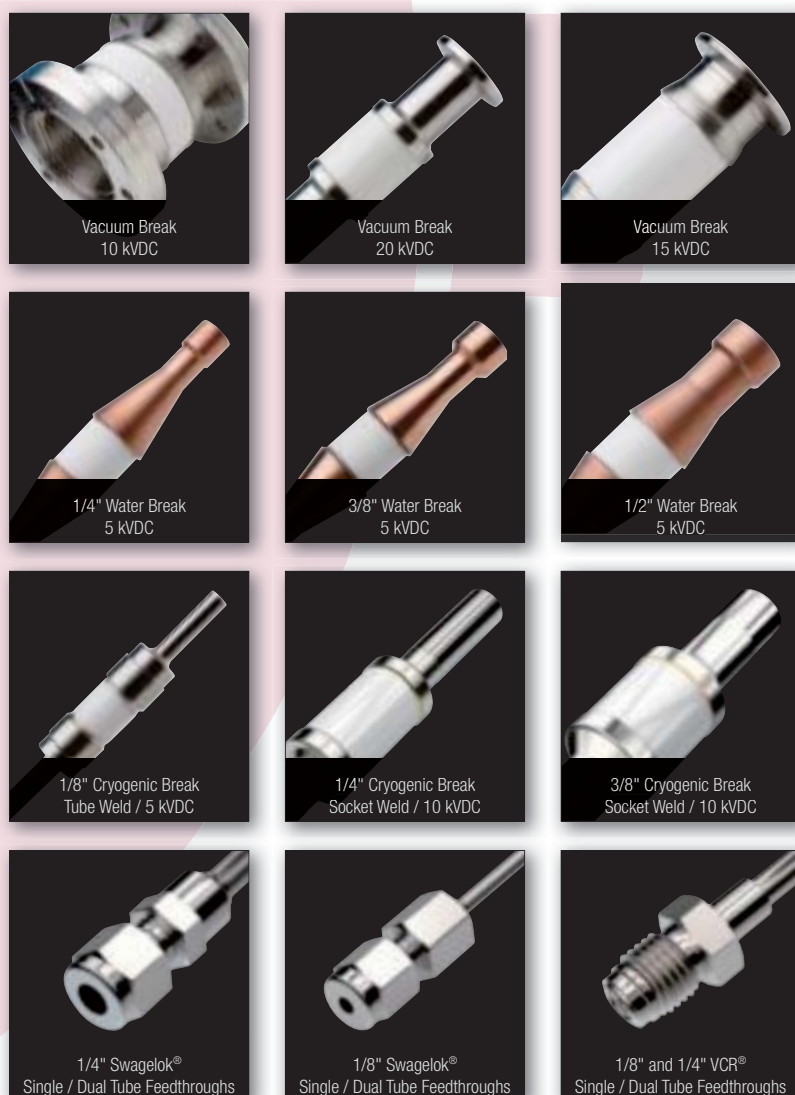


Section Contents



Electrical Breaks / Isolators 182

Vacuum Brakes	183
Water Breaks	184
Cryogenic Breaks	185

Fluid Feedthroughs 186

Swagelok® Compression Fitting	186
1/8 and 1/4 Inch Tube, CF / ISO NW	187
VCR® Metal Gasket Fitting	188
1/8 and 1/4 Inch Tube, CF / ISO NW	189

Product Highlights

Vacuum Breaks — excellent voltage isolation in both UHV and HV environments. Constructed using high purity alumina ceramic sealed to stainless sleeve adapters.

Water, Fluid Breaks — voltage isolation in water or coolant fluid lines. Soldering or brazing requires low temperatures below 700°C. Standard adapters fit 1/4 to 1/2 Inch diameter tubes.

Cryogenic, Fluid Breaks — great voltage isolation for cryogenic fluid lines. Designed to be TIG welded into cryogenic fluid transmission lines with 1/8 to 3/8 Inch diameters. Allows safe operation to -200°C.



Electrical Breaks

Vacuum, Water and Cryogenic Breaks

Electrical Breaks

Vacuum, Water, and Cryogenic Breaks



Electrical Breaks / Isolators

Accu-Glass Products, Inc. offers a complete line of tubular electrical breaks for vacuum applications requiring cryogenic, water and/or vacuum transmission lines. Cryogenic and vacuum breaks consist of ceramic insulating tubes with metal tubes brazed to each end and welded to either Conflat® compatible CF flanges or standard ISO KF flanges. Water breaks consist of ceramic tubes brazed to copper tubes that can be easily brazed to existing copper water supply-lines. The central ceramic tube provides electrical isolation between the conductive metal ends. If the breaks are used between two rigid components, a bellows should be used in the system to reduce mechanical stress that may cause the ceramic to break.

