Furness Controls
PRESSURE | FLOW | LEAK DETECTION

# Certificate of Calibration

## Certificate N° CL18308

Issued by: Furness Controls Limited

Date of Issue: 22 February 2023

| | | |
|---|---|---|
| Customer | : | Sarlin Oy AB, Kaivokselantie 3-5 |
| | : | PL 750/00101 Helsinki, 01610 Vantaa, Finland |
| Via | : | N/A |
| Calibrated at | : | Furness Controls Limited. Bexhill. UK |
| Reference No | : | 97721 |
| Customer Order No | : | PO35034 |
| Date Calibrated | : | 22 February 2023 |
| Instrument | : | FCO510 Micromanometer |
| Ranges | : | ± 200.00 Pa, ± 2000.0 Pa |
| Manufacturer | : | Furness Controls Limited |
| Serial No | : | 9805145 |
| Transducer No | : | Not Known |
| Firmware Version | : | x510A03a -1.280 |

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Beeching Road
Bexhill-on-Sea
East Sussex
TN39 3LG, UK
Tel : +44 (0) 1424 819980
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The results shown in this calibration certificate relate specifically to the items calibrated, as identified above.

This certificate is issued in accordance with the Quality System implemented by Furness Controls Limited, which is registered by NQA against the provisions of BS EN ISO 9001. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. A history of traceability to National Standards and a list of authorised signatories is available from Furness Controls Ltd.
 This certificate has been authorised using an electronic signature.

Pressure Range: 0 to -200 Pa Signal O/P: 0 to 5 V

Results as received

| Reference Pressure | Output | Instrument being calibrated Error | Display | Deviation | Error |
|---|---|---|---|---|---|
| Pa | V | % of Rdg | Pa | Pa | % of Rdg |
| 0.000 | -0.00012 | N/A | 0.00 | 0.000 | N/A |
| 40.015 | 0.99975 | 0.06 | -39.99 | 0.025 | 0.06 |
| 80.036 | 1.99934 | 0.08 | -79.97 | 0.066 | 0.08 |
| 120.093 | 3.00071 | 0.05 | -120.01 | 0.083 | 0.07 |
| 160.044 | 3.99888 | 0.06 | -159.94 | 0.104 | 0.06 |
| 199.870 | 4.99465 | 0.04 | -199.74 | 0.130 | 0.07 |
| 231.563 | 5.12046 | 11.55 | -231.45 | 0.113 | 0.05 |
| 79.901 | 1.99615 | 0.07 | -79.84 | 0.061 | 0.08 |
| 0.000 | -0.00012 | N/A | 0.02 | 0.020 | N/A |

Each result is the average of 20 readings taken.

Pressure Range: 0 to -2000 Pa Signal O/P: 0 to 5 V

Results as received

| Reference Pressure | Output | Instrument being calibrated Error | Display | Deviation | Error |
|---|---|---|---|---|---|
| Pa | V | % of Rdg | Pa | Pa | % of Rdg |
| 0.00 | -0.00012 | N/A | 0.1 | 0.10 | N/A |
| 400.66 | 1.00026 | 0.14 | -400.3 | 0.36 | 0.09 |
| 799.91 | 1.99900 | 0.04 | -799.5 | 0.41 | 0.05 |
| 1201.87 | 3.00397 | 0.02 | -1201.5 | 0.37 | 0.03 |
| 1607.39 | 4.01787 | 0.02 | -1606.8 | 0.59 | 0.04 |
| 1998.02 | 4.99416 | 0.02 | -1997.2 | 0.82 | 0.04 |
| 2261.35 | 5.12046 | 9.43 | -2261.1 | 0.25 | 0.01 |
| 791.54 | 1.97801 | 0.04 | -791.0 | 0.54 | 0.07 |
| 0.00 | -0.00012 | N/A | 0.0 | 0.00 | N/A |

Each result is the average of 20 readings taken.

Pressure Range: 0 to 2000 Pa Signal O/P: 0 to 5 V

Results as received

| Reference Pressure | Output | Instrument being calibrated Error | Display | Deviation | Error |
|---|---|---|---|---|---|
| Pa | V | % of Rdg | Pa | Pa | % of Rdg |
| 0.00 | -0.00012 | N/A | 0.1 | 0.10 | N/A |
| 401.37 | 1.00349 | 0.01 | 401.5 | 0.13 | 0.03 |
| 800.46 | 1.99936 | -0.09 | 799.8 | -0.66 | -0.08 |
| 1199.39 | 2.99607 | -0.08 | 1198.3 | -1.09 | -0.09 |
| 1598.89 | 3.99485 | -0.06 | 1597.5 | -1.39 | -0.09 |
| 1999.96 | 4.99696 | -0.06 | 1998.4 | -1.56 | -0.08 |
| 2259.35 | 5.12046 | -9.35 | 2258.7 | -0.65 | -0.03 |
| 799.51 | 1.99714 | -0.08 | 798.9 | -0.61 | -0.08 |
| 0.00 | -0.00012 | N/A | 0.1 | 0.10 | N/A |

Each result is the average of 20 readings taken.

