

Topic Outline

2c. Vacuum Peripherals

Valves

Gate Valves

Butterfly Valves

Gasket Valves

Throttle Valves

Feedthroughs and Ports

Windows

Power

Liquids (or Gases)

Sample Manipulator

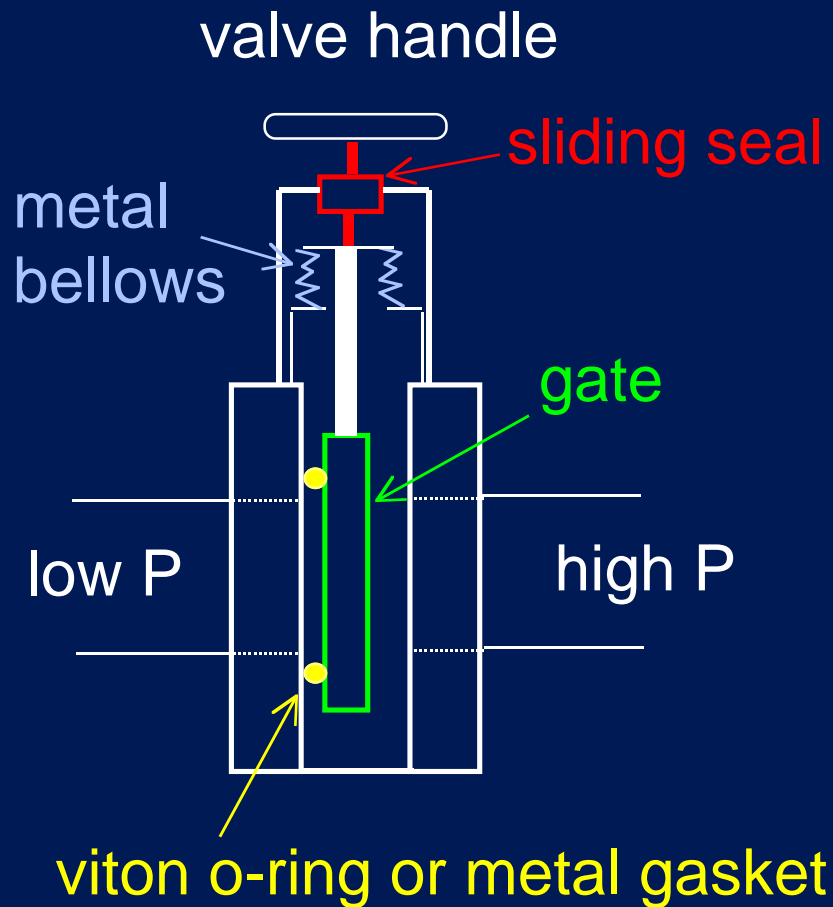
Transport Rods

Gasketed

Magnetically Coupled

Bellows

Gate Valves



Operation

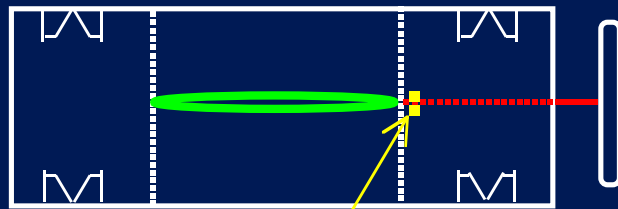
The handle raises or lowers the shaft through the seal. This expands or contracts the bellows to raise or lower the gate. The gate typically travels on a set of rollers and is spring loaded.

Application

Transport of samples into and out of the vacuum system.

