

**Topic Outline**

2c. Vacuum Peripherals

**Valves**

- Gate Valves
- Butterfly Valves
- Gasket Valves
- Throttle Valves

**Feedthroughs and Ports**

- Windows
- Power
- Liquids (or Gases)

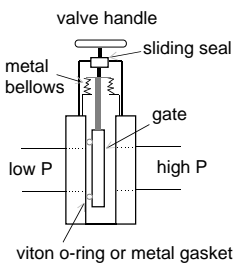
**Sample Manipulator**

**Transport Rods**

- Gasketed
- Magnetically Coupled
- Bellows

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**Gate Valves**

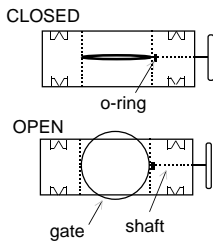


**Operation**  
The handle raises or lowers the shaft through the seal. This expands or contracts the bellows to raise or lower the gate. The gate typically travels on a set of rollers and is spring loaded.

**Application**  
Transport of samples into and out of the vacuum system.

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**Butterfly Valves**



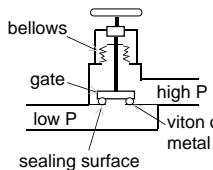
**Operation**  
The handle turns the shaft to turn the gate to the open or closed position.

**Application**  
ON/OFF transport of gases through a line.

This is NOT the valve to use for controlled flow of gases.

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**Gasket Valves**

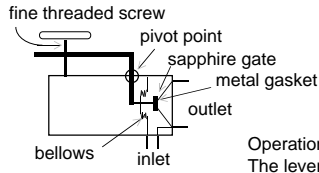


**Operation**  
The gate is moved away from the sealing surface by the action of the handle and shaft.

**Application**  
Opening or closing pump lines from the chamber.

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**Throttle Valves**



**Application**  
This IS the valve to use for fine control over the flow of gases.

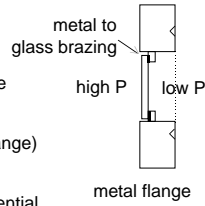
**Operation**  
The lever arm moves the gate away from or against the metal gasket.

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**Windows**

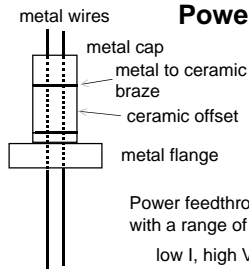
**Desired Properties**

- transparent in visible range (opaque in x-ray range)
- (transparent in UV or IR range)
- stable under bake out
- withstands pressure differential



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**Power**

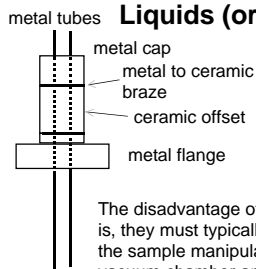


similar arrangements exist for thermocouple inputs

Power feedthroughs are available with a range of I - V characteristics  
low I, high V - large ceramics  
high I, low V - thick wires

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**Liquids (or Gases)**



The ceramic offset acts as a thermal insulator for cryo liquids. It is otherwise unnecessary.

The disadvantage of liquid feedthroughs is, they must typically be well connected to the sample manipulator INSIDE the vacuum chamber and therefore cannot be removed after they are put in place.

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### Sample Manipulator

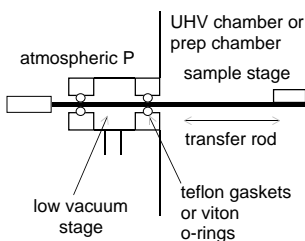
**Desired Properties**

- rotation of sample about normal and azimuth
- heating to XXX °C (W melting temperature)
- cooling to YYY °C (liquid N<sub>2</sub> temperature)
- thermocouple connection circuit to sample
- electrical conduction path through sample
- rapid and reliable interchange of samples
- ability to handle moderately large samples
- We cannot satisfy all of these at one time!

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### Gasketed

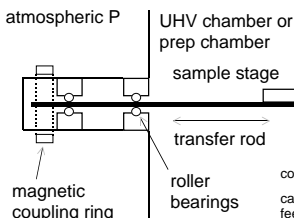
This system is also differentially pumped.



- pros
- reliable
- can include power, thermocouple, or liquid feedthroughs
- cons
- requires regular replacement of seals
- can accidentally "vent" chamber to air if seals fail

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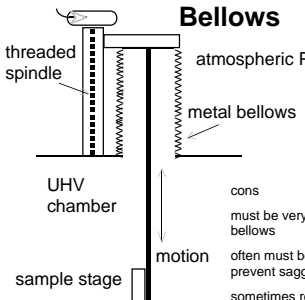
### Magnetically Coupled



- pros
- reliable
- does not require differential pumping to reach UHV
- no danger of accidental "vent" to air
- cons
- cannot include any feedthroughs from the outside

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### Bellows



- pros
- reliable and UHV tight
- can include feedthroughs (mounted separately)
- can often include sample rotation (about normal and azimuth)
- cons
- must be very careful not to damage bellows
- often must be mounted vertically (to prevent sagging of bellows)
- sometimes requires breaking the vacuum to change the sample

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