

Datasheet

Lodestar subsea AHRS



Lodestar is a solid-state Attitude and Heading Reference System (AHRS) highly optimised for cost, size, weight, and power (C-SWaP).

The instrument is a turn-key solution comprised of carefully selected high-grade and highly reliable inertial sensors integrated into a Sonardyne in-house designed Inertial Measurement Unit (IMU).

The selected inertial sensors are the standard for commercial aviation with a proven 20+ year track record. These sensors have a highly desirable characteristic being insensitive to vibration, temperature changes and having very limited initial errors. The result is a system which is highly suitable for the marine environment where performance, robustness and data integrity need to be available from initialisation, even during the harshest conditions.

Lodestar requires no external aiding and settles robustly in dynamic conditions in less than 5 minutes.

On-board data storage and backup battery functionality ensures continued operation and eliminates the risk of data-loss even if communications or external power is lost.

Power-pass through to external aiding sensors is supported to ease integration requiring only a single cable for comms and power.

If a full INS solution is required, the Lodestar can easily be field upgraded to a SPRINT system.

This makes the Lodestar a flexible and future proof solution for both ROV guidance and survey applications.

Lodestar has a proven track record spanning more than 10 years in the field in diverse applications from ROV guidance and autopilot to demanding survey applications.

The instrument is available in 4,000 and 6,000 m depth ratings with a variety of connector options and configurations.

Applications include

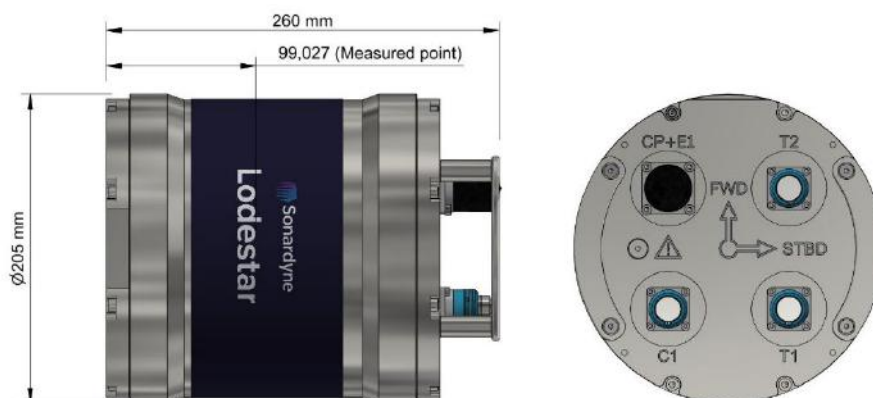
- ROV control & guidance
- Offshore construction

Key features

- Turn-key solution for motion sensor and gyrocompass
- Up to 0.08° heading accuracy
- 0.01° roll and pitch accuracy
- 5 minute AHRS settling time
- Fast follow up speed of 900°/sec
- MTBF inertial sensors (gyros and accelerometers) > 400,000 hours
- Choice of depth ratings: 4,000 and 6,000 m
- Choice of connectors: Seacon (standard) or Seanet® (for use with FMC Schilling Robotics ROV)
- Transport approved rechargeable Li-ion battery back-up as standard
- 8 GB internal memory allows post processing and remote diagnostics
- Ethernet and serial interfaces
- Export is not ITAR controlled
- Lodestar AHRS can be remotely upgraded to SPRINT INS

Specifications

Lodestar subsea AHRS



Feature	Lodestar 300	Lodestar 500	
Depth rating	4,000 / 6,000 m	4,000 / 6,000 m	
Performance			
Heading	0.2°	0.1°	
AHRS settle time	<5 minutes in dynamic conditions		
Roll and pitch	0.01°	0.01°	
Power			
Power requirement	20–50 V dc, 15 W nominal, 35 W maximum		
Power pass through	3 x for external aiding sensors (up to 3 A per sensor)		
Backup battery type/life	Li-ion/5 minutes	Li-ion/5 minutes	
Data/Comms			
Data storage	8 GB internal memory	8 GB internal memory	
Serial ports/protocol	4x RS232 or RS485	4x RS232 or RS485	
Other ports	1x Ethernet, 4 triggers	1x Ethernet, 4 triggers	
Output rate	Up to 100 Hz	Up to 100 Hz	
Output telegrams ¹	Industry standard AHRS/INS telegrams including acceleration and rotation rates		
Mechanical			
Connectors	4x Seacon / Seanet, 1x Seacon / Seanet		
Mechanical construction	Titanium		
Dimensions (diameter x height)	4,000 m (Seacon)	205 x 260 mm	205 x 260 mm
	6,000 m (Seacon)	205 x 280 mm	205 x 280 mm
	4,000 m (Seanet)	205 x 250 mm	205 x 250 mm
Weight in air/water ²	4,000 m	18.5/11.5 kg	18.5/11.5 kg
	6,000 m	22/14 kg	22/14 kg
Environmental			
Operating temperature	-20 to +55°C	-20 to +55°C	
Storage temperature	-20 to +60°C	-20 to +60°C	
Shock rating	22 g, 11 ms half sine	22 g, 11 ms half sine	

