



# USBL POSITIONING AND COMMUNICATION SYSTEMS

PRODUCT INFORMATION GUIDE

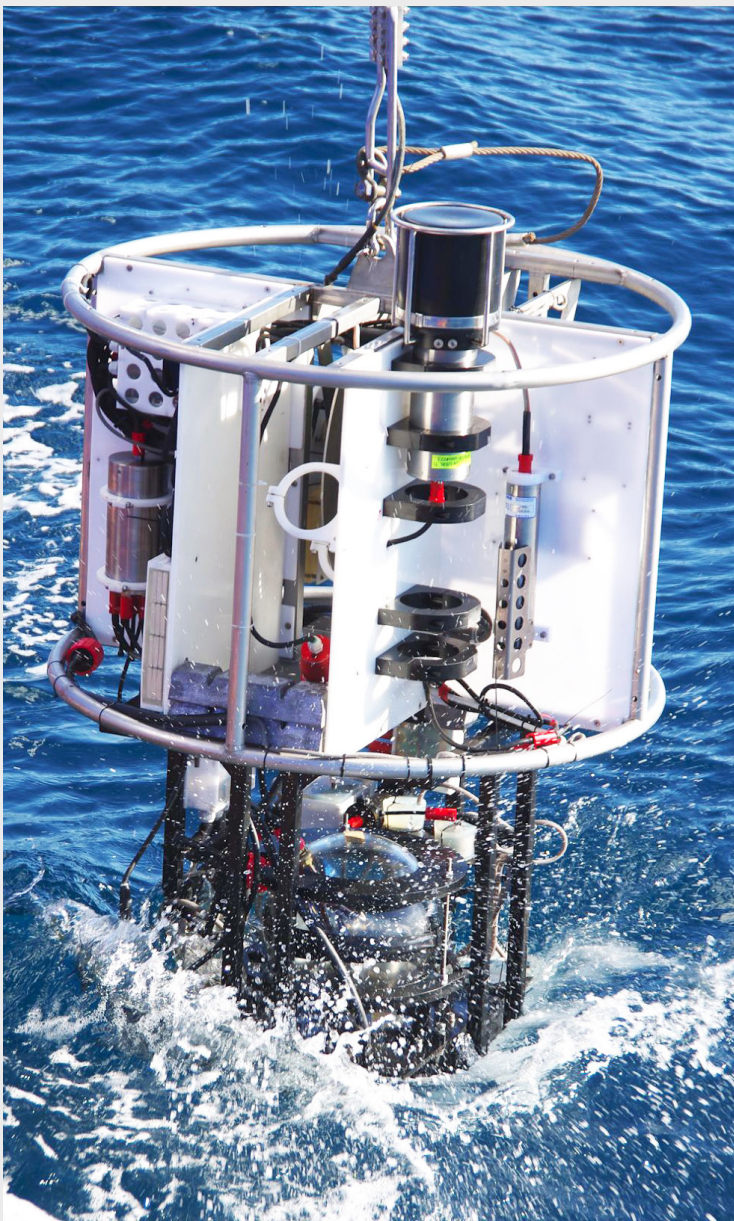


## S2CR USBL UNDERWATER POSITIONING AND COMMUNICATION SYSTEMS

Evologics S2CR USBL is a series of combined positioning and communication devices. Offering powerful USBL transceiver functionality with full benefits of an S2C technology communication link, S2CR USBL devices provide accurate USBL tracking and full-duplex digital communication, delivering 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 S2CR- and M-series modems as pingers or transponders
- Patented S2C (Sweep Spread Carrier) Technology - spread spectrum technology based on extensive bionic studies
- Simultaneous USBL positioning and data transmissions, track multiple targets simultaneously
- Can be used as Inverted USBL
- Self-adaptive algorithms for reliable performance in adverse underwater conditions, 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



### APPLICATIONS

#### Positioning of offshore equipment

Track the positions of offshore equipment during installation to ensure accurate placement at predetermined 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

#### Increase measurement accuracy

Track the position of sensors and detectors to increase the accuracy of 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
- Acoustic Wake-Up module
- Integrated data-logger
- Acoustic releaser
- Short- mid- and long-range devices for shallow or deep water applications
- OEM versions available
- Compatible with S2C R modem and LBL solutions

