

Electrical & Fluid Feedthroughs

6



Section 6

Electrical Feedthroughs

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MDC's ceramic-to-metal business unit is located in the beautiful city of Sarasota, Florida

Ceramic Seals...

Since MDC and Insulator Seal (ISI) join forces in March of 1998, MDC Precision, LLC provide the scientific and industrial vacuum community with the best possible quality, service and price for vacuum solutions and components.

In the vacuum components industry there can be few more specialized technologies than the production of ceramic-to-metal seals. Ceramic-to-metal seals, the bonding of metals to ceramics, are fundamental to the manufacture of thousands of components in applications where electricity and optics must interface with high and ultrahigh vacuum environments. MDC's single goal is to provide leading edge solutions for this growing range of electrical and optical vacuum applications. In a relatively short period of time, MDC's product line has attained a global reputation for high quality manufacturing and fast delivery of thousands of electrical and optical vacuum components.

Our Ceramic Seals scientists, engineers and technicians have been perfecting the science and art of ceramic-to-metal bonding for over twenty years. Using time

tested proprietary vacuum bonding techniques and advanced vacuum brazing systems MDC Ceramic Seals business unit provides the scientific and industrial vacuum community with ceramic-to-metal products of unsurpassed quality and performance. Over the past two decades MDC's Ceramic Seals business unit has assembled the industry's most comprehensive line of hermetically sealed electrical and optical ceramic-to-metal components. Our manufacturing process is geared for the batch production of standard components for stock. A closely monitored inventory allows them to meet customer expectations of fast delivery to national and global destinations.

The sealing and bonding process begin with the careful specification, selection, testing and qualification of vacuum grade materials to be used in the design and manufacturing of all MDC ceramic-to-metal products. A proprietary active-alloy metalization process is at the heart of all seal production. High purity alumina ceramics are routinely bonded and sealed to low expansion metals in vacuum furnace

To preview the complete MDC Precision product line, prices, availability and order, log onto www.mdcvacuum.com



Metalization application and assembly process



Vacuum furnace, high temperature brazing



...MDC's Electrical and Optical Ceramic-to-Metal Seal Business Unit

environments using precious and semiprecious high temperature vacuum tube-grade braze alloys. This method of fabrication produces products suitable for service in UHV applications and thermal cycling as high as 450°C.

MDC's electrical feedthroughs, electrical breaks and envelopes, sapphire and quartz viewports are all manufactured by MDC's Ceramic Seals business unit. The MDC product line is now a key component in MDC's drive for leadership in high and ultrahigh vacuum technology. MDC has offerings of electrical and viewport components that include the most popular and commonly used products. Concurrently, a full complement of electrical feedthroughs, optical grade viewports and other ceramic-to-metal components are available on our website www.mdcprecision.com.

Some of the additional products available in the MDC product line include a complete line of thermocouple feedthroughs, single and double-ended multipin instrumentation feedthroughs, an extensive selection of industry standard coaxial instrumentation and power

feedthroughs, high frequency RF power feedthroughs with patented cooling geometry, electrical breaks suitable for cryogenic service, VacOptix® patented viewports for deep ultraviolet and far infrared optical applications as well as custom engineered products for exotic or demanding applications. Please note that in most cases, custom ceramic-to-metal requests not found in either the MDC, MDC catalog or at www.mdcprecision.com should be directed to MDC's Ceramic Seals Technical Sales for consideration.

MDC's Ceramic Seals business unit is staffed with sales, design and manufacturing engineers dedicated exclusively to the promotion, production, implementation and support of standard ceramic-to-metal seal solutions for the high and ultrahigh vacuum industry. Our staff can also handle custom solution inquires which go beyond either divisions' standard catalog offerings.

MDC and it's Ceramic Seals business unit are ISO-9001-2008 certified as a means to better serve its customers and the industries they serve. The care taken in every aspect of manufacturing is carried all

the way down the line, even to the double-packing of each component for maximum protection during transit.

MDC's complete product line is featured in a separate comprehensive catalog. You can see the most up to date MDC product line, the latest prices, availability or order the catalog at www.mdcprecision.com.

MDC's Ceramic Seals Technical Sales may be contacted directly for custom quotes or technical questions at...

