

# *Signature 55*

REVOLUTIONIZING LONG RANGE CURRENT PROFILING

BROADBAND SERIES



TRUE INNOVATION MAKES A DIFFERENCE

# Signature55

- REVOLUTIONIZING LONG RANGE CURRENT PROFILING



Nortek is pleased to introduce the Signature55, a dual frequency long range current profiler that uses broadband processing and modern electronics to give you the most flexible current profiler available. Designed to be mounted on buoys and offshore platforms for online applications or in bottom frames and subsurface buoys in stand-alone mode, the instrument has a verified range of 1000m in the open ocean. It also comes with a host of new features, including a complete Ethernet interface.

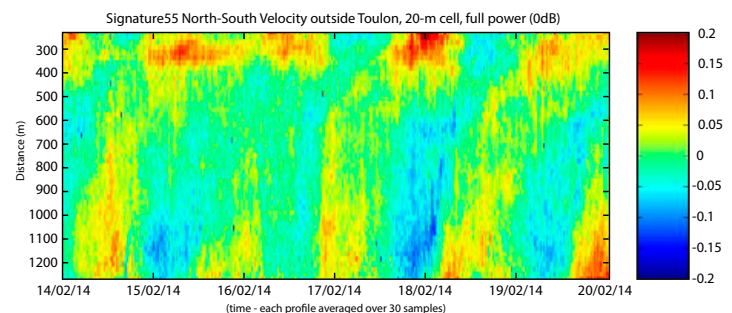
## Profiling Range Consideration

The ability to profile current velocity over 1000 meters depends on a series of instrument and environmental parameters. Users can control transmit power and cell size by changing the instrument configurations, while transducer size and efficiency, acoustic frequency, receiver sensitivity, and immunity to noise are determined by instrument design. Nortek designed and optimized all elements of the Signature55 with a strict focus on achieving 1000m range. Environmental parameters like salinity and acoustic scattering conditions, however, will also influence the profiling range.

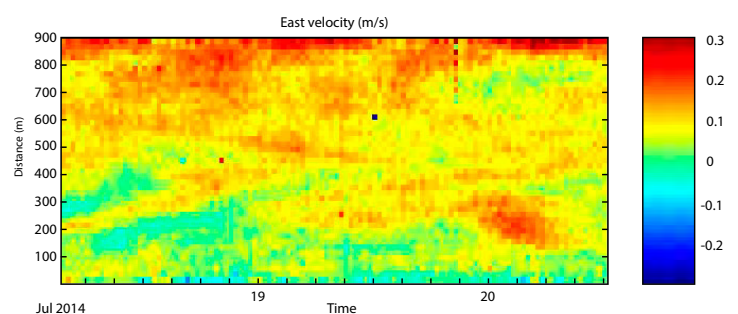
Local scattering conditions are difficult to predict and require real data in the area of interest to determine range. Scattering conditions also vary with time, depth, and biological activity.

Nortek has tested the Signature55 both independently and in partnership with experienced long range instrument users around the globe in order to better predict performance in local scattering conditions and varying environments.

Displayed to the right is data collected by NortekMed off the coast of Toulon, France and a selection of data collected at Mississippi Canyon Block 118 in the Gulf of Mexico by the Gulf Integrated Spill Research Consortium led by Chief Scientist, Dr. Scott Socolofsky of Texas A&M University.



Comparative tests conducted in the Mediterranean exhibited more than 30dB variation in scattering conditions over the profiling range. Here, the Signature55 profiled more than 1000m in both up-looking and down-looking orientation, due to an abundance of small targets close to the bottom and at the surface.



