



Marksman is the advanced acoustic positioning system that provides an accurate and highly repeatable position reference for dynamically positioned vessels. Marksman is primarily suited to deep water Mobile Drilling Units, Well Intervention and Heavy Lift Construction vessels, where the system calculates position relative to a seabed deployed transponder array. As Marksman operates using Sonardyne's latest digital Wideband 2 signal technology, even in offshore fields with simultaneous vessel operations (SIMOPS), the system maintains a reliable output.

LUSBL Positioning

Marksman calculates position by measuring two-way ranges and bearings between a transceiver on the vessel and a transponder array on the seabed. The system combines the performance of Long Baseline (LBL) positioning, where accuracy is virtually independent of water depth, with the convenience of Ultra-Short Baseline (USBL). The combined technique, Long and Ultra-Short Baseline (LUSBL), offers a high level of positional repeatability with a fast system calibration. The robustness and stability of the positioning solution has made Sonardyne LUSBL systems the primary reference on many installations, particularly in fields off Brazil and West Africa where DGPS can be affected by scintillation (sunspot activity).

6G[®] Technology

Marksman is part of Sonardyne's new 6G[®] (Sixth Generation) product family. These systems use digital ultra-wide bandwidth acoustic signals offering fast, robust transmission of data, precise ranging and greater immunity to vessel and ROV noise and interference from other acoustic systems.

6G[®] technology is simple and intuitive to operate allowing users to quickly gain confidence and thereby reducing risk. New acoustic instruments are easier to set up and enable faster and more efficient solutions for applications such as structure

Marksman at a glance



- Highly repeatable DP position reference
- Can be configured for DP2 and DP3 class vessels
- Dual independent and dual redundant equipment configurations available
- Fully automated system setup
- Up to 1Hz position updates
- Easy to use, software user interface
- Compatible with Sonardyne's acoustically aided inertial navigation technology

MARKSMAN LUSBL

HIGHLY REPEATABLE POSITION REFERENCE FOR DP VESSELS

tracking, BOP control and autonomous monitoring. Long battery life enables seabed reference transponders to be semi-permanently deployed, reducing the need for intervention to replace batteries.

Dual Independent / Dual Redundant

Marksman can be installed in Dual Independent or Dual Redundant configurations.

In Dual Independent configuration, the hardware is setup to offer two stand-alone Marksman systems each outputting an independent position telegram to the DP system. Each of the systems can operate on a dedicated transponder array or use the same array through time synchronization of acoustic interrogation.

Dual Redundant provides cross wiring of transceivers and processors on the top side to provide redundancy in hardware. Any transceiver and/or processor can fail in the system whilst maintaining a position output to the DP system.

DP-INS

Sonardyne's acoustically aided Inertial Navigation System (DP-INS) provides an independent DP position reference that complements a Marksman installation.

DP-INS offers many benefits such as the ability to ride through short term signal drop-outs from acoustic by maintaining a useful position output to the DP at 5Hz. Sonardyne's inertial navigation technology also provides cost saving benefits such as being able to run at much slower acoustic update rates, thereby further extending transponder battery life and being able to operate using a single transponder instead of full seabed array. Refer to separate DP-INS brochure for more details.

The Lodestar sensor platform on which DP-INS is based, is also a premium quality AHRS unit that can be used to remove the effects of vessel motion upon the transceiver. For optimum system performance, Lodestar is mounted above the acoustic transceiver and connected to it. This achieves a tightly compensated solution that enables an achievable system accuracy of 0.05% of slant range.

Riser Monitoring and Riser Profiling

Sonardyne's Marine Riser Angle Monitoring System (MRAMS) and Riser Profiling System (RPS) can be used stand-alone or integrated within Marksman. MRAMS monitors the differential angles of a BOP and riser at the Lower Flex Joint, alerting users to any critical deviations. RPS provides a wireless real-time vertical profile of current speed and direction, temperature and inclination of drilling and production risers.

System Configuration

Bridge / Instrument Room Hardware

Onboard, the Navigation Sensor Hub (NSH) is the interface between the in-water acoustic instruments, sensors and the Navigation Computer which runs the Marksman acoustic positioning software. In addition to accurately time-stamping incoming data from external devices such as gyro, VRU and GPS, the NSH also provides power and communications for vessel's acoustic transceiver.

Developed in close co-operation with end users, Marksman's software user interface is easy to learn and intuitive to use. Important information and warning messages are visible at a glance whilst touch screen operation enables commands to be quickly executed. An extensive set of features allow the user to optimise the performance of the system, including real-time acoustic quality indicators and signal noise analysis.

