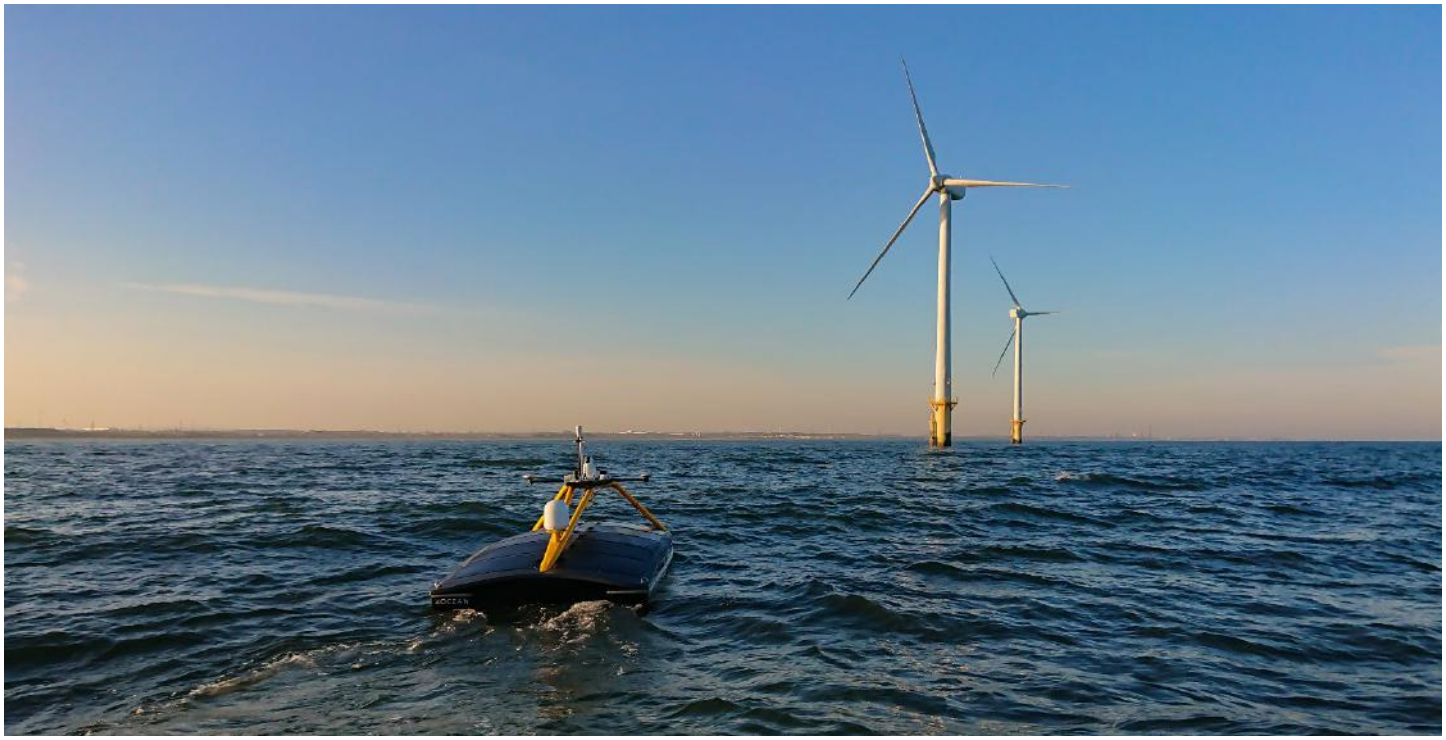
Datasheet
Mini-Ranger 2



Mini-Ranger 2 is our mid-level USBL system that's also able to support data harvesting, using USVs, from seabed-deployed instruments or communicating with underwater assets such as AUVs.

With a 995 m operating range, extendable to 4,000 m, Mini-Ranger 2 can track up to 10 underwater targets simultaneously, including divers, towed instruments, ROVs and AUVs.

Opt for the Marine Robotics software pack and it will communicate with subsea robotic platforms; sharing position and allowing you to exchange data.

Expected system accuracy is 0.2–1.3% of slant range depending on system configuration. If you need higher precision or looking for a USBL that you can use as a dynamic positioning reference, then take a look at our top performing USBL, Ranger 2 Standard, or Ranger 2 Survey.

Mini-Ranger 2 is a compact, easily installed system, so it's the ideal choice for temporary installation on small survey vessels, as well as uncrewed surface vessels (USVs). It's built around the same market-leading 6G hardware and Wideband 2 digital acoustic technology you'll find in our entire family of USBL systems – even the software is the same.

HPT 3000

At the heart of the system is HPT 3000, a highly capable surface-deployed USBL transceiver which is optimised for; performance in shallow water, high elevation and long lay back operating scenarios, as well data telemetry.

It's typically deployed over the side of a vessel on a simple pole arrangement or under the hull of a USV. If the system is going to be permanently deployed, a though-hull deployment setup is possible.

