

Thermo Scientific AquaSensors Liquid Analytical Measurement Systems

Universal Plug-n-Play Sensors
and Online Systems for:

- pH & ORP
- Conductivity & Resistivity
- Toroidal Conductivity
- Dissolved Oxygen
- Free Chlorine & Dissolved Ozone
- Turbidity & Suspended Solids

Direct Network Connections or
Conventional Analyzer Systems





◀ Water Analysis Instruments
Headquarters, Beverly, MA

Thermo Scientific AquaSensors

Thermo Scientific AquaSensors products are innovative liquid analytical measurement systems for water quality and process control applications. Unique product designs reduce equipment and installation costs while improving reliability.

Thinking Outside the Box

Thermo Scientific AquaSensors DataStick™ Measurement Systems began with a revolutionary idea – Simplify analytical measurements by designing digital sensors that connect directly to PLC's, HMI's and PC-based SCADA systems. The patented DataStick measurement system features pre-calibrated, plug-in sensor heads that provide 24-bit data and can be calibrated, configured or diagnosed directly from a PLC or computer system.

This evolution in analytical measurement is available in a complete line of true plug-n-play modular sensor configurations for the measurement of pH, ORP (Redox), contacting and toroidal conductivity, resistivity, dissolved oxygen, drinking water turbidity, high level turbidity, suspended solids, dissolved ozone and free chlorine.

DataStick Means Integral Communications

The modular DataStick provides unparalleled flexibility. Configure a communication protocol and measurement parameter by simply connecting the appropriate sensor head and communication module. A wide variety of integrated network protocols are supported directly from the DataStick measurement system including Ethernet/IP, Modbus TCP, TCP/IP, Modbus RTU, DeviceNet, CANopen, Profibus DPV0/DPV1, USB and RS232.

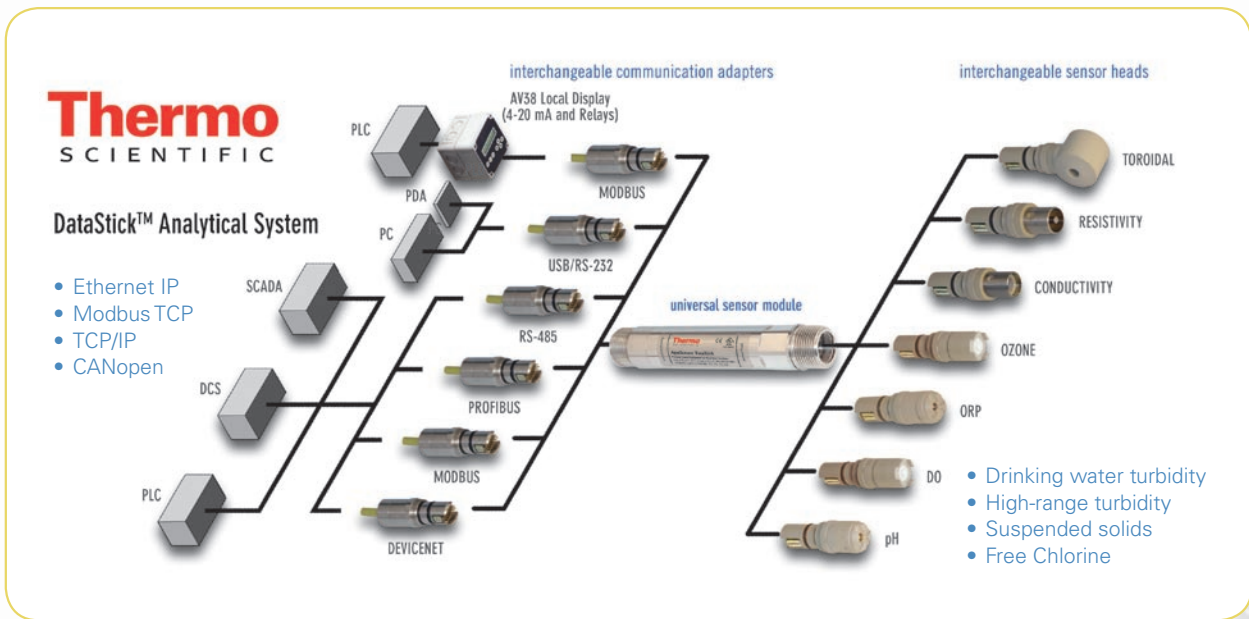
The DataStick consumes very little power and can be used in portable applications with USB connections to laptop computers. Multiple DataSticks can be accessed directly using a standard web browser, terminal program, AquaComm for Windows, or PLC programs.

