

# User's Guide

## Modular Fluidized Hall Flow Meter System

-Timed/Automated MFHF-



**MATSYS**

Materials and Manufacturing Systems

45490 Ruritan Circle

Sterling, Virginia 20164

703.964.0400

[www.matsys.com](http://www.matsys.com)

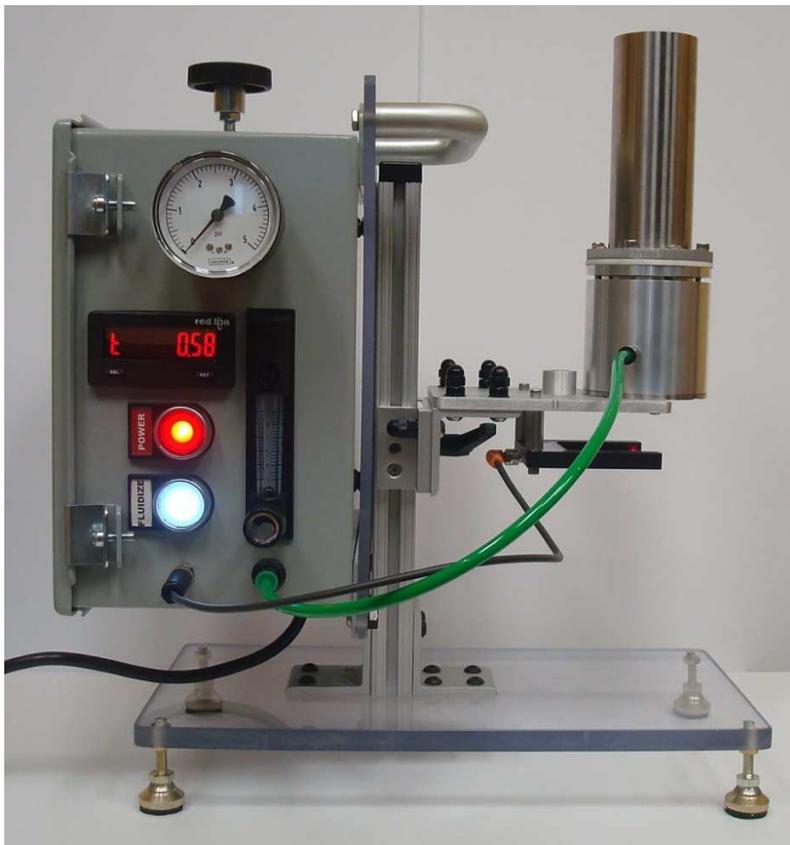
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## **INTRODUCTION**

The MATSYS Fluidized Hall Flow Meter system was designed for consistent powder evaluation, and can be used on a wide variety of particulate materials. The system includes a fluidized flow meter, control cabinet with timer, support bracket, and reflective optical sensor. The fluidized flow meter design consists of a fluidized porous plate formed into a funnel which is welded into a stainless steel cup or o-ring sealed into a cup housing. Fluidization is controlled using a gas pressure regulator and an adjustable flow meter.



### **Fluidized Hall Meter**

Powder is supplied to the fluidized hall meter by filling it with a predetermined amount of material (ie. 150g). The fluidization process begins when the system is activated through the box mounted pushbutton, or a customer installed trigger switch. When fluidization is turned on the funnel dispenses material out of the bottom, and the optical sensor is interrupted and triggers the timer. The timer is setup for cumulative time recording, so any residual or intermittent powder output will add to the total dispensed time.

For powders that will freely flow through the flowmeter opening WITHOUT fluidization the timer function can be used to compare the flow rate improvement offered by fluidization. The pre-weighed powder amount and the time it takes for the powder to flow can provide the customer with a powder flow rate. This rate can be adjusted by changing the fluidization settings and re-running the test.

### **Control Cabinet**

The control cabinet houses the gas controls for the system. These controls regulate powder fluidization rates. An optional combination in-line moisture separator, filtration system and gas dryer remove moisture and solid contaminants from the gas supply. A pressure regulator (0-5 psi) and pneumatic solenoid is used to regulate the flow of gas to the fluidizer. The solenoid is activated when the power switch is on. A flow meter (up to 30 SCFH) is used to monitor the gas flow at the fluidizer. A reflective optical sensor is used to activate and record fluidization times at the opening from the bottom of the funnel.

