

Colorimetry, Turbidity and UV-Vis Spectrophotometry – The Optical Measurements

Colorimeters and Turbidity meters both employ optical measurements. Optical measurements use light to quantify the amount of a colored or cloudy sample. Colorimeters are used to measure the concentration of a sample component. Turbidity meters can determine how cloudy the sample is and report a number value for the turbidity.

Colorimetric measurements use a small light source to pass a narrow band of light straight through a reacted test sample in a vial. The light beam exiting the sample vial is collected in a detector at 180 degrees from the initial beam. The detector reading that was measured is converted to a concentration for that specific test. Some single parameter colorimeters have only one measurement performed. Multi-parameter meters require the user to select the appropriate method number to match the test and reagent type being used.

These tests allow you to expand your testing capabilities for species that are not detectable by pH, DO, Conductivity and Ion Selective Electrode (ISE) electrochemical methods. Colorimeters require the use of a reagent in most cases. The reagent will react with the targeted component of the sample. The user can then measure the reacted sample in their colorimeter to determine the concentration of the component in that sample. The sample result is compared to a programmed calibration curve in the meter of reacted, known standard values. The colorimeter measurement can be seen on the display.

Globally, there are many regulations that are in place to ensure our drinking water is safe to drink and our wastewater will not alter or destroy our local ecosystems and oceans. Regulations vary due to the sample components in the area. A disinfectant, used to purify water, is commonly tested by colorimetry. In groundwater that is the source of a drinking water supply, there could be underground iron deposits creating a tint of color to the water. The water may be checked for iron level and also the chemical form of that iron. Water components present that increase maintenance frequency may also be tested regularly to monitor and maximize time online.

Many test reagents are available for measuring parameters that are reported as required on regulatory compliance permits.

Turbidity is a measurement of “cloudiness” or particulates floating in the sample. The more particles present, the higher the sample’s turbidity. Low turbidity sample particles can often not be seen. An instrument is needed to quantify the turbidity present. Turbidity meters require standards to calibrate the meter periodically and to check the calibration by a read-back of the standards. Orion AQ4500 Method is approved for Drinking Water and Wastewater reporting and also satisfies the ISO 7027 measurement reporting with our ISO Nephelometric mode.

Visit our online library at www.thermoscientific.com/WAI-Library to review the colorimetry and turbidity approvals. You will find our newly approved Orion AQ4500 Drinking Water and Wastewater turbidity methods. Our ISO 7027 method being used around the world. We have posted many application notes and briefs to assist you with your testing.

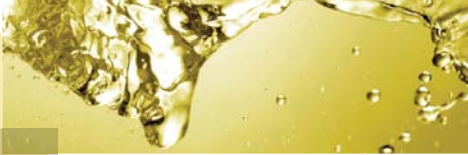


Colorimeters



Turbidimeters

Please visit www.thermoscientific.com/waterlibrary for more product information.



Accurate Results, Within Your Reach

We've got you covered

It's been said that anything worth doing is worth doing right. At Thermo Fisher Scientific we combine intelligent design with quality craftsmanship to give you the tools you need for effective water analysis, whether in the lab or in the field. In essence, we do our job right, so you can do the same.

Recognized worldwide, our water analysis instruments combine accuracy and precision with intuitive operation, dependability and ease of use. Our products are backed by substantial research and development, built with an unmatched standard of excellence.

Spectrophotometers – Lab Intelligence

A good lab depends on expert equipment.

Thermo Scientific™ Orion™ AquaMate™ Spectrophotometers are the ideal instrument for water and wastewater analysis laboratories, combining innovative technology, compact design and accurate results.

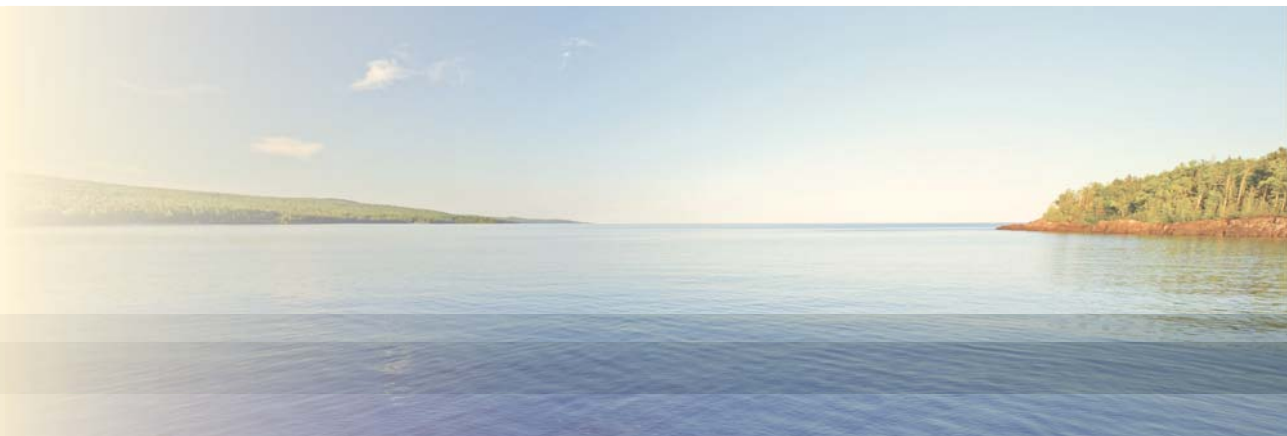
- Spectrophotometers that meet your requirements – choose the AquaMate 8000 UV-Vis or AquaMate 7000 Vis
- Simple and efficient sample analysis using over 260 preprogrammed methods for common reagent chemistries
- One-point calibration adjustment feature ensures the highest accuracy from preprogrammed methods
- User customizable methods for absorbance, % transmittance and concentration testing
- Performance verification tests ensure wavelength accuracy and instrument functionality

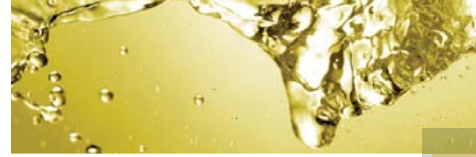
Colorimeters / Turbidity Meters – Fieldwork Essentials

Portable design with uncompromised performances.

Thermo Scientific Orion Colorimeters and Turbidity Meters are accurate, dependable and easy to use, with handheld portability, preprogrammed methods, optimum wavelengths, user-friendly displays, and easy calibration.

