Mass Flowmeter Calibration Certificate

Model 4043 (a) Revision D (c)
Serial Number 40430230014 (b)

Flowmeter Calibration Verification

Calibration Date Fri 23-Aug-2002 11:19 (d)
Verification Date Fri 23-Aug-2002 11:29 (e)
Temperature 23.6°C (f)
Pressure 14.28 psia (g)

Air - As Left (h)
Tolerance: 1.75% reading or 0.050 SLPM (i)

Actual (SLPM)	Measured (SLPM)	Difference (%)	Tolerance (%)
(j) 0.520	(k) 0.517	(l) -0.6	(m) -6
1.613	1.603	-0.6	-19
3.561	3.542	-0.5	-31
7.947	7.922	-0.3	-19
14.97	14.99	0.1	5
24.45	24.30	-0.6	-34
41.39	41.32	-0.2	-9
71.51	71.19	-0.5	-26
110.1	110.4	0.3	16
147.6	147.8	0.1	7
182.4	183.3	0.5	28

Oxygen - As Left (h)
Tolerance: 1.75% reading or 0.050 SLPM (i)

Actual (SLPM)	Measured (SLPM)	Difference (%)	Tolerance (%)
(j) 0.560	(k) 0.545	(l) -2.6	(m) -30
1.583	1.573	-0.6	-19
3.566	3.558	-0.2	-12
8.014	7.987	-0.3	-20
14.97	14.93	-0.3	-16
24.46	24.33	-0.5	-29
41.41	41.24	-0.4	-23
71.46	71.02	-0.6	-35
110.0	110.2	0.2	11
147.5	147.5	-0.0	-2
182.4	183.3	0.5	29

This flowmeter has been calibrated on the TSI Flowmeter Calibration Facility (TSI 9120254) using the procedures outlined in TSI 9010471. The calibration of the Flowmeter Calibration Facility maintains NIST traceability in accordance with TSI 9120254.

TSI Standard Conditions: 70°F (21.11°C) and 14.7 psia (n)

Calibration Standard:	FLOWCAL1	(o)
Std. Last Verified:	29-Jun-2010	(p)
Std. Next Verify Due:	27-Sep-2010	(q)

Verified By: _____

Shipping Address: TSI Inc., 500 Cardigan Rd, Shoreview, MN 55126 USA (r)

Printed: Monday 27-Sep-2010 08:35 (s)

(a) Model Number

The model number of the unit under test.

(b) Serial Number

The serial number of the unit under test.

(c) Revision

The hardware revision level of the unit under test.

(d) Calibration Date

The date that the unit under test was last calibrated.

(e) Verification Date

The date the verification data printed on certificate was taken.

(f) Temperature

The temperature of the gas used for the test.

(g) Pressure

The testing ambient pressure.

(h) Gas

The gas for the table of the verification data listed below.

(i) Tolerance

This is the required tolerance for passing this test.
For As-Found verifications, the tolerance is the same as the specification of the unit under test. For As-Left verifications, the tolerance allowed is tighter than the specification of the meter.
For example "A tolerance of 2% of reading or 0.050 SLPM" is 2% of the flow rate or 0.05 standard L/min, whichever is greater. This means for flow rates above 2.5 standard L/min the tolerance is 2% of the flow reading and below 2.5 standard L/min the tolerance is 0.05 standard L/min.

(j) Actual

This column is the actual flow rate indicated by the flow reference in standard L/min.

(k) Measured (SLPM)

This column is the flow rate measured by the unit under test in standard L/min.

(l) Difference (%)

This column is the percent difference between the unit under test and the reference. Difference =100% x {Measured-Actual}/ Actual.

(m) Tolerance (%)

This column is the percent of the tolerance for the difference when compared to the tolerance required to pass the test. The important thing to know is that if the magnitude of this number is less than 100% the meter passed the test at that flowrate.

Percent of Tolerance = 100% x {Difference/Tolerance}. See (j) and (i) for Difference and Tolerance descriptions.

For example, if the reference reads 10.00 standard L/min, the unit under test reads 9.90 standard L/min, and the tolerance is 2%, then the
Percent of Tolerance = 100% x (9.90-10.00)/(2%x 10.00) = 100% x {-0.1/0.2} = -50%.

Note that using the numbers from the certificate columns (k) and (l) will not result in the same value shown in column (m). This is due to the fact that the values for (k) and (l) on the certificate are rounded from the actual numbers used in the calculation of (m), which go out several decimal places.

(n) Standard Conditions

The condition TSI uses for defining standard conditions of temperature and pressure. For an explanation of standard flow rate see the applications note Standard Flow Rate vs. Volumetric Flow Rate.

(o) Calibration Standard

The TSI Inc. flow reference standard used for the testing.

(p) Std. Last Verified

The date of the last verification performed on the TSI flow reference standard.

(q) Std. Next Verify Due

The date that the TSI flow reference standard is due for the next verification.

(r) Shipping address

The TSI Inc. shipping address.

(s) Print Date

The Date that the Certificate was printed.