¹ Specific outputs may be limited below quoted performance for reasons of export classification and control and should not be used as IMU data.

² Estimated weights.

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SPRINT subsea INS



SPRINT is an Aided Inertial Navigation System (AINS) highly optimised for cost, size, weight, and power (C-SWaP).

The instrument is a turn-key solution comprised of carefully selected high-grade and highly reliable inertial sensors integrated into a Sonardyne in-house designed Inertial Measurement Unit (IMU).

The selected inertial sensors are the standard for commercial aviation with a proven 20+ year track record. These sensors have a highly desirable characteristic being insensitive to vibration, temperature changes and having very limited initial errors. The result is a system which is highly suitable for the marine environment where performance, robustness and data integrity need to be available from initialisation, even during the harshest conditions.

SPRINT's dual AHRS & INS algorithm capability is unique in the market and allows for automatic on-board integrity checking between algorithms as well as having instantaneous INS start up with north alignment from the on-board AHRS. This capability allows for simultaneous use from one instrument, e.g. AHRS plus DVL for ROV piloting and INS plus DVL for survey operations.

Internal battery backup provides continuous on-board navigation and data storage supporting post-mission diagnostics and post-processing, even throughout brownout periods.

SPRINT INS interfaces to aiding sensors such as USBL, DVL, pressure sensor and sound speed.

Power-pass through to aiding sensors is supported to ease integration enabling the SPRINT to be interfaced using a single connection.

SPRINT has a proven track record spanning 10 years in the field in diverse applications from ROV guidance and autopilot to demanding survey applications such as multibeam Out-Of-Straightness surveys and sparse-LBL using tightly coupled 6G acoustics.

The instrument is available in 4,000 and 6,000 m depth ratings and is one of the smallest form factor subsea inertial instruments available.

Typical applications

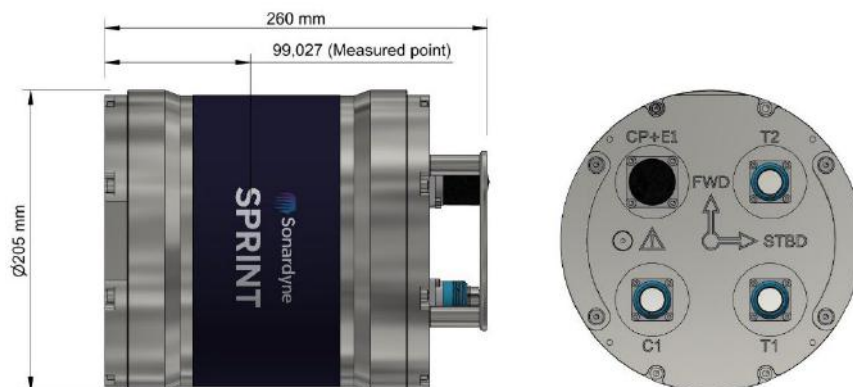
- Vehicle guidance & control
- Station keeping and autopilot including mid-water applications
- USBL aided INS survey
- DVL aided relative navigation
- AUV's
- ROV and tow fish positioning
- Hydrographic survey
- Offshore construction
- As laid and out of straightness
- Multibeam survey
- Touchdown monitoring
- Structure placement

Key features

- Turn-key solution for motion sensor, gyrocompass and INS
- SPRINT provides concurrent AHRS and INS capability for dual use
- Fast follow up speed of 900°/sec
- Choice of depth ratings: 4,000/6,000 m
- Choice of connectors: Seacon (standard) or Seanet® (for use with FMC Schilling Robotics ROV)
- Transport approved rechargeable Li-ion battery back-up as standard
- 8 GB internal memory allows post processing and remote diagnostics
- Full ocean depth aiding from USBL
- Export is not ITAR controlled
- Ethernet and serial interfaces

