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Viewports & Glass Components



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MDC viewports and glass components

- Corning type 7056 glass
- Fused Quartz
- UV grade synthetic Sapphire
- Zero length geometry
- Magnetic and non magnetic construction

Viewports & Glass Components

For more information on VacOptix® and other MDC specialty viewports, please visit www.www.mdcvacuum.com.

Glass Viewports

Glass viewports are an economical, practical and common solution for vacuum observation ports. Glass viewports are typically sealed to low expansion nickel-iron alloys or 300 series stainless steel metal sleeves using the latest in glass-to-metal bonding technology. The material in MDC glass viewports is Corning type 7056 glass, the most commonly used vacuum window material in the industry. MDC glass viewports provide high and ultrahigh vacuum compatibility for basic optical applications. Glass viewports are available on MDC's standard vacuum mounts including Del-Seal™ CF, Kwik-Flange™ and Large-Flange™ ISO flanges with clear apertures from 5/8 to 5-3/8 inch diameters. Since glass is susceptible to scratching and weak under point stresses, caution must be exercised when heating or cooling glass viewport assemblies. Thermal gradients in excess of 10°C per minute must be avoided. Because of implosion hazard, glass viewports with scratches or nicks should be replaced. For customers desiring a viewport with a replaceable glass substrate, MDC offers a weldable 4 inch view diameter Pyrex® viewport assembly. These viewports are constructed with Corning type 7740 glass and are sealed in place using an elastomer gasket and suitable for service to 1x10⁻⁸ Torr.

Quartz Viewports

Quartz viewports are designed and rated for high and ultrahigh vacuum applications. They are constructed using vacuum grade

materials including high purity silicon dioxide, fused quartz, 304 stainless steel for all metal components, and vacuum tube grade braze alloys. UV grade fused silica viewports are available from MDC's Insulator Seal division in Sarasota, Florida. Suprasil™ 1 and Suprasil™ 2 ultraviolet grade fused silica materials are standard catalog viewports at ISI. Fused silica and quartz are polycrystalline, isotropic materials with no crystal orientation. Their physical, thermal, dielectric and optical properties are uniform in all directions of measurement. Optical grade fused quartz is suitable for all but the most demanding optical applications. This material is guaranteed to be grade B or better. Natural impurities in fused quartz cause a blue-violet fluorescence when exposed to ultraviolet radiation at 253.7µm. This fluorescence is not evident in synthetic fused silica, which is manufactured by flame hydrolysis of silicon tetrachloride. Quartz viewports are available up to 7.78 inch view diameters. Fused quartz and fused silica viewports are preferred over glass viewports because of their transparency to ultraviolet radiation. Other advantages include a higher abrasion resistance and a low coefficient of thermal expansion, making them very resistant to thermal shock. The main limitation with fused quartz or fused silica viewports is that they cannot be heated to temperatures over 200°C. The lead-silver alloy used to seal and bond the window to a stainless steel sleeve melts at 305°C.

Sapphire Viewports

Sapphire is a synthetic, hexagonal single crystal anisotropic material which displays

VIEWPORT TYPE	PROPERTIES		BAKEOUT MAX		MAXIMUM THERMAL GRADIENT	MATERIALS	
	ZERO LENGTH	MAGNETIC	DEL-SEAL™ CF	ISO		WINDOW	SLEEVE
GLASS	YES	YES	400°C	200°C	10°C/MIN	BOROSILICATE	NiFe
GLASS	NO	NO	400°C	200°C	10°C/MIN	BOROSILICATE	304ss
QUARTZ	YES	NO	200°C	200°C	25°C/MIN	SiO ₂	304ss
SAPPHIRE	YES	YES	450°C	200°C	25°C/MIN	Al ₂ O ₃	NiFe



Glass viewport family

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Quartz viewport family

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substantially different physical, thermal, dielectric and optical characteristics when measured along different axes. MDC sapphire viewports are constructed using 90° crystal orientation, where the crystal orientation is parallel to a window's surface. Viewports with crystal orientation parallel to the optical axis, or 0° orientation, can be custom ordered from Insulator Seal. MDC offers a wide selection of sapphire viewport assemblies suitable for high and ultrahigh vacuum applications. The use of high purity sapphire and nickel-iron low expansion alloys enables these viewports to be repeatedly baked to temperatures as high as 450°C. All sapphire viewports up to 1 inch in diameter use ultraviolet grade sapphire material. Those exceeding 1 inch diameters are supplied with regular grade sapphire. Please reference the transmission curves on this page for transmission characteristics and comparisons. Also note that limitations in current sapphire crystal growth technology make it difficult to guarantee constant transmission performance at wavelengths below 0.25µm

In general, poor surface finish can contribute as much as 10% to a window's total transmission losses. The sapphire viewports offered in this catalog are supplied with flat faces polished to a 50-20 scratch-dig while quartz viewports are 80-50 scratch-dig. Although these finishes are suitable for most optical applications, the optics industry recommends a 20-10 scratch-dig finish for wavelengths below 0.25µm.

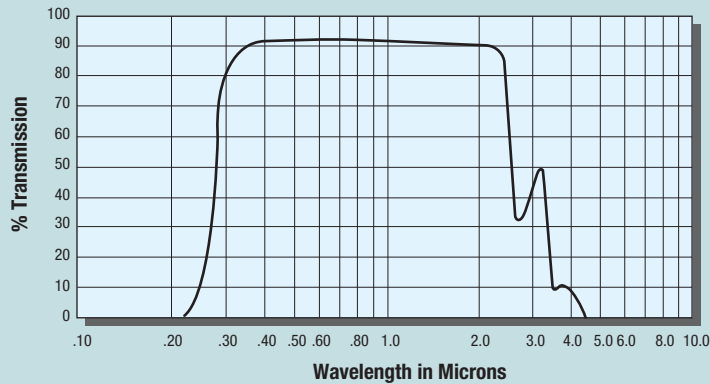
Note: Visible light is 4,000 (violet) to 7,000 (red) Ångstroms (1Å = 10⁻⁸ cm)

BRAZE	COMMENTS
FUSED	MATCHED EXPANSION SEAL
FUSED	HOUSEKEEPER SEAL
PbAg	BRAZE ALLOY MELTS AT 305°C
AgCu	BRAZE ALLOY MELTS AT 800°C



