

HA-MFV EtherCAT®

High Accuracy Mass Flow Verifier



The MKS High Accuracy MFV is designed for installation on the process tool to verify the mass flow controller flow rate in situ. The HA-MFV's 1.0% of Reading measurement accuracy gives the user the ability to verify the MFC's flow with the actual process gas to a degree significantly better than previous rate-of-rise devices or the process chamber rate-of-rise method. The former devices were subject to external volume effects while the latter method were subject to significant variation due to process chamber conditions.

The HA-MFV provides significantly better measurement accuracy and is insensitive to external volume (volume from MFC to the HA-MFV) conditions and variation. Insensitivity of the HA-MFV to external volume also results in more

precise matching of measurements between HA-MFVs on multiple tools for the same process; assuring the user of precise tool-to-tool process matching.

The insensitivity of the HA-MFV to external volume is realized through the use of sonic nozzle technology. The sonic nozzle creates a pressure drop and sonic flow conditions. In sonic flow, variations in pressure downstream of the nozzle have no effect on upstream conditions. Thus, the sonic nozzle effectively decouples the measurement in the HA-MFV from the upstream volume.

Product Features

- Superior 1.0% or better measurement accuracy enables wafer-to-wafer, chamber-to-chamber, and tool-to-tool process matching
- Ability to support multiple gas panels on a process tool due to its external volume insensitivity reduces cost of implementation
- Wide measurement range of 3 to 3000 sccm enables the measurement of most critical gas flow for a wide variety of semiconductor processes
- In situ assessment of MFC flow rate improves process control and avoids unnecessary downtime due to removal of a "good" MFC
- Rapid measurement times allow easy integration into tool preventative maintenance schedules

1. Patents & Patents Pending



Key Benefits

- Direct process gas flow rate measurement to validate MFC accuracy
- Supports multiple gas panels on tool providing superior chamber to chamber flow matching

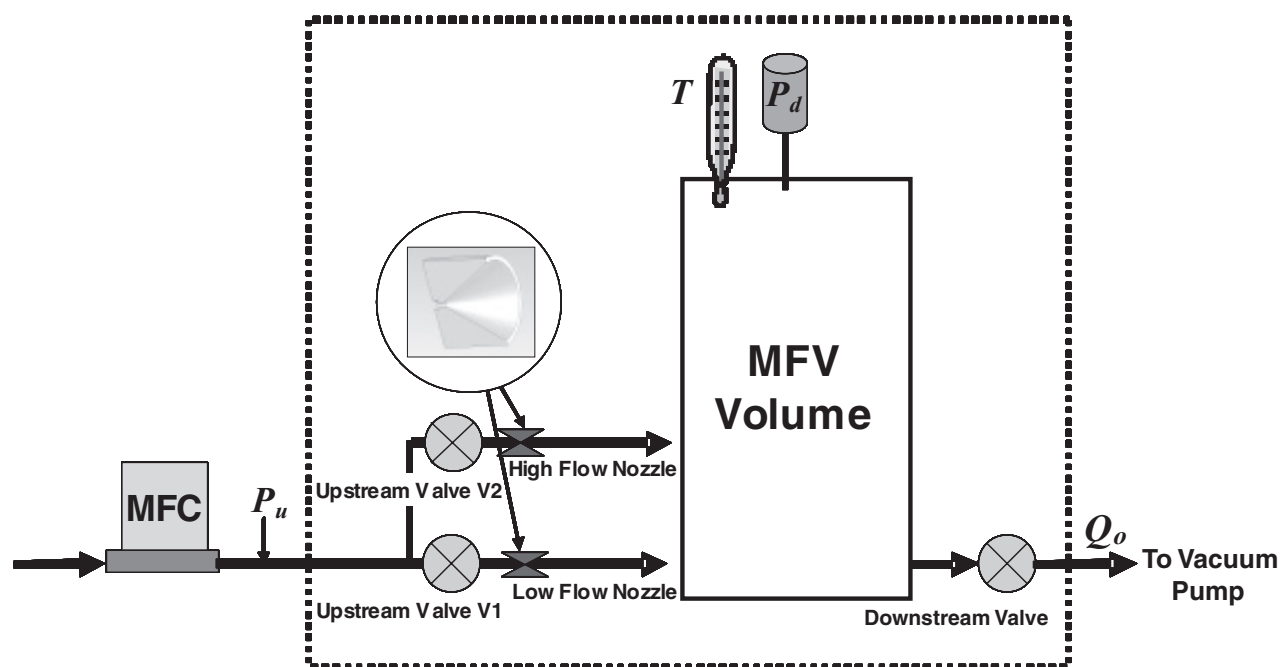
Performance		
Mass Flow Verification Accuracy ¹		±1.0% Reading
Mass Flow Verification Range ²		3 to 3000 sccm N ₂ equivalent
Repeatability		±0.5% Reading
Reproducibility		±0.3% Reading
Pressure Range		100 Torr
Pressure Accuracy		0.25% Reading
Proof Pressure		45 psia
Burst Pressure		150 psig
Pneumatic Air Supply Pressure	Minimum Maximum	<ul style="list-style-type: none"> • 80 psig • 100 psig
Temperature Coefficients	Span	<0.002% Reading/°C
Warm-up Time		60 minutes
Normal Operating Temperature		10° to 40°C
Temperature Display		0° to 100°C
Temperature Readout Units		°C
Temperature Accuracy		+2°C
Temperature Resolution		0.1°C
Compliance ²		CE
Environmental		
Storage Humidity Range		0 to 95% RH non-condensing
Storage Temperature		-20° to 60°C (-4° to 160°F)
Electrical/Communications		
Control Interface Options	EtherCAT	Dual RJ-45 (Comm.) M8 Male 5pin (PWR)
Diagnostic Interface Options	EtherNet	RJ-45 female
Input Voltage		+24 VDC (±10%) (EtherCAT)
Input Current/Voltage Required	Max Current at Start Up Avg Current at Steady State	<ul style="list-style-type: none"> • +24 VDC (±5%) @ 500 mA • +24 VDC (±5%) @ 250 mA (valves closed)
Physical		
Body Overall (height x width x length)		6.98 in x 10.0 in x 10.0 in (177.3 mm x 254.0 mm x 254.0 mm)
Process Connections	Gas Supply Vacuum Supply Pneumatic Air Supply	<ul style="list-style-type: none"> • Swagelok® compatible 8 VCR® female rotatable • Swagelok® compatible 8 VCR® female rotatable • 1/8" one-touch quick connect tube
Leak Integrity	External	<1 x 10 ⁻⁹ scc/sec He
Materials Wetted	Volume Seals Valve Seat	<ul style="list-style-type: none"> • 316L SST passivated, Inconel®, Incoloy® • 316 SST nickel plated • PCTFE with Elgiloy® Diaphragm
Surface Finish		<32 μ inches Ra
Weight		23.9 lbs (10.9 kg)

