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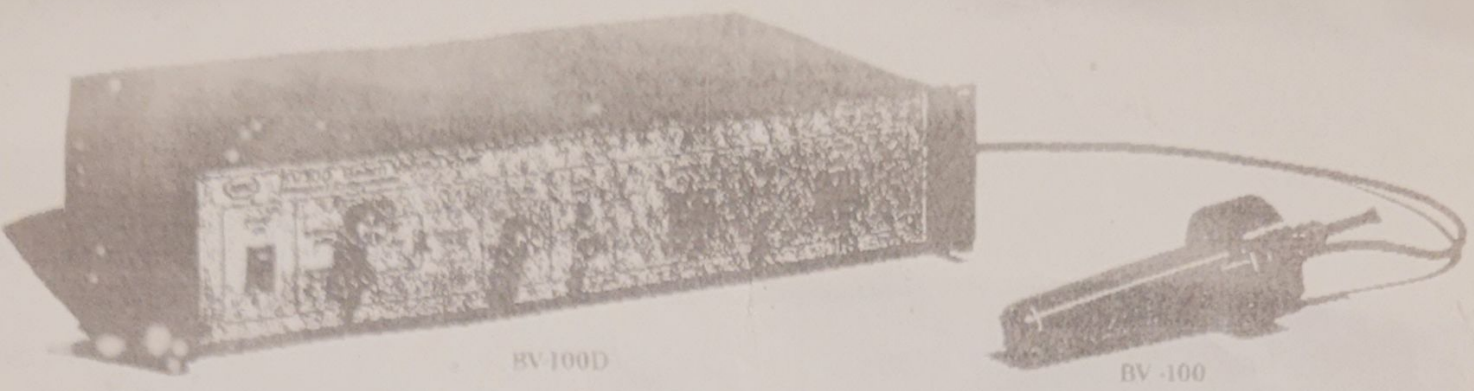
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Molecular Beam Valve



BV-100D

BV-100

(U. S. pat. no. 4,583,710)

- Pulses as short as 100 microseconds
- Backing pressures up to 10 atmospheres
- Usable with corrosive gases
- Operating temperature to 100 °C, bakeout to 150 °C
- Adjustable beam intensity and duration
- Compact, with interchangeable end plates
- Acoustically and electromagnetically quiet

The BV-Series Molecular Beam Valve system produces short-duration, high speed gas pulses that can be synchronized with an external event such as a laser pulse or a second gas pulse. The heart of the system is the compact **Model BV-100** electromagnetically actuated molecular beam valve. Control and synchronization signals are provided by the easy-to-use **Model BV-100D** electronic drive unit. A selection of high-vacuum compatible accessories makes it easy to integrate the system into your experiment.

Spectroscopists will find this valve ideal for pulsed laser spectroscopy and molecular scattering studies because it delivers high intensity beams with a narrow velocity distribution. Pulses as short as 100 microseconds can be produced at repetition rates up to 50 Hz. The unique design of the valve actuator mechanism allows continuous variable control over intensity and pulse duration while maintaining low power requirement, the valve needs no cooling and the system is electrically and acoustically quiet.

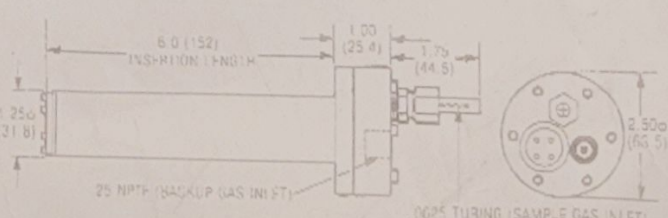
The valve is constructed from high-vacuum compatible materials such as stainless steel, nickel, Viton, and Kel-F. It can be used at backing pressures up to 10 atmospheres. The **BV-100** is rated for operation up to 100 °C and is compatible with vacuum system bake-out temperatures up to 150 °C. Particular attention was given to isolating the actuator assembly from the sample gas in order to accommodate a wide range of corrosive gases. Unlike other valves, this design does not expose the actuator mechanism itself to the corrosive gas, thus avoiding contamination and extending lifetime and performance.

The valve body consists of two chambers; a front sample gas chamber and a rear auxiliary gas chamber separated by a stainless steel bellows. The ferromagnetic actuator disc sits between two coils in the auxiliary gas chamber and is connected to the Viton valve plug by a shaft passing through the bellows. Energizing the rear coil retracts the plug from the orifice allowing sample gas to escape. Energizing the front coil returns the plug back to the orifice. The Viton orfice sealing plug is easily field-replaceable using the replacement kit supplied with the valve.

The molecular beam valve is easy to install in your vacuum system. Since it is only 1-1/4 in. (32mm) in diameter, it slips conveniently through standard flanged vacuum ports. Three types of fittings are available as accessories, so all you have to do is insert the valve into the fitting on your vacuum system and connect it to a gas supply.

Model BV-100D Beam Valve Driver provides full electronic control for the beam valve. The electromagnetic valve actuator assembly is driven by two low current, low voltage driving circuits to open and close the valve. The BV-100D provides the carefully shaped and timed pulses required for both "square topped," long-duration valve openings and "partial," spike- or intensity-regime operation.

Front panel controls provide continuously variable repetition rate, delay, pulse duration and intensity. The repetition rate can be set either by an internal trigger generator, or by a TTL compatible EXT TRIG input. The variable delay can be used, for example, to synchronize the gas pulse to a laser pulse.

