



500 Cardigan Road  
Shoreview, MN 55126-3996  
USA  
EIN 41-0843524

# Service Report For RMA 30029919

**Date Received:** 30 Oct 2019

**Date Completed:** 08 Nov 2019

**Sold-To Customer:** 5401866  
NESCAUM  
89 South St  
Boston MA 02111-2674  
USA

**Ship-To Customer:** 5401866  
NESCAUM  
89 South St  
Boston MA 02111-2674  
USA

*10/29/19  
From Clear Stak  
Returned to ClearStak  
12/1/19*

**Customer PO:** CC-George Allen  
**Service Performed:** CL-4140 Calibration of Flowmeter 4140  
**Model Serviced:** 4140 Flowmeter, 20 L/min, Air,O2,N2, 1/4 inch  
**Serial Number:** 41401737007

**CUSTOMER RETURN REASON:**

Return reason not specified

**CUSTOMER RETURN REASON CONFIRMED:** YES

**AS FOUND RESULT:** FAIL

**FINDINGS:**

Unit failed as found tests, please see certificate for details. Light debris found on sensor.

**RESOLUTION:**

The following action items were taken to ensure proper operation:  
Instrument was cleaned, calibrated and a complete operational checkout was performed.

## **TSI QUALITY COMMITMENT**

**TSI VISION**

Creating a better world by helping protect people, products and the environment, and by optimizing research and industrial processes.

**TSI MISSION**

TSI provides trusted measurement, application guidance, and data analytics solutions that enable our customers to make informed decisions.

**OUR QUALITY POLICY**

The employees of TSI are committed to meet and, where possible, exceed our customer's requirements for application guidance, precision measurement solutions and data management through the continual improvement of our products and processes.

Thank you for the opportunity to service your instrument.



# Mass Flowmeter Calibration Certificate

Model: 4140  
 Serial Number: 41401737007  
 As Found date: 07-Nov-2019

Rev: F

Summary Status	
<input checked="" type="checkbox"/> As-Found	<input type="checkbox"/> In Tolerance
<input type="checkbox"/> As-Left	<input checked="" type="checkbox"/> Out of Tolerance

Environmental Conditions	
Pressure:	99.9 KPa
Temperature:	21.2°C

## Air Flow

Tolerance:  $\pm(2.00\%$  of reading or 0.005 SLPW<sup>m</sup>)

Reference Measured (SLPM)	Reference Measured (SLPM)	Allowable Range Min	Allowable Range Max
0.050	0.051	0.045	0.055
0.158	0.160	0.153	0.163
0.284	0.288	0.278	0.290
0.404	0.410	0.396	0.412
1.011	1.030	0.990	1.031
2.003	2.034	1.963	2.044
3.670	3.735	3.596	3.743
7.459	7.581	7.309	7.608
15.03	15.25	14.73	15.33
20.09	20.40	19.69	20.49

## Oxygen Flow

Tolerance:  $\pm(2.00\%$  of reading or 0.005 SLPW<sup>m</sup>)

Reference Measured (SLPM)	Reference Measured (SLPM)	Allowable Range Min	Allowable Range Max
0.046	0.048	0.041	0.051
0.149	0.151	0.144	0.154
0.284	0.289	0.279	0.290
0.453	0.460	0.443	0.462
0.971	0.993	0.952	0.990
2.016	2.049	1.976	2.057
3.722	3.776	3.648	3.797
7.473	7.604	7.323	7.622
14.95	15.18	14.65	15.25
20.03	20.38	19.63	20.43

## Temperature

Tolerance:  $\pm 1.000$  °C

Reference Measured (°C)	Reference Measured (°C)	Allowable Range Min	Allowable Range Max
20.98	21.31	19.98	21.98

## Pressure

Tolerance:  $\pm 0.145$  psia

Reference Measured (psia)	Reference Measured (psia)	Allowable Range Min	Allowable Range Max
14.49	14.47	14.34	14.63
21.77	21.75	21.62	21.91

Internal Calibration Reference(s)		
Measurement Type	Reference (FC5)	Due for Calibration
Flow	E005067	31-Jan-2020
Pressure	E005068	31-Jan-2020
Temperature	E005069	31-Jan-2020

TSI Std Conditions: 70 °F (21.1 °C) and 14.7 psia

TSI Inc.  
 500 Cardigan Rd  
 Shoreview, MN 55126 USA

Printed 07-Nov-2019 18:27, Ver 3.5.4.2 Page 1 of 1

Verified by:

\*Tolerance specified: whichever is greater

TSI does hereby certify that this flowmeter has been calibrated using TSI procedure 10000021269. The calibration of the reference standards maintain national laboratory traceability to National Institute of Standards & Technology (NIST).



# Mass Flowmeter Calibration Certificate

Model: 4140

Serial Number: 41401737007

Verification date: 07-Nov-2019

Rev: F

Summary Status	
<input type="checkbox"/> As-Found	<input checked="" type="checkbox"/> In Tolerance
<input checked="" type="checkbox"/> As-Left	<input type="checkbox"/> Out of Tolerance

Environmental Conditions	
Pressure:	99.8 kPa
Temperature:	20.8°C

## Air Flow

Tolerance:  $\pm(1.75\%$  of reading or 0.005 SLPM\*)

Reference Measured (SLPM)	Reference Measured (SLPM)	Allowable Range Min	Allowable Range Max
0.051	0.051	0.046	0.056
0.159	0.158	0.154	0.164
0.290	0.291	0.285	0.295
0.407	0.408	0.400	0.414
1.006	1.006	0.988	1.023
2.006	1.998	1.971	2.041
3.764	3.768	3.698	3.829
7.524	7.533	7.393	7.656
15.00	15.00	14.73	15.26
20.03	20.05	19.67	20.38

## Oxygen Flow

Tolerance:  $\pm(1.75\%$  of reading or 0.005 SLPM\*)

Reference Measured (SLPM)	Reference Measured (SLPM)	Allowable Range Min	Allowable Range Max
0.048	0.046	0.043	0.053
0.150	0.150	0.145	0.155
0.292	0.292	0.286	0.297
0.458	0.456	0.450	0.466
1.030	1.033	1.012	1.048
1.976	1.976	1.942	2.011
3.715	3.710	3.650	3.780
7.508	7.518	7.377	7.640
15.01	14.99	14.75	15.27
20.03	20.05	19.68	20.38

## Temperature

Tolerance:  $\pm 1.000$  °C

Reference Measured (°C)	Reference Measured (°C)	Allowable Range Min	Allowable Range Max
20.79	20.90	19.79	21.79

## Pressure

Tolerance:  $\pm 0.110$  psia

Reference Measured (psia)	Reference Measured (psia)	Allowable Range Min	Allowable Range Max
14.48	14.48	14.37	14.59
21.86	21.87	21.75	21.97

Internal Calibration Reference(s)		
Measurement Type	Reference (FC6)	Due for Calibration
Flow	E005055	31-Dec-2019
Pressure	E005056	31-Dec-2019
Temperature	E005057	31-Dec-2019

TSI Std Conditions: 70 °F (21.1 °C) and 14.7 psia

**TSI Inc.**  
**500 Cardigan Rd**  
**Shoreview, MN 55126 USA**

Printed 07-Nov-2019 21:10, Ver 3.5.4.2 Page 1 of 1

Verified by:

\*Tolerance specified, whichever is greater

TSI does hereby certify that this flowmeter has been calibrated using TSI procedure 10000021269. The calibration of the reference standards maintain national laboratory traceability to National Institute of Standards & Technology (NIST).