Tech Questions 941-807-7334
Custom Quotes 941-807-7334

Telephone 941-751-2880
Toll-Free 800-548-9509
Facsimile 941-751-3841
Email sales@mdcprecision.com
Web www.mdcprecision.com



ISO-9001 certified company



The industry's largest inventory



Fast delivery to national and global destinations



Feedthrough family

- Coaxial
- Power
- High current
- High voltage
- Breaks and envelopes
- Instrumentation
- Accessories

To see the complete MDC Precision product line, prices, availability and order a free copy of the MDC Precision catalog, please visit www.mdcvacuum.com

In the vacuum components industry there can be few more specialized technologies than the production of ceramic-to-metal seals. Ceramic-to-metal seals, the bonding of metals to ceramics are fundamental to the manufacture of thousands of components in applications where electricity and optics must interface with high and ultrahigh vacuum environments.

The electrical feedthroughs offered in this catalog are electrically rated for operation with one side in dry atmospheric conditions while the opposite end is in a stable vacuum environment with a maximum system pressure of 1×10^{-4} Torr. We recommend that users make allowances for deviations from these stated operating parameters and take adequate safety precautions when working with high voltages or currents.

Coaxial

Coaxial feedthroughs are those products constructed with two concentric conductor paths. One outer metal tube or shield path, concentric with, and enclosing, a cylindrical center conductor path. The inner and outer paths are separated and insulated with a high purity alumina ceramic dielectric. In this catalog, MDC offers coaxial components with military and industry standard BNC, MHV, SHV, Type N and SHV Bakeable connector interfaces.

The BNC coaxial connection, also referred to as the bayonet naval connection, is commonly used in 50 and 75 ohm low power instrumentation lines. Due to restrictions in geometry and the relatively high dielectric constant of alumina ceramics, BNC feedthroughs offered in this catalog are not impedance matched or rated.

The MHV coaxial connection, also referred to as miniature high voltage or high voltage BNC's, are ideally suited for medium to high power applications with higher voltage requirements. Caution should be exercised in electrical systems fitted with both BNC and MHV connections. BNC and MHV connections are almost identical in appearance and geometry and should never be cross-mated since their electrical ratings are not compatible. BNC connections are rated for 500VDC while MHV connections can handle voltages as high as 5000VDC.

The SHV coaxial connection, also referred to as safe high voltage connections, are also rated for service to 5000VDC. The difference between these feedthroughs and their MHV counterparts are the pin and contact geometry. SHV cable connectors have recessed female contacts with the male mating pin located in the feedthrough. The exact opposite is true with BNC and MHV connections. SHV cable-connector center contacts do not protrude beyond connector ends as they do on an MHV. This makes the SHV safer if accidentally powered while disconnected. Additional coaxial feedthroughs, including SMA, SMB, SHV-15, SHV-20, Triaxial, Microdot type and various others, can be purchased from www.mdcvacuum.com.

Power

Power feedthroughs are used to transmit either high voltage, high current or a combination of both. These products can be used for a multitude of vacuum applications including vacuum furnaces, sample heating or biasing, in-vacuum coating applications such as electron-beam evaporation, resistive heating evaporation, and DC plasma sputtering. Proven and time tested designs



Coaxial feedthroughs



Power feedthroughs, medium current

are employed to optimize the electrical performance of MDC power feedthroughs. Where space is not a limitation, ceramic surfaces are made as long as possible to maximize strike and creep distances. If space is limited, ceramics are convoluted in order to achieve increased surface distances with minimal impact on an insulator's overall length. Convoluted or fluted ceramics are recommended for environments where moisture or other surface contaminant may hinder electrical performance of conventional straight wall insulators. All power feedthrough air-side ceramic surfaces are glazed with a high temperature glass coating. This glass coating reduces ceramic surface roughness and minimizes surface contamination thus enhancing an insulator's electrical surface tracking characteristics. The power feedthroughs offered in this catalog are constructed with exposed, bare metal conductors on both the air and vacuum sides. Connectors for these feedthroughs are available, but must be purchased separately.

Included in the MDC product line are tubular conductor feedthroughs that can be used to transmit both power and coolants simultaneously. These products are referred to herein as watercooled feedthroughs. Watercooled electrical components should be used with grounded, closed-loop cooling systems and / or the use of nonconductive coolants such as deionized water or ethylene glycol. Although inefficiently, tap water will conduct electricity. Water cooling lines must therefore be electrically grounded and constructed of nonconductive material such as polypropylene tubing. Properly grounded water lines will provide a safe dissipation path for any power conducted by the water.