Sapphire viewport family page 309

Glass Transmission Curve

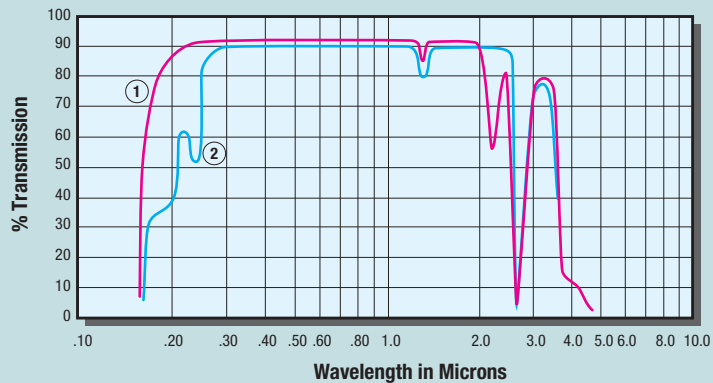


Glass

1 mm thick
Reflection
Losses
Included

7056 Borosilicate

Quartz Transmission Curve



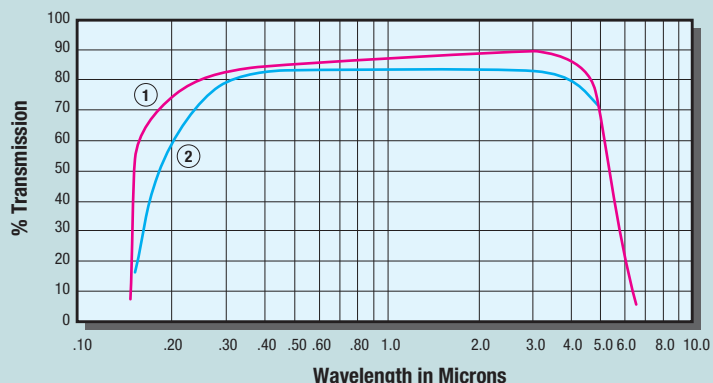
Quartz

10 mm thick
Reflection
Losses
Included

(1) UV Grade
Fused Silica

(2) Regular Grade
Fused Quartz

Sapphire Transmission Curve



Sapphire

1 mm thick
Reflection
Losses
Included

(1) UV Grade

(2) Regular Grade



MDC viewports and glass components

- Pyrex® Viewports
- Rotary shutter assemblies
- Single ended glass adapters
- Double ended glass adapters
- Sealed end glass adapters
- Flexible glass adapters

Viewports & Glass Components

Pyrex® Viewports

MDC Pyrex® viewports provide a convenient and economical solution for high vacuum systems requiring periodic glass substrate replacement. Some applications like vacuum coating will deposit coating materials on system viewports which will eventually render them useless. The Pyrex® substrate is sealed against an elastomer gasket and clamped in place with an aluminum retaining flange. It is important to note that most glass materials are susceptible to point stressing if clamped directly against a metal surface. For this reason MDC Pyrex® viewport retaining flanges are fitted with a cushion gasket that prevents metal to glass contact. These viewports are offered in a weldable 4 inch view diameter half-nipple geometry. They are constructed with Corning type 7740 glass and are suitable for service to 1×10^{-8} Torr.

Viewport Shutter Assemblies

MDC manually actuated rotary shutters allow quick and easy shielding of standard viewports fitted with Del-Seal™ CF metal seal flanges. These shutters are ideally suited for vacuum coating applications where viewports are not easily replaced or too expensive to do so. Shutters are mounted on double-sided Del-Seal™ CF flanges and fitted with reliable, bellows sealed UHV rotary motion feedthrough actuation. MDC standard rotary motion feedthroughs are a popular and economical solution for in-vacuum sample or device rotation. They are constructed of the highest grade vacuum compatible materials. Position is measured along a 360° laser etched black-anodized barrel graduated in 5° increments. Welded stainless steel bellows, a unique off-axis wobble design and the use of rotary shaft bearing supports provide devices

of unsurpassed reliability and performance.

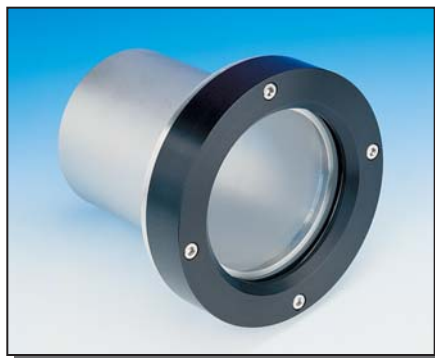
Positive position locks are included on each assembly to prevent over swinging the shutter mechanism. The swing angle of these shutters is dependent on the flange to tube size combination selected. For all practical purposes the shutter swing angles given in this catalog are for shutters mounted on standard half-nipple tube diameters. Every shutter purchased will be shipped with these default swing angles. If the mounting port is welded directly to a chamber wall and is not restricted by a long access tube, greater swing angles will be possible.

Glass Adapters

MDC glass to metal adapters provide a means of attaching glass components to a metal vacuum system and or metal hardware to a glass system. These glass adapters are produced with the latest in glass-to-metal seal technology and are available in either Pyrex® code 7740 or Borosilicate code 7052 glass.

Five glass seal geometries are offered, these include flange to glass with open end, flange to flange with glass transition, flange to glass with sealed end, flange to glass with open end and flexible bellows transition and glass to glass with flexible bellows transition. Most are offered on 1-1/3 to 8 inch Del-Seal™ CF flanges with glass tube from 1/8 to 6 inch diameters. All overall lengths and glass lengths are nominal $\pm 1/8"$. Products fitted with Kwik-Flange™ ISO KF flanges are available for tube diameters of 3/4, 1, 1-1/2 and 2 inches.

The flange to glass with open end versions are designed for installation to a flanged system on one end and to either a quick



Pyrex® viewports

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Rotary shutter assembly

page 311



disconnect elastomer sealed compression fitting or for fusing directly to a glass tube, apparatus or system. The flange to flange glass transition versions allow mounting between two flanged systems. They can also be used as low voltage electrical breaks on vacuum tube lines. Flange to glass adapters with a sealed glass end can be mounted to a flanged system and provide a bell jar like glass enclosure that is ideally suited for experiments requiring the transparency of glass. Flexible glass adapters are fitted with formed bellows and are specifically designed for joining metal flanged systems or glass tubed systems with misaligned components.

VacOptix®

To further extend vacuum optics capabilities, Insulator Seal offers an exclusive line of viewports using its patented VacOptix® seal technology. This proprietary sealing technique allows the sealing of exotic optical materials previously unavailable to the ultrahigh vacuum industry. VacOptix® materials include magnesium fluoride, calcium fluoride, crystal quartz, fused silica, borosilicate glass, sapphire, silicon, germanium, zinc sulfide and zinc selenide. These viewports provide the largest available transmission spectrum in the industry. VacOptix® are laser optics quality viewports for transmission of spectral energy from deep ultraviolet to far infrared wavelengths.

All dimensions in this catalog are given in inches unless specified otherwise.