Accu-Glass Products' electrical breaks are all suitable for service in ultrahigh vacuum environments. Cryogenic and vacuum breaks are not suitable for water service because of corrosion, while water and vacuum breaks are not suitable for cryogenic service because of expansion differentials and material embrittlement.

Features

- Vacuum, water and cryogenic types
- Low temperature service to -200°C (Cryogenic)
- High temperature service to 400°C (450°C short term)
- Alumina ceramic electrical insulator
- Custom solutions on request

Specifications

Electrical¹

Voltage	See Tables
---------	------------

Material

Tube (weld ends)	
Water	Copper
Vacuum / Cryogenic	304 Stainless Steel
Ceramic Insulator	
Vacuum, Water, and Cryogenic	Alumina

Vacuum Range

UHV, Ultrahigh vacuum	1x10 ⁻¹⁰ Torr
HV, High vacuum	1x10 ⁻⁸ Torr

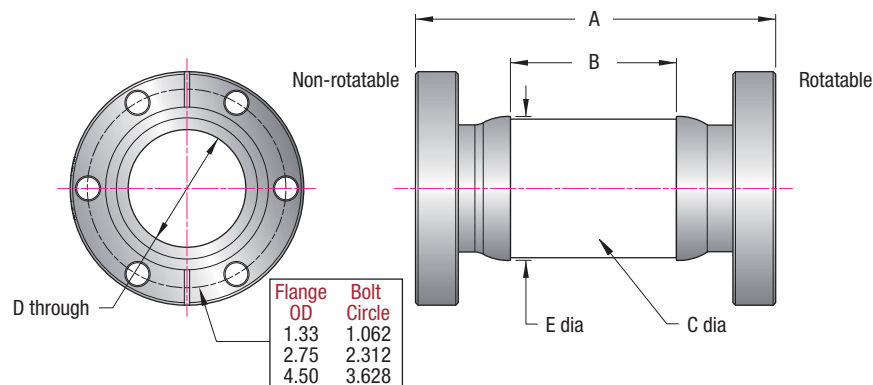
Temperature Range^{2,3}

Cryogenic	-200° to 400°C
Water ⁴	0° to 100°C
Vacuum	
CF Flange	-55° to 450°C
ISO Flange	-25° to 200°C
Thermal Gradient	25°C / Minute Maximum

Notes

1. Electrical ratings are maximum test values, with break's vacuum side at $\leq 1 \times 10^{-4}$ Torr. Also, see 'glow discharge' information on page 270.
2. Overall assembly ratings must be adjusted to that of its lowest rated component. For cryogenic service, the lowest recommended temperature is -80°C.
3. Ceramic-to-metal assemblies subjected to sudden and/or repeated thermal shock will have shorter life spans. For optimum product life, heating and cooling must always be performed gradually, and within specified thermal gradient limits.
4. Water breaks have been designed for use with properly grounded, closed-loop cooling systems that use deionized water and/or other non-conductive coolants.

§ Unless specified otherwise, dimensional units in all sections of this catalog are expressed in inches.



Vacuum Breaks are designed for service in ultrahigh vacuum applications. A maximum thermal gradient of 25°C per minute across the break must be observed to prevent seal damage. Vacuum breaks with CF flanges attached have one non-rotatable flange on one end and a rotatable flange on the other.

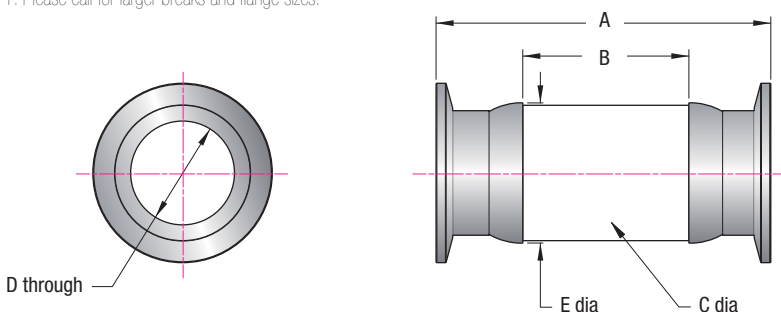
CF Flange¹ — -55° to 450°C / UHV to 1x10⁻¹⁰ Torr

Flange Size	Voltage Isolation	A	B	C	D	E	Model Number	Part Number
-------------	-------------------	---	---	---	---	---	--------------	-------------

