

Palladium Hydrogen Gas Purifier

PS7-PD1-10 through PS7-PD1-70

The MegaTorr® palladium hydrogen gas purifiers use a micro-channel palladium membrane process to provide ultra-high purity (UHP) hydrogen for semiconductor applications. Outlet impurity levels for all impurities including O₂, CO, CO₂, H₂O, CH₄, He, Ar, and N₂ are reduced to sub parts per billion (ppb) levels.

Hydrogen is fed into the system via the H₂ inlet connection. The gas flows into palladium (Pd) cells, which allow only pure hydrogen to diffuse through the membranes to the pure side. The purified gas then flows to the outlet connection. The Pd cells operate at 400°C, and trapped impurities are vented through the bleed gas line. A nitrogen purge system is included to purge the purifier at startup and during any shutdown.

SAFETY FEATURES

- **Hydrogen sensor:** Placed inside the cabinet to detect hydrogen and give a control system alert.
- **Emergency stop button (EMO):** Provides immediate shutdown of heater power.
- **High temperature hardware interlock:** For over-temperature protection independent of the control system.

STANDARD FEATURES

- Microprocessor PLC
- 5.7" color touch screen human machine interface (HMI)
- Nitrogen purge system
- Bleed gas vent line
- Leak test connections
- Inlet and outlet pressure transducers
- Electric gas preheater with heat exchanger
- Closed-loop temperature controls
- Alarm and gas relay customer connections
- Vented cabinet purge with low airflow warning



- Ground fault equipment protection (GFEP)
- Data storage
- Purifier hold down brackets

OPTIONAL EQUIPMENT

- Deoxo pre-purifier for inlet hydrogen with >100 ppm O₂
- Inlet mass flow meter provides process gas flow rate and total flow indication
- Auto or manual bypass allows process gas flow to bypass the PD cell.
- MODBUS® Data communication port provides operation data output.
- Z-purge of electrical bay for safety compliance in certain operating environments.
- Separate control power allows purifier control system to be powered by an external, customer supplied power source or UPS.

APPLICATIONS

- Semiconductor
- Flat panel display
- Fiber optic
- LED/compound semiconductor
- Research
- Solar
- Fuel cell

MODEL	TYPICAL FLOW AT 260 PSIG INLET, 80 PSIG OUTLET PRESSURE
PS7-PD1-10 ~ 30*	7.0 Nm ³ /hr – 21.0 Nm ³ /hr
PS7-PD1-40 ~ 70*	28.0 Nm ³ /hr – 49.0 Nm ³ /hr

*Standard models available in sizes 10, 20, 30, 40, 55, and 70 Nm³ defined at normal conditions of 20°C and 1 atm.

PRODUCT SPECIFICATIONS (FOR ALL MODELS)

Gas purified	Hydrogen
Inlet requirements	<p>H₂: 4.0N inlet purity*, 20 micron max particle size</p> <p>Temperature 0° – 35°C (32° – 95°F)</p> <p>Pressure 3.8 barg (55 psig) minimum 20.7 barg (300 psig) maximum Customer must provide inlet overpressure protection at no greater than 22.8 barg (330 psig)</p>
Instrument air	<p>Clean, dry air or nitrogen filtered to 10 µm</p> <p>Pressure 6.6 barg (95 psig) minimum 9.7 barg (140 psig) maximum</p>
Optional Z-purge (uses instrument air supply)	<p>Clean, dry air or nitrogen filtered to 10 µm</p> <p>Pressure 6.6 barg (95 psig) minimum 9.7 barg (140 psig) maximum</p>
Nitrogen purge	<p>99.95% or better, 5 – 20 slpm</p> <p>Pressure 5 barg (72 psig) minimum 6.8 barg (98 psig) maximum</p>
Helium leak test input pressure	<p>Minimum 10 psig greater than N₂ pressure</p> <p>Maximum 13.79 barg (200 psig)</p>
Impurities removed	H ₂ O, O ₂ , CO, CO ₂ , N ₂ , CH ₄ **, NMHC, He, and Ar to <1 ppb*
Inlet particle filtration	0.5 micron (standard)
Maximum allowable differential pressure	<12.4 bard (180 psid)
Operating temperature (nominal)	Palladium cell at 400°C (752°F)
Applicable codes and standards	<p>ASME Pressure Vessel Standards Section VIII</p> <p>US National Electric Code</p> <p>CE Marking (must be specified on order)</p>

*Consult factory for non-standard inlet or outlet purity requirements. Analytical specification certified at greater than 10% of the maximum flow (NMHC, He, and Ar removal is guaranteed but not measured).

**Tested to < 10ppb at the factory, < 1 ppb outlet purity achieved after suitable conditioning.

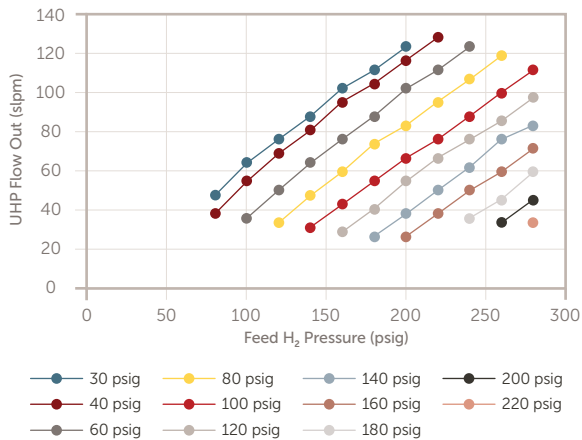
Purifier model	PS7-PD1-10 ~ 70
Dimensions	Height: 999 mm (~39.3") Width: 762 mm (~30.0") Depth: 483 mm (~19.0") Weight: <300 Kg (<660 lbs)
Purifier clearance	1 meter (~3 feet) in front of purifier
Mechanical connections	Feed inlet: ½" FVCR Purified outlet: ½" FVCR Bleed gas outlet vent: ¼" FVCR Nitrogen purge inlet: ¼" MVCR Cabinet vent: 4" duct Pneumatic inlet: ⅜" FNPT
Bleed gas vent temperature	Ambient air +30°C (+54°F)
Bleed gas vent flow rate	2% of maximum rated flow
Main power	3600 W 208 or 230 VAC, 1 phase, 50/60 hZ
Separate control power	120 or 230 VAC, 1 phase, 50/60 Hz, Power consumption: 0.1 kW
Cabinet ventilation	260Nm³/hr (150 scfm) (at facilities vacuum – 0.2" H₂O)
Installation	Indoor, non-classified area, ambient temperature 5° – 35°C (41° – 95°F)

