

Recording Current Meter



SEAGUARD® Recording Current Meter

The SEAGUARD® RCM series is a completely new generation of current meters based on the SEAGUARD® datalogger platform and the ZPulse™ Doppler Current Sensor¹. Modern computer technology combined with advanced digital signal processing provides accurate and detailed measurements with almost unlimited resolution. Optional parameters are available through a new range of smart sensors that include temperature, pressure and conductivity. The new SEAGUARD® RCM series come in 300m, 2000m and 6000m depth ranges.

SEAGUARD® RCM advantages:

- *Large storage capacity on SD card*
- *Broadband ZPulse™ multi-frequency technology reduces power consumption and improves quality*
- *Down to 2 seconds recording interval*
- *Low current drain*
- *Smart sensor topology based on a reliable semi-high speed CANbus interface (AiCaP)*
- *Windows CE based datalogger with TFT based color touch panel for local configuration*
- *SEAGUARD Studio visualization software*
- *For use in sea and fresh water*

¹ Patent Pending

The new SEAGUARD® RCM series replaces the industry standard RCM 9 and RCM 11 series. It has been completely redesigned from bottom up and employs modern technology in the datalogger section and in the different sensor solutions.

The SEAGUARD® architecture is based on a general datalogger unit and a set of autonomous smart sensors. The datalogger and the smart sensors are interfaced by means of a reliable CANbus interface using an XML based protocol (AiCaP). During power-up, each of the sensors that are connected to the bus will report their capabilities and specifications to the datalogger. The datalogger then assembles the information and provides the user with the possibility to configure the instrument based on the present nodes. The solution provides for great flexibility in both use and design of the different elements within the system.

The autonomous sensor topology also gives the sensor designer flexibility and opportunities where each sensor type may be optimized with regard to its operation, each sensor may now provide several parameters without increasing the total system load.

Data storage takes place on a Secure Digital (SD) card. The current capacity for this card type is up to 1000 MBytes, which is far adequate for most applications.

Sensor Capability

The SEAGUARD® RCM comes standard with the ZPulse™ multi-frequency Doppler current sensor. The new current sensor employs acoustic pulses comprising several frequency components to lower the statistical variance in the Doppler shift estimate. The advantage of this is reduced statistical error with fewer pings, hence increased sampling speed and less power consumption. The new Doppler Current Sensor also incorporates a robust fully electronic compass and a tilt sensor.

The SEAGUARD® RCM may also be delivered with new smart sensor solutions for temperature, pressure and conductivity. All sensors have increased resolution compared with the older models. The temperature sensor also has decreased settling time to utilize the increased sampling speed provided by the SEAGUARD® platform. AiCaP Turbidity Sensor and Oxygen Optode will follow.

Specifications

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SEAGUARD® RCM Specifications	
Top-end Plate capability: Up to 6 sensors can be fitted onto the Top-end Plate, of which 4 can be analogue sensors (0-5V)	
Recording System:	Data Storage on SD card
Storage Capacity:	512 MB
Battery Alkaline 3614:	9V, 15Ah (nominal 12.5Ah; 20W down to 6V at 4°C)
or Lithium 3677:	7.2V, 30Ah
Recording Interval:	From 2s, depending on the node configuration for each instrument
Recording settings:	Fixed interval settings Customized Sequence setting
Protocol:	AiCaP CANbus based protocol
Depth Capacity:	300m/2000m/6000m
Platform Dimensions:	
300m version (SW):	H: 356mm OD: 139mm
2000m version (IW):	H: 352mm OD: 140mm
6000m version (DW):	H: 368mm OD: 143mm
External Materials	
300m version:	PET, Titanium, Stainless Steel 316, Durotong DT322 polyurethane
2000/6000m version:	Stainless steel 316, Titanium, OSNISIL, Durotong DT322 polyurethane
Weight:	Depends on node configuration
Packing:	Depends on node configuration
Accessories Included:	SEAGUARD Studio Alkaline Battery 3614 SD card: 512 MB Standard cable 4299 Power Calculator
Optional Accessories:	Recommended Spares In-line mooring frame 4044 ¹⁾ /3824A/3910 Lithium Battery 3677 Maintenance Kit 3813/3813B Tools kit 3986 Bottom mooring frame 3438R/3448 Base Brackets 3627 (2) for frame Protecting Rods 3783 Vane Plate 3681