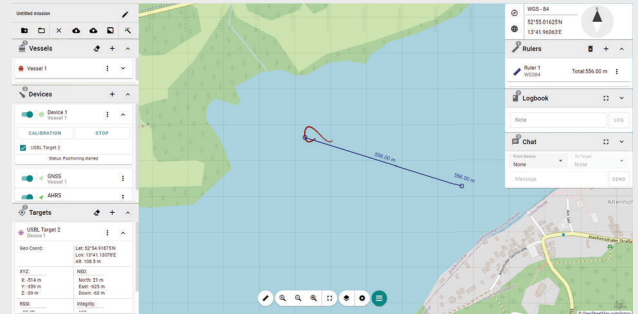
### SENSOR INTEGRATION

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

**Si** SINAPS 2 POSITIONING SOFTWARE

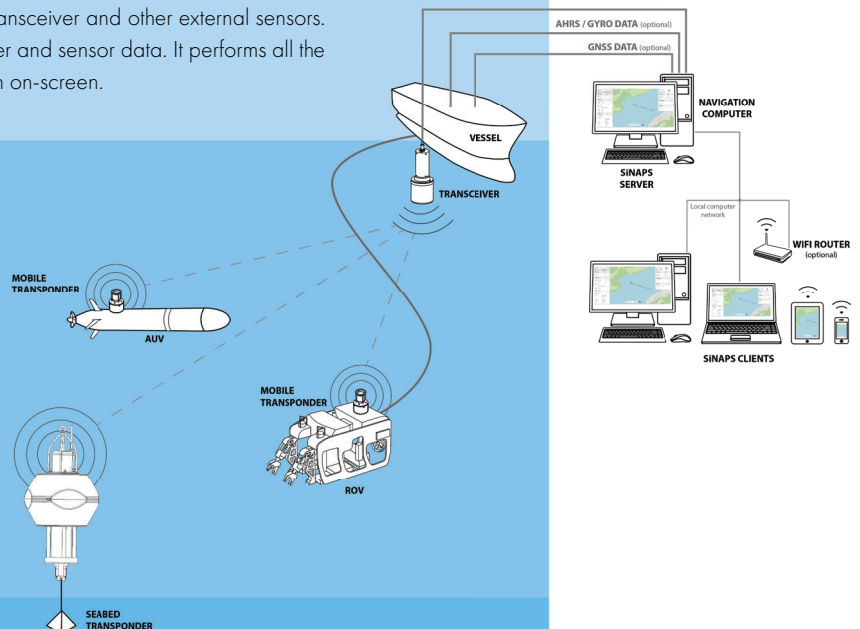
SiNAPS 2 (S2C intelligent Navigation and Positioning Software) is the latest positioning software from EvoLogics. Rebuilt from scratch in 2020, it comes with a more powerful and efficient data engine with improved positioning accuracy. The updated user interface and intuitive workflows allow for easier onboarding and system integration.

- Real-time multiple target tracking
- Supports various positioning methods: USBL, iUSBL, LBL, SBL
- Built-in system calibration tools
- Data input from multiple sensors, real-time output of positioning data and sensor data for custom forwarding and processing
- Web-based user interface - use the software on any device in the local computer network
- Intuitive and fast to configure even for complex scenarios
- Easy management of multiple databases for separated data sets
- Supports advanced data fusion strategies, automation options available



SiNAPS is a client-server application. SiNAPS server is a software component running on the Navigation computer that is interfaced with the USBL transceiver and other external sensors. SiNAPS server receives, processes and stores transceiver and sensor data. It performs all the necessary calculations to display positioning information on-screen.

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 user interface can be opened in most current web-browsers on any device in the local computer network. It is possible to open SiNAPS clients on multiple devices at once. To access SiNAPS UI, one must simply navigate the web-browser to the correct address.



USBL POSITIONING METHOD

A USBL transceiver is mounted on the vessel and uses acoustic signals to determine distances and bearings towards the tracked targets. It measures the time elapsed from transmission of its acoustic interrogation signal to reception of an acoustic reply from the target transponder, and converts it into distance to the target. Containing several transducers separated by a short distance (the ultra-short baseline antenna), the transceiver calculates the angle toward the transponder using the phase-differencing method.

