Calibration of molbox1+ flow terminal

molbox1+ Calibration

Calibration of molbox1+ Consists of:

- Calibration of the pressure transducers
- Verification of the Ohmic measurement system
- Calibration of the MFC function
  - If option is installed

molbox1+ Calibration

molbox1+ pressure calibration:

- Calibration of the pressure transducers

  Requirements of standard:

  - **Range: 20 to 600 kPa (3 to 87 psia) for molbox1+ A700K**
  - Range: 20 to 300 kPa (3 to 45 psia) for molbox1+ A350K
  - Range: 100 to 1400 kPa (15 to 200 psia) for molbox1+ A1.4M
  - Range: 100 to 2000 kPa (15 to 300 psia) for molbox1+ A2M
  - Uncertainty: ± 0.005 % of reading

  Recommend using PG7601 or 2465 piston gauge

molbox1+ Calibration

Temperature Calibration:

- Verification of Ohmic measurement system
  - molbloc simulators, set
    - 100 Ohm, ~0.0°C/32°F, PN 3069694
    - 107 Ohm, ~18°C/64°F, PN 3069682
    - 110 Ohm, ~26°C/78°F, PN 3069701
    - Each comes with cal. report and instruction sheet
  - Or use Reference resistors
    - Decade box
    - Other

Ohmic Measurement system (background1)

- molbox1+ includes an Ohmic measurement system used to measure the resistance of the two Platinum Resistance Thermometers (PRTs) mounted in a molbloc. The temperature of the PRTs is calculated from the resistance. The molbloc PRTs have nominal resistance at 0°C of 100 ohm and a slope of 0.3896 following DIN Norm 43760. The measured resistance at 0°C for each PRT is stored on the molbloc EEPROM and read by the molbox1+.
- The Ohmic measurement system self-calibrates using on-board 100 and 110 ohm reference resistors. On molbox1+ power up, an automated routine adjusts the Ohmic measurement system relative to the on-board, reference resistor readings. The on-board reference resistors used to calibrate the molbox1+ measurement system have uncertainty of ± 0.01% and stability of ± 0.0025% for one year, ± 0.005% for three years.

Ohmic Measurement system (background2)

- The self-calibration feature and the very high accuracy and stability of the reference resistors relative to the uncertainty of the molbox1+ temperature measurements make it unnecessary to calibrate the Ohmic measurement system independently. It is good practice, however, to verify the Ohmic measurement system. This is most easily accomplished by connecting a known resistance value to the measurement circuit where the molbloc PRTs are normally connected and verifying that the molbox1+ reads the correct corresponding temperature when that resistance is connected. Reference resistors mounted in a molbloc simulator for easy connection to molbox1+ using the normal molbloc connection cable can be purchased. If the molbox1+ Ohmic measurement system and associated connections are working properly, when the simulator is connected the molbox1+, temperature indicated by molbox1+ should equal the reference temperature corresponding to the molbloc simulator reference resistor following: Ref T[˚ C] = (Ref Resist[Ω]-100)/0.3896

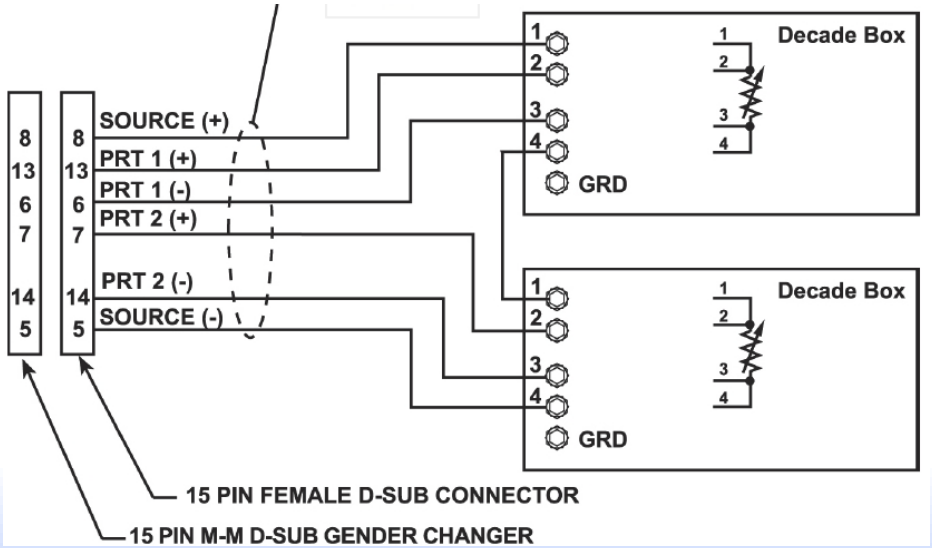
Ohmic Measurement system (background3)

