

# Low Level Verification Kit for Thermo Scientific Orion 1811EL Sodium Monitor

## Assembly

1. Wrap 1/8" MNPT end of elbow fitting with 2 inches of Teflon tape supplied in kit.
2. Screw elbow into grey PVC reducing adapter.
3. Place 1 O-ring on 1/4" x 28 end of PVC adapter with elbow.
4. Push 3 inches of black 1/4" poly tubing into elbow fitting and hand-tighten securely.
5. Push other end of tubing into base of tee fitting and tighten.
6. Place each 1/4" knurled PVC adapter into nuts on side and top of tee fitting and tighten.
7. Place second O-ring on male end of micro-valve and screw valve into adapter on side of tee fitting. Make sure that valve knob is turned 1/4 turn to the left (off position) so that black dot is on left side of the valve.

## Installation

1. Shut off power and sample flow to monitor.
2. Remove electrodes and thermistor from electrode holder and carefully let them hang by their cables.
3. Remove reagent bottle and store in a safe area such as under a fume hood.
4. Remove ground cable from base of electrode holder.
5. Disconnect restrictor tube from flow meter by loosening 5/8" nut and pulling grey adapter fitting upward. Remove clip holding tube to back panel.
6. Disconnect air pump by pulling tubing off connectors on left side of pump.
7. Remove electrode chamber by loosening the two mounting screws on the left side.
8. Carefully unscrew restrictor tube from flowcell. Be sure small O-ring is not misplaced.
9. Screw assembled kit into the flowcell until its O-ring makes contact with surface. Continue turning kit clockwise until it is in a vertical, upright position.
10. Reinstall flowcell, electrodes, and thermistor. Rotate kit's tee fitting so micro-valve inlet is on left side of flowcell.
11. Connect restrictor tube between installed kit and flow meter.

12. Reconnect ground wire and air pump.
13. Reinstall reagent.
14. Turn on power and sample flow to monitor. Let monitor run 30 minutes or until meter reading stabilizes.

## **Use**

1. Locate dynamic calibrator (Cat. No. 15DC15) and syringe kit (Cat. No. 180096). Use 20 cc syringe supplied in low level verification kit for smooth response.
2. Prepare a 100 ppb sodium standard by serial dilution of sodium standard (Cat. No. 941107).
3. Make sure sample bypass is off, then measure flow rate at drain and adjust to 40 mL/min if required. For best accuracy, determine flow rate by accurately weighing sample discharge.
4. Note background sodium reading and be sure it is stable.
5. Set up calibrator on stand near monitor.
6. Connect luer lock, coupling, and calibration tubing from syringe kit with 20 cc syringe.
7. Fill syringe with sodium standard solution and expel any air bubbles.
8. Mount syringe in center groove of calibration pump and secure with clamp.
9. Move drive carriage until it contacts with syringe plunger.
10. Plug in dynamic calibrator.
11. Turn flow rate to read 500. Turn range switch to  $\times/1$  position. Allow line to expel air and then turn range switch to off. Connect calibration tubing to inlet of micro-valve on left side of flowcell.
12. Turn thumbwheel on micro-valve on quarter turn to the right, aligning the dot on the valve with the direction of flow.
13. Turn pump range switch to  $\times/100$  and wait at least 10 minutes until reading stabilizes.
14. Note analyzer reading. It should be approximately 0.5 ppb higher than background value noted in step 4, provided monitor is in calibration. Exact additions can be determined by use of the equation provided with the attached test results.
15. The percent flow can be varied between 25.0% to 100.0% to produce standard additions between 0.25 and 0 ppb without changing standard in syringe. Wait 5 to 10 minutes after adjustment to be sure reading is stable.

This kit can be used in a similar manner on any 1800 series analyzer. Contact our Technical Support Department at 1-800-225-1480 if there are any questions.

## Performance Test Result

Calibration Values:  $E_0 = 47.3$ , Slope = 60.1  
Measured Background Concentration = 0.07 ppb  
Reagent used was Ethylamine.

The testing was performed by injecting a known concentration standard into the sample flow, with a syringe pump.