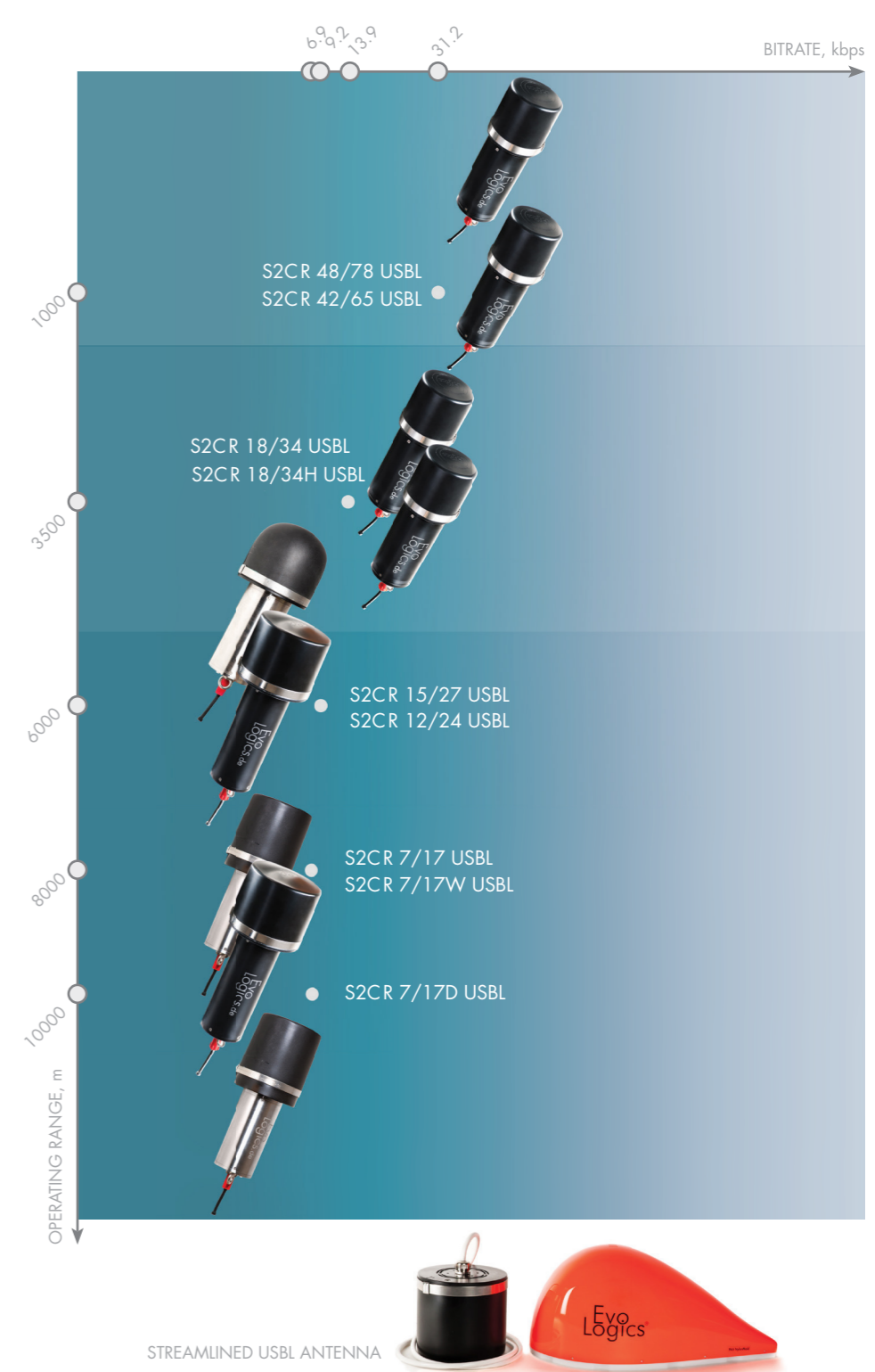
Transponders are attached to tracking targets, for example, to autonomous underwater vehicles (AUVs), remotely operated vehicles (ROVs), towfish etc. Transponders reply to acoustic signals from the USBL transceiver with their own acoustic pulses, allowing it to calculate their positions.

Optional third-party external instruments (an AHRS sensor and/or a GNSS receiver) provide information about the vessel's orientation and real-world coordinates. The operator's Navigation computer is interfaced with the USBL transceiver and the external instruments, and is connected to the local computer network. EvoLogics positioning software, the SiNAPS, is installed on the Navigation computer. SiNAPS controls the positioning system and provides display features to monitor the mission in real-time.