HPT 3000 is connected to the system's 1U-high Ethernet Serial Hub (ESH) and your PC running the Ranger 2 software application. Fit a transponder to each target you want to track and you're ready to go. Mini-Ranger 2 is simple to configure and easy to use, even with no experience of acoustic tracking technology.

As standard HPT 3000 enables data harvesting from seafloor instruments using a crewed or uncrewed vessel.

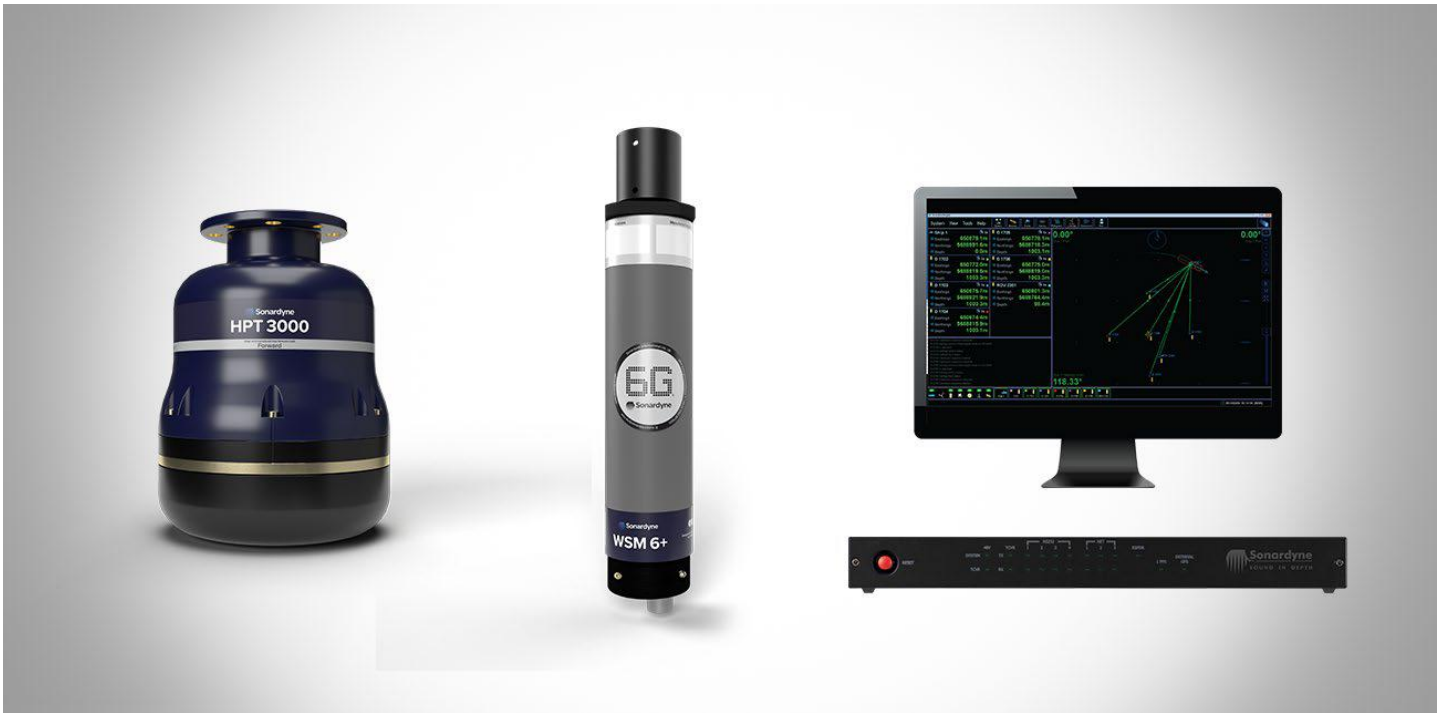
Transponder options

A wide range of Sonardyne 6G transponders can be used with Mini-Ranger 2, allowing you to select the most appropriate model for each task. If you're tracking divers, man-portable AUVs and micro-class ROVs, Nano is a popular choice. When tracking larger targets such as; a towfish, a crane wire lowering a structure, or an observation-class ROV, WSM 6+ will meet your requirements.

And if you're looking for a combined tracking and acoustic release transponder, RT 6 is now available. It allows you to deploy, track and recover seafloor equipment, all using the same instrument.

