

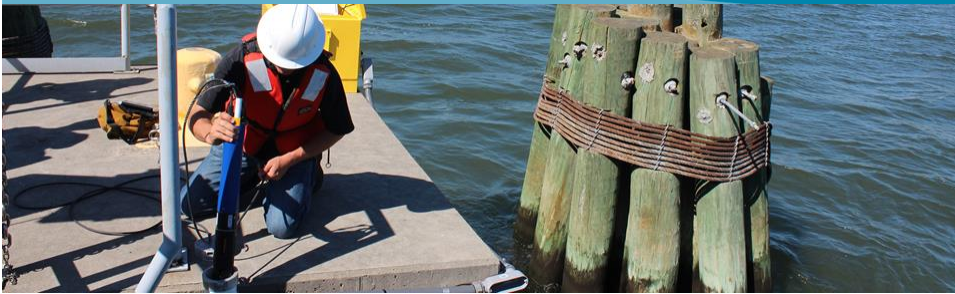
May 2015



YSI Observing Equipment Ensuring Your Data Quality

MIKE LIZOTTE

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YSI Sonde History



In 1994 YSI introduced its first multiparameter sonde the Model 6000, this platform introduced the first flow independent, and patented, DO sensor to the multi-parameter sonde market place.



In 1998 YSI we upgraded this platform and introduced the Model 6600 multi-parameter sonde.



Other products followed including the 6600 EDS which used a patented brush anti-fouling system, and the last addition in the 6600V2-4 which gave our customers maximum application and deployment flexibility.





YSI Sonde History, Continued



Over the years in all these platforms we gathered data from our customers and their applications and learned what they liked and what they wanted improved.

In 2012 it was time to show our customers that we had listened and we introduced the EXO sonde line to the market place.

This product line which was 3 years in the making completely redefined what a multi-parameter sonde should be and how it should work.



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The EXO Platform





EXO: What did we change?

The short answer is EVERYTHING – The 6-Series product line was a workhorse and over the years we made many changes, options, and improvements to these platforms. However, at some point there comes a time when advances in electronics, technology and the lessons learned make it necessary to start over and build a new product that will serve our customers for many years to come.



EXO is the culmination of 20+ years worth of our sonde building experience combined with the latest advances in materials and electronics technology.



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EXO Design Goals

- Reduce calibration costs, labor and materials
- Reduce servicing requirements
- Extend deployments for long term monitoring and DCP (data collection platform) studies
- More accurate sensors for higher data quality
- Smart QC with automatic calibration and meta data generation
- Improve Anti-Fouling capabilities for all sensors
- Data must be compatible with legacy 6-Series data



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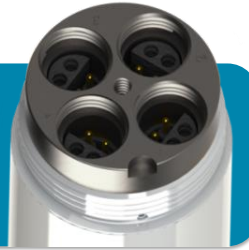
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EXO¹ Sonde



Sampling and Ground Water
4 sensor ports
Diameter: 4.70 cm (1.85 in)
Length: 64.77 cm (25.50 in)



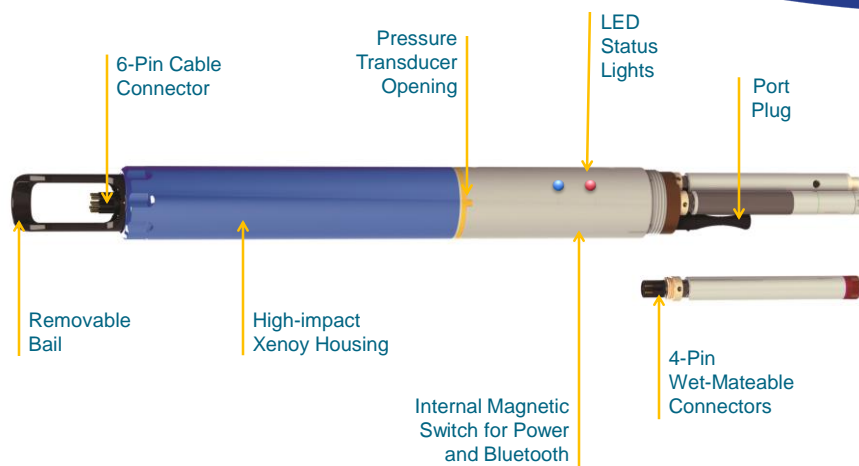
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EXO¹ Sonde Anatomy



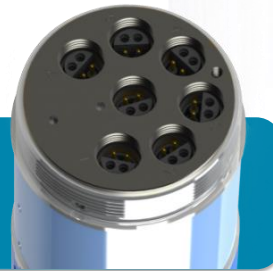
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EXO² Sonde



Continuous Monitoring
6 ports + wiper port
Diameter: 7.62 cm (3.00 in)
Length: 71.10 cm (28.00 in)



