



DOPPLER CURRENT SENSOR 3900

A rugged, true vector averaging sensor for measuring current speed and direction in the sea.

Features:

- *Rugged, Small Size*
- *High Accuracy*
- *Insensitive to fouling*
- *Ideal for use on buoys, quays, piers and in hand held systems.*
- *Function test easily carried out with Test Unit 3731*

The DCS 3900 is intended for commercial as well as for research purposes. It can be used to monitor the water current in harbors, along the coast, near offshore oil platforms etc. The In-line Doppler Current Sensor DCS 3900 is a rugged and reliable sensor that offers users great flexibility to obtain accurate current measurements.

The sensor uses the Doppler Shift principle as the basis for its measurements. The sensor transmits acoustic pulses into the surrounding water. As the sound propagates, small particles or air bubbles in the water reflect a portion of the energy.

The transducers pick up the back-scattered energy from the area 0.4 to 2.2 meters from the sensor. This energy is analyzed to find any frequency change (known as the Doppler Shift). An upward shift signifies that the particles are moving towards the sensor and vice-verse.

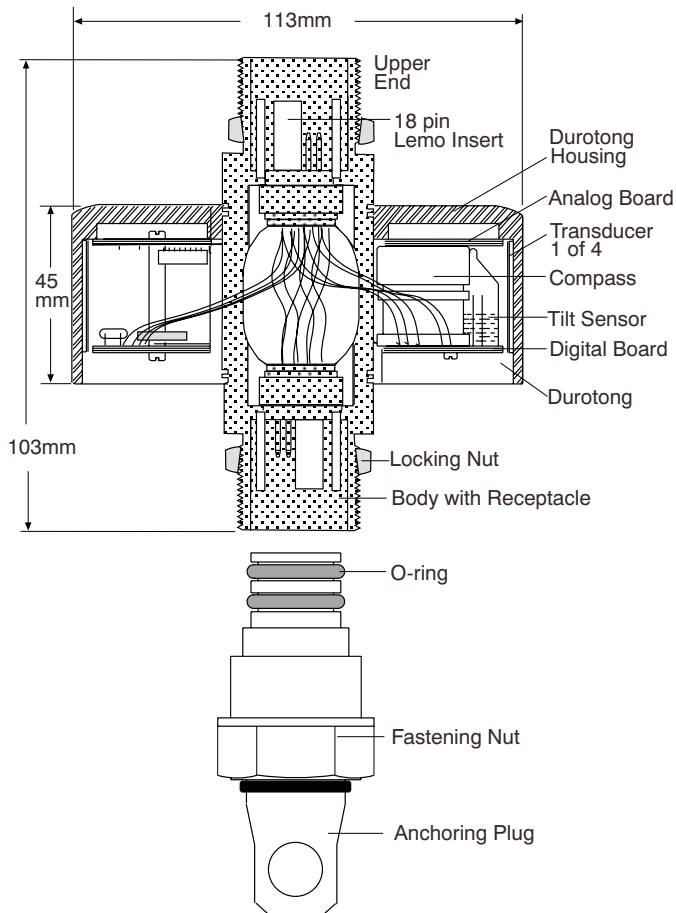
After reading the internal compass circuit (Hall effect compass), the sensor is able to determine the current speed

and direction. The sensor will ping towards the water current. The current measurements are compensated for tilt by the use of an electrolytic tilt sensor.

The measurement accuracy is proportional to the square root of the number of pings in a measuring interval. The sensor automatically chooses the ping rate after the first measuring interval. If the previous interval lasted less than 2.5 minutes, the ping rate will be set to 10 pings per second. If the previous interval lasted more than 2.5 minutes, the ping rate will be set to 1 ping per second. The current consumption will be greater with increasing ping rates and decreasing intervals.

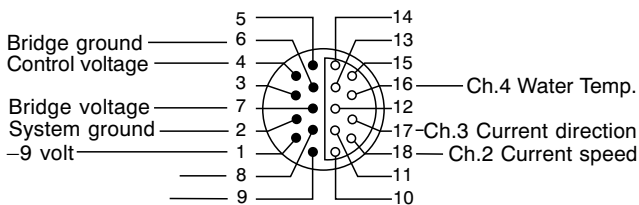
The DCS 3900 output data is in the Aanderaa SR10 standard format.

The sensor will output Current Speed, Current Direction and Water Temperature where Current Speed and Direction are averaged values. The temperature is measured using a temperature dependent crystal-oscillator-circuit.