Vacuum Breaks — CF Flange

1.33 CF	20 kV	3.62	1.00	1.00	0.625	1.04	BRK-VAC20KV-133	111183
1.33 CF	35 kV	4.60	2.00	1.00	0.630	1.04	BRK-VAC35KV-133	111184
2.75 CF	5 kV	2.58	0.25	1.63	1.250	1.69	BRK-VAC5KV-275	111185
2.75 CF	15 kV	4.20	2.00	1.66	1.250	1.69	BRK-VAC15KV-275	111186
4.50 CF	10 kV	4.50	0.75	3.20	2.300	3.23	BRK-VAC10KV-450	111187

1. Please call for larger breaks and flange sizes.



Vacuum Breaks are designed for service in ultrahigh vacuum applications. A maximum thermal gradient of 25°C per minute across the break must be observed to prevent seal damage.

ISO KF Flange¹ — -25° to 200°C / HV to 1x10⁻⁸ Torr

Flange Size	Voltage Isolation	A	B	C	D	E	Model Number	Part Number
-------------	-------------------	---	---	---	---	---	--------------	-------------

Vacuum Breaks — ISO KF Flange

NW16 KF	20 kV	3.62	1.00	1.00	0.625	1.04	BRK-VAC20KV-K16	111191
NW16 KF	35 kV	3.88	2.00	1.00	0.630	1.04	BRK-VAC35KV-K16	111192
NW40 KF	5 kV	2.50	0.25	1.63	1.250	1.69	BRK-VAC3KV-K40	111193
NW40 KF	15 kV	4.03	2.00	1.63	1.250	1.69	BRK-VAC15KV-K40	111194

1. Please call for larger breaks and flange sizes.



111183 / 20kV Vacuum Break



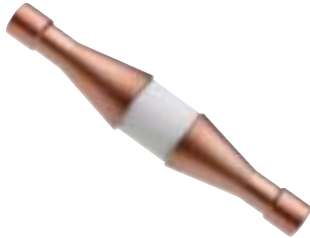
111187 / 10kV Vacuum Break



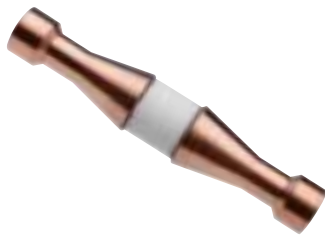
111191 / 20kV Vacuum Break



111194 / 15kV Vacuum Break



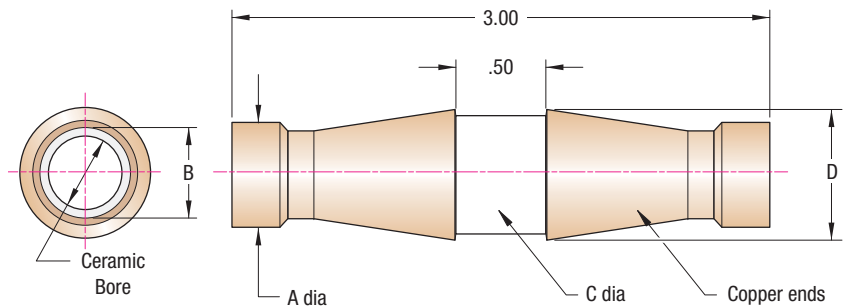
111180 / 1/4" Water Break



111181 / 3/8" Water Break



111182 / 1/2" Water Break



Water/Liquid Breaks are designed for the transmission of water or other coolant fluids. These components are rated for a maximum line pressure of 75 psig. A maximum thermal gradient of 25°C per minute across the break must be observed to prevent seal damage. During installation, brazing or soldering temperatures must not exceed 700°C.

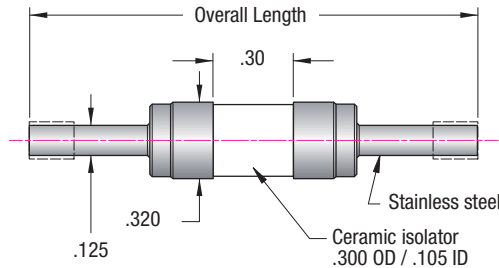
Water Breaks — 5 kVDC / 100°C / UHV to 1×10^{-10} Torr

Tube Size	A	B Nominal	Ceramic Bore	C	D	Model Number	Part Number
5 kVDC Isolation							
1/4"	0.32	0.25	0.21	0.52	0.59	BRK-WTR-250	111180
3/8"	0.44	0.378	0.25	0.52	0.59	BRK-WTR-375	111181
1/2"	0.59	0.5	0.41	0.66	0.74	BRK-WTR-500	111182