- 1) In-line Mooring Frame 4044: breaking strength 800 kg
- 2) Based on 300 pings
- 3) Extended range available on request.
- 4) Available on request
- 5) 9600 baud, 8 data bits, 1 stop bit, No parity, Xon/Xoff Handshake
- 6) Dependent on flow through cell bore

ZPulse™ Doppler Current Sensor (DCS) Specifications	
Current Speed:	(Vector averaged)
Range:	0-300 cm/s
Resolution:	0.1 mm/s
Mean Accuracy:	± 0.15 cm/s
Relative:	± 1% of reading
Statistic variance (std)	0.3 cm/s (ZPulse mode), 0.45 cm/s ²⁾
Current Direction:	
Range:	0 – 360° magnetic
Resolution:	0.01°
Accuracy:	±5° for 0-15° tilt ±7.5° for 15-35° tilt
Tilt Circuitry:	
Range:	0-35°
Resolution:	0.01°
Accuracy:	±1.5°
Compass Circuitry:	
Resolution:	0.01°
Accuracy:	±3°
Acoustics:	
Frequency:	1.9 to 2.0 MHz
Power:	25 Watts in 1ms pulses
Beam angle (main lobe):	2°
Installation distance:	
From surface:	0.75m
From bottom:	0.5m
Supply Voltage:	6– 14 Volts
Operating Temperature:	-5 to +50°C

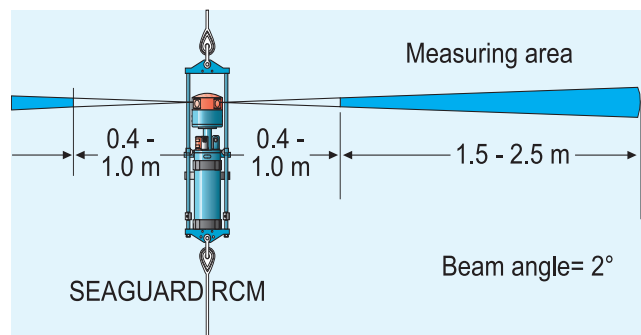
Optional Sensors Specifications	
Temperature Sensor 4060	
Range:	0-36°C (32-96.8°F) ³⁾
Resolution:	0.001°C (0.0018°F)
Accuracy:	±0.03°C (0.054°F)
Response Time 63%):	< 2 seconds
Pressure Sensor 4117A/B/C	
Resolution:	<0.002% FSO
Accuracy:	±0.04° FSO
4117 A Range:	0-1000 kPa (0-145 psia) ⁴⁾⁵⁾
4117 B Range:	0-4000 kPa (0-580 psia) ⁵⁾
4117 C Range:	0-10000kPa (0-1450 psia) ⁴⁾⁵⁾
Conductivity Sensor 4319	
Range:	0-7.5 S/m
Resolution:	0.0002 S/m
Accuracy	
4319 A:	±0.005 S/m
4319 B:	±0.0018 S/m
Response Time:	<3s ⁶⁾

Illustrations and Descriptions

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The ZPulse™ Doppler Current Sensor (DCS) is the standard sensor on the SEAGUARD® RCM. The sensor outputs Absolute Current Speed and Direction, Speed in east and north direction, Ping count, and extensive readout of quality control parameters such as Single-ping Standard deviation, Heading, Tilt in X- and Y-direction, and Signal Strength.

The SEAGUARD® RCM utilizes the wellknown Doppler Shift principle as basis for its measurements.