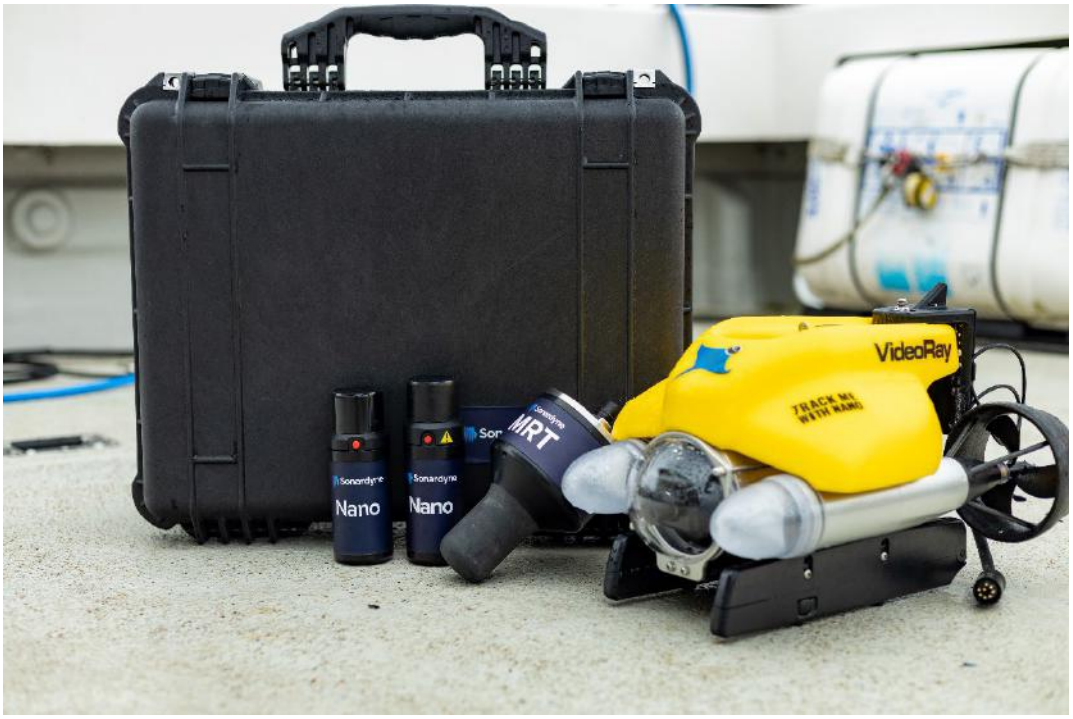
See the Sonardyne website for more information on Mini-Ranger 2.

Specifications
Mini-Ranger 2



Feature	Specification
Design	Powerful features for commercial users
	Easy to transport, hardware comes in one shipping box
	Configurable for manned or uncrewed vessel operations
	Quick to mobilise, configure and uninstall
	Shares common platform with other Sonardyne USBLs
Performance	0.2% positioning repeatability using external MRU
	1.3% positioning repeatability using internal MRU
	Up to 10 targets tracked, simultaneously
	995 m tracking range; extendable to 4,000 m
	Up to 3 Hz position update rate
Acoustics	MF frequency (20–34 kHz)
	Supports Sonardyne Messaging Service for data exchange
	Sonardyne Wideband 2 digital acoustic for reliable performance in both shallow and deep environments
	Transceiver optimised for high elevation tracking
Ownership	What's in the box: HPT 3000, ESH, deck cables, software, manual
	Warranty: 1 year return to Sonardyne service centre
	ITAR Controlled: No
	UK Export License: Not required for 995 m version. Required for extended range (4,000 m) version

Datasheet
Micro-Ranger 2



Micro-Ranger 2 has been designed as a true one box battery powered USBL solution, small enough to be carried as hand luggage on commercial flights and mobilised at short notice.

Micro-Ranger 2 uses a positioning technique known as Ultra-Short BaseLine (USBL) to calculate the position of underwater targets. A transceiver at the surface transmits an acoustic signal to transponders attached to each of the targets you wish to track. Using the return signal from each transponder, Micro-Ranger 2 determines its range (distance), bearing (heading) and depth, displaying the results on a radar-style software display.

If you're a first-time user of USBL technology, you'll find Micro-Ranger 2 incredibly easy to use. Connect your laptop to the inbuilt Wi-Fi, then attach a transponder to each target you want to monitor the position of. With the transceiver lowered into the water, you're ready to start tracking up to 10 divers, underwater vehicles or any other underwater equipment.

To deliver the best possible positioning performance and operator experience,
Micro-Ranger 2 uses the same market-leading 6G® hardware and Wideband®2 digital acoustic technology you'll find in Sonardyne's family of deepwater USBL systems, but with significantly less cost and complexity

Built around Sonardyne's Micro-Ranger Transceiver the USBL system can be deployed from the quayside or a vessel and is optimised for omni-directional tracking.

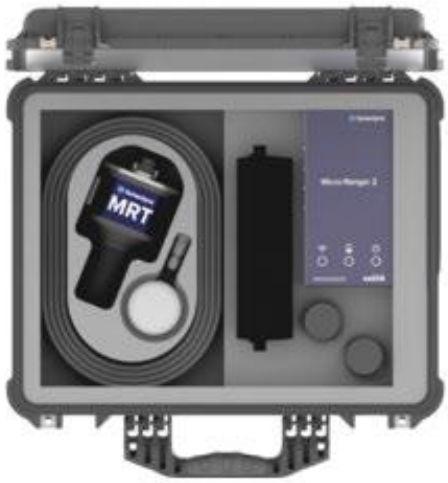
Each system is supplied with two of Sonardyne's Nano transponders, in either NFC or cabled configurations.

