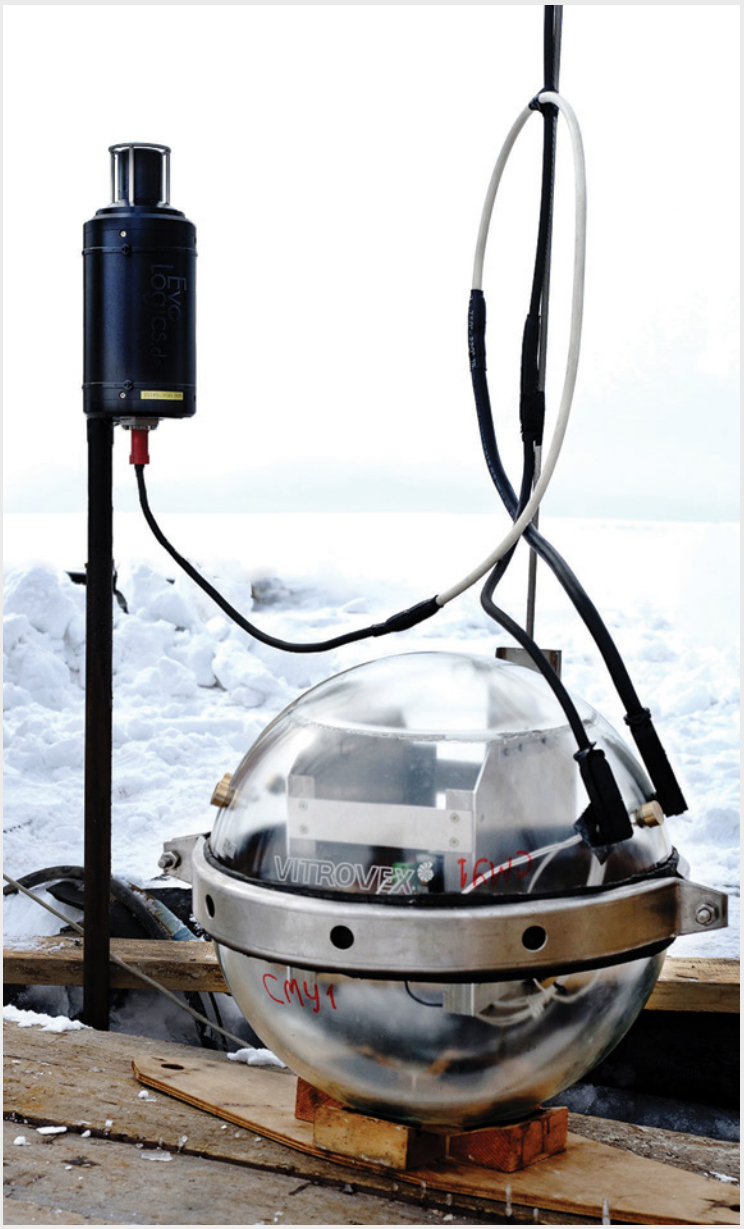
LBL POSITIONING AND COMMUNICATION SYSTEMS

PRODUCT INFORMATION GUIDE

EVOLOGICS S2C LBL UNDERWATER POSITIONING AND COMMUNICATION SYSTEMS

EvoLogics LBL systems bring the benefits of long baseline (LBL) acoustic positioning to offshore and maritime applications that demand highly accurate results. S2C R-series underwater acoustic modems that operate as transponders, deployed around the working area in an array of geo-referenced baseline nodes, allow to track and navigate mobile targets with highest accuracy that does not depend on the depth. Combining highly accurate LBL positioning with full benefits of an S2C technology communication link, an S2C LBL system delivers an excellent all-round performance ideal for application scenarios that demand space-, energy- and cost-saving solutions. Switching between positioning and communication modes is not necessary: positioning data is calculated simultaneously with acoustic transmissions. Both features complement each other in a fully integrated positioning and communication system that opens new possibilities for a wide range of subsea applications.