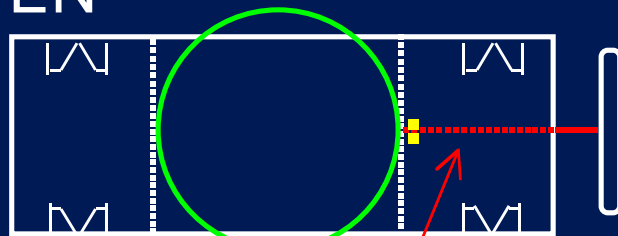
Butterfly Valves

CLOSED



o-ring

OPEN



gate

shaft

Operation

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

Application

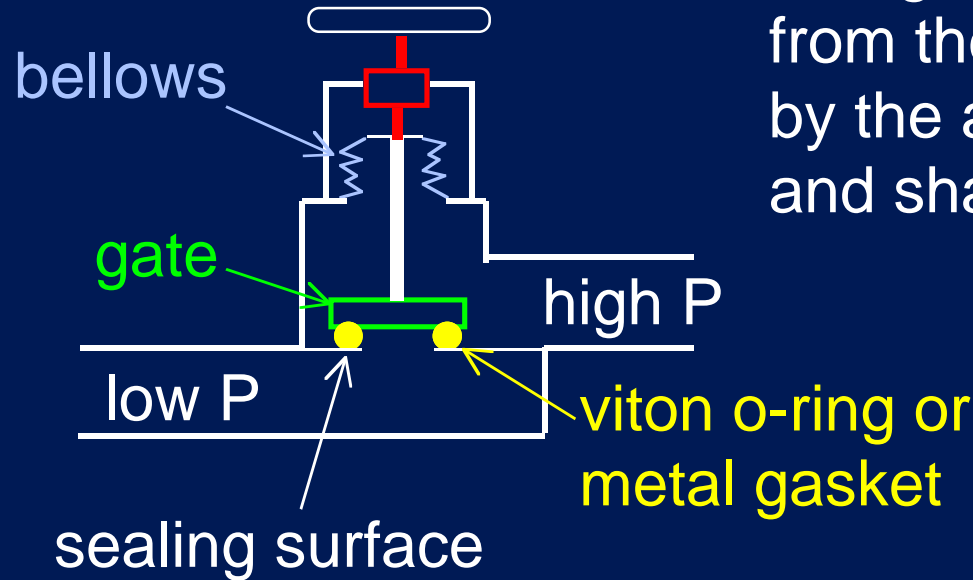
ON/OFF transport of gases through a line.

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

Gasket Valves

Operation

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

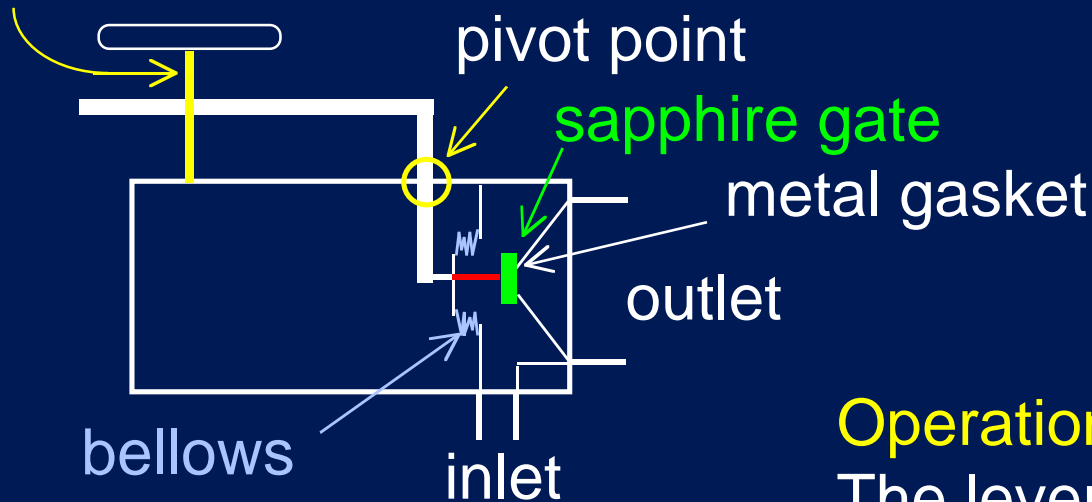


Application

Opening or closing pump lines from the chamber.

Throttle Valves

fine threaded screw



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.