- The Reference temperature [°C] calculated from the actual reference resistor value is written on the molbloc simulator. The temperature value read by the molbox1+ when the molbloc simulator is connected can be observed by pressing [P&T] on the molbox1+ front panel. The disagreement between the reference temperature and the molbloc indication should not exceed 0.05°C.

molbox1+ Calibration

Temperature Calibration:

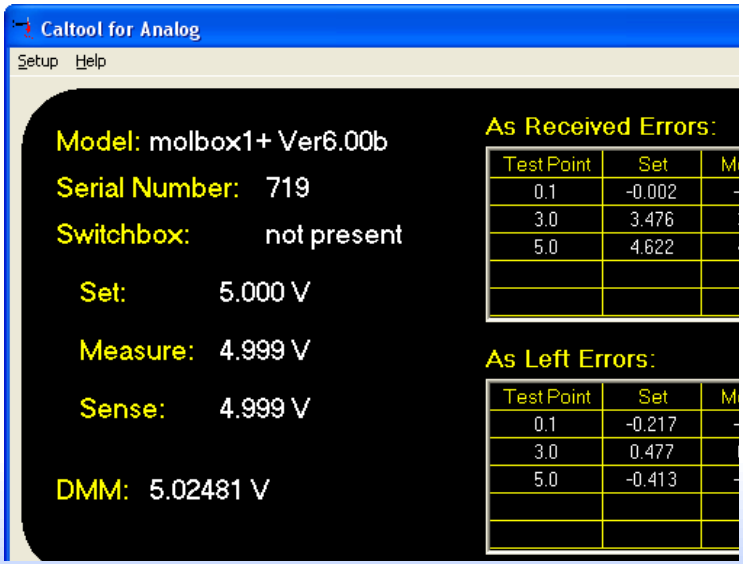
- Verification of Ohmic measurement system
  - Alternate method, resistance standard / decade box
    - Calibration cable kit, PN 3071644
    - Use with decade box
    - Can also use to calibrate molbloc simulators



molbox1+ Calibration

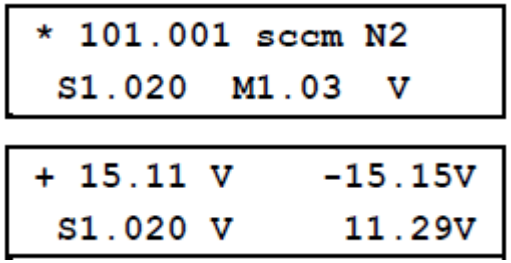
MFC Option Calibration:

- Calibration of the MFC option
  - Precision voltmeter: 0 - 10 vDC, 0-25 mA DC
  - Uncertainty: ± 0.02 % of reading
  - Analog calibration cable 3069720
  - CalTool for Analog calibration software, included with molbox1+ when shipped with MFC option. Software also available on flukecal.com website



MFC Option Information (from manual)

- molbox1+ may be delivered with an optional MFC control option. The MFC control option allows voltage or current set points to be set to a MFC, and voltage or current values to be read back from a MFC or MFM.
- The MFC control option is self-calibrating using on-board 5 and 10V references. Voltage is converted to current using a precision 250Ω resistor.
- The MFC control option signals are:
  - sense (V), measure (V or mA)
  - valve (V), negative power supply (V)
  - positive power supply (V), set (V or mA)



- Any of the MFC control signals can be adjusted using adders and multipliers in the same manner as the pressure adders and multipliers used to adjust the molbox1+ Q-RPTs. The normal procedure, however, is to use the ***molbox1 Analog Calibration*** software and cable provided with the accessories of a molbox1+ delivered with the optional MFC control option