Specifications

SPRINT subsea INS



Performance		SPRINT 300	SPRINT 500	SPRINT 700
Heading		0.05° secant latitude	0.04° secant latitude	0.02° secant latitude
INS initialisation		Instantaneous		
Roll and pitch		0.01°		
INS aiding supported		USBL, Depth, DVL, Zero Velocity, Manual Position, LBL, GNSS		
USBL/LBL aided		3x precision improvement	3.5x precision improvement	4.5x precision improvement
USBL/LBL and DVL aided		3 to 7 x precision improvement	4 to 10 x precision improvement	6 to 13 x precision improvement
LBL/DVL aided		3 cm confined area, 20 cm wide area (dynamic)		
DVL aided ^{1 2}	Typical survey	0.05%	0.03%	0.02%
	Distance from origin	0.15%	0.10%	0.08%
DVL aiding loss/drift ¹		1.2 m over 1 minute, 5 m over 2 minutes	0.8 m over 1 minute, 3.2 m over 2 minutes	<0.5 m over 1 minute, 2 m over 2 minutes
Station keeping		<1 m over 24 hours (Syrinx DVL)		
Power				
Power requirements		20–50 V dc, 15 W nominal (35 W maximum)		
Power pass through		3x for external aiding sensors (up to 3 A per sensor)		
Internal battery backup		Li-ion/5 minutes		
Data/Comms				
Data storage		8 GB internal memory		
Serial ports/protocol		4x RS232 or RS485		
Other ports		Ethernet, 4x Triggers		
Output rate		Up to 100 Hz		
Mechanical				
Connectors options		4x Seacon/Seanet, 1x Seacon/Seanet		
Mechanical construction		Titanium		
Dimensions (diameter x height)	4,000 m (Seacon)	205 x 260 mm		
	6,000 m (Seacon)	205 x 280 mm		
	4,000 m (Seanet)	205 x 250 mm		
Weight in air/water ³	4,000 m	18.5/11.5 kg		
	6,000 m	22/14 kg		
Environmental				
Depth rating		4,000/6,000 m		
Operating temperature		-20 to +55°C		
Storage temperature		-20 to +60°C		
Shock rating		22 g, 11 ms half sine		

¹ CEP50 (assumes use of a high performance DVL such as the Sonardyne Syrinx 600).

² SPRINT-Nav performance achievable by co-locating with Syrinx DVL.

³ Estimated weights.

Datasheet

SPRINT-Nav



SPRINT-Nav is the world's highest performing all-in-one hybrid navigator for all subsea vehicles and survey operations and is available in two frequencies: 600 kHz or 400 kHz for higher altitude tracking.

The SPRINT-Nav is a turn-key solution combining carefully selected inertial sensors, a Syrnix Doppler Velocity Log (DVL) and a high accuracy pressure sensor into a single housing.

The result is not only the highest performing hybrid navigator but also one of the smallest navigation instruments on the market.

All onboard sensors are optimally integrated to provide seamless operation and unprecedented levels of performance compared with standalone instruments from different vendors.

The unit comes pre-calibrated and requires no additional calibration to achieve unprecedented performance with minimal operational complexity.

SPRINT-Nav's inertial dual AHRS & INS algorithm capability is unique in the market and allows for automatic on-board integrity checking between algorithms as well as instantaneous INS start up with North alignment from the on-board AHRS. This capability allows for simultaneous use from one instrument, e.g. AHRS plus DVL for ROV piloting and INS plus DVL for survey operations.

Tight beam-level DVL aiding for the on-board INS with optimal timing and use of proprietary QC metrics provides higher performance and more reliable navigation in demanding bottom-lock environments. Furthermore, the tight integration also enables unconventional mounting arrangements, i.e. tilting the SPRINT-Nav, enabling vehicle integration previously not possible.

Each DVL transducer is fitted with a full depth-rated water block to ensure protection of the internal components. Combined with beam level aiding the SPRINT-Nav will continue to function even if one of the DVL transducers has been damaged.

SPRINT-Nav can be interfaced using a single connection and/or the internal sensors can be interfaced separately depending on requirements.

Internal battery backup provides continuous on-board navigation and data storage supporting post-mission diagnostics and post-processing, even throughout brownout periods.

Export of SPRINT-Nav is simplified as compared to other separate DVL and INS units. For example, shipping from outside the USA does not require a re-export licence.