- Rugged, handheld portability and waterproof options for fieldwork convenience
- User-friendly interface for quick and easy results processing
- Compatibility with several tests and reagent types
- Approvals and regulatory requirements met in many industries





Orion AquaMate 7000 Vis Spectrophotometer

The cost-effective solution for accurate, visible-only measurements

The AquaMate 7000 Vis Spectrophotometer offers 325 to 1100 nm selectable wavelengths and 5 nm spectral bandwidth and is ideal for most routine concentration measurements. For its relatively small footprint and lightweight design, it boasts numerous features at a competitive price. The intuitive user interface and simple, single-beam optical geometry generate accurate results.



AquaMate 7000

Orion AquaMate 8000 UV-Vis Spectrophotometer

The ideal instrument for extensive, full wavelength measurement options

The AquaMate 8000 UV-Vis Spectrophotometer offers 190 to 1100 nm selectable wavelengths and 1.8 nm spectral bandwidth and delivers unsurpassed data quality throughout the entire UV to near-IR region of the spectrum. A dual-beam optical geometry and high-intensity, instant-on xenon lamp are utilized for accurate measurements and up to seven years of maintenance-free operation. Superior signal-to-noise performance and fast wavelength scanning technology allow high-quality spectral data to be acquired quickly and reliably.



AquaMate 8000

Thermo Scientific offers a full line of Orion Colorimetry and Turbidity Meters

Using optical measurement, Colorimeters measure the concentration of a sample component and Turbidity Meters determine how cloudy a sample is.

Regulations ensure our drinking water is safe and our wastewater will not alter or destroy local ecosystems and oceans. Disinfectants, used to purify water, are commonly tested by colorimetry. Groundwater that is the source of a drinking water supply may be checked for iron level and the chemical form of that iron. Water components that increase maintenance frequency may be tested regularly to monitor and maximize time online. Many test reagents are available for measuring parameters that are reported as required on regulatory compliance permits.

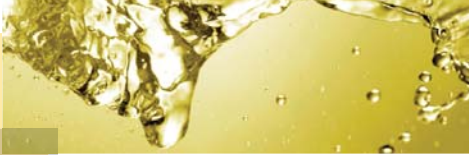


AQ3070 Meter

AQ3700 Meter

AQ4000 Meter





Thermo Scientific Orion AquaMate Spectrophotometers

AquaMate 7000 & 8000 Meters

Orion AquaMate Spectrophotometers include over 260 preprogrammed methods for easy and convenient measurements using Orion AQUAfast reagent chemistries or chemistries from other key reagent manufacturers. Methods are stored on the USB memory stick, so they can be added or removed from the instrument as needed. The 3-position holder allows flexibility in vial sizes with an adjustable holder for 13 to 25 mm round vials, a holder for 20 or 50 mm rectangular vials and a holder for 10 mm square vials. AquaMate Spectrophotometers also utilize performance verification tests to ensure wavelength accuracy and instrument functionality.

AquaMate 7000 Vis Spectrophotometer

- Selectable wavelengths in the visible range of 325 to 1100 nm
- Single-beam optics and Tungsten-halogen lamp
- 5.0 nm spectral bandwidth, ideal for most routine concentration measurements
- Simple operation, expanded functionality and great value
- 1 year warranty

AquaMate 8000 UV-Vis Spectrophotometer

- Selectable wavelengths in the UV and visible range of 190 to 1100 nm
- Dual-beam optics utilizing a Xenon Flash lamp for an average of five years of maintenance-free performance
- 1.8 nm spectral bandwidth for optimal resolution
- Enhanced wavelength scanning technology that acquires high-quality spectral data at speeds up to 4,200 nm per minute
- 1 year warranty

Depending on the needs of your lab, choose the AquaMate 7000 Vis Spectrophotometer for 325 to 1100 nm wavelengths or choose the AquaMate 8000 UV-Vis with full 190 to 1100 nm wavelengths for a greater range of measurement options.

Use your current chemistry reagents – no need to change. The AquaMate preprogrammed methods are compatible with many leading reagent manufacturers.





Specifications

Specifications		AquaMate 8000 UV-Vis Spectrophotometer	AquaMate 7000 Vis Spectrophotometer
Optical Design		Dual beam – internal reference detector	Single beam
Spectral Bandwidth		1.8 nm	5.0 nm
Light Source (Typical Lifetime)		Xenon flash lamp (5 years)	Tungsten-halogen lamp (1000 hours)
Detector		Dual silicon photodiodes	Silicon photodiode
Wavelength	Range	190 to 1100 nm	325 to 1100 nm
	Accuracy	±1.0 nm	±1.0 nm
	Repeatability	±0.5 nm	±0.5 nm
	Slew Speed	11,000 nm/min	11,000 nm/min
	Scanning Speed	10 to 4,200 nm/min	10 to 4,200 nm/min
	Data Interval	0.2, 0.5, 1.0, 2.0, 3.0, 5.0 nm	1.0, 2.0, 3.0, 5.0 nm
Photometric	Measurement Modes	Absorbance, % transmittance, concentration	Absorbance, % transmittance, concentration
	Range	-0.5 to 5.0 A ; -1.5 to 125 %T ; ±9999 C	-0.1 to 3.0 A ; -0.3 to 125 %T ; ±9999 C
	Linearity	Up to 3.5 A at 260 nm	Up to 3.0 A at 340 nm
	Accuracy	±0.005 A at 1.0 A, <0.00025 at 0.0 A	0.5 % or ±0.005 A, whichever is greater up to 2 A
	Noise	<0.00050 at 1.0 A, <0.00080 at 2.0 A RMS at 260 nm	<0.001 A at 0.0 A, <0.002 A at 2.0 A Peak-to peak at 340 nm
	Drift	<0.0005 A/hr	0.002 A/hr after warm-up
Stray Light		<0.08 %T at 220 nm and 340 nm, <0.1 %T at 340 nm and 400 nm, <1.0 %T at 198 nm	<0.08 %T at 220 nm and 340 nm, <0.1 %T at 340 nm and 400 nm, <1.0 %T at 198 nm
Display		Graphical with LCD backlight – 9.7 x 7.1 cm (3.8 x 2.8 in)	Graphical with LCD backlight – 9.7 x 7.1 cm (3.8 x 2.8 in)
Keypad		Sealed membrane with tactile response keys	Sealed membrane with tactile response keys
Connectivity		USB type A port for USB stick (front panel), USB type B port for computer (rear panel), USB type A port for printer (rear panel)	USB type A port for USB stick (front panel), USB type B port for computer (rear panel), USB type A port for printer (rear panel)
Dimensions		30 W x 40 D x 25 H cm (11.8 x 15.7 x 9.8 in)	30 W x 40 D x 25 H cm (11.8 x 15.7 x 9.8 in)
Weight		8.6 kg (19 lb.)	8.6 kg (19 lb.)
Power Requirements		100 to 240 V ; 50 to 60 Hz	100 to 240 V ; 50 to 60 Hz

