

# Instruction Sheet

## *Thermo Scientific Orion AQUAfast AC4027 Aluminum Ampoules*

This instruction sheet provides step-by-step instructions for using the Thermo Scientific™ Orion™ AQUAfast™ AC4027 Aluminum Auto-Test Ampoules with the Orion AQUAfast AQ4000 colorimeter. The Orion AQUAfast Auto-Test ampoules are designed for use with the Orion AQUAfast AQ4000 colorimeter. Auto-Test ampoules contain a pre-measured amount of liquid reagent and easily fill with the correct volume of sample for simplified reagent and sample mixing. Each ampoule contains an Auto-ID barcode that is read by the AQ4000 colorimeter and used to automatically identify the test parameter and initiate the test. For complete setup and operation instructions for the colorimeter, consult the Orion AQUAfast AQ4000 colorimeter user guide.

<b>Product: AC4027</b>
<b>Revision Date: April 6, 2015</b>
256436-001 Revision C

## Product Information

AC4027 Aluminum for Drinking Water Auto-Test Ampoules

0.04 – 0.25 mg/L

Program ID# 033

## Test Method Overview

The Aluminum Auto-Test test method is based on the reaction between aluminum and Eriochrome Cyanine R, which forms a red dye-lake.<sup>1,2</sup> The amount of color present is directly proportional to the amount of aluminum present in the sample.

1. APHA Standard Methods, 20<sup>th</sup> ed., ECR Method, Method 3500-Al B (1998)
2. Rapid Modified Eriochrome Cyanine R Method for Determination of Aluminum in Water, Kenneth E. Shull and Gene R. Guthan, page 1456 – 1468, J. AWWA, Nov 1967

## Safety Information

Read the Safety Data Sheet (SDS) before performing this test. Wear safety glasses and gloves.

## Sample Collection/Pretreatment

Collect samples in clean plastic containers. Preserve samples by adjusting the pH to 2 or less with nitric acid. Before analysis, adjust the sample pH to between 2.9 and 4.7 using nitric acid or potassium hydroxide solution.

## Neutralizer Solution Preparation

Fill the neutralizer solution bottle to the neck with distilled water. Shake the bottle until the dry chemical dissolves completely, then re-dilute to the neck and shake the bottle again to mix well. If the solution will be stored at room temperature, label the bottle with a 6 week expiration date. If it will be stored in the refrigerator, label it with a 3 month expiration date.

## Test Procedure

**Note:** Zero the Orion AQUAfast AQ4000 colorimeter using a sealed zero vial from the Orion AQUAfast Zero Auto-Test Kit, Cat. No. AQ4ZER, before generating the reagent blank.

**Note:** A fresh reagent blank ampoule must be created and used to set the reagent blank value in the instrument for each series of tests performed.

## Reagent Blank Procedure

Careful preparation and analysis of the reagent blank is important for accurate aluminum results. If the reagent blank absorbance does not fall within the range of 0.190 to 0.245 (in step 13 below), prepare and analyze another reagent blank, following the instructions closely.

1. Add 10 drops of the Neutralizer solution to the sample cup. *See Figure 1.*
2. Fill the sample cup up to the 20 mL mark with deionized water. *See Figure 2.*
3. Wait 1 minute.
4. Add 1 mL of the Activator solution using the supplied 1 mL syringe. *See Figure 3.* Stir briefly with the tip of the ampoule.
5. Place the Auto-Test ampoule in the sample cup. Snap the tip by pressing the ampoule against the side of the cup. The ampoule will fill leaving a small bubble to facilitate mixing. *See Figure 4.*
6. Mix the contents of the ampoule by inverting it several times, allowing the bubble to travel from end to end each time. Wipe all liquid from the exterior of the ampoule.
7. Wait 7 minute for color development.
8. Press the prgm key. Enter the ID code 33 and press the yes key.
9. Press the setup key and then press the ▲ or ▼key until "BLANK" is displayed.
10. Press the yes key and "SET BLNK?" will be displayed. Press the yes key and "SAMPLE?" will be displayed.
11. Insert the ampoule into the AQ4000 colorimeter. Align the ▼ on the Auto-Test ampoule with the ◆ on the adapter.
12. Immediately cover the ampoule with the colorimeter's light cover.
13. Press the yes key and allow instrument to read the reagent blank. The blank value will be displayed and the instrument will proceed to the next function and display "VERIFY".
14. Press the meas key to proceed to the measure mode.