The “Expected value” was calculated using the following equation.

$$\frac{(Q_s + C_s) + (Q_a + C_a)}{Q_s + Q_a} = C_m$$

Where

$Q_s$	=	Sample Flow Rate (38.31 mL/min)
$C_s$	=	Sample Background Concentration (0.07 ppb)
$Q_a$	=	Injected Standard Flow Rate
$C_a$	=	Injected Standard Concentration
$C_m$	=	Concentration Measured by 1811EL

Expected Value (ppb)	Measured Value (ppb)	Absolute Error	Percent Error
0.33	0.31	- 0.02	- 6.06
0.59	0.6	0.01	1.69
1.1	1.13	0.03	2.73
2.12	2.03	- 0.09	- 4.25
8.27	8.17	- 0.1	- 1.21
41	41.2	0.2	0.49
81.8	84.2	2.4	2.93
204	209	5	2.45
502	490	- 12	- 2.39
978	966	- 12	- 1.23

Mean Error = - 0.48

Std. Dev. of % Error = 2.94

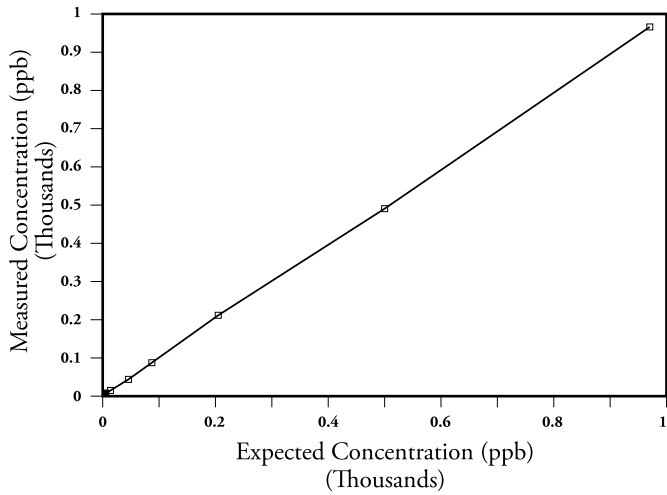
The correlation coefficient of the Measured Value vs. Expected Value = 0.9999476

Thermo Scientific Orion 1811EL Accuracy Specification (with DKA) = 10% or 0.05 ppb whichever is greater.

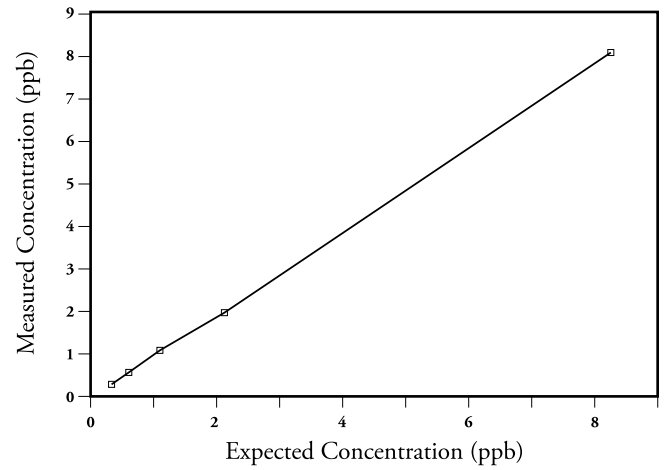
The performance test results are well within specification over the complete range of the instrument.

# Thermo Scientific Orion 1811EL Performance Test

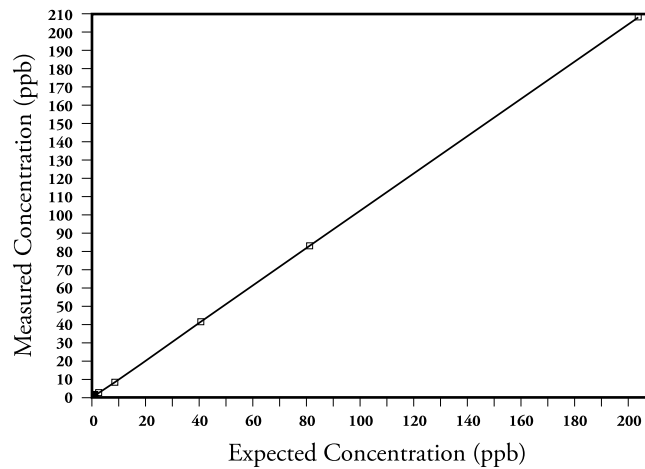
Ethylamine Reagent



Ethylamine Reagent



Ethylamine Reagent



©2008 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific Inc. and its subsidiaries.



**Environmental Instruments**  
Water Analysis Instruments

**North America**  
166 Cummings Center  
Beverly, MA 01915 USA  
Toll Free: 1-800-225-1480  
Tel: 1-978-232-6000  
Dom. Fax: 1-978-232-6015  
Int'l Fax: 978-232-6031

**Europe**  
Denmark House, Angel Drove  
Ely, Cambridgeshire  
England, CB7 4ET  
Tel: 44-1353-666111  
Fax: 44-1353-666001

**Asia Pacific**  
Blk 55, Ayer Rajah Crescent  
#04-16/24, Singapore 139949  
Tel: 65-6778-6876  
Fax: 65-6773-0836

[www.thermo.com/water](http://www.thermo.com/water)