## **SYSTEM SETUP AND INSTALLATION**

### **1. Gas Supply**

The gas source is connected to the dryer then through the bulkhead fitting located on the bottom of the control cabinet. It is best to use an inert gas to fluidize, such as argon or nitrogen. Alternatively, a compressed air source can be used but the proper conditioning components to provide dry clean air must be utilized. Compressed air supply pressure to the fluidized fill shoe control cabinet should be between 30 and 60 psi (**Never exceeding 150psi**). The control cabinet will provide proper instrument pressure limitations to the fluidizer as long as care is taken to maintain a quality air supply, i.e. air that is free of oil, dirt and moisture. If the setup is equipped with a desiccant dryer it will supply correct dryness as long as no significant liquid accumulation occurs. To prevent liquid build up in the gas lines it is common practice to install an appropriately sized after-cooler and moisture separator system on the shop air compressor. As an extra precaution, it is recommended that a secondary liquid separator and trap be installed ahead of the control cabinet.

During normal use, and especially during initial setup of a new system, the quality of the air supply should be closely monitored for any oil, moisture, or solid contamination.

#### **For systems equipped with a desiccant dryer**

The functionality of a desiccant gas dryer can be readily checked by observing the dew-point indicator particles which are mixed into the desiccant located inside the dryer:

- ◆ When the indicator particles color is blue, the dryer function is normal and it is O.K. to operate the system.
- ◆ When the indicator particles color is pink, the outlet air is humid. It is time to replace the desiccant before you operate the system.

#### **For systems equipped with a membrane dryer (optional)**

The desiccant dryer can be upgraded to a very low maintenance membrane dryer. With a membrane dryer you can readily check outlet moisture condition by observing the dew-point indicator which is located on the top of the membrane dryer:

- ◆ When the dew-point indicator is blue, the operation is normal.
- ◆ When the dew-point indicator is pink, the outlet air is humid.

**Note: It takes approximately 1 hour to change the color of the dew-point indicator from the start-up of supply air.**

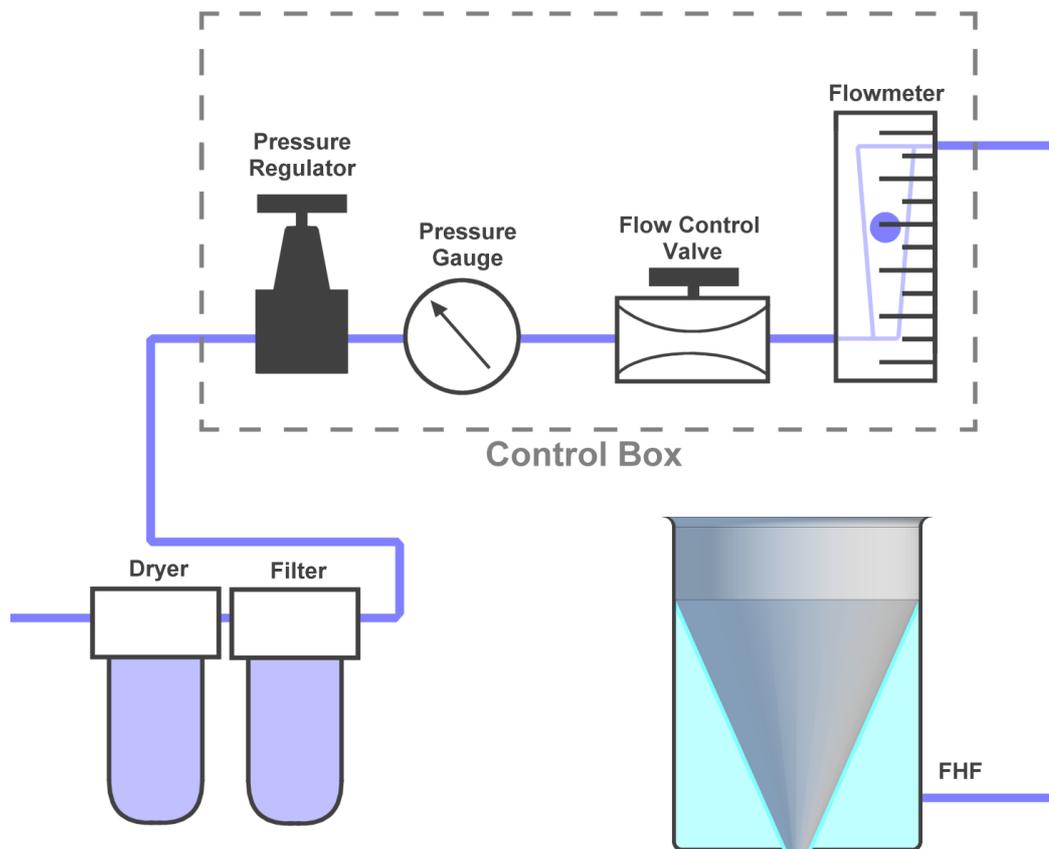
## **2. Connecting the Hall Meter to the Control Panel**

Tubing is provided to connect the fluidized hall meter to the control cabinet. The cable that links the optical sensor to the control box will also need to be connected.