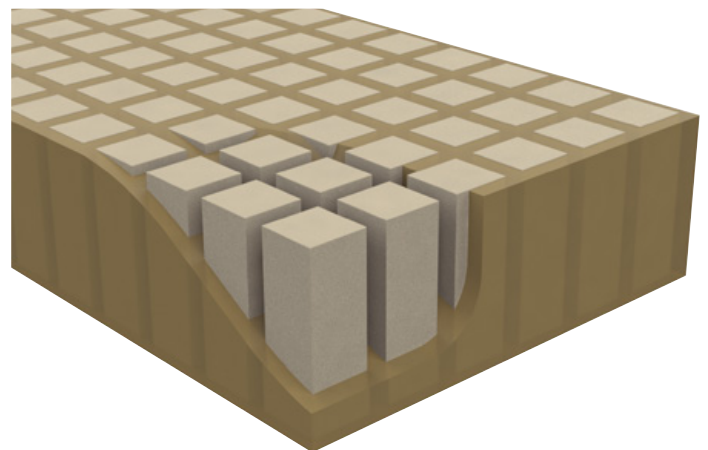
This deployment in the Gulf of Mexico at 950m depth was able to reach the surface. The active shelf biology in this location, however, would enable a downward-looking instrument to profile even further than this upward-looking deployment.

The AD2CP is Nortek's broadband Doppler signal processing platform. It is the product of thousands of engineering man-hours and includes a series of innovative elements, which will open doors to new applications and inspire exciting research possibilities.

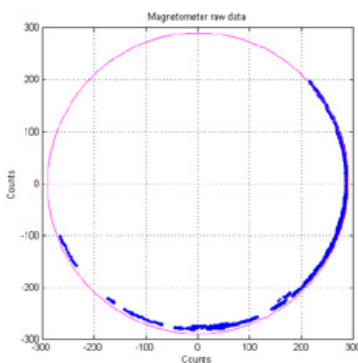
- ✓ AD2CP broadband combines frequency-modulated transmissions with fast sampling rates and adjustable bandwidth. The result is unparalleled performance in both standard and specialized applications.
- ✓ AD2CP hardware can alternate between multiple measurement modes. One instrument replaces several by offering concurrent or alternating measurements of currents, turbulence, waves and ice.
- ✓ AD2CP recorders will store all raw Doppler and sensor data. Improve data quality by removing contamination from fish or other influences.
- ✓ AD2CP Ethernet connection provides easy access to the instrument from any location, simple integration into instrumentation networks, and fast recorder download.
- ✓ AD2CP adjustable power output facilitates long endurance operation by allowing new short-range applications, which combine higher vertical resolution with lower power consumption.
- ✓ AD2CP blue light illuminates when power is applied and blinks when the transmitter is active. Deploy the instrument with the utmost confidence that it is operating.

## Signature55 Transducers

To achieve optimum efficiency and range, the Signature55 transducers use "piezo-composite" elements that have been designed and produced at Nortek Piezo in Aberdeen, Scotland. The three transducers are 25 cm in diameter. The large size increases the directivity, and hence the profiling range. This also reduces the potential interference from objects that are located within the profiling range. For QA/QC purposes, all AD2CPs collect signal amplitude and correlation values along each beam and in each range cell. It is also possible to use the measured vertical velocity for QA/QC purposes, just as in Nortek systems employing the standard three transducer design.



## Magnetometer



The Signature55 employs a three-axis magnetometer and two tilt measurements to derive compass readings. Taking advantage of multi-GB recorder sizes, the Signature55 collects and stores all sensor data, as part of the standard AD2CP data structure.

This allows the user to

remove the influence of magnetic materials on the compass as long as the instrument rotates at least 180 degrees during deployment. The resulting hard iron correction improves the estimate of current direction.

## Online Applications

The mechanical design of the Signature55 is suitable for applications on platforms, drilling rigs, and buoys. All parts exposed to seawater are made from strong plastics and titanium to protect from corrosion. The rugged metal connector and the cable to the controller are also designed to avoid corrosion and maintain reliable data return.

To facilitate the integration of the Signature55 into third party controllers or software programs, the interface can be controlled with ASCII commands and data can be output in the form of NMEA strings. An interface manual is available from Nortek to guide integrators.

The Signature55 maximizes data quality and minimizes the sensitivity of the instrument by utilizing correlation, an instrument quality parameter to discard weak data points before calculating the average current profile. This is especially important in areas with external noise, whether from sonars, fish, bad weather, or propellers.