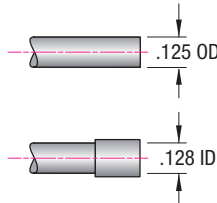
Figure-1 — Cryogenic 1/8 Inch Tube Diameter

Weld Configurations



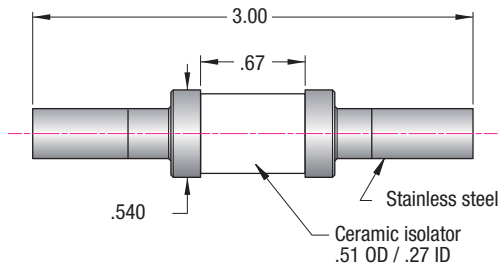
1.1
tube-weld

1.2
socket-weld
(dashed lines,
both ends)



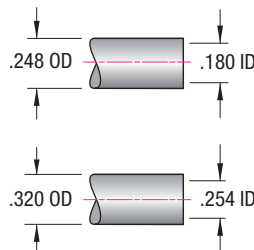
112060 / 1/8" Cryogenic Break
1.1 Tube-Weld

Figure-2 — Cryogenic 1/4 Inch Tube Diameter



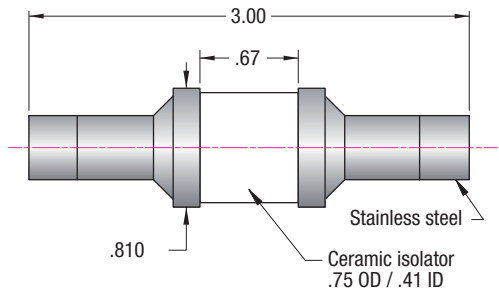
2.1
tube-weld

2.2
socket-weld



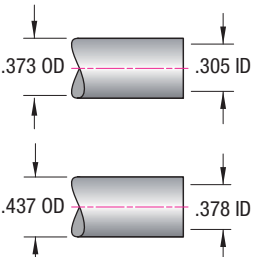
112062 / 1/4" Cryogenic Break
2.1 Tube-Weld

Figure-3 — Cryogenic 3/8 Inch Tube Diameter



3.1
tube-weld

3.2
socket-weld



112063 / 1/4" Cryogenic Break
2.2 Socket-Weld



112065 / 3/8" Cryogenic Break
3.1 Tube-Weld



112064 / 3/8" Cryogenic Break
3.2 Socket-Weld

Cryogenic Breaks are designed for transmission of cryogenic fluids at liquid nitrogen temperatures of -200°C. A maximum thermal gradient of 25°C per minute across break must be observed to prevent seal damage. Thin metal transitions provide flexibility at cryogenic temperatures and limited to a line pressure of 15 psig maximum.

Cryogenic Breaks — 5 and 10 kVDC / -200°C to 400°C / UHV to 1x10⁻¹⁰ Torr

Nominal Tube Size	Figure	Weld Configuration	Overall Length	Model Number	Part Number
-------------------	--------	--------------------	----------------	--------------	-------------

5 kVDC Isolation

1/8"	1.1	Tube	1.87	BRK-CRYO-125T	112060
1/8"	1.1	Tube	2.37	BRK-CRYO-125LT	112061
1/8"	1.2	Socket	2.37	BRK-CRYO-125S	112066