Local Display & Control...and Conventional Solutions

For local display and calibration of any DataStick system, the low cost AV38 should be used. It supports multiple DataSticks and provides current outputs for traditional data reporting and PID control. Relays are provided for alarm, control or wash functions. A variety of communication protocols are available for remote display, calibration and configuration of DataStick measurement systems.

The AnalogPlus line of analytical measurement systems features traditional cabled sensors with improved reliability and accuracy. All AnalogPlus sensors can be used with the AV88 universal analyzer, as well as other compatible industrial analyzers.

Made in the USA; CE and UL approvals



Thermo Scientific DataStick™ Measuring System

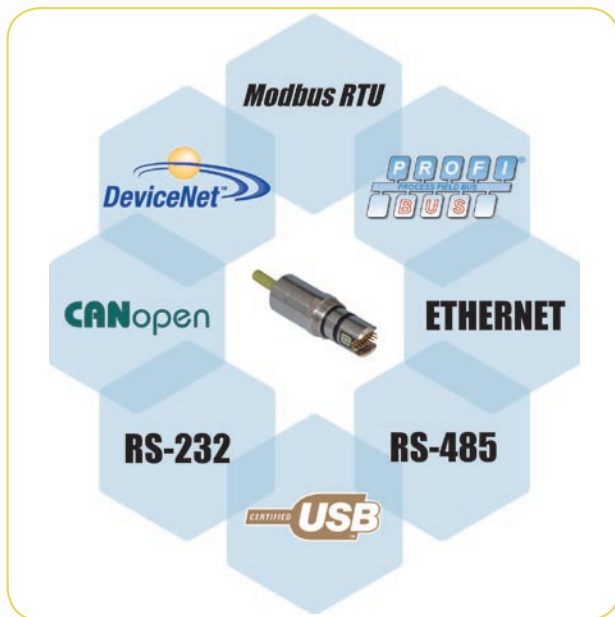
The Thermo Scientific DataStick is a versatile, configurable analytical measurement system. By mixing and matching interchangeable plug-n-play components, the DataStick can be tailored for many water quality and process control applications. It can

be remotely configured, calibrated and diagnosed. The DataStick can be configured for a large and growing list of protocols for water quality and process control measurements.

Universal Plug-N-Play Sensors

Key AquaSensors DataStick Applications

Drinking Water Treatment	Wastewater Treatment	Industrial Water Treatment	Measurement Parameter	Recommended DataStick Product
•	•	•	pH/ORP	Thermo Scientific Differential pH/ORP Measurement System
•		•	Conductivity/Resistivity	Thermo Scientific Conductivity/Resistivity Measurement System
	•	•	Total Dissolved Solids (TDS)	Thermo Scientific Toroidal Conductivity Measurement System
•	•	•	Dissolved Ozone	Thermo Scientific Ozone Measurement System
	•		Optical Dissolved Oxygen	Thermo Scientific RDO Pro Rugged Optical Dissolved Oxygen Measurement System
	•		Dissolved Oxygen	Thermo Scientific Dissolved Oxygen (ppm) Measurement System
		•	Dissolved Oxygen	Thermo Scientific Dissolved Oxygen (ppb) Measurement System
•		•	Low-Range Turbidity	Thermo Scientific AquaClear Low-Range Turbidimeter
•	•	•	Turbidity	Thermo Scientific Wide-Range Turbidity Measurement System
	•	•	Suspended Solids (TSS)	Thermo Scientific Suspended Solids (TSS) Measurement System
•		•	Free Chlorine	Thermo Scientific AquaChlor Free Chlorine Analyzer