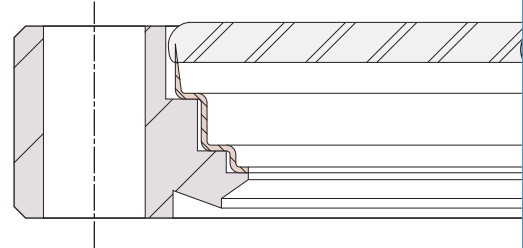
Glass adapters

beginning page 312

Viewport Sealing Methods

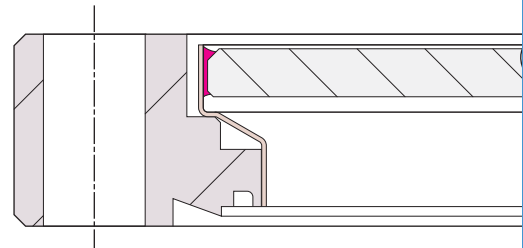
Glass

Glass is fused to a thin nickel-iron metal transition



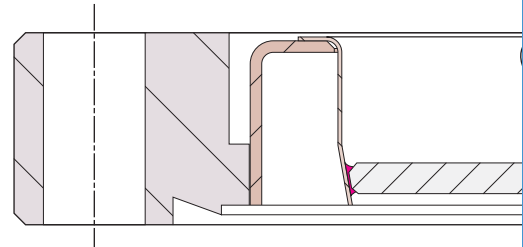
Quartz

Quartz is metalized and brazed directly to stainless steel using a lead-silver braze alloy



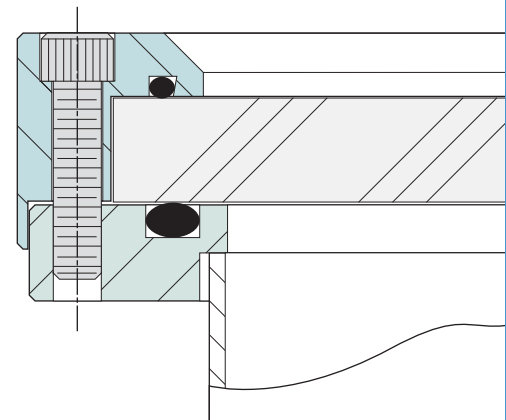
Sapphire

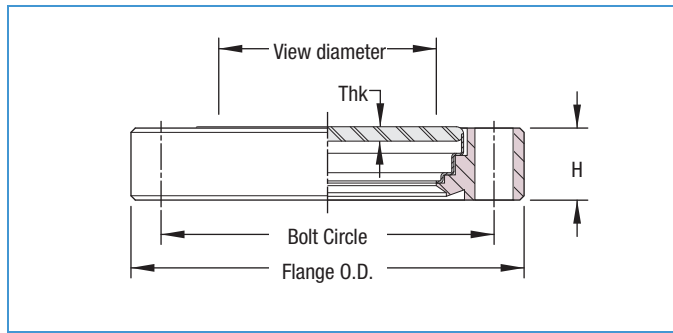
Sapphire is metalized and vacuum brazed to a nickel-iron sleeve using a tapered seal interface



Pyrex®

A Pyrex® substrate is sandwiched between two elastomer seals. The outer elastomer (top in drawing) is for cushioning and the inner elastomer (bottom in drawing) makes the vacuum seal.

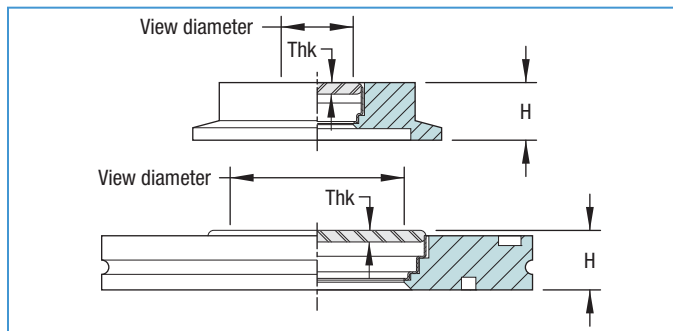




- 7056 Glass
- Zero Profile
- Del-Seal™ CF flange
- Kovar sleeve

NOMINAL FLANGE	FLANGE O.D.	BOLT CIRCLE	VIEW DIA.	GLASS THICKNESS	H	WT LB	REFERENCE	PART NUMBER
1-1/3	1.33	1.062	.62	.070	.285	1/2	VP-075	450000
2-1/8	2.12	1.625	.90	.070	.470	3/4	VP-100	450041
2-3/4	2.73	2.312	1.50	.105	.500	1-1/2	VP-150	450002
3-3/8	3.37	2.850	2.00	.170	.625	1-1/2	VP-200	450003
4-1/2	4.47	3.628	2.69	.170	.680	2-1/2	VP-250	450004
4-5/8	4.62	4.030	2.69	.170	.750	2-1/2	VP-300	450005
6	5.97	5.128	3.88	.200	.780	3-1/2	VP-400	450006
6-3/4	6.75	5.969	3.88	.200	.840	5	VP-500	450007
8	7.97	7.128	5.38	.375	.880	6	VP-600	450008
10	9.97	9.128	5.38	.375	.970	8	VP-800	450009

Viewports & Glass Components



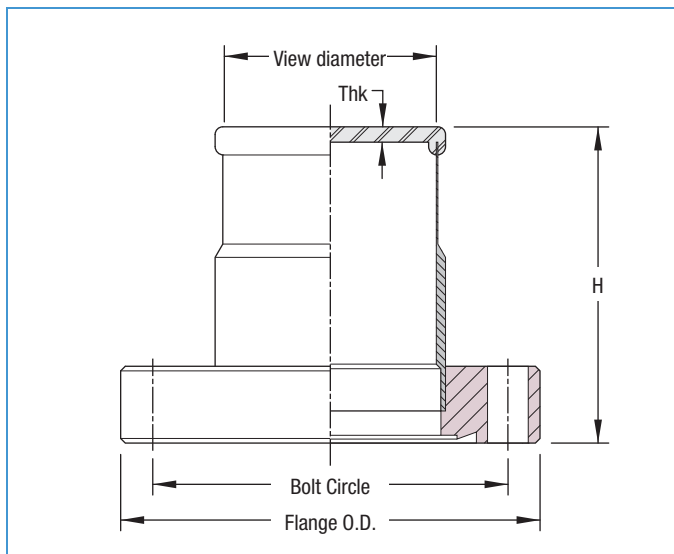
- 7056 Glass
- Zero Profile
- Kwik-Flange™ ISO KF
- Large-Flange™ ISO LF
- Kovar sleeve