Ordering Information

Cat. No.	Description
AQ8000	AquaMate 8000 UV-Vis Spectrophotometer, includes methods on USB memory stick, 6-position vial holder turret, 3-position vial holder turret, 1-position vial holder turret, user documentation, dust cover, USB cable, and 110 V, 220 V, 240 V power cords
AQ7000	AquaMate 7000 Vis Spectrophotometer, includes methods on USB memory stick, 3-position vial holder turret, user documentation, dust cover, USB cable, and 110 V, 220 V, 240 V power cords
AQ006C	AquaMate 6-position vial holder turret for six 10 mm square vials
AQ003C	AquaMate 3-position vial holder turret for one adjustable 13-25 mm round vial, one adjustable 20-50 mm rectangular vial and one 10 mm square vial
AQ001C	AquaMate 1-position vial holder turret for one 10 mm square vial
AQ0USB	AquaMate methods, USB memory stick
AQCHNV	AquaMate power cord, China, Australia, New Zealand plug
AQ240V	AquaMate power cord, 240 V UK, Singapore plug
AQ220V	AquaMate power cord, 220 V Euro plug
AQ110V	AquaMate power cord, 110 V US, Japan plug
AC2V24	24 mm round vials, 12 pack

Note: When ordering the AQ8000 or AQ7000 instruments, the AQCHNV power cord needs to be ordered separately.

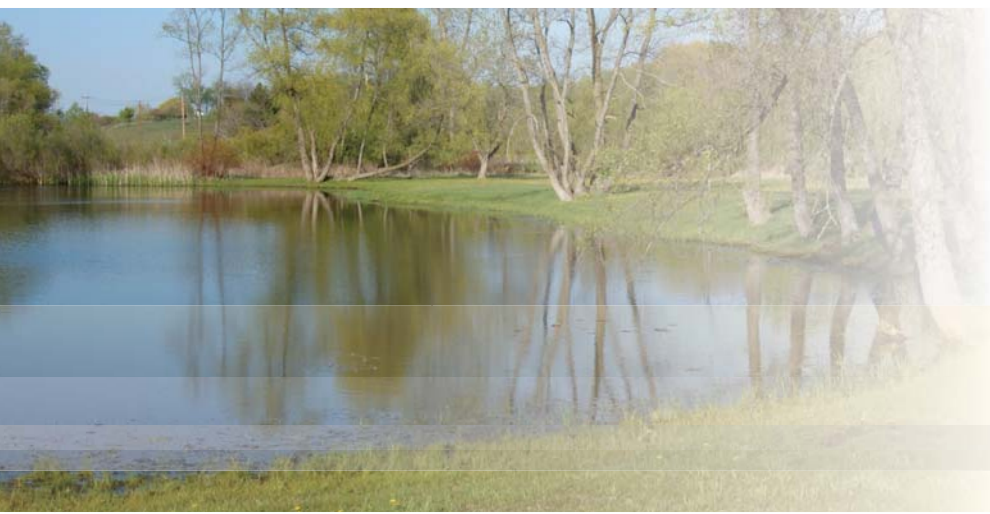
Thermo Scientific Orion Colorimetry and Turbidity Markets

You can find colorimetry and turbidity measurements in a wide variety of industries. The tests are quick and easy and often cost less than alternative methods. Thermo Scientific Orion colorimetry and turbidity products have approvals and meet the regulatory requirements in many industries. We also have several types of tests for common parameters to give you choices of reagent types, ranges and simplicity to fit your requirements. The reagent table on pages 124 and 125 highlights our EPA approved, accepted and equivalent methods.

Commonly Tested Parameters by Market

Agriculture	Beverage	Drinking Water	Environmental	Wastewater	Aquaculture	Boiler/Cooling Water	Chemical
Ammonia	Bromine	Aluminum	Ammonia	Aluminum	Ammonia	Aluminum	Aluminum
Chlorine	Chlorine	Ammonia	Bromine	Ammonia	Bromine	Ammonia	Ammonia
Iron	Chlorine Dioxide	Bromine	Chlorine	Bromine	Chlorine	Bromine	Copper
Nitrate	Copper	Chloride	COD	Chlorine	Copper	Chlorine	Iron
Nitrite	Fluoride	Chlorine	Copper	COD	Nitrate	Chlorine dioxide	Nitrate
Oxygen	Iron	Chlorine Dioxide	Iron	Copper	Nitrite	Copper	Nitrite
pH	Manganese	Copper	Nitrate	Iron	Oxygen	Hydrazine	pH
Phosphate	Nitrate	Fluoride	Nitrite	Manganese	Ozone	Iron	Phosphate
Silica	Oxygen	Iron	Ozone	Nitrate	pH	Nitrate	Silica
Sulfate	pH	Manganese	pH	Nitrite	Phosphate	Nitrite	Sulfate
Turbidity	Phosphate	Nitrate	Silica	Oxygen	Turbidity	Ozone	Sulfide
	Silica	Nitrite	Sulfate	Ozone		Oxygen	Zinc
	Turbidity	pH	Sulfide	pH		Phosphate	
		Phosphate	Zinc	Phosphate		pH	
		Ozone		Sulfate		Silica	
		Silica		Sulfide		Zinc	
		Sulfate		Zinc			
		Sulfide		Turbidity			
		Zinc					
		Turbidity					

Metal Plating	Mining	Pulp & Paper	Solid Waste/Sludge	Petroleum	Pharmaceutical/Biotech	Semi-conductor
Copper	Copper	Aluminum	Aluminum	Ammonia	Chlorine	Aluminum
Iron	Cyanide	Chlorine	Copper	Chlorine	Cyanide	Copper
pH	Iron	Chlorine dioxide	Nitrate	Iron	Ozone	Fluoride
Phosphate	pH	pH	Nitrite	Nitrate	pH	pH
	Phosphate	Phosphate	pH	pH	Silica	Silica
	Zinc	Silica	Phosphate	Sulfide		
		Zinc	Zinc			





Thermo Scientific Orion AQ3700 Colorimeter

Featuring digestion tests for nitrogen, phosphate and COD



The Orion AQ3700 is the newest addition to the colorimetry line. With over 70 pre-programmed method options, this IP67 waterproof portable meter offers liquid, powder and tablet tests for expanded ranges and test options. There are six wavelengths generated by the long life LEDs in the meter. This instrument has a graphical display that is easy to understand and can be used in English, Spanish, German, French, Italian, or Polish.

See pages 122-125 for additional AQ3700 reagents.