Configuring a Measurement System

There are three steps to specifying a Thermo Scientific AquaSensors DataStick measurement system:

1. Select a preferred communication protocol
2. Choose the body material and mounting requirements for the DataStick sensor
3. Select a measurement parameter and sensor head

1. Communication Protocol Adapter

Thermo Scientific AquaSensors is committed to supporting a wide variety of industrial communication protocols for remote measurement, calibration, configuration and diagnostics. If a protocol of interest is not listed here, others may be considered. Contact factory for details.

Communications Adapter Selection Matrix			
Body Material	Communications	Cable Length	Cable Termination
316 stainless steel	RS-232 ASCII	10 feet	Stripped wires
PEEK®	Modbus RTU	30 feet	Custom
	Modbus RS-232	Custom	
	Ethernet		
	DeviceNet		
	Profibus DP		
	USB		
	CANopen		

2. Universal DataStick Body

Choose the preferred material of construction and process mounting preference:

DataStick™ Selection Matrix	
Body Material	Mounting
316 stainless steel	1 inch NPT front/back
CPVC	1 inch NPT back w/ smooth front
PEEK®	2.0 & 2.5 inch Tri-Clamp
	Custom mounting

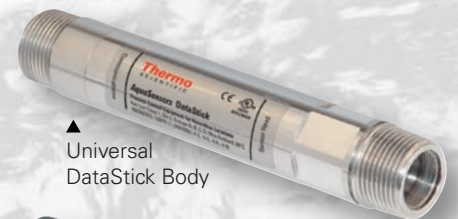
The DataStick sensor body is designed as a universal module and resembles conventional sensors with 1" NPT process threads for "convertible" immersion or inline mounting. Other special mounts are available.

3. Measurement Sensor Head

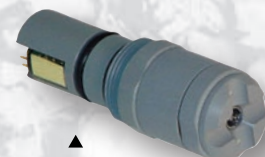
See page 7 for sensor configurations for measurement of pH, ORP (Redox), contacting and toroidal conductivity, resistivity, dissolved oxygen, drinking water and high level turbidity, suspended solids, dissolved ozone and free chlorine.



▲ Communication Protocol Adapter



▲ Universal DataStick Body



▲ Differential pH Sensor



Thermo Scientific AV38 Local Display

Local Display with Current Outputs and Relays for DataSticks: Thermo Scientific AV38 Display

The Thermo Scientific AV38 Display delivers automatic recognition of DataStick sensor type, calibration, configuration and diagnostics. The AV38 will operate with any DataStick regardless of configuration. (See page 6 for more details)

Direct HMI/PLC Interface

Integrated System Monitoring and Controlling from a Single Location: HMI/PLC

Use an HMI (Human Machine Interface)/PLC (Programmable Logic Controller) for indication, calibration, configuration and diagnostics of the entire measurement system from one convenient location.

- **Modbus:** Modbus RTU register map provides measurement and calibration data in floating point and integer formats – over RS-485 or RS-232 hardware interfaces. Sensor configuration and diagnostics are also accessible.
- **DeviceNet:** Electronic Data Sheet (EDS) supports all measurements. Easy configuration works with all PLC's that support DeviceNet.
- **Ethernet:** Plugs into any Power over Ethernet (PoE) enabled switch or power injector. Accessible with a static IP address with any Web browser and automatically detects any uses Ethernet/IP or Modbus TCP protocols when used with industrial PLC's.

Additional information is available upon request regarding other communication protocols, including: Profibus, ASCII over RS-232 or CANopen.

