



# UNDERWATER ACOUSTIC MODEMS

PRODUCT INFORMATION GUIDE



## Evologics S2CR-series underwater acoustic modems

Evologics S2CR-series underwater acoustic modems provide full-duplex digital communication using the 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 S2CR 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.

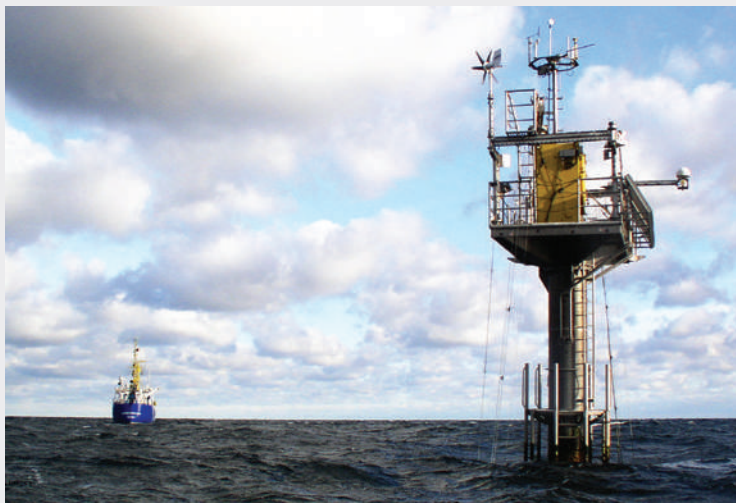
- Patented S2C (Sweep Spread Carrier) Technology - spread spectrum technology based on extensive bionic studies
- Self-adaptive algorithms for reliable performance in adverse underwater conditions
- Intelligent data interweaving for maximum full-duplex channel utilization
- Multiple data streams with 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

### MODULES AND OPTIONS

- Integrated rechargeable battery
- Acoustic Wake-Up module
- Integrated data-logger available
- Acoustic releaser
- Short- mid- and long-range devices for shallow or deep water applications
- OEM versions available
- Compatible with S2C R 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

#### ROVs and AUVs

Optimize command transmissions with the 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 a releaser with control functions for a fully autonomous solution for long term measurements

#### 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

## DEVELOPER TOOLS

### S2CR White Line Science Edition (WiSE)-series underwater acoustic modems

- An embedded network protocol development platform provides an excellent testbed for new underwater network protocols
- Run custom networking scripts, sensor-specific data preprocessing scripts and modules directly on real hardware in real-world conditions
- Use all the benefits of the main EvoLogics S2CR modem range

#### SPECIFICATIONS

GENERAL	Same as S2CR-series modems
FIRMWARE	16-64 MB sandbox (extendable, up to 32 GB with SD memory card)
	Pre-installed NS-2 Framework
	Pre-installed Tcl/EXPECT



S2CR 48/78 WISE

S2CR 18/34 WISE

S2CR White Line Science Edition (WiSE) series of underwater acoustic modems offers an open environment for network protocol developers, providing a flexible framework for testing new network protocols on real hardware - the new S2CR WiSE acoustic modems facilitate an embedded developer sandbox of up to 32 GB. The EvoLogics WiSE toolchain allows to build custom firmware modules for S2C modems and opens endless opportunities for new implementations.

All S2CR WiSE modems provide a preinstalled NS-2/NS-Miracle - an extended version of the popular network simulator that supports simulation of TCP, routing and multicast protocols over communication networks. Without rewriting the code, existing NS-2 network protocol scripts can now be run directly on acoustic modems, making S2C WiSE a time- and cost-effective hardware solution that does not require additional coding and eliminates the need to interface each node of the test network to a dedicated host PC with NS-2.

Implementing the patented S2C technology, the EvoLogics WiSE modems offer all the benefits of the main EvoLogics S2CR modem range. S2CR WiSE modems are available in a variety of configurations to suit a wide range of application scenarios.

### S2CR underwater acoustic modem emulator

- Enables to test new underwater network protocols and/or application solutions without underwater modems
- A time-saver for code debugging and refinement
- Supports several virtual modems at once
- Offers the freedom of working over remote access
- Solutions, designed and tested with the emulator, are easy to export to modem hardware

The S2CR underwater acoustic modem emulator a new tool that offers more flexibility for underwater network protocol developers and end-users of EvoLogics underwater acoustic modems.

A real-time emulator of the S2CR-series underwater acoustic modems, this tool is aimed at optimizing underwater network protocol development by taking out expensive modem hardware from the early testing stages - it emulates all features of the modem's data-link protocol layer and includes a simulator of the physical protocol layer.

A network of virtual underwater acoustic modems, configured and run on EvoLogics server, can be accessed remotely and provides a hardware-free framework for development and training. Any code, written and run on the modem emulator, can be later run on the actual modem hardware without any modifications, offering a time-saving solution that minimizes development costs for upper layer network protocols and simplifies integration of acoustic modems into underwater infrastructure.