Specifications

Specifications	Description
Incident Light Source	6 light emitting diodes (LED)
Wavelengths	430, 530, 560, 580, 610, 660 nm
Photometric Precision	2 % full scale as measured with standard solutions
Photometric Resolution	±0.005 Abs
Software	
Test Methods	Preprogrammed with user prompts and feedback, efficient user's favorite list
Autoranging	Yes
Blank Capability	Per method
Test Reagent Formats	Powder, tablet, liquid, reagent reaction tubes, acid digestion tubes
Datalog Points	Up to 1000, time and date stamp
New Method Upload Capability	Yes, via internal RJ45 port
Meter Hardware	
Display	Backlit, graphic display
Inputs	12 button numeric keypad, plus 3 function keys
Sample Required	10 mL
Sample Cells Accepted	24 mm sample vials; 13 mm ampoules and 16 mm tubes with included adapters
Outputs	IRDA (adapter required)
Auto Shut Down	20 min after last key-press, wakes to last location
Power	4 AA batteries (>3000 tests)
Regulatory and Safety	CE, FCC part 15
Environmental Conditions	5 to 40 °C (30 to 90 % non-condensing at 30 °C)
Meter Waterproof Rating	IP67
Warranty	2 years

New Reagents for AQ3700

Cat. No.	New Test	Range, mg/L	Reagent Type
AC2002	Alkalinity-m/ Acid Demand pH 4.3	5 to 200/ 0.1-4 mmol/L	Tablet
AC3002P	Alkalinity-p	5 to 500	Tablet
AC4P27	Aluminum, LR	0.01 to 0.25	Tablet & liquid
ACR012	Ammonia, LR	0.02 to 2.5	Powder & reaction tube
ACR011	Ammonia, HR	1 to 50	Powder & reaction tube
AC3072	Chlorine total HR/ Sodium Hypochlorite	5 to 200/ 0.2 to 16 % NaOCl	Tablet
AC3032C	Hardness, Calcium	50 to 900	Tablet
AC3032C2	Hardness, Calcium 2 LR	0 to 500	Tablet
AC3032T	Hardness, total	2 to 50	Tablet
AC4P54	Manganese, LR	0.01 to 0.7	Powder & liquid
ACR007	Nitrate	1.0 to 30.0	Powder pack & reaction tube
AC4P46	Nitrite	0.01 to 0.3	Powder pack
ACD004	Nitrogen, total, LR	0.5 to 25	Powder pack & digestion tube
ACD007	Nitrogen, total, HR	5 to 150	Powder pack & digestion tube
ACR095	Phosphate, ortho	0.06 to 5	Powder pack & reaction tube
ACD095AH	Phosphate, acid hydrolyzable	0.02 to 1.6	Powder pack & digestion tube
ACD095	Phosphate, total	0.02 to 1.1	Powder pack & digestion tube
AC3001TB	pH	8.0 to 9.6	Tablet
AC3072	Sodium hypochlorite	0.2 to 16 % NaOCl	Tablet

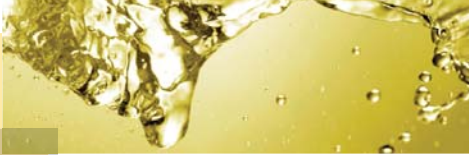
Ordering Information

Cat. No.	Description
AQ3700	Meter kit includes AQ3700 meter, 4 batteries, 4 vials (24 mm), 3 vials (16 mm), 1 adapter each for 16 mm and 13 mm vials, carrying case, user guide with test methods, tablet tampering stir rod and brush. Order reagents and IR adapter separately.

Accessories for AQ3700 Meter

Cat. No.	Description
AC2V16	Replacement 16 mm vials, package of 10
AC2V24	Replacement 24 mm vials, package of 12
AC37A16	Replacement 16 mm adapter for AQ3700
AC37A13	Replacement 13 mm adapter for AQ3700
AC3R0D	Stir rod, package of 10
AC3C8R	Cleaning brush, package of 5
AC3VSK	Meter verification check standards kit
AQ37IRIM	IR data transfer interface module

Many of our long-standing colorimetry tablet and powder reagents as well as COD tests are already programmed into the AQ3700. See pages 122-125 for additional test parameters, meter accessories, digestion supplies, and more reagent options.



Thermo Scientific Orion AQ4000 Colorimeter

The most advanced microprocessor-based LED colorimeter on the market today!

The AQ4000 colorimeter stores up to 189 pre-programmed methods and can record 100 data points in the field with a time and date stamp. Download later to a printer or computer in the lab.

The AQ4000 colorimeter takes all the guesswork out of sample preparation with the Auto-Test™ ampoules and the exclusive Auto-ID™ feature.

Quality of the measurement is assured since the ampoules are only opened when a measurement is about to be taken.

- **Auto-ID:** Automatically identifies the species to be measured, selects the method and the wavelength plus initiates the method – no buttons to push!
- **Auto-Test Ampoules:** Pre-measured liquid reagent ampoules are specially designed to work with the AQ4000

Selection of Display Units is Push-Button Easy

Choose from concentration, absorbance or percent transmittance. The AQ4000 accepts round vials with diameters of 13, 16 or 24 mm. Best of all, the AQ4000 carries a full two year warranty.

Use the AQ4000 with Our Tablets or Powders

- **Tablets:** Quick dissolve tablets that are easy to add to the sample. Tablets can be used with the AQUAfast II series and AQ4000 colorimeters.
- **Powders:** Pre-measured and ready-to-use packets. Just add the packet to the sample, allow it to dissolve and then take your measurement. Many reagents meet regulatory requirements.
- **COD Reagents:** Available in three measurement ranges – low, mid and high range.

Updating the AQ4000 with New Methods is Simple


The latest software updates are available at www.thermoscientific.com/water. A simple download procedure updates the colorimeter with the most current programs in a few quick, easy steps.

See pages 124 and 125 for reagent chemistries that you can use with the AQ4000 colorimeter.

AQ4000 Colorimeter and Accessories

Cat. No.	Description
AQ4000	Orion IV colorimeter only (order reagents separately)
AQ40FK	Replacement field case to carry AQ4000 meter, accessories and reagents
AQ4CBL	RS232 cable for data download and software updates
AQ4ZER	AQUAfast zero kit
AC2V16	16 mm vials, 10 pack
AC2V24	24 mm vials, 12 pack

AQII Series Accessories

Cat. No.	Description
AC2V16	16 mm replacement vials, 10 pack
AC2V24	24 mm replacement vials, 12 pack
AC2T24	24 mm replacement turbidity vials, 12 pack
AC2073	 Chlorine secondary reference standards kit for AQ2070



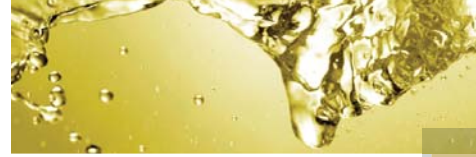
Signifies a hazardous solution.