## **3. Initial Setup**

The following steps should be followed for initial setup of the system:

1. The Flowmeter system should be leveled to ensure accurate sensing.
2. Connect clean, oil free gas (30-60 psi) to the 1/4" NPT inlet of the desiccant dryer located on the bottom left of the control box.
3. Place a container onto the table surface of the flowmeter system under the outlet of the flowmeter.
4. Loosen the handbrake lever on the linear guide that the flowmeter is mounted to then move the flowmeter to your desired height. Then retighten the handbrake lever.
5. Using a weight scale fill another container with your desired pre-weighed powder amount (i.e. 200 grams). Set this powder aside until after the checkout procedure.



#### 4. Checkout Procedure

If you are using the system for the first time you must complete the initial setup outlined above before performing the following checkout procedure. You should also perform this checkout procedure if the system has been out-of-service for an extended period of time or if you suspect a performance problem.

This checkout procedure will verify proper operation of the gas control system as well as the condition of the transport tube and delivery chute fluidizers.

1. Make sure that all tubing is connected properly (refer to Figure 2).
2. With gas supply off, read pressure gage and adjust reading to "0" as necessary.
3. With no material in the fluidizer, adjust the gas pressure regulator to the values shown in the "Fluidizer Gas Calibration Chart" supplied with

your system and read the gas flow value on the flow meter. Compare readings with the values in the calibration chart.

4. Verify that you get approximately the same flow values as those printed in the “Fluidizer Gas Calibration Chart”.

If you experience problems obtaining similar values to those given in the chart, contact MATSYS before proceeding. Otherwise you are ready to operate the fluidized fill shoe.

## 5. Powder Checkout

For first time use you should adjust the gas pressure regulator and flow meter to the recommended settings for your powder as supplied by MATSYS or as follows:

1. Connect powder hose from hopper to transport tube.
2. With particulate material in the fluidized fill shoe, set the gas pressure regulator to 0.5 psi.
3. Run and check flow quality.
4. Increase the gas pressure in 0.5 psi increments as needed to achieve the flow rate you want. **The lowest possible gas pressure which yields consistent flow is normally the optimum operational set point.**
5. Once you have set the pressure, no further adjustment is necessary. It is recommended that you periodically perform the initial checkout to verify that the system is functioning properly.

Factors that can affect the flow set point are:

- Powder type – density, and general flow characteristics.
- Flow rate - speed and volume.
- Opening size - Hall meter diameter.

## **5. Operation**

If the powder you intend to test flow freely through the flowmeter WITHOUT fluidization, adjustment of the height of the flowmeter relative to the optical sensor may need to be made so that your finger will not trigger the optical sensor when you use it to block the opening of the flowmeter. The following steps may need to be reordered or amended to run the test without fluidization.

- 1. Wearing gloves, place a finger under the opening of the fluidized hall flowmeter so that the opening is blocked.**
- 2. Fill the hall flowmeter with the pre-weighed amount of powder you set aside in a container earlier (i.e. 200 grams).**
- 3. Remove your finger from the opening of the flowmeter.**
- 4. Press the reset button on the Timer module to clear the recorded time.**
- 5. Turn on fluidization.**
- 6. The timer will record the amount of time it takes for the full pre-weighed amount of powder to dispense.**
- 7. Visually check the flowmeter for residual powder.**
- 8. Record the elapsed time indicated on the timer.**
- 9. Turn off fluidization.**

## **7. Hall Meter Porous Plate Care**

Care should be taken not to contaminate the fluidizer porous plate with foreign matter that might cause flow restriction. Avoid contacting the porous plates with the following material types: ultra fine particulate (particles smaller than the porous fluidizer plate 0.5 micron rating), adhesives, gelatins, pastes or hardening resins, and non-evaporative liquids.

If contamination of the fluidizer porous plates is suspected, you may be able to clean the plate with isopropyl alcohol to revive it. To clean the porous plate, adjust the gas pressure to approximately 3 psi and open the flow meters fully (full counterclockwise). This will allow the gas to flow through the porous plate while you swab the plate with an alcohol soaked Q-tip.

If cleaning the fluidizer porous plates in this manner does not remove the contamination, the plate will need to be cleaned with an ultrasound cleaner following the basic process steps:

1. Presoak the fill shoe in 70 % isopropyl alcohol\* for approximately 5 minutes.
2. With no gas flow, ultrasound for 5 minutes.
3. With 2-3 psi gas pressure, ultrasound for another 5 minutes.
4. (This step is required only when substituting # 222 cleaning solution or similar for isopropyl alcohol, refer to note below). Post soak in 70 % isopropyl alcohol\* for approximately 5 minutes. This post soak should be at room temperature for 2 minutes with no gas flow, and then with gas flow pressure set at 2-3 psi.
5. Air dry at room temperature with 2-3 psi gas pressure for 1 hour.
6. Test the flow again referring to the flow calibration sheet and return the fill shoe to service if flows are within 1 SCFH of the original values on the flow calibration sheet.

