



# High Purity Porous Metal Flow Restrictors.



## High Purity Porous Metal Flow Restrictors.

For reliable, affordable flow control, without the drawbacks of mass flow controllers, needle valves and calibrated orifices.

Whatever your priorities in flow control – whether you want low cost, consistent performance, or resistance to clogging – there's one alternative that will satisfy on all counts: Mott High Purity Porous Metal Flow Restrictors. Featuring Mott's unique porous metal media developed specifically for semiconductor manufacturing, Mott Flow Restrictors provide compact, long-lasting flow control coupled with:

- **A cost-effective design** – Mott's simple flow restrictor design consists of a porous metal element inside a standard fitting, providing maximum strength and reliability at a minimum cost.
- **Fixed, tamper-proof performance** – Each Mott Flow Restrictor delivers the specified downstream flow for the life of the product. There are no moving parts or potential adjustments which can hamper performance.
- **Clog-free performance, with laminar flow** – The porous metal element spans the full width of the inner channel, allowing gases to move through hundreds of microchannels without increasing flow velocity or creating irregular flow paths. Downstream flow is smooth and constant, and the media will not wear from friction, or clog when exposed to sporadic particles.

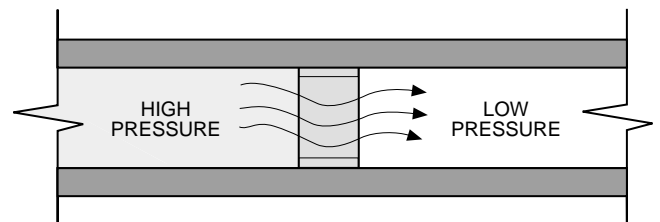
### Additional benefits of Mott Flow Restrictors.

- **All-metal construction** – Porous metal elements constructed of 100% stainless steel, nickel or Hastelloy® are permanently affixed into 1/4" face seal fittings. Other configurations are available. There are no elastomers or other non-metallic materials which could flex or shed particles.

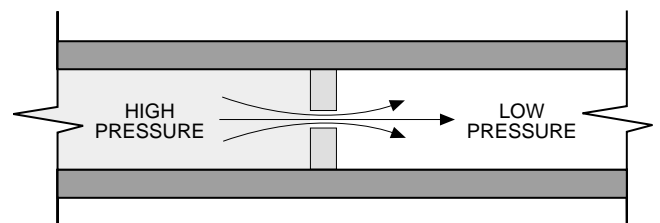
- **Tolerance of high temperature and pressure** – Stainless steel Mott Flow Restrictors withstand sustained temperatures to 450°C (inert gas), and pressures to 120 psig, standard; up to 1500 psig by request.
- **Wide range of flow rates** – Downstream flows range from 100 SLPM to  $<1 \times 10^{-6}$  SCCM.
- **Cleaned and bagged in a Class 100 clean room** – For superior out-of-box performance.
- **Calibrated** – To nitrogen and hydrogen flow curves. Compatible with all process gases including oxygen. Sized to specialty gas applications through viscosity curves.

### Major advantages over calibrated orifices.

- **Reduces the flow burden** – From one pore to hundreds.
- **Prevents plugging** – By distributing flow over the entire insert.



*Flow Restrictor: Gas moves uniformly through porous metal element with minimal friction due to viscosity.*

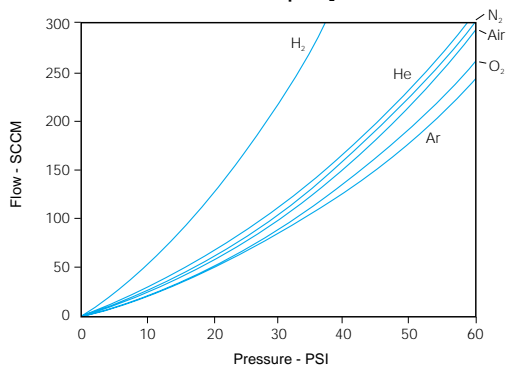


*Standard Orifice: Speed, pressure and heat increase as gas moves through the orifice, causing wear and tear.*

