Chamber Accessories and Feedthroughs

For many years now **KEY HIGH VACUUM PRODUCTS, INC.** has fabricated **"custom"** vacuum chambers and components for our systems group, in addition to countless others for prominent public and private universities, government laboratories, etc.. A majority of the chambers **KEY HIGH** constructed for our customers, are per customer specification.

KEY HIGH is proud to announce we have expanded extensively on our product line, offering numerous new items including **"standard"** building block chamber components. These **"standard"** chambers and components allow the user to design and manufacture a system with flexibility in the project. This permits the procurement of only the components necessary when constructing a new system or updating an existing system.

In the subsequent pages are listed standard chamber components as well as **several hard to find items, such as valve controllers, hoists and other sub-assemblies.** These items permit the user to fabricate a complete vacuum system in a variety of configurations. By mixing together baseplates, collars and bell jars a variety of unique possibilities become open to the user.

At KEY, we sell solutions; different types of chamber accessories as well as an extensive assortment of high vacuum components; long life valves, traps and many other high vacuum accessories.

As with all of our products our custom products group can quote special order assemblies in most instances from simple sketches. This assures prompt quotes and dependable delivery dates.

Please call Key High at 631-360-3970 or email us at info@KeyHigh.com for the most up-to-date listing of products and for pricing information.

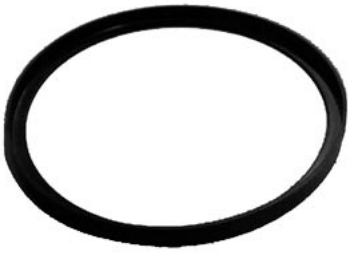
Pyrex® bell jars are supplied with rimless ground edge for use with flat baseplates and collars. The rimless edge accepts standard "L" shaped bell jar gaskets for a leak tight seal. Bakeouts higher than 150° C is not recommended and should only be done with infrared heat lamps, as they distribute heat evenly and minimize stress points. **Bell Jar Guards** are strongly recommended to protect personnel against an accidental implosion. **KHVP** guards are manufactured from perforated aluminum with aluminum spun top and tightening straps to conform to each individual bell jar.

Pyrex® Bell Jars

Part Number	Diameter / Height
BJ-1	10" X 12"
BJ-2	12" X 18"
BJ-3	18" X 18"
BJ-4	18" x 30"

Bell Jar Guards

Part Number	Diameter / Height
G-1	10" X 12"
G-2	12" X 18"
G-2A	14" X 18"
G-2B	15" X 18"
G-3	18" X 18"
G-4	18" X 30"

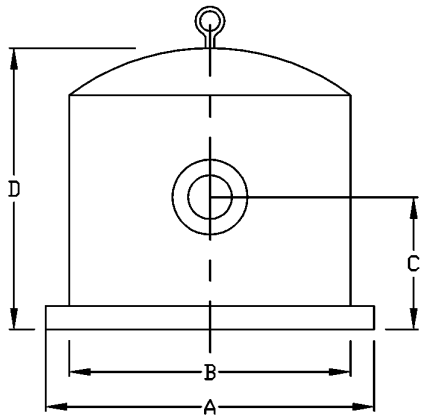


Bell Jar " L" Gaskets

Part Number	Material	Description
B-1	Buna N	For 10" diameter
V-1	Viton® A	For 10" diameter
B-2	Buna N	For 12" diameter
V-2	Viton® A	For 12" diameter
B-2A	Buna N	For 14" diameter
V-2A	Viton® A	For 14" diameter
B-3	Buna N	For 18" diameter
V-3	Viton® A	For 18" diameter

Stainless Steel Bell Jars, Collars

The **SSBJ Series** bell jars are manufactured from 304 stainless steel and are also intended for flat baseplates and collars. A dovetail groove is located in the base flange and viton® o-ring installed in all units. The **SSBJ Series** include a 4" Pyrex® viewport and a lifting eyelet. Standard finish is a satin type glass bead on all tubing and upon request electropolishing and other options are available.



Stainless Steel Bell Jars

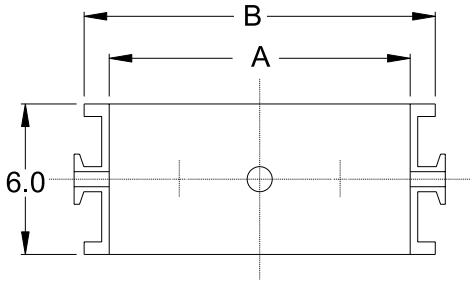
Part Number	A	B	C	D
SSBJ-1	14.00	12.00	6.00	12.00
SSBJ-2	20.00	18.00	12.00	30.00
SSBJ-3	26.00	24.00	12.00	30.00

* Price on request

Feedthrough Collars

Part Number	A	B	Ports	Flanges
SSC-12-4	12.00	14.00	4	NW 40
SSC-12-4MS	12.00	14.00	4	MS275-150N
SSC-12-6	12.00	14.00	6	NW 40
SSC-12-6MS	12.00	14.00	6	MS275-150N
SSC-18-8	18.00	20.00	8	NW 40
SSC-18-8MS	18.00	20.00	8	MS275-150N
SSC-24-12	24.00	26.00	12	NW 40
SSC-24-12MS	24.00	26.00	12	MS275-150N

* Price on request

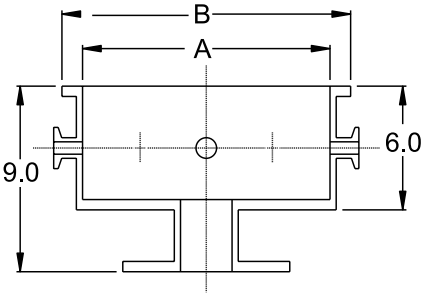


Note: All SSC collars include dovetail groove and Viton® o-ring on one side

Stainless Steel Combination Baseplate / Collar

Part Number	A	B	ASA Flange	Ports	Flanges
SSCBC-12-4	12.00	14.00	ASA-9-B-6	4	NW 40
SSCBC-12-4MS	12.00	14.00	ASA-9-B-6	4	MS275-150N
SSCBC-12-6	12.00	14.00	ASA-9-B-6	6	NW 40
SSCBC-12-6MS	12.00	14.00	ASA-9-B-6	6	MS275-150N
SSCBC-18-8	18.00	20.00	ASA-11-B-8	8	NW 40
SSCBC-18-8MS	18.00	20.00	ASA-11-B-8	8	MS275-150N
SSCBC-24-12	24.00	26.00	ASA-11-B-8	12	NW 40
SSCBC-24-12MS	24.00	26.00	ASA-11-B-8	12	MS275-150N

* Price on request

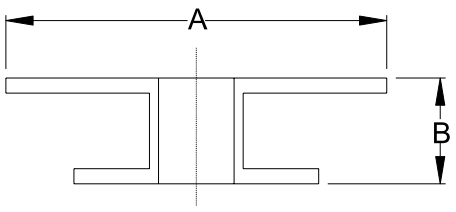


Note: Both the ASA flange and the top flange of the baseplate are smooth faced flanges as typically the bell jar and pump have o-ring grooves and or gaskets. Flanges with o-ring grooves are available upon special order.

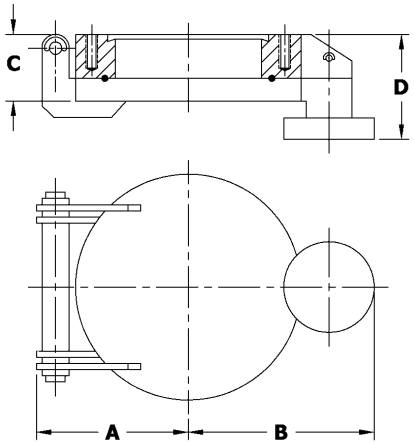
Stainless Steel Baseplates

Part Number	A	B	ASA Flange
SSB-12	14.00	4.00	ASA-9-B-6
SSB-18	20.00	4.00	ASA-11-B-8
SSB-24	26.00	4.00	ASA-11-B-8

* Price on request

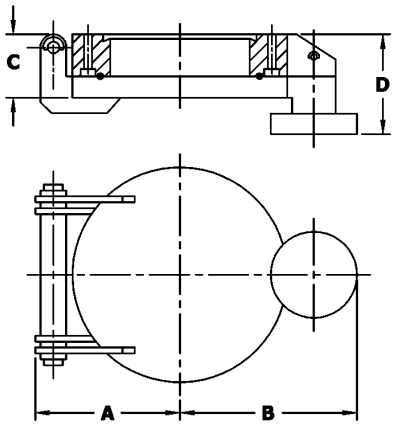


The **QAD Series** access doors that are a hinged design employ a viton® o-ring in the blank door itself and a standard MET-SEAL flange interface for bolting to the chamber itself. A rotary knob opens the door itself and the base flanges are offered with **tapped** holes and **clearance** holes. Clearance holes require the use of stainless steel socket head cap screw.



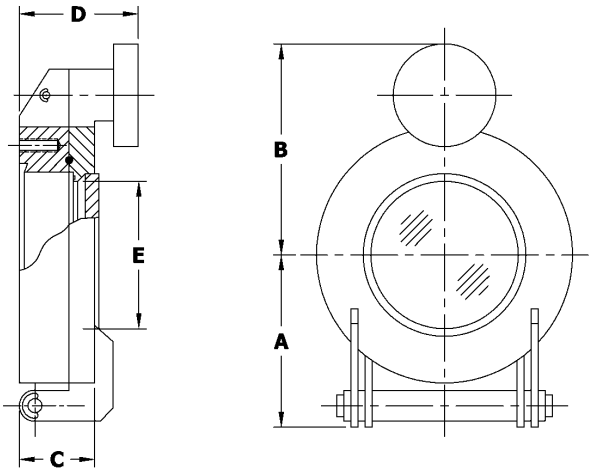
QADT Assemblies with Tapped Base Flange

Part Number	MET-SEAL Flange	Base Flange Thread	MET-SEAL Bore	A	B	C	D
QADT-275	2-3/4" OD	1/4-28	1.33"	1.74	2.25	.87	1.46
QADT-450	4-1/2" OD	5/16-24	2.50"	2.75	3.75	1.06	1.85
QADT-600	6" OD	5/16-24	4.02"	3.43	4.68	1.28	2.63
QADT-800	8" OD	5/16-24	5.80"	4.61	5.68	1.38	2.75
QADT-1000	10" OD	5/16-24	8.01"	5.74	6.67	1.46	2.85



QAD Assemblies with Thru Holes on Base Flange

Part Number	MET-SEAL Flange	Base Flange Thru Hole	MET-SEAL Bore	A	B	C	D
QAD-275	2-3/4" OD	.265	1.33"	1.74	2.25	.87	1.46
QAD-450	4-1/2" OD	.332"	2.50"	2.75	3.75	1.06	1.85
QAD-600	6" OD	.332"	4.02"	3.43	4.68	1.28	2.63
QAD-800	8" OD	.332"	5.80"	4.61	5.68	1.38	2.75
QAD-1000	10" OD	.332"	8.01	5.74	6.67	1.46	2.85



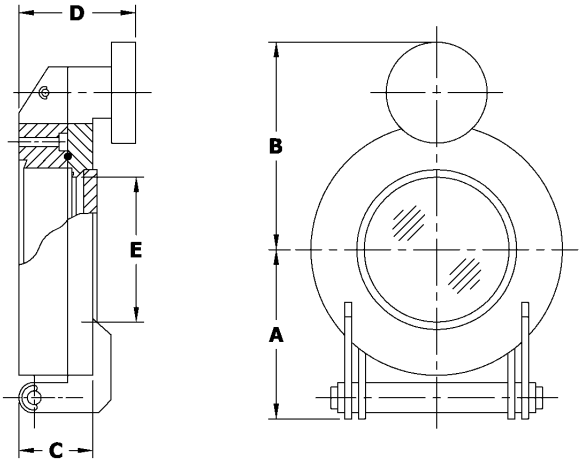
"VP" Series Quick Access Doors

Features:

- 7056 glass viewport directly in access door
- TIG welded construction

"VP" Series Quick Access Doors with Tapped Base Flange

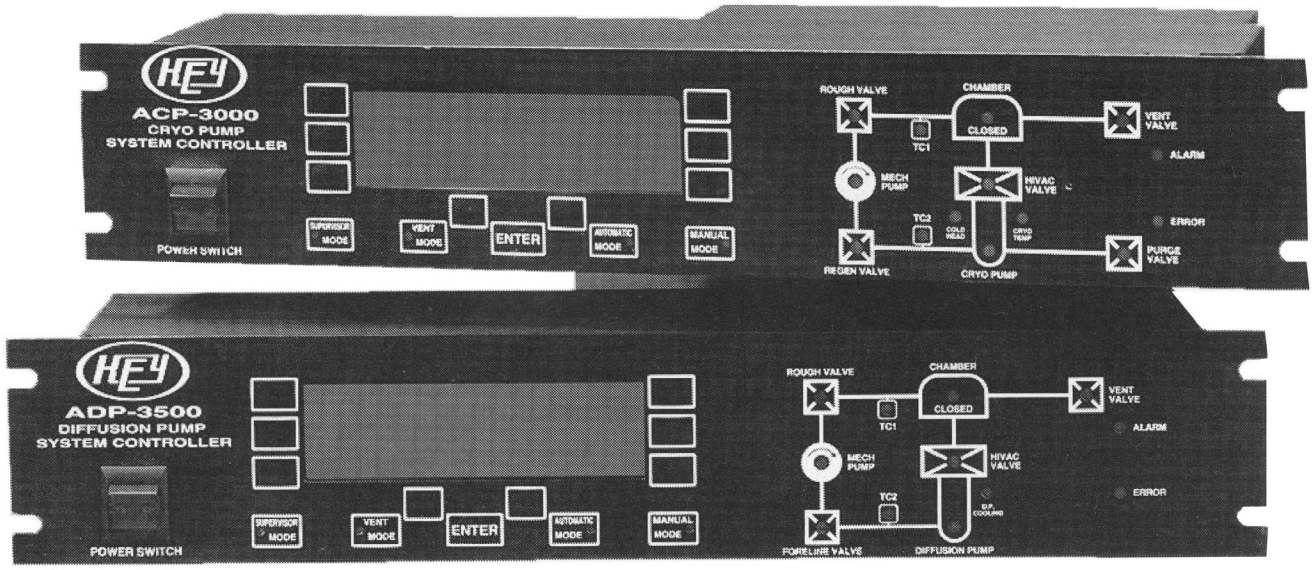
Part Number	MET-SEAL Flange	Base Flange Thread	MET-SEAL Bore	A	B	C	D	E
QADT-275-VP	2-3/4" OD	1/4-28	1.33	1.74	2.25	.87	1.46	1.4
QADT-450-VP	4-1/2" OD	5/16-24	2.50	2.75	3.75	1.06	1.85	2.7
QADT-600-VP	6" OD	5/16-24	4.02	4.68	4.68	1.28	2.63	3.87
QADT-800-VP	8" OD	5/16-24	5.80	5.68	5.68	1.38	2.75	5.38
QADT-1000-VP	10" OD	5/16-24	8.01	6.67	6.67	1.46	2.85	5.38



"VP" Series Quick Access Doors with Thru Holes on Base Flange

Part Number	MET-SEAL Flange	Base Flange Thread	MET-SEAL Bore	A	B	C	D	E
QAD-275-VP	2-3/4" OD	.265	1.33	1.74	2.25	.87	1.46	1.4
QAD-450-VP	4-1/2" OD	.332	2.50	2.75	3.75	1.06	1.85	2.7
QAD-600-VP	6" OD	.332	4.02	3.43	4.68	1.28	2.63	3.87
QAD-800-VP	8" OD	.332	5.80	4.61	5.68	1.38	2.75	5.38
QAD-1000-VP	10" OD	.332	8.01	5.74	6.67	1.46	2.85	5.38

Model ACP-3000 & ADP-3500 Cryo and Diffusion Vacuum System Controllers



KEY HIGH'S cryo valve controller is far and above superior to any other controller on the market today!

KEY HIGH VACUUM PRODUCTS INC. is proud to announce our **NEW ACP-3000** cryo pump system controller to meet your every need. Our controllers can be easily programmed to control and monitor vacuum systems and their processes.

Features:

- New modular design. Large display constantly keeps user informed of all system conditions
- Dual thermocouple displays are included
- Fully automatic vent and protected manual control, including password protected service mode
- Built in cryo pump temperature sensor
- All vacuum system data is data streamed from the controller Information from process runs is preserved in host computer
- Three user defined process control setpoints are provided
- Monitors bell jar position. If the bell jar is not down, roughing valve will not open, protecting the mechanical pump from overheating
- Password protection for programmed parameters and setpoints
- Nonvolatile memory protects pre-set parameters against power failure and returns system safely to its original state
- Complete regeneration control of cyro pump

TECHNICAL SPECIFICATIONS:

- Standard output voltages 110 VAC and 24 VDC
- All voltages easily changed at factory or in field

INPUTS:

Bell jar down: contact closure N.O.
Cryo pump: diode sensor
Thermocouple:
Type DV-6M thermocouple gauge tubes

RS-232 serial port for computer interface
TC1 interlock: contact closure N.O.
TC2 interlock: contact closure N.O.

OUTPUTS:

Mechanical pump: line voltage, 2 AMP maximum.
Separate motor starter required.

Cryo pump compressor: line voltage, 2 AMP maximum.
Separate relay required
Valves: line voltage, 2 AMP maximum

PHYSICAL DIMENSIONS:

19" wide (standard rack mount)
3-1/2" height
9" depth
Weight: six pound

MODE OF OPERATION:

A. ***Automatic mode:*** In auto the ACP-3000 will cycle the vacuum system from ATM to high vacuum.

B. ***Manual mode:*** All pumps and valves can safely be operated from this mode.

C. ***Vent mode:*** The ACP-3000 incorporates adjustable timers to provide proper valve sequencing.

D. ***Service mode:*** This password-protected mode overrides all internal safety interlocks. This aids in system set-up and trouble shooting.

Liquid Nitrogen Level Controller

MODEL LN2-1000

- *Fully automatic*
- *Dual sensor*
- *Splash guard on upper sensor*
- *Compact design*
- *Rack mountable*

Description:

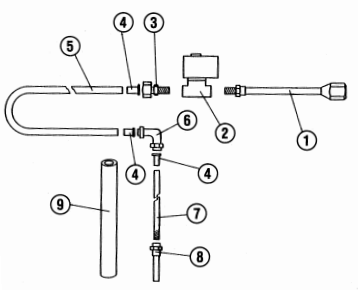
KEY HIGH VACUUM PRODUCTS INC.'s liquid nitrogen controller **Model LN2-1000** is a fully automatic dual sensor controller. Probes are placed at a high and low level. The lower sensor (fill level) activates the controller by applying power to the liquid nitrogen valve solenoid. The upper sensor (full level) deactivates the solenoid shutting off further liquid nitrogen.

Specifications:

Power:	115 VAC 60 Hz
Sensors:	Diode type 10ft sheathed cable
Dimensions:	2" high x 6" wide x 7" deep
Outlet:	115 VAC 60 Hz

Liquid Nitrogen Transfer Line Kit Accessories

Item No.	Part Number	Description
1	**60001**	Dewar adapter-6-1/2" long with 1/2" SAE flare nut & 1/4" MPT
2	**60002**	Solenoid valve -40 PSI 115V AC 60 Hz 9/32" orifice with 1/4" FPT
2	**60003**	Solenoid valve -100 PSI 115V AC 60 Hz 7/32" orifice with 1/4"FPT
3	**60004**	Adapter tube -1/4" MPT with 3/8" ferrule
4	**60005**	Insert
5	**60006**	Tubing flexible -1/4" ID, 43" long (Other lengths available)
6	**60007**	3/8" elbow
7	**60008**	Dewar nozzle -1/8" NPT one end, 10" long
8	**60009**	Splash arrestor
9	**60011**	Flexible foam plastic insulation 1/2" wall
	60010	3/8" ferrule coupling
	60014	Replacement splash guard

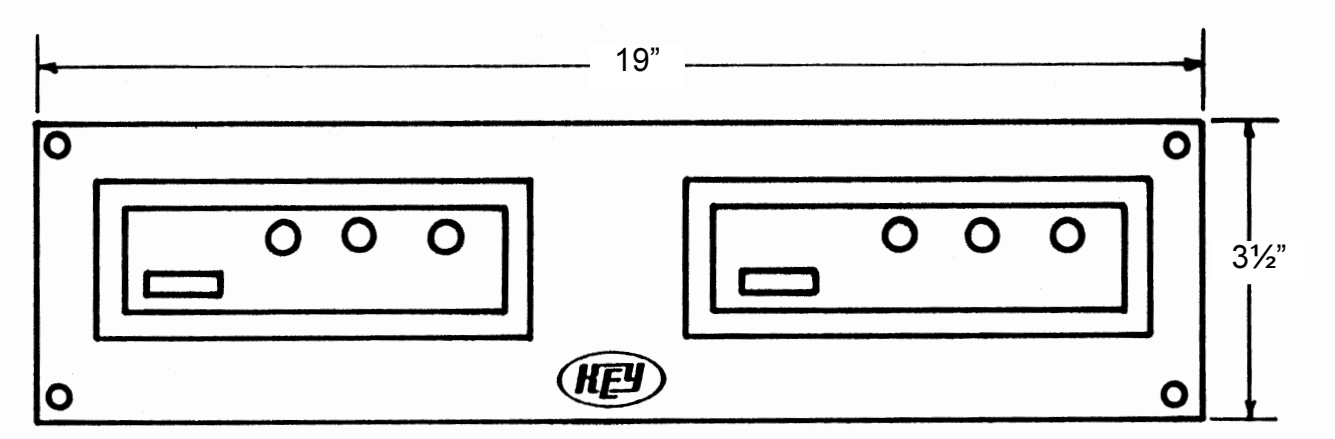


Liquid Nitrogen Transfer Line Kits

Part Number	Description
60012	Complete Kit-40 PSI with insulation
60013	Complete Kit-100 PSI with insulation

Rack Mount Option for one or two LN2-1000 Controllers

Part Number	Description
60015	Single Rack Mount
60015-1	Double Rack Mount



Model DFP-3000

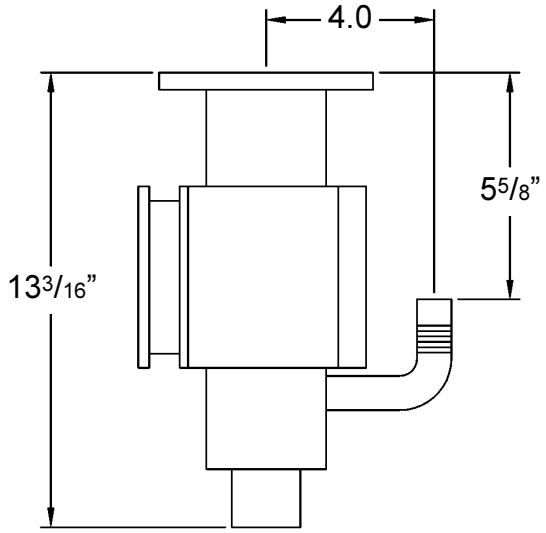
- *Air cooled*
- *Compact design*
- *Low cost*

KEY HIGH VACUUM PRODUCTS, INC.'s model **DFP-3000** is a stainless steel body that is air cooled, fast warming and of compact design. The **DFP-3000** diffusion pump is suitable for any mobile or fixed pumping station. Applications include altitude simulation, evaporators and leak detectors allow it to be the ideal pump providing trouble free service for many years. The jet assembly features a full fractionating design to ensure constant fractioning of the fluid, providing long stable performance.