Direct PC/SCADA Connection

Menu-Guided Network Data Reporting: PC/SCADA

Choose any PC or SCADA to report data from a network of DataSticks. Thermo Scientific AquaSensors AquaComm™ Software, standard OPC server software, or any terminal software program such as Microsoft HyperTerminal can be used to measure, calibrate, configure and diagnose the entire measurement system from one convenient location. AquaComm is a Windows program that automatically configures itself for each DataStick and directly supports USB, RS-232 and Modbus.

DataSticks can communicate directly with PCs via:

- USB (no external hardware)
- RS-232 (requires DC power)
- CANopen (requires hardware/software)
- Modbus (requires RS-485 hardware)
- DeviceNet (requires hardware/software)
- Profibus (requires hardware/software)



▲ AV38 shown with NEMA 4X enclosure



Thermo Scientific AV38 Local Display/Controller

- Allows 1 or 2 DataStick sensor inputs for conventional use
- Gateway mode allows view of multiple DataSticks in network
- Compatible with any DataStick
- Standard ¼ DIN NEMA 4X wall mount enclosure
- Optional ¼ and ½ DIN panel mount and pipe mount
- Sun shield available for outdoor use
- Meets CE requirements for heavy industrial use
- Carries cULus general electrical classification (UL61010-1)

- Menu functions include calibration, configuration and diagnostics
- PID controller for pH and conductivity
- Two 4 to 20 mA current outputs
- Two Form-C relays for alarm, control and wash
- Available in 24 VDC or 100 to 240 VAC powered versions
- Digital host communications available for interface to PC, SCADA or other control systems

The Thermo Scientific AV38 Display delivers a backlit, high contrast display at a low cost. It provides automatic recognition of DataStick sensor type, calibration, configuration and diagnostics. The AV38 will operate with any DataStick regardless of configuration.

Thermo Scientific DataStick Sensors

DataStick sensor heads are pre-calibrated and can be easily replaced or exchanged in any DataStick measurement system without reinitializing the system. Cost-effective robust designs in a broad range of measurements.

- Pre-calibrated plug-n-play sensor heads
- Rugged, foul-resistant sensors designed for continuous use in the most demanding applications
- Direct 24-bit data reporting
- Plug-n-play industrial communication adapters
- 1 inch NPT sensor heads available in a variety of materials
- Engineering specifications, mounting hardware and product description available: request individual data sheets
- Meets CE requirements



Sensor Specifications

Parameter	Differential pH & ORP Sensors	Conductivity & Resistivity Sensors	Toroidal Conductivity Sensors	Dissolved Oxygen Sensors	Dissolved Ozone Sensors	Free Chlorine Sensors
Highlight	Differential pH and ORP measurements	Two electrode measurement with 0.01, 0.1 and 1.0 cell constants	Electrodeless conductivity sensor	Polarographic Clark cell	Robust and chemically resistant PEEK construction	Reagent-free chlorine with amperometric measurement
Range	pH: 0 to 14 pH ORP: ±2100 mV	Conductivity: 0 to 5000 µS/cm Resistivity: 0 to 18.2 MΩ•cm	0 to 2 S/cm	0 to 40 ppm	0 to 10 ppm	0 to 10.0 ppm
Resolution	pH: 0.01 pH ORP: 0.1 mV	Conductivity: 4.5 sig figs Resistivity: 4.5 sig figs	4.5 sig figs	0.01 ppm	0.01 ppm	0.01 ppm
Key Features	Easy to replace/refresh reference junctions and solutions Accurate temperature compensation Standard protected tip with integral ground electrode	High performance construction Accurate temperature compensation	Wide range and high resolution measurement Ideal for applications with heating and cooling cycles—common in CIP (clean-in-place) and chemical blending Accurate temperature compensation	Rugged, foul resistant membrane Easy-to-replace sensor membrane cap Temperature measurement included Also available in ppb measurement ranges Accurate temperature and pressure compensation	Amperometric cell technology Easy-to-replace sensor membrane cap Accurate temperature compensation	Optional automatic pH compensation in AquaChlor system



