

Ultimate Process Gas Load Calculations - DEUTERIUM
 2.75" Conflat High Vacuum System
 Design Iteration #4

1.) Maximum Gas Loads for Deuterium for Processes in Molecular Flow (Beam-on-Target Systems)

$$S_e = (Q_{total})/P_w$$

$$S_e = \text{Effective Speed} = 49.241 \text{ L/s (Deuterium @ 20C)}$$

$$Q_{total} = \text{Total Gas Load (Torr} \cdot \text{L/s)} = Q_{\text{water_vapor}} + Q_{\text{process_gas}}$$

$$P_w = \text{Working Pressure (Torr)}$$

$$Q_{\text{process_gas}} = (S_e \times P_w) - Q_{\text{water_vapor}}$$

$$1 \text{ Torr} \cdot \text{L/s} = 80 \text{ SCCM}$$

a.) Unbaked, Pumped 1 hr

S_e (L/s)	P_w (Torr)	$Q_{\text{water_vapor}}$ (Torr-L/s)	$Q_{\text{process_gas}}$ (Torr-L/s)	Gas Flow Rate (SCCM)
49.241	1.000E-07	2.903E-05	-2.411E-05	-1.928E-03
49.241	1.000E-06	2.903E-05	-2.021E-05	1.617E-03
49.241	1.000E-05	2.903E-05	4.634E-04	3.707E-02
49.241	1.000E-04	2.903E-05	4.895E-03	3.916E-01

b.) Unbaked, Pumped > 24 hr

S_e (L/s)	P_w (Torr)	$Q_{\text{water_vapor}}$ (Torr-L/s)	$Q_{\text{process_gas}}$ (Torr-L/s)	Gas Flow Rate (SCCM)
49.241	1.000E-07	1.428E-05	-9.356E-06	-7.485E-04
49.241	1.000E-06	1.428E-05	3.496E-05	2.797E-03
49.241	1.000E-05	1.428E-05	4.781E-04	3.825E-02
49.241	1.000E-04	1.428E-05	4.910E-03	3.928E-01

c.) Baked, Pumped > 24 hr

S_e (L/s)	P_w (Torr)	$Q_{\text{water_vapor}}$ (Torr-L/s)	$Q_{\text{process_gas}}$ (Torr-L/s)	Gas Flow Rate (SCCM)
49.241	1.000E-07	9.589E-06	-4.665E-06	-3.732E-04
49.241	1.000E-06	9.589E-06	3.965E-05	3.172E-03
49.241	1.000E-05	9.589E-06	4.828E-04	3.863E-02
49.241	1.000E-04	9.589E-06	4.915E-03	3.932E-01

2.) Maximum Gas Loads for Deuterium for Processes in Transitional Flow (Fusor Operation)

$$S_e = (Q_{total})/P_w$$

$$S_e = \text{Effective Speed} = 42.265 \text{ L/s (Deuterium @ 20C)}$$

$$Q_{total} = \text{Total Gas Load (Torr} \cdot \text{L/s)} = Q_{\text{water_vapor}} + Q_{\text{process_gas}}$$

$$P_w = \text{Working Pressure (Torr)}$$

$$Q_{\text{process_gas}} = (S_e \times P_w) - Q_{\text{water_vapor}}$$

$$1 \text{ Torr} \cdot \text{L/s} = 80 \text{ SCCM}$$

a.) Unbaked, Pumped 1 hr

S_e (L/s)	P_w (Torr)	$Q_{\text{water_vapor}}$ (Torr-L/s)	$Q_{\text{process_gas}}$ (Torr-L/s)	Gas Flow Rate (SCCM)
42.265	1.000E-03	2.903E-05	4.224E-02	3.379E+00
42.265	1.000E-02	2.903E-05	4.226E-01	3.381E+01

b.) Unbaked, Pumped > 24 hr

S_e (L/s)	P_w (Torr)	$Q_{\text{water_vapor}}$ (Torr-L/s)	$Q_{\text{process_gas}}$ (Torr-L/s)	Gas Flow Rate (SCCM)
42.265	1.000E-03	1.428E-05	4.225E-02	3.380E+00
42.265	1.000E-02	1.428E-05	4.226E-01	3.381E+01

c.) Baked, Pumped > 24 hr

S_e (L/s)	P_w (Torr)	$Q_{\text{water_vapor}}$ (Torr-L/s)	$Q_{\text{process_gas}}$ (Torr-L/s)	Gas Flow Rate (SCCM)
42.265	1.000E-03	9.589E-06	4.226E-02	3.380E+00
42.265	1.000E-02	9.589E-06	4.226E-01	3.381E+01