- Full compatibility - use S2C R- and M -series modems as pingers or transponders
- Patented S2C (Sweep Spread Carrier) Technology - spread spectrum technology based on extensive bionic studies
- LBL positioning with up to **1.5 cm accuracy**
- Simultaneous LBL positioning and data transmissions, multiple target tracking
- "Silent" positioning mode: targets do not transmit beacon signals and self-position with broadcasts from baseline nodes
- Self-adaptive algorithms for reliable performance in adverse conditions, forward error correction and data compression
- Advanced communication protocol with several data delivery algorithms: send and receive large volumes of data with the highest bitrate possible in current conditions; send and receive short instant messages without interrupting the main data flow between devices
- Addressing and networking: build relay chains and underwater networks with broadcasting capabilities
- Low power consumption and additional power-saving options



APPLICATIONS

Positioning of offshore equipment
Track positions of offshore equipment during installation to ensure highly accurate placement at defined coordinates

Navigation of ROVs and AUVs
Simultaneously track positions of multiple ROVs or AUVs and control their missions with instant commands

Cartography
Locate underwater features with geo-referenced coordinates when used together with GPS or differential GPS

Sensor network tracking
Track drifts of moored sensors and detectors for accurate geo-referencing of their measurements

Diver Tracking
Monitor positions of several divers and exchange information with them during the mission

MODULES AND OPTIONS

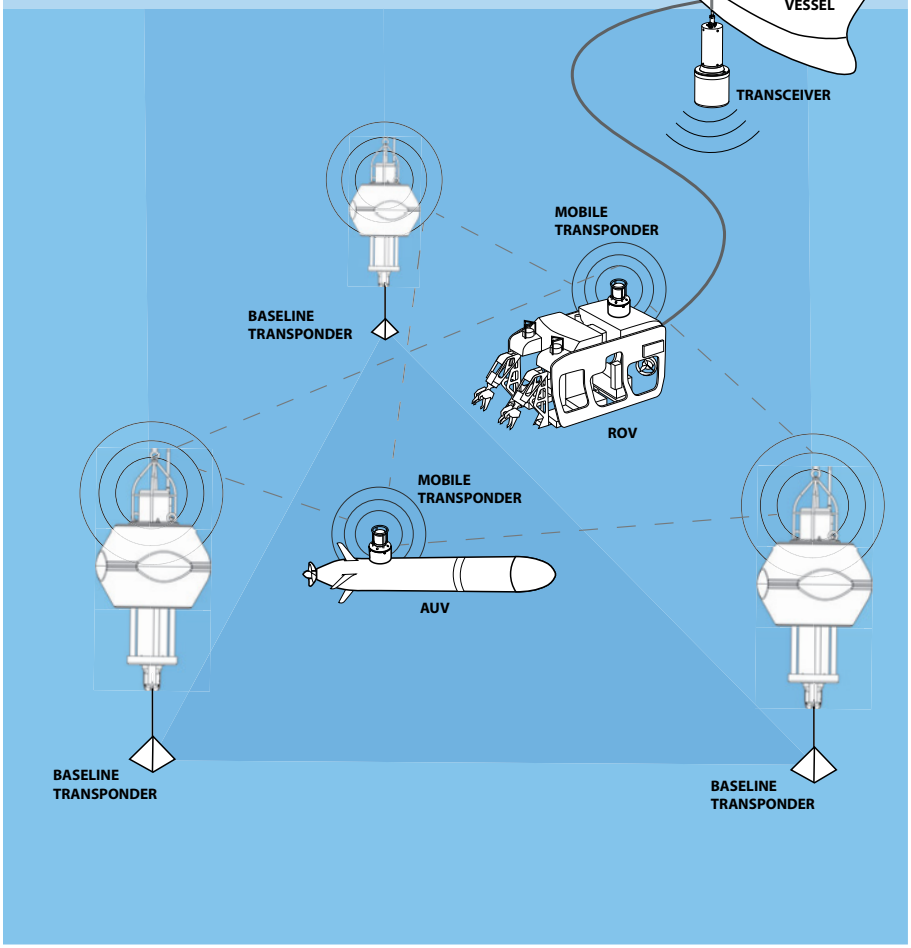
- AHRS (Attitude and Heading Reference System)
- GPS integration
- Integrated rechargeable battery
- Power-saving acoustic Wake-Up module
- Integrated data-logger
- Acoustic releases and floatation collars
- Short- mid- and long-range devices for shallow or deep water applications
- OEM versions available
- Compatible with S2C R modem and USBL solutions