## Deep Water Mooring Solution

### Nortek Signature Buoy



The Nortek subsurface buoy is purpose-built for the Signature55. The elliptical shape minimizes the drag and an integrated frame holds the instrument in place.

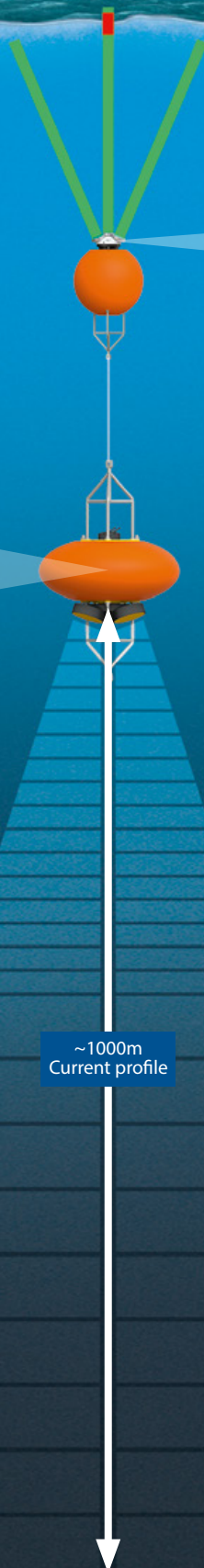
Easy access to the battery compartment is available from the end opposite the transducers, so downloading of data or battery change is simplified and does not require the instrument to be dismounted.

### Dual Mode Advantage

The Signature55 can operate in two alternating modes, as configured by the user. This sample configuration takes advantage of both. Here, a downward looking Signature55 operates in Mode A, at maximum power, with long range and large cells to measure the mean current profile over 1000 m. This is alternated with Mode B, which operates at reduced transmit power over a shorter range. Mode B offers increased vertical and temporal resolution to reveal complex ocean dynamics such as internal waves and mixing layer dynamics.

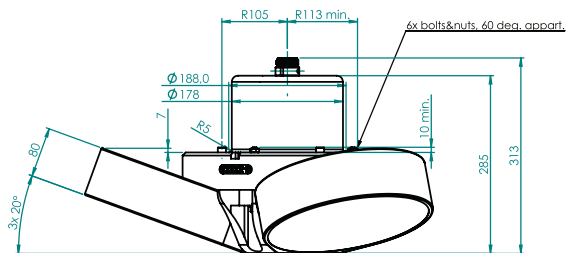
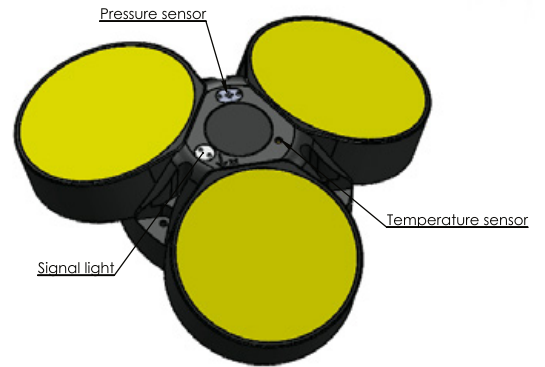
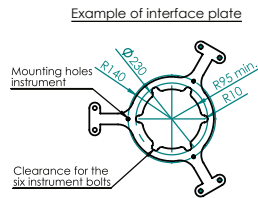
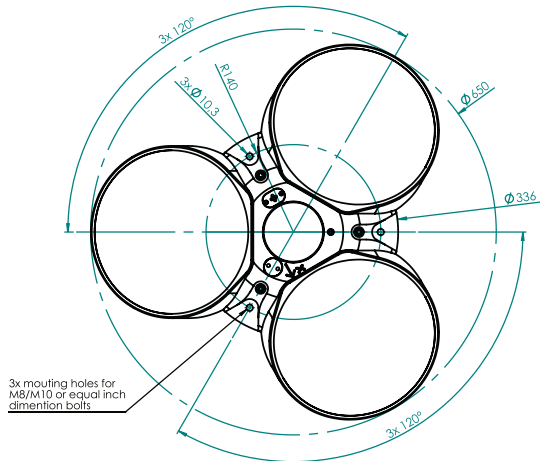
### AWAC with SUV

The Nortek AWAC in patented SUV mode adds the advantage of higher resolution current profiles at the surface as well as directional wave measurements.