SPECIFICATIONS AND CONFIGURATION OPTIONS

		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	
GENERAL	OPERATING DEPTH	Delrin 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	
		Stainless Steel 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	
	OPERATING RANGE	1000 m	1000 m	3500 m	3000 m	6000 m	6000 m	8000 m	10000 m	8000 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		
TRANSDUCER BEAM PATTERN	horizontally omnidirectional	wide - angle 100 degrees	horizontally omnidirectional	hemispherical	wide-angle 120 degrees	directional 70 degrees	hemispherical	directional 80 degrees	hemispherical		
USBL	SLANT RANGE ACCURACY <sup>1)</sup>	0.01 m	0.01 m	0.01 m	0.01 m	0.01 m	0.01 m	0.01 m	0.01 m	0.01 m	
	BEARING RESOLUTION	0.1 degrees	0.1 degrees	0.1 degrees	0.1 degrees	0.1 degrees	0.1 degrees	0.1 degrees	0.1 degrees	0.1 degrees	
	NOMINAL SNR	10 dB	10 dB	10 dB	10 dB	10 dB	10 dB	10 dB	10 dB	10 dB	
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	
	BIT ERROR RATE	less than 10 <sup>-10</sup>						less than 10 <sup>-10</sup>			
	INTERNAL DATA BUFFER	1 MB, configurable						1 MB, configurable			
	INTERFACE <sup>2)</sup>	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			
POWER	POWER CONSUMPTION <sup>3)</sup>	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	
		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	
		Receive Mode 1.4 W	1.4 W	1.4 W	1.4 W	1.4 W	1.4 W	1.4 W	1.4 W	1.4 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	
POWER SUPPLY OPTIONS <sup>4)</sup>	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 5 Ah or 10 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							✓	✓	✓
		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							✓	✓	✓
	DIMENSIONS <sup>5)</sup>	Housing Total length	∅ 110 x 218 mm 355 mm	∅ 110 x 218 mm 355 mm	∅ 110 x 218 mm 355 mm	∅ 110 x 218 mm 355 mm	∅ 110 x 218 mm 393 mm	∅ 110 x 218 mm 403 mm	∅ 110 x 218 mm 385 mm	∅ 110 x 218 mm 385 mm	∅ 110 x 218 mm 385 mm
	USBL antenna	∅ 130 x 137 mm	∅ 130 x 137 mm	∅ 130 x 137 mm	∅ 130 x 137 mm	∅ 180 x 175 mm	∅ 180 x 185 mm	∅ 180 x 167 mm	∅ 180 x 167 mm	∅ 180 x 167 mm	
WEIGHT, dry/wet	Delrin	4500/500 g	4500/500 g	4500/500 g	4500/500 g	8100/1400 g	8100/1400 g	8600/4200 g	8600/4200 g	8600/4200 g	
INTERNAL AHRS <sup>6)</sup>	Internal Xsens® MTi AHRS (Attitude and Heading Reference System) compensates the changes of roll, pitch and heading							✓	✓	✓	
iUSBL CONFIGURATION	Inverted USBL: the transceiver is installed on the positioning target							✓	✓	✓	
WAKE-UP MODULE <sup>7)</sup>	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							✓	✓	✓	
POWER SWITCH <sup>8)</sup>	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							✓	✓	✓	
ADVANCED TIMEKEEPING MODULE	Allows to accept 1 PPS input from GPS, optionally includes a Chip Scale Atomic Clock for highly precise timekeeping							✓	✓	✓	
SDM VERSION	Software Defined Modem mode: transmit/receive arbitrary waveforms and set a reference to trigger signal detection							✓	✓	✓	
ACOUSTIC RELEASE DEVICE	Reliable mechanism for recovery of underwater assets to the surface. Also available in OEM version for system integration							✓	✓	✓	
FLOATATION COLLAR	Floatation collar for fast recovery to the surface							✓	✓	✓	
PRESSURE SENSOR	Accurate pressure measurements							✓	✓	✓	
CABLE - MOUNTED TRANSDUCER/ANTENNA	Separated transducer/antenna, standard cable length 1.5 m, other upon request. Streamlined antennas available							✓	✓	✓	
OEM VERSION	Version without housing: transducer/antenna and electronics for system integration. Streamlined antennas available							✓	✓	✓	
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	



<sup>1)</sup> Accuracy obtained in environment with a flat sound velocity profile, slant ranges estimated in local coordinate frame of the device without the aid of AHRS/GNSS and/or any other sensors contributing to the resulting accuracy. Slant range estimation is based on the measured propagation time, slant range accuracy depends on sound velocity profile, refraction and signal-to-noise ratio.

<sup>2)</sup> One RS-232 Interface can be replaced with a RS-422 interface. Contact Evologics for more information!

<sup>3)</sup> 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.

<sup>4)</sup> 300 VDC available for 42/65 models. Contact Evologics for more information on power supply options!

<sup>5)</sup> Dimensions of a 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.

<sup>6)</sup> Internal Xsens® MTi AHRS (Attitude and Heading Reference System) compensates the changes of roll, pitch and heading. Power consumption increases by 400 mW with AHRS installed.

<sup>7)</sup> 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.

<sup>8)</sup> 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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