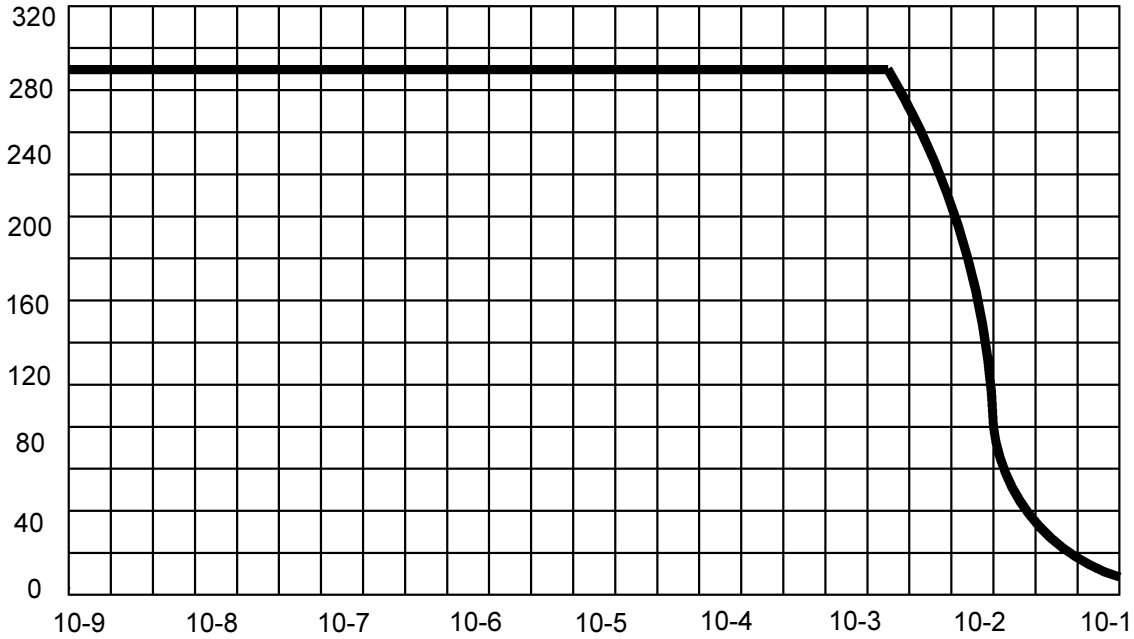
KEY HIGH VACUUM PRODUCTS, INC.'s DFP-3000 is designed to achieve the best possible pumping speed with a minimum backstreaming.

DFP High Vacuum Diffusion Pump

Dimensional data



Performance Chart Air Speed L/S



Inlet Pressure - Torr

Pumping Speed:

Air	285 L/S
Helium	205 L/S
Max throughput	.3 Torr L/S
Recommending backing pump	3.2 CFM
Warm up time	8 minutes
Cool down time	10 minutes
Fluid quantity	150 CC
Foreline connection	1" OD
Backstreaming rate	< .001 mg/cm/min

Physical Data:

O.D.	6.0
I.D.	3.375
O ring	2-238
Four (4) holes .750 diameter on a 4.750 diameter bolt circle	
Jet material -	aluminum
Pump body material -	Stainless steel
Heater	110 volts
	250 watts

Motorized Bell Jar Hoist

Model BJH-500

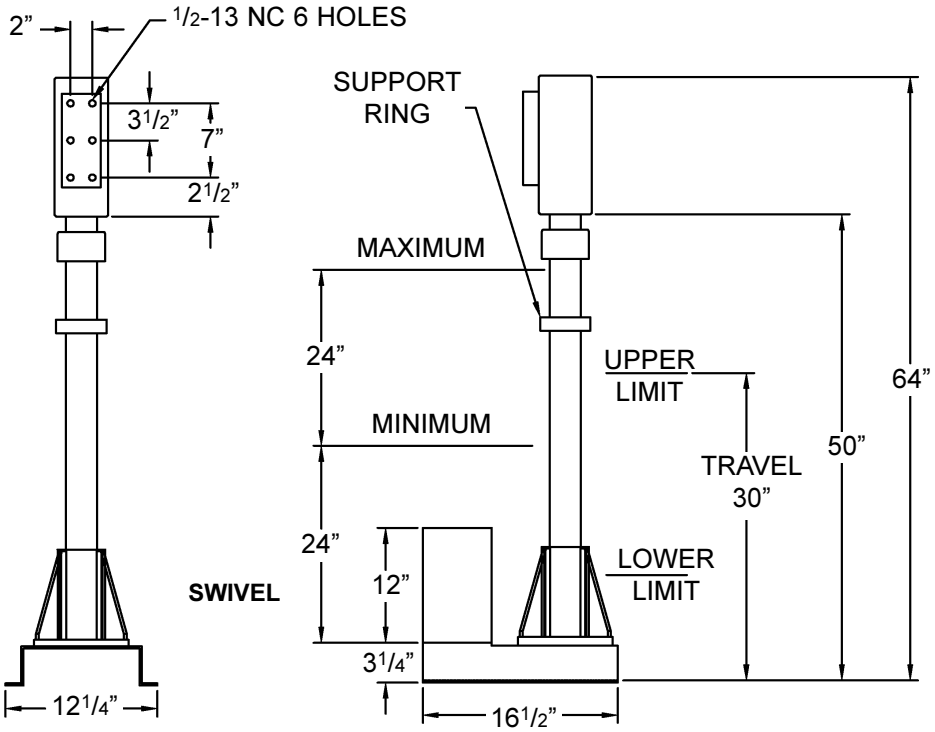
Features:

- Reliable, smooth, quiet operation
- Bell jars up to 400 pounds can be used
- This is a complete unit with a three-position switch
- No guide rods required
- Upper and lower limit switches
- Rotating swivel head for 360 degrees of rotation
- Operates on 110 VAC, 60 HZ

Price: $4,195.00

Options:

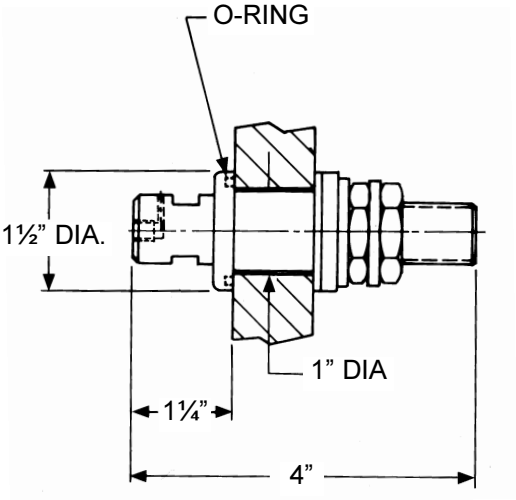
- Other travel lengths
- Pressure vacuum switch that prevents hoist operation when bell jar is under vacuum
- Mounting bell jar plate per customer requirement



The following standard types of feedthroughs can be supplied with all collars. The standard **KHVP** feedthroughs fit 1-inch ports; **MET-SEAL** flanges or ISO quick-connect flanges are optional. Non-standard collar sizes for different numbers of feedthroughs as well as various collar heights can be provided on special order.

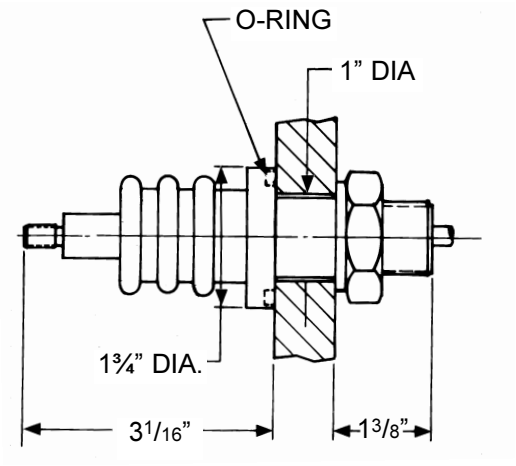
High-Current Feedthrough - Model FTO-101

Material: 3/4" OFHC® copper rod
Current Rating: 400 Amps
Voltage Rating: 50 V



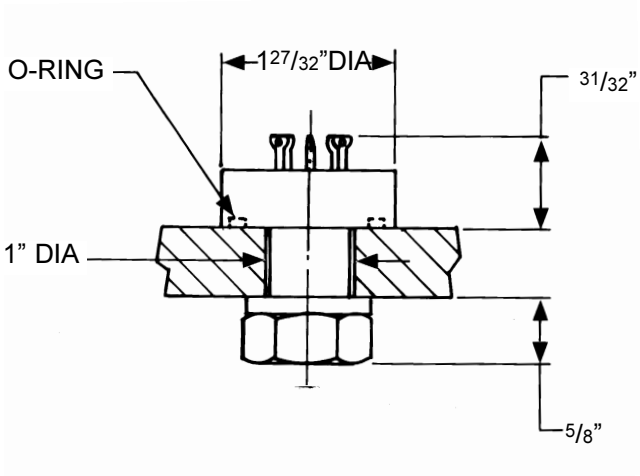
High-Voltage Feedthrough- Model FTO-102

Material: Break-resistant ceramic
Current Rating: 1 Amp
Voltage Rating: 20 KV



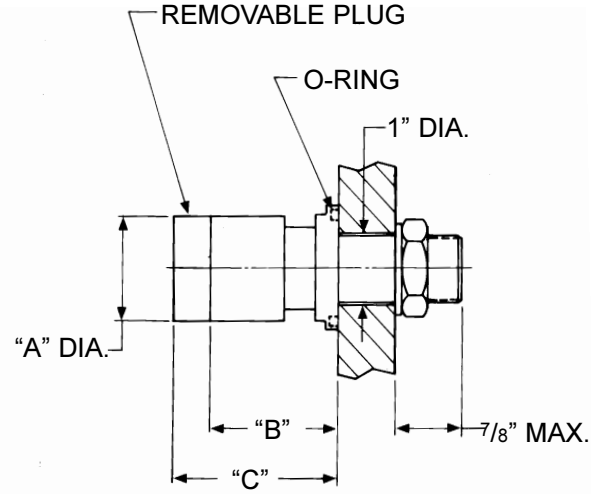
Octal Header Feedthrough-Model FTO-103

Material: Chrome plated brass
Pins: Nickel-plated copper
Current Rating: 5 Amps per pin
Voltage Rating: 220 V between pins



Quick-Coupling Feedthrough-Model FTO-104

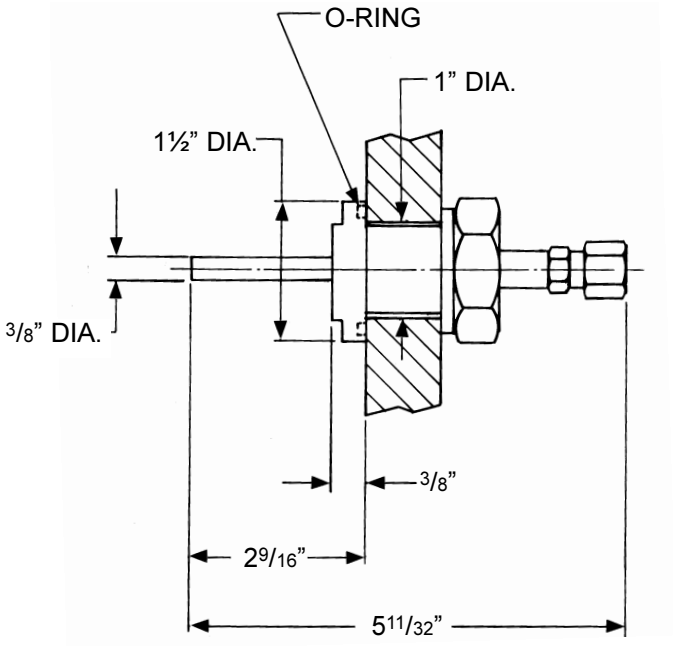
Material: Chrome plated brass
Temperature Range: -120°C to + 90°C



