

CDF MIXING SHED GOW MAC ZEROING AND CALIBRATION

This procedure outlines the steps to be taken in order to zero and calibrate the Gow Mac Thermal Conductivity Analyzer located in the CDF Gas Mixing Shed.

Editorial Hand-Process Changes Other Than Spelling
Require PPD/CDF Operations Department Co-Head Approval

HPC Number	Date	Section Number	Initials
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____

Approval:

(PPD/CDF Operations Department Co-Head)

(Date)

1.0 Controlled Copies of This Procedure

Four controlled copies of this procedure will exist.

One at the CDF Department Office.

One on the CDF Web Page.

One on the CDF ADMIN. Server.

One in the CDF Assembly Building Process Systems Control Room.

All other copies will be marked, "**INFORMATIONAL COPY ONLY**"

2.0 GOW MAC ZEROING AND CALIBRATION PROCEDURE

To execute this procedure, obtain the Gow Mac Checklist from the Procedure 312 Notebook located in the CDF Assembly Building Process Systems Control Room. When completed, place the checklists in the Completed Procedures section of the same Procedure 312 notebook.

3.0 GOW MAC CHECKLISTS

The following checklist sections are for the zeroing and calibration of the CDF Mixing Shed Gow Mac. Follow and record each step listed in the Checklist.

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General Gow Mac Operation Notes

In order to operate, the Gow Mac requires a reference gas flow and a sample gas flow. In normal operations, the gas that is sampled is the A/E gas we mix and the reference gas is the "Golden Gas". The Gow Mac compares the thermal conductivity of each flow and displays the sample concentration as it differs from the reference gas.

The SuperGold Gas and the Golden Gas are cylinders of 50% Argon and 50% Ethane gas gravimetrically mixed and analyzed by a gas supplier. The analysis reports supplied indicate the accuracy of the mixture.

The cylinders with the greatest accuracy have been kept to serve as the SuperGold Gas. These SuperGold cylinders contain the gas that all other Golden Gas cylinders are compared to throughout CDF Run II providing a level of consistent mixing required at CDF.

The Golden Gas cylinders are compared to the "SuperGold" Gas prior to their use in order to determine the offset (difference in accuracy). The Golden Gas offset is recorded in units as displayed on the front panel of the Gow Mac.

In order to calibrate the Gow Mac, an Argon/Ethane (A/E) SuperGold cylinder will be attached at the cylinder location normally occupied by the Golden Gas during operations. The Calibration cylinders (+1% ethane and -1% ethane) will be "sampled" in order to perform the calibration.

Name: _____ Date: ___/___/___ Time: ___:___

Precautions / Warnings

Before and during this procedure, the following precautions must be taken:

- ___ 1. Take only one cylinder of Argon/Ethane into the Mixing Shed at a time. More than one cylinder of A/E will change the risk classification of the Mixing Shed.
- ___ 2. Cylinders must not be stored inside the Mixing Shed.
- ___ 3. The SuperGold cylinder will remain outdoors.
- ___ 4. Argon/Ethane Mixing should be disabled during this calibration.
- ___ 5. Note that flow must be provided to the Gow Mac at all times to avoid damaging the cell.
- ___ 6. Use a flammable gas leak detector throughout this procedure to check for leaks when connections are made. Snoop should not be used in order to avoid contaminating the system.
- ___ 7. Be sure that combustibles and flammable materials (alcohol, cardboard, etc.) are not present in the Mix Shed.

Name: _____ Date: ___/___/___ Time: ___:___

Installation of the SuperGold Cylinder

- ___ 1. Close the Golden Gas cylinder valve.
- ___ 2. Be sure that EV-MSGGVLV is closed.
- ___ 3. Remove the Golden Gas cylinder and cap it.
- ___ 4. Install the SuperGold cylinder.
- ___ 5. Momentarily crack open the SuperGold Cylinder Valve to pressurize the supply line (up to EV-MSGGVLV) and then close it again. The pressure may be seen on the cylinder pressure regulator gauge, PI-1001.
- ___ 6. Vent the line through MV-1000. Close MV-1000.
- ___ 7. Repeat steps e. & f. three more times.
- ___ 8. The SuperGold cylinder valve may now be left open.

Zeroing the Gow Mac

Note that in this procedure the Gow Mac must be zeroed with the SuperGold Gas as a calibration will follow. In a case in which only Gow Mac zeroing will occur, the Golden Gas cylinder may be used.

- ___ 1. Open EV-MSGGVLV.
- ___ 2. Energize EV-MSGG2GM.
- ___ 3. Energize EV-MSGMZERO.
- ___ 4. The Gow Mac zeroing flow is now established. Flows to both the reference port and the sample port are preset to 50 ccm. Allow this flow to continue for one hour or until the reading is stable.
- ___ 5. Adjust the "Zero Adjust" such that the local readout is zero.

Name: _____ Date: ____/____/____ Time: ____:____

Installing the Calibration Cylinder (+1% Ethane)

- ___ 1. Begin with the "+1% ethane" calibration gas (50.96% ethane in argon).
- ___ 2. Bring the cylinder into the mixing shed and attach it at PRV-1725.
- ___ 3. Set MV-1725 to the "Calibrate" position.
- ___ 4. Minimize the PRV-1725 delivery pressure, then open the calibration cylinder valve. Next set the delivery pressure to 6 psig.
- ___ 5. Open EV-MSGMBYP to purge the supply line for 5 minutes.
- ___ 6. Close EV-MSGMBYP.