Windows

Desired Properties

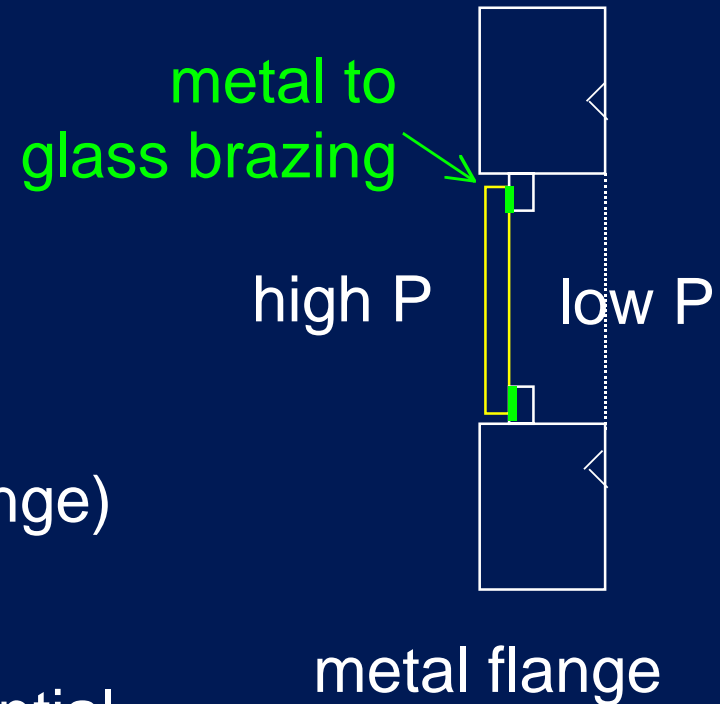
transparent in visible range

(opaque in x-ray range)

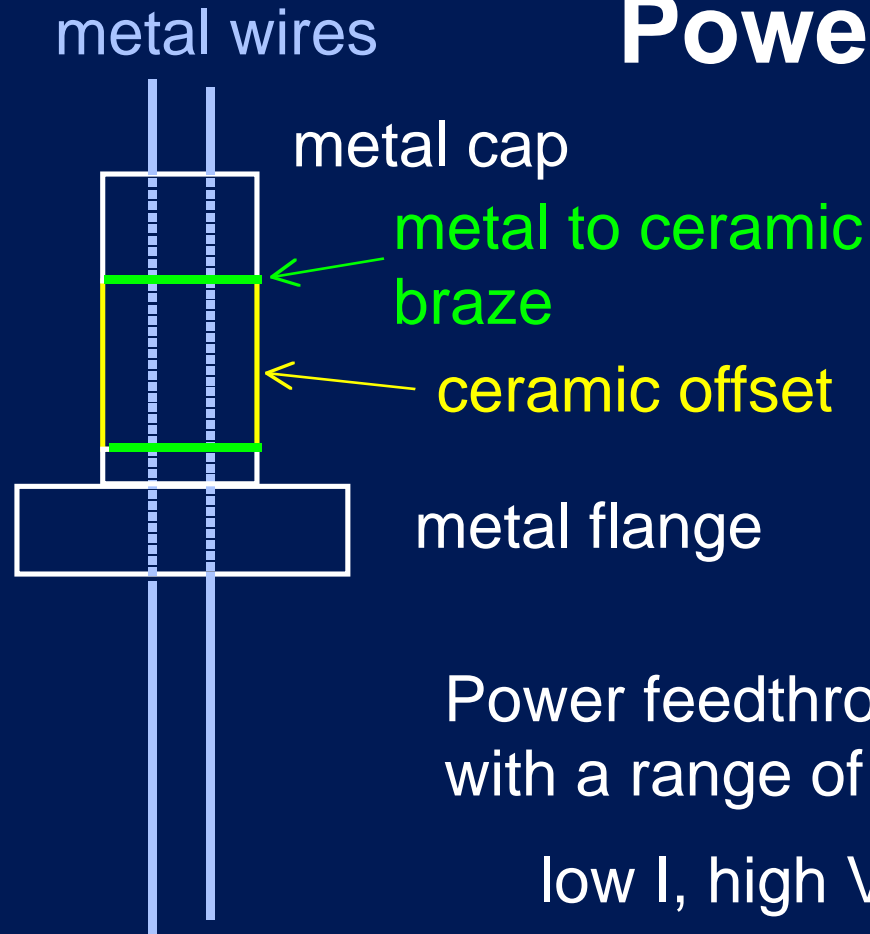
(transparent in UV or IR range)