SENSOR INTEGRATION

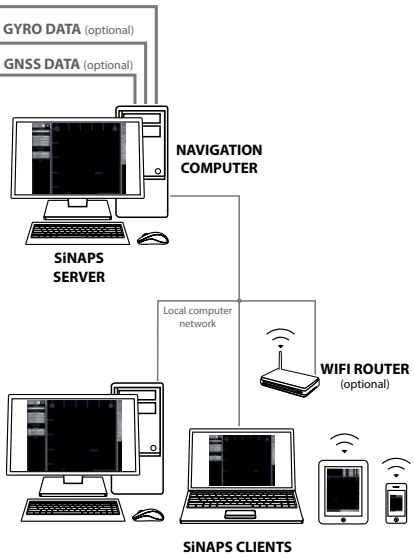
- ADCP: Acoustic Doppler Current Profiler
- SVP: Sound Velocity Profiler
- CTD: Conductivity, Temperature, Depth, Pressure sensors
- INS: Inertial Navigation System
- More options upon request

EVOLOGICS LBL COMMUNICATION AND POSITIONING SYSTEM: TYPICAL CONFIGURATION

An LBL positioning system uses an array of sea-floor mounted baseline transponders: their exact locations are known, so they are used as reference points for determining target positions. Baseline transponders reply to acoustic interrogation signals from target-mounted transceivers with their own acoustic pulses, allowing a target transceiver to calculate its position by measuring the distance between itself and each transponder of the baseline array.



SINAPS POSITIONING SOFTWARE



EvoLogics SiNAPS positioning software is a client-server application. SiNAPS server is installed on the navigation computer and interfaced with the vessel transceiver and other external instruments. SiNAPS server receives, processes and stores data from the transceiver and external instruments.

SiNAPS client is the web-based user interface of the positioning system. It displays real-time information about the positions of the vessel and the targets, provides access to data management tools and system configuration settings. The UI can be opened in most current web-browsers on multiple devices in the local computer network at once.

Baseline transponders are either mounted in sea-floor stands or equipped with acoustic release mechanisms and flotation collars for easier recovery to the surface. They are deployed around the work site and carefully calibrated prior to LBL system operation. Target transceivers are mounted on positioning targets, for example, on autonomous underwater vehicles (AUVs), remotely operated vehicles (ROVs) etc., and use acoustic signals to determine distances to baseline nodes.

A GPS receiver is installed on the vessel for accurate calibration of the baseline transponder array after its deployment. During calibration, the vessel moves above the deployed baseline transponders to accurately determine their location. Coupled with a vessel transceiver, the GPS receiver provides the baseline nodes' positions in real-world coordinates.

Third-party or built-in AHRS sensor (Attitude and Heading Reference System) provides information about the vessel's orientation during calibration to eliminate positioning errors. The navigation computer is installed on the vessel, interfaced with the vessel transceiver and other external instruments and connected to the local computer network. EvoLogics positioning software, the SiNAPS, and the Transponder communication utility, a web-based tool to monitor and control the baseline transponders, are accessible from the navigation computer to configure, control and monitor the mission.

SPECIFICATIONS AND CONFIGURATION OPTIONS

The LBL Positioning System uses S2C R-modems in baseline transponder configuration. Standard R-, M- and T-Series modems can be configured as target transceivers.