Typical applications

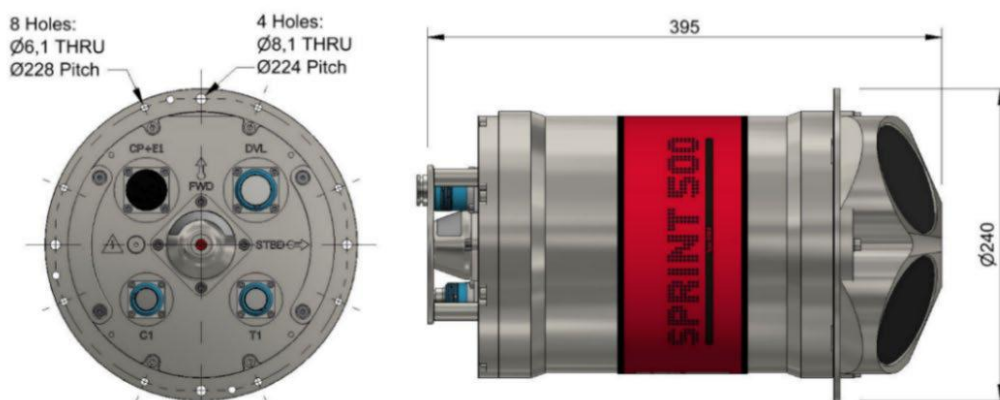
- Any subsea vehicle including AUV, AIV, ROV, Towfish & ROTV
- Ideally suited for autonomous and resident vehicles
- Survey and construction

Key features

- World's highest performing hybrid navigator
- All-in-one turn-key solution
- Dual concurrent AHRS, INS and DVL output capability for multi-use
- Instantaneous INS initialisation from AHRS with no alignment procedure required
- Dual AHRS & INS algorithms enabling internal health check of orientation
- Proven long life and high MTBF inertial sensors from trusted long-term US supplier
- Remote diagnostics and performance verification
- Fully water blocked DVL endcap protecting internal electronics
- Full ocean depth aiding from USBL
- Two DVL Frequencies available: 600 kHz or 400 kHz HA (High Altitude)
- Export is not ITAR controlled

Specifications

SPRINT-Nav



Performance		SPRINT-Nav 300	SPRINT-Nav 500	SPRINT-Nav 700	SPRINT-Nav X
DVL aided ¹	Typical survey	0.04%	0.02%	0.01%	0.01%
	Distance from origin	0.12%	0.07%	0.05%	Get in touch
	High Altitude (HA) option ²	0.12%	0.08%	0.06%	Get in touch
Unaided		1.2 m in 60 s	0.8 m in 60 s	0.5 m in 60 s	Get in touch
Altitude min/max	Standard	0.4/175 m			
	High Altitude (HA) option ²	0.4/230 m			
USBL & DVL aided	Precision improvement	Up to 7x better	Up to 10x better	Up to 13x better	Up to 13x better
Station keeping		<1 m over 24 hours			
LBL/DVL aided		3 cm confined area, 20 cm wide area (dynamic)			
INS/AHRS heading ¹ (Secant latitude)	INS	0.05°	0.04°	0.02°	0.01°
	AHRS	0.20°	0.10°	0.08°	0.08°
AHRS/INS roll and pitch ¹		0.01°	0.01°	0.01°	0.01°
Pressure sensor		0.01% FS removable module			
ADCP	Profiling range ³	Standard	0.4–80 m		
		HA	0.4–120 m		
	Vel. range & RMS (along beam)	Up to ±11.2 m/s ±0.4% of measured value			
	Maximum number of cells	255			
	Maximum ping rate	4 Hz (ADCP) or 2.5 Hz (DVL+ADCP)			
Power					
Power requirements		20–50 V dc, 15 W nominal, 35 W maximum			
Internal battery backup		Li-ion/5 minutes			
Physical/Comms					
Data storage		8 GB internal memory			
Serial ports/protocol		4x RS232 or RS485			
Other ports		Ethernet, 4 triggers			
Mechanical construction		Titanium			
Dimensions (diameter x height) (incl. connectors and mounting ring)	4,000 m	240 x 395 mm			
	6,000 m	240 x 405 mm			
Weight air/water ⁴	4,000 m	23.9/13.1 kg			
	6,000 m	28.1/17.2 kg			
Environmental					
Depth rating		4,000/6,000 m			
Operating temperature		-5 to 50°C			
Storage temperature		-25 to 55°C			

¹ CEP50.

² High Altitude DVL 400 kHz.

³ Standard 600 kHz and High Altitude (HA) 400 kHz.

⁴ Estimated weights.