Vessel Transceiver

Sonardyne's directional HPT transceiver is specifically designed for drilling and heavy construction vessels and is optimised to receive signals arriving within a $\pm 50^\circ$ cone below the vessel. Any noise generated outside of this area, for example by thrusters

Lodestar AHRS + HPT

The combination of Sonardyne's Lodestar AHRS for vessel motion compensation, interfaced to a HPT positioning and telemetry transceiver, all installed on a through-hull deployment machine, deliver the most precise positioning available.



Worldwide Track Record

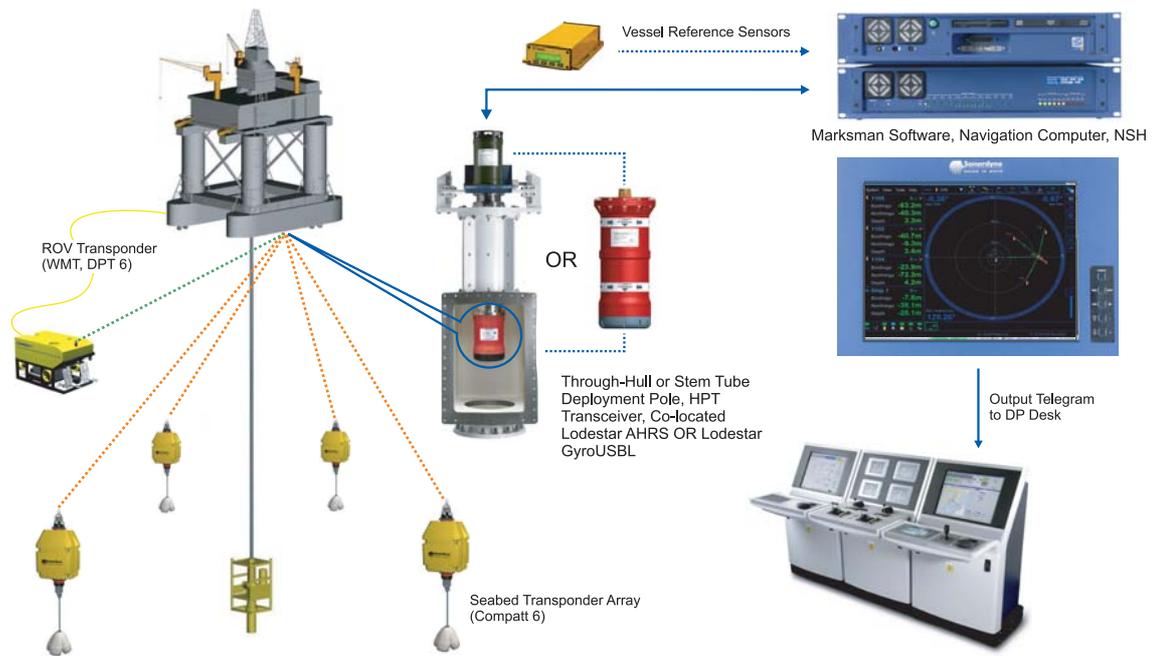
Sonardyne has decades of experience installing deployment machines and acoustic transceivers, from retro fits of existing installations to complete newbuilds.



Marksman Software

An experienced DPO can learn to use Marksman with confidence after only a few hours tuition.





to the side, is significantly attenuated, therefore improving the positioning accuracy. The omni-directional HPT is suitable for general survey, tracking and DP operations.

Optimal system performance is achieved by ensuring that the mechanical installation of the transceiver is as rigid as possible. Sonardyne's through-hull deployment machine has a stiff, one piece Inconel clad steel pole that hydraulically lowers and raises the transceiver through a gate valve. A sea chest with inspection hatch allows for ease of installation and cleaning of the transceiver. Sonardyne also offers a through-tube method of transceiver deployment for convenient retrofitting systems to older vessels. Refer to separate brochure for more details.

Subsea Transponders

The primary transponder for use with Marksman is Compatt 6; Sonardyne's most advanced multi-function transponder capable of deep water, ultra-long life deployment. Compatt 6 meets the need for a semi-permanent seabed transponder that can be utilised to support subsea positioning tasks during the life of a field.

For tracking ROVs and other mobile targets, Wideband Mini Transponder (WMT), is a versatile mini-sized transponder depth rated to 3,000 metres. Marksman is also compatible with previous generation transponder hardware.