NOMINAL ISO REF.	FLANGE O.D.	BOLT CIRCLE	VIEW DIA.	GLASS THICKNESS	H	WT LB	REFERENCE	PART NUMBER
KWIK-FLANGE™ ISO KF								
NW16	1.18	-	.62	.070	.363	1/2	KVP-075	450030
NW25	1.57	-	.90	.070	.580 ¹	1/2	KVP-100	450042
NW40	2.16	-	.90	.105	.500 ¹	1/2	KVP-150	450043
NW50	2.95	-	1.50	.105	.625	1/2	KVP-200	450033
LARGE-FLANGE™ ISO LF								
NW63	3.74	-	2.00	.170	.470	1	LVP-250	450011
NW80	4.33	-	2.00	.170	.470	2	LVP-300	450012
NW100	5.12	-	2.69	.170	.688	2	LVP-400	450013
NW160	7.09	-	3.88	.200	.790	4	LVP-600	450014
NW200	9.45	-	5.38	.375	.875	7	LVP-800	450015
NW250	11.42	-	5.38	.375	.875	11	LVP-1000	450016
NW320	14.57	-	5.38	.375	.875	12	LVP-1200	450017
NW400	17.72	-	5.38	.375	.875	40	LVP-1600	450018
NW500	21.65	-	5.38	.375	.875	47	LVP-2000	450019

¹ Glass extends beyond thickness of flange



Del-Seal™ CF



- Nonmagnetic construction
- Del-Seal™ CF flange
- Stainless steel sleeve

NOMINAL FLANGE	FLANGE O.D.	BOLT CIRCLE	VIEW DIA.	GLASS THICKNESS	H	WT LB	REFERENCE	PART NUMBER
1-1/3	1.33	1.062	.50	.070	1.12	1/2	VP-075N	451004
2-3/4	2.73	2.312	1.25	.125	2.00	1	VP-150N	451000
3-3/8	3.37	2.850	1.62	.170	2.12	2	VP-200N	451005
4-1/2	4.47	3.628	2.00	.170	2.12	2-1/2	VP-250N	451001
6	5.97	5.128	3.50	.200	2.12	3-1/2	VP-400N	451002
8	7.97	7.128	5.38	.375	2.75	6	VP-600N	451003

Construction Note

Non-magnetic construction requires longer transition length between seal joints and weld joints. The stainless steel sleeve is thinned out to give maximum flexibility at the glass to metal seal.



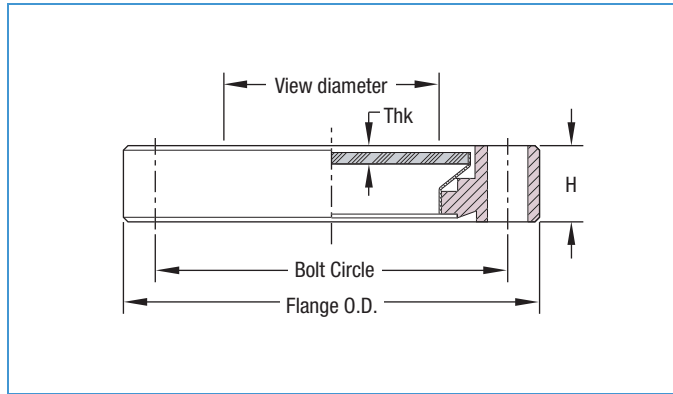
Quick-Access Doors

Quick-Access Doors with viewports are available in Section 7.2, pages 438-439.

Viewports are constructed of Corning type 7056 glass fused to a Kovar® nickel-iron transition sleeve.



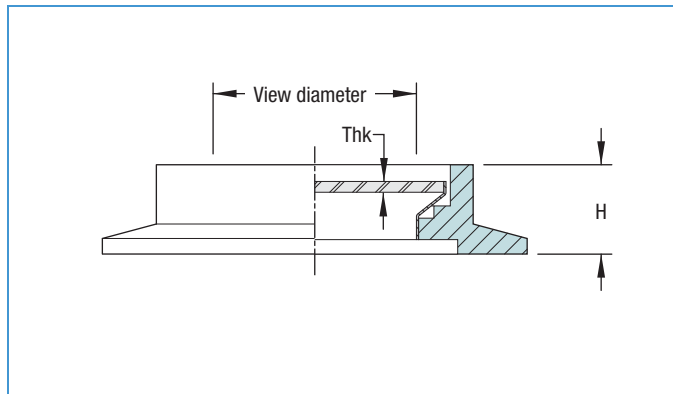
Del-Seal™ CF



- Fused quartz
- Zero profile
- Del-Seal™ CF flange
- Stainless steel sleeve

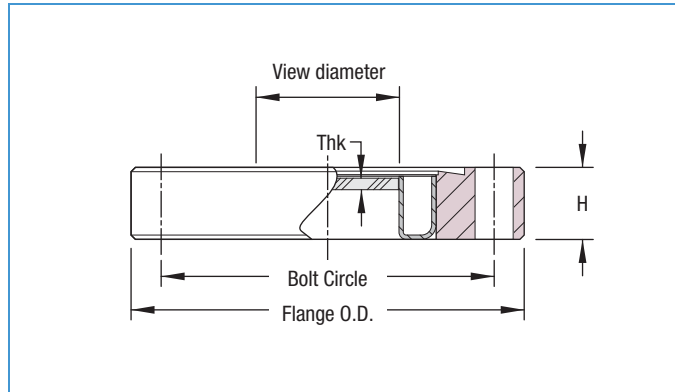
NOMINAL FLANGE	FLANGE O.D.	BOLT CIRCLE	VIEW DIA.	QUARTZ THICKNESS	H	WT LB	REFERENCE	PART NUMBER
2-3/4	2.73	2.312	1.40	.125	.500	1	VP-150QZ	450020
3-3/8	3.37	2.850	1.40	.125	.620	1	VP-200QZ	450021
4-1/2	4.47	3.628	2.69	.250	.680	2-1/2	VP-250QZ	450022
4-5/8	4.62	4.030	2.69	.250	.750	2-1/2	VP-300QZ	450023
6	5.97	5.128	3.88	.250	.780	3	VP-400QZ	450024
6-3/4	6.75	5.969	3.88	.250	.840	3	VP-500QZ	450025
8	7.97	7.128	5.38	.375	.880	3-1/2	VP-600QZ	450026
10	9.97	9.128	7.78	.375	.970	6	VP-800QZ	450027

Kwik-Flange™ KF



- Fused quartz
- Zero profile
- Kwik-Flange™ ISO KF flange
- Stainless steel sleeve

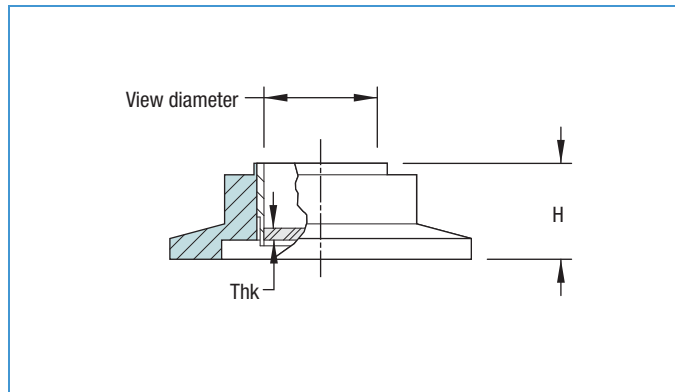
NOMINAL FLANGE	FLANGE O.D.	BOLT CIRCLE	VIEW DIA.	QUARTZ THICKNESS	H	WT LB	REFERENCE	PART NUMBER
NW50	2.95	-	1.40	.125	.620	1/2	KVP-200QZ	450028



