

DOCUMENT TITLE: **Cal/PM TE0084040 MSV Leak Test System**

DOCUMENT TYPE: ☒ Calibration ☒ Preventive Maintenance

EQUIPMENT NAME: **METERING SYRINGE VALVE LEAK TEST SYSTEM**

EQUIPMENT NUMBER: **TE0084040**

AUTHOR(S): **TYLER MODELSKI**

DATE: **March 29, 2018**

REVISED BY: **N/A**

DATE: **N/A**

EQUIPMENT REQUIRED

Quantity	Part Number	Description
1	LM02-AAD-00-0-15D	Calibrated Bronkhorst Flow Meter - Liqui-Flow Mini LM02

REFERENCE DOCUMENTATION

Document Number	Description
730001799	Operating Procedure, Calibration and PM
730000295MP	Quality System Document Control
735004416	Test Spec and Procedure, MSV Leak Test

DEFINITIONS AND ABBREVIATIONS

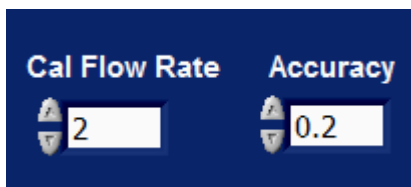
Term	Definition/Abbreviation
Calibration	A process to ensure that equipment is capable of producing accurate results. This includes verifying measurements and/or making adjustment(s) to ensure measurement accuracy.
PM	Preventive Maintenance: The servicing, for the purpose of maintaining equipment in satisfactory working order, by performing systematic inspection, detection, and correction of potential failures. PM activities may include tests, measurements, and parts replacement.
VDC	Volts Direct Current
BSM	Binary Solvent Manager
GUI	Graphical User Interface
μL/min	Microliters Per Minute
psi	Pounds Per Square Inch

PROCEDURE

1. Bronkhorst Flow Meter Calibration

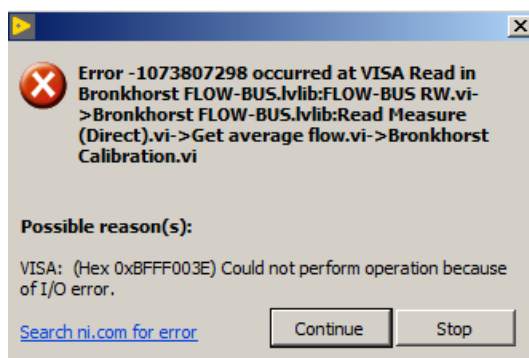
1.1. Obtain a calibrated Bronkhorst LIQUI-FLOW Mini.

1.2. Launch the TE0084040 Bronkhorst Calibration Utility from the test computer desktop. Set the **Cal Flow Rate to 2** and the **Accuracy to 0.2**.



1.3. Click **START CALIBRATION** and follow the on screen instructions.

1.4. During the calibration, the test program will prompt the operator to replace the Bronkhorst with a calibrated Bronkhorst and vice versa. When the swaps are performed, the program will display the following error:



This error is expected and the Bronkhorst should continue to be installed. Once the Bronkhorst is installed, click **Continue** until the test program resumes.

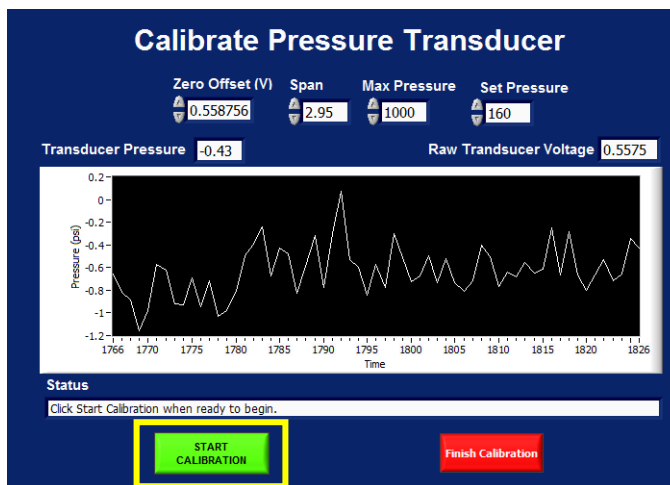
1.5. Record the calibration check results in the Calibration / Preventative Maintenance record.



