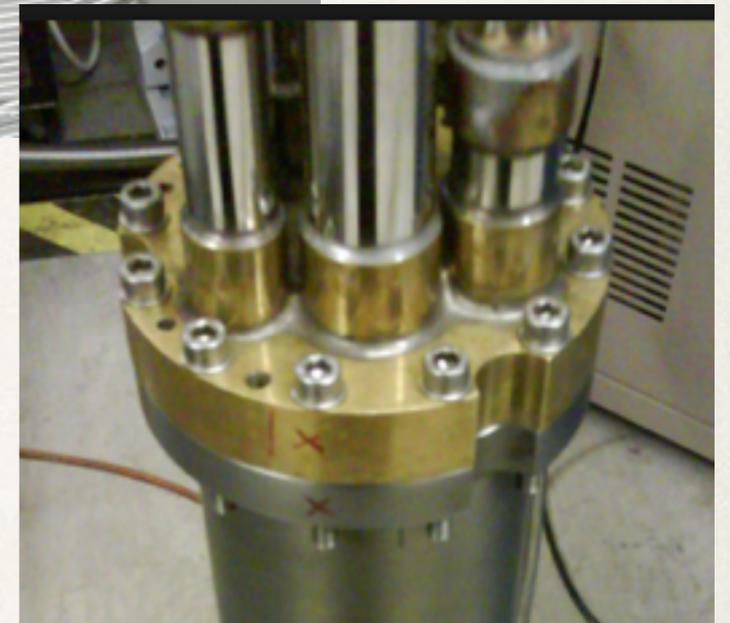


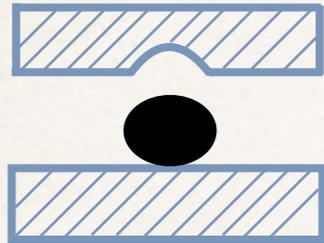
# Indium Seals

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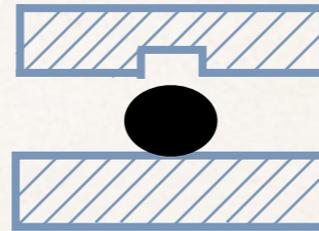
- ❖ Specially for cryogenic temperatures.
- ❖ Works with similar or dissimilar surfaces.
- ❖ Lower melting point and harder than lead.
- ❖ Make the indium seals vertically to avoid any side forces (as gravity).
- ❖ Try to use bolts with a bigger rate of contraction than the flanges
- ❖ Wear gloves all the time.



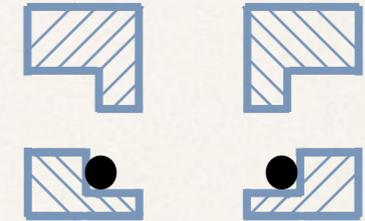
# Seal Design



One flange with a semicircular groove done with a rounded mill of the same diameter of the indium wire, machined to a depth equal to half the indium wire diameter. And, the other flange a polished surface.



One flange with a square step groove, machined with a standard flat nosed end mill. The gap area of the seal should be around 80% or slightly less of the cross sectional area of the indium wire. And, the other flange is a polished surface



One flange with a step groove and the other with the reverse mating form. The gap should be around 80% of the cross sectional area of the indium wire. This is the most effective form.

The bolts pressing the plates should be close enough to allow the force fields to overlap at about the 50% point.

Flange Diameter	Socket Head/Bolt Circle	Indium O-Ring size
1" - 2"	4-40 SH/ 8X45.0 deg.	.020" - .030"
2.5" - 4.0"	6-32 SH/ 12X30.0 deg.	.040"
4.5" - 6.0"	8-32 SH/ 16X22.5 deg.	.040" - .060"
7.0" - 19.0"	10-32SH/ 24X15.0 deg.	.060" - .090"
20" - 48"	1/4-20 bolts spaced 2"	.090" - .125"

# Seal Process



1. Remove indium residues of both flanges with a wooden spatula or any soft tool ( avoid to scratch the surfaces).
2. Polish the surfaces with a polishing pad.
3. Clean the surfaces with acetone or isopropanol and with to dry.
4. Clean the indium wire with a kimwipe moistened with isopropanol (be very careful with the wire).
5. Fit the wire in the groove and finish with a crossover joint.
6. With your fingers, carefully compress the wire to the flange and try to make the crossover joint of the same thickness as the wire.
7. Screw the flanges together until about 1/8th turn of plastic deformation. And repeat the process in all the bolts until no deformation can be felt.
8. Wait 10 minutes for the indium seal to relax and tight all the bolts again.

# Oxide formation in the indium wire

At room temperature the indium surface oxide about 80-100 Armstrong.

1. Clean the indium in isopropyl alcohol or acetone to remove any surface organics. Allow to dry.
2. Etch the indium in 10% HCl for 1 minute to remove the surface oxides.
3. Rinse the indium in DI water to remove the acid.
4. Rinse the indium in isopropyl alcohol or acetone to remove the water.
5. Blow dry with dry nitrogen or allow to air dry.

See more at [Indium Corporation](#)

# Disposal of indium

Collect all the indium waste and don't mix with anything else. Try to recycle it. For example using [Indium Corporation](#)