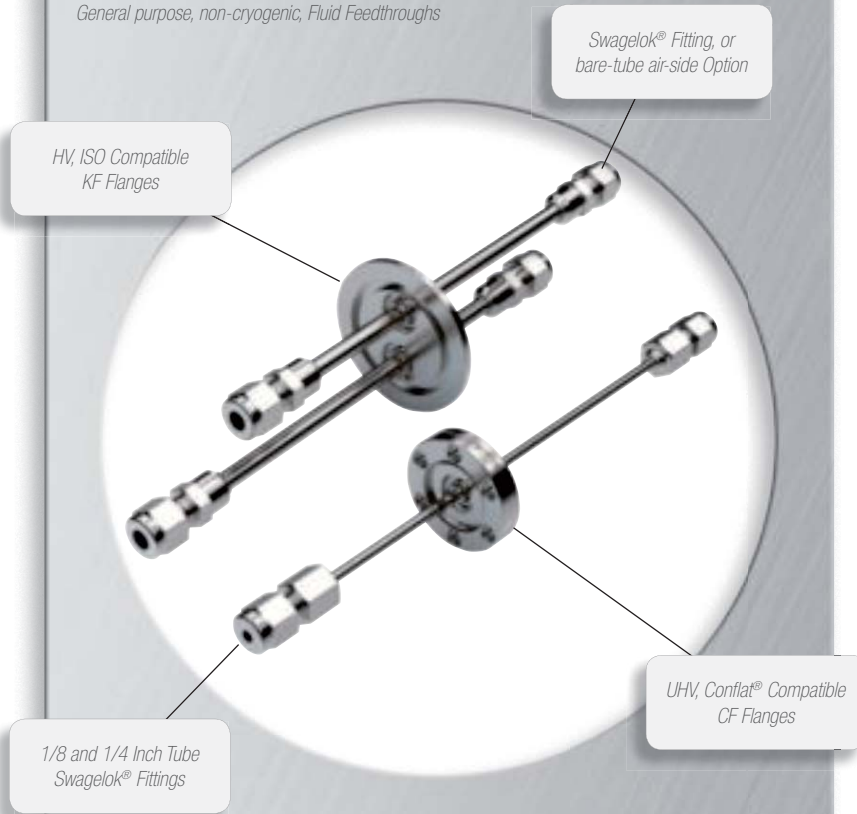
10 kVDC Isolation

1/4"	2.1	Tube	3.00	BRK-CRYO-250T	112062
1/4"	2.2	Socket	3.00	BRK-CRYO-250S	112063
3/8"	3.1	Tube	3.00	BRK-CRYO-375T	112065
3/8"	3.2	Socket	3.00	BRK-CRYO-375S	112064



Swagelok® Compression Fittings

General purpose, non-cryogenic, Fluid Feedthroughs



Swagelok® Compression Fitting Feedthroughs

Accu-Glass compression tube fitting feedthroughs are terminated with Swagelok® brand compression fittings. As their name implies, Swagelok® fittings produce a demountable, gas-tight, cold-formed (swaged) mechanical joint between a tube's OD and the ferrules housed inside each fitting. Tube finish, temper and wall thickness are all critical parameters for making reliable, gas and vacuum-tight seals. Please consult Swagelok® specifications and installation guidelines for best results.

These are general purpose, non-cryogenic, tube feedthroughs used for gas and/or fluid coolant delivery into high and ultrahigh vacuum systems.

AG fluid feedthroughs are available in single or dual tube configurations, with 1/8 or 1/4 inch tube diameters. Standard feedthroughs are offered with fittings TIG welded on both tube ends. However, an air-side bare-tube option is also available. This option can be ordered by appending a '.80' suffix to the end of any standard part number (note that price remains the same). Bare-tube terminations are often required when compression joints will not fit — or a demountable joint is just not allowed, and where direct welding to stainless steel supply-lines is the preferred solution.

Can't find what you need? Contact Accu-Glass Products to discuss other configuration options or solutions customized to your specific requirements.

Features

- Swagelok® Compression Fittings
- 1/8 and 1/4 Inch tube sizes
- General purpose, non-cryogenic fluid use
- High temperature rated to 450°C
- Custom Solutions on Request

Specifications

Material

CF Flange / Tubes, Stainless Steel	304
Swagelok® Fittings, Stainless Steel ¹	316

Vacuum Range

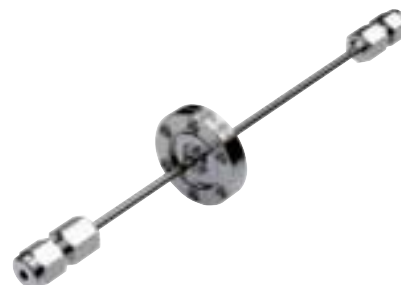
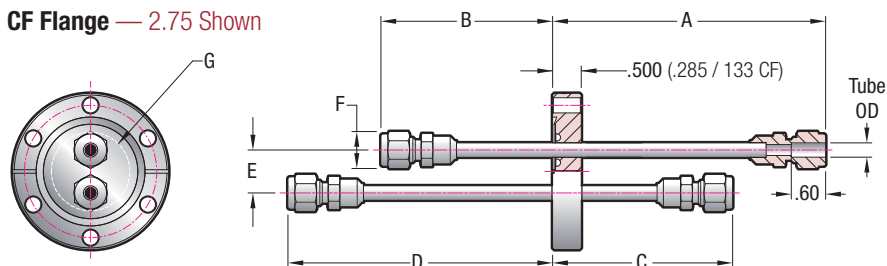
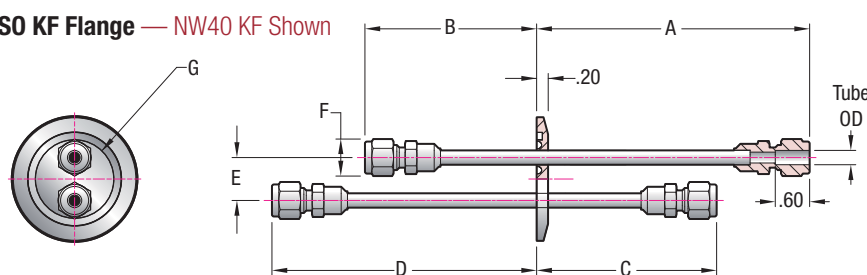
UHV, Ultrahigh vacuum	1x10 ⁻¹³ Torr
HV, High vacuum	1x10 ⁻⁸ Torr