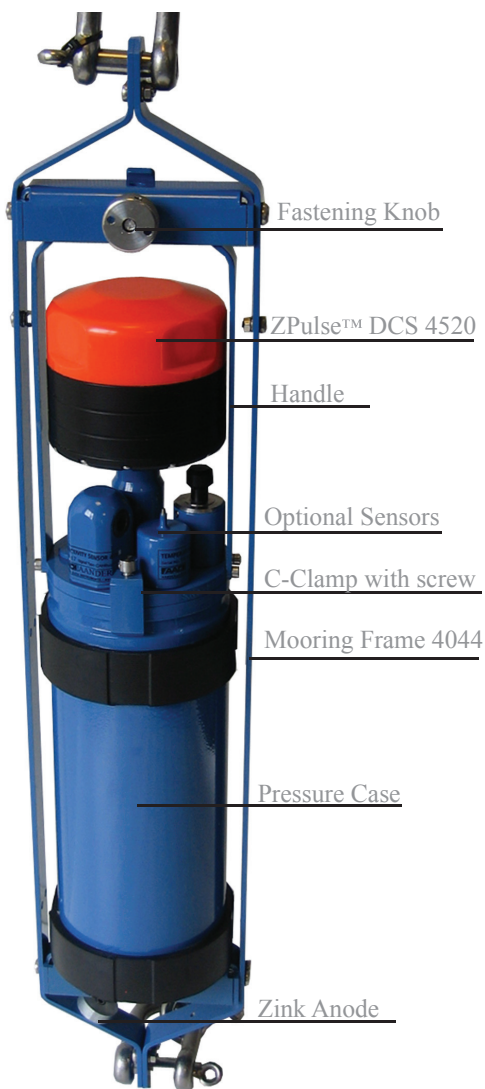
Four transducers transmit short pulses (pings) of acoustic energy along narrow beams (600, 300, 150, or 50 pings in each recording interval). The same transducers receive backscattered signals from scatterers that are present in the beams, which are used for calculation of the current speed and direction.

The scattering particles are normally plankton, gas bubbles, organisms and particles stemming from man-made activity.

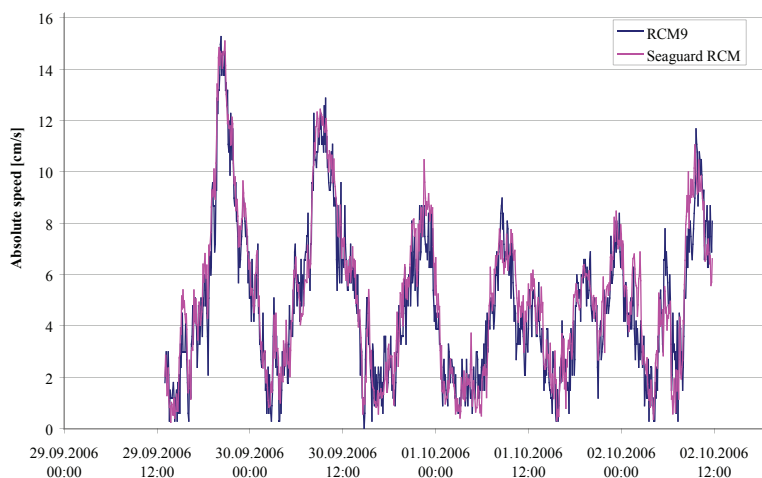
To minimize the effect of marine fouling and local turbulence, the ZPulse™ DCS starts measuring the horizontal current in an area of 0.4 to 1.0 meter from the instrument, see figure above.

Comparing SEAGUARD® RCM with RCM 9

The SEAGUARD® RCM has been tested together with a RCM 9 to compare the measurement results. The deployment was performed during a weekend in a fjord outside Bergen. The graph below shows the absolute speed of both instruments. Pink graph is representing the SEAGUARD® RCM, while blue is representing the RCM 9. The SEAGUARD® was in this test set to transmit 150 ping during each recording interval, while the RCM 9 was set to transmit 300 ping. Although the SEAGUARD® only transmitted half as many pings compared to the RCM 9, the two instruments gave very similar results. Lower ping count reduces power consumption.



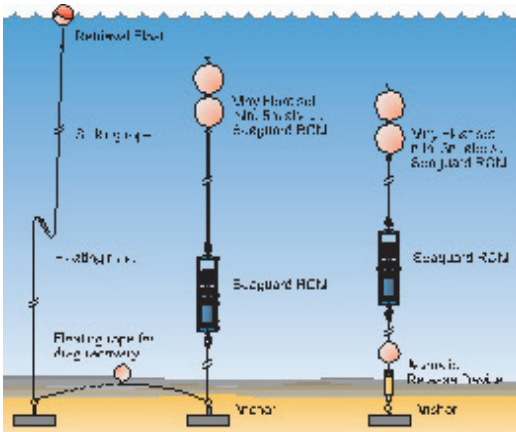
Note!
If application requires breaking strength of more than 800 kg, mount the SEAGUARD® RCM SW in in-line mooring frame 3824A. Remember to change the handles.