# SPECIFICATIONS

		S2CR 48/78	S2CR 42/65	S2CR 18/34	S2CR 12/24	S2CR 7/17
GENERAL	OPERATING DEPTH	Delrin	200 m	200 m	200 m	200 m
		Aluminium Alloy	1000 m	1000 m	1000 m	1000 m
		Stainless Steel	2000 m	2000 m	2000 m	2000 m
		Titanium	2000 m	2000 m	6000 m	6000 m
	OPERATING RANGE		1000 m	1000 m	3500 m	6000 m
CONNECTION	FREQUENCY BAND		48 - 78 kHz	42 - 65 kHz	18 - 34 kHz	13 - 24 kHz
	TRANSDUCER BEAM PATTERN		horizontally omnidirectional	wide-angle 100 degrees	horizontally omnidirectional	directional 70 degrees
	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
	BIT ERROR RATE		less than 10 <sup>-10</sup>			
	INTERNAL DATA BUFFER		1 MB, configurable			
POWER	HOST INTERFACE <sup>1)</sup>		Ethernet, RS-232 (RS-485 <sup>2)</sup> /422 optional)			
	INTERFACE CONNECTOR		up to 2 SubConn® Metal Shell 1500 Series			
	POWER CONSUMPTION	Stand-by Mode	2.5 mW	2.5 mW	2.5 mW	2.5 mW
		Listen Mode <sup>3)</sup>	5 - 285 mW	5 - 285 mW	5 - 285 mW	5 - 285 mW
		Receive Mode <sup>4)</sup>	less than 1.1 W	less than 1.1 W	less than 1.6 W	less than 1.1 W
PHYSICAL		Transmit Mode	5.5 W, 250 m range	5.5 W, 250m range	2.8 W, 1000m range	2.5 W, 1500m range
			8 W, 500 m range	8 W, 500m range	8 W, 2000m range	5 W, 3000m range
			18 W, 1000 m range	18 W, 1000m range	35 W, 3500m range	15 W, 6000m range
			60 W, max. available	60 W, max. available	80 W, max. available	40 W, 8000m range
						80 W, max. available
	POWER SUPPLY <sup>5)</sup>		External 24 VDC (12 VDC optional) or internal rechargeable battery (optional)			
	DIMENSIONS <sup>6)</sup>	Housing Total length	Ø 110 x 170 mm 265 mm	Ø 110 x 170 mm 265 mm	Ø 110 x 170 mm 265 mm	Ø 113 x 220 mm 390 mm
	WEIGHT, dry/wet	Delrin	2250/400 g	1390/690 g	2445/400 g	2990/490 g
		Aluminium Alloy	2100/1400 g	2100/1400 g	2170/1470 g	4160/1560 g
		Stainless Steel	8000/5800 g	8000/5800 g	9800/5800 g	8000/5800 g
		Titanium	6500/4500 g	6500/4500 g	6500/4500 g	7780/5180 g

## CONFIGURATION OPTIONS

HOUSING	DELIRIN	Plastic non-magnetic corrosion-resistant housing, depth rating 200 m	
	ALUMINIUM ALLOY	Light metal housing for short-term deployments, depth rating 1000 m	
	STAINLESS STEEL	Robust metal housing, suitable for long-term deployment in harsh environments, depth rating 2000 m	
	TITANIUM	Corrosion resistant, suitable for long-term deployment in harsh environments, depth rating 6000 m	
INTERFACE	1 CONNECTOR	RS-232 <sup>7)</sup> or	
		Ethernet	
	2 CONNECTORS	RS-232 + RS-232 or	
		RS-232 + Ethernet	
MODULES	WAKE-UP MODULE <sup>8)</sup>	RS-232 interface	✓
		Ethernet interface	×
		RS-232 + RS-232 interface	✓
		RS-232 + Ethernet interface	×

Unique application scenarios might require additional customizing. Evologics experts are always ready to address any special requests!



<sup>1)</sup> See the Configuration Options for available standard interface combinations.

<sup>2)</sup> RS-485 protocol does not support duplex communication and must be customized. Contact Evologics for more information!

<sup>3)</sup> User-configurable Listen Mode is only available with a Wake-Up module installed. Power consumption in Listen Mode depends on Listen Mode settings.

<sup>4)</sup> Power consumption for the RS-232 interface option. Add 600 mW for the Ethernet interface option.

<sup>5)</sup> Contact Evologics for more information on power supply options!

<sup>6)</sup> 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!

<sup>7)</sup> One RS-232 Interface can be replaced with either RS-485 or RS-422 interface.

More interface configurations available by special request. Contact Evologics for more information!

<sup>8)</sup> 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. Please note: the Wake Up Module is only compatible with the 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.

# Evo Logics®

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