See terms and conditions for important shipping information at www.thermoscientific.com/water

Easily create and store your own calibration curve for up to 10 new tests in the meter.



Versatile AQ4000 Meter



Thermo Scientific Orion AQ3070 Chlorine Meter

Measures free and total chlorine for EPA reporting – and more!



AQ3070 Meter



AQ3070 Meter Kit

- EPA-approved AC4P71 free chlorine and AC4P72 total chlorine methods for drinking water and wastewater
- Single meter programmed for free chlorine, total chlorine, pH, chlorine dioxide and cyanuric acid measurements
- Additional capability for liquid pH test, chlorine dioxide and cyanuric acid – no need to purchase separate meters for additional tests
- Chlorine dioxide and cyanuric acid tablets feature long shelf lives, so they are ready when you need them

Designed with the user in mind, these small rugged IP67 portable meters have a large easy-to-read display with a very simple user interface. The expanded range for free and total chlorine measurements gives you a real number if you are out of the EPA measurement range to quickly recover your process. The results are accurate and repeatable. You save time while measuring by not having to cover and uncover the vial for each measurement. The field case keeps the meter and test supplies always ready for testing.

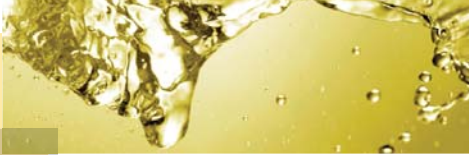
Visit www.thermoscientific.com/WAI-Library for our EPA letters and methods.

Specifications

Specifications	Description
Display	LCD
Keys	Power, mode, zero, read/enter
Sample Requirement	10 mL
Light Shield Cover Over Vial for Measuring	Not needed
Power with Auto Shutoff	4 x AAA, >3000 tests
Regulatory Approvals	CE, TUV for US and Canada, FCC part 15
Warranty	2 years
Operating Range	0 to 50 °C, 0 to 90 % relative humidity, non-condensing at 30 °C
Test Parameter Ranges	
Free Chlorine	0.02 to 4.0 mg/L; US EPA range 0.03 to 2.0 mg/L
Total Chlorine	0.02 to 4.0 mg/L; US EPA range 0.03 to 2.0 mg/L
Chlorine Dioxide	0 to 11.4 mg/L
pH	5.9 to 8.2 pH
Cyanuric Acid	5 to 90 mg/L

Ordering Information

Cat. No.	Description	Contents
AQ3070	Orion III chlorine meter kit	Meter, 6 sample vials, AC4P71 free chlorine, AC4P72 total chlorine, batteries, vial cleaning brush, tablet tamping stir rod, user guide, MSDSs, and carrying case
AC4P71	AQUAfast AC4P71 free chlorine powder packets	100 tests
AC4P72	AQUAfast AC4P72 total chlorine powder packets	100 tests
AC2099	Chlorine dioxide tablets	100 tests
AC3001	pH, 2 x 15 mL dropper bottles	60 tests
AC2098	Cyanuric acid, tablets	100 tests
AC3V25	Replacement 25 mm vials, pack of 3	3 vials
AC3ROD	Replacement tablet tamping stir rod	1 package of 10
AC3CBB	Replacement vial cleaning brush	1 package of 5



Thermo Scientific Orion AQ4500 Turbidity Meter

The AQ4500 features both White and Infrared light sources – so this is the only meter you need for all of your turbidity testing.

The AQ4500 turbidimeter has dual source LED that allows readings that comply with reporting requirements for both EPA and ISO 7027 methodologies.

- Nephelometric and ratiometric measurements with autoranging
- IR mode options for measurement of wines and colored samples
- Data log capacity of up to 100 data points
- Reading ranges vary from 0 to 4000 with appropriate units based on test selected
- Includes turbidity standards kit, rugged carrying case, and replacement vials
- The AQ4500 is truly IP67 waterproof to a depth of 3 meters

For drinking water, our Orion AQ4500 Method has been approved for regulatory reporting and is published in the US Federal Register.

For wastewater, our Orion AQ4500 Method has been approved for regulatory reporting and is published in the US Federal Register.

Methods are available at www.thermofisher.com/WAI-Library.

The IR based methods meet ISO 7027 requirements. Review the measurement information in the user guide to determine the method needed.

Specifications

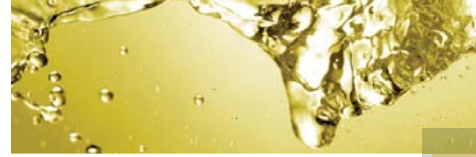
Specifications	Description
Light Source	White LED, IR LED
Temperature Effect	LED temperature compensated
Includes Measurement Modes	EPA 180.1, ISO nephelometric, ISO absorbance, IR ratiometric, % transmittance, EPA GLJ method 2, EBC (European Brewing Chemists), ASBC (American Society of Brewing Chemists)
Measurement Ranges	0 to 4000 NTU, EPA 0 to 2000 NTU, GLI range 0 to 40 NTU, ISO-7027 0 to 150 FAU, IR Ratio 0 to 4000 NTU, EBC 0 to 24.5, ASBC 0 to 236
Resolution	0.01 (0 to 9.99 NTU), 0.1 (10 to 99.9), 1 (100 to 1000)
Precision	±2 % of reading plus 0.01 NTU from 0 to 500 NTU, ±3 % of reading from 500 to 100 NTU, ±5 % of reading from 1000 to 2000 NTU
Calibration Standards	Provided primary SDVB standards
Sample Size Minimum	10 mL
User Interface	Automatic sample measurement for each measurement with simple user interface
RS232	Bidirectional
Datalog	100 points
Real Time Clock	Yes
Power	Long life – low power consumption – about 2500 hours with 4 alkaline AA batteries or about 10000 with lithium batteries
Waterproof Rating	IP67
Warranty	2 years
Regulatory and Safety	CE, FCC part 15
Operating Temperatures	(-40 °C to 60 °C), 90 % relative humidity at 30.0 °C max

Ordering Information

Cat. No.	Description
AQ4500	Orion AQ4500 turbidimeter and calibration kit. Kit includes meter, 4 primary standards, standard and sample vials, silicone oil and cloth in carrying case
AQ4CBL	RS232 cable for data download and software updates
AC45FZ	Formazin turbidity standard, 4000 NTU, 475 mL
AC45S1	Silicon oil and cloth kit for AQ4500
AC45ST	Primary turbidity calibration kit for AQ4500 meter only, replacement
AC2T24	24 mm replacement turbidity only vials, 12 pack



AQ4500 Kit



Thermo Scientific Orion AQ3010 Turbidity Meter



AQ3010 Meter Kit

- Ergonomic IP67 turbidity meter for lab or field use
- Uses Nephelometric principle with 90 ° detection
- In most locations a separate light cap or shield is not needed
- Meets ISO 7027 and offers consistent light source for greater accuracy
- Easy vial indexing with continuous measurement mode
- No mixing or diluting with polymer bead primary standards for faster calibration
- Three year warranty

The Orion AQ3010 Turbidity Meter makes it easy to determine the clarity of your sample with one keystroke and without an extra light shield cap in many environments. With autoranging from 0 - 1000 NTUs, this small waterproof portable meter is very easy to use, plus features a large easy-to-read LCD display. The meter is supplied with ready-to-use, highly stable EPA-approved and ISO accepted polymer bead primary standards. Calibration is easy with step-by-step prompts with the option to choose which points to calibrate. The standards can be used for a calibration check at any time, verifying that your readings are accurate.