Watercooled power feedthroughs can carry

higher current loads than solid conductors of equal size and material when adequately cooled. Current or power ratings are not given for watercooled feedthroughs because these ratings are dependent on a coolant's flow rate and its heat dissipating capacity. Since tap water temperatures can vary dramatically from one location to another, so too will water's heat dissipation capacity. Users are advised to establish safe and practical coolant flow rates based on the power requirements for their specific application and coolant heat dissipation capacity

Breaks & Envelopes

Breaks and envelopes are tube like adapters with metal tube hardware bonded to the ends of a ceramic tube. Components with diameters below and including 2.50 inches are referred to as vacuum breaks, while those above are referred to as vacuum envelopes. The bonded metal tube ends provide a means of attaching the breaks and envelopes to vacuum tube lines using flange mounts or welding. The central ceramic portion of a break or envelope provides electrical insulation between the two conductive metal ends. In other words, the ceramic produces an electrical break in an otherwise continuous and conductive metal tube geometry.

The joining of ceramics to metals is a compromise between materials with dissimilar expansion coefficients. Low expansion metals combined with careful joint design bring expansion coefficients to an acceptable match and effectively minimize the stresses caused by differential expansion between the ceramic and metal components being bonded. Minute variations in expansion coefficients can be detrimental

if ceramic to metal seals are subjected to severe thermal gradients. The maximum recommended thermal gradient for any ceramic to metal seal should not exceed 25°C per minute.

Multipin

Multipin instrumentation refers to any feedthrough product containing more than one conductor path or pin that is also fitted with fastening air-side connectors. These feedthroughs are commonly used for the transmission of signal voltages and currents. They are commonly referred to as instrumentation feedthroughs because of their use in instrument control applications such as electron microscopes, electron-beam evaporation, electron microscopy, surface science analysis and semiconductor process controls. MDC multipin instrumentation feedthroughs are fitted with industry standard MS threaded circular connectors which comply with MIL-C-5015 specifications.

Complete air and vacuum connectivity are standard with MDC's new D-Subminiature instrumentation feedthroughs. Nine, fifteen and twenty-five pin geometries are hermetically sealed using the latest in glass-ceramic bonding technology. Air side connections are designed to interface with standard off-the-shelf serial cable connectors. Vacuum connectivity is made possible with MDC's unique UHV compatible connectors and ribbon cables. These instrumentation feedthroughs provide the same conveniences of circular type multipin products, but offer higher pin density in a smaller footprint.

Connector accessories are available for most electrical feedthroughs at the end of this section.



Power feedthroughs, high voltage page 336



Breaks and envelopes page 342



Type-D Subminiature page 348



Features

- Noise shield for low power instrumentation transmission
- Bayonet style threadless connection
- Grounded or floating shield
- Air side connector provided
- Additional configurations available through MDC - see pages 320-321 for MDC Ceramic Seals contact information

Specifications

Application	Used in 50Ω and 75Ω low power instrumentation transmission lines
Configuration	Single ended coaxial, either Grounded or Floating shield
Voltage	Grounded shield: 500V DC maximum Floating shield: 2500V DC maximum, ground to floating shield
Current	3 Amperes maximum
Impedance Rating	Not constant
Material	
Flanges	304ss
Coaxial conductor	304ss
Vacuum Range	UHV: 1×10^{-4} to 1×10^{-13} Torr HV: 1×10^{-4} to 1×10^{-8} Torr
Temperature Range	UHV: -200°C to 450°C maximum, without connector HV: -20°C to 150°C maximum, without connector Connector: -65° to 165°C maximum Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table
Connector	All feedthroughs supplied with air-side mating connector for use with RG 58/U cable