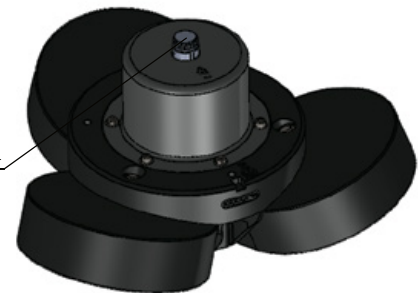


~1000m  
Current profile

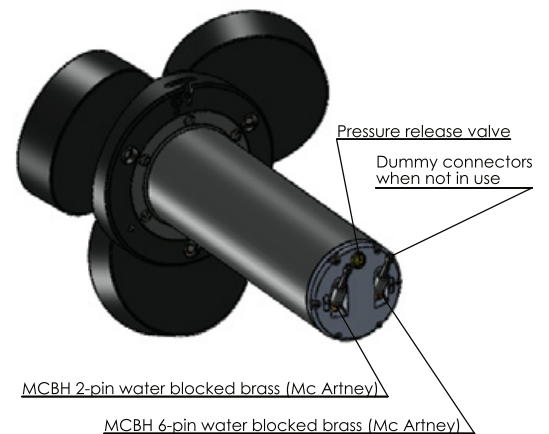
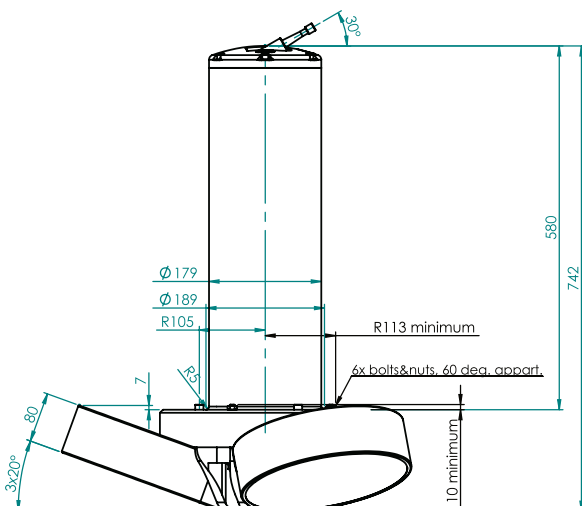
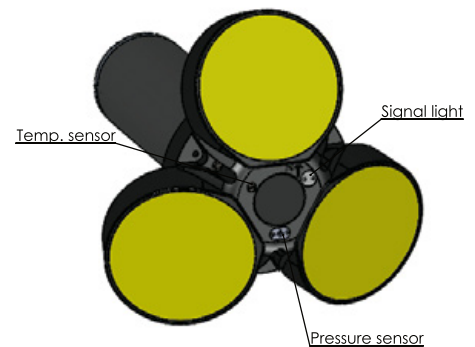
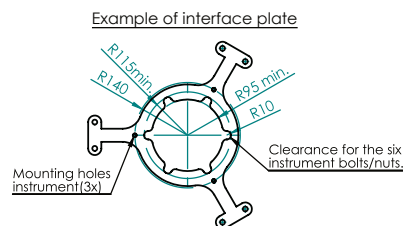
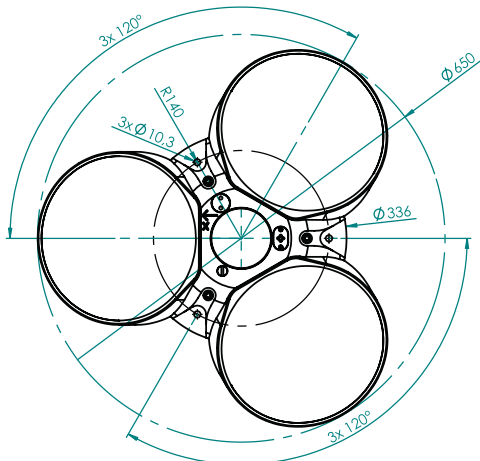
## Signature55 Online - Technical Drawings