- Regular grade and UV grade sapphire material¹
- Zero profile
- Del-Seal™ CF flange
- Kovar sleeve

NOMINAL FLANGE	FLANGE O.D.	BOLT CIRCLE	VIEW DIA.	SAPPHIRE THICKNESS	H	WT LB	REFERENCE	PART NUMBER
1-1/3	1.33	1.062	.59 ¹	.062	.500	1/2	VP-075S	453000
2-3/4	2.73	2.312	.94 ¹	.080	.500	1	VP-100S	453001
4-1/2	4.47	3.628	1.94	.094	.680	1-1/2	VP-200S	453002

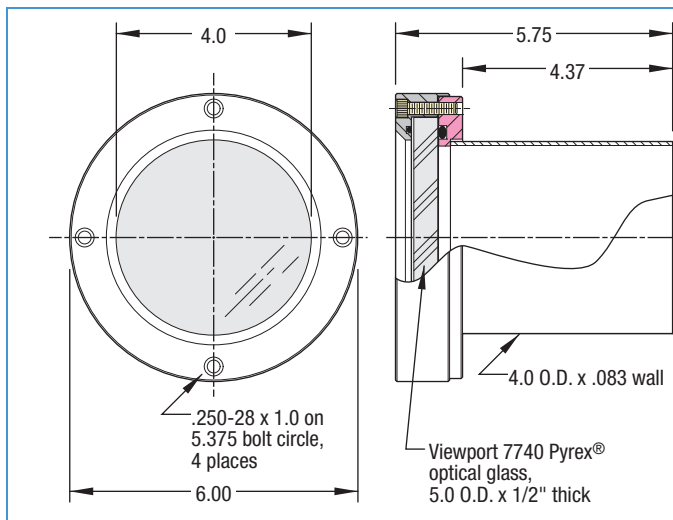
¹ Note: UV grade sapphire, all other sizes are regular grade sapphire



- Regular grade and UV grade sapphire material¹
- Zero profile
- Kwik-Flange™ ISO KF flange
- Kovar sleeve

NOMINAL FLANGE	FLANGE O.D.	BOLT CIRCLE	VIEW DIA.	SAPPHIRE THICKNESS	H	WT LB	REFERENCE	PART NUMBER
NW16	1.18	-	.59 ¹	.062	.500	1/2	KVP-075S	453020
NW25	1.57	-	.59 ¹	.062	.500	1/2	KVP-100S	453021
NW40	2.16	-	.94	.080	.500	1/2	KVP-150S	453022
NW50	2.95	-	.94	.080	.500	1/2	KVP-200S	453023

¹ Note: UV grade sapphire, all other sizes are regular grade sapphire



- Weld neck, 4-inch O.D.
- Pyrex® 7740 borosilicate optical glass
- 4-inch diameter nominal viewing area
- Type 304 stainless steel mounting
- Viton® O-ring seal
- Replaceable glass

Description

Economical visual quality viewport used on high vacuum chambers. Weldable configuration allows installation on a custom built stainless steel chamber. The replaceable viewport glass is captured between two elastomer O-rings. The viewport can be easily disassembled by removing four screws from the retainer ring.

The Pyrex® viewport is installed as a standard component on MDC stainless steel bell jars found in Chambers, Section 8.

DESCRIPTION	WT LB	REFERENCE	PART NUMBER
PYREX VIEWPORT WITH 4" O.D. WELD NECK	3	PVP-4	450010

DESCRIPTION	WT LB	REFERENCE	PART NUMBER
REPLACEMENT GLASS, 7740 PYREX OPTICAL 5" O.D.	1	-	045010
BOLT, SOCKET HEAD, STAINLESS STEEL, .250-28 x 1" LONG (Pkg of 4)	1/4	-	190166
O-RING, GLASS-TO-FLANGE	1/4	-	041346
O-RING, GLASS-TO-RETAINER	1/4	-	041243





