# Evo Logics®

UNDERWATER ACOUSTIC MODEMS

EvoLogics Underwater Acoustic Modems

EvoLogics underwater acoustic modems provide full-duplex digital communication using EvoLogics' patented S2C (Sweep-Spread Carrier) Technology, delivering an excellent performance, resistant to the challenges of the dynamic subsea environment. Self-adaptive algorithms adjust the S2C parameters to maintain the highest bitrate possible in current conditions.

Every EvoLogics underwater acoustic modem was designed as a reliable tool to solve multiple communication tasks. It implements advanced data delivery algorithms, supports addressing and networking and is easy to control with a comprehensive set of commands and software-configurable settings.

· S2CR and S2CM Underwater Acoustic Modems are fully compatible with EvoLogics USBL and LBL positioning systems and can facilitate simultaneous communication and navigation when used as target transponders and baseline beacons.

· S2C WiSE devices offer extra opportunities for developers.

· Advanced configuration options and multiple options for system integration provides solutions for unique application scenarios. OEM versions and streamlined transducer units available upon request.
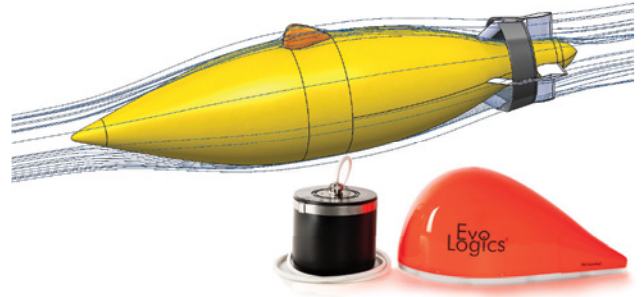
MODULES AND OPTIONS

· Integrated rechargeable battery
· Acoustic Wake-Up Module
· Integrated data-logger
· Acoustic release device
· Short- mid- and long-range devices for shallow or deep water applications
· OEM versions available
· Compatible with S2C USBL and LBL solutions
· More options upon request

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

APPLICATIONS

Oil & Gas
Support deepwater oil and gas exploration with a reliable communication system that provides real-time transmissions of sensor data or sending commands to remote equipment

Unmanned Underwater Vehicles (ROVs and AUVs)
Real-time tracking and data aquisition, command transmissions with instant messaging feature - send commands on top of the main data flow from sensors or cameras

Oceanography
Collect measurement data from various sensors in real-time or over periodic intervals, store and transmit data with user-adjustable priorities. Long term deployments are ensured with low power consumption and a power saving wake-up module

