CALIBRATION REPORT NO. 698xx
Calibration Date: December 2, 2009 For:
COMPANY XYZ
CITY, STATE, COUNTRY
Purchase Order Number: 4500122747
Calibration of
molbox1+ A700K , No. 1234

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with DHI Laboratory Quality Assurance Manual, Rev. C, September 2003 and conform to ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO/IEC Guide 25, ISO 9002, ISO-10012-1, MIL-STD 45662A and when specified by our customers NRC regulations 10CFR50 Appendix B and 10CFR21, and/or other quality requirements defined in customers purchase descriptions.

TRACEABILITY

Traceability for pressure is maintained through the fundamental units of mass [kg] and length [m^2] and the derived unit of acceleration of gravity [m/s^2].

- The traceability of effective area is maintained through the 2004 DHI Piston-Cylinder Calibration Chain to the National Institute of Standards and Technology, NIST, United States, and the Laboratoire National D'Essais, LNE, France.

- Traceability of mass is maintained to the fundamental unit of the kilogram (kg) through reference mass set R100 measured by Troemner Calibration Services who maintains direct traceability to the National Institute of Standards and Technology (NIST).

- DHI local gravity has been determined through the National Geodetic Survey gravity prediction.

The traceability to NIST or other national metrology institutes for secondary measurement standards is established through laboratories approved by the DH Instruments quality assurance program. Test reports for references maintained by DHI are available upon request to the recipient of this calibration report.

ilac-MRA A2LA ACCREDITED CALIBRATION 1599.01

Metrologist Laboratory Representative

FLUKE ® DH Instruments

Pursuant to the requirements of DHI Quality Procedures, DHI does not provide a calibration due date unless you have specifically requested us to assign an interval in your purchasing documentation. If requested the calibration due date is given on the calibration sticker attached to this report. If there is not a calibration sticker delivered with this report, it is possible this device did not meet the uncertainty specifications listed in the body of this calibration report.

TEST IDENTIFICATION

The instrument tested consists of a **molbox1+ A700K , No. 1234** with an uncertainty of:

- Pressure - ±(0.01% of reading or, 0.003% of span, whichever is greater)[2].
- Analog - ± 3mV or 0.01mA input
- Flow - The molbox is intended to be used to support molbloc mass flow elements by providing pressure and resistance measurements, along with gas property data, and calculating flow with an uncertainty of:
  - Standard molblocs ±0.2% of reading or ±0.02% F.S., whichever is greater.[1]
  - Premium molblocs ±0.125% of reading or ±0.0125% F.S., whichever is greater.[1]

[1]NOTE: The full scale flow values vary for different types of gasses due to the differences in gas characteristics, or, full scale flow values may vary due to the type of calibration performed on the molblocs. Refer to your molbloc calibration reports for the actual calibrated full scale range.

[2]This uncertainty includes stability assuming regular use of the AutoZero function. Without AutoZero, an additional ±0.005% of span per year may be combined with the uncertainty shown above.

TEST CONDITIONS

- Reference identification and uncertainties for the pressure transducers are given with each pressure range.
- Internal standard resistors were measured with DHI molbloc simulator working standard SN SET NO. 1 DHI RESISTOR cal date: 20090306 - 20100306 with an uncertainty of ± 0.015% of reading.
- Test and reference uncertainties are given with a coverage factor of 2 based on the recommendations given in ANSI/NCSL Z540-2-1997.
- Four hours were allowed for the test instrument temperature to stabilize before commencing the test. Ambient conditions throughout the calibration were 21 to 25 °C, 10 to 50%RH and 96 to 100kPa.
- Procedure used: LAB145A

TEST RESULTS

Pressure Transducers

A table for each test run lists the following:

1. Reference pressure: Pressure defined by the reference at equilibrium
2. Test reading: Pressure displayed by the instrument under test
3. Absolute disagreement: Test - Ref
4. Tolerance: Allowable “As Received” or “Adjustment” tolerance. Adjustment tolerance does not include uncertainty in the reference or uncertainty due to 12 month stability.
5. TUR: Test uncertainty ratio
6. Calibration status

TEST RESULTS (cont)

