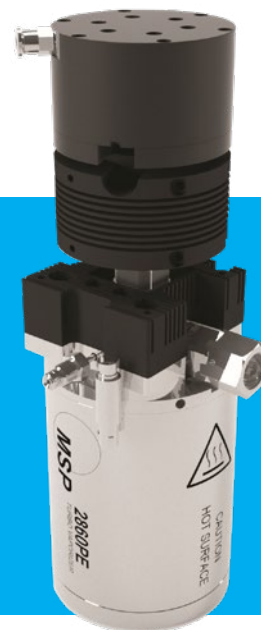


TURBO-VAPORIZER™ MODEL 2860PE

DROP-IN REPLACEMENT FOR DIRECT
LIQUID INJECTION (DLI) VALVE

High performance vaporization in a compact package, The Turbo-Vaporizer™ Model 2860PE is the drop-in replacement for poorly performing Direct Liquid Injection (DLI) valve systems. This compact solution results in more uniform films with lower non-uniformity percentage, denser films and less plasma induced damage. Model 2860PE features extremely stable concentration outputs, and its capacity to use increased liquid flow rates translates to increased deposition rates. These advantages, along with the increased operating times between maintenance cycles, equate to quality improvement and cost savings.



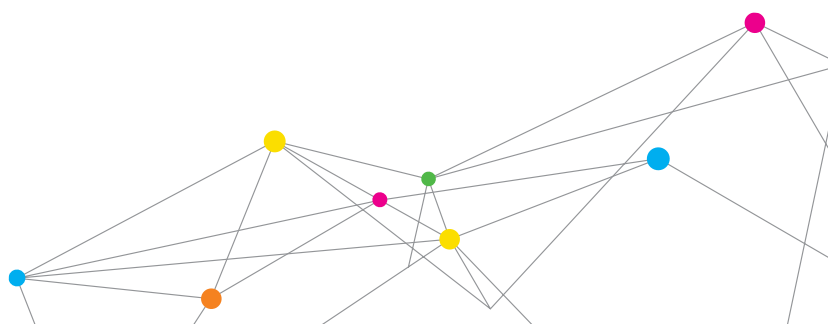
Model 2860PE includes a Performance Enhance (PE) atomizer and a compact heat exchanger providing complete vaporization at the lowest heat load.

The PE atomizer features on-board flow control, annular gas entry and a factory tunable gas orifice. The design provides precision flow control, fast response time, uniform vapor concentration, liquid bubble elimination and minimized dead volume resulting in sharp on/off vapor pressure curves even in low vacuum environments.

This compact vaporizer can fit in the exact location of competitive DLI valve units for retrofit opportunities, yet still includes a heat exchanger with enough energy and residence time to provide complete vaporization; minimizing maintenance requirements. Sheathed air surrounding the liquid prior to vaporization results in a much lower risk of thermal decomposition and particle generation.

Features and Benefits

- + Active heat exchanger for complete vaporization
- + Low temperature vaporization/reduced risk of thermal decomposition
- + Ability to vaporize difficult precursors
- + Liquid on demand - sharp on/off
- + Ultra-fast vaporization
- + High vapor concentration potential
- + Chemically resistant - 316 Stainless Steel construction



SPECIFICATIONS

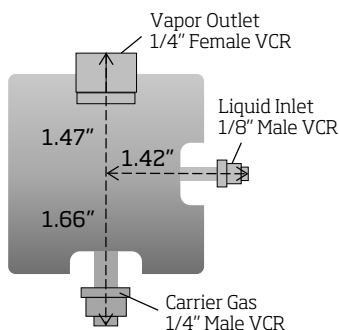
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Specifications

Max Liquid Flow Rate*DI Water (g/hr)	60
Max Flow Rate*TEOS (g/hr)	720
Max Carrier Gas Flow Rate* N ₂ (SLPM)	15
Temperature Range* (°C)	40-200
Typical Power (W)	300
Dimensions HxWxL (mm/in)	254x127x101.6 mm 10x5x4 inches
Mass (kg/lb)	7.2/3.3

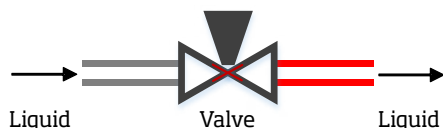
*Liquid and gas flow rates are affected by liquid and gas type

Connection Types & Locations, Top View



The Model 2860PE is a drop in replacement to common DLI valve units. The fitting dimensions and types were designed to be an exact match for fast retrofit.

Potential Problems with Direct Liquid Injection (DLI) Valves



- + Thermal decomposition
- + Incomplete vaporization
- + Decomposed liquid forms particles
- + Intensive maintenance
- + Limited concentration
- + Clogging of DLI valve and downstream tubing

The Model 2860PE is the solution to poorly performing DLI valve systems.

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UNDERSTANDING, ACCELERATED

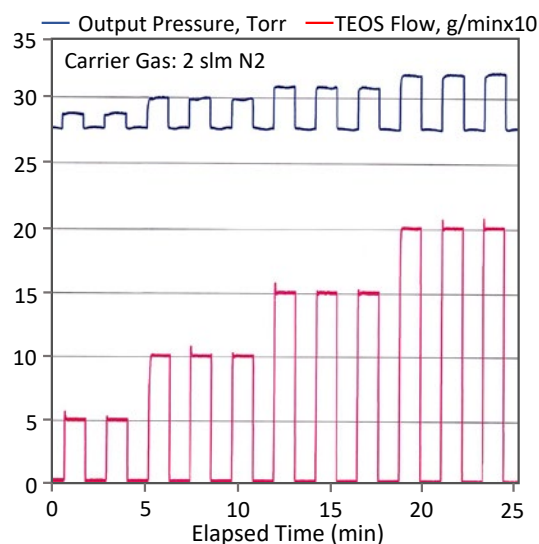
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Turbo-Vaporizer Output Pressure vs Time as a Function of Liquid Flow Rate

The vapor pressure downstream of the vaporizer correlates well with the TEOS liquid flow rate: showing fast response time and sharp on/off. The flat curves at the top of each cycle show extremely steady concentration output. As the TEOS flow rate increases, the vapor pressure also increases, showing a linear relationship with liquid flow rate and concentration. Competitive DLI valve units have low vapor concentration output limits - regardless of how much liquid is pumped into the system.



H = Superior; M = Moderate; L = Poor

	MSP Turbo-Vaporizer	DLI Valve	Bubbler
Stability	H	M	L
Flow Control	H	H	L
Complete Vaporization	H	L	M
Low/No Thermal Decomposition	H	L	M
Low Flow	H	H	M
High Flow	H	L	L
Long MTBR	H	L	M
Carrier Gas	M	H	M
Response Time	H	M	L