Part No.	Size	A	B	C
FTO-104-1	1/8"	5/8"	1-11/32"	1-15/32"
FTO-104-2	1/4"	3/4"	1-11/32"	1-15/32"
FTO-104-3	3/8"	15/16"	1-3/4"	2"
FTO-104-4	1/2"	1-1/4"	1-3/4"	2"

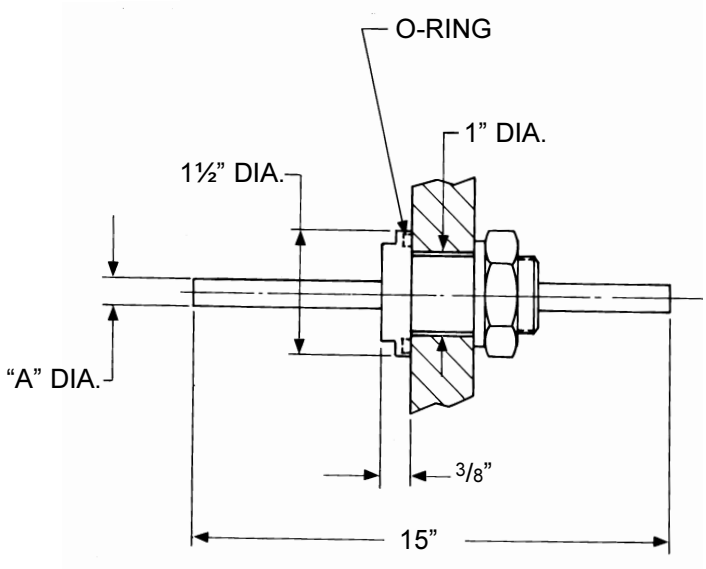
Liquid Nitrogen Feedthrough-Model FTO-105

Material: Chrome plated brass body; 3/8"OD x .035 wall tube
3/8" Swagelok® on atmosphere side



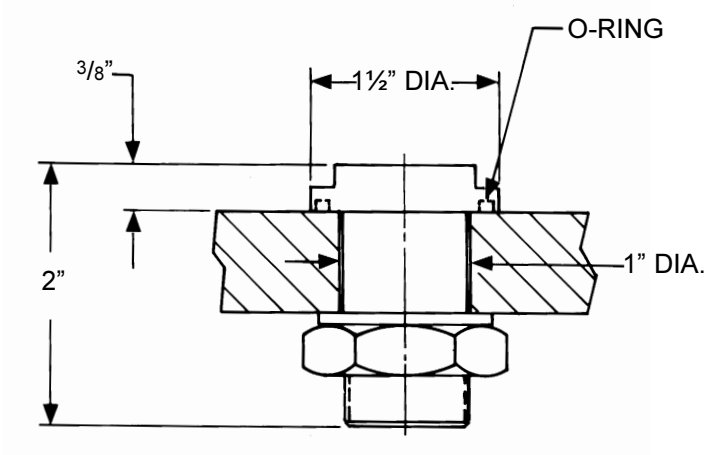
Water Feedthrough- Model FTO-106

Material: Chrome plated brass body; 304 stainless steel tube 1/4" OD x .035 wall



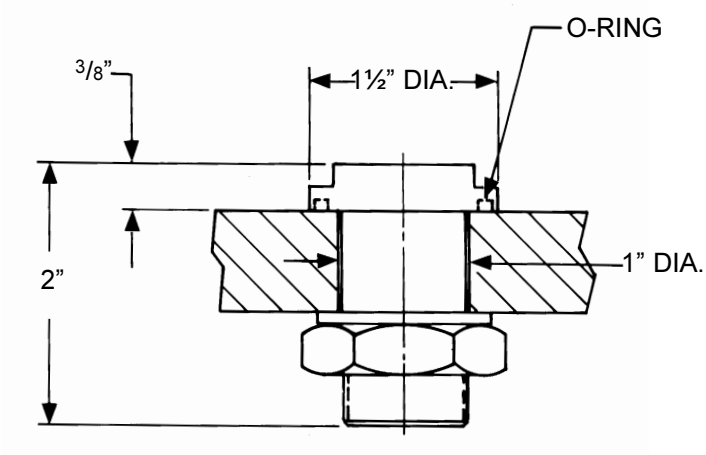
Blank Fixturing Support Feedthrough-Model FTO-107

Material: Brass



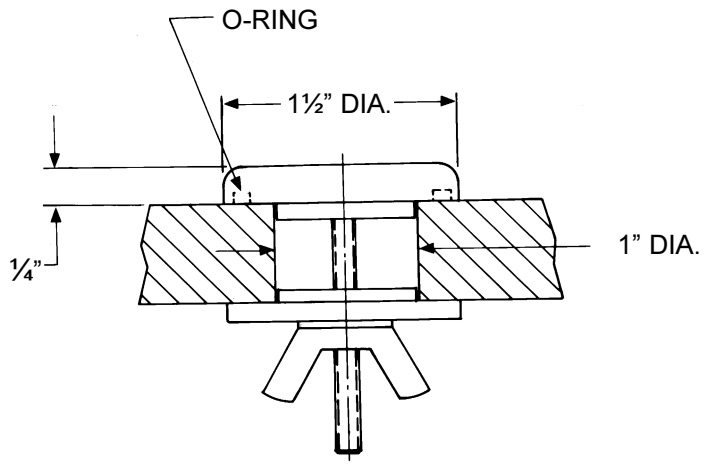
Blank Fixturing Support Feedthrough-Model FTO-107-SS

Material: Stainless steel body



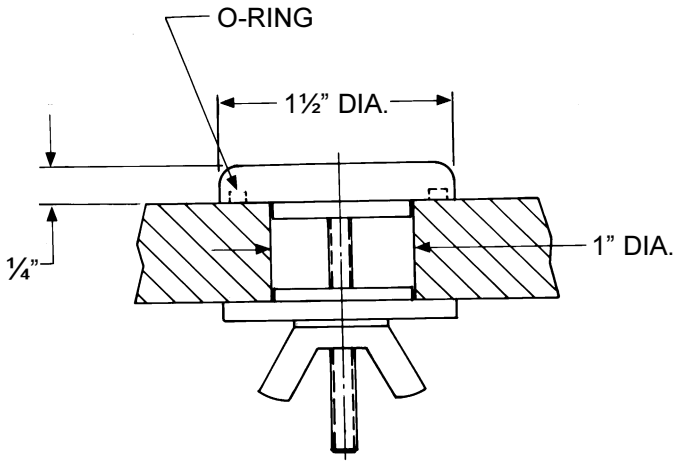
Blank Plug Feedthrough-Model FTO-108

Material: 6061-T6 aluminum
Plugs feedthrough hole not in use



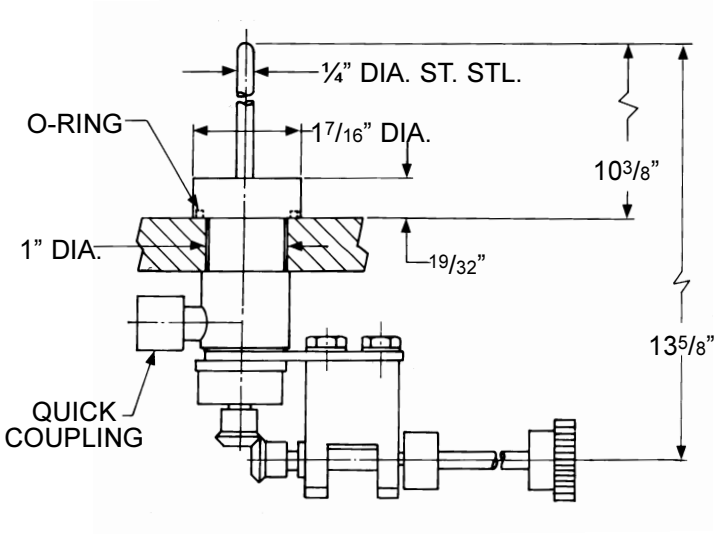
Blank Plug Feedthrough-Model FTO-108-SS

Material: Stainless steel
Plugs feedthrough hole not in use



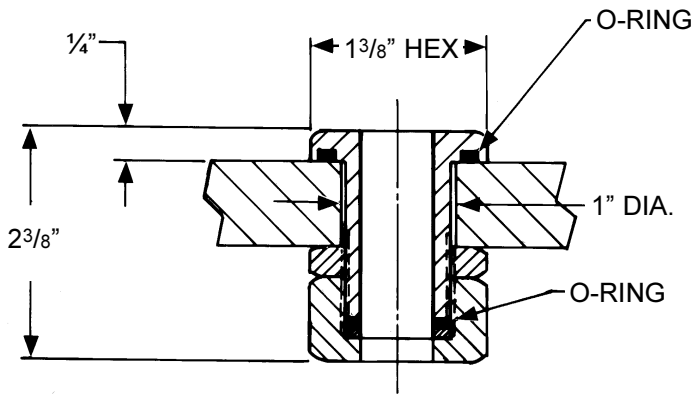
Direct Drive Rotary Feedthrough-Model FTO-109

Material: Chrome plated brass body
Provides rotary motion inside vacuum system



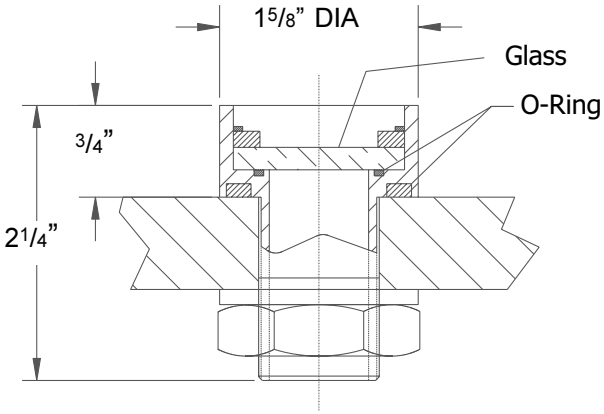
Quick Connect-Model FTO-110

Material: Chrome plated brass
For mounting 3/4" Ion gauge to baseplate



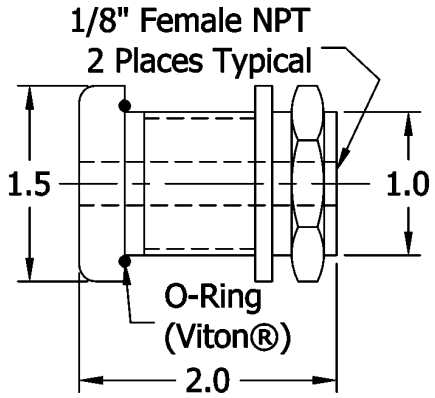
Sight Port- Model FTO-111

Material: Chrome plated brass
This port is standard supplied with a flat Pyrex® window.