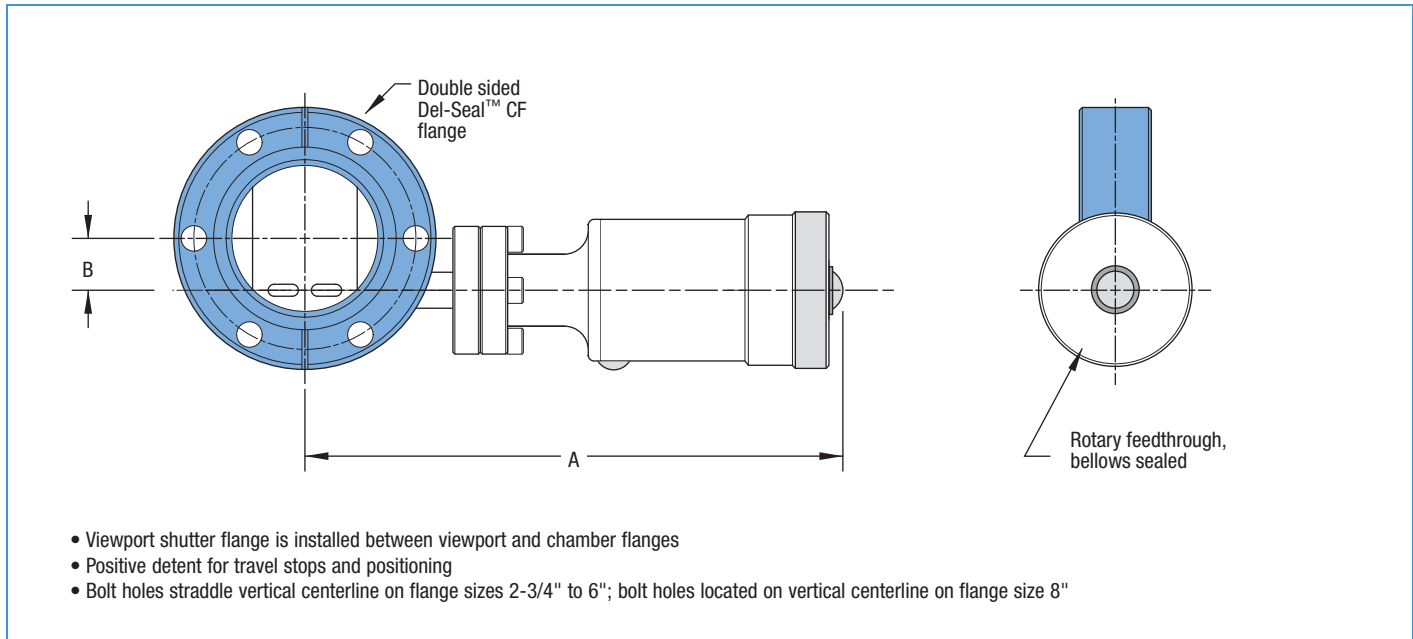
ULTRAHIGH VACUUM SERIES

Description

VPS Series viewport shutters provide quick and efficient shielding for all standard viewports. These shutters are ideally suited for service in high and ultrahigh vacuum coating applications. These swing type pivoting shutters feature a double-sided sealing design and are designed to mount between a port flange and the viewport. The shape of each shutter takes advantage of the maximum aperture of the inside of a standard port tube. The actual amount of shutter swing is dependent on the mating chamber's tube port diameter. The table below gives the maximum swing angle for each shutter when mounted on a standard Del-Seal™ flanged half nipple. To provide maximum shielding of viewports each shutter body has a step machined to match the shape and contour of the shutter's flapper plate. Actuation of the shutter is provided through an MDC bellows sealed rotary drive. Improved design features include all stainless steel body allowing for bakeout up to 230°C. A positive click-stop action has also been added to the rotary driver that allows for partial opening of the shutter's flapper plate between the fully opened and fully closed positions.

Features

- 100% viewport shielding
- Double-sided flange mount
- Del-Seal™ CF metal seal interface
- Actuated with bellows sealed rotary feedthrough
- Bakeable to 230°C
- Six flange sizes



NOMINAL FLANGE	FLANGE O.D.	BOLT CIRCLE	FLANGE THICKNESS	A	B	SHUTTER ANGLE	WT LB	REFERENCE	PART NUMBER
2-3/4	2.73	2.312	.75	5.59	.54	85°	1-1/2	VPS-275	454000
3-3/8	3.37	2.850	.62	5.95	.94	72°	2	VPS-338	454004
4-1/2	4.47	3.628	.68	7.06	1.07	72°	3	VPS-450	454001
6	5.97	5.128	.78	7.39	1.78	75°	4-1/2	VPS-600	454002
6-3/4	6.75	5.969	.84	7.78	1.53	76°	6-1/2	VPS-675	454005
8	7.97	7.128	.87	8.14	2.49	78°	9-1/2	VPS-800	454003

Refer to individual double sided flange size for mounting hardware, Section 1.1, page 56



Features

- 7740 Pyrex® or optional type 7052 glass
- Type 304ss flange material
- Metal or O-ring seal geometries
- Kovar® or stainless steel sleeve
- Custom lengths available on request
- Other configurations available on request

Description

MDC Glass to Metal Adapters facilitate the attachment of glass accessories to metal high vacuum systems and to attach UHV flange mounted devices to glass systems.

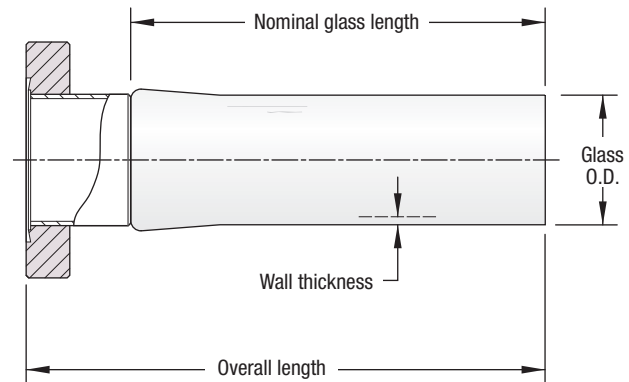
Standard adapters are offered with a choice of 7740 Pyrex® to Kovar® sleeve or 7740 Pyrex® to Type 304 stainless steel sleeve nonmagnetic combination. Stainless steel is recommended for cryo temperature applications. Adapters with Kovar® sleeve material have a lower temperature limitation of -80°C.

Del-Seal™ CF flange mounted units are bakeable to 400°C and useable to below 10⁻¹⁰ Torr. Kwik-Flange™ mounted adapters are bakeable to 200°C intermittent and can be used at 150°C sustained temperature. Overall lengths and glass lengths for all glass components are nominal ±1/8".

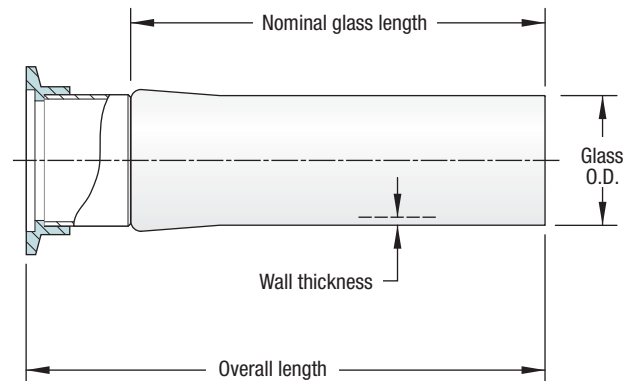
All sizes are also available with 7052 glass.

ULTRAHIGH & HIGH VACUUM SERIES

Del-Seal™ CF



Kwik-Flange™ KF



- Nominal lengths ±1/8"



KOVAR TO 7740 PYREX®



DEL-SEAL™ CF



304SS TO 7740 PYREX®

Dimensions given in the table below apply to both the Kovar® adapters on the left and the 304 stainless steel adapters on the right. Over-all tolerance is $\pm 1/8"$.