ULTRAHIGH & HIGH VACUUM SERIES

Figure 1

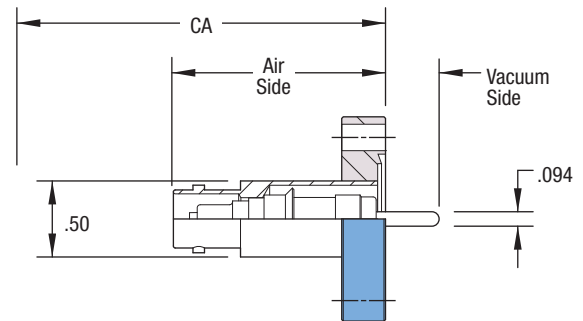


Figure 2

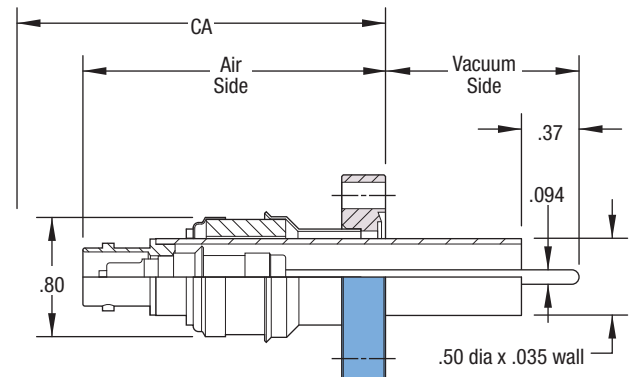
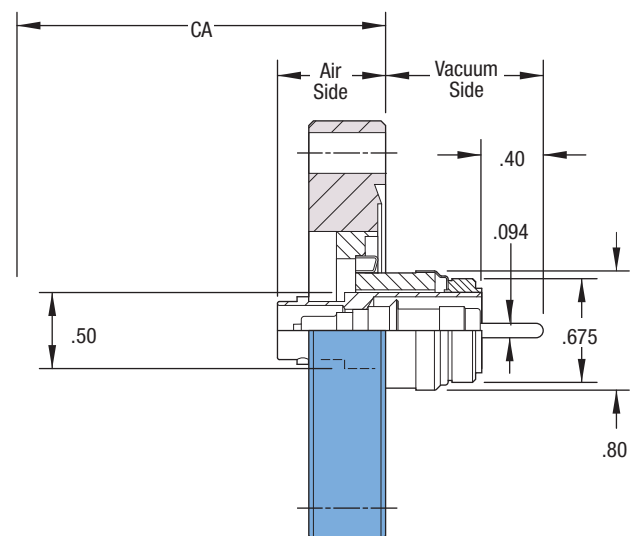
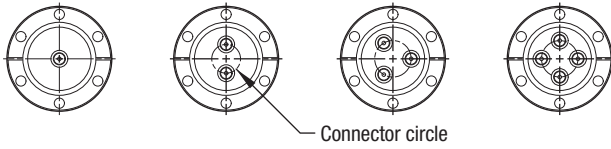


Figure 3



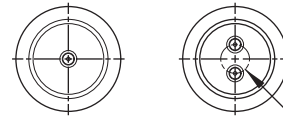
End Views - Vacuum Side

Del-Seal™ CF



Connector circle

Kwik-Flange™ KF



Connector circle

Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	FLANGE O.D.	FIG.	NO. OF CONN.	CONN. CIRCLE	AIR SIDE	VAC SIDE	CA	WT LB	REFERENCE	PART NUMBER
GROUNDING SHIELD											
1-1/3	1.062	1.33	1	1	-	1.38	.35	2.05	3/4	BNC-133	630000
2-3/4	2.312	2.73	1	1	-	1.38	.35	2.05	1	BNC-275	630001
2-3/4	2.312	2.73	1	2	.95	1.38	.35	2.05	1	BNC-275-2	630002
2-3/4	2.312	2.73	1	3	.95	1.38	.35	2.05	1	BNC-275-3	630003
2-3/4	2.312	2.73	1	4	.95	1.38	.35	2.05	1	BNC-275-4	630004
FLOATING SHIELD											
1-1/3	1.062	1.33	2	1	-	2.00	1.25	2.67	3/4	FBNC-133	630006
2-3/4	2.312	2.73	3	1	-	.70	1.05	1.37	1	FBNC-275	630005

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	FLANGE O.D.	FIG.	NO. OF CONN.	CONN. CIRCLE	AIR SIDE	VAC SIDE	CA	WT LB	REFERENCE	PART NUMBER
GROUNDING SHIELD											
K075	NW16	1.18	1	1	-	1.43	.30	2.10	1/2	K075-BNC	630020
K100	NW25	1.57	1	1	-	1.33	.40	2.00	1/2	K100-BNC	630021
K150	NW40	2.16	1	1	-	1.33	.40	2.00	1/2	K150-BNC	630022
K200	NW50	2.95	1	1	-	1.33	.40	2.00	1/2	K200-BNC	630023
K150	NW40	2.16	1	2	.75	1.33	.40	2.00	3/4	K150-BNC-2	630024
K200	NW50	2.95	1	2	.75	1.33	.40	2.00	3/4	K200-BNC-2	630025
FLOATING SHIELD											
K150	NW40	2.16	3	1	-	.65	1.08	1.30	1/2	K150-FBNC	630026
K200	NW50	2.95	3	1	-	.65	1.08	1.30	1/2	K200-FBNC	630027

Connectors



DESCRIPTION	LENGTH INCH	PIN DIA.	QTY PER PKG.	WT LBS	REFERENCE	PART NUMBER
PUSH-ON, WITH SET SCREW ¹	-	.094	10	1/4	POEC-094	991539-01
GROUNDING COAXIAL ²	19	.094	1	1/2	CCG-094-19	640080
GROUNDING COAXIAL ²	39	.094	1	1/2	CCG-094-39	640081
FLOATING COAXIAL ²	19	.094	1	1/2	CCF-094-19	640082
FLOATING COAXIAL ²	39	.094	1	1/2	CCF-094-39	640083