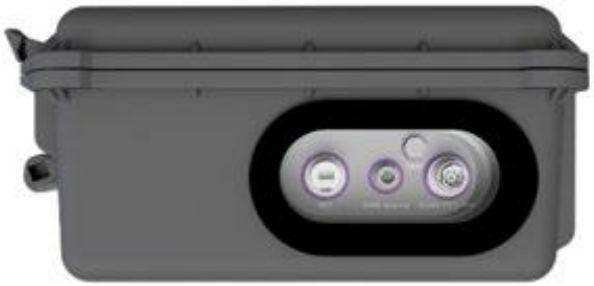
Note: The PC is not included.

Key features

- One box tracking solution for AUVs, ROVs and instruments
- Wide input voltage range for powering + charging on the job
- Optimised for shallow water high elevation tracking
- Track and actuate Sonardyne releases
- Internal rechargeable battery with external on/off switch
- Industry standard IP68 external connectors
- Global database of sound velocity profiles for ease of use and accuracy
- Available as an integrator kit with Marine Robotics Pack for AUV communication
- Export license free

Specifications
Micro-Ranger 2





Feature		Type 8241 - Micro-Ranger 2
Dimensions		524 x 428 x 206 mm
Weight		13.5 kg
External power + charge		12/24 V dc, 115–230 V ac, 30 W maximum, 3.5 W typical
Internal battery		Li-Ion 33 Wh[1]
Battery life		>10 hours at 1 Hz ping rate
Connection type		Ethernet or Wi-Fi (DHCP) to PC
User connection ports[2]		X1 RJ45 Ethernet port/X2 USB charging ports/RS232 via PC
Operating temperature		-15 to 45°C
Storage temperature		-20 to 45°C
IP rating		IP67[3]
Performance & Acoustics		
Accuracy[4]	Array	<3.5% of slant range 1DRMS
	System	<5% of slant range 1DRMS
Repeatability		0.3% of slant range 1DRMS
Range		<995 m
Update Rate		Up to 3 Hz
Beam Shape		Omni-directional
Frequency		19–34 kHz
Included in System Kit		
Software		Micro-Ranger 2
Transponder		X2 NFC Nano or x2 cabled Nano
Transceiver		Micro-Ranger USBL Transceiver (MRT) USBL
Internal GNSS		Single frequency GNSS
Cabling		10 m USBL cable/5 m GNSS cable
Charger		Portable topside charger/Nano charger
Documentation		Manual and quick start guide

[1] UN 38.3 certified with electronic disconnect for transport.
[2] Additional user connections possible to Micro-Ranger 2 software via UDP.
[3] IP67 when operating with a closed box.
[4] System accuracy includes internal Heading, Pitch, Roll and GNSS. Array accuracy excludes GNSS error and incorrect Heading, Pitch and Roll.

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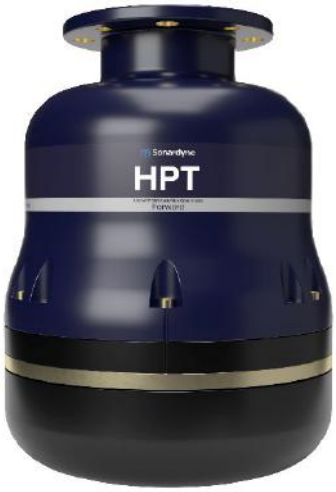
Datasheet
HPT 3000 USBL Transceiver



The HPT 3000 Ultra-Short BaseLine (USBL) is a new smaller, lighter, high-performance Ethernet interfaced transceiver supporting Sonardyne's Wideband®2 6G® instruments.

This smaller HPT offers significant improvements for survey positioning for coastal and near shore operations where high elevation tracking is required in low noise environments.

The advanced multi-element processing enables transponders to be positioned more precisely, more quickly and more robustly due to improvements in signal processing algorithms. When used as part of a complete Mini-Ranger 2 USBL system, heading and inertial navigation sensor, class leading performance is achieved.

The internal MTi-30 Xsens sensor provides pitch, roll and heading data for search and salvage applications which are time critical, requiring turn on and track functionality. Shallow water operations and pipelay from anchor barges also benefit from the internal sensor being calibration free.

'Discovery Mode' enables users to automatically detect previously deployed transponders including their configured address and channel, making the system easier to use.

The HPT 3000 is a highly capable acoustic transceiver. Its multiple simultaneous channels enable robust tracking of 10 targets.

Manufactured in aluminium bronze, the HPT 3000 is intended to be fitted temporarily or permanently to a vessel's through-hull or over-the-side pole.