Comparison between data measured by a SEAGUARD® RCM (pink) and a RCM 9 (blue). The graph is showing absolute speed measured in a fjord outside Bergen, Norway.

Applications

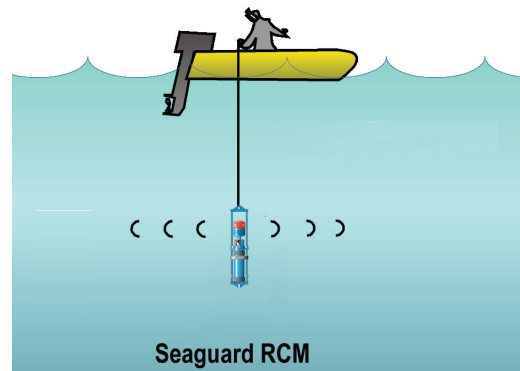
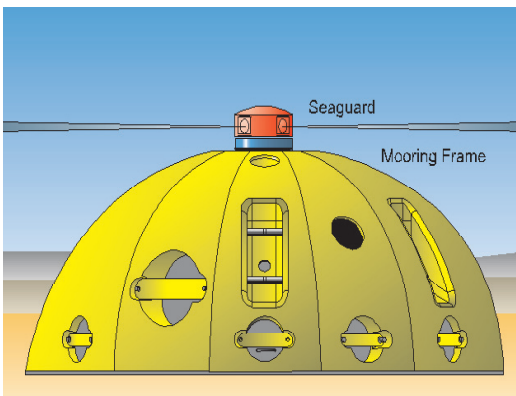
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The most common way to use the SEAGUARD® RCM is in an in-line mooring configuration. As it operates under a tilt up to 35° from vertical, it has a variety of in-line mooring applications by use of surface buoy or sub surface buoy. The instrument is installed in a mooring frame that allows easy installation and removal of the instrument without disassembly of the mooring line.

Drop line is conveniently done due to its compact design, low drag force and easy handling. The instrument can be lowered into the sea from a small boat using a simple winch. Data can be stored internally and read after retrieval.

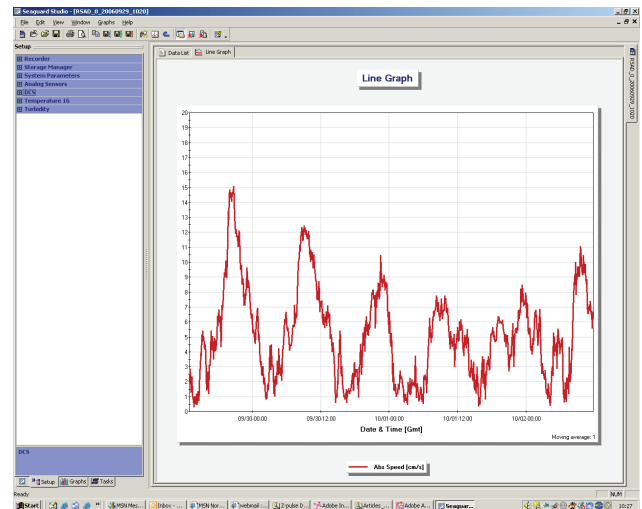
SEAGUARD® RCM can also be used in a bottom frame mooring (non-magnetic).



SEAGUARD Studio

With SEAGUARD Studio you can:

- Import deployment data collected by the SEAGUARD® RCM from a SD card.
- Display configuration setting used in the deployment.
- List and edit listed data.
- Possible to show data from several instrument at the same time for comparative studies.
- Export data to Matlab.
- Export data to ASCII text files.
- Print or export graphs in different formats.
- Copy graphs to the clipboard for inclusion into other programs such as Word, Excel or similar.
- Save edited sessions.



Example of SEAGUARD Studio presenting absolute speed data measured with a SEAGUARD® RCM.

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