The Orion AQ3010 meter comes with everything you need in a field case for easy storage and transport. This meter is covered by a 3 year warranty!

Make your job easier!

Visit our new applications webpage at <http://www.thermoscientific.com/waterapps> for regulatory links, methods, applications and technical information.

Specifications

Specifications	Description
Display	LCD
Keys	Power, cal, scroll up, scroll down, read/enter
Automatic Range Selections and Resolution	0.01 to 19.99 NTU with 0.01 NTU resolution
	20.0 to 99.9 NTU with 0.1 NTU resolution
	100-1000 NTU with 1 NTU resolution
Precision	±2 % of reading ±1 LSD for 0-500 NTU
	±3 % of reading ±1 LSD for 501-1000 NTU
Response Time	<6 seconds
Sample Requirement	10 mL
Included Calibration Standards	0.02, 20.0, 100, and 800 NTU
Sample Vials	25 mm diameter with indexing mark
Light Source	IR LED for ISO 7027 turbidity measurement
Power	4 x AAA >3000 tests (4 x AAA lithium >12000 tests)
Battery Conservation Feature	Auto shutoff after 20 minutes of inactivity
Ambient Operating Temperature	0 to 50 °C (0 to 90 % non-condensing relative humidity at 30 °C)
Self Diagnostics	Yes, with troubleshooting error codes
Waterproof Rating	IP67
Regulatory Approvals	CE, TUV 3-in-1 for CSA-US, FCC part 15
Warranty	3 year

Ordering Information

Cat. No.	Description	Contents
AQ3010	Orion turbidity meter kit	Meter, set of EPA-approved polymer-based primary turbidity standards, batteries, light shield cover, seven vials, lint-free cloth, silicone oil, MSDS and user guide
AC301S	Replacement set of EPA-approved and ISO accepted polymer-based primary turbidity standards	60 mL bottle of 0.02, 20.0, 100, and 800 NTU
AC3SIL	Replacement silicone oil and cloth	1 bottle of silicone oil and one cloth
AC3V25	Replacement 25 mm vials, pack of 3	3 empty 25 mm vials with caps
AC3CBR	Replacement vial cleaning brush	Brush, package of 5

Thermo Scientific Orion COD Test Systems

COD testing correlated to BOD readings can save time and money



The AQ4000 and AQ3700 colorimeters support additional tests, including chlorine, nitrite and ammonia (see pages 123-125).

- Ideal for environmental and wastewater monitoring with EPA accepted methods
- Three ranges of COD reagents
- COD reactor can digest up to 25 samples simultaneously in 2 hours or less and meet fast COD temperature requirements
- Works with the new AQ3700 multiparameter colorimeter or the AQ4000 advanced colorimeter

Just add the sample to the COD vial, digest sample in the reactor and read results with your Orion colorimeter.

The AQ4000 and AQ3700 Colorimeters Offer:

- Pre-programmed methods for water quality testing
- Multiple wavelength and more test options
- Datalogging and GLP features
- Bidirectional RS232 interface on AQ4000
- IR Interface on AQ3700 (IRDA required)
- Compatibility with 13, 16 and 24 mm diameter vials
- IP67 waterproof housing
- 2 year warranty

Please visit www.thermoscientific.com/water for more product, methods information and method approval letters from EPA.

Select One Meter

Cat. No.	Description
AQ4000	Orion AQ4000 advanced colorimeter with COD
AQ3700	Orion AQ3700 colorimeter with COD, total nitrogen and total phosphate

Order Digester

Cat. No.	Description
COD165	Orion thermoreactor for digestion methods to 165 °C

Select Your Test Reagents by Range and Quantity

Cat. No.	Range	No. of Vials	EPA Approved
CODL00	0 to 150 ppm	25	Yes
CODH00	0 to 1500 ppm	25	Yes
CODHPO	0 to 15000 ppm	25	No requirement

Select a Standard

Cat. No.	Description
CODS01	AQUAfast 1000 ppm COD standard, 475 mL
CODS10	AQUAfast 10000 ppm COD standard, 475 mL



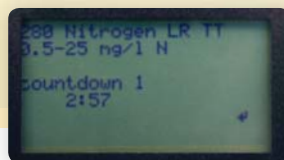
COD Reactor, Test Reagents and Standards with AQ4000 Meter



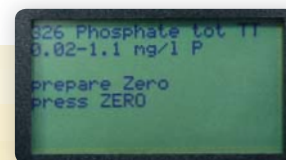
Thermo Scientific Orion Digestion Test Reagents



Orion AQ3700 Meter



Total Nitrogen LR Test



Total Phosphate Test

Tube Digestions for Nitrogen and Phosphate Nutrient Removal Process Monitoring

The benefit of efficient operation is important to all production facilities, no matter what they make. By optimizing the process in wastewater treatment, the dirty water can move to the next stage of the process at the perfect time – not prior to the being fully treated and not over-treated. Overtreatment wastes chemicals and slows down the processing. Undertreatment can cause problems if the discharge does not meet the permit levels. Typically total nitrogen and total phosphate and other digestions were very long reflux processes with expensive glassware. Now the results can be ready in an hour or so using persulfate digestion tube methods. This greatly improves the turnaround time for the results. These in process checks of the nutrient removal status can ensure you are on track for the final levels you need to attain or give you timely information to correct the process.

With the AQ3700 meter, total nitrogen and total phosphate tube digestion tests are now available. The kit includes the reagents and accessories for the test.

If you are already testing COD levels, you can quickly add these important tests and start reaping the benefits!