Monitoring Stations
Integrate the communication system with a power source, multiple sensors and an acoustic releaser for a fully autonomous solution for long-term data collection missions
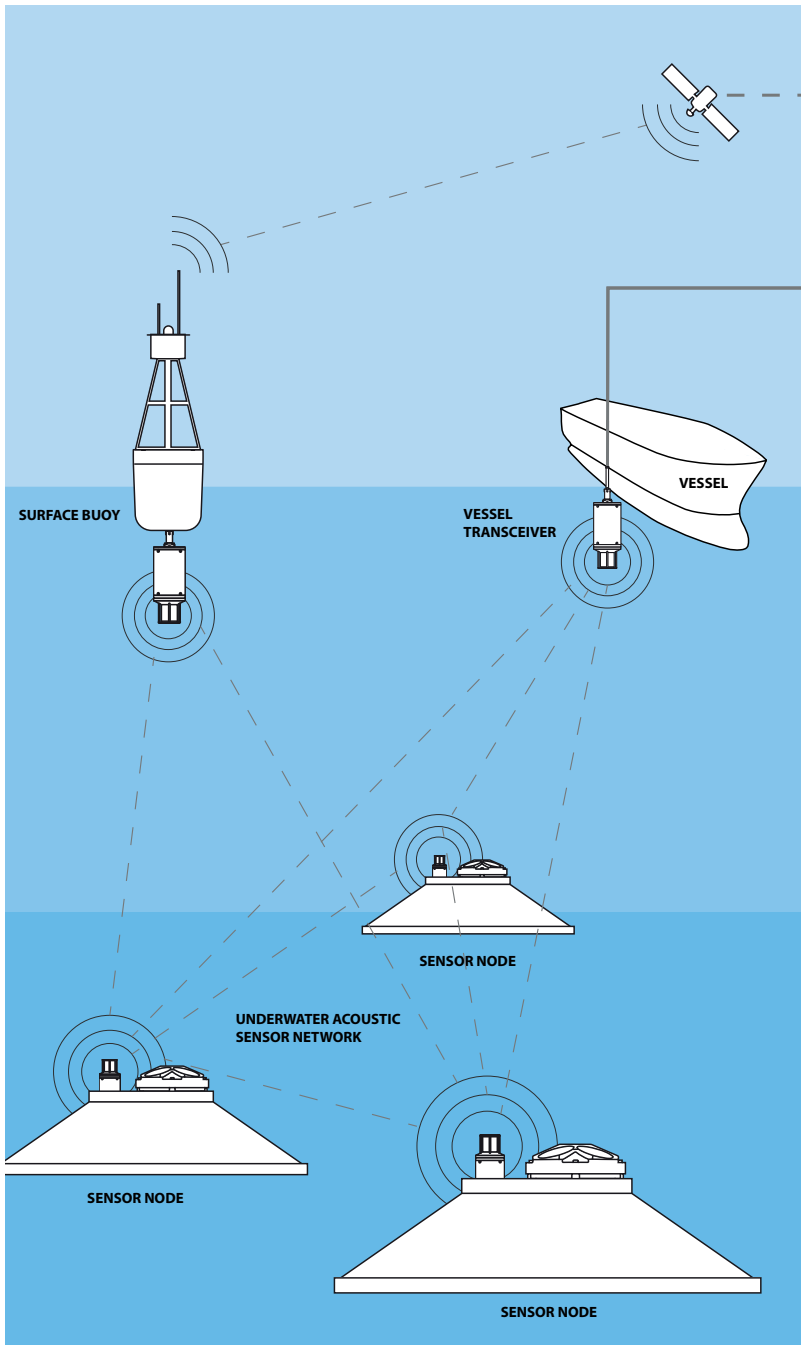
Seismic
Collect seismic data and use the instant messaging feature for alarm-triggering events

Networks and Relay chains
Transmit information over longer distances or cover a larger area with different access points

Information and Communication Centers
Advanced data management and expandable modular design can become the central point for all your underwater communication needs

SURFACE BUOY

VESSEL

VESSEL TRANSCEIVER

SENSOR NODE

UNDERWATER ACOUSTIC SENSOR NETWORK

SENSOR NODE

SENSOR NODE

HOST PC

S2C R Series
versatile and configurable

S2C M Series
light and compact

S2C R WiSE
extra features for developers
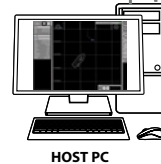
- Self-adaptive algorithms for reliable performance in adverse underwater conditions
- Intelligent data interweaving for maximum full-duplex channel utilization
- Multiple data streams with user-adjustable priorities
- Built-in forward error correction and data compression
- Advanced communication protocol 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

Developer Tools

S2C WiSE-Series modems: the sandbox - an embedded network protocol development platform - provides an excellent testbed. Run custom networking scripts, sensor-specific data preprocessing scripts and modules directly on real hardware in real-world conditions.

S2C Modem Emulator: test protocols and/or application solutions without underwater modems. A time-saver for code debugging and refinement. Solutions, designed and tested with the emulator, are easy to export to modem hardware. Available over remote access or as a standalone EvoLogics Modem Emulator Box.