Birns Millennium 3M-14B-OR-CA connector.  
Birns Millennium 3M-CP-RA (angeled) or 3M-CP (straight) could be used on this connector



## Signature55 Standalone - Technical Drawings





## Technical Data

### Water Velocity Measurements

Profiling range*:	1000m (55kHz), 600m+ (75kHz)
Cell size:	5–20m
Min. blanking:	2 m
Max. # cells:	200
Velocity range:	User selectable 1.25, 2.5, 3.75, 5.0 m/s
Accuracy:	1% of measured value $\pm$ 0.5cm/s
Velocity resolution:	0.1cm/s
Max Sampling Rate:	1 Hz, High-power 1/3 Hz
*) Maximum range depends on power consumption and acoustic scattering conditions	

### Echo Intensity

Sampling:	Same as velocity
Resolution:	0.5dB
Dynamic range:	70dB
Transducer acoustic frequency:	55 and 75 kHz
No. of beams:	3, slanted at 20°
Beam width:	4.5°-5.5°

### Sensors

<b>Temperature:</b>	Thermistor embedded in head
Range:	-4°C to 40°C
Accuracy/Resolution:	0.1°C/0.01°C
Time response:	2 min
<b>Compass:</b>	Solid State Magnetometer
Accuracy/Resolution:	2° for tilt < 20°/0.01°
<b>Tilt:</b>	Solid State Accelerometer
Accuracy/Resolution:	0.2° for tilt < 30°/0.01°
Maximum tilt:	Full 3D
Up or down:	Automatic detect
<b>Pressure:</b>	Piezoresistive
Standard Range:	0–100m (inquire for options)
Accuracy/Resolution:	0.1% FS / Better than 0.002% of full scale

### Data Communication

I/O:	Ethernet or configurable RS-232/RS422
Serial Communication Baud rate:	300-1250000 baud
Recorder download baud rate:	20 Mbit/s (Ethernet only) - 1 GByte in 6 minutes
Controller Interface:	ASCII command interface with telemetry options over Telnet and serial interface. Complete data download over standard Ethernet FTP. Telemetry file downloadable over serial interface. See interface manual for more information.

### Data Recording

Capacity (standard):	16 GB / Optional 64 GB
Data record:	86 bytes + 4 x Nbeams x Ncells
Mode:	Stop when full

### Real Time Clock

Accuracy:	$\pm$ 1 min/year
Clock retention in absence of external power:	1 year

### Software

Operating system:	Windows® 7 or later
Functions:	Deployment planning, start with alarm, data retrieval, conversion to ASCII and Matlab format.
Online data:	Collection and graphical display.

### Power

DC input:	15–48VDC
Max. average consumption:	15W
Typical average consumption:	0.2-0.5W. Ethernet adds 0.75W
Sleep Consumption:	100µA, power depends on supply voltage.
Transmit power:	4–400W, adjustable levels
Ping sequence:	Multiplexing or Parallel

### Materials

Standard model:	Delrin® with titanium bolts. Reinforced polyurethane transducer cups.
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### Connectors

Bulkhead:	Birns 3M-14B-OR-CA 5S316
Cable:	Birns 3M-14B-CP-CA on 10-m polyurethane cable

### Environmental

Operating temperature:	-4°C to 40°C
Storage temperature:	-20°C to 60°C
Shock and vibration:	IEC 60068-1/IEC60068-2-64
Pressure rating:	1500m

### Dimensions

See drawing	
<b>Online:</b>	
Weight in air:	55kg
Weight in water:	26kg

### Standalone:

Weight in air with Alkaline batteries:	75.5kg
Weight in water with Alkaline batteries:	35.1kg
Weight in water with Lithium batteries:	32.2kg
Weight in air with Lithium batteries:	72.6kg



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