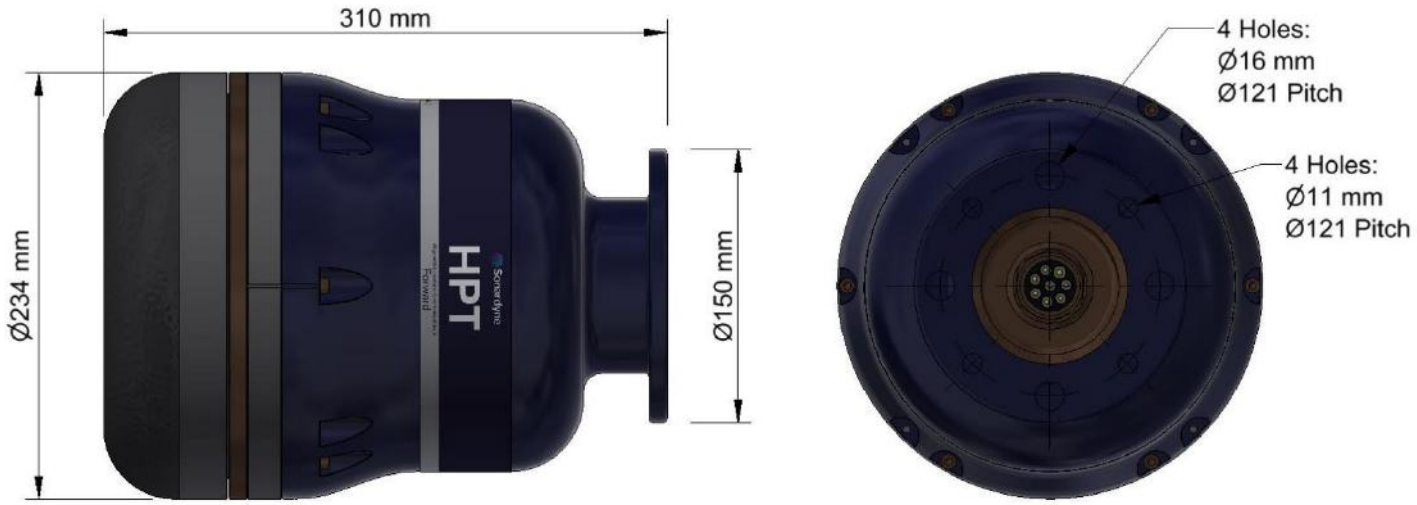
The full hemispherical coverage optimises performance in shallow water environments boosting transmissions and receive sensitivity in the horizontal axis.

Ethernet connectivity enables the system to function over existing ship network wiring for rapid installation.

Key features

- High performance USBL transceiver utilising Wideband 2 ranging and telemetry offer improved USBL precision and robustness
- Enhanced USBL array design for shallow water high elevation tracking.
- Internal "Xsens" sensor magnetic compass for quick operation.
- True simultaneous tracking of multiple transponders providing high update rates
- Built in health checks including array and electronics diagnostics
- Discovery mode allows users to automatically scan for transponders deployed within acoustic range
- Waterfall plot for enhanced ambient noise monitoring.
- Audio codec for live streaming. To allow noise and signals to be heard in the water.
- Compatible with the Sonardyne 6G suite of products.
- Ethernet connectivity using an Ethernet Serial Hub (ESH)
- Upgradable to Long BaseLine (LBL) and Modem

Specifications
HPT 3000 USBL Transceiver



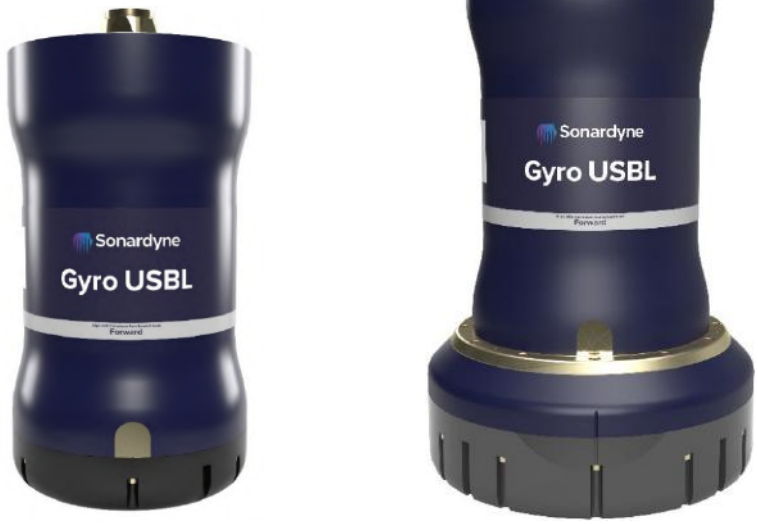
Feature		Type 8212
Operational frequency		MF (20–34 kHz)
Transceiver performance	Operating range	Restricted to 995 m with Mini Ranger 2 system (4000 m with extended range version)
	Acoustic cover	Full 180°
	Range precision	Better than 15 mm
	Positioning repeatability external MRU	All transceivers tested to better than 0.2% of slant range 1 Drms / 0.14% 1 Sigma
	Positioning repeatability internal Xsens pitch and roll	All transceivers tested to better than 1.3% of slant range 1 Drms / 0.9% 1 Sigma
Transmit source level (dB re 1 µPa @ 1 m)		194 dB
Tone equivalent energy (TEE)[1]		200 dB (3 JA)
Electrical		48 V dc (±10%), typical 15 W, maximum 120 W
Communication		Ethernet 100 Mbps
Operating temperature		-5 to 40°C
Storage temperature		-20 to 45°C
Mechanical construction		Aluminium bronze
Dimensions (height x diameter)		310 x 234 mm
Weight in air/water		19.4/9.5 kg

Note: The absolute accuracy of the system is dependent upon the quality of external attitude and heading sensors, beacon source level, vessel noise, water depth, mechanical rigidity of the transceiver deployment machine, SV knowledge and proper calibration of the total system using CASIUS.