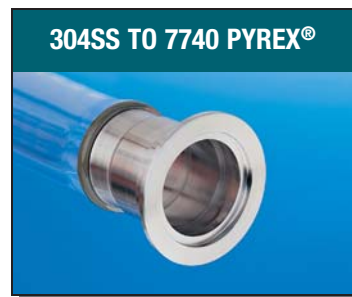
PART NUMBER	REFERENCE	KOVAR-TO-PYREX OVERALL LENGTH	NOMINAL GLASS O.D.	WALL THICKNESS	NOMINAL FLANGE	FLANGE O.D.	SS-TO-PYREX OVERALL LENGTH	REFERENCE	PART NUMBER
461000	GA-012P	5-3/8	1/8	.032	1-1/3	1.33	4-7/8	GA-012P-S	460000
461001	GA-018P	5-3/8	3/16	.032	1-1/3	1.33	4-7/8	GA-018P-S	460001
461002	GA-025P	5-3/8	1/4	.040	1-1/3	1.33	4-7/8	GA-025P-S	460002
461003	GA-031P	5-3/8	5/16	.040	1-1/3	1.33	4-7/8	GA-031P-S	460003
461004	GA-037P	5-3/8	3/8	.040	1-1/3	1.33	4-7/8	GA-037P-S	460004
461005	GA-050P	5-3/8	1/2	.050	1-1/3	1.33	4-7/8	GA-050P-S	460005
461006	GA-062P	5-3/8	5/8	.050	1-1/3	1.33	4-7/8	GA-062P-S	460006
461007	GA-075P	5-3/8	3/4	.050	1-1/3	1.33	5-1/4	GA-075P-S	460007
461008	GA-087P	5-3/8	7/8	.060	2-1/8	2.12	4-7/8	GA-087P-S	460008
461009	GA-100P	5-3/8	1	.060	2-1/8	2.12	4-7/8	GA-100P-S	460009
461010	GA-112P	5-3/8	1-1/8	.060	2-3/4	2.73	4-7/8	GA-112P-S	460010
461011	GA-125P	5-3/8	1-1/4	.070	2-3/4	2.73	4-7/8	GA-125P-S	460011
461023	GA-137P	5-3/8	1-3/8	.080	2-3/4	2.73	4-7/8	GA-137P-S	460012
461012	GA-150P	5-3/8	1-1/2	.080	2-3/4	2.73	4-7/8	GA-150P-S	460013
-	-	-	1-5/8	.080	3-3/8	3.37	4-7/8	GA-162P-S	460014
-	-	-	1-3/4	.080	3-3/8	3.37	4-7/8	GA-175P-S	460015
461013	GA-200P	5-7/8	2	.080	3-3/8	3.37	5-1/2	GA-200P-S	460016
461014	GA-225P	5-7/8	2-1/4	.100	4-1/2	4.47	5-3/8	GA-225P-S	460017
461015	GA-250P	7-1/2	2-1/2	.100	4-1/2	4.47	5-5/8	GA-250P-S	460018
-	-	-	2-3/4	.100	4-5/8	4.62	5-3/8	GA-275P-S	460019
461016	GA-300P	7-1/2	3	.100	4-5/8	4.62	6-3/8	GA-300P-S	460020
-	-	-	3-1/4	.100	6	5.97	6-3/8	GA-325P-S	460021
-	-	-	3-1/2	.100	6	5.97	6-3/8	GA-350P-S	460022
-	-	-	3-3/4	.100	6	5.97	6-3/8	GA-375P-S	460023
461020	GA-400P	10-1/8	4	.100	6	5.97	6-3/8	GA-400P-S	460024
461021	GA-500P	10-5/8	5	.120	6-3/4	6.75	8-1/4	GA-500P-S	460025
461022	GA-600P	10-5/8	6	.140	8	7.97	8-1/4	GA-600P-S	460026



KOVAR TO 7740 PYREX®



KWIK-FLANGE™ KF



304SS TO 7740 PYREX®

Dimensions given in the table below apply to both the Kovar® adapters on the left and the 304 stainless steel adapters on the right.

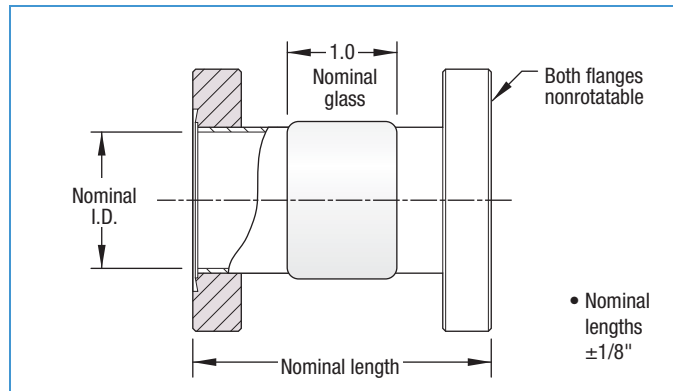
PART NUMBER	REFERENCE	KOVAR-TO-PYREX OVERALL LENGTH	NOMINAL GLASS O.D.	WALL THICKNESS	NOMINAL FLANGE	FLANGE O.D.	SS-TO-PYREX OVERALL LENGTH	REFERENCE	PART NUMBER
461040	KGA-075P	5-3/4	3/4	.050	NW16	1.18	5-1/4	KGA-075P-S	460040
461041	KGA-100P	5-1/2	1	.060	NW25	1.57	4-7/8	KGA-100P-S	460041
461042	KGA-150P	5-1/2	1-1/2	.080	NW40	2.16	5	KGA-150P-S	460042
461043	KGA-200P	6	2	.080	NW50	2.95	5-1/2	KGA-200P-S	460043

Viewports & Glass Components



Del-Seal™ CF

• 400°C maximum bakeout



- 7052 Glass
- Kovar sleeve material
- Optional Pyrex® to stainless steel
- 304ss nonrotatable flange
- Custom lengths available on request
- Other configurations available on request

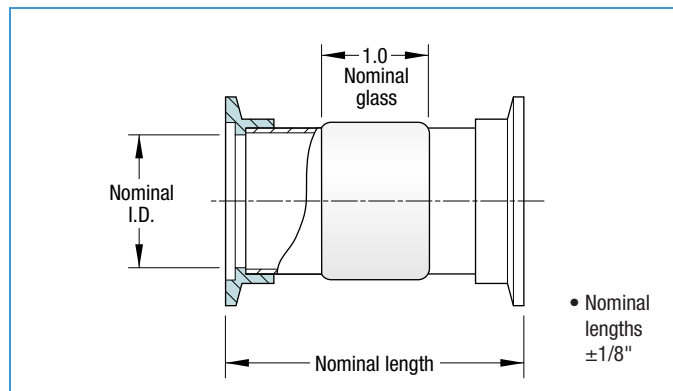
NOMINAL I.D.	FLANGE SIZE	FLANGE O.D.	BOLT CIRCLE	NOMINAL LENGTH	WT LB	REFERENCE	PART NUMBER
9/16	1-1/3	1.33	1.062	3.00	1/2	DEG-075	462000
13/16	2-1/8	2.12	1.625	3.22	3/4	DEG-100	462001
1-5/16	2-3/4	2.73	2.312	2.98	3/4	DEG-150	462002
1-13/16	3-3/8	3.37	2.850	3.83	1	DEG-200	462003
2-3/16	4-1/2	4.47	3.628	5.13	2	DEG-250	462004
2-11/16	4-5/8	4.62	4.030	5.13	2-1/2	DEG-300	462005
3-11/16	6	5.97	5.128	5.25	4	DEG-400	462006
4-1/2	6-3/4	6.75	5.969	5.30	5	DEG-500	462007
5-1/2	8	7.97	7.128	5.38	7	DEG-600	462008