Overview of Nitrogen and Phosphorus Methods

- Persulfate digestion for nitrogen; persulfate/ascorbic acid digestion for phosphorus
- Nitrogen tests require two tubes – one for a blank and one for the test; phosphate test needs just one tube for the blank and test
- 100 °C digestion temperature for 30 minutes and let cool about 10 more minutes for additional reagent reaction times
- Orion COD 165 digester has the temperatures needed for nitrogen and phosphate tests, see page 122

Nitrogen

Cat. No.	Description	Quantity
ACD004	Total nitrogen LR reagents (0.5 to 25 mg/L)	50 tests
ACD007	Total nitrogen HR reagents (5 to 150 mg/L)	50 tests

Phosphate

Cat. No.	Description	Quantity
ACD095	Total phosphorous reagents (0.02 to 1.1 mg/L)	50 tests

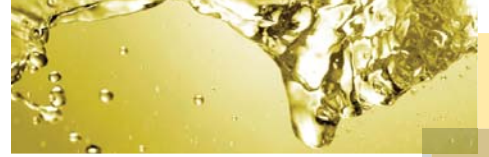
Thermo Scientific Orion AQUAfast Colorimeter Reagent Chemistries



Colour Codes

■ Tablet
 ■ Liquid
 ■ Powder
 ■ Auto-Test Ampoule

Parameter	Reagent Type	Catalog Number	Description	Range	Method	Number of Tests	Meter Models	EPA Approved Methods
Alkalinity-m	Tablet	AC2002	AQUAfast II alkalinity-m	5.0 - 200 mg/L	Acid/indicator	100	AQ4000, AQ3700, AQ2001	–
Aluminum	Auto-Test Ampoule	AC4027	AQUAfast IV aluminum	0.04 - 0.25 mg/L	Eriochrome cyanine R	30	AQ4000	WWV equivalent
	Tablet	AC2027	AQUAfast II aluminum	0.05 - 0.30 mg/L	Eriochrome cyanine R	50	AQ4000, AQ3700, AQ2005, AQ2020	WWV equivalent
Ammonia (Nitrogen)	Powder	AC4P12	AQUAfast ammonia-nitrogen, powder	0.1 - 0.50 mg/L	Salicylate	100	AQ4000, AQ3700	–
	Auto-Test Ampoule	AC4010	AQUAfast IV ammonia (ultra low range)	0.10 - 3.0 mg/L	Salicylate	30	AQ4000	–
	Auto-Test Ampoule	AC4012	AQUAfast IV ammonia (low range)	0.5 - 7.0 mg/L	Nesslerization	30	AQ4000	WWV equivalent
	Auto-Test Ampoule	AC4011	AQUAfast IV ammonia (high range)	1.0 - 14 mg/L	Nesslerization	30	AQ4000	WWV equivalent
	Tablet	AC2012	AQUAfast II ammonia, as nitrogen	0.05 - 1.0 mg/L; 0.5 - 10.0 mg/L	Indophenole/phenate	50	AQ4000, AQ3700, AQ2004	WWV equivalent
Bromine	Tablet	AC2035	AQUAfast II bromine	0.1 - 13.5 mg/L	DDPD	100	AQ3700, AQ2005	No requirement
Chloride	Auto-Test Ampoule	AC4017	AQUAfast IV chloride	2.0 - 40 mg/L	Mercuric nitrate	30	AQ4000	–
	Tablet	AC2017	AQUAfast II chloride	0.5 - 25 mg/L	Silver nitrate/turbidity	50	AQ4000, AQ3700, AQ2005	–
Chlorine Dioxide	Auto-Test Ampoule	AC4099	AQUAfast IV chlorine dioxide	0.80 - 12 mg/L	DPD	30	AQ4000	No requirement
	Tablet	AC2099	AQUAfast II chlorine dioxide	0.04 - 2.8 mg/L	DPD	100	AQ4000, AQ3070, AQ3700, AQ2020	No requirement
Chlorine	Powder	AC4P71	AQUAfast chlorine, free, DPD, powder packets, EPA-approved method	0.03 - 2.00 mg/L	DPD	100	AQ4000, AQ3070, AQ3700	DW
	Powder	AC4P71B	AQUAfast chlorine, free, powder packets bulk packaging, EPA-approved method	0.03 - 2.00 mg/L	DPD	1000	AQ4000, AQ3070, AQ3700	DW
	Tablet	AC2071	AQUAfast II chlorine, DPD, free only	0.05 - 6.0 mg/L	DPD	100	AQ4000, AQ2070, AQ3700	–
	Auto-Test Ampoule	AC4070	AQUAfast IV chlorine, free and total, EPA-approved method	0.05 - 6.0 mg/L	DPD	30	AQ4000	DW
	Tablet	AC2070	AQUAfast II chlorine, free and total	0.05 - 6.0 mg/L	DPD	50 each	AQ4000, AQ3700, AQ2070, AQ2020	–
	Powder	AC4P72	AQUAfast chlorine, total, DPD, powder packets, EPA-approved method	0.03 - 2.00 mg/L	DPD	100	AQ4000, AQ3070, AQ3700	DW & WWV
	Powder	AC4P72B	AQUAfast chlorine, total, powder packets bulk packaging, EPA-approved method	0.03 - 2.00 mg/L	DPD	1000	AQ4000, AQ3070, AQ3700	DW & WWV
	Tablet	AC2072	AQUAfast II chlorine, total, EPA-approved method	0.05 - 6.0 mg/L	DPD	50	AQ4000, AQ3700, AQ2070	DW & WWV
Copper	Powder	AC4P29	AQUAfast copper, bicinchoninate, powder	0.05 - 5.00 mg/L	Bicinchoninate	100	AQ4000, AQ3700	WWV equivalent
	Auto-Test Ampoule	AC4029	AQUAfast IV copper (soluble)	0.5 - 12 mg/L	Bathocuproine	30	AQ4000	WWV equivalent
	Tablet	AC2065	AQUAfast II zinc/copper	0.02 - 1.0 mg/L	Zincon	50	AQ4000, AQ3700, AQ2002	–
	Tablet	AC2029	AQUAfast II copper	0.05 - 5.0 mg/L	Biquinoline	50	AQ4000, AQ3700, AQ2005	–
Cyanide	Auto-Test Ampoule	AC4006	AQUAfast IV cyanide (free)	0.20 - 0.50 mg/L	Pyridine-barbituric acid	30	AQ4000, AQ3700	ETV verified, DW & WWV equivalent
Cyanuric Acid	Tablet	AC2098	AQUAfast II cyanuric acid	5 - 90 mg/L	Melamine	100	AQ3070, AQ3700, AQ2003	–
Fluoride	Liquid	AC2009	AQUAfast II fluoride SPADNS kit, EPA-approved method	0.05 - 2.0 mg/L	SPADNS	50	AQ4000, AQ3700, AQ2009, AQ2020	DW & WWV
Hydrazine	Tablet	AC2030	AQUAfast II hydrazine kit	0.05 - 0.50 mg/L	Dimethylamino-benzaldehyde	100	AQ4000, AQ3700, AQ2003	No requirement