[1] WBv2+ signals are 4x the duration of Sonardyne tone signals (WBv1 & WBv2 are 2x). The TEE figure shows the operational performance when comparing wideband and tone systems.
Detection performance is directly related to the signal energy (Joules (Watt seconds)) and not power. WBv2+ signals are longer in duration (greater energy) than WBv1 and Tone, therefore the detection performance is the same or improved for low transmit source levels.

For further information, contact us at **E** sales@sonardyne.com

Datasheet
Gyro USBL 5000/7000



Gyro USBL combines a Sonardyne 6th (6G®) generation high performance HPT Ultra-Short BaseLine (USBL) transceiver and a Lodestar Attitude and Heading Reference System (AHRS) / Inertial Navigation System (INS) in the same mechanical assembly.

With the AHRS / INS in fixed mechanical alignment to the USBL's acoustic array, and 'in-water' pre calibrated at the factory, Gyro USBL can be quickly deployed without need for a USBL calibration. This enables significant savings in vessel time and operational costs. Depending on the array type, Gyro USBL can offer precision of better than 0.1% of slant range out of the box.

The HPT transceiver component of the instrument utilises the latest Sonardyne Wideband®2 signal processing and is fully compatible with other products in the Sonardyne 6G equipment range.

Lodestar is tightly integrated with the HPT transceiver, providing highly accurate time-stamped motion and acoustic data. This enables unparalleled precision and accuracy of position estimation by removing many of the sources of error associated with all USBLs such as lever arm offsets, pole bending, and ship flexing.

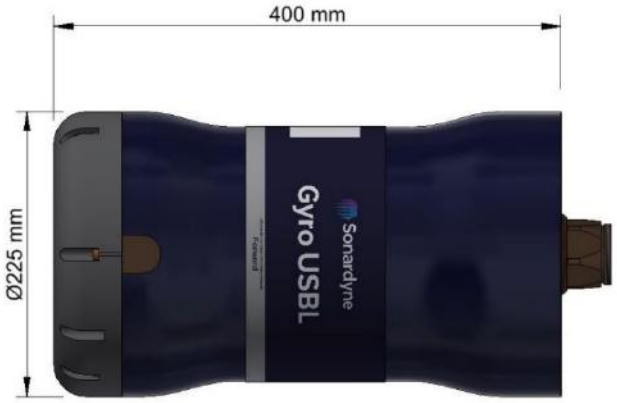
Two accuracy versions of Lodestar are available. A cost-effective version for standard USBL operations and a "plus" variant optimised for long layback tracking and touch-down monitoring.

Manufactured in aluminium bronze the Gyro USBL is ideally suited for installations on vessels of opportunity using through-hull or over-the-side poles. It is also ideal for permanent installation on flexible stem tubes and on very small vessels such as USVs.

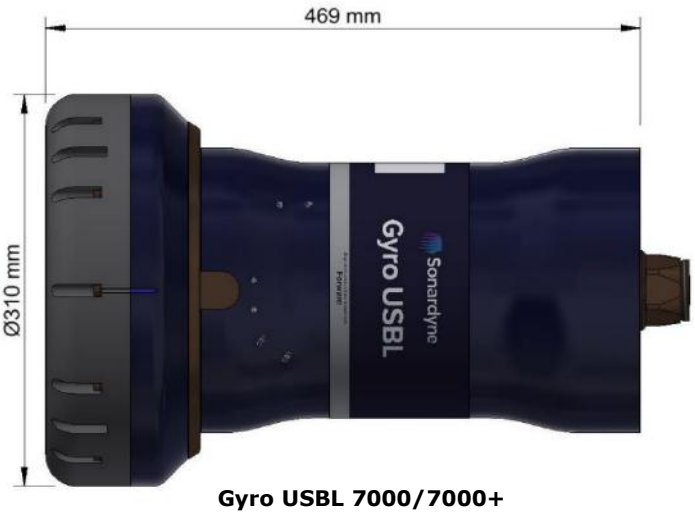
Key features

- Integrated Sonardyne 6G Wideband 2 USBL transceiver and Lodestar AHRS / INS offering high performance
- Small form factor
- Available in two inertial performance versions; standard for typical top-down operations and "plus" optimised for long layback tracking and touch-down monitoring.
- Available in two transducer array versions; standard and deepwater optimised
- LMF variant available on request
- Calibration free offering rapid deployment
- Class leading system precision and accuracy.
- Sonardyne Marksman LUSBL, DP-INS (plus variant) and Ranger 2 USBL compatible
- Compatible with Sonardyne's through-hull, over-the-side and stem tube deployment systems
- Ethernet and RS485 connectivity