			R 48/78	R 42/65	R 18/34	R 18/34H	R 15/27	R 12/24	R 7/17	R 7/17D	R 7/17W	M 48/78	M 42/65	M 18/34	M HS
GENERAL	OPERATING DEPTH	Delrin	200 m	200 m	200 m	200 m	200 m	200 m	200 m	200 m	200 m	200 m	200 m	200 m	200 m
		Aluminium Alloy	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	not available			
		Stainless Steel	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m
		Titanium	2000 m	2000 m	2000 m	2000 m	6000 m	6000 m	6000 m	10000 m upon request	6000 m	not available			
	OPERATING RANGE		1000 m	1000 m	3500 m	3000 m	6000 m	6000 m	8000 m	10000 m	8000 m	1000 m	1000 m	3500 m	300 m
	FREQUENCY BAND		48 - 78 kHz	42 - 65 kHz	18 - 34 kHz	18 - 34 kHz	15 - 27 kHz	13 - 24 kHz	7 - 17 kHz	7 - 17 kHz	7 - 17 kHz	48 - 78 kHz	42 - 65 kHz	18 - 34 kHz	120 - 180 kHz
	TRANSDUCER BEAM PATTERN		horizontally omnidirectional	wide - angle 100 degrees	horizontally omnidirectional	hemispherical	wide-angle 120 degrees	directional 70 degrees	hemispherical	directional 80 degrees	hemispherical	horizontally omnidirectional	wide - angle 100 degrees	horizontally omnidirectional	omnidirectional
CONNECTION	ACOUSTIC CONNECTION		up to 31.2 kbit/s	up to 31.2 kbit/s	up to 13.9 kbit/s	up to 13.9 kbit/s	up to 9.2 kbit/s	up to 9.2 kbit/s	up to 6.9 kbit/s	up to 6.9 kbit/s	up to 6.9 kbit/s	up to 31.2 kbit/s	up to 31.2 kbit/s	up to 13.9 kbit/s	up to 62.5 kbit/s
	BIT ERROR RATE		less than 10^{-10}						less than 10^{-10}			less than 10^{-10}			
	INTERNAL DATA BUFFER		1 MB, configurable						1 MB, configurable			1 MB, configurable			
	INTERFACE [1]		Ethernet or RS-232						Ethernet or RS-232			Ethernet or RS-232			
	INTERFACE CONNECTORS		up to 4 connectors, Ethernet and serial combinations						up to 4 connectors, Ethernet and serial combinations			1 connector			
POWER	POWER CONSUMPTION [2]	Stand-by Mode	2.5 mW	2.5 mW	2.5 mW	2.5 mW	2.5 mW	2.5 mW	2.5 mW	2.5 mW	2.5 mW	2.5 mW	2.5 mW	2.5 mW	0.5 mW
		Listen Mode	5 - 285 mW	5 - 285 mW	5 - 285 mW	5 - 285 mW	5 - 285 mW	5 - 285 mW	5 - 285 mW	5 - 285 mW	5 - 285 mW	not available			
		Receive Mode	0.8 W	0.8 W	0.8 W	0.8 W	0.8 W	0.8 W	0.8 W	0.8 W	0.8 W	0.8 W	0.8 W	0.8 W	0.8 W
		Transmit Mode	up to 60 W	up to 40 W	up to 65 W	up to 65 W	up to 65 W	up to 57 W	up to 45 W	up to 65 W	up to 70 W	up to 55 W	up to 35 W	up to 55 W	up to 8.5 W
	POWER SUPPLY OPTIONS [3]	External	24 VDC (12 VDC)						24 VDC (12 VDC)			24 VDC (12 VDC)			
		Internal	Rechargeable battery 5 Ah or 10 Ah						Rechargeable battery 5 Ah or 10 Ah			Rechargeable battery 3.350 Ah			
PHYSICAL	HOUSING OPTIONS	Delrin	Plastic non-magnetic corrosion-resistant housing for short-term deployments, depth rating 200 m						✓	✓	✓	✓	✓	✓	✓
		Aluminium Alloy	Light metal housing for short-term deployments, depth rating 2000 m						✓	✓	✓	not available			
		Stainless Steel	Robust metal, suitable for long-term deployments in harsh environments, depth rating 1000 m or 2000 m						✓	✓	✓	✓	✓	✓	✓
		Titanium	Corrosion resistant housing, suitable for long-term deployment in harsh environments, depth rating 6000 m						✓	✓	✓	not available			
	DIMENSIONS [4]	Housing Total length	Ø 110 x 178 mm 265 mm	Ø 110 x 178 mm 265 mm	Ø 110 x 178 mm 265 mm	Ø 110 x 218 mm 300 mm	Ø 110 x 178 mm 295 mm	Ø 113 x 220 mm 390 mm	Ø 110 x 178 mm 322 mm	Ø 110 x 178 mm 338 mm	Ø 110 x 178 mm 246 mm	Ø 63 mm x 235 mm 310 mm	Ø 63 mm x 235 mm 300 mm	Ø 63 mm x 235 mm 310 mm	Ø 63 mm x 235 mm 310 mm
	WEIGHT, dry/wet	Delrin	2250/400 g	2300/300 g	2245/400 g	3100/1200 TBC g	3850/1080 g	2990/490 g	4700/600 g	6200/600 g	3000/490 g	1120/330 g	1210/420 g	1265/480 g	1120/330 g
MODULES AND OPTIONS	WAKE-UP MODULE [5] not compatible with Ethernet		The Wake Up Module turns the rest of the device on if it detects incoming acoustic signals or incoming data on one host interface. Once the device completes receiving or transmitting data, it switches itself off. 2-connector version available for R-series						✓	✓	✓	✓ single-interface version only			
	POWER SWITCH [6] not compatible with Ethernet		The Power Switch allows to provide power supply to up to 4 external instruments and turn them on/off on command						✓	✓	✓	not available			
	ADVANCED TIMEKEEPING MODULE		Allows to accept 1 PPS input from GPS, optionally includes a Chip Scale Atomic Clock for highly precise timekeeping						✓	✓	✓	✓ only available for OEM modem versions			
	SDM VERSION		Software Defined Modem mode: transmit/receive arbitrary waveforms and set a reference to trigger signal detection						✓	✓	✓	✓	✓	✓	✓
	ACOUSTIC RELEASE DEVICE		Baseline transponders - reliable mechanism for recovery to the surface. Also available in OEM version for system integration						✓	✓	✓	not available			
	FLOATATION COLLAR		Baseline transponders - floatation collar for fast recovery to the surface						✓	✓	✓	not available			
	PRESSURE SENSOR		Accurate pressure measurements						✓	✓	✓	not available			
	CABLE-MOUNTED TRANSDUCER		Separated transducer for easier system integration. Standard cable length 1.5 m, other upon request.						✓	✓	✓	✓	✓	✓	✓
	OEM VERSION		Version without housing: transducer and electronics for system integration						✓	✓	✓	✓	✓	✓	✓
	APPLICATIONS		Fast short and medium range transmissions in horizontal channels	Fast short and medium range transmissions in vertical, slant and horizontal channels	Medium range transmissions in horizontal channels	Medium range transmissions in slant channels	Long range transmissions in vertical and slant channels, long-term deployment	Long range transmissions in vertical and slant channels, long-term deployment	Long range transmissions in vertical and slant channels, depth-rated	Long range transmissions in vertical channels, depth-rated	Long range transmissions in slant channels, depth-rated	Fast short and medium range communication for UUVs	Fast short and medium range communication for UUVs	Medium range communication for UUVs	High-speed short range communication for UUVs and divers