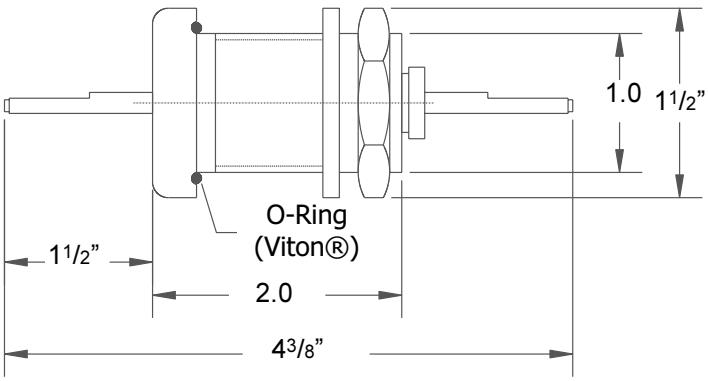
Gas Back Fill/Thermocouple- Model FTO-119-SS

Material: Stainless steel
1/8" FNPT both sides



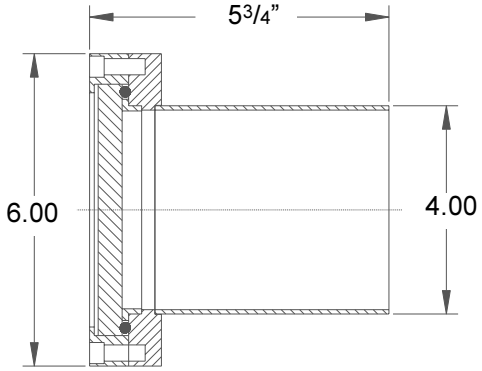
Direct Drive-Model FTO-120-SS

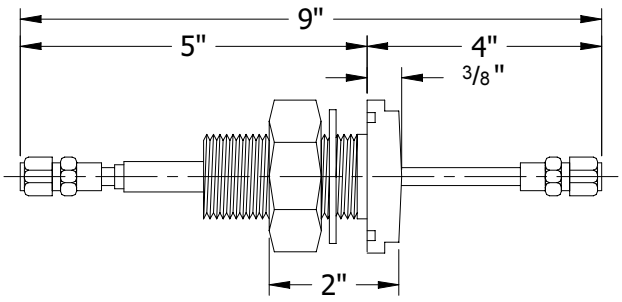
Material: Stainless steel
Viton® sealed shaft 500 RPM maximum



Viewport/Weld Stub-Model FTO-VP6

Material: Stainless steel half nipple
Pyrex® glass, Viton® sealed



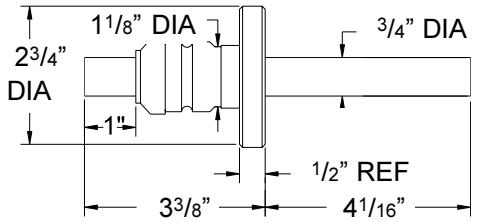


Water Feedthroughs

Part Number	End Fittings
FTO-121	1/4" Swagelok®
FTO-122	1/4" Male VCR®

High Current Feedthrough - Model HCF-101

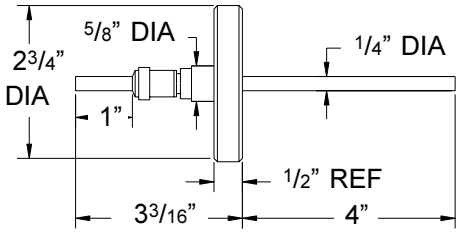
Ceramic insulated
2-3/4" O.D. MET-SEAL flange
Specifications:
Conductor: 3/4" OFHC® copper rod
Current Rating: 600 Amps
Voltage Rating: 3 KV
Temperature Range: -150°C to 450°C



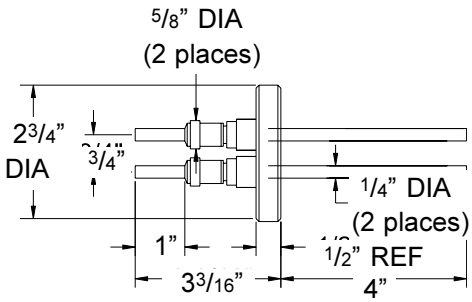
Model HCF-101

Medium Current Feedthroughs - Series CF-102

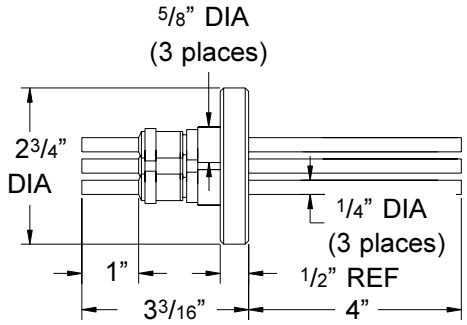
Ceramic insulated
1.33" and 2-3/4" MET-SEAL flanges
Available with one (Model CF-102-1), two (Model CF-102-2), three (Model CF-102-3) and four (Model CF-102-4) conductors
Single conductor is also available with 1.33" O.D., Mini-flange (Model CF-102-133)
Specifications:
Conductor: 1/4" OFHC® copper rod
Current Rating: 150 AMPS
Voltage Rating: 5 KV
Temperature Range: - 150°C to 450°C



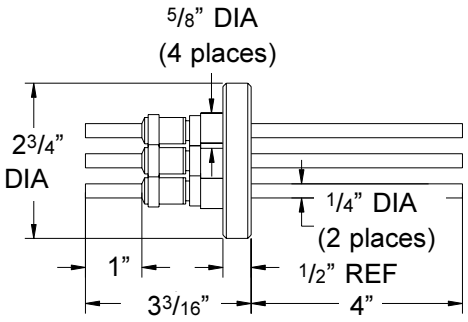
Model CF-102-1



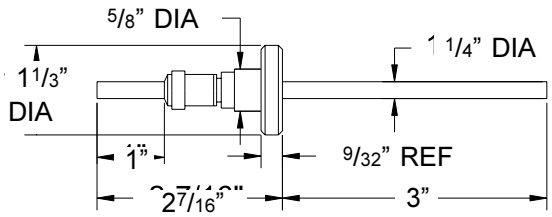
Model CF-102-2



Model CF-102-3



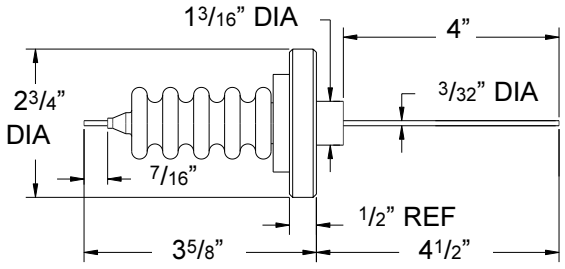
Model CF-102-4



Model CF-102-133

High Voltage Feedthrough - Model HVF-103

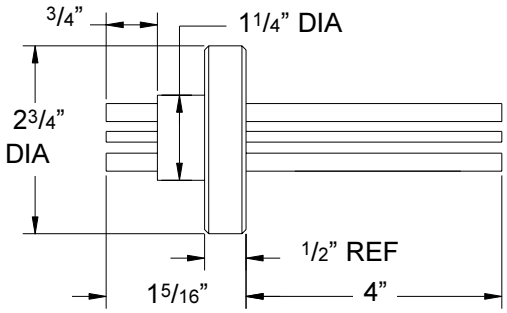
Ceramic insulated
2-3/4" O.D. **MET-SEAL** flange
Specifications:
Conductor: 3/32" stainless steel rod
Current Rating: 1 Amp
Voltage Rating: 30 KV
Temperature Range: - 150°C to 450°C



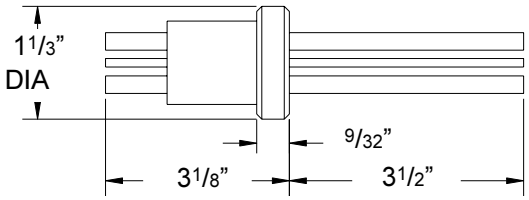
Model HVF-103

Eight-Pin Feedthroughs - Series EPF-104

Kovar®/ceramic insulated
2-3/4" O.D. **MET-SEAL** flange
This eight-pin feedthrough is also available with 1.33" OD Mini-flange (Model EPF-104-133)



Model EPF-104-1



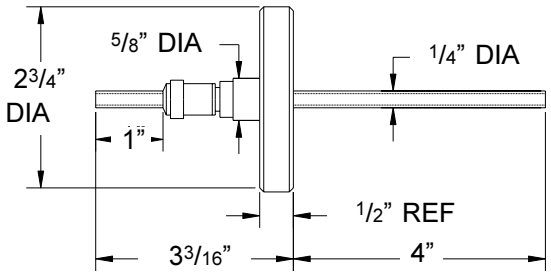
Model EPF-104-133

High Voltage Water Cooled Feedthroughs - Series WC-105

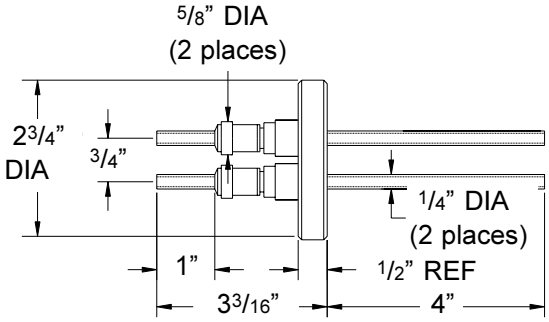
Ceramic insulated
2-3/4" O.D. **MET-SEAL** flange
Available with :

One conductor: Model: WC-105-1
Two conductor: Model: WC-105-2
Three conductor: Model: WC-105-3
Four conductor: Model: WC-105-4

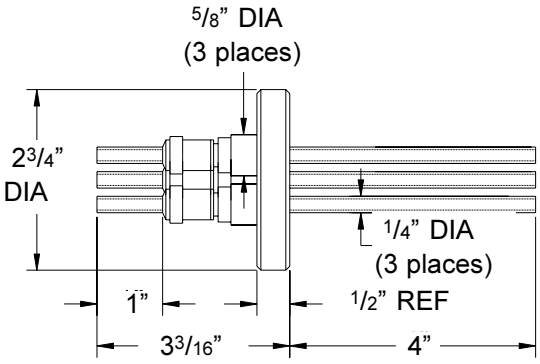
Specifications:
Conductors: 1/4" OFHC® copper rod
Maximum Temperature Change: 25°C/Minute
Voltage Rating: 5 KV
Temperature Range: - 150°C to 450°C



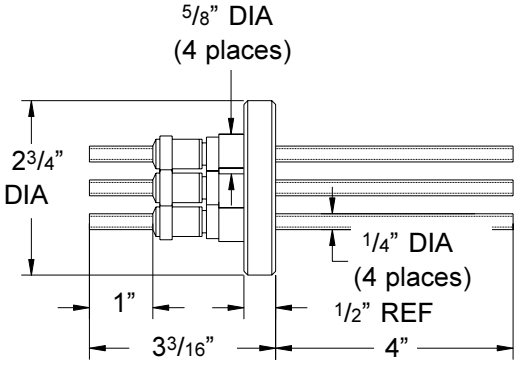
Model WC-105-1



Model WC-105-2

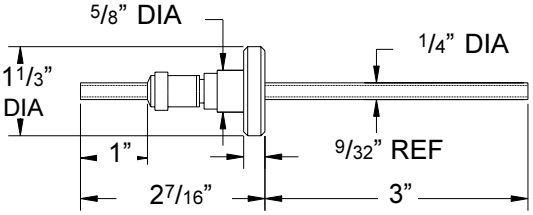


Model WC-105-3



Model WC-105-4

Single conductor is also available with a 1.33" O.D. Mini-flange - Model WC-105-133



High Voltage Shields

HVS SERIES (High Voltage Shields) are a safety device directly related to the safety of company personnel, and are intended to cover electrical high vacuum feedthroughs which are based on typical Mini 1-1/3" OD and 2-3/4" OD MET-SEAL style flanges.

Safety and convenience:

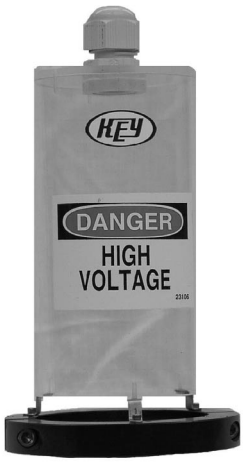
When properly installed, HVS shrouds can safeguard operators from possible accidental electrocution, as the acrylic material is an excellent electrical insulator. Alert people, develop safety practices, and help keep your workplace safe by alerting people to potential hazards with proper accident prevention. "Danger High Voltage" label located on the OD of the shroud clearly indicates an imminently hazardous situation, which if not avoided, can result in serious injury or death. Along with increasing machine safety, an additional benefit is gained by the protection of fragile components and instruments.

