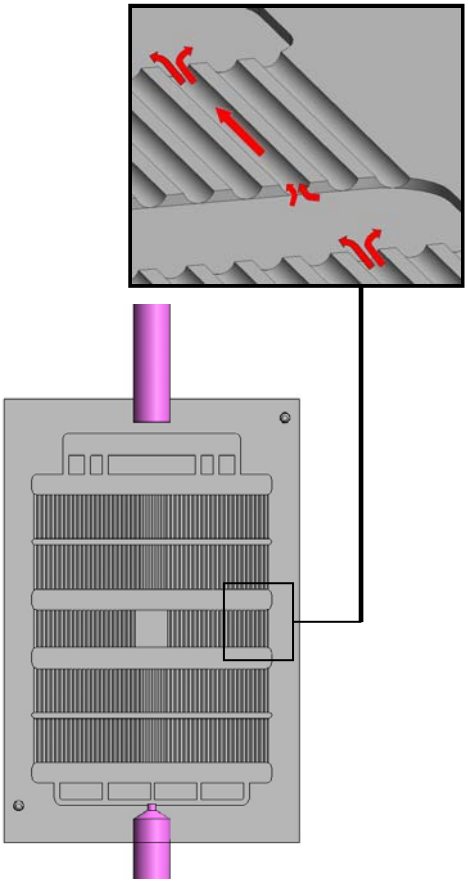
PORTER

VAPORIZER MODULE

- Fast Response
- Very Stable Vapor Flow
- High Surface Area Geometry
- Baffled and Channeled Grid
- 110 VAC Power

The Porter Vaporizer Module, in conjunction with the D2000i Liquid Mass Flow Controller, is the heart of a system to provide stable, accurate vapor delivery for a variety of liquid sources. Our patented technology yields products that serve as critical components in direct liquid injection systems for semiconductor precursors. We have partnered with major tool manufacturers on the development of delivery systems for the latest chemistries. Please contact us for further information.



Vaporizer Geometry

The baffled and channeled grid maintains an efficient inlet to outlet fluid communication by a system of seamless slots. The cross-sectional area of the seamless slots is small enough to prevent surface tension from beading the liquid, which would reduce contact with the heated surface and reduce efficient heat transfer. Liquid is turned into vapor by the application of heat a full 360° surrounding the liquid surface. If liquid is heated in a single slot or channel, bubbles of vapor can form that will expand rapidly and push slugs of liquid to the outlet, causing spitting. The horizontal fluid communication channels create a baffle to any uncontrolled vaporization, allowing fluid to slip sideways as vapor bubbles travel rapidly up the multiple count main grid pathways. To enhance the sideways motion, the fluid communication channels are larger in cross-section than the individual vertical grid paths. The fluid remaining in the communication channel continues to fully vaporize and the remaining bubbles find a path to the outlet without pushing any slugs of liquid to the outlet. The grid geometry efficiently vaporizes a direct liquid inlet flow as well as a mixed, atomized aerosol inlet flow from a mixing valve output containing liquid and a carrier gas. A carrier gas is often used in vaporizing systems to reduce the temperature required to achieve vaporization (based on the partial pressure of the vapor [calculated using the mole ratio of the liquid and carrier] being lower than the vapor pressure at that temperature). Lower vaporization temperature may minimize precursor breakdown and damage.

Specifications

Material: 316 Stainless Steel

Response Time: Less than 3 seconds during dynamic cycling into a primed vaporizer

Warm-up Time: 10 minutes

Maximum Operating Temperature (at outlet): 150°C

Maximum Operating Pressure: 125 PSIG

Leak Integrity: 1 x 10^{-9} atm. cc/sec. helium

Power Supply Requirements: 110 VAC

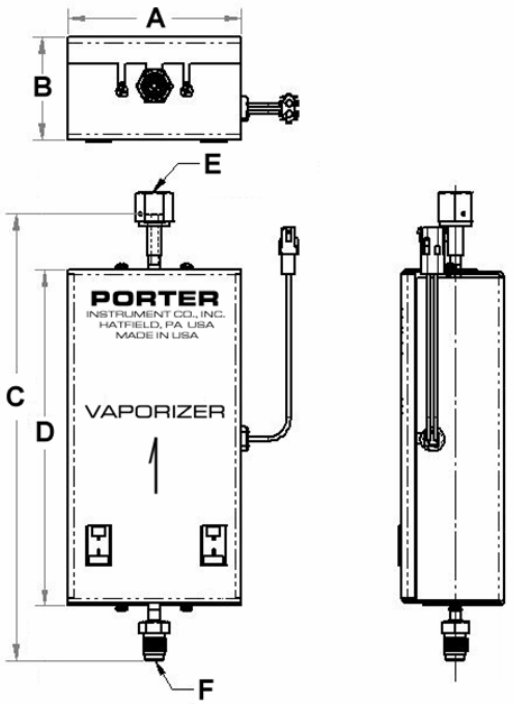
Heater Type: Silicone or Cartridge

Mounting Orientation: Vertical (+/-15°)

External Electrical Connections: 2-pin power connector AMP "Posi-Lok" type; thermocouple J or K-type, 3 or 6 feet

Inlet/Outlet Process Connections: ⅛" or ¼" compression; ⅛", ¼" or ½" male metal gasket face seal (mmgfs); ¼" female metal gasket face (fmgfs) seal

Dimensional Data V10,V20,V30



Model	A	B	C	D	E (Outlet)	F (Inlet)
V10	4.00	2.38	7.39	4.81	¼" FMGFS	¼" MMGFS
V20	4.00	2.38	10.40	7.81	¼" FMGFS	¼" MMGFS
V30	10.50	2.38	10.71	7.94	½" MMGFS	¼" MMGFS

Vaporizer Grid Specifications

Internal Volumes (⅛"mmgfs inlet; ¼" fmgfs outlet; with 0.016 inlet tube capillary):
V10: < 1.5 ml (less outlet leg < 0.5 ml)
V20: < 1.75 ml (less outlet leg < 0.75 ml)
V30: < 6 ml (less outlet leg < 5 ml)

Inlet Restrictions: ⅛" tube stub, 0.016" diameter; ⅛" tube stub, 0.031" diameter; ¼" tube stub, 0.031" diameter (special 5" length capillary, 0.010" ID is available)

Vaporizer horizontal fluid communication channel cross sectional equivalence:
L = 0.1" diameter, S = 0.06" diameter

Vaporizer vertical grid cross sectional equivalence:
V10, V20: 0.1" diameter; V30: 0.23" diameter

Total heated grid surface area:
V10: 8 $in.^2$ (50 count seamless vertical grid; 4L, 2S horizontal seamless fluid communication channels)
V20: 20 $in.^2$ (50 count seamless vertical grid; 4L, 7S horizontal seamless fluid communication channels)
V30:100 $in.^2$ (266 count seamless vertical grid; 3L, 8S horizontal seamless fluid communication channels)

Flow Capacities and Power Requirements

Model	Flow Capacity (TEOS)	Size (inches)	Power
V10	2.5 ml/min	2 X 3	100 watts
V20	20 ml/min	2 X 6	200 watts (100 watts optional)
V30	100 ml/min	6 X 8	1100 watts

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