Pressure Range: 0 to 200 Pa Signal O/P: 0 to 5 V

Results as received

| Reference Pressure | Output | Instrument being calibrated Error | Display | Deviation | Error |
|---|---|---|---|---|---|
| Pa | V | % of Rdg | Pa | Pa | % of Rdg |
| 0.000 | -0.00012 | N/A | 0.01 | 0.010 | N/A |
| 40.178 | 1.00309 | -0.14 | 40.14 | -0.038 | -0.09 |
| 80.167 | 2.00332 | -0.04 | 80.13 | -0.037 | -0.05 |
| 120.047 | 3.00059 | -0.02 | 120.01 | -0.037 | -0.03 |
| 160.050 | 3.99972 | -0.04 | 159.96 | -0.090 | -0.06 |
| 200.127 | 5.00275 | -0.01 | 200.05 | -0.077 | -0.04 |
| 228.471 | 5.12046 | -10.35 | 228.39 | -0.081 | -0.04 |
| 79.784 | 1.99314 | -0.07 | 79.72 | -0.064 | -0.08 |
| 0.000 | -0.00013 | N/A | -0.01 | -0.010 | N/A |

Each result is the average of 20 readings taken.

Pressure Range: 0 to -200 Pa Signal O/P: 0 to 5 V

Results after adjustment

| Reference Pressure | Output | Error | Instrument being calibrated Display | Deviation | Error |
|---|---|---|---|---|---|
| Pa | V | % of Rdg | Pa | Pa | % of Rdg |
| 0.000 | -0.00013 | N/A | 0.00 | 0.000 | N/A |
| 40.089 | 1.00149 | 0.07 | -40.09 | -0.001 | 0.00 |
| 80.430 | 2.01067 | 0.00 | -80.42 | 0.010 | 0.01 |
| 120.010 | 3.00099 | -0.02 | -120.01 | 0.000 | 0.00 |
| 160.070 | 4.00217 | -0.01 | -160.06 | 0.010 | 0.01 |
| 200.190 | 5.00532 | -0.01 | -200.18 | 0.010 | 0.00 |
| 230.780 | 5.12045 | 11.25 | -230.76 | 0.020 | 0.01 |
| 80.170 | 2.00391 | 0.02 | -80.15 | 0.020 | 0.02 |
| 0.000 | -0.00013 | N/A | 0.00 | 0.000 | N/A |

Each result is the average of 20 readings taken.

Pressure Range: 0 to -2000 Pa Signal O/P: 0 to 5 V

Results after adjustment

| Reference Pressure | Output | Error | Instrument being calibrated Display | Deviation | Error |
|---|---|---|---|---|---|
| Pa | V | % of Rdg | Pa | Pa | % of Rdg |
| 0.00 | -0.00013 | N/A | 0.0 | 0.00 | N/A |
| 399.97 | 1.00026 | -0.03 | -400.0 | -0.03 | -0.01 |
| 799.65 | 1.99936 | -0.01 | -799.6 | 0.05 | 0.01 |
| 1201.13 | 3.00348 | -0.02 | -1201.2 | -0.07 | -0.01 |
| 1601.89 | 4.00631 | -0.04 | -1602.1 | -0.21 | -0.01 |
| 2001.55 | 5.00510 | -0.02 | -2001.6 | -0.05 | 0.00 |
| 2347.95 | 5.12045 | 12.77 | -2347.7 | 0.25 | 0.01 |
| 799.45 | 1.99803 | 0.03 | -799.3 | 0.15 | 0.02 |
| 0.00 | -0.00013 | N/A | 0.1 | 0.10 | N/A |

Each result is the average of 20 readings taken.

Pressure Range: 0 to 2000 Pa Signal O/P: 0 to 5 V

Results after adjustment

| Reference Pressure | Output | Error | Instrument being calibrated Display | Deviation | Error |
|---|---|---|---|---|---|
| Pa | V | % of Rdg | Pa | Pa | % of Rdg |
| 0.00 | -0.00013 | N/A | 0.0 | 0.00 | N/A |
| 400.85 | 1.00149 | -0.06 | 400.8 | -0.05 | -0.01 |
| 800.89 | 2.00180 | -0.02 | 800.8 | -0.09 | -0.01 |
| 1201.02 | 3.00297 | 0.01 | 1201.0 | -0.02 | 0.00 |
| 1601.21 | 4.00346 | 0.01 | 1601.0 | -0.21 | -0.01 |
| 1999.10 | 4.99795 | 0.00 | 1999.0 | -0.10 | -0.01 |
| 2331.05 | 5.12046 | -12.13 | 2331.1 | 0.05 | 0.00 |
| 800.26 | 2.00057 | 0.00 | 800.3 | 0.04 | 0.00 |
| -0.01 | -0.00013 | N/A | 0.0 | -0.01 | N/A |

Each result is the average of 20 readings taken.