Calibration of the Gow Mac

- ___ 1. Switch EV-MSGMZERO to the de-energized state.
- ___ 2. Allow this flow to continue for one hour or until the reading is stable.
- ___ 3. Adjust the Span/Calibration so that the Gow Mac local readout is set at -4.00. The -4.00 local reading at the Gow Mac reflects the concentration of the "+1% Ethane" gas mixture. See CDF Design Note 5693, "CDF Mixing Shed Gow Mac User's Guide," for additional information on the Gow Mac output signals.
- ___ 4. Check that the %G_AT_MSGM (R3 S4 C1) readout in APACS is -1.000%. The remote output to APACS is provided via the Gow Mac chart recorder output. If required, adjust the recorder calibration such that %G_AT_MSGM reads -1.000%.
- ___ 5. Repeat the "Zeroing the Gow Mac" checklist section and Calibration (with the "+1% Ethane" gas cylinder) steps 1-4 as listed above one additional time to verify the settings.
- ___ 6. When finished, set the Gow Mac to zero with SuperGold (by following steps 1-3 in "Zeroing the Gow Mac" above) in order to continue the calibration check (energize EV-MSGMZERO).
- ___ 7. Close MV-1726. Close the Calibration cylinder valve and remove the cylinder, cap it, and return it to its designated storage area.

Name: _____ Date: ____/____/____ Time: ____:____

Installing the Calibration Cylinder (-1% Ethane)

- ___ 1. Next, install the "-1% ethane" calibration gas (48.95% ethane in argon).
- ___ 2. Bring the cylinder into the mixing shed and attach it at PRV-1725.
- ___ 3. MV-1725 should already be in the "Calibrate" position.
- ___ 4. Minimize the PRV-1725 delivery pressure, then open the calibration cylinder valve. Next set the delivery pressure to 6 psig.
- ___ 5. Open EV-MSGMBYP to purge the supply line for 5 minutes.
- ___ 6. Close EV-MSGMBYP.

Gow Mac Calibration Check with "-1% Ethane" Calibration Cylinder

- ___ 1. Switch EV-MSGMZERO to the de-energized state.
- ___ 2. Allow this flow to continue for one hour or until the reading is stable.
- ___ 3. Observe the Gow Mac local readout. The readout should be very near to +3.94.
- ___ 4. Set the system to zero with SuperGold in order to conclude the calibration check (energize EV- MSGMZERO).

Obtain the signature of the CDF Gas Systems Engineer to approve the results of the zeroing and calibration of the Mixing Shed Gow Mac.

Gow Mac Calibration Approval: _____ Date: _____
(CDF Gas Systems Engineer)

Name: _____ Date: ____/____/____ Time: ____:____

Calibration System Isolation

- 1. Close the Calibration cylinder valve and remove the cylinder, cap it, and return it to its designated storage area.
- 2. Cap the inlet to PRV-1725.
- 3. Switch MV-1725 to the "Mixing System" position.
- 4. Be sure that EV-MSGMBYP is closed.

Verify Gow Mac Zero

- 1. Before continuing, allow the Gow Mac to re-zero.
- 2. When zeroed, Close/de-energize the following valves in the order listed:

- EV-MSGG2GM
- EV-MSGMZERO
- EV-MSGGVLV

Note: EV-MSAE2GM and EV-MSGMBYP should already be closed.

Re-Install the Golden Gas Cylinder

- 1. Close the SuperGold cylinder valve.
- 2. Be sure that EV-MSGGVLV is closed.
- 3. Remove the SuperGold cylinder, cap it, and return it to its designated storage area.
- 4. Install the Golden Gas cylinder.
- 5. Momentarily crack open the Golden Gas Cylinder Valve to pressurize the supply line (up to EV-MSGGVLV) and then close it again. The pressure may be seen on the cylinder pressure regulator gauge, PI-1001.
- 6. Vent the line through MV-1000. Close MV-1000.
- 7. Repeat steps e. & f. three more times.
- 8. The Golden Gas cylinder valve may now be left open.

4.0 DEVIATIONS

None are allowed.

5.0 Required Training and Authorized Training Personnel

Authorized Training Personnel are listed below:
CDF Gas Systems Engineer

The training should be documented on a standard Fermilab Training Form and the Training Expiration date should be tied to the end date of the Collider Run (e.g. "the end of Collider Run II"). The completed forms must be inserted in the CDF Department Office copy of this procedure.

6.0 Training Materials

This procedure covering the operation of the Gow Mac zeroing and calibration must be read and understood.

The authorized training personnel must give a training lecture on the use of the Gow Mac at the CDF Mixing Shed.

7.0 List of Trained People for this Procedure

A list of trained personnel for this procedure should be kept in a separate section at the end of the CDF Department copy of the procedure.

8.0 References and Supporting Documentation

For a layout of the Mixing Shed Gow Mac inside the Mixing Shed Rack, see Fermilab drawing # 2563.9-ME-154459.