SPECIFICATIONS

| GENERAL	Same as S2CR-series modems
FIRMWARE	16-64 MB sandbox (extendable up to 64 GB with SD card)
	Pre-installed NS-2 Framework
	Pre-installed Tcl/EXPECT

S2C EMULATOR BOX

S2CR 48/78 WISE
S2CR 18/34 WISE

SPECIFICATIONS AND CONFIGURATION OPTIONS

		S2CR 48/78	S2CR 42/65	S2CR 18/34	S2CR 12/24	S2CR 7/17	S2CM 48/78	S2CM 42/65	S2CM 18/34	S2CM HS	S2CR 48/78WISE	S2CR 18/34WISE
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
	Aluminium Alloy	2000 m	2000 m	2000 m	2000 m	2000 m	not available				not available	
	Stainless Steel	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m	not available	
	Titanium	2000 m	2000 m	2000 m	6000 m	6000 m	not available				not available	
OPERATING RANGE		1000 m	1000 m	3500 m	6000 m	8000 m	1000 m	1000 m	3500 m	300 m	1000 m	3500 m
FREQUENCY BAND		48 - 78 kHz	42 - 65 kHz	18 - 34 kHz	13 - 24 kHz	7 - 17 kHz	48 - 78 kHz	42 - 65 kHz	18 - 34 kHz	120 - 200 kHz	48 - 78 kHz	18 - 34 kHz
TRANSDUCER BEAM PATTERN		horizontally omnidirectional	wide-angle 100 degrees	horizontally omnidirectional	directional 70 degrees	hemispherical	horizontally omnidirectional	wide-angle 100 degrees	horizontally omnidirectional	omnidirectional	horizontally omnidirectional	wide-angle 100 degrees
CONNECTION												
ACOUSTIC CONNECTION		up to 31.2 kbit/s	up to 31.2 kbit/s	up to 13.9 kbit/s	up to 9.2 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	up to 31.2 kbit/s	up to 13.9 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 AND CONNECTORS [1]	1 connector	Ethernet or RS-232					Ethernet or RS-232				Ethernet or RS-232	
	2 connectors	Ethernet + RS-232 or RS-232 + RS-232					not available				Ethernet + RS-232 or RS-232 + RS-232	
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	0.5 mW	2.5 mW	2.5 mW
	Listen Mode	5 - 285 mW	5 - 285 mW	5 - 285 mW	5 - 285 mW	5 - 285 mW	not available				5 - 285 mW	5 - 285 mW
	Receive Mode	less than 1.1 W	less than 1.1 W	less than 1.6 W	less than 1.1 W	less than 1.1 W				0.8 W	less than 1.1 W	less than 1.6 W
	Transmit Mode	5.5 W, 250 m; 8 W, 500 m; 18 W, 1000 m; 60 W, maximum	2.8 W, 1000 m; 8 W, 2000 m; 35 W, 3500 m; 80 W, maximum	2.5 W, 1500 m; 5 W, 3000 m; 15 W, 6000 m; 40 W, maximum	3 W, 2000 m; 10 W, 4000 m; 40 W, 8000 m; 80 W, maximum		5.5 W, 250 m; 8 W, 500 m; 18 W, 1000 m; 60 W, maximum		2.8 W, 1000 m; 8 W, 2000 m; 35 W, 3500 m; 80 W, maximum	3.5 W, 200 m; 10 W, maximum	3 W, 2000 m; 10 W, 4000 m; 40 W, 8000 m; 80 W, maximum	5.5 W, 250 m; 8 W, 500 m; 18 W, 1000 m; 60 W, maximum
POWER SUPPLY OPTIONS [3]	External	24 VDC (12 VDC optional)					24 VDC (12 VDC optional)				24 VDC (12 VDC optional)	
	Internal	Rechargeable battery (optional)					not available				not available	