PIN CONFIGURATION (Upper and Lower Receptacle)

External view. Pin = ●; Bushing = ○



All connections wired through from upper to lower receptacle.

*) For the 0-500cm/s range the resolution is reduced to 0.5 cm/s and the static precision is reduced to 0.55cm/s.

**) The ±0.08°C accuracy can be obtained for other ping rates provided the sensor is calibrated for this specific ping rate. Please contact factory if this is required.

CALIBRATION

Serial No:

The sensor has nominal calibration coefficients for temperature, current speed and direction. To convert the raw data readings to engineering units use the formula: $R = A + BN + CN^2 + DN^3$, where $R_{Speed} = \text{cm/s}$, $R_{Dir} = \text{Deg. Mag}$, $R_{Temp} = \text{Deg. C}$.

The nominal coefficients are:

For Current speed, range 0-300 cm/s P/N 3900

A	0	C	0
B	2.933E-01	D	0

For Current speed, range 0-500 cm/s. P/N 3900A

A	0	C	0
B	4.889E-01	D	0

Current Speed:
(Vector averaged, SR10 output)

Available Ranges:

P/N 3900 0-300 cm/s, standard
P/N 3900A 0-500 cm/s, on request *)

Resolution: 0.1% of FSR

Accuracy:

Absolute: ±0.15 cm/s
Relative: ± 1% of reading
Statistic precision: 0.55 cm/s (Standard deviation)

Current Direction:
(Vector averaged)

Range: 0-360° magnetic
Resolution: 0.35°

Accuracy: ±5° for 0-15° tilt
±7.5° for 15-35° tilt

Temperature:

Range: -10 to 43°C

Resolution: 0.05°C

Accuracy: ±0.08°C with 600pings/min. only
Better than ±0.16°C for other ping rates. See below **)

Acoustic Frequency: 2MHz

Acoustic Power: 25W in 1ms pulses

Beam Angle: ±1° (Main lobe)

Installation distance: Minimum 0.5m from the bottom
Minimum 0.75m from the surface

