EvoLogics®

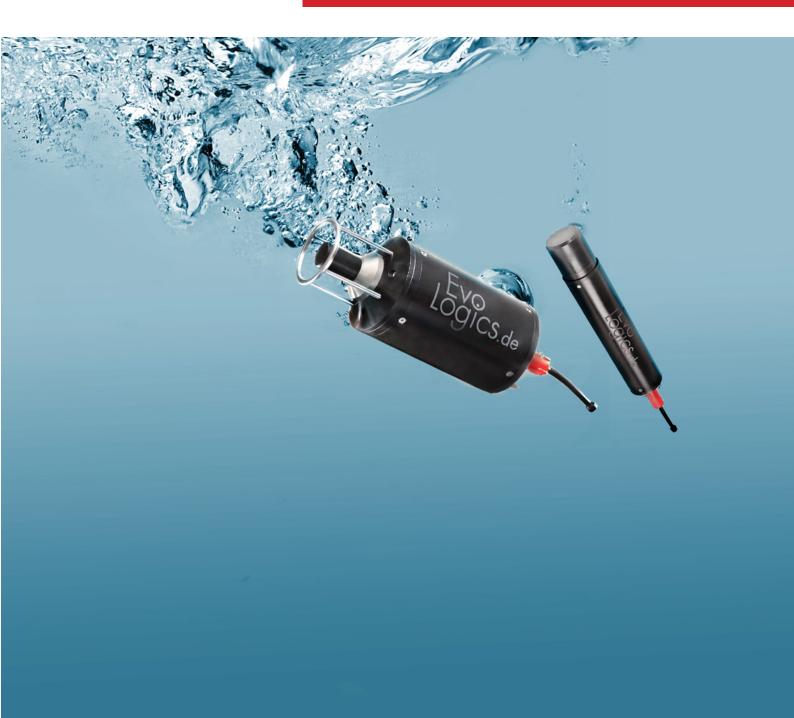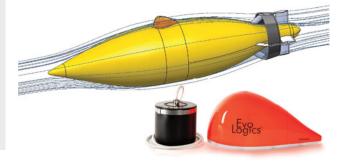# UNDERWATER ACOUSTIC MODEMS

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 implements advanced data delivery algorithms, supports addressing and networking and is easy to control with a comprehensive set of commands and software-configurable settings.

- Use as transponders, beacons and pingers - all modems are fully compatible with EvoLogics USBL/LBL positioning systems and can facilitate simultaneous communication and navigation.

- WiSE and SDM devices offer extra opportunities for developers.

- OEM versions without housing and streamlined transducer units are available for system integration with UUVs.

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 adjustable priorities. Low power consumption and a power saving wake-up module enable long-term deployments

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
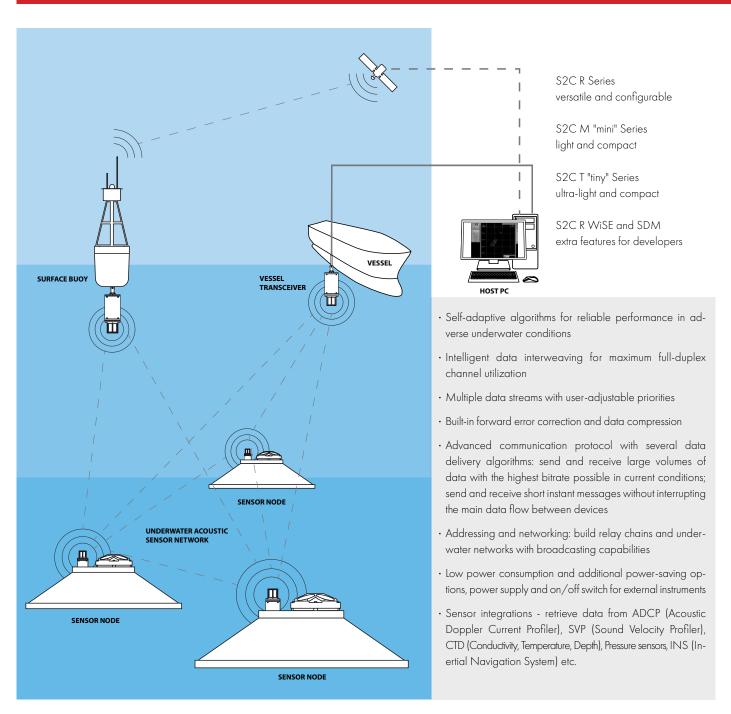Collect seismic data and use the instant messaging feature for alarm-triggering events

Networks and Relay chains
Transmit information over longer distances or cover a larger area

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

The **R-series** offers a broad selection of short- mid- and long-range devices for shallow or deep water applications.

The **M-series** of "mini"-modems targets size- and weight-sensitive applications with a lighter and more compact design.

The new **T-series** "tiny"-modems are ultra light and compact.

S2C R WiSE and SDM modems provide extra features for developers.

Chart — BITRATE, kbps (vertical axis: 52.5, 31.2, 13.9, 9.2, 6.9) vs OPERATING RANGE, m (horizontal axis: 300, 1000, 3500, 6000, 8000, 10000)

S2CM HS

S2CR 48/78   S2CR 42/65
S2CM 48/78   S2CM 42/65
             S2CT 42/65

S2CM 15/27
S2CR 15/27
S2CR 12/24   S2CR 7/17   S2CR 7/17D
                  S2CR 7/17W

S2CR 18/34   S2CR 18/34H
S2CM 18/34
S2CT 18/34

S2C R Series
versatile and configurable

S2C M "mini" Series
light and compact

S2C T "tiny" Series
ultra-light and compact

S2C R WiSE and SDM
extra features for developers

SURFACE BUOY

VESSEL

VESSEL TRANSCEIVER

HOST PC

SENSOR NODE

UNDERWATER ACOUSTIC SENSOR NETWORK

SENSOR NODE

SENSOR NODE

· 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, power supply and on/off switch for external instruments

· Sensor integrations - retrieve data from ADCP (Acoustic Doppler Current Profiler), SVP (Sound Velocity Profiler), CTD (Conductivity, Temperature, Depth), Pressure sensors, INS (Inertial Navigation System) etc.