¹ Wrench included with Push-On connector

² **In-Vacuum Coaxial Connectors** Grounded vacuum connectors are fitted with a central BeCu push-on contact designed to mate with a .094" diameter pin. The 304ss coaxial shell is slotted for a spring fit into the cavity between a BNC's central conductor and its shell. Floating connectors include a radial set screw located in the shell. Both styles are prewired with MDC KAP5 in-vacuum coaxial cable (see page 352). User ends of cables are terminated with a coaxial geometry for installation into customer applications and can be grounded using 2-56 thread (see page 341 for product drawing). Contact accepts up to 50 mil wire. Choice of either 19" or 39" nominal length.



Features

- Noise shield for medium power applications
- Bayonet style threadless connection
- Grounded shield
- Air side connector provided
- Additional configurations available through MDC - see pages 320-321 for MDC Ceramic Seals contact information

Specifications

Application	Used in medium power applications with higher voltage requirements than BNC. Does not intermate with BNC connectors.
Configuration	Single ended coaxial, either Grounded or Floating shield
Voltage	Grounded shield: 5000V DC maximum Floating shield: 2500V DC maximum, ground to floating shield
Current	3 Amperes maximum
Impedance Rating	Not constant
Material	
Flanges	304ss
Coaxial conductor	304ss
Vacuum Range	UHV: 1×10^{-4} to 1×10^{-13} Torr HV: 1×10^{-4} to 1×10^{-8} Torr
Temperature Range	UHV: -200° to 450°C maximum, without connector HV: -20° to 150°C maximum, without connector Connector: -65° to 165°C maximum Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table
Connector	All feedthroughs supplied with air-side mating connector for use with RG 59/U cable

ULTRAHIGH & HIGH VACUUM SERIES

Figure 1

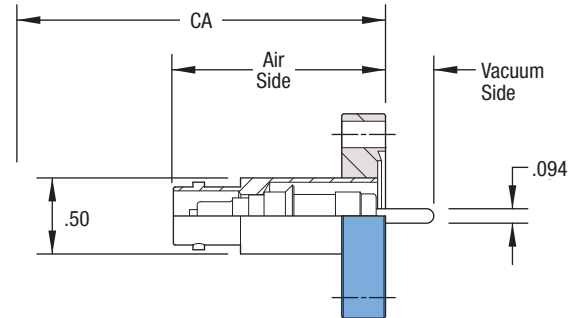


Figure 2

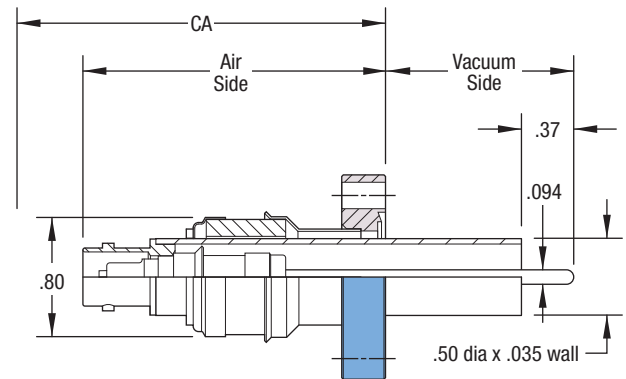
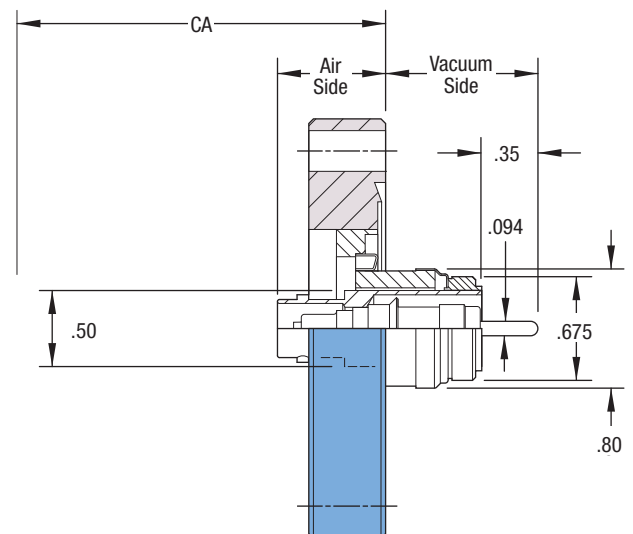
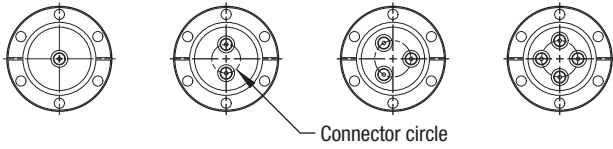


