



# The VRV-Parametric

Hardware

## Wet-Bench Exhaust Controller

The VRV -Parametric Exhaust Controller is derived from the family of stainless steel and epoxy valves developed by Progressive Technologies Inc [acquired by Brooks Automation, Inc. July, 2001.] The VRV – Parametric has all of the same features as traditional valves but at lower cost and increased chemical resistance. The design is the result of a parametric development of the control technology, which aims at satisfying customer requirements with custom engineering. Such level of engineering has been foreseen as a necessity to satisfy the requirements with robust.

### Features:

#### Speed:

Fractional second response to wet bench pressure and exhaust pressure changes.

#### Accuracy:

+/-10% of set point

#### Stability of Control:

Long term stability due to simple all-mechanical controller.

#### Reliability:

Only one moving component.

#### Safe Design:

Low exhaust pressure or failure mode is the fully open position of the controller.

#### Chemical Resistance:

Appropriate FM approved material determined by exhaust effluent.

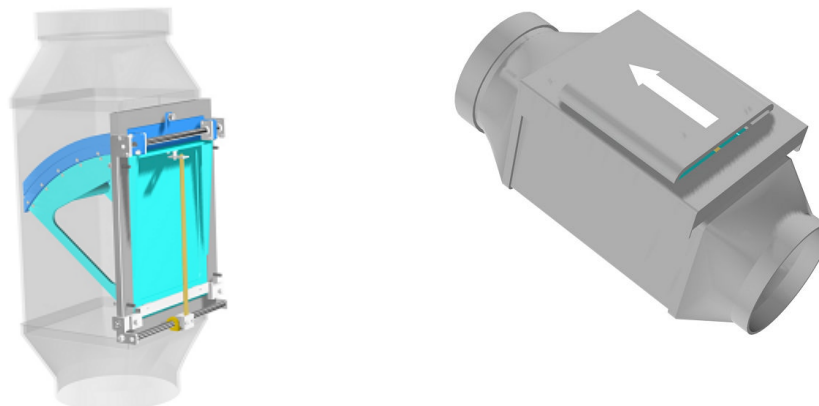
#### Modularity:

The controller can be utilized for a variety of applications and requirements.

## BENEFITS:

- **Safer** Operating Environment
- **Isolation** of wet bench from system perturbations.
- **Stable and Repeatable** environment yields higher manufacturing quality
- **Accuracy and Control Range** yields reduced air usage of wet bench and associated abatement equipment.
- **Energy Savings** resulting from standby mode operation.
- **Capital Equipment Savings** following from precise minimized air flow control.
- **No Periodic Rebalancing** of air flow to and from wet benches.
- **Low Maintenance**

VRV - Parametric Valve  
250mm, CPVC.



**Operating Principle:**

The VRV - Parametric exhaust controller sees three pressures:

- exhaust pressure that pulls the air through the valve;
- wetbench or “process” pressure or flow that needs to be controlled;
- clean-room pressure existing upstream of or outside the wetbench or process.

One moving component inside the valve is designed to sum all effects of above pressures for operational use. The resulting forces and moments caused by these static and dynamic pressures are kept in a continuous and nearly instantaneous equilibrium by the controlling element. The controlling element is a non-linear spring. The high force-to-weight ratio of the mechanism causes rapid, near instant response (less than 50 ms) even to large perturbations in exhaust pressure. Functionally, the process pressure has become isolated from other airflow events or disturbances in the environment. This inherent functionality is achieved with an all-mechanical system.

The objectives of the VRV - Parametric controller are to provide uncompromised safety, energy savings to the maximum safe level, durability and long-term stability of performance, and modularity to fit the frequent changes of a research environment. The requirements for the exhaust control valve of new downdraft wetbenches have been developed during cooperative discussions with customers and contractors.

**Summary of Specifications**

<b>Material in the Flow</b>	CPVC (Factory Mutual Approved Material)
<b>Exhaust Pressure Requirement</b>	-400 to -150 Pa
<b>Flow Rates through “#40-Style Wetbench”</b>	500 m <sup>3</sup> /hr to 1650 m <sup>3</sup> /hr, where <ul style="list-style-type: none"> <li>□ 1650 m<sup>3</sup>/hr is High-Flow setpoint           <ul style="list-style-type: none"> <li>○ adjustable from 1500 to 1700 m<sup>3</sup>/h</li> <li>○ flow accuracy +/-10% of setpoint for exhaust</li> <li>○ flow accuracy +/-10% of setpoint for table coverage below 50%</li> </ul> </li> <li>□ 500 m<sup>3</sup>/hr or actual flow through the FFU at 33%           <ul style="list-style-type: none"> <li>○ with fully closed 0cm sash</li> <li>○ actual range between 300 to 550 m<sup>3</sup>/h</li> </ul> </li> </ul>
<b>Pressure Control in wetbench manifold</b>	Operation at High-Flow, approx. -30Pascal Operation at Low-Flow approx. -60 Pascal
<b>Reference Pressure</b>	Controlled Service Chase or Grey Room Pressure, approx. +13 Pa.
<b>VRV - Parametric Orientation</b>	VUP (flow vertically up), must be +/- 1.5° of vertical
<b>VRV - Parametric Inlet</b>	25cm male stub
<b>VRV – Parametric Outlet</b>	25cm female stub