Temperature Range ^{2,3}

CF Flange Mount	450°C
ISO KF Flange Mount	150°C
Swagelok® Fitting	450°C

Notes

1. Swagelok® fittings are designed for use with high-quality, fully annealed (Type 304, 304/304L, 316, 316/316L, 317, 317/317L, 321, 347) (seamless or welded and drawn) stainless steel hydraulic tubing, ASTM A269 and A213, or equivalent. Hardness not to exceed 90 HRB or 200 HV. Tubing to be free of scratches, suitable for bending and flaring. Consult Swagelok® for more information.
 2. Overall assembly ratings must be adjusted to that of its lowest rated component.
 3. This is a system bakeout temperature rating, without any fluid circulating in feedthrough tubes /lines. Consult Swagelok® for more information on high temperature and pressure ratings.
- § Unless specified otherwise, dimensional units in all sections of this catalog are expressed in inches.

**CF Flange — 2.75 Shown****113000** / UHV Single, 1/8 Inch Tube
Fluid Feedthrough on 1.33 CF**ISO KF Flange — NW40 KF Shown****113005** / UHV Dual, 1/4 Inch Tube
Fluid Feedthrough on 2.75 CF**Swagelok® Compression Fittings¹ — Feedthroughs for water or non-cryogenic fluids**

Flange Size	Number of Tubes	Tube OD	A	B	C	D	E	F	G	Part Number
-------------	-----------------	---------	---	---	---	---	---	---	---	-------------

CF Flange — 450°C² / UHV to 1x10⁻¹⁰ Torr

133 CF	1	1/8	4.75	3.00	—	—	—	.510	—	113000
133 CF	1	1/4	4.75	3.00	—	—	—	.615	—	113001
275 CF	1	1/8	4.75	3.00	—	—	—	.510	—	113002
275 CF	1	1/4	4.75	3.00	—	—	—	.650	—	113003
275 CF	2	1/8	4.75	3.00	3.13	4.63	.750	.510	1.26	113004
275 CF	2	1/4	4.75	3.00	3.13	4.63	.750	.650	1.40	113005

ISO KF Flange — 150°C² / HV to 1x10⁻⁹ Torr

NW16 KF	1	1/8	4.75	3.00	—	—	—	.510	—	113007
NW16 KF	1	1/4	4.75	3.00	—	—	—	.615	—	113008
NW25 KF	1	1/8	4.75	3.00	—	—	—	.510	—	113009
NW25 KF	1	1/4	4.75	3.00	—	—	—	.650	—	113010
NW40 KF	1	1/8	4.75	3.00	—	—	—	.510	—	113011
NW40 KF	1	1/4	4.75	3.00	—	—	—	.650	—	113012
NW40 KF	2	1/8	4.75	3.00	3.13	4.63	.750	.510	1.26	113013
NW40 KF	2	1/4	4.75	3.00	3.13	4.63	.750	.650	1.40	113014
NW50 KF	1	1/8	4.75	3.00	—	—	—	.510	—	113015
NW50 KF	1	1/4	4.75	3.00	—	—	—	.650	—	113016
NW50 KF	2	1/8	4.75	3.00	3.13	4.63	.750	.510	1.26	113017
NW50 KF	2	1/4	4.75	3.00	3.13	4.63	.750	.650	1.40	113018