Figure 3



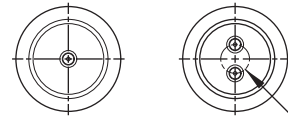
End Views - Vacuum Side

Del-Seal™ CF



Connector circle

Kwik-Flange™ KF



Connector circle

Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	FLANGE O.D.	FIG.	NO. OF CONN.	CONN. CIRCLE	AIR SIDE	VAC SIDE	CA	WT LB	REFERENCE	PART NUMBER
GROUNDING SHIELD											
1-1/3	1.062	1.33	1	1	-	1.38	.30	2.53	3/4	MHV-133	632000
2-3/4	2.312	2.73	1	1	-	1.38	.30	2.53	1	MHV-275	632001
2-3/4	2.312	2.73	1	2	.95	1.38	.30	2.53	1	MHV-275-2	632002
2-3/4	2.312	2.73	1	3	.95	1.38	.30	2.53	1	MHV-275-3	632003
2-3/4	2.312	2.73	1	4	.95	1.38	.30	2.53	1	MHV-275-4	632004
FLOATING SHIELD											
1-1/3	1.062	1.33	2	1	-	2.00	1.25	3.15	3/4	FMHV-133	632006
2-3/4	2.312	2.73	3	1	-	.70	.98	1.85	1	FMHV-275	632005

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	FLANGE O.D.	FIG.	NO. OF CONN.	CONN. CIRCLE	AIR SIDE	VAC SIDE	CA	WT LB	REFERENCE	PART NUMBER
GROUNDING SHIELD											
K075	NW16	1.18	1	1	-	1.43	.25	2.58	1/2	K075-MHV	632020
K100	NW25	1.57	1	1	-	1.33	.35	2.48	1/2	K100-MHV	632021
K150	NW40	2.16	1	1	-	1.33	.35	2.48	1/2	K150-MHV	632022
K200	NW50	2.95	1	1	-	1.33	.35	2.48	1/2	K200-MHV	632023
K150	NW40	2.16	1	2	.75	1.33	.35	2.48	3/4	K150-MHV-2	632024
K200	NW50	2.95	1	2	.75	1.33	.35	2.48	3/4	K200-MHV-2	632025
FLOATING SHIELD											
K150	NW40	2.16	3	1	-	.65	1.03	1.80	1/2	K150-FMHV	632026
K200	NW50	2.95	3	1	-	.65	1.03	1.80	1/2	K200-FMHV	632027

Connectors



DESCRIPTION	PIN DIA.	QTY PER PKG.	WT LBS	REFERENCE	PART NUMBER
PUSH-ON, WITH SET SCREW ¹	.094	10	1/2	POEC-094	991539-01

¹ Wrench included with Push-On connector



Features

- Noise shield for medium power applications
- Safe disconnect configuration
- Bayonet style threadless connection
- Grounded shield
- Air side connector provided
- Additional configurations available through MDC - see pages 320-321 for MDC Ceramic Seals contact information

Specifications

Application	Used in medium power applications. Similar to MHV, but reverses the male/female pin/contact on the air-side connection. Does not intermate with BNC or MHV connectors.
Configuration	Single ended coaxial
Voltage	5000V DC maximum
Current	5 Amperes maximum
Impedance Rating	Not constant
Material	
Flanges	304ss
Coaxial conductor	Nickel
Vacuum Range	UHV: 1×10^{-4} to 1×10^{-13} Torr HV: 1×10^{-4} to 1×10^{-8} Torr
Temperature Range	UHV: -200° to 450°C maximum, without connector HV: -20° to 150°C maximum, without connector Connector: -65° to 165°C maximum Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table
Connector	All feedthroughs supplied with air-side mating connector for use with RG 59/U cable