UPSTREAM TRANSDUCER (HIGH) AS LEFT

REFERENCE PRESSURES (kPa)	TEST READING (kPa)	ABSOLUTE DISAGREEMENT (kPa)	ADJUSTMENT TOLERANCE ±(kPa)	TUR (-)	CALIBRATION STATUS (-)
17.8479	17.849	0.001	0.017	24:1	in tolerance
99.9951	99.992	-0.003	0.017	8:1	in tolerance
200.7702	200.765	-0.006	0.017	4:1	in tolerance
299.1382	299.134	-0.005	0.024	4:1	in tolerance
449.8428	449.839	-0.004	0.036	4:1	in tolerance
600.2793	600.282	0.002	0.048	5:1	in tolerance
449.8424	449.846	0.003	0.036	4:1	in tolerance
299.1376	299.141	0.003	0.024	4:1	in tolerance
200.7696	200.771	0.001	0.017	4:1	in tolerance
99.9947	99.997	0.002	0.017	8:1	in tolerance
17.8477	17.851	0.003	0.017	24:1	in tolerance

PA: 0.0 Pa PM: 1.000000 REFERENCE UNCERTAINTY: ±(0.0017% of rdg + 0.4Pa)
REFERENCE ID: SN 753 DHI P-C cal date: 20080313 - 20100313, SN 2231 DHI M/S cal date: 20090723 - 20100123, SN 208 DHI BASE cal date: 20091007 - 20100407

DOWNSTREAM TRANSDUCER (LOW) AS LEFT

REFERENCE PRESSURES (kPa)	TEST READING (kPa)	ABSOLUTE DISAGREEMENT (kPa)	ADJUSTMENT TOLERANCE ±(kPa)	TUR (-)	CALIBRATION STATUS (-)
17.8479	17.848	0.000	0.017	24:1	in tolerance
99.9951	99.994	-0.001	0.017	8:1	in tolerance
200.7702	200.767	-0.004	0.017	4:1	in tolerance
299.1382	299.137	-0.001	0.024	4:1	in tolerance
449.8428	449.840	-0.003	0.036	4:1	in tolerance
600.2793	600.281	0.002	0.048	5:1	in tolerance
449.8424	449.844	0.001	0.036	4:1	in tolerance
299.1376	299.141	0.003	0.024	4:1	in tolerance
200.7696	200.769	0.000	0.017	4:1	in tolerance
99.9947	99.996	0.001	0.017	8:1	in tolerance
17.8477	17.849	0.001	0.017	24:1	in tolerance

PA: 0.0 Pa PM: 1.000000 REFERENCE UNCERTAINTY: ±(0.0017% of rdg + 0.4Pa)
REFERENCE ID: SN 753 DHI P-C cal date: 20080313 - 20100313, SN 2231 DHI M/S cal date: 20090723 - 20100123, SN 208 DHI BASE cal date: 20091007 - 20100407

TEST RESULTS (cont)

TEMPERATURE MEASUREMENTS

This molbox1+ was tested at three nominal resistance levels for each channel and each individual resistance to verify the resistance measurements and corresponding temperature readings made on a molbloc's PRTs. The following data shows the nominal reference temperatures and the temperature measured by the molbox1+ As Left from our laboratory. The tolerance is applied to the combined temperature measurement ((upstream + downstream)/2) for molbox1+ versions 6.0 and up) and is ± 0.05°C of the nominal value which corresponds to approximately ± 0.032% of reading on flow.

	Channel A	Channel B
0°C (100 Ω measurements)		
Upstream	-0.010 °C	0.010 °C
Downstream	0.000 °C	0.000 °C
25.67°C (110 Ω measurements)		
Upstream	25.650 °C	25.690 °C
Downstream	25.670 °C	25.690 °C
38.5°C (115 Ω measurements)		
Upstream	38.480 °C	38.530 °C
Downstream	38.510 °C	38.520 °C
TA	0.000 °C	0.000 °C
TM	1.0000	1.0000

FINAL TEST RESULTS

A final test was performed using two calibrated DHI molbloc references, a molbox1 from the DHI metrology service and the molbox1 SN **1234**. The following table gives the results of the test. The tolerance for this test is ±0.125 % of reading for the absolute flow value and ±0.05% of reading for the difference between channel A and channel B.

CHANNEL A			CHANNEL B				
REF [sccm]	TEST [sccm]	DIFFERENCE [% of reading]	REF [sccm]	TEST [sccm]	DIFFERENCE [% of reading]	CHANNEL A-B [% of reading]	STATUS
211.7300	211.8600	0.061	211.63	211.68	0.024	0.038	Flow IT, A-B IT
511.8000	512.1400	0.066	511.5600	511.8500	0.057	0.010	Flow IT, A-B IT
1015.7200	1016.3400	0.061	1014.6600	1015.1400	0.047	0.014	Flow IT, A-B IT