1. For "bare tube(s)" on air-side, append ".80" to desired part number... price is the same with this option.

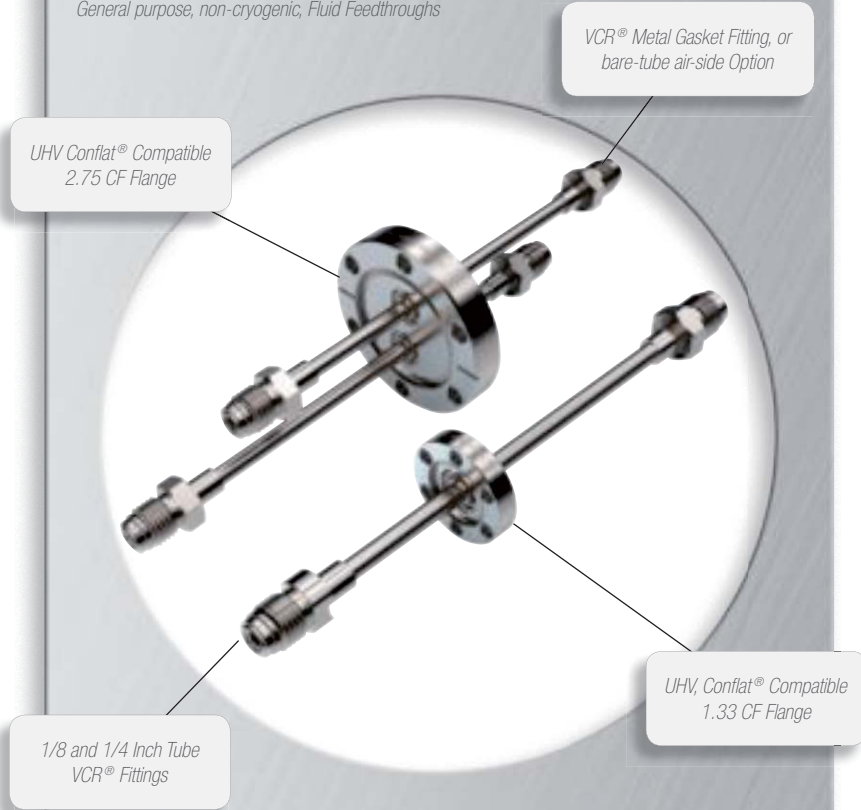
2. This is a bakeout temperature rating, without fluid in feedthrough tubes / lines.

**113007** / HV Single, 1/8 Inch Tube
Fluid Feedthrough on ISO KF16**113014** / HV Dual, 1/4 Inch Tube
Fluid Feedthrough on ISO KF40



VCR® Metal Gasket Fittings

General purpose, non-cryogenic, Fluid Feedthroughs



VCR® Metal Gasket Fitting Feedthroughs

Accu-Glass metal-gasket tube fitting feedthroughs are terminated with VCR® metal gasket face seal fittings. VCR® fittings are zero-clearance, demountable UHV compatible mechanical joints produced by crushing a deformable metal gasket between two mating and polished fitting gland faces. Fitting gland finish, and metal-gasket temper are critical parameters for making reliable, gas and ultrahigh vacuum seals. Please consult Swagelok's VCR® specifications and installation guidelines for best results.

These are general purpose, non-cryogenic, tube feedthroughs used for gas and/or fluid coolant delivery into high and ultrahigh vacuum systems.

Accu-Glass Products fluid feedthroughs are available in single or dual tube configurations, with 1/8 or 1/4 inch tube diameters. Standard feedthroughs are offered with fittings TIG welded on both tube ends. However, an air-side bare-tube option is also available. This option can be ordered by appending a '.80' suffix to the end of any standard part number (note that price remains the same). Bare-tube terminations are often required when there is no space for a fitting joint — or a demountable joint is just not allowed, and where direct welding to stainless steel supply-lines is the preferred solution.

Can't find what you need? Contact Accu-Glass Products to discuss other configuration options or solutions customized to your specific requirements.

Features

- VCR® Metal Gasket Fittings
- 1/8 and 1/4 Inch tube sizes
- General purpose, non-cryogenic fluid use
- High temperature rated to 450°C
- Custom Solutions on Request

Specifications

Material¹

CF Flange / Tubes, Stainless Steel	304
VCR® Fittings, Stainless Steel ¹	316

Vacuum Range

UHV, Ultrahigh vacuum	1x10 ⁻¹³ Torr
HV, High vacuum	1x10 ⁻⁸ Torr

Temperature Range^{1,2,3}

CF Flange Mount	450°C
ISO KF Flange Mount	150°C
VCR® Fitting	450°C
VCR® SS, 316L Gasket	450°C
VCR® Cu, Copper Gasket	204°C
VCR® Ni, Nickel Gasket	315°C