ULTRAHIGH & HIGH VACUUM SERIES

Figure 1

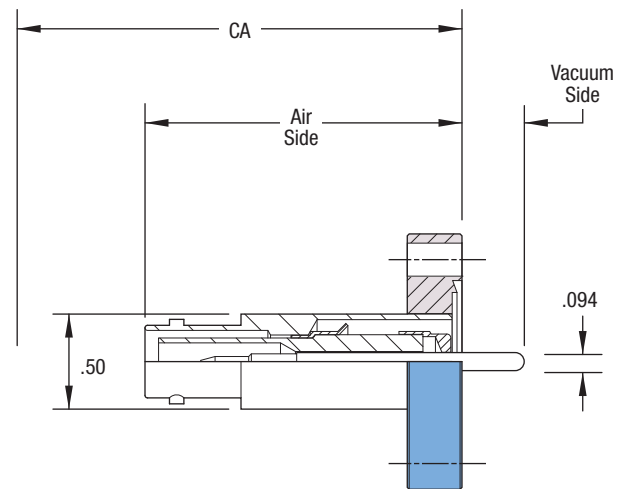
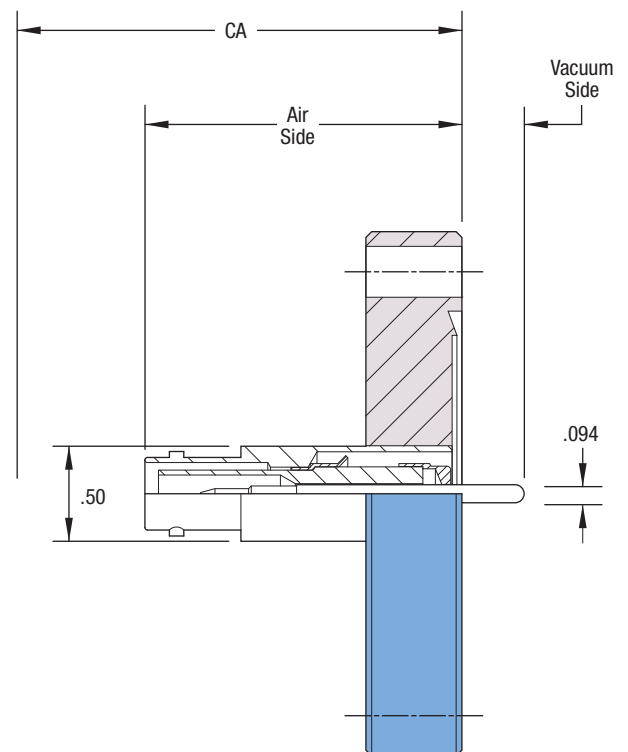
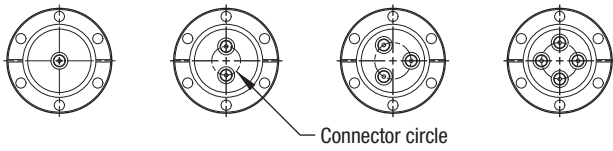


Figure 2



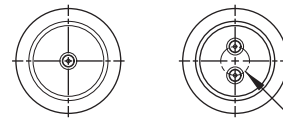
End Views - Vacuum Side

Del-Seal™ CF



Connector circle

Kwik-Flange™ KF



Connector circle

Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	FLANGE O.D.	FIG.	NO. OF CONN.	CONN. CIRCLE	AIR SIDE	VAC SIDE	CA	WT LB	REFERENCE	PART NUMBER
GROUNDING SHIELD											
1-1/3	1.062	1.33	1	1	-	1.65	.32	2.78	3/4	SHV-133	634000
2-3/4	2.312	2.73	2	1	-	1.65	.32	2.78	1	SHV-275	634001
2-3/4	2.312	2.73	2	2	.95	1.65	.32	2.78	1	SHV-275-2	634002
2-3/4	2.312	2.73	2	3	.95	1.65	.32	2.78	1	SHV-275-3	634003
2-3/4	2.312	2.73	2	4	.95	1.65	.32	2.78	1	SHV-275-4	634004

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	FLANGE O.D.	FIG.	NO. OF CONN.	CONN. CIRCLE	AIR SIDE	VAC SIDE	CA	WT LB	REFERENCE	PART NUMBER
GROUNDING SHIELD											
K075	NW16	1.18	1	1	-	1.70	.27	2.83	1/2	K075-SHV	634020
K100	NW25	1.57	1	1	-	1.60	.37	2.73	1/2	K100-SHV	634021
K150	NW40	2.16	1	1	-	1.60	.37	2.73	1/2	K150-SHV	634022
K200	NW50	2.95	1	1	-	1.60	.37	2.73	1/2	K200-SHV	634023
K150	NW40	2.16	1	2	.75	1.60	.37	2.73	3/4	K150-SHV-2	634024
K200	NW50	2.95	1	2	.75	1.60	.37	2.73	3/4	K200-SHV-2	634025

Connectors



DESCRIPTION	PIN DIA.	QTY PER PKG.	WT LBS	REFERENCE	PART NUMBER
PUSH-ON, WITH SET SCREW ¹	.094	10	1/2	POEC-094	991539-01

¹ Wrench included with Push-On connector



Features

- Noise shield for low power applications
- 50 Ohm impedance rating
- Threaded connection
- Grounded shield
- Air side connector provided
- Additional configurations available through MDC - see pages 320-321 for MDC Ceramic Seals contact information