**Note:** Since blank values are stored in the memory, only a single blank measurement is required for each box or lot of Auto-Test reagents. A new blank should be set with each new box or lot of Auto-Test reagent.

## Sample Measurement Procedure

1. Add 10 drops of the Neutralizer solution to the sample cup. *See Figure 1.*
2. Fill the sample cup up to the 20 mL mark with the sample. *See Figure 2.*
3. Wait 1 minute.
4. Add 1 mL of the Activator solution using the supplied 1 mL syringe. *See Figure 3.* Stir briefly with the tip of a new Auto-Test ampoule.
5. Place the Auto-Test ampoule in the sample cup. Snap the tip by pressing the ampoule against the side of the cup. The ampoule will fill leaving a small bubble to facilitate mixing. *See Figure 4.*
6. Mix the contents of the ampoule by inverting it several times, allowing the bubble to travel from end to end each time. Wipe all liquid from the exterior of the ampoule.
7. Insert the ampoule into the AQ4000 colorimeter. Align the ▼ on the Auto-Test ampoule with the ◆ on the adapter to obtain a continuous beeping and view \*\*\*\*\* across the display. If \*\*\*\*\* and beeping are not observed, rotate the ampoule to the right or left to initiate the measurement.
8. Immediately cover the ampoule with the colorimeter's light cover.
9. The AQ4000 will begin a 7 minute countdown. After the countdown is completed, the AQ4000 will automatically proceed to the measure mode.
10. Record the concentration reading from the AQ4000 display as mg/L or ppm Al or log the measurement into the data logger by pressing the log key.

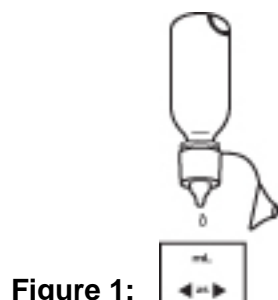


Figure 1:

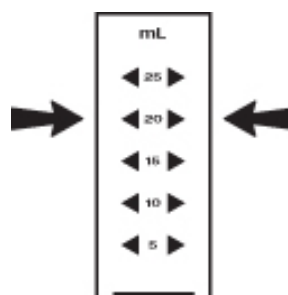


Figure 2:

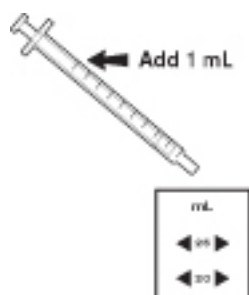


Figure 3:

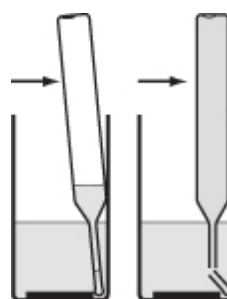


Figure 4:

## Interferences

Negative errors are caused by both fluoride and polyphosphates. When the fluoride concentration is constant, the percentage error decreases with increasing amounts of aluminum. If the fluoride concentration is known, the effect of fluoride can be determined from the fluoride correction table provided. Polyphosphate interference may be removed by a pre-digestion of the sample as outlined in the Standard Methods reference.<sup>1</sup>

## Correction of Fluoride Interference

Read the aluminum concentration from the AQ4000 colorimeter. Find that value in the column on the left. Read across the chart to the column that matches the fluoride concentration of the sample. The value in the box (where the AQ4000 reading intersects the fluoride concentration) is the actual aluminum concentration (mg/L) of the sample.