Transponder Deployment and Calibration

Wideband 2 offers enhanced digital modulation of signals, further improving the robustness and precision of Sonardyne's Wideband 1 systems. With range repeatability better than 15mm, transponder arrays can be reduced from a radius of 1/3 of water depth around the vessel, to the extent of an ROV's tether. For example, in 2,000 metres of water, arrays can now be set on a radius of 250 metres rather than 700 metres. This saves vessel time as it does not need to move location.

Similar cost savings are generated during the calibration of the transponder array. Marksman's system architecture negates the need for baseline measurements between transponders by enabling a 'top-down' calibration as the transponders are deployed. This procedure takes less than one hour once the rig is on location.



Transponder Deployment and Options

(Above) A seabed array of Compatt transponders and floatation collars is prepared for deployment. Compatt 6 (Below right) is Sonardyne's most advanced transponder, offering long deployment and a depth rating up to 7,000 metres. (Below left and middle) WMT and DPT 6 transponders available for ROV tracking.



Global Headquarters
 T. +44 (0) 1252 872288
 F. +44 (0) 1252 876100
 sales@sonardyne.com

Aberdeen, UK
 T. +44 (0) 1224 707875
 F. +44 (0) 1224 707876
 sales@sonardyne.com

Houston, USA
 T. +1 281 890 2120
 F. +1 281 890 7047
 usa.sales@sonardyne.com

Singapore
 T. +65 6542 1911
 F. +65 6542 6937
 asia.sales@sonardyne.com

Macaé, Brasil
 T. +55 22 2123 4950
 F. +55 22 2123 4951
 brasil.sales@sonardyne.com

Marksman System Performance

Water Depth	LUSBL Tracking		USBL Tracking
	LBL Array Radius	Expected Repeatability	Expected Repeatability
1000m	175m	0.16m	1.5m
2000m	350m	0.17m	2.9m
3000m	525m	0.39m	5.1m

Expected repeatability values are 1 drms assuming quiet vessel (84dB// μ Pa.m) with standard size USBL transceiver at centre of an array of 5 directional beacons, correct sound speed, rigid deployment and Lodestar AHRS.

Number of Targets Tracked	1 surface, unlimited subsea
Position Update Rate	1 second, dependent upon water depth
Gyro Data Formats	NMEA HDT, SG Brown (ASCII, BIN), Robertson SKR82
VRU Data Formats	SON2, TSS1, TSS2, EM1000, EM3000, PRDID
GPS Data Formats	GPGGA, GPGLL

Marksman Equipment List Key: ● = Required ○ = Optional



● Software Marksman ○ Software MRAMS ○ Software Riser Profiling ● Type 8026 Navigation Computer ● Type 8098 Navigation Sensor Hub



● Type 8142 HPT USBL Transceiver ○ Type 8084 Lodestar AHRS Subsea ○ Type 8084 Lodestar GyroUSBL ● Type 7950 Deployment Machine ○ Type 8169 Stem Tube Deployment Pole



● Type 8300 Compatt 6 Transponder ○ Type 8301 DPT 6 Transponder ○ Type 8190 Wideband Mini Transponder ○ Type 8170/1 WSM 6 Transponder

Other Wideband Systems from Sonardyne

- DP-INS
- SPRINT
- Ranger 2 USBL
- Fusion 6G[®] LBL
- Wideband Emergency BOP Controller
- Wideband Acoustic Data Logger

Marksman Key Technology



6G[®]

Sonardyne's new sixth generation (6G[®]) technology platform provides robust performance, ease of use, greater functionality, equipment flexibility and compatibility with aided inertial technologies. Its features reduce operational risk, deliver more efficient operations and lower the cost of ownership.



Wideband 2[®]

Sonardyne Wideband[®] 2 is an ultra-wide bandwidth signal architecture exclusively developed for 6G[®] hardware. Delivering seamless acoustic navigation and telemetry of subsea data, the technology offers a host of benefits; fast and robust transmission of data, precise ranging, wide area coverage, mitigation from multipath signals and greater immunity to noise from vessels and other acoustic systems.



Battery Life

Do more for longer. 6G[®] products are designed using the latest low power electronic architecture saving you time and money by not having to recover equipment to recharge or replace transponder battery packs.



Dual Redundancy

Marksman can be configured for dual redundancy where vessel systems are cross linked so that in the event of equipment failure, acoustic positioning operations can continue.



Support

Need to get in touch? Sonardyne's customer support team are available around the clock to get you the answers you need. From advice on which product to use to operational support, it's all part of the service.