DEVELOPER TOOLS

S2C WiSE-Series modems: the sandbox is an embedded network protocol development platform and 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.

Software Defined Modem (SDM) mode: transmit and receive arbitrary waveforms and set a reference to trigger signal detection.

S2C R WiSE Modems

GENERAL	Same as R-series modems
FIRMWARE	16-64 MB sandbox (extendable up to 64 GB with SD card)

S2C EMULATOR BOX

S2C R 48/78 WISE
S2C R 18/34 WISE

SPECIFICATIONS AND CONFIGURATION OPTIONS

		R 48/78	R 42/65	R 18/34, 18/34 D, 18/34H	R 15/27	R 12/24	R 7/17, 7/17D, 7/17W	M 48/78	M 42/65	M 18/34	M 15/27	M HS	T 42/65	T 18/34
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			not available			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	not available	
	Titanium	2000 m	2000 m	2000/6000 m (18/34D)	6000 m	6000 m	6000/10000 m (7/17D)			not available			not available	
OPERATING RANGE		1000 m	1000 m	3500 m	6000 m	6000 m	8000/10000 m (7/17D)	1000 m	1000 m	3500 m	6000 m	300 m	1000 m	3500 m
FREQUENCY BAND		48 - 78 kHz	42 - 65 kHz	18 - 34 kHz	15 - 27 kHz	13 - 24 kHz	7 - 17 kHz	48 - 78 kHz	42 - 65 kHz	18 - 34 kHz	15 - 27 kHz	120 - 180 kHz	42 - 65 kHz	18 - 34 kHz
TRANSDUCER BEAM PATTERN		horizontally omnidirectional	wide - angle 100 degrees	horizontally omnidirectional hemispherical (18/34H)	wide-angle 120 degrees	directional 70 degrees	hemispherical (7/17 and 7/17W) directional 80 degrees (7/17D)	horizontally omnidirectional	wide - angle 100 degrees	horizontally omnidirectional	wide-angle 120 degrees	omnidirectional	horizontally omnidirectional	horizontally omnidirectional
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 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 9.2 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}					less than 10^{-10}	
INTERNAL DATA BUFFER		1 MB, configurable					1 MB, configurable	1 MB, configurable					1 MB, configurable	
INTERFACE [1]		Ethernet or RS-232					Ethernet or RS-232	Ethernet or RS-232					Ethernet only	
INTERFACE CONNECTORS		up to 4 connectors, Ethernet and serial combinations						1 connector					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	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	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	1.3 W	1.3 W
	Transmit Mode	up to 60 W	up to 40 W	up to 65 W	up to 65 W	up to 57 W	up to 45 W	up to 55 W	up to 35 W	up to 55 W	up to 65 W	up to 8.5 W	up to 60 W	up to 65 W
POWER SUPPLY OPTIONS [3]	External	24 VDC (12 VDC)					24 VDC (12 VDC)	24 VDC (12 VDC)					24 VDC (12 VDC)	
	Internal	Rechargeable battery 5 Ah or 10 Ah						Rechargeable battery 3.350 Ah					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]	Delrin housing Total length	Ø 110 x 178 mm 265 mm	Ø 110 x 178 mm 265 mm	Ø 110 x 178/218 mm (18/34H) 265/300 mm (18/34H)	Ø 110 x 178 mm 295 mm	Ø 110 x 178 mm 322 mm	Ø 110 x 178 mm 322 / 338 mm (7/17D) 246 mm (7/17W)	Ø 63 x 235 mm 310 mm	Ø 63 x 235 mm 300 mm	Ø 63 x 235 mm 310 mm	Ø 63 x 235 mm 350 mm	Ø 63 x 235 mm 310 mm	Ø 63 x 170 mm 240 mm	Ø 63 x 170 mm 250 mm
WEIGHT, dry/wet	Delrin	2250/400 g	2300/300 g	2245/400 g 3100/1200 g (18/34H)	3850/1080 g	2990/490 g	4700/600 g 6200/600 g (7/17D) 3000/490 g (7/17W)	1120/330 g	1210/420 g	1265/480 g	2360/1570 g TBC	1200/300 g	1150/350 g	1200/400 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					not available	
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					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					not available	
SDM VERSION		Software Defined Modem mode: transmit/receive arbitrary waveforms and set a reference to trigger signal detection						✓	✓	✓	✓	✓	not available	
ACOUSTIC RELEASE DEVICE		Reliable mechanism for recovery of underwater assets to the surface. Also available in OEM version for system integration						not available					not available	
FLOATATION COLLAR		Floatation collar for fast recovery to the surface						not available					not available	
PRESSURE SENSOR		Accurate pressure measurements						not available					not available	
CABLE - MOUNTED TRANSDUCER		Separated transducer for easier system integration. Standard cable length 1.5 m, other upon request						✓	✓	✓	✓	✓	not available	
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	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	Fast short and medium range communication for UUVs	Fast short and medium range communication for UUVs	Medium range communication for UUVs	Long range transmissions in vertical and slant channels	High-speed short range communication for UUVs and divers	Fast short and medium range communication for compact UUVs	Medium range communication for compact UUVs

[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-interface 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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