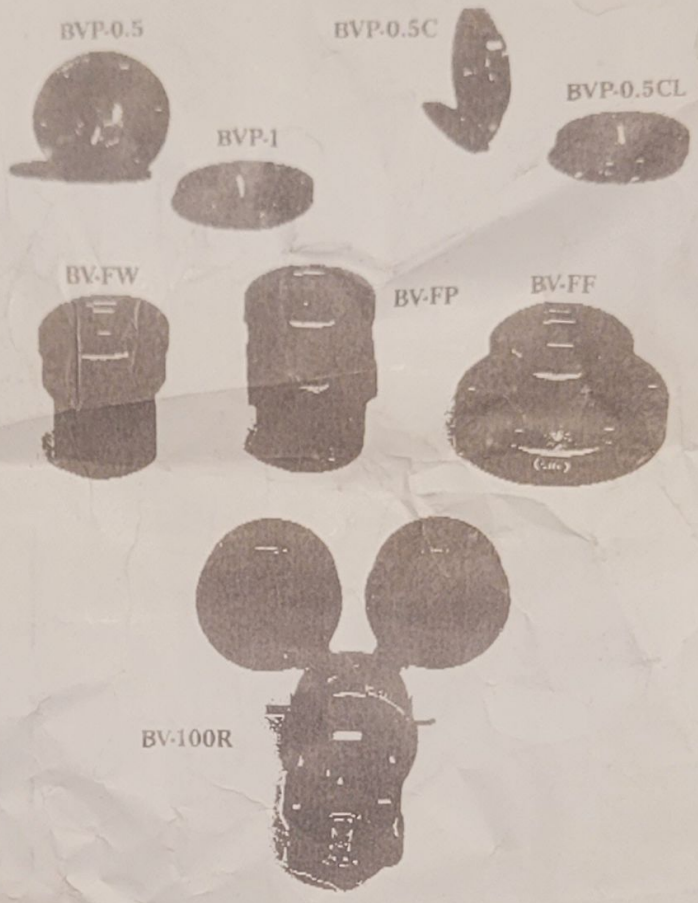


ACCESSORIES

END PLATES Interchangeable stainless steel end plates are available with a choice of orifice diameter and either flat or conical (120° and 30° full angle) surfaces. The 30° conical surface is particulary useful for molecular cluster formation. A blank end-plate is also available so the user can fabricate a custom orifice. Unless otherwise specified, the valve is supplied with **Model BVP-0.5 End Plate** with a flat 0.5mm diameter orifice.

FITTINGS Three high-vacuum compatible fittings make it simple to connect to virtually any vacuum system. The valve slips through the fitting and a vacuum-tight Viton O-ring seal is completed by finger tightening a standard vacuum connector assembly. Fitting **BV-FF** has a standard 2-3/4 in. knife-edged flange to connect to a vacuum port. **Model BV-FW** has a 1.50 in. tubular end for welding to the user's vacuum flange. **Model BV-FP** is terminated in a 1-1/4 in. NPT male thread.

DOME-LOADED REGULATOR The pressure differential between the valve's sample and auxiliary chambers cannot exceed 0.1 psi for full performance, or 5 psi with degraded performance. The stainless steel **Model BV-100R** dome-loaded pressure regulator assembly, when used with an auxiliary gas such as nitrogen, controls the differential pressure of the sample gas at the beam valve actuator to ensure optimal performance. It is recommended for smooth high-pressure operation particularly with corrosive gases. Inlet and outlet ports are 1/4 in. NPTF, and the auxiliary gas inlet port is 1/8 in. NPTF.



Specifications

BV-100V Valve

Pulse Duration	100 microsec min.
Beam Intensity	To 10^{22} molecules/steradian-sec
Repetition Rate	Adjustable to 50 Hz max.
Maximum Pressure	10 atmosphere
Max. Temperature	100°C operating, 150°C bakeout
Orifice Diameter	0.5mm supplied with valve; optional 1mm or blank
Size	Valve housed in 6 in. x 1-1/4 in. dia. package for variable intrusion depth into vacuum port
Gas Inlet Fittings	1/4 in. NPTF backing gas inlet, 1/16 in. O.D. tubing sample gas inlet

BV-100D Valve Driver Unit

Repetition Rate	0.5 to 50 Hz, continuously variable
Pulse Width	100 microsec to 1 msec
Pulse Delay	0.05 to 2 msec
Beam Intensity	Adjustable from zero to full intensity
Trigger Select	Internal/External
Input,	TTL-compatible External Trigger
Outputs	TTL-compatible SYNC, Pulse Current Monitor
Size	3-1/2 in. (60mm) H x 12 in. (305mm) D x 19 in. (483mm) W Rack Mount
Power	115/230 VAC 50-60 Hz, 1 amp
Control Cable	8 ft. (2.4m) length

Beam Valve System

	Model
Beam Valve	BV-100
Beam Valve Driver	BV-100D
Flanged Fitting	BV-FF
Weldable Fitting	BV-FW
Threadable Fitting	BV-FP
Dome-Loaded Regulator	BV-100R
End Plates	
0.5 mm dia., flat orifice	BVP-0.5
1.0 mm dia., flat orifice	BVP-1
0.5 mm dia., 120° conical orifice	BVP-0.5C
1.0 mm dia., 120° conical orifice	BVP-1C
0.5 mm dia., 30° conical orifice	BVP-0.5CL
1.0 mm dia., 30° conical orifice	BVP-1CL
Blank	BVP-0

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