1.6. If the calibration check fails, replace the Bronkhorst with a calibrated LIQUI-FLOW Mini and send the current Bronkhorst out for calibration.

2. Pressure Transducer Calibration

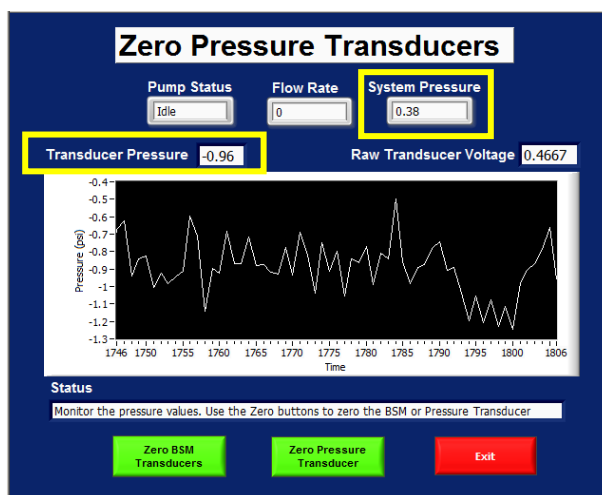
- 2.1. Launch the TE0084040 Pressure Transducer Calibration Utility from the test computer desktop and follow the on screen instructions.



- 2.2. When ready to begin, click **START CALIBRATION**

- 2.3. Monitor the Transducer Pressure and BSM System Pressure until the readings indicate the system is in a zero pressure state.

NOTE: The valves in the test system have been set to relieve all pressure. The pressure in the fluidics system should be hovering close to 0 psi during this monitoring stage.



- 2.4. When ready to zero the transducers:

2.4.1. Click the **Zero BSM Transducer** button once.

2.4.2. Click the **Zero Pressure Transducer** button once. This will set the zero offset voltage of the transducer to the current Raw Transducer Voltage.

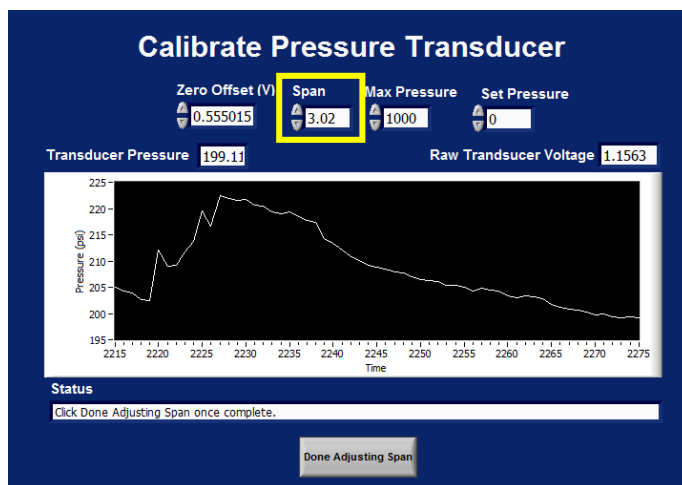
- 2.5. Obtain a pressure source with a calibrated pressure meter.

- 2.6. When prompted, remove the side panel of the tester, and connect the output of the pressure

source to the pressure transducer.