Datasheet

SPRINT-Nav Mini



The SPRINT-Nav Mini is the world's smallest hybrid acoustic-inertial navigator. Built on years of experience gained with SPRINT-Nav, it is designed to provide accurate, precise and robust guidance or navigation information for subsea vehicles.

The SPRINT-Nav Mini combines carefully selected inertial sensors, a Syrinx Mini Doppler velocity log (DVL+ADCP) and a high accuracy pressure sensor into a single housing and is optimised for size, weight and power consumption.

Like all SPRINT-Nav products, the SPRINT-Nav Mini uses information from all the sensors optimally to provide seamless operation and unprecedented levels of performance compared with standalone instruments.

The SPRINT-Nav mini outputs industry standard messages for command and control of AUVs, ROVs and USVs, removing complex integration.

The SPRINT-Nav Mini comes equipped with highly accurate gyroscopes and accelerometers which are not affected by magnetism and provide a true north seeking gyrocompass.

The SPRINT-Nav Mini provides velocity, depth and altitude which is free from noise and immune to short term DVL acoustic outages. Being able to provide these messages, including quality metrics, at a constant output rate of up to 200 Hz drastically improves vehicle control.

The compact form factor is significantly smaller and lighter than any other combination available in the market.

It comes pre-calibrated and requires no additional calibration offering minimal operational complexity.

It offers an easy-to-use Web UI, which provides an intuitive dashboard viewer as well as configuration and detailed status pages for integration and troubleshooting. A clearly defined API allows for deep integration into vehicle control systems and remote operation of the system.

The SPRINT-Nav Mini is supplied with either top- or sidewall-mounted connectors for easy vehicle integration. For vehicles where height is critical, the sidewall variant measures only 187 mm in height.

Typical applications

- Ideal for observation-class ROVs, light work-class ROVs, AUVs, USVs, manned submersibles and diver navigation boards
- Ideally suited for both remotely operated and autonomous vehicles
- True North seeking

Key features

- World's smallest hybrid acoustic-inertial navigator
- All-in-one turn-key solution
- Highly optimised size, weight and power
- 300 and 4,000 m variants
- Fixed frequency, continuous and robust vehicle control, guidance and navigation outputs
- Low-height variant available measuring only 187 mm in height
- Factory calibrated
- 500 kHz DVL + ADCP
- 0.3–200 m bottom track operating altitude
- Intuitive Web UI
- Modern API
- Export is not ITAR controlled

Specifications

SPRINT-Nav Mini



Performance		SPRINT-Nav Mini	
DVL aided ¹	Typical survey	0.05%	
	Distance from origin	0.30%	
Altitude min/max		0.3/200 m	
USBL & DVL aided	Precision improvement	Up to 5x better	
Heading ² (secant latitude) with GNSS or USBL, and DVL ³		0.10°	
Heading ² (secant latitude) with GNSS or USBL or DVL		0.15°	
Roll and pitch ²		0.02°	
Angular rate range		±450°/s	
Velocity precision (<2 m/s at 50 m altitude)		<0.4 cm/s	
Depth accuracy ²		0.01% FS	
ADCP	Profiling Range	0.4–100 m	
	Velocity Range & RMS (along beam)	Up to ±6.7 m/s ±0.4% of measured value	
	Maximum number of Cells	255	
	Max Ping rate	1 Hz	
Power			
Power requirements ⁴		24 V dc, 10 W nominal	
Physical/Comms			
Data storage		32 GB internal memory	
Serial ports/protocol		3x RS232	
Interfaces		Ethernet, UDP/TCP, WebUI, 2 x trigger inputs (1PPS/DVL trigger), NTP, ZDA + 1PPS out	
Mechanical construction		300 m	POM-C
		4,000 m	Titanium
Dimensions (diameter x height)	Standard	300 m	148 x 213 mm
		4,000 m	148 x 213 mm
	Side connector	300 m	148 x 187 mm (174 x 187 mm including connector)
		4,000 m	148 x 187 mm (174 x 187 mm including connector)
Weight Air/Water ⁵		300 m	3.6/0.7 kg
		4,000 m	7.1/4.2 kg
Environmental			
Depth rating		300/4,000 m	
Operating temperature		-5 to 50°C	
Storage temperature		-25 to 55°C	

¹ CEP50

² RMS

³ Heading accuracy is improved by availability of both absolute position (GNSS/USBL) and DVL.

⁴ Contains backup battery to maintain system performance during power dropouts.

⁵ Estimated weights.