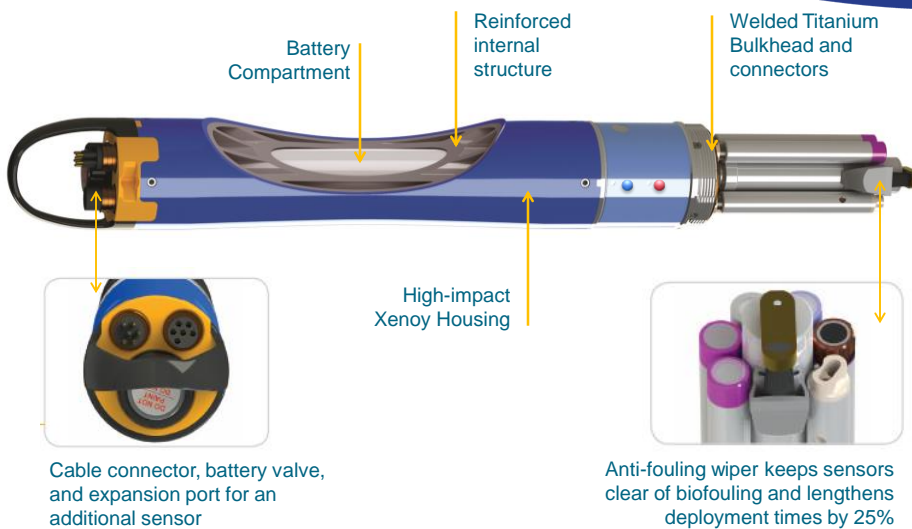
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EXO² Sonde Anatomy





Features you'll only find in EXO



Assisted Calibration
Graphical KOR software speeds the calibration process while reducing reagent consumption



Auto-recognition
and set-up of all sensors with background data routing



Titanium Sensors
with wet-mateable connectors and welded seals for deeper depths



Cable-free Operation
through the use of wireless communications



Biofouling Protection
with copper-alloy components and anti-fouling wipers



Smart QC
Automatically checks for faults and errors to ensure successful deployments

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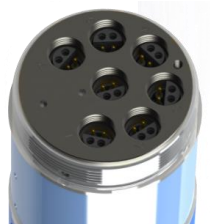
Smart Ports – Smart Sensors

Flexible:

- Any sensor port
- Concurrent calibration
- Wet-matable connectors

Protection:

- AC Capacitive Coupling protects electrical circuitry



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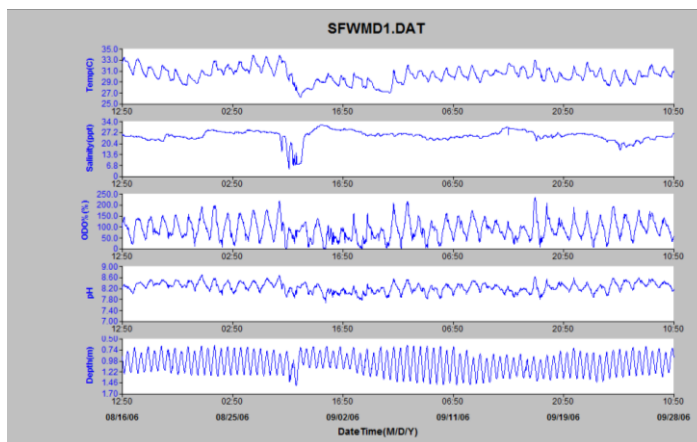
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Defensible Data



Will your data be defensible?



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How to make sure it's defensible!

- Choose the right sensor technology
- Establish a good QA/QC Program
- Ensure proper instrument preparation
- Perform documented calibrations
- Proper site selection and design (NWQMC)
- Provide biofouling protection
- Keeping good Meta data & field records

SmartQC



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Sensor Technology

- The instrument you choose can make a difference in the success of your monitoring program
- Consider the benefits that different technologies and platforms offer. Initial cost should not always be the deciding factor
- Look for instrumentation that is rugged, field serviceable, resists the effects of biological fouling and provides the user with the performance and calibration data for your QA/QC program



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QA/QC – Why is this important?

Quality Assurance (QA), Quality Control (QC) and Standard Operating Procedures (SOP) are separate components of a monitoring program that work together to provide data of known quality.

Together they minimize and quantify the error that is introduced in sampling and allows for the tracking of any errors that might occur. QA/QC includes planning, assessment, reporting and making necessary changes to the water monitoring program to ensure quality data.



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QA/QC – Continued

The National Water Quality Monitoring Council (NWQMC) has excellent reference material available that can assist you in the setup of your QA/QC monitoring program.

Visit www.watersensors.org and download the QA (ACCR) Matrix.

Also visit www.exowater.com for links to EXO-University.com and other important support documentation.