2.7. Set the pressure source to 210 psi.

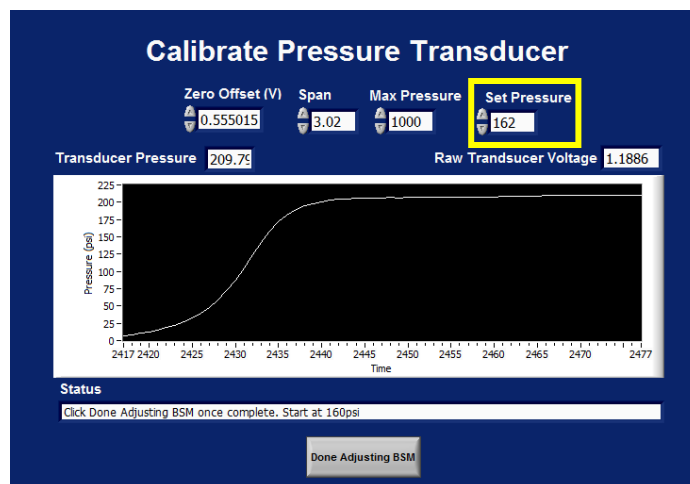
2.8. Monitor the **Transducer Pressure**. Use the **Span** control to adjust the **Transducer Pressure** to approximately +/- 1psi of the calibrated pressure gauge.



2.9. Once the pressure has been adjusted, click **Done Adjusting Span**.

2.10. Remove the pressure source and reconnect the transducer to the system fluidics.

2.11. Adjust the **Set Pressure** control until the **Transducer Pressure** displays 210 +/- 1psi
 NOTE: Start by setting pressure to 160psi and adjust from that set point. The pressure will change when the value is changed.



2.12. Once the pressure has been adjusted, click **Done Adjusting BSM**.

2.13. Click **Finish Calibration** to close the pressure transducer calibration utility.

3. Computer Maintenance

- 3.1. Maintain Test Computer per 735003678, Generic PC Maintenance Procedure.

4. Test Box – Cleaning

- 4.1. General Cleaning, inside and out.
- 4.2. Check inside and around tester enclosure for loose hardware.
- 4.3. Check inside and around tester enclosure for loose tools.
- 4.4. Check inside and around tester enclosure for loose or out-of-place items.

5. Test Box – Fluidics

- 5.1. Inspect all PEEK tubing and fittings for wear/damage. Replace as needed.
- 5.2. Inspect both VICI 4 Port Single Steam Valves for wear/damage. Replace as needed.

6. MSV Test Fixture 999045028

- 6.1. Inspect the tip of the lever. Verify that the lever attaches securely to the valve shaft. Replace if needed.
- 6.2. Verify that the lever rotates smoothly while connected to the valve shaft. Replace if needed.

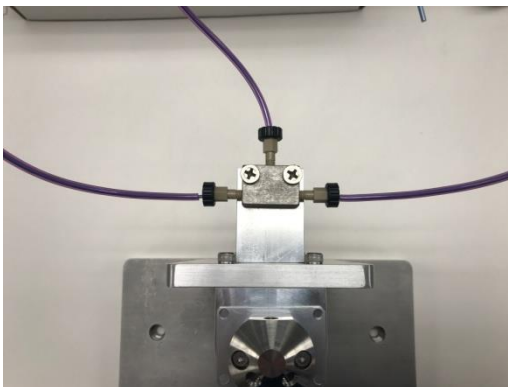
7. Micro BSM

- 7.1. Inspect fittings for wear/damage. Replace as needed.
- 7.2. Inspect tubing for wear/damage. Replace as needed.

8. System Verification

8.1. Setup the system per Appendix A.

8.2. Connect the system fluidics to the 3-way connector.



8.3. Toggle the **Self Test Mode** button on and then click **START TEST**. Verify that all port to port leak rates are less than 0.2 $\mu\text{L}/\text{min}$ and that the test pressure is ± 3 psi of 210 psi.

NOTE: The record can be found in SigmaSure under the part number "MSV_SELF_TEST" and serial number "SELF_TEST".

