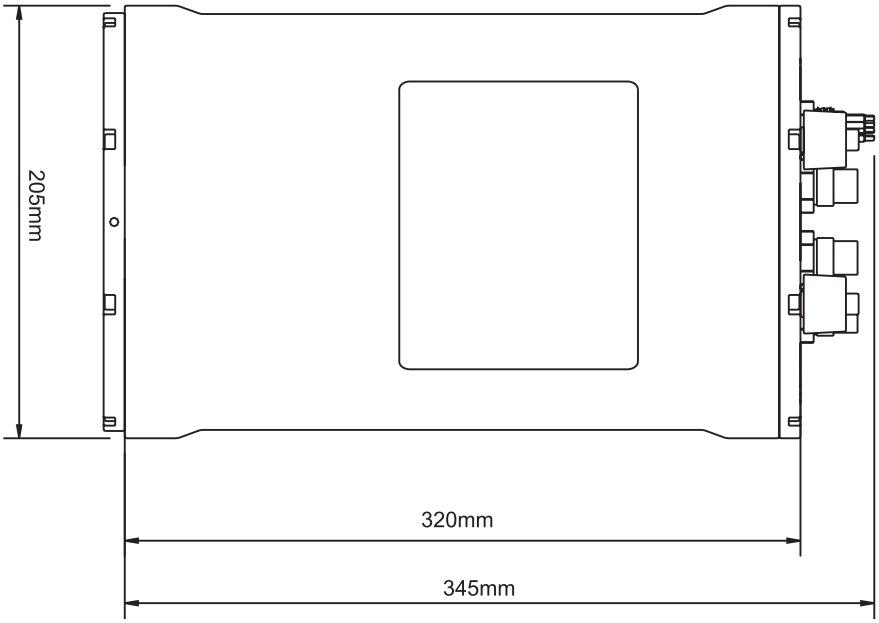


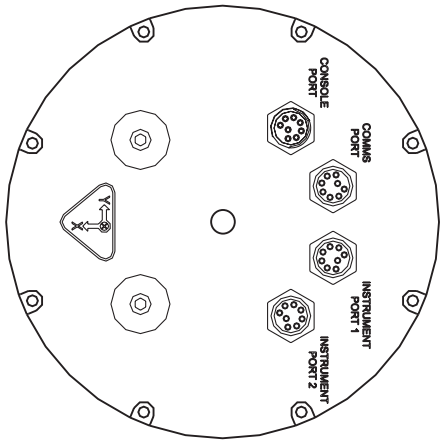


Lodestar AHRS – Surface

Feature		Type 8084-001
Attitude - Heading	Range	0-360°
	Static Accuracy	0.10° secant latitude rms
	Dynamic Accuracy	<0.15° secant latitude rms
	Settle Time	<5 minutes
	Follow Up Speed	500° / Second
	Resolution	0.01°
Attitude - Roll & Pitch	Range	±180° (no physical limit)
	Static Accuracy	0.01°
	Dynamic Accuracy	<0.02°
	Resolution	0.01°
Attitude - Heave	Range	±99m
	Accuracy (Real Time)	5cm or 5% whichever the greater
	Bandwidth	User Selectable
	Resolution	0.01m
Physical	Size	276 x 297 x 214mm (hxwxd)
	Weight	13Kg
	Mechanical Construction	Aluminium (Powder Coated)
Environmental	Operating Temperature	-10°C to +55°C
	Shock Rating Operational	22g, 11ms half sine
	IP Rating	IP66
	Power Requirement	90-260V AC or 18-50V DC, 10W nominal, 20W max
	Back Up Battery Type / Life	Li-Ion / 3 hours
	Data Storage	4GB on board memory
Digital Output	Number of Digital Ports / Protocol	4 Digital Ports / RS232 or RS485
	Other Ports	1 Ethernet

Lodestar AHRS – Subsea
Specifications





Lodestar AHRS – Subsea

Feature		Type 8146-000-04
Attitude – Heading	Range	0-360°
	Static Accuracy	0.10° secant latitude rms
	Dynamic Accuracy	<0.15° secant latitude rms
	Settle Time	<5 minutes
	Follow Up Speed	500° / Second
	Resolution	0.01°
Attitude – Roll & Pitch	Range	±180° (no physical limit)
	Static Accuracy	0.01°
	Dynamic Accuracy	<0.02°
	Resolution	0.01°
Attitude – Heave	Range	±99m
	Accuracy (Real Time)	5cm or 5% whichever the greater
	Bandwidth	User Selectable
	Resolution	0.01m
Physical	Size	205mm Dia. x 345mm
	Weight in Air / Water	13.9Kg / 2.9Kg
	Mechanical Construction	Anodised Aluminium
Environmental	Operating Temperature	–10°C to +55°C
	Shock Rating Operational	22g, 11ms half sine
	Depth Rating	1,000 / 3,000 / 5,000 metres
	Power Requirement	18-50V DC, 10W nominal, 20W max
	Back Up Battery Type / Life	Li-Ion / 3 hours
	Data Storage	4GB on board memory
Digital Output	Number of Digital Ports / Protocol	4 Digital Ports / RS232 or RS485
	Other Ports	1 Ethernet

Sonardyne
SOUND IN DEPTH

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