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				not available	
	Stainless Steel	Robust metal, suitable for long-term deployments in harsh environments, depth rating 1000 m or 2000 m					✓	✓	✓	✓	not available	
	Titanium	Corrosion resistant housing, suitable for long-term deployment in harsh environments, depth rating 6000 m					not available				not available	
DIMENSIONS [4]	Housing / Total length	Ø110 x170 mm / 265 mm	Ø110 x170 mm / 265 mm	Ø110 x170 mm / 265 mm	Ø113 x 220 mm / 390 mm	Ø113 x 260 mm / 420 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	Ø110 x170 mm / 265 mm	Ø110 x170 mm / 265 mm
WEIGHT, dry/wet	Delrin	2250/400 g	1390/690 g	2445/400 g	2990/490 g	2990/490 g	1120/330 g	1210/420 g	1265/480 g	1120/330 g	2250/400 g	2445/400 g
OPTIONS												
WAKE-UP MODULE [5] not compatible with Ethernet		✓	✓	✓	✓	✓	not available				not available	
PRESSURE SENSOR		✓	✓	✓	✓	✓	✓	✓	✓	✓	not available	
CABLE-MOUNTED TRANSDUCER		✓	✓	✓	✓	✓	✓	✓	✓	✓	not available	
OEM VERSION		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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	Long range transmissions in vertical and slant channels, long-term deployment	Long range transmissions in vertical and 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	Underwater network protocol development	Underwater network protocol development
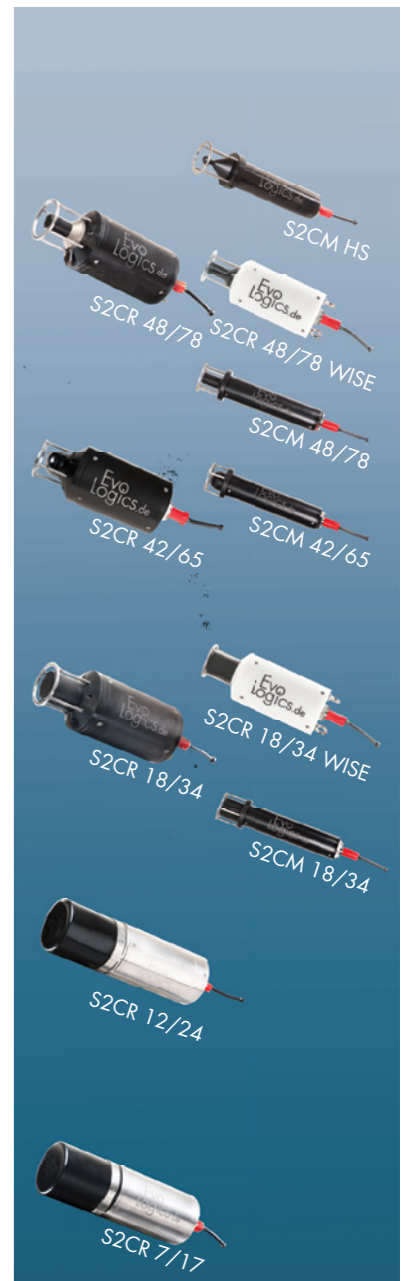
[1] One RS-232 Interface can be replaced with either RS-485 or RS-422 interface. RS-485 protocol does not support duplex communication and must be customized. Contact EvoLogics for more information!
[2] Power consumption for RS-232 interface. Add 600 mW if Ethernet interface is installed. User-configurable Listen Mode is only available with a Wake-Up module installed. Power consumption in Listen Mode depends on Listen Mode settings.
[3] Contact EvoLogics for more information on external and internal power supply options!
[4] S2CR 48/78, 18/34 - dimensions of a Delrin housing, other builds are slightly larger; S2CR 12/24, 7/17 - dimensions of a titanium housing, other builds are slightly smaller. Contact EvoLogics for more information on device dimensions and weights!
[5] The Wake Up Module turns the rest of the device on if it detects incoming acoustic signals or incoming data on the host interface. Once the device completes receiving or transmitting data, it switches itself off. **The Wake Up Module is only compatible with RS-232 interface!** It is not compatible with Ethernet, RS-485 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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