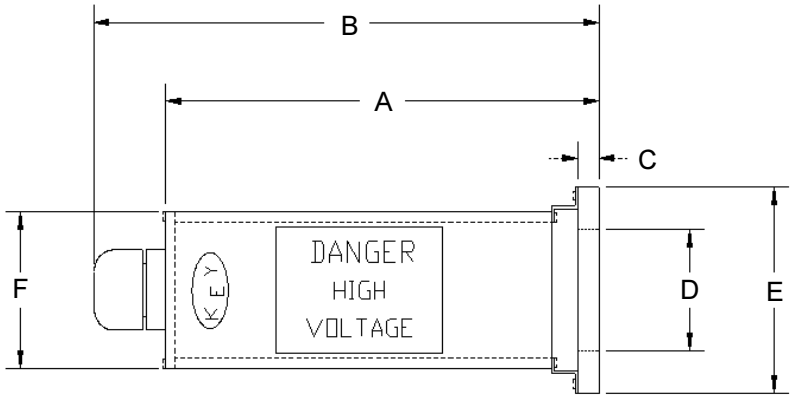
Features:

HVS SERIES simply are attached via 2 each socket head cap screws located on the aluminum split clamp, which secures directly to the electrical feed through flange OD.

The shroud itself is clear scratch resistant acrylic; the cord grips are standard liquid tight strain reliefs which are intended to seal cable entries and keep contaminants from entering the enclosure.

Maximum temperate ratings -40º to + 150º F





High Voltage Shields

Part Number	Flange OD	Cable Dia.	A	B	C	D	E	F
133-HVS★	1.33"	0.14 - 0.39	5-3/4"	6-7/8"	.30"	1-1/3"	2-5/16"	1-3/4"
133-HVS-1★	1.33"	0.20 - 0.47	3-3/4"	4-7/8"	.30"	1-1/3"	2-5/16"	1-3/4"
133-HVS-2★	1.33"	0.28 - 0.55	4-3/4"	5-7/8"	.30"	1-1/3"	2-5/16"	1-3/4"
133-HVS-3★	1.33"	0.35 - 0.71	6-3/4"	7-7/8"	.30"	1-1/3"	2-5/16"	1-3/4"
275-HVS★	2-3/4"	0.14 - 0.39	6"	7-1/8"	1/2"	2-3/4"	3-3/4"	2-3/4"
275-HVS-1★	2-3/4"	0.20 - 0.47	4"	5-1/8"	1/2"	2-3/4"	3-3/4"	2-3/4"
275-HVS-2★	2-3/4"	0.28 - 0.55	5"	6-1/8"	1/2"	2-3/4"	3-3/4"	2-3/4"
275-HVS-3★	2-3/4"	0.35 - 0.71	7"	8-1/8"	1/2"	2-3/4"	3-3/4"	2-3/4"

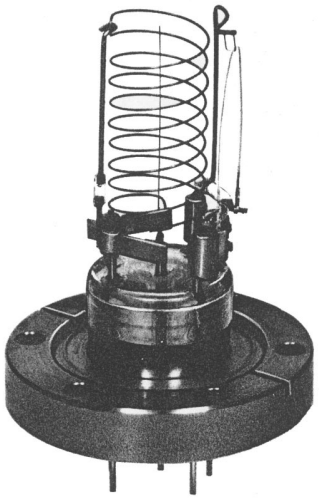
★ = New Product

75 Series Nude Ionization Gauge Tubes

The **75 Series** nude gauge tubes are hot cathode Bayard-Alpert type with an operating range of 2 x 10-10 torr to 1 x 10-3 torr and are resistance heated. The **75 Series** is of rugged construction and will tolerate long outgassing cycles.

Specifications:

Grid: + 180 VDC to grid (Ground)
Collector: 0 VDC (Collector)
Filament: + 30 VDC to ground (filament)
Sensitivity: 100 microamps per micron at 10 mA grid current (nitrogen)
X-Ray Limit: 4 x 10-10 torr



Part Number	Mounting Flange / description
KN-75	2-3/4" OD MET-SEAL, Iridium Filament
KN-75-TT	2-3/4" OD MET-SEAL, Twin Tungsten Filaments
KN-75-NW40	NW 40, Iridium Filament
KN-75-NW40-TT	NW 40, Twin Tungsten Filaments

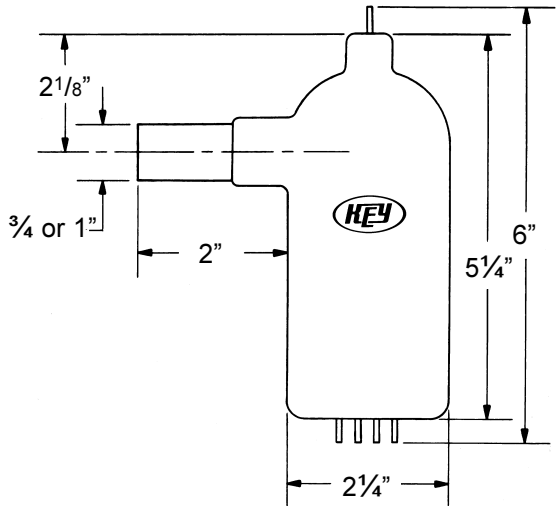
75 Series Iridium Filament Ionization Gauge Tubes

The **75 Series** glass gauge tubes are Bayard-Alpert type with an operating range of 2 x 10-10 to 1 x 10-3 torr. This gauge is a long life type with a rugged construction, that will tolerate accidental air inrushes and has an easy outgassing grid. The **75 Series** ionization gauge tubes are interchangeable with other manufacturers of the same construction.

Specifications:

Thoria coated iridium filament
Grid: + 180 VDC to grid (Ground)
Collector: 0 VDC (Collector)
Filament: 3 to 5 volts at 4 to 6 Amps a.c. heating current; D.C. potential +30 volts
Grid Degas: 6.3 to 7.5 volts at 10 amps
Sensitivity: 100 microamps per micron at 10 mA grid current (nitrogen)
X-ray limit: 2 x 10-10 torr

Part Number	Description
IG-75-NIR	3/4" Nonex® Tubulation
IG-75-PIR	3/4" Pyrex® Tubulation
IG-75-KIR	3/4" Kovar® Tubulation
IG-100-NIR	1" Nonex® Tubulation
IG-100-PIR	1" Pyrex® Tubulation
IG-100-KIR	1" Kovar® Tubulation
IG-100-KIRF	1" Tube to 2-3/4" OD MET-SEAL
IG-100-KIR-KF25	1" Tube to NW-25
IG-100-KIR-KF40	1" Tube to NW-40



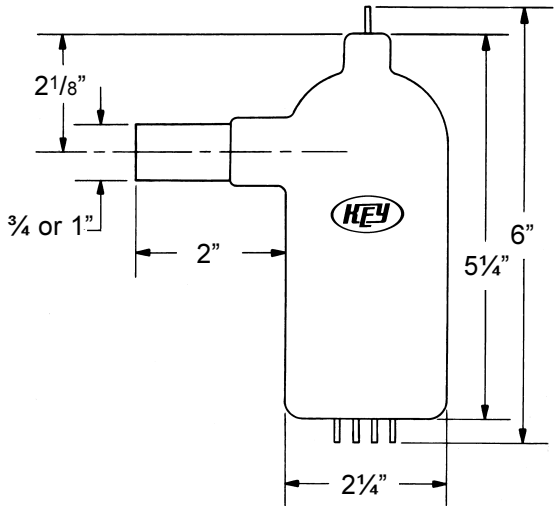
75 Series Twin Tungsten Filament Ionization Gauge Tubes

The **75 Series** glass gauge tubes are Bayard-Alpert type with an operating range of 2 x 10-10 torr to 1 x 10-3 torr. The **75 Series** is of rugged construction, will tolerate long outgassing cycles, and incorporates the twin tungsten filaments which can be switched without breaking vacuum, with most commercial controllers.

Specifications:

Twin tungsten filaments
Grid: + 180 VDC to grid (Ground)
Collector: 0 VDC (Collector)
Filament: + 30 VDC to ground (filament)
Sensitivity: 100 microamps per micron at 10 mA grid current (nitrogen)
X-Ray Limit: 2 x 10-10 torr

Part Number	Description
IG-75-NTT	3/4" Nonex® Tubulation
IG-75-PTT	3/4" Pyrex® Tubulation
IG-709-NT	.709 Nonex® Tubulation
IG-75-KTT	3/4" Kovar® Tubulation
IG-100-NTT	1" Nonex® Tubulation
IG-100-PTT	1" Pyrex® Tubulation
IG-100-KTT	1" Kovar® Tubulation
IG-100-KTTF	1" Tube to 2-3/4" OD MET-SEAL
IG-100-KTT-KF25	1" Tube to NW-25
IG-100-KTT-KF40	1" Tube to NW-40



Note: All gauges are calibrated for nitrogen; for gases other than nitrogen, see chart below:

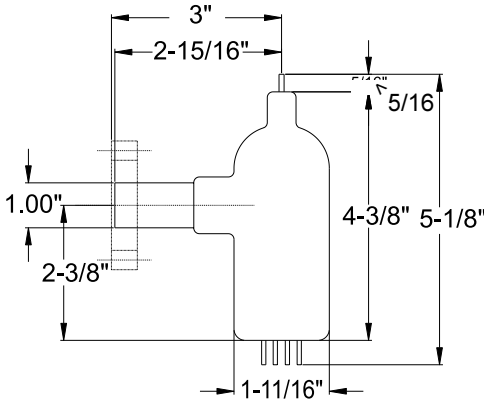
Gas	Multiply Reading By
Argon	0.72
Helium	6.06
Hydrogen	2.40
Krypton	0.52
Neon	3.36
Water Vapor	1.40
Xenon	0.35

99 Series Broad Range Ionization Gauge Tubes

The **99 Series** glass gauge tubes are platinum coated Bayard-Alpert gauges with an operating range of 1 x 10-1 (argon) to 4 x 10-10 torr. This gauge has a platinum coating for higher accuracy and the platinum coating is grounded to the 5th pin

Specifications:

Thoria coated iridium filament
Grid: + 180 VDC to grid (Ground)
Collector: 0 VDC (Collector)
Filament: 4 VAC
Grid Degas: 6.3 to 7.5 volts at 10 amps
Sensitivity: 100 microamps per micron at 10 mA grid current (nitrogen)
X-ray Limit: 4 x 10-10 torr



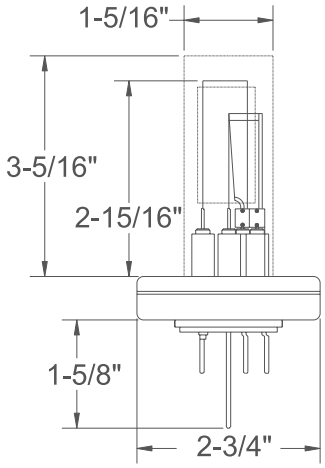
Part Number	Description
IG-100-NIRBR	1" Nonex® Tubulation
IG-100-KIRBR	1" Kovar® Tubulation
IG-100-KIRFBR	1" Tube to 2-3/4" OD MET-SEAL
IG-100-KIR-KF25BR	1" Tube to NW 25
IG-100-KIR-KF40BR	1" Tube to NW 40

76 Series UHV Nude Ionization Gauge Tube

The **76 Series** nude gauge tubes are electron beam type with an operating range of 5 x 10-12 to 1 x 10-3 torr and incorporate dual iridium filaments. These rugged constructed gauges have a long life filament that is easily field replaceable.