Specifications
Gyro USBL 5000/7000



Gyro USBL 5000/5000+



Gyro USBL 7000/7000+

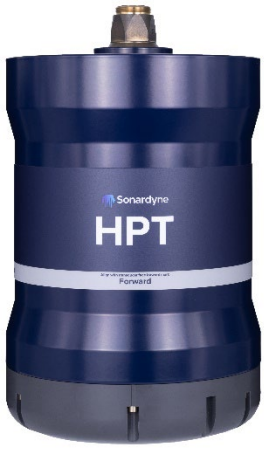
Feature			Gyro USBL 5000 Type 8084-0425 Gyro USBL 5000+ Type 8084-0455	Gyro USBL 7000 Type 8084-0427 Gyro USBL 7000+ Type 8084-0457
Operational frequency			MF (20–34 kHz)	MF (20–34 kHz)
Transceiver performance	Operating range		Up to 7,000 m	Up to 7,000 m
	Acoustic coverage		Up to ± 90°	Up to ±90° optimised for deepwater (dependant on frequency of operation)
	Range accuracy		Better than 15 mm	Better than 15 mm
	Expected system slant range accuracy 1 drms (20 dB)[1]		0.07%	0.04%
Transmit source level (dB re 1 µPa @ 1 m)			200 dB	200 dB
Tone equivalent energy (TEE)[2]			206 dB	206 dB
Heading	Accuracy	Plus variant	0.1° secant latitude	0.1° secant latitude
		Standard variant	0.2° secant latitude	0.2° secant latitude
	Settle time		<5 minutes in dynamic conditions	<5 minutes in dynamic conditions
Pitch & roll (accuracy)			0.01°	0.01°
Heave	Range		±99 m	±99 m
	Accuracy (real time)		5 cm or 5% (whichever the greater)	5 cm or 5% (whichever the greater)
Electrical			+48 V dc maximum 160 W	+48 V dc maximum 160 W
Connector			AGP-2716	AGP-2716
Communication			RS485, baud rate switchable, Ethernet 100 Mbps	
Operating temperature			-5 to 40°C	-5 to 40°C
Storage temperature			-20 to 45°C	-20 to 45°C
Dimensions (length x diameter)			400 x 225 mm	469 x 310 mm
Weight in air/water			35.7/21.6 kg	55.9/35.3 kg

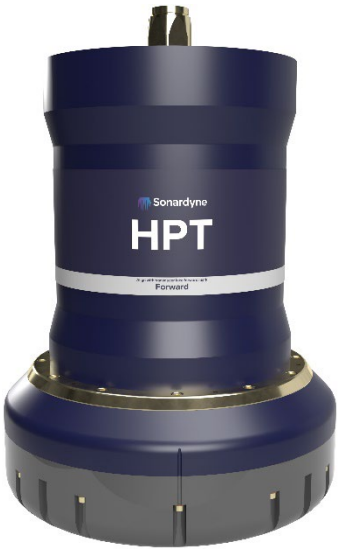
Note: The absolute accuracy of the system is dependent upon the beacon source level, vessel noise, water depth, mechanical rigidity of the transceiver deployment machine, SV knowledge and proper calibration of the total system using CASIUS

[1] System performance is directly affected by frequency of operation. These figures are taken at top end of the band of operation, i.e. 33.5 kHz for MF band

[2] WBv2+ signals are 4x the duration of Sonardyne tone signals (WBv1 & WBv2 are 2x). The TEE figure shows the operational performance when comparing wideband and tone systems.

Datasheet
HPT 5000/7000 USBL Transceiver





The HPT 5000 and 7000 Ultra-Short BaseLine (USBL) and telemetry transceiver is a high-performance platform which supports Sonardyne's Wideband®2 6G® instruments and offers significant improvements in acoustic positioning and telemetry performance.

The advanced multi-element processing enables transponders to be positioned more precisely, more quickly and more robustly due to improvements in signal processing algorithms and array design. When used as part of a complete USBL system such as Marksman or Ranger 2 and tightly integrated with Sonardyne's Lodestar attitude, heading and inertial navigation sensor, class leading performance in all water depths is achieved.

New functionality, such as 'Discovery Mode' which enables users to automatically detect previously deployed transponders including their configured address and channel, makes the system easier to use. The HPT also fully supports 6G LBL operations via Fusion LBL software.

The HPT transceiver is also a highly capable acoustic telemetry transceiver. Its multiple simultaneous channels enable robust high speed telemetry reception from Sonardyne's 6G subsea transponder modems and data loggers so reducing valuable vessel time.

Manufactured in aluminium bronze, the HPT is intended to be fitted temporarily or permanently to a vessel's through-hull or over-the-side pole.