PERFORMANCE DATA

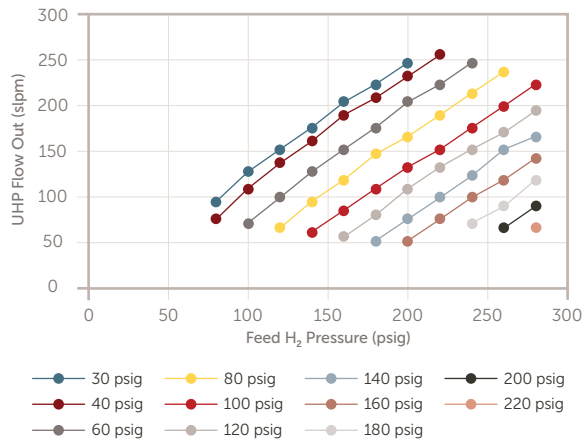
Flow Rate

This is an estimate of maximum flow conditions. Actual minimum flow conditions may be slightly above or below the estimates shown.

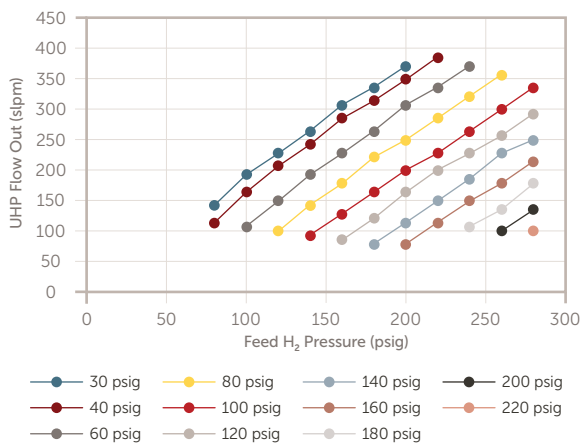
UPH Flow Rate vs. Inlet Pressure PD2 -10



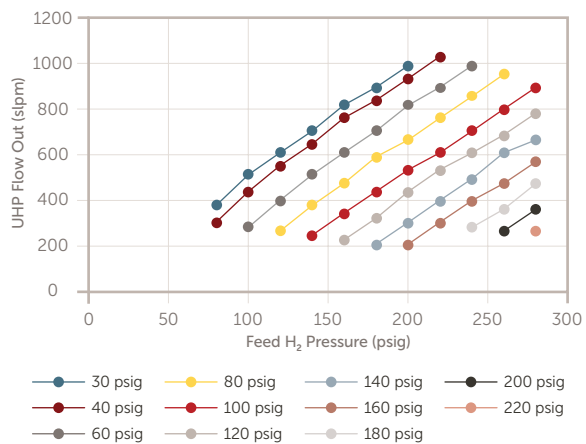
UPH Flow Rate vs. Inlet Pressure PD2 -20



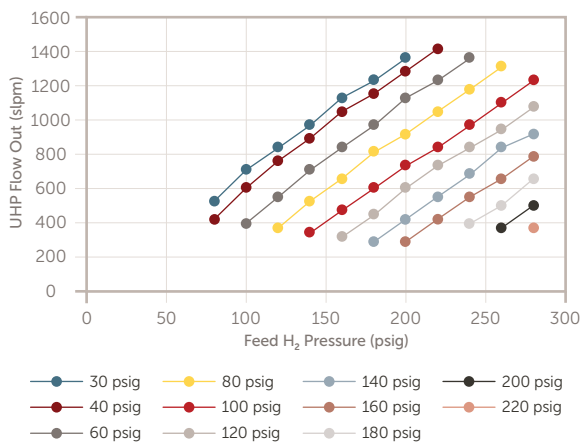
UPH Flow Rate vs. Inlet Pressure PD2 -30



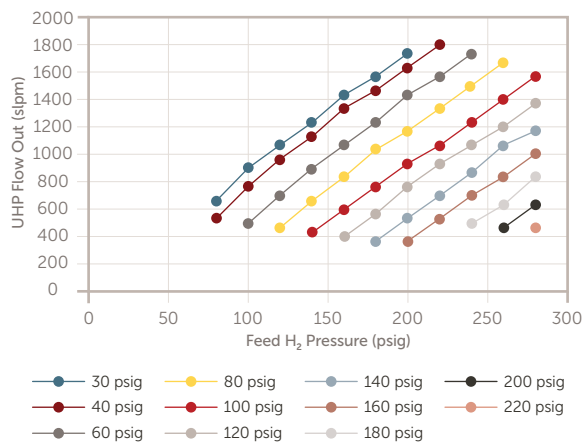
UPH Flow Rate vs. Inlet Pressure PD2 -40



UPH Flow Rate vs. Inlet Pressure PD2 -55



UPH Flow Rate vs. Inlet Pressure PD2 -70



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