Viewports & Glass Components



Kwik-Flange™

• 200°C maximum bakeout

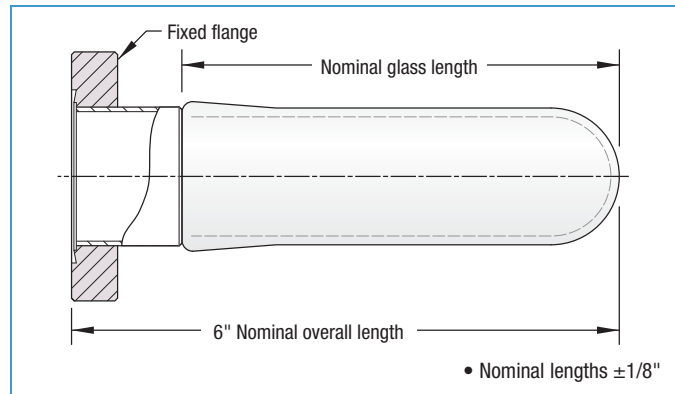


- 7052 Glass
- Kovar sleeve material
- Optional Pyrex® to stainless steel
- 304ss flange
- Custom lengths available on request
- Other configurations available on request

NOMINAL I.D.	FLANGE SIZE	FLANGE O.D.	ISO REF.	NOMINAL LENGTH	WT LB	REFERENCE	PART NUMBER
9/16	K-075	1.18	NW16	3.00	1/2	KDEG-075	462020
13/16	K-100	1.57	NW25	3.20	3/4	KDEG-100	462021
1-5/16	K-150	2.16	NW40	3.30	1	KDEG-150	462022
1-13/16	K-200	2.95	NW50	3.80	1-1/2	KDEG-200	462023

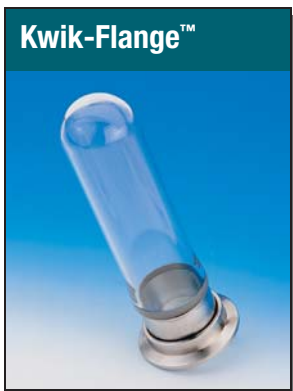


• 400°C maximum bakeout

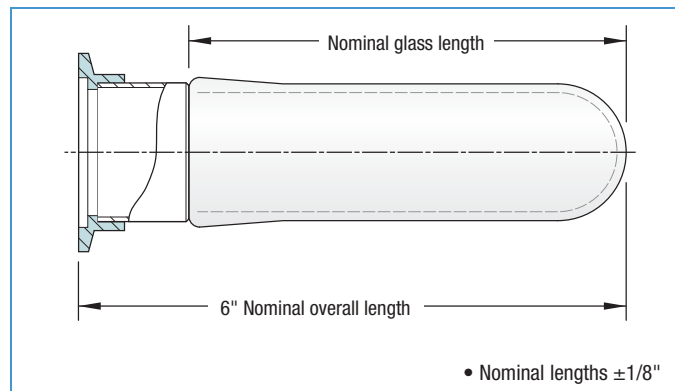


- 7052 Glass
- Kovar sleeve material
- Optional Pyrex® to stainless steel
- 304ss nonrotatable flange
- Custom lengths available on request
- Other configurations available on request

NOMINAL I.D.	FLANGE SIZE	FLANGE O.D.	BOLT CIRCLE	NOMINAL GLASS LENGTH	WT LB	REFERENCE	PART NUMBER
9/16	1-1/3	1.33	1.062	4-3/8	1/2	SEG-075	463000
13/16	2-1/8	2.12	1.625	4-3/4	3/4	SEG-100	463001
1-5/16	2-3/4	2.73	2.312	4-3/4	1	SEG-150	463002
1-13/16	3-3/8	3.37	2.850	4-1/4	1-1/4	SEG-200	463003
2-3/16	4-1/2	4.47	3.628	4-1/4	1-3/4	SEG-250	463004
2-11/16	4-5/8	4.62	4.030	4-1/4	2	SEG-300	463005
3-11/16	6	5.97	5.128	3-7/8	3	SEG-400	463006
4-1/2	6-3/4	6.75	5.969	3-7/8	4	SEG-500	463007
5-1/2	8	7.97	7.128	3-7/8	5	SEG-600	463008



• 200°C maximum bakeout

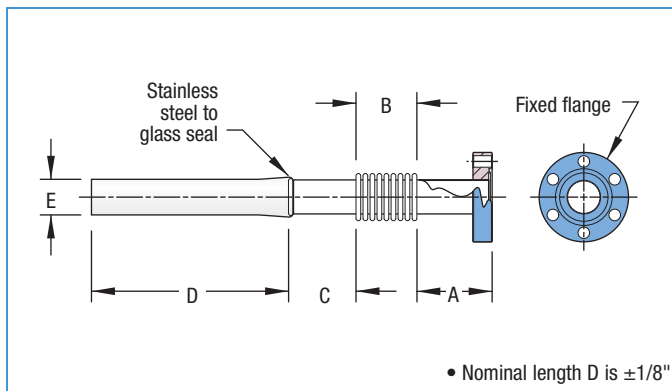


- 7052 Glass
- Kovar sleeve material
- Optional Pyrex® to stainless steel
- 304ss flange
- Custom lengths available on request
- Other configurations available on request

NOMINAL I.D.	FLANGE SIZE	FLANGE O.D.	ISO REF.	NOMINAL GLASS LENGTH	WT LB	REFERENCE	PART NUMBER
9/16	K075	1.18	NW16	4-3/8	1/2	KSEG-075	463020
13/16	K100	1.57	NW25	4-3/8	3/4	KSEG-100	463021
1-5/16	K150	2.16	NW40	4-3/8	1	KSEG-150	463022
1-13/16	K200	2.95	NW50	4-1/4	1	KSEG-200	463023



• 400°C maximum bakeout



- Excellent vibrational absorption
- Ideal for high heat and cryogenics
- 7740 Pyrex®
- 321ss bellows material
- 304ss flange material

FLANGE SIZE	A	BELLOWS B ¹	C	D	E	MAX. BEND	WT LB	REFERENCE	PART NUMBER
1-1/3	.87	2.00	.75	3.00	.250	180°	1/2	FGA-025-2	466000
1-1/3	.87	1.00	.75	3.00	.375	90°	1/2	FGA-037-1	466007
1-1/3	.87	3.00	.75	3.00	.375	225°	1/2	FGA-037-3	466008
1-1/3	1.12	1.00	1.00	3.00	.500	45°	1/2	FGA-050-1	466001
1-1/3	1.12	3.00	1.00	3.00	.500	180°	1/2	FGA-050-3	466002
2-3/4	1.12	1.00	1.00	3.00	.750	30°	1-1/2	FGA-075-1	466003
2-3/4	1.12	3.00	1.00	3.00	.750	90°	1-1/2	FGA-075-3	466004
2-3/4	1.12	1.00	1.00	3.00	1.000	20°	2	FGA-100-1	466009
2-3/4	1.12	3.00	1.00	3.00	1.000	90°	2	FGA-100-3	466010
2-3/4	1.12	1.00	1.00	3.00	1.500	15°	2	FGA-150-1	466005
2-3/4	1.12	3.00	1.00	3.00	1.500	60°	2	FGA-150-3	466006

¹ Allows up to 50% expansion and 20% compression of bellows length