**\* Important Note:**

**Isopropyl alcohol is considered a flammable liquid**

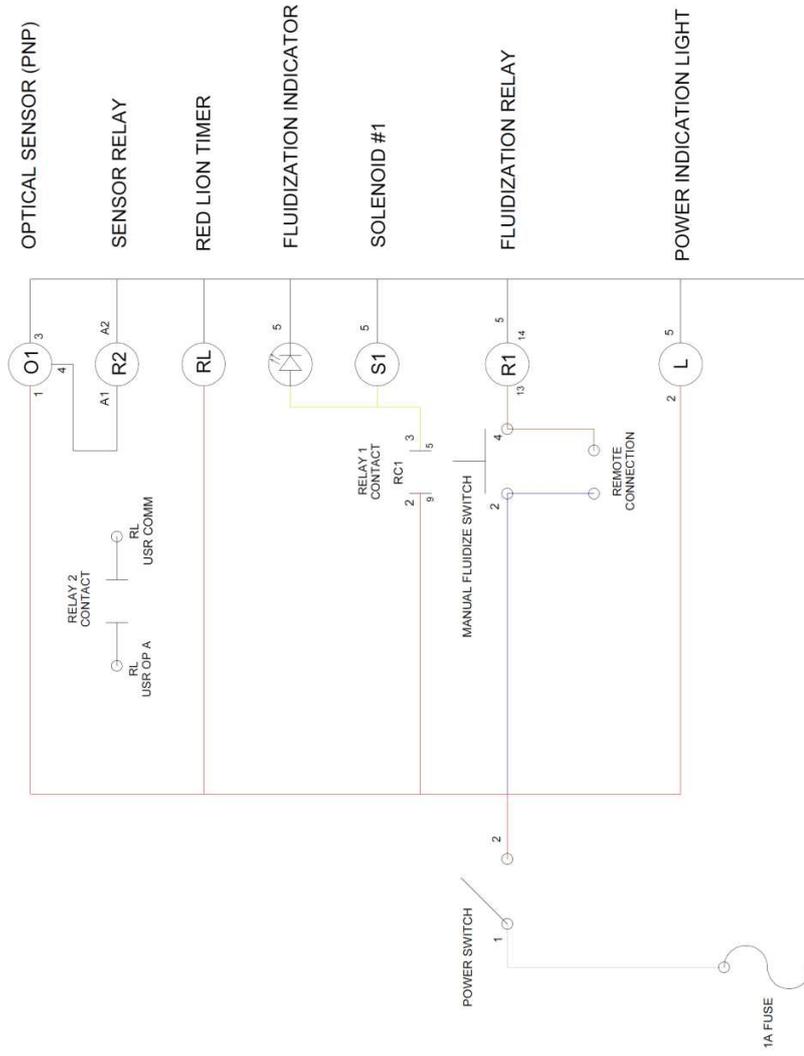
To be safe avoid heat, sparks, and open flame. The typical rated flashpoint for isopropyl alcohol is 72° F. Ultrasonic cleaners generate heat and therefore must be appropriately cooled or purged when containing alcohol. A recommended substitute for alcohol is L&R Manufacturing # 222 ultrasonic cleaning solution. If # 222 or similar cleaner is used you must use Step # 4 above after ultrasound to flush residual cleaner from the filler.

If cleaning the fluidizer porous plate in the described manner does not remove the contamination, the plate may need to be repaired or replaced. In this case it is recommended that the fluidizer be returned to MATSYS for service.

		Pressure (PSI)	Flow Rate (SCFH)
45490 Ruritan Circle, Sterling, VA 20164		0.5	2.5
703-964-0400		1	5
Serial#	SVF011816	1.5	7
Date:	1/18/2016	2	9.5
Employee:	Steven Lawver	2.5	Off Scale
Customer:	3M	3	Off Scale

Notes:  
Project:

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



DIMENSIONAL TOLERANCES: ± 0.005"

DRAWN	SLAWMER	DATE	02/25/14
CHECKED	R ROWLAND		
QA	MATSYS INC.		
MFG			
APPROVED	MATSYS INC.		

TIMED MFHF CONTROL	
Electrical Diagram	
SIZE	C
FIG. NO.	012716_T
REV	1/1
SCALE	1:1
SHEET	1/1