stable under bake out

withstands pressure differential



Power



similar
arrangements
exist for
thermocouple
inputs

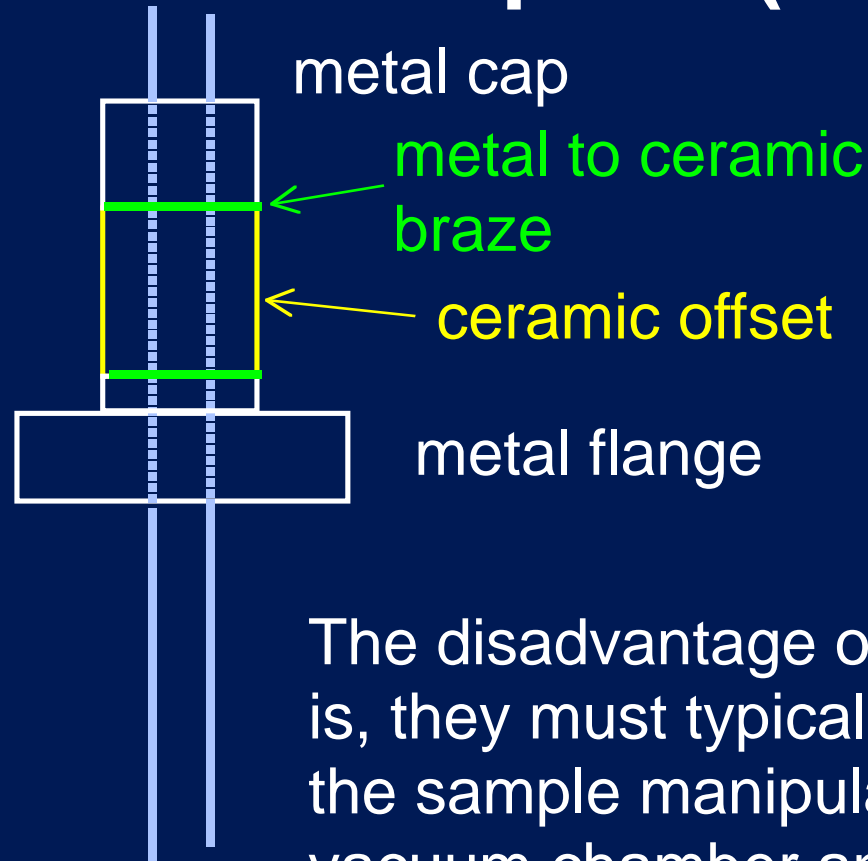
Power feedthroughs are available
with a range of I - V characteristics

low I, high V - large ceramics

high I, low V - thick wires

metal tubes

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.

Sample Manipulator

Desired Properties

rotation of sample about normal and azimuth

heating to XXX °C (W melting temperature)

cooling to YYY °C (liquid N₂ temperature)