Current consumption: 1 ping per second: 5mA
10 pings per second: 50mA

Supply Voltage: 7-14VDC

Operating Temp.: -10 to +50°C

Depth Capability: 500 meters

Electrical Connection: 18-pin Strain-proof Plug

Breaking Load: 1500kg

Material and Finish: Durotong, titanium

Net. Weight: 800 grams

Accessories: Interconnecting Cable 3810,

Cable to Reading Unit

3863/3809/3852

Test Unit 3731

Warranty: Two years against faulty materials and workmanship

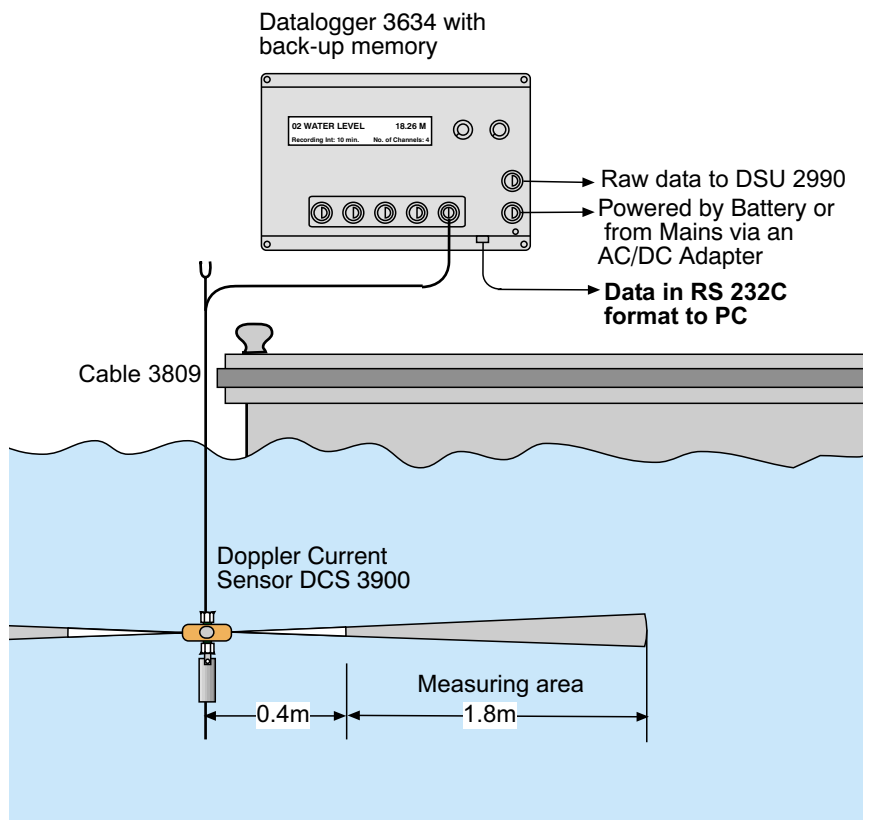
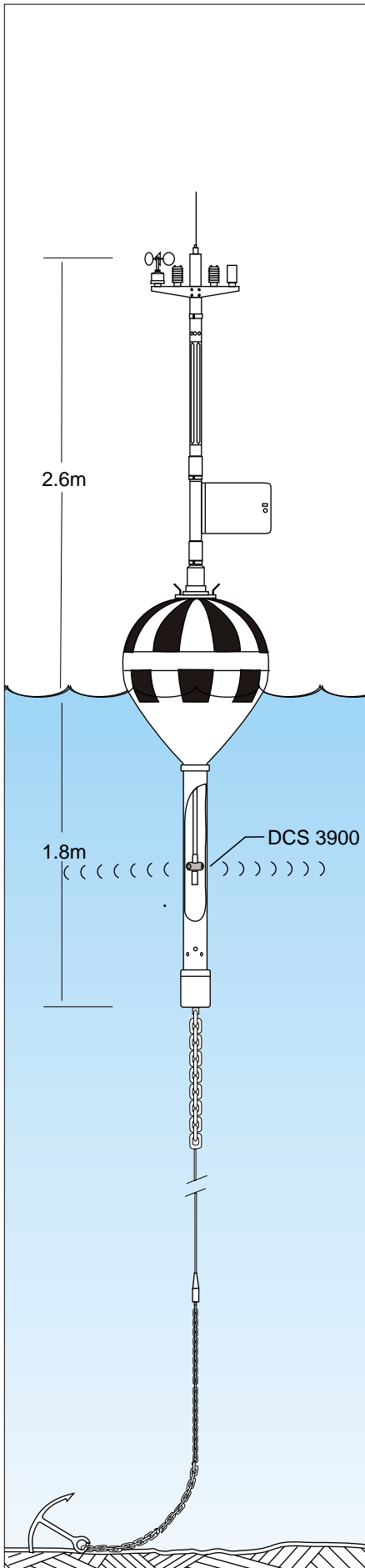
Our standard warranty (2 years) is not applicable in cases where breakage or malfunction occur to the subsurface cable during installation or when caused by excessive wear or other external forces.

In many cases where current measurements are needed, the solid-state Doppler Current Sensor 3900 is superior to other current sensors.

Due to its small size and built in compass, the sensor is easy to install and the acoustic principle makes it almost insensitive to fouling. The DCS 3900 normally operates at a ping rate of 1 ping per second. To increase the accuracy at lower recording interval, the DCS 3900 will automatically increase the ping rate to 10 pings per second when the recording interval is less than 2.5 minutes. Some practical ways to use the sensor are shown on this and next page.

A small measuring System with DCS 3900 and Datalogger 3634.

The submerged Doppler Current Sensor is connected to the Datalogger 3634 via Cable 3809. The cable can be made in different lengths and the system is powered either by battery or via an AC/DC Adapter from mains. The sensor readings, current speed, current direction and water temperature are displayed on an LCD in engineering units. The signals are available as raw data in the standard Aanderaa PDC-4 code for storage in the Data Storage Unit DSU 2990. The same signals are also available in RS 232C format for input to a PC.

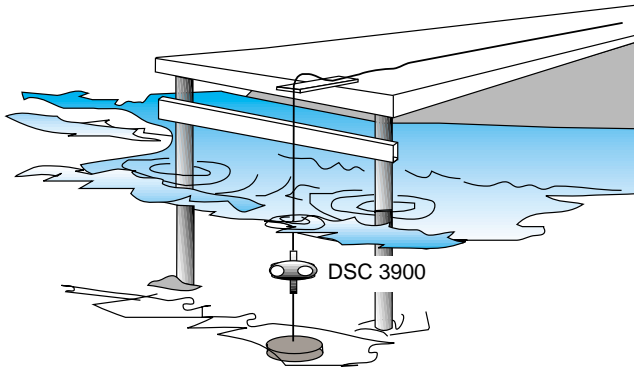


DCS 3900 on a BUOY

On the Coastal Monitoring Buoy 3280 the DCS is placed inside a central PVC tube at 1m depth. This gives a symmetrical installation with minimal interference from the buoy structure. The buoy can be equipped with up to three Doppler Current Sensors and also sensors for wave and atmospheric parameters. Data can be relayed ashore by VHF radio where the data is displayed or conveyed further by telephone. See Data Sheet D 299 for further information.