Pressure Range: 0 to 200 Pa Signal O/P: 0 to 5 V

Results after adjustment

| Reference Pressure | Output | Error | Instrument being calibrated Display | Deviation | Error |
|---|---|---|---|---|---|
| Pa | V | % of Rdg | Pa | Pa | % of Rdg |
| 0.000 | 0.00016 | N/A | 0.01 | 0.010 | N/A |
| 40.099 | 1.00243 | 0.00 | 40.10 | 0.001 | 0.00 |
| 80.316 | 2.00810 | 0.01 | 80.33 | 0.014 | 0.02 |
| 120.166 | 3.00523 | 0.04 | 120.19 | 0.024 | 0.02 |
| 160.043 | 4.00129 | 0.01 | 160.04 | -0.003 | 0.00 |
| 200.611 | 5.01654 | 0.03 | 200.62 | 0.009 | 0.00 |
| 227.274 | 5.12046 | -9.88 | 227.25 | -0.024 | -0.01 |
| 80.077 | 2.00181 | -0.01 | 80.07 | -0.007 | -0.01 |
| 0.000 | -0.00012 | N/A | 0.02 | 0.020 | N/A |

Each result is the average of 20 readings taken.

Temperature Sensor, Current Range : 4 to 20 mA

Results as received

| Reference Current mA | Instrument being calibrated Output mA | Deviation mA | Error % of Rdg |
|---|---|---|---|
| 4.0000 | 4.000 | 0.0000 | 0.00 |
| 11.9999 | 12.001 | 0.0011 | 0.01 |
| 20.0011 | 20.004 | 0.0029 | 0.01 |

Each result is the average of 20 readings taken.

Absolute Pressure Sensor, Current Range : 4 to 20 mA

Results as received

| Reference Current mA | Instrument being calibrated Output mA | Deviation mA | Error % of Rdg |
|---|---|---|---|
| 3.9999 | 4.000 | 0.0001 | 0.00 |
| 12.0034 | 12.005 | 0.0016 | 0.01 |
| 20.0010 | 20.004 | 0.0030 | 0.01 |

Each result is the average of 20 readings taken.

Test Engineer : Gary Markham Signature : G Markham

Received in good condition, showing fair wear and tear.

The temperature of the instrument under test was : 21.0 ± 0.5 °C.

The ambient temperature was 20 ± 2 °C and the relative humidity was < 80 %.

Procedure:

The instrument provides a digital display and a voltage output corresponding to the applied differential pressure. The display can be programmed to indicate equivalent flowrate.
Inputs are available for two 4 - 20 mA transmitters to indicate temperature and absolute pressure.
When adjusted, the pressure indication was set to zero before each adjusted reading was taken.

The reference pressure was measured using a digital piston pressure calibrator.

The output was measured using an Agilent 34401A digital multimeter.

The calibration medium was dry air.

The readings of the reference standards and of the instrument under test were taken either manually or via RS232 when available to a PC running a calibration program.

A set of readings was taken as received and a second set of readings was taken after adjustment.

Negative readings were taken with positive pressure applied to the negative port of the instrument.

Standards & Uncertainties

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

The uncertainty associated with the measurement of the applied pressure is:

0 to 3 kPa 0.010 % + 0.030 Pa

The uncertainty of the indicated pressure is the uncertainty of the applied pressure +1 lsd (EUT).

The uncertainty of the indicated voltage (0-10 V) is 0.0035 % of reading + 30 µV + 1 lsd (EUT).

The uncertainty of the indicated current is 0.010 % of reading + 1.0 µA + 1 lsd (EUT).

The uncertainty of the electrical output is the uncertainty of the applied pressure plus the uncertainty of the electrical measurement.

Pressure Standard(s) used: FRS4 RS36 (0 to 3 kPa)

Electrical Standard(s) used: Agilent 34401A RS54

Programme & version: CS043: V4.0.6.FCO510.51

Comments:

The manufacturer's specification for accuracy of this instrument is 0.25 % R.

Test Engineer : Gary Markham Signature : G Markham

---------- End of calibration certificate ----------