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Proper Instrument Preparation

- Xylem / YSI has many resources available to its customers to aid your program
- EXO-University.com is a great online course that will teach you everything about using and deploying your sondes
- We also have great downloads like our "10 Tips" document at www.exowater.com



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Smart Cal. – Aiding your QA/QC

- Calibration sheet for EXO pH sensor 2 point calibration performed
- Green check mark confirms successful calibration
- Pre and post values recorded in KOR software
- Slope automatically calculated

Calibration Worksheet			
UTC Time		Eastern Standard Time	
Start Date/Time	6/2/2014 15:50:54	End Date/Time	6/2/2014 15:50:54
End Date/Time	6/2/2014 15:55:16	Previous Calibration Date/Time	2/25/2014 21:16:52
Sensor Type		Sensor Type	
Sensor SN		Sensor SN	
Sensor Firmware Version		Sensor Firmware Version	
Calibration Parameter		Calibration Parameter	
QC Score		QC Score	
Standard	Cal Point 1	Cal Point 2	Cal Point 3
Pre Calibration Value	7.02 pH	10.06 pH	
Post Calibration Value	7.02 pH	10.06 pH	
Raw Value (pH mV)	-30.30	-214.04	
Temperature	25.41° C	25.48° C	
Additional Input 1 (N/A)			
Additional Input 2 (N/A)			
Type	YSI pH 7 Buffer	YSI pH 10 Buffer	
Manufacturer	YSI	YSI	
Lot Number			
Calibration Point Accepted	YES	YES	
Stability Achieved	YES	YES	
Completed	YES	Additional Post Calibration Info:	
Applied	YES	pH 7.02 and 10.06 Delta Slope 183.73 mV/85.44 mV per pH unit	



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Site Selection & Design



Proper Selection and Design

Again the National Quality Water Monitoring Council www.watersensors.org is a great resource for assisting you with choosing site locations and provides a wealth of other information for ensuring your success in the field. Download the Field Deployment Guide to get started.

And www.exowater.com and EXO-University.com have many very useful tips to assist in your site setup and construction.





Biofouling Protection



Protective Sleeves



Copper Tape



Biofouling Inhibitor



Anti-fouling Guard



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Fouling – “The Enemy”

- In most deployments biofouling of the sensors is the reason water quality instruments cannot be deployed for extended periods of time
- Advances in technology, improved durability and the drift free nature of sensors like optical DO have now made long term deployments possible if the sensors can be kept clean
- Fouling has many forms, whether fresh water or marine, most locations have some form of biofouling that must be kept at bay if we are to have high quality data



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Example 1: 6600 in 30 day study

- Biofouling on wiper shafts, edges of sensors pH probe, and CT sensor
- At first glance because the optics are clear you would think that this data would be good
- What fouling looks like in water vs. out can be quite different



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EXO² Sonde at Example 1 Site

- Sensors perfectly clean even after 30 days insitu
- Throughout the EXO development program the central wiper with its garage and copper alloy wiper arm demonstrated superior cleaning capabilities in all tested environments



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Example 2: 6600 later in season, 50 days

- Picture shows much cleaner sensors, some growth attached to the wiper shafts
- This again looks like minimal fouling and not a threat to the optical data
- But placing the sonde back in water shows a very different situation...



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Wiper Shaft: Fouling in Water

- The small growth on the end of the wiper shafts fans out when in water
- Currents and flow will make this growth move back and fourth in front of the optics
- The result is offsets, spikes, and interference in the measurements



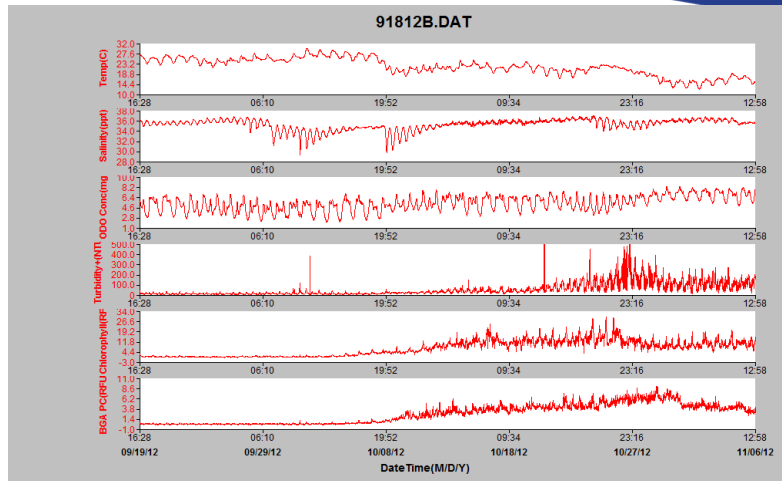
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Biofouling effects on sensors



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Meta Data and Field Documentation

- I believe that you now have a good idea why it is important to have all the components we listed implemented in a monitoring program
- The total package can result in high data quality and reduced data and field costs
- We hope that you have found this presentation informative and that you visit the recommended resources.
- Thank you for attending!



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Join our on-demand training program for Water Quality Sondes.



Learn from the experts



Detailed product review



Real-world applications

Join us at...

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Who's
Minding
the Planet?

Questions?

Email us:

Environmental@ysi.com
Info@ysi.com

Call us:

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