



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

Service Report For Request 300247378

Date Received: 23 Jan 2020

Date Completed: 18 Feb 2020

Sold-To Customer: 5401866

George Allen
NESCAUM
89 South St Ste 602
Boston MA 02111-2674
USA

Ship-To Customer: 5662140

Kelli Obrien
ClearStak
99 Canal St
Putnam CT 06260
USA

Customer PO: CC-George A. 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:

reading 5 to 10% low, erratic.

CUSTOMER RETURN REASON CONFIRMED: YES

AS FOUND RESULT: PASS

FINDINGS:

Sensor and thermistor mount was cracked.

RESOLUTION:

The following action items were taken to ensure proper operation:

Sensor and thermistor were replaced. 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: 04-Feb-2020

Rev: F

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

Environmental Conditions	
Pressure: 99.0 kPa	
Temperature: 20.9°C	

Air Flow

Tolerance: $\pm 2.00\%$ of reading or 0.005 SLPM¹⁾

Reference Measured (SLPM)	Reference Measured (SLPM)	Allowable Range Min	Allowable Range Max
0.051	0.050	0.046	0.056
0.160	0.158	0.155	0.165
0.293	0.290	0.287	0.299
0.411	0.407	0.403	0.419
1.000	0.989	0.980	1.020
2.006	1.979	1.966	2.046
3.765	3.725	3.690	3.840
7.526	7.488	7.375	7.677
15.07	14.91	14.77	15.37
19.97	19.73	19.57	20.37

Oxygen Flow

Tolerance: $\pm 2.00\%$ of reading or 0.005 SLPM¹⁾

Reference Measured (SLPM)	Reference Measured (SLPM)	Allowable Range Min	Allowable Range Max
0.049	0.047	0.044	0.054
0.152	0.149	0.147	0.157
0.291	0.288	0.285	0.297
0.457	0.452	0.448	0.466
1.029	1.023	1.008	1.050
1.975	1.956	1.936	2.014
3.779	3.734	3.703	3.855
7.536	7.491	7.385	7.687
14.98	14.82	14.68	15.28
20.00	19.77	19.60	20.40

Temperature

Tolerance: ± 1.000 °C

Reference Measured (°C)	Reference Measured (°C)	Allowable Range Min	Allowable Range Max
20.68	21.19	19.68	21.68

Pressure

Tolerance: ± 0.145 psia

Reference Measured (psia)	Reference Measured (psia)	Allowable Range Min	Allowable Range Max
14.37	14.35	14.22	14.51
21.78	21.77	21.64	21.93

Internal Calibration Reference(s)		
Measurement Type	Reference (FCI)	Due for Calibration
Flow	E005055	28-Feb-2020
Pressure	E005056	28-Feb-2020
Temperature	E005057	28-Feb-2020

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

Verified by:

TSI Inc.
500 Cardigan Rd
Shoreview, MN 55126 USA

¹⁾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: 17-Feb-2020

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:	97.9 kPa
Temperature:	21.4°C

Air Flow

Tolerance: ±(1.75% of reading or 0.005 SLPM*)

Reference Measured (SLPM)	Measured (SLPM)	Allowable Range	
		Min	Max
0.050	0.050	0.045	0.055
0.158	0.157	0.153	0.163
0.286	0.286	0.281	0.291
0.407	0.405	0.400	0.414
1.000	0.996	0.983	1.018
1.989	1.981	1.954	2.024
3.692	3.706	3.628	3.757
7.458	7.464	7.328	7.589
14.96	14.88	14.70	15.22
20.00	20.01	19.65	20.35

Oxygen Flow

Tolerance: ±(1.75% of reading or 0.005 SLPM*)

Reference Measured (SLPM)	Measured (SLPM)	Allowable Range	
		Min	Max
0.046	0.048	0.041	0.051
0.149	0.148	0.144	0.154
0.286	0.283	0.281	0.291
0.455	0.452	0.447	0.463
0.976	0.972	0.959	0.993
2.019	2.016	1.983	2.054
3.727	3.728	3.662	3.793
7.457	7.461	7.327	7.588
14.96	14.87	14.70	15.23
19.97	19.97	19.62	20.32

Temperature

Tolerance: ±1.000 °C

Reference Measured (°C)	Measured (°C)	Allowable Range	
		Min	Max
21.40	21.25	20.40	22.40

Pressure

Tolerance: ±0.110 psia

Reference Measured (psia)	Measured (psia)	Allowable Range	
		Min	Max
14.20	14.20	14.09	14.31
21.52	21.53	21.41	21.63

Internal Calibration Reference(s)		
Measurement Type	Reference (FC5)	Due for Calibration
Flow	E005067	30-Apr-2020
Pressure	E005068	30-Apr-2020
Temperature	E005069	30-Apr-2020

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

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 500 Cardigan Rd
 Shoreview, MN 55126 USA

Verified by:

*Tolerance specified, whichever is greater

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