Fluoride Adjustment Chart for AQ4000 Colorimeter

		mg/L Fluoride (F) Concentration																			
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.0	
mg/L Aluminum (Al) Concentration – AQ4000 Reading	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	0.010	0.011	0.013	0.014	0.016	0.017	0.020	0.024	0.027	0.031	0.034	0.038	0.042	0.045	0.048	0.050	0.050	0.050	0.050	0.050	
	0.020	0.022	0.025	0.028	0.031	0.034	0.037	0.040	0.044	0.047	0.050	0.055	0.060	0.065	0.070	0.075	0.075	0.075	0.075	0.075	
	0.030	0.033	0.038	0.042	0.046	0.050	0.053	0.056	0.060	0.063	0.067	0.075	0.083	0.090	0.098	0.100	0.100	0.100	0.100	0.100	
	0.040	0.044	0.049	0.053	0.057	0.063	0.067	0.071	0.076	0.080	0.084	0.092	0.100	0.108	0.117	0.125	0.130	0.140	0.155	0.150	
	0.050	0.056	0.060	0.065	0.070	0.075	0.080	0.085	0.090	0.095	0.100	0.110	0.120	0.130	0.140	0.150	0.160	0.165	0.170	0.175	
	0.060	0.066	0.070	0.079	0.084	0.088	0.095	0.100	0.105	0.110	0.117	0.127	0.137	0.147	0.157	0.167	0.176	0.175	0.194	0.200	
	0.070	0.077	0.083	0.089	0.095	0.100	0.110	0.115	0.120	0.125	0.134	0.143	0.153	0.163	0.173	0.184	0.193	0.185	0.209	0.217	
	0.080	0.088	0.096	0.102	0.110	0.117	0.125	0.130	0.135	0.140	0.150	0.160	0.170	0.180	0.190	0.200	0.209	0.220	0.230	0.234	
	0.090	0.099	0.108	0.117	0.126	0.134	0.140	0.145	0.150	0.155	0.163	0.171	0.181	0.192	0.203	0.212	0.224	0.232	0.240	0.250	
	0.100	0.110	0.120	0.130	0.140	0.150	0.155	0.160	0.165	0.170	0.175	0.183	0.193	0.204	0.214	0.225	0.237	0.240	0.250	0.250	
	0.110	0.120	0.130	0.140	0.150	0.160	0.166	0.171	0.176	0.182	0.188	0.193	0.204	0.215	0.226	0.237	0.250	0.250			
	0.120	0.130	0.140	0.150	0.160	0.170	0.176	0.182	0.187	0.195	0.200	0.204	0.215	0.227	0.238	0.250					
	0.130	0.140	0.150	0.160	0.170	0.180	0.187	0.193	0.198	0.207	0.213	0.216	0.226	0.238	0.250						
	0.140	0.150	0.160	0.170	0.180	0.190	0.198	0.204	0.211	0.219	0.225	0.227	0.237	0.250							
	0.150	0.160	0.170	0.180	0.190	0.200	0.208	0.217	0.225	0.232	0.239	0.238	0.250								
	0.160	0.170	0.180	0.190	0.200	0.210	0.217	0.236	0.233	0.241	0.250	0.25									
	0.170	0.180	0.190	0.200	0.210	0.220	0.228	0.243	0.241	0.250											
	0.180	0.190	0.200	0.210	0.220	0.230	0.237	0.250	0.250												
	0.190	0.200	0.210	0.220	0.230	0.240	0.246	0.250													
0.200	0.210	0.220	0.230	0.240	0.250	0.250															
0.210	0.220	0.230	0.240	0.250																	
0.220	0.230	0.240	0.250																		
0.230	0.240	0.250																			
0.240	0.250																				
0.250																					

## Ordering Information

Cat. No.	Description
AC4027	Orion AQUAfast Aluminum Auto-Test Kit, 30 Ampoules
AC4010	Orion AQUAfast Ammonia as N Ultra Low Range Auto-Test Kit, 30 Ampoules
AC4070	Orion AQUAfast Chlorine (Free & Total) Auto-Test Kit, 30 Ampoules
AC4078	Orion AQUAfast Iron (Total & Soluble) Auto-Test Kit, 30 Ampoules
AC4082	Orion AQUAfast Sulfate Auto-Test Kit, 30 Ampoules
AC4016	Orion AQUAfast Sulfide (Soluble) Auto-Test Kit, 30 Ampoules
AQ4ZER	Orion AQUAfast Zero Vial Auto-Test Kit
AQ4CBL	Orion AQUAfast RS232 Cable for AQ4000 Colorimeter
AQ4000	Orion AQUAfast AQ4000 Colorimeter, Includes 4 AA Batteries, 16 mm Vial, Zero Vial Auto-Test Kit, 16 mm Vial Adapter, 13 mm Vial Adapter, Field Case, User Guide, Tablet Tampering Stir Rod, Vial Cleaning Brush

For a complete listing of all available Thermo Scientific Orion AQUAfast reagents, colorimeters and accessories, please visit [www.thermoscientific.com/water](http://www.thermoscientific.com/water).

## Contact Information

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For any questions or if you require assistance, contact our Technical Support Specialists:

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Outside the United States, call +1-978-232-6000

For additional product information, contact your local authorized dealer, local Thermo Scientific Orion technical sales representative or contact us using the Water and Lab Products (WLP) contact information below.

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