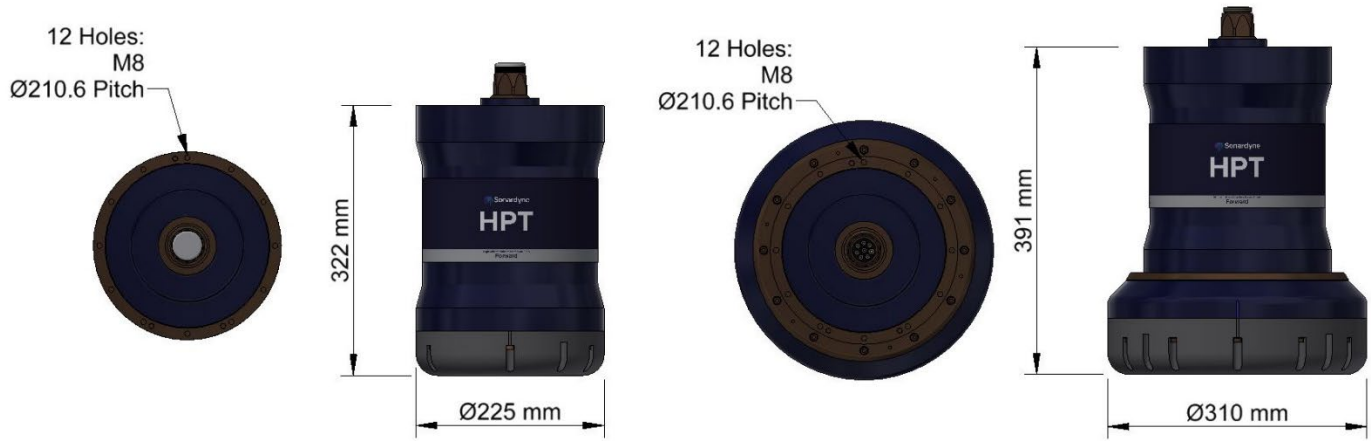
A number of different array designs are available from full hemispherical coverage to specialist directional designs for ultra deepwater high noise environments.

Key features

- High performance USBL transceiver utilising Wideband 2 ranging and telemetry offer improved USBL precision and robustness
- Enhanced USBL array designs for improved noisy vessel and deepwater performance
- True simultaneous tracking of multiple transponders providing high update rates
- Seamless simultaneous positioning and telemetry of data whilst tracking
- Sonardyne Wideband 1, 2 and HRP400 ranging mode compatible
- Built in health checks including array and electronics diagnostics
- Discovery mode allows users to automatically scan for transponders deployed within acoustic range
- In water ambient noise monitoring
- Integral robust high data rate telemetry for fast acquisition of data from subsea instruments.
- Compatible with Marksman LUSBL, Ranger 2 USBL and Fusion 6G LBL systems
- Optional Ethernet connectivity

Specifications

HPT 5000/7000 USBL Transceiver



Feature		Type 8142-001	Type 8142-002 (deepwater optimised unit)
Operational frequency		MF (20–34 kHz)	MF (20–34 kHz)
Transceiver performance	Operating range	Up to 7,000 m	Up to 7,000 m
	Acoustic coverage	Up to ± 90°	Up to ± 90º optimised for deep water (depending on frequency of operation)
	Range precision	Better than 15 mm	Better than 15 mm
	Positioning repeatability	All transceivers tested to better than 0.1% of slant range 1 Drms	All transceivers tested to better than 0.07% of slant range 1 Drms
Transmit source level (dB re 1 µPa @ 1 m)		200 dB	200 dB
Tone equivalent energy (TEE)[1]		206 dB (13 JA)	206 dB (13 JA)
Electrical		48 V dc (±10%), Typical 15 W, Max 120 W	48 V dc (±10%), Typical 15 W, Max 120 W
Communication		RS485, baud rate switchable, Ethernet 100 Mbps	RS485, baud rate switchable, Ethernet 100 Mbps
Operating temperature		-5 to 40°C	-5 to 40°C
Storage temperature		-20 to 45°C	-20 to 45°C
Mechanical construction		Aluminium bronze	Aluminium bronze
Dimensions; length x diameter		322 x 225 mm	391 x 310 mm
Weight in air/water		26.7/15.3 kg	46.9/29.0 kg
Options		Tilted array adaptor	Tilted array adaptor

Note: The absolute accuracy of the system is dependent upon the quality of external attitude and heading sensors, beacon source level, vessel noise, water depth, mechanical rigidity of the transceiver deployment machine, SV knowledge and proper calibration of the total system using CASIUS.

[1] WBv2+ signals are 4x the duration of Sonardyne tone signals (WBv1 & WBv2 are 2x). The TEE figure shows the operational performance when comparing wideband and tone systems.
Detection performance is directly related to the signal energy (Joules (Watt seconds)) and not power. WBv2+ signals are longer in duration (greater energy) than WBv1 and Tone, therefore the detection performance is the same or improved for low transmit source levels.

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