TRANSPONDER WITH ACOUSTIC RELEASE

OEM ACOUSTIC RELEASE DEVICE

[1] One RS-232 Interface can be replaced with a RS-422 interface. Contact EvoLogics for more information!
[2] Power consumption for RS-232 interface. Add 500 mW if an Ethernet interface is installed. Add 300 mW if the Wake-Up Module is installed. User-configurable Listen Mode is only available with a Wake-Up module installed. Power consumption in Listen Mode depends on Listen Mode settings.
[3] 300 VDC available for 42/65 models. Contact EvoLogics for more information on external and internal power supply options!
[4] Dimensions of a build in Delrin housing, other builds are slightly larger. Dimensions vary depending on housing type and installed options. Contact EvoLogics for more information on device dimensions and weights, request a drawing if necessary.
[5] **The Wake Up Module is only compatible with RS-232 interface!** It is not compatible with Ethernet or RS-422. 2-channel Wake Up Module version reacts to incoming data on two serial interfaces.
[6] **The Power Switch is only compatible with RS-232 interface!** It is not compatible with Ethernet or RS-422.

ABOUT US

EvoLogics GmbH develops underwater information and communication systems based on bionic concepts, combining cutting edge engineering with the best ideas found in nature. The advanced product features have become enabling technologies for deep water exploration and production.

EvoLogics range of products offers highly reliable, flexible and cost-effective solutions for multiple underwater communication, positioning, navigation and monitoring applications. We strive for innovation and invest our vast experience into developing, manufacturing and supporting products that deliver an excellent performance and solve the most challenging tasks.

The company was founded in 2000 in Berlin, Germany, by a group of leading international scientists and maritime engineering experts. The company since focuses on developing innovative solutions for maritime and offshore industries, as well as smart robotic systems design and bionic research.

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