▲ Thermo Scientific AquaClear™ Low-Range Turbidimeter

Thermo Scientific DataStick Systems

Thermo Scientific AquaClear™ Low-Range Turbidimeter

- Meets or exceeds USEPA Method 180.1
- Pre-calibrated measurement
- 135 ml sample chamber
- Low volume reduces calibration reagent costs
- 0 to 200 NTU measurement range
- 0.001 NTU resolution
- 3 year light source
- Compact mounting foot print
- Local interface with current outputs and relays
- Single or dual sensor input design
- Low flow rate
- Temperature measurement included
- Digital network interface
- Plug & play industrial communications adapters

Thermo Scientific AquaClear turbidimeter uses a DataStick sensor with a pre-calibrated optical detector. The DataStick sensor is inserted in the sample chamber facilitating the nephelometric design for turbidity measurements.

This compact online turbidimeter meets or exceeds USEPA Method 180.1 requirements for drinking water monitoring. It is designed to perform best in low turbidity ranges typical in stringent membrane filtration applications. The unique sample chamber makes this system easy to calibrate, clean and maintain. The chamber design also removes bubbles from the sample to ensure accurate turbidity measurements. Its low-volume, 135 ml, significantly reduces the amount of Formazin needed for calibration.

The specially designed, low cost tungsten lamp is rated for at least three years without need for replacement and provides improved measurement response time. The close-coupled detector reduces noise and maintains very stable readings without the need for large amounts of digital filtering.



Wide-Range Turbidity Sensors

- Conforms to ISO 7027 for wide range turbidity
- **Range:** 0 to 4000 NTU
Resolution: 0.1 NTU
- 90 and 180 degree light paths
- Optional wash head to avoid fouling
- Temperature measurement included



Total Suspended Solids Sensors

- Conforms to ISO 7027 for suspended solids
- **Range:** 0 to 20,000 mg/L
Resolution: 1 mg/L
- Optional wash head to avoid fouling (pictured)
- Temperature measurement included



► Thermo Scientific AquaChlor™ Free Chlorine System

Thermo Scientific DataStick Systems

Thermo Scientific AquaChlor Free Chlorine Monitoring System

Monitor Free Chlorine with amperometric measurement system.

- Turn-key, reagent-free design
- EPA compliant according to Method 334.0
- Ideal for monitoring free chlorine in drinking water distribution
- Range: 0 to 10 ppm
Resolution: 0.01 ppm
- Designed to operate between pH 4.0 and 9.0
- Easy-to-replace sensor membrane cap
- Temperature compensated
- Compact mounting foot print
- Local interface with output and relays
- Digital network interface

Thermo Scientific AquaChlor uses DataSticks for pH and a pre-calibrated chlorine detection. The DataSticks are inserted in the sample chamber specifically designed for free chlorine measurements. The unique flow chamber maintains regulated pressure and flow for optimum measurement performance.

Thermo Scientific RDO® Pro Optical Dissolved Oxygen System

The latest generation in luminescent dissolved oxygen technology for wastewater monitoring. Eliminates membranes, solutions and start-up time!

- 0 to 20 ppm measurement range (0 to 2000 % saturation)
- No membranes – only annual field replaceable caps
- High precision & accuracy with fast and stable response
- Reduced maintenance – long lasting calibration
- No conditioning necessary prior to use – fast start up
- Three-year sensor warranty
- Resists photo-bleaching and abrasive process media
- No “poisoning” by sulfides
- No cross sensitivity to carbon dioxide, ammonia, pH, sulfates, chlorides, or hydrogen sulfide
- Plug & play design with digital network interface
- Versatile immersion and ball-float mounting configurations

Thermo Scientific AquaSensors RDO Pro optical dissolved oxygen systems work with the AV38 Local Display/Controller – single or dual sensor inputs – providing unmatched accuracy and low maintenance for wastewater professionals.