thermocouple connection circuit to sample

electrical conduction path through sample

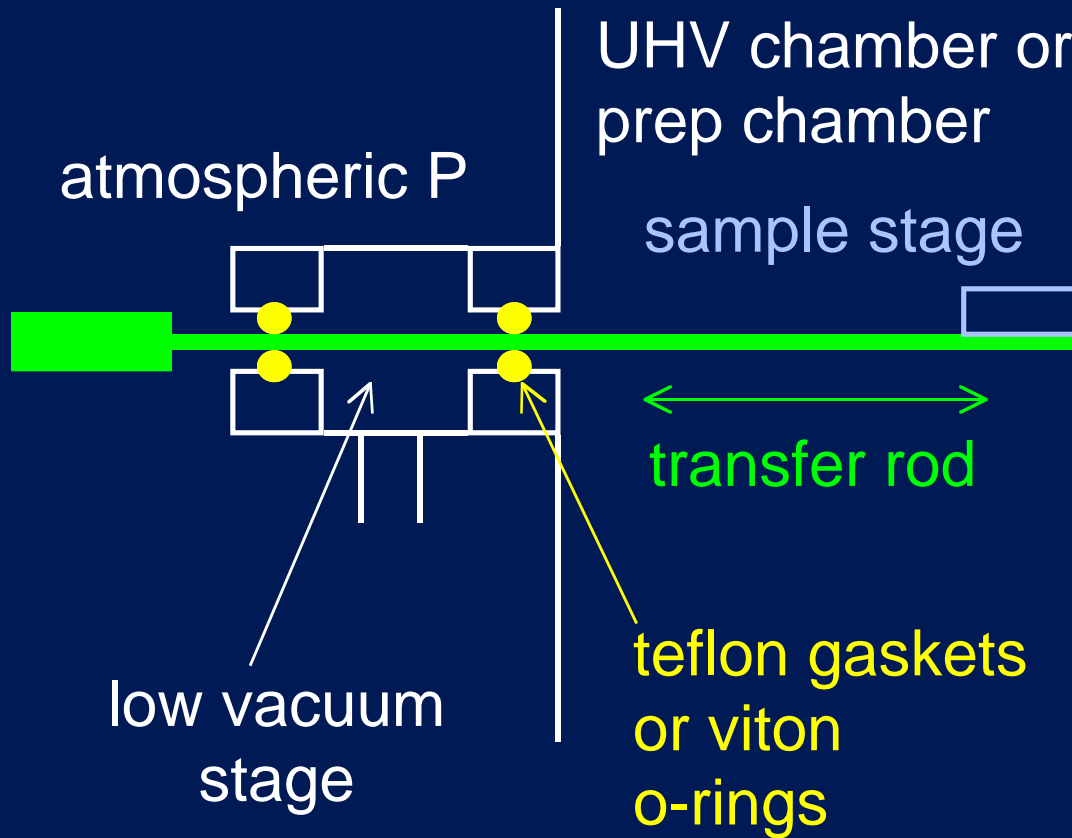
rapid and reliable interchange of samples

ability to handle moderately large samples

We cannot satisfy all of these at one time!

Gasketed

This system is also differentially pumped.



pros

reliable

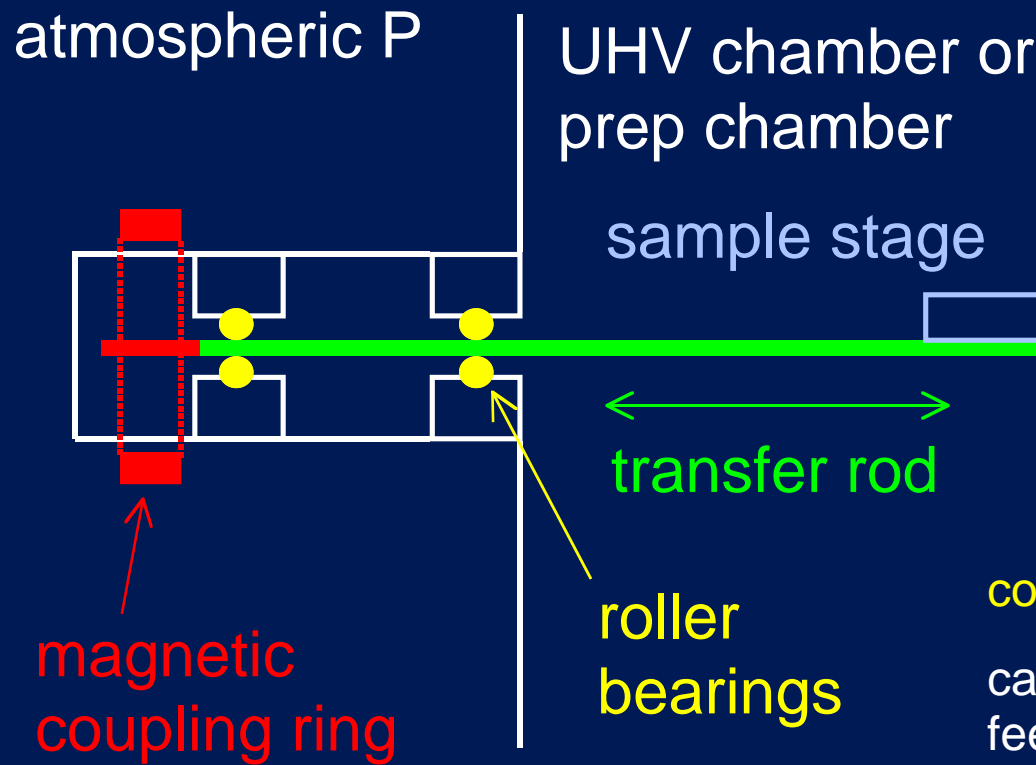
can include power, thermocouple, or liquid feedthroughs