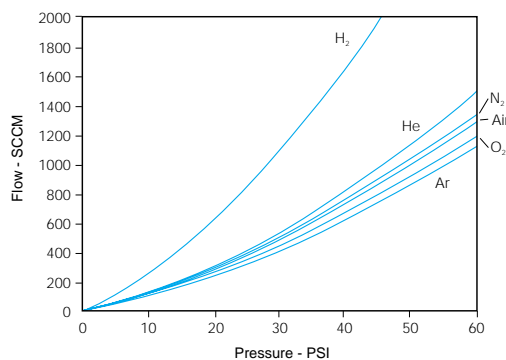


# Typical flow characteristics of three standard Mott Flow Restrictors.

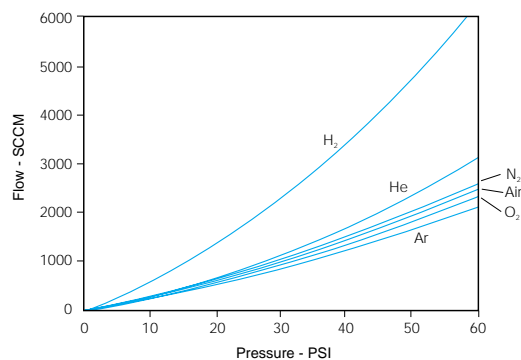
100 SCCM @ 30 psi N<sub>2</sub> Restrictor



500 SCCM @ 30 psi N<sub>2</sub> Restrictor



1000 SCCM @ 30 psi N<sub>2</sub> Restrictor



## How to determine the flows of other gases.

The flows of gases not yet tested with Mott Flow Restrictors can be estimated by adjusting for the viscosity relative to nitrogen. Ratios of some common process gases are shown in the table below.

To make the correction between nitrogen and the target gas, use the following formula:

$$\text{Nitrogen flow} = (\text{target gas flow}) \left( \frac{\text{target gas viscosity}}{\text{N}_2 \text{ viscosity}} \right)$$

### Example:

418 SCCM of N<sub>2</sub> = 500 SCCM HCl (148/177)

SEMICONDUCTOR GAS VISCOSITY

| Gas              | Viscosity* (μP) | Degrees Celsius | Ratio Compared to N <sub>2</sub> |
|------------------|-----------------|-----------------|----------------------------------|
| N <sub>2</sub>   | 177.02          | 25              | 1.00                             |
| Ar               | 225.00          | 25              | 1.27                             |
| AsH <sub>3</sub> | 155.00          | 25              | 0.88                             |
| BF <sub>3</sub>  | 170.00          | 25              | 0.96                             |
| Cl <sub>2</sub>  | 134.50          | 25              | 0.77                             |
| NH <sub>3</sub>  | 99.13           | 25              | 0.57                             |
| PH <sub>3</sub>  | 107.98          | 25              | 0.65                             |
| SiH <sub>4</sub> | 109.20          | 25              | 0.62                             |
| HCl              | 148.00          | 25              | 0.84                             |

\* Viscosity at standard conditions, temp. of 25°C at 101.325 kPa.

## Mott can provide virtually any desired flow.

Mott High Purity offers many standard flow restrictors in addition to those shown here. If you have a specific request, contact Mott with your application inlet pressure, desired flow, operating temperature and type of gas, and a Mott engineer will discuss product availability.

| Catalog Number for Standard Configurations | Porous Media          | Face Seal Union               | Internal Surface Finish | Length         |
|--|-----------------------|-------------------------------|-------------------------|----------------|
| 5140-1/4-SS-FLOW-CLS100                    | 316L Stainless Steel* | 1/4" Face Seal Fitting (Std.) | 32 Ra                   | 1.55" (39.4mm) |
| 5140-1/4-SS-FLOW-CLS100-10Ra               | 316L Stainless Steel* | 1/4" Face Seal Fitting (Std.) | 10 Ra                   | 1.55" (39.4mm) |

\* Other media available for special applications.