▲ AV88 shown with NEMA 4X enclosure



Thermo Scientific AV88 AnalogPlus™ Analyzer

- Connects to any AnalogPlus Sensor via internal personality modules
- Can be easily reconfigured in the field for any AnalogPlus measurement
- Displays sensor measurement and temperature data
- Menu functions: Calibration, configuration and diagnostics
- Digital protocol options for remote measurement, calibration, configuration and diagnostics
- Two - 4 to 20 mA current outputs
- Two Relays for Alarm, Control and Wash
- PID Controller for pH and Conductivity
- Convenient ¼ DIN NEMA 4X wall mount enclosure
- Optional ¼ and ½ DIN panel mount and pipe mount
- Sun shield available for outdoor use
- Meets CE requirements for heavy industrial use
- Carries cULus general electrical classification (UL61010-1)

The AV88 Universal Analyzer can be configured in the field for any AnalogPlus sensor parameter. The ¼ DIN analyzer has a backlit alphanumeric display with easy-to-use keypad navigation. Digital protocol options for remote measurement, calibration, configuration and diagnostics. Standard power: 24 VDC. Optional power: 100 to 240 VAC.



▲ AnalogPlus Differential pH Sensor



Thermo Scientific AnalogPlus™ Sensors

Rugged, foul resistant sensors are ideal for challenging process applications.

- Sensors are designed for continuous use in the most demanding applications
- Fast and accurate temperature response
- 3/4, 1.0 and 1.5 inch NPT sensor sizes
- Offered in CPVC for a wide range of applications at an affordable price
- Offered in PEEK for higher temperatures and greater chemical resistance in process applications
- Engineering specifications, mounting hardware and product descriptions available: request individual data sheets

Sensor Specifications

Parameter	pH	ORP	Conductivity	Resistivity	Toroidal Conductivity	Dissolved Oxygen	Ozone
Range	0 to 14 pH	±2100 mV	0 to 5000 µS/cm	0 to 18.2 MΩ•cm	0 to 2 S/cm	0 to 40 ppm	0 to 10 ppm
Resolution	0.01 pH	0.1 mV	4.5 sig figs	4.5 sig figs	1 µS/cm	0.01 ppm	0.01 ppm
Accuracy	0.1% of reading	0.1% of reading	0.1% of reading	0.1% of reading	0.1% of reading	1% of reading	2%
Key Features	Replaceable reference salt bridge	Replaceable reference salt bridge	Titanium or 316 SS two-electrode cell	Titanium two-electrode cell	Ideal for CIP (Clean-In-Place) applications	Easy to replace membrane cartridge	Easy to replace membrane cartridge
Sensor Details	Standard, low & high temp, pure water, HF	Platinum or gold	0.01, 0.1, & 1.0 cell constants	0.01 cell constant	Electrodeless	Polarographic	Polarographic
Sensor Materials	CPVC, PEEK	CPVC, PEEK	CPVC, PEEK, Titanium & 316SS	CPVC, PEEK, Titanium & 316SS	CPVC, PEEK	PEEK	PEEK
Sensor Process Connection	1 & 1½" NPT	1 & 1½" NPT	½, ¾ or 1" NPT	½, ¾ or 1" NPT	¾" NPT	1" NPT	1" NPT

Thermo Scientific Water Analysis Instruments One Source. Total Solution.

Understanding the challenges of providing safe and reliable drinking water, controlling reliable wastewater treatment processes or providing reliability and value for industrial water treaters – Thermo Scientific process products offer a broad range of analytical measurement options to meet critical requirements with accuracy and confidence you can trust.

Our products are designed for flexibility, ease-of-use and low cost operation. From digital plug and play systems to advanced optical DO sensors and a vast array of differential and analog measurement capabilities, we have the products to fit your water quality and chemical process applications.

- Wastewater Treatment
- Drinking Water
- Power
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