Parameter	Reagent Type	Catalog Number	Description	Range	Method	Number of Tests	Meter Models	EPA Approved Methods
Iron	Powder	AC4P79	AQUAfast iron total TPTZ, powder	0 - 1.80 mg/L	TPTZ	100	AQ4000, AQ3700	–
	Powder	AC4P78	AQUAfast iron total ferro, powder	0 - 3.00 mg/L	1,10 Phenanthroline	100	AQ4000, AQ3700	WW equivalent
	Auto-Test Ampoule	AC4078	AQUAfast IV iron 1 (total & soluble)	0.45 - 7.0 mg/L	1,10 Phenanthroline	30	AQ4000	WW equivalent
	Tablet	AC2078	AQUAfast II iron	0.02 - 1.0 mg/L; 0.2 - 10 mg/L	TPTZ	100	AQ4000, AQ3700, AQ2005	–
Manganese	Powder	AC4P55	AQUAfast manganese HR, powder	0.2 - 20.0 mg/L	Periodate oxidation	100	AQ4000, AQ3700	WW equivalent
	Auto-Test Ampoule	AC4055	AQUAfast IV manganese	1.0 - 30 mg/L	Periodate oxidation	30	AQ4000, AQ3700	WW equivalent
	Tablet	AC2055	AQUAfast II manganese	0.05 - 4 mg/L	Formaloxime	50	AQ4000, AQ3700, AQ2003	–
Molybdate	Powder	AC4P42	AQUAfast molybdenum, molybdate, HR, powder	0 - 40.0 mg/L	Mercaptoacetic acid	100	AQ4000, AQ3700	–
Nitrate	Auto-Test Ampoule	AC4007	AQUAfast IV nitrate 3 (as NO ₃)	5.0 - 50 mg/L	Cadmium reduction	30	AQ4000	DW & WW equivalent
	Auto-Test Ampoule	AC4005	AQUAfast IV nitrate 2 (as N)	0.40 - 3.0 mg/L	Cadmium reduction	30	AQ4000	DW & WW equivalent
	Auto-Test Ampoul	AC4004	AQUAfast IV nitrate (as N) LR	0.20 - 1.5 mg/L	Cadmium reduction	30	AQ4000	DW & WW equivalent
	Tablet	AC2007	AQUAfast II nitrate	1 - 40 mg/L	Zinc reduction	50	AQ4000, AQ3700, AQ2007	–
Nitrite	Powder	AC4P46	AQUAfast nitrite LR, powder	0 - 0.350 mg/L	Diazotization (Azo)	100	AQ4000, AQ3700	DW & WW equivalent
	Auto-Test Ampoule	AC4046	AQUAfast IV nitrite	0.080 - 0.80 mg/L	Diazotization (Azo)	30	AQ4000	DW & WW equivalent
	Tablet	AC2046	AQUAfast II nitrite, EPA-approved method	0.05 - 0.50 mg/L	Diazotization (Azo)	100	AQ4000, AQ3700, AQ2046	DW & WW
Oxygen	Auto-Test Ampoule	AC4008	AQUAfast IV oxygen	2.0 - 15 mg/L	Azo dye	30	AQ4000	–
Ozone	Auto-Test Ampoule	AC4048	AQUAfast IV ozone	0.20 - 2.5 mg/L	DDPD	30	AQ4000	–
	Tablet	AC2048	AQUAfast II ozone	0.05 - 0.5 mg/L	DPD/glycine	100	AQ3700, AQ2001	–
pH	Liquid	AC3001	AQUAfast II pH, dropper bottle	5.9 - 8.2	Phenol red	30	AQ3070, AQ3700	–
	Tablet	AC2001	AQUAfast II pH	6.5 - 8.4	Phenol red	100	AQ4000, AQ3700, AQ2001	–
Phosphate	Powder	AC4P95	AQUAfast phosphorus 3, powder	0.07 - 2.5 mg/L	Phosphomolybdic blue/ascorbic acid	100	AQ4000, AQ3700	DW & WW equivalent
	Auto-Test Ampoule	AC4095	AQUAfast IV phosphate 2-LR	0.75 - 8.0 mg/L	Stannous chloride	30	AQ4000, AQ3700	–
	Tablet	AC2096	AQUAfast II phosphorus HR	10 - 100 mg/L	Phosphomolybdic blue/ascorbic acid	50	AQ4000, AQ3700, AQ2003	DW & WW equivalent
	Tablet	AC2095	AQUAfast II phosphorus LR, EPA approval method	0.05 - 4.0 mg/L	Vanado molybdate	50	AQ4000, AQ3700, AQ2004	DW & WW
Silica	Powder	AC4P60	AQUAfast silica HR, powder packets	1.0 - 75.0 mg/L	Silicomolybdate	100	AQ4000, AQ3700	DW & WW equivalent
	Auto-Test Ampoule	AC4060	AQUAfast IV silica	1.0 - 14 mg/L	Heteropoly blue	30	AQ4000	DW equivalent
	Powder	AC2061	AQUAfast II silica phosphate removal	NA	NA	100	AQ4000, AQ3700, AQ2002	–
	Tablet	AC2060	AQUAfast II silica	0.05 - 4.0 mg/L	Silicomolybdate	50	AQ4000, AQ3700, AQ2002	DW & WW equivalent
Sulfate	Powder	AC4P82	AQUAfast sulfate 4, powder packets	2 - 70 mg/L	Barium sulfate/ turbidity	100	AQ4000, AQ3700	DW & WW equivalent
	Auto-Test Ampoule	AC4082	AQUAfast IV sulfate	8.0 - 100 mg/L	Barium sulfate/ turbidity	30	AQ4000	DW & WW equivalent
	Tablet	AC2082	AQUAfast II sulfate	5 - 200 mg/L	Barium sulfate/ turbidity	100	AQ4000, AQ3700, AQ2005	DW & WW equivalent
Sulfide	Auto-Test Ampoule	AC4016	AQUAfast IV sulfide (soluble)	0.3 - 3.0 mg/L	Methylene blue	30	AQ4000	WW equivalent
	Tablet	AC2016	AQUAfast II sulfide	0.05 - 0.50 mg/L	Methylene blue	50	AQ4000, AQ3700, AQ2004	WW equivalent
Zinc	Auto-Test Ampoule	AC4065	AQUAfast IV zinc	0.30 - 3.0 mg/L	Zincon	30	AQ4000	WW equivalent
	Tablet	AC2065	AQUAfast IV zinc/copper	0.02 - 1.0 mg/L	Zincon	50	AQ4000, AQ3700, AQ2002	WW equivalent