DCS installed on a Pier or Jetty

Many piers or quays are often subject to strong and varied currents, which can be particularly risky to ships if they are unaware of them. The cost and inconvenience of an accident far outweighs the cost of a DCS with real-time display of data.



The DCS can be moored under a pier with an anchor, see above. The cable from the sensor should be fastened to the pier and kept tight thus keeping the sensor horizontal and in a fixed position. A free horizontal distance of 2 meters from the DCS is required. A cable, which can be up to 500m in length, connects the sensor to Datalogger 3660 or 3634. For real-time display of data Current Display Panel 3800P can be connected directly to the Datalogger.



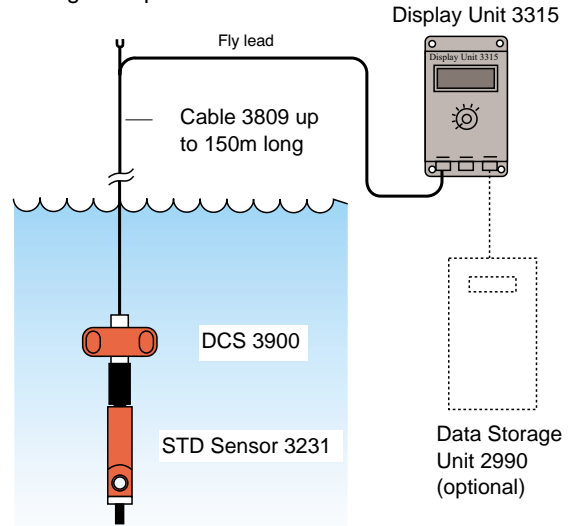
The Display Panel is designed for console installation. Output and input receptacles are conveniently placed on the back side of the panel. A two pin receptacle connects DC power to the system.

Analog displays of current speed and direction are performed by two circles (75 mm) of Light Emitting Diodes (LEDs). The circle for Current Speed has 24 LEDs and the circle for Current Direction 36 over 360° giving 10° between each diode.

This indication is primarily intended for a quick reference and a more accurate indication is shown digitally just below the circles by light emitting displays; the current speed (knots) with one decimal and wind direction $\pm 1^\circ$. Both values are average current for the selected sampling intervals.

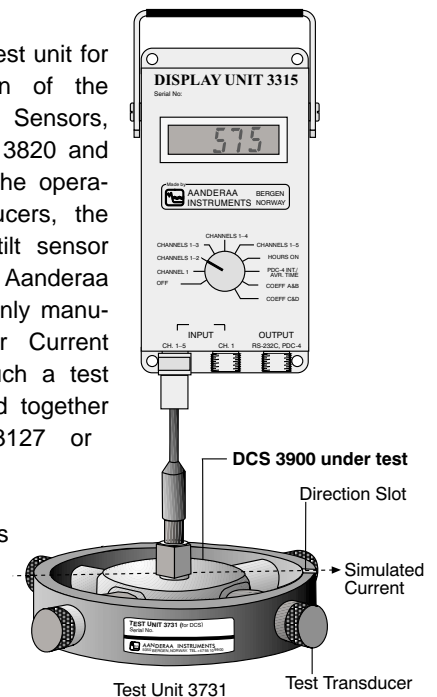
Combination of Sensors

The DCS3900 can also be used in combination with other sensors such as CTD Sensor as shown below. A DCS 3900 in combination with Display Unit 3315 installed in the harbor office will, as shown on the illustration below, display the measured parameters in real-time and in engineering units. The system described, combined with Wind Monitoring System 3400, will provide important information for safer docking of ships.



Test Unit 3731

A unique, low cost test unit for testing the function of the Doppler Current Sensors, DCS 3900, 3900R, 3820 and 3920. Before use, the operation of the transducers, the compass and the tilt sensor should be verified. Aanderaa Instruments is the only manufacturer of Doppler Current Sensors offering such a test unit. It can be used together with Deck Unit 3127 or Display Unit 3315. Request datasheet D320 for more details



Representative's Stamp

Latest version is on the Internet

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