Specifications:

Grid: + 180 VDC to grid (Ground)
Collector: 0 VDC (Collector)
Filament: + 30 VDC to ground (filament)
Sensitivity: 25 torr
X-Ray Limit: 2 x 10-11



Part Number	Mounting flange / filament description
KN-76	2-3/4" OD MET-SEAL, Twin Iridium Filaments
KN-76-TT	2-3/4" OD MET-SEAL, Twin Tungsten Filaments
KN-76-NW40	NW 40 flange, Iridium Filaments
KN-76-NW40-TT	NW 40 flange, Twin Tungsten Filaments

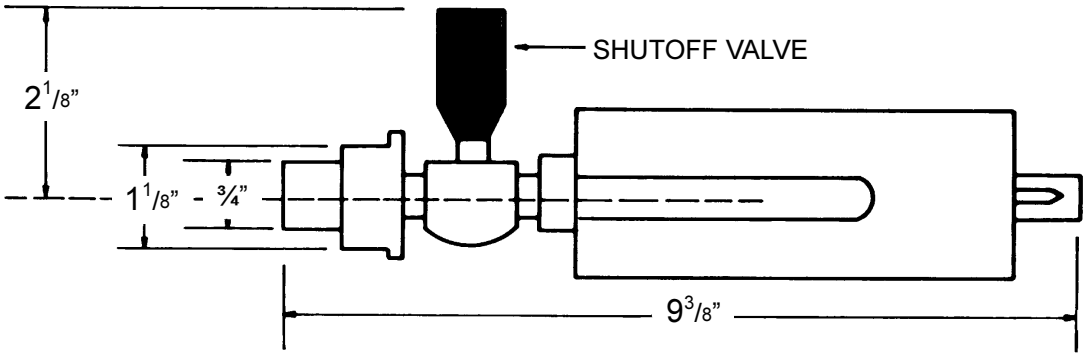
Note: All gauges are calibrated for nitrogen; for gases other than nitrogen see chart below:

Gas	Multiply Reading By
Argon	0.72
Helium	6.06
Hydrogen	2.40
Krypton	0.52
Neon	3.36
Water Vapor	1.40
Xenon	0.35

CLS Series Helium Permeation Calibrated Leaks

- ***Chrome plated brass body***
- ***Bellows sealed shutoff valve***
- ***Used for helium leak detector calibration***

Part Number	Leak Ranges Ranges (Torr L/sec @ 25 ° C)
CLS-8	1 x 10-5 to 2 x 10-6
CLS-9	1 x 10-6 to 2 x 10-7
CLS-10	1 x 10-7 to 2 x 10-8
CLS-11	1 x 10-8 to 2 x 10-9
CLS-12	1 x 10-9 to 2 x 10-10



Note 1: Actual leak rates that exist within the ranges given above for each model is considered within specifications.

Note 2: **KEY HIGH VACUUM PRODUCTS, INC.** recommends storing all permeation leaks with the **Shut off valve open** to prevent saturation of the glass element.

Options:
- ***KEY SPEEDY NW40 and NW50 fittings are available upon request***
- ***Larger or smaller leak rates are available upon request***

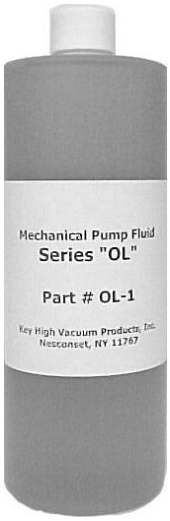
Recalibration Service:
KEY HIGH VACUUM PRODUCTS, INC. provides a complete recalibration and refilling service traceable to the National Bureau of Standards. **KEY** also services and repairs other brand helium permeation gas leaks. **All calibrated gas leaks are shipped with certified calibration reports traceable to the NBS.**

Mechanical Pump Fluid Series "OL"

Description: **"OL" Series** mechanical pump fluid is a distilled hydrocarbon fluid developed for all types of mechanical vacuum pumps. This fluid performs especially well in direct drive pumps. It has excellent resistance to oxidation and gum formation.

Specifications:

Vapor Pressure	8 x 10-5 Torr
Pour Point	4.5°F
Flash Point	450°F
Viscosity @ 100°F	47.7
Viscosity @ 130°F	23.6
Viscosity @ 210°F	6.5
Specific Gravity 25°C/25°C	.869



"OL" Ordering Information

Part Number	Description
OL-1	1 Quart
OL-2	1 Gallon
OL-3	5 Gallons
OL-4	55 Gallons

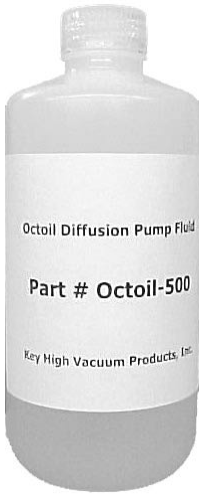
Octoil Diffusion Pump Fluid

Description: (Molecularly Distilled Synthetic Ester)

Octoil is a highly distilled synthetic ester fluid designed for use in diffusion pumps where pressures of 10-7 torr are required. It has become a standard fluid in diffusion pump leak detectors and mass spectrometers

Specifications:

Color	Clear
Viscosity @ 100°F	12.6cSt/68.2 SUS
Viscosity @ 130°F	7.9cSt/68.2 SUS
Specific Gravity	0.913
Flash Point (COC)	288°C / 550°F
Flash Point	209°C / 409°F
Fire Point	248°C / 248°F
Boiling Point °C @ .01 torr	141
Ultimate Vacuum, torr untrapped	3 x 10-7
Ultimate Vacuum, torr trapped	5 x 10-8



"OL" Ordering Information

Part Number	Description
OCTOIL-100	100 cc
OCTOIL-500	500 cc
OCTOIL-1	1 gallon

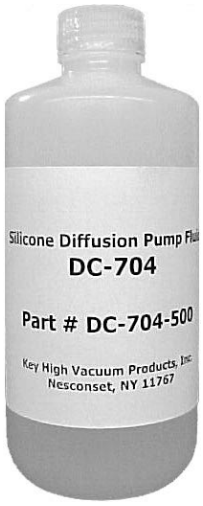
Silicone Diffusion Pump Fluid DC-704

Description: (Tetramethyltetraphenyltrisiloxane)

DC-704 Series diffusion pump fluid is recommended for systems operating in the 10-6 to 10-8 torr range. The thermal stability allows quick pump downs and keeps pump jet stack free of tars and carbon even after repeated exposure to atmosphere at operating temperatures.

Specifications:

Color	Light Straw
Viscosity @ 25°C (77°F), cs	39
Specific Gravity @ 25°C	1.07
Specific Gravity @ 70°C	1.03
Specific Gravity @ 100°C	1.00
Flash Point °C Open Cup	221
Boiling Point @ 0.5 torr, °C	215
Vapor Pressure @ 25°C	2.1 x 10-8 torr
Ultimate Vacuum Untrapped	10-7 to 10-8 torr
Ultimate Vacuum Trapped	10-11 torr
Oxidation Resistance	Excellent
Backstreaming Rate	Low
Boiler Temperature, °C	220



DC-704 Ordering Information

Part Number	Description
DC-704-50	50 cc
DC-704-100	100 cc
DC-704-500	500 cc
DC-704-1	1 Gallon

Silicone Diffusion Pump Fluid DC-705

Description: (Penta Phenyltrimethyltrisiloxane)

DC-705 Series diffusion pump fluid is recommended for high vacuum systems operating in the 10-8 to 10-10 torr range. **DC-705** is the premier silicone diffusion pump fluid as it displays the same durable physical properties of the **704 Series** and the enhanced characteristics of little or no backstreaming and excellent vapor pumping capabilities.

Specifications:

Color	Light Straw
Viscosity @ 25°C (77°F), cs	1.09
Specific Gravity, @ 70°C	1.04
Specific Gravity, @ 100°C	1.02
Flash Point °C, open Cup	243
Boiling Point @ 0.5 torr, °C	245
Extrapolated Vapor Pressure @ 25°C (77°F) torr	3 x 10-10
Ultimate Vacuum, torr untrapped	10-9 to 10-10
Ultimate Vacuum, torr trapped	10-11
Oxidation Resistance at Operating Temperature	Excellent
Backstreaming Rate	Very Low
Boiler Temperature, °C	250-270

DC-705 Ordering Information

Part Number	Description
DC-705-50	50 cc
DC-705-100	100 cc
DC-705-500	500 cc
DC-705-1	1 Gallon

Santovac® 5 Diffusion Pump Fluid

Description (Synthetic Polyphenyl Ether)

Santovac® 5 is a diffusion pump fluid capable of producing ultra high vacuum levels in the 10-10 torr range. Its very low vapor pressure reduces backstreaming and can eliminate the need for baffles thereby maintaining system cleanliness and increasing pumping speeds. Its superior thermal and oxidation stability offers longer operating terms than most other fluids. Unlike silicone based fluids there is no danger of depositing electrically insulating films making it ideal for use in analytical vacuum equipment.

Specifications:

Color	Clear
Viscosity @ 35° C (100°F)	363cST/1860SUS
Viscosity @ 99° C (210°F)	13.1cSt/72SUS
Specific Gravity	1.198
Flash Point °C open Cup	288°C / 550°F
Boiling Point @ 0.5 torr	275°C
Vapor Pressure torr @ 25°C	4 x 10-10

Santovac® 5 Ordering Information

Part Number	Description	Price
SANTOVAC#5	500 cc	UPON REQUEST

Silicone High Vacuum Grease

Description:

The **HVL Series** silicone grease is a general-purpose grease and is equal to Dow Corning High Vacuum Grease.® **HVL Series** silicone grease is used in most general vacuum systems and only a thin layer of grease should be used. (Only enough where as the o-ring itself is "shiny". No grease itself should be visible) **HVL** silicone grease maintains its consistency for -30°F to 550°F and can be effectively used at pressures as low as 10-7 torr.

Specifications:

Color	Translucent White
Flash Point	> 625°F
Fire Point	> 625°F
Temperature Range	-45°F to 525°F

HVL Ordering Information

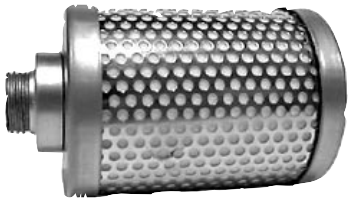
Part Number	Description
HVL-4OZ	4 oz. container

Oil Mist Eliminators

KHVP-2000 Series throw away mist eliminators are designed to be used on any rotary vane pumps, eliminating the oil mist which is ejected through the exhaust port during the initial pump down to 1 mbar. Oil mist is harmful to the lungs and by incorporating the **KHVP-2000 Series** into a rotary vane pump eliminates this issue and will help maintain a cleaner working environment. The **KHVP-2000** disposable mist eliminators are of a general-purpose design capable of retaining oil mist as small as one micron and are not intended for aggressive gases. Other sizes and mounting arrangements are available upon request, contact factory.

Specifications:

Part Number	Use with CFM Pump	Mounting Thread
KHVP-2000	1 to 6 CFM	1/2" Male NPT
KHVP-2000-1	7 to 15 CFM	3/4" Male NPT
KHVP-2000-2	16 to 30 CFM	1" Male NPT



Oil Analysis Kit

The **OAK-2000** is an acidity test kit that allows the user to monitor the condition of the oil. By monitoring the vacuum pump oil maintenance costs are reduced and pump failure is averted. Each kit contains 10 vials of test solution, fill the vial with pump fluid and shake the vial and check the color. These kits give the user valuable information on the current condition of the pump fluid and assist in developing planned maintenance schedules as well as avoiding costly pump failure.