cons

requires regular replacement of seals

can accidentally "vent" chamber to air if seals fail

Magnetically Coupled



pros

reliable

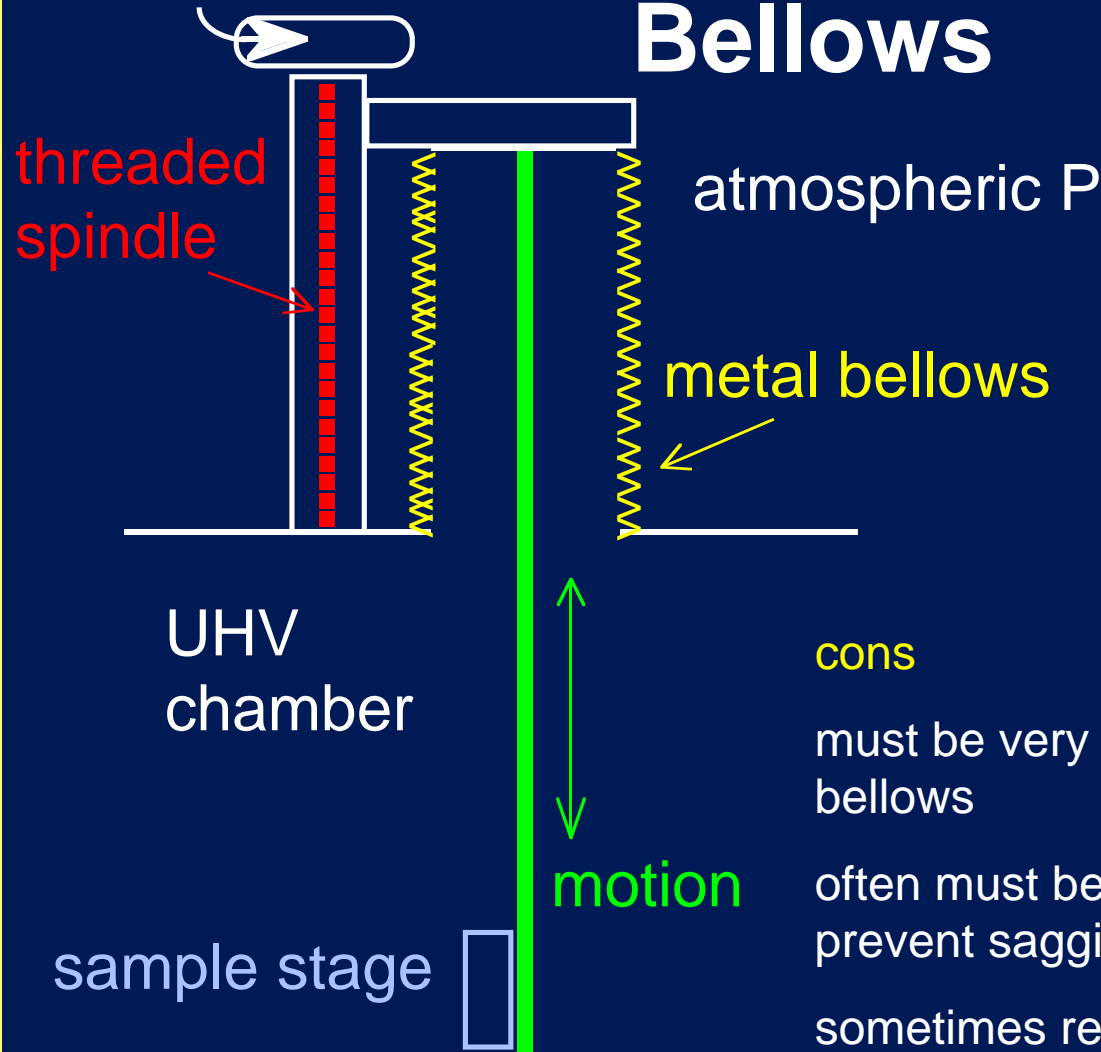
does not require differential pumping to reach UHV

no danger of accidental "vent" to air

cons

cannot include any feedthroughs from the outside

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