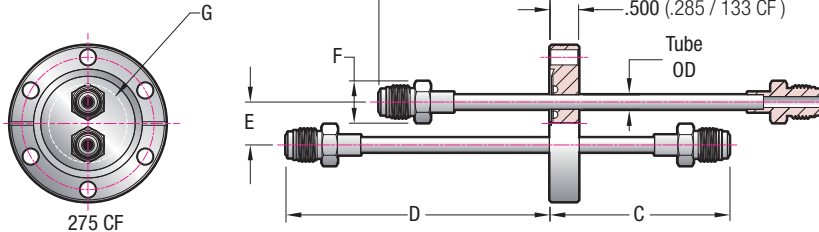
Notes

1. VCR® fittings are designed for use with high-quality, annealed (Type 304, 304/304L, 316, 316/316L) seamless stainless steel tubing. Consult Swagelok® for proper VCR® fitting installation and use.
2. Overall assembly ratings must be adjusted to that of its lowest rated component.
3. This is a system bakeout temperature rating, without any fluid circulating in feedthrough tubes /lines. Consult Swagelok® for more information on VCR® high temperature and pressure ratings.

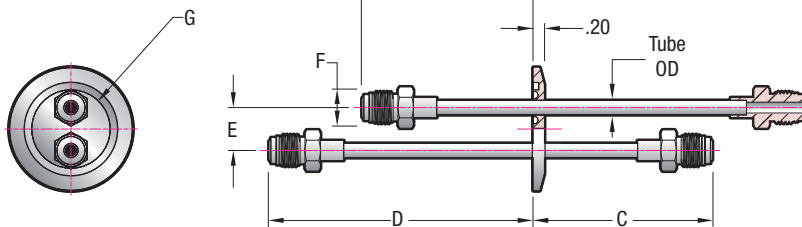
§ Unless specified otherwise, dimensional units in all sections of this catalog are expressed in inches.



CF Flange — 2.75 Shown



ISO KF Flange — NW40 KF Shown



VCR® Metal Gasket Fittings¹ — Feedthroughs for gas, water or non-cryogenic fluids

Flange Type	Number of Tubes	Tube OD	A	B	C	D	E	F	G	Part Number
-------------	-----------------	---------	---	---	---	---	---	---	---	-------------

CF Flange — 450°C² / UHV to 1x10⁻¹⁰ Torr

133 CF	1	1/8	4.75	3.00	—	—	—	.430	—	113020
133 CF	1	1/4	4.75	3.00	—	—	—	.630	—	113021
275 CF	1	1/8	4.75	3.00	—	—	—	.430	—	113022
275 CF	1	1/4	4.75	3.00	—	—	—	.720	—	113023
275 CF	2	1/8	4.75	3.00	3.13	4.63	.750	.430	1.18	113024
275 CF	2	1/4	4.75	3.00	3.13	4.63	.750	.720	1.47	113025

ISO KF Flange — 150°C² / HV to 1x10⁻⁸ Torr

NW16 KF	1	1/8	4.75	3.00	—	—	—	.430	—	113026
NW16 KF	1	1/4	4.75	3.00	—	—	—	.630	—	113027
NW25 KF	1	1/8	4.75	3.00	—	—	—	.430	—	113028
NW25 KF	1	1/4	4.75	3.00	—	—	—	.720	—	113029
NW40 KF	1	1/8	4.75	3.00	—	—	—	.430	—	113030
NW40 KF	1	1/4	4.75	3.00	—	—	—	.720	—	113031
NW40 KF	2	1/8	4.75	3.00	3.13	4.63	.750	.430	1.18	113032
NW40 KF	2	1/4	4.75	3.00	3.13	4.63	.750	.720	1.47	113033
NW50 KF	1	1/8	4.75	3.00	—	—	—	.430	—	113034
NW50 KF	1	1/4	4.75	3.00	—	—	—	.720	—	113035
NW50 KF	2	1/8	4.75	3.00	3.13	4.63	.750	.430	1.18	113036
NW50 KF	2	1/4	4.75	3.00	3.13	4.63	.750	.720	1.47	113037

1. For "bare tube(s)" on air-side, append ".80" to desired part number... price is the same with this option.

2. This is a bakeout temperature rating, without fluid in feedthrough tubes / lines.



113021 / UHV Single, 1/4 Inch Tube Fluid Feedthrough on 1.33 CF



113025 / UHV Dual, 1/4 Inch Tube Fluid Feedthrough on 2.75 CF



113026 / HV Single, 1/8 Inch Tube Fluid Feedthrough on ISO KF16



113032 / HV Dual, 1/8 Inch Tube Fluid Feedthrough on ISO KF40