Part Number
OAK-2000

Rubber Vacuum Tubing

Hardness, Shore A +/-5	45
Specific gravity	1.08
Tensile Strength, PSI	3000
Average Elongation %	600
Brittle Temperature	-40° F
Maximum Operating Temperature	180° F

Vacuum Tubing Ordering Info:

Part Number	Description
VT1	3/8" Wall x 3/8" ID
VT2	3/8" Wall x 1/2"ID
VT3	3/8" Wall x 5/8" ID
VT4	1/2" Wall x 1" ID
VT5	1/2" Wall x 1-5/8" ID
VT6	1/2" Wall x 2" ID

Clamps for VT Series Hose

Part Number	Description
HC1	Fits VT1, VT2 & VT3
HC2	Fits VT4
HC3	Fits VT5
HC4	Fits VT6

Viton® (Fluorocarbon) O-Rings .070 cross section series

Part Number	I.D.	O.D.
VOR001★	.029	.109
VOR002★	.042	.142
VOR003★	.056	.176
VOR004★	.070	.210
VOR005★	.101	.241
VOR006★	.114	.254
VOR007★	.145	.285
VOR008★	.176	.316
VOR009★	.208	.347
VOR010★	.239	.379
VOR011★	.301	.441
VOR012★	.364	.504
VOR013★	.426	.566
VOR014★	.489	.629
VOR015★	.551	.691
VOR016★	.614	.754
VOR017★	.676	.816
VOR018★	.739	.879
VOR019★	.801	.941
VOR020★	.846	1.004
VOR021★	.926	1.066
VOR022★	.989	1.129
VOR023★	1.051	1.191
VOR024★	1.114	1.254
VOR025★	1.176	1.316
VOR026★	1.239	1.379
VOR027★	1.301	1.441
VOR028★	1.364	1.504
VOR029★	1.489	1.629
VOR030★	1.614	1.754
VOR031★	1.739	1.879
VOR032★	1.864	2.004
VOR033★	1.989	2.129
VOR034★	2.114	2.254
VOR035★	2.239	2.379
VOR036★	2.364	2.504
VOR037★	2.489	2.629
VOR038★	2.614	2.754
VOR039★	2.739	2.879
VOR040★	2.864	3.004
VOR041★	2.989	3.129
VOR042★	3.239	3.379
VOR043★	3.489	3.629
VOR044★	3.739	3.879
VOR045★	3.989	4.129
VOR046★	4.239	4.379
VOR047★	4.489	4.629
VOR048★	4.739	4.879
VOR049★	4.989	5.129
VOR050★	5.239	5.379

★ = New Product

Viton® (Fluorocarbon) O-Rings .103 cross section series

Part Number	I.D.	O.D.
VOR110★	.362	.568
VOR111★	.424	.630
VOR112★	.487	.693
VOR113★	.549	.755
VOR114★	.612	.818
VOR115★	.674	.880
VOR116★	.737	.943
VOR117★	.799	1.005
VOR118★	.862	1.068
VOR119★	.924	1.130
VOR120★	.987	1.193
VOR121★	1.049	1.255
VOR122★	1.112	1.318
VOR123★	1.174	1.380
VOR124★	1.237	1.443
VOR125★	1.299	1.505
VOR126★	1.362	1.568
VOR127★	1.424	1.630
VOR128★	1.487	1.693
VOR129★	1.549	1.755
VOR130★	1.612	1.818
VOR131★	1.674	1.880
VOR132★	1.734	1.943
VOR133★	1.799	2.005
VOR134★	1.862	2.068
VOR135★	1.925	2.131
VOR136★	1.987	2.193
VOR137★	2.050	2.256
VOR138★	2.112	2.318
VOR139★	2.175	2.381
VOR140★	2.237	2.443
VOR141★	2.300	2.506
VOR142★	2.362	2.568
VOR143★	2.425	2.631
VOR144★	2.487	2.693
VOR145★	2.550	2.756
VOR146★	2.612	2.818
VOR147★	2.675	2.881
VOR148★	2.737	2.943
VOR149★	2.800	3.006

★ = New Product

Viton® (Fluorocarbon) O-Rings .103 cross section series

Part Number	I.D.	O.D.
VOR150★	2.862	3.068
VOR151★	2.987	3.193
VOR152★	3.237	3.443
VOR153★	3.487	3.693
VOR154★	3.737	3.943
VOR155★	3.987	4.193
VOR156★	4.237	4.443
VOR157★	4.487	4.693
VOR158★	4.737	4.943
VOR159★	4.987	5.193
VOR160★	5.237	5.443
VOR161★	5.487	5.693
VOR162★	5.737	5.943
VOR163★	5.987	6.193
VOR164★	6.237	6.443
VOR165★	6.487	6.693
VOR166★	6.737	6.943
VOR167★	6.987	7.193
VOR168★	7.237	7.443
VOR169★	7.487	7.693
VOR170★	7.737	7.943
VOR171★	7.987	8.193
VOR172★	8.237	8.443
VOR173★	8.487	8.693
VOR174★	8.737	8.943
VOR175★	8.987	9.193
VOR176★	9.237	9.443
VOR177★	9.487	9.693
VOR178★	9.737	9.943

★ = New Product

Viton® (Fluorocarbon) O-Rings .139 cross section series

Part Number	I.D.	O.D.
VOR210★	.734	1.012
VOR211★	.796	1.074
VOR212★	.859	1.137
VOR213★	.921	1.199
VOR214★	.984	1.262
VOR215★	1.046	1.324
VOR216★	1.109	1.387
VOR217★	1.171	1.449
VOR218★	1.234	1.512
VOR219★	1.296	1.574
VOR220★	1.359	1.637
VOR221★	1.421	1.699
VOR222★	1.484	1.762
VOR223★	1.609	1.887
VOR224★	1.734	2.012
VOR225★	1.859	2.137
VOR226★	1.984	2.262
VOR227★	2.109	2.387
VOR228★	2.234	2.512
VOR229★	2.359	2.637
VOR230★	2.484	2.762
VOR231★	2.609	2.887
VOR232★	2.737	3.012
VOR233★	2.859	3.137
VOR234★	2.984	3.262
VOR235★	3.109	3.387
VOR236★	3.234	3.512
VOR237★	3.359	3.637
VOR238★	3.484	3.762
VOR239★	3.609	3.887
VOR240★	3.734	4.012
VOR241★	3.859	4.137
VOR242★	3.984	4.262
VOR243★	4.109	4.387
VOR244★	4.234	4.512
VOR245★	4.359	4.637
VOR246★	4.484	4.762
VOR247★	4.609	4.887
VOR248★	4.734	5.012
VOR249★	4.859	5.137
VOR250★	4.984	5.262
VOR251★	5.109	5.387
VOR252★	5.234	5.512

★ = New Product

Viton® (Fluorocarbon) O-Rings .139 cross section series

Part Number	I.D.	O.D.
VOR253★	5.359	5.637
VOR254★	5.484	5.762
VOR255★	5.609	5.887
VOR256★	5.734	6.012
VOR257★	5.859	6.137
VOR258★	5.984	6.262
VOR259★	6.234	6.512
VOR260★	6.484	6.762
VOR261★	6.734	7.012
VOR262★	6.984	7.262
VOR263★	7.234	7.512
VOR264★	7.484	7.762
VOR265★	7.734	8.012
VOR266★	7.984	8.262
VOR267★	8.234	8.512
VOR268★	8.484	8.762
VOR269★	8.734	9.012
VOR270★	8.984	9.262
VOR271★	9.234	9.512
VOR272★	9.484	9.762
VOR273★	9.734	10.012
VOR274★	9.984	10.262
VOR275★	10.484	10.762
VOR276★	10.984	11.262
VOR277★	11.484	11.762
VOR278★	11.984	12.262
VOR279★	12.984	13.262
VOR280★	13.984	14.262
VOR281★	14.984	15.262
VOR282★	15.955	16.223
VOR283★	16.955	17.233
VOR284★	17.955	18.233

★ = New Product

Viton® (Fluorocarbon) O-Rings .210 cross section series

Part Number	I.D.	O.D.
VOR325★	1.475	1.895
VOR326★	1.600	2.020
VOR327★	1.725	2.145
VOR328★	1.850	2.270
VOR329★	1.975	2.395
VOR330★	2.100	2.520
VOR331★	2.225	2.645
VOR332★	2.350	2.770
VOR333★	2.457	2.895
VOR334★	2.600	3.020
VOR335★	2.725	3.145
VOR336★	2.850	3.270
VOR337★	2.975	3.395
VOR338★	3.100	3.520
VOR339★	3.225	3.645
VOR340★	3.350	3.770
VOR341★	3.475	3.895
VOR342★	3.600	4.020
VOR343★	3.725	4.145
VOR344★	3.850	4.270
VOR345★	3.975	4.395
VOR346★	4.100	4.520
VOR347★	4.225	4.645
VOR348★	4.350	4.770
VOR349★	4.475	4.895
VOR350★	4.600	5.020
VOR351★	4.725	5.145
VOR352★	4.850	5.270
VOR353★	4.975	5.395
VOR354★	5.100	5.520
VOR355★	5.225	5.645
VOR356★	5.350	5.770
VOR357★	5.475	5.895
VOR358★	5.600	6.020
VOR359★	5.725	6.145
VOR360★	5.850	6.270
VOR361★	5.975	6.395
VOR362★	6.225	6.645
VOR363★	6.475	6.895
VOR364★	6.725	7.145
VOR365★	6.975	7.395
VOR366★	7.225	7.645
VOR367★	7.475	7.895
VOR368★	7.725	8.145
VOR369★	7.975	8.395
VOR370★	8.225	8.645
VOR371★	8.475	8.895
VOR372★	8.725	9.145
VOR373★	8.975	9.395
VOR374★	9.225	9.645

★ = New Product

Viton® (Fluorocarbon) O-Rings .210 cross section series

Part Number	I.D.	O.D.
VOR375★	9.475	9.895
VOR376★	9.725	10.145
VOR377★	9.975	10.395
VOR378★	10.475	10.895
VOR379★	10.975	11.395
VOR380★	11.475	11.895
VOR381★	11.975	12.395
VOR382★	12.975	13.395
VOR383★	13.975	14.395
VOR384★	14.975	15.395
VOR385★	15.955	16.375
VOR386★	16.955	17.375
VOR387★	17.955	18.375
VOR388★	18.953	19.373
VOR389★	19.953	20.373
VOR390★	20.953	21.373
VOR391★	21.953	22.373
VOR392★	22.940	23.360
VOR393★	23.940	24.360
VOR394★	24.940	25.360
VOR395★	25.940	26.360

★ = New Product

Viton® (Fluorocarbon) O-Rings .275 cross section series

Part Number	I.D.	O.D.
VOR425★	4.475	5.025
VOR426★	4.600	5.150
VOR427★	4.725	5.275
VOR428★	4.850	5.400
VOR429★	4.975	5.525
VOR430★	5.100	5.650
VOR431★	5.225	5.775
VOR432★	5.350	5.900
VOR433★	5.475	6.025
VOR434★	5.600	6.150
VOR435★	5.725	6.275
VOR436★	5.850	6.400
VOR437★	5.975	6.525
VOR438★	6.225	6.775
VOR439★	6.475	7.025
VOR440★	6.725	7.275
VOR441★	6.975	7.525
VOR442★	7.225	7.775
VOR443★	7.475	8.025
VOR444★	7.725	8.275
VOR445★	7.975	8.525
VOR446★	8.475	9.025
VOR447★	8.975	9.525
VOR448★	9.475	10.025
VOR449★	9.975	10.525
VOR450★	10.475	11.025
VOR451★	10.975	11.525
VOR452★	11.475	12.025
VOR453★	11.975	12.525
VOR454★	12.475	13.025
VOR455★	12.975	13.525
VOR456★	13.475	14.025
VOR457★	13.975	14.525
VOR458★	14.475	15.025
VOR459★	14.975	15.525
VOR460★	15.475	16.025
VOR461★	15.955	16.505
VOR462★	16.455	17.005
VOR463★	16.955	17.505
VOR464★	17.455	18.005
VOR465★	17.955	18.505
VOR466★	18.455	19.005
VOR467★	18.955	19.505
VOR468★	19.455	20.005
VOR469★	19.955	20.505
VOR470★	20.955	21.505
VOR471★	21.955	22.505
VOR472★	22.940	23.940
VOR473★	23.940	24.490
VOR474★	24.940	25.490
VOR475★	25.940	26.490

★ = New Product