Test Controls

START TEST

STOP TEST

PRIME SYSTEM

BSM INTERFACE

ZERO FLOW METER

PRESSURE TRANSDUCERS

Self Test Mode

UUT Results

Serial Number	Start Time	End Time
self_test	10:38:40.781 AM 4/19/2018	10:41:45.679 AM 4/19/2018

Port 2 to 3 Status	Leak Rate ($\mu\text{L}/\text{min}$)	Pass/Fail
Test Complete	0.072	●

Port 1 to 3 Status	Leak Rate ($\mu\text{L}/\text{min}$)	Pass/Fail
Test Complete	0.035	●

Port 1 to 2 Status	Leak Rate ($\mu\text{L}/\text{min}$)	Pass/Fail
Test Complete	-0.002	●

WATERS CORPORATION

Metering Syringe Valve Leak Test System

CALIBRATION and PREVENTIVE MAINTENANCE RECORD

Date:	Performed By:	
Equipment I.D.	Location:	
Due Date:	Interval (Months):	Next Due Date:

Test Equipment Used	Serial Number/Identification Number	Calibration/PM Date
Calibrated Bronkhorst Flow Meter		
Calibrated Pressure Gauge		

Section 1: Bronkhorst Calibration	RESULT	RESULT
Flow Rate Difference USL = 0.20 µL/min LSL = -0.20 µL/min	Flow Rate Difference: _____ µL/min	PASS ☐ FAIL ☐ SEE NOTE ☐

Section 2: Pressure Transducer Calibration	
Perform the Pressure Transducer Calibration.	PERFORMED ☐ SEE NOTE ☐

Section 3: Computer Maintenance	
Maintain Test Computer per 735003678, Generic PC Maintenance Procedure.	PERFORMED ☐ SEE NOTE ☐

Section 4: Test Box – Cleaning	
General Cleaning, inside and out.	PERFORMED ☐ SEE NOTE ☐
Check inside and around tester enclosure for loose hardware.	PERFORMED ☐ SEE NOTE ☐
Check inside and around tester enclosure for loose tools.	PERFORMED ☐ SEE NOTE ☐
Check inside and around tester enclosure for loose or out-of-place items.	PERFORMED ☐ SEE NOTE ☐

Section 5: Test Box – Fluidics	
Inspect all PEEK tubing and fittings for wear/damage. Replace as needed.	PERFORMED ☐ SEE NOTE ☐
Inspect both VICI 4 Port Single Steam Valves for wear/damage. Replace as needed.	PERFORMED ☐ SEE NOTE ☐

Section 6: MSV Test Fixture 999045028

Inspect the tip of the lever. Verify that the lever attaches securely to the valve shaft. Replace if needed.

PASS ☐ FAIL ☐ SEE NOTE ☐

Verify that the lever rotates smoothly while connected to the valve shaft. Replace if needed.

PASS ☐ FAIL ☐ SEE NOTE ☐

Section 7: Micro BSM

Inspect fittings for wear/damage. Replace as needed.

PERFORMED ☐ SEE NOTE ☐

Inspect tubing for wear/damage. Replace as needed.

PERFORMED ☐ SEE NOTE ☐

Section 8: System Verification

RESULT

RESULT

Step 8.2: Port 2 to 3 Self Test

Leak Rate <= 0.20 µL/min

Pressure = 210 psi +/- 3 psi

Leak Rate: _____ µL/min

Pressure: _____ psi

PASS ☐ FAIL ☐ SEE NOTE ☐

Step 8.2: Port 1 to 3 Self Test

Leak Rate <= 0.20 µL/min

Pressure = 210 psi +/- 3 psi

Leak Rate: _____ µL/min

Pressure: _____ psi

PASS ☐ FAIL ☐ SEE NOTE ☐

Step 8.2: Port 1 to 2 Self Test

Leak Rate <= 0.20 µL/min

Pressure = 210 psi +/- 3 psi

Leak Rate: _____ µL/min

Pressure: _____ psi

PASS ☐ FAIL ☐ SEE NOTE ☐

NOTES