¹ Includes non-linearity, hysteresis, and non-repeatability.

² Maximum flow rate may be limited by specific gas properties, e.g. vapor pressure.

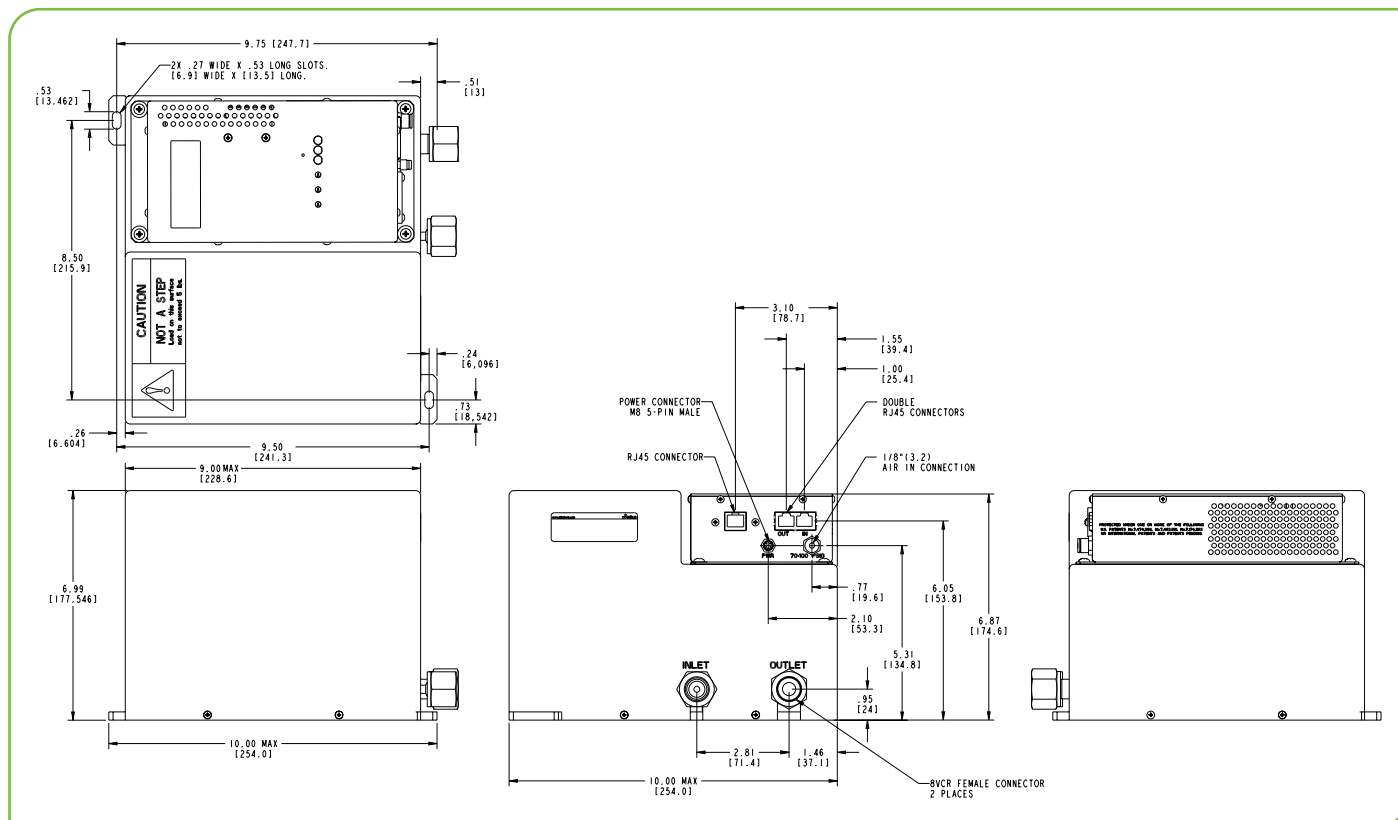
Please consult factory for latest gas and flow rate list.

HA-MFV Functional Block Diagram



The HA-MFV utilizes sonic nozzles to isolate upstream flow conditions from the device making it external volume insensitive. This insensitivity along with precise temperature, pressure and volume measurements enables the device to provide measurement accuracies of better than 1.0% of Reading.

Dimensional Drawing



Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

Ordering Information

Please contact your local MKS office for configuration and availability information.