Specifications

Application	Used in 50Ω low power instrumentation transmission lines Does not intermate with other connectors.
Configuration	Single ended coaxial, Grounded shield
Voltage	500V DC maximum
Current	3 Amperes maximum
Impedance Rating	50 Ohm style
Material	
Flanges	304ss
Coaxial conductor	Nickel
Vacuum Range	UHV: 1×10^{-4} to 1×10^{-13} Torr HV: 1×10^{-4} to 1×10^{-8} Torr
Temperature Range	UHV: -200° to 450°C maximum, without connector HV: -20° to 200°C maximum, intermittent -20°C to 150°C maximum, sustained Connector: -65° to 165°C maximum Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table
Connector	All feedthroughs supplied with air-side mating connector

ULTRAHIGH & HIGH VACUUM SERIES

Figure 1

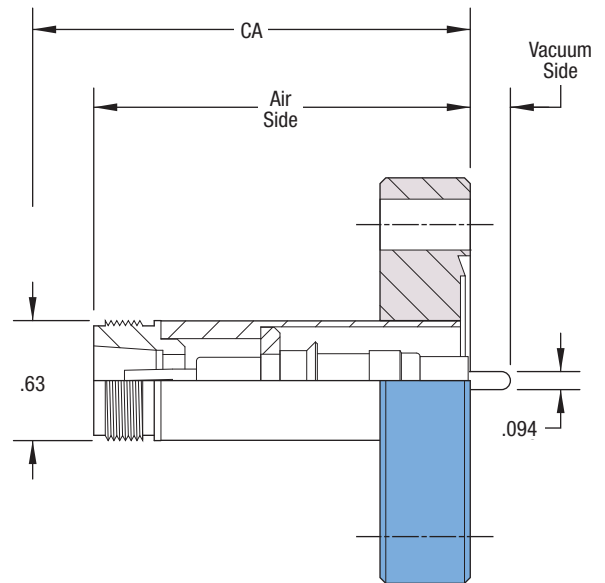
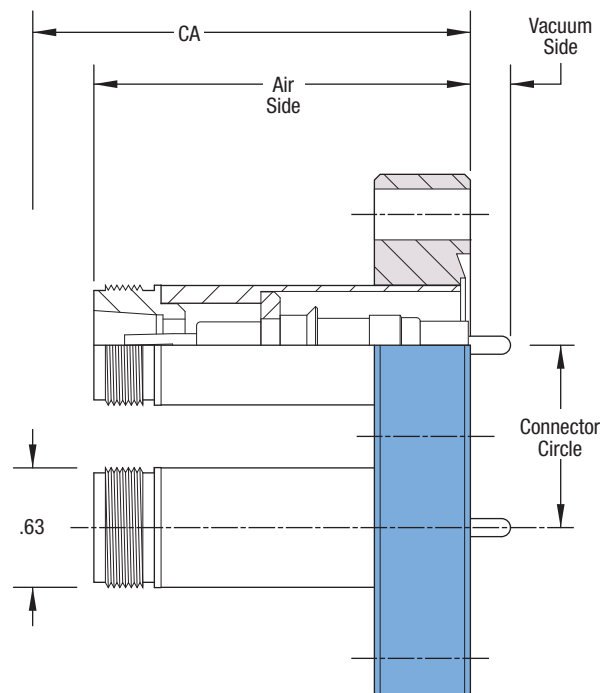
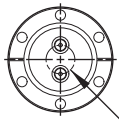


Figure 2



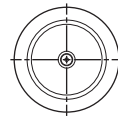
End Views - Vacuum Side

Del-Seal™ CF



Connector circle

Kwik-Flange™ KF



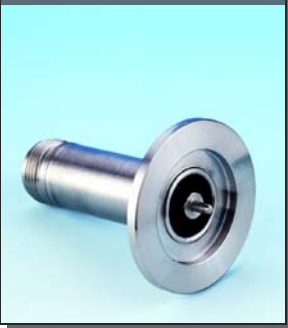
Connector circle

Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	FLANGE O.D.	FIG.	NO. OF CONN.	CONN. CIRCLE	AIR SIDE	VAC SIDE	CA	WT LB	REFERENCE	PART NUMBER
GROUND SHIELD											
1-1/3	1.062	1.33	1	1	-	1.96	.22	3.06	3/4	IM50-133	636000
2-3/4	2.312	2.73	1	1	-	1.96	.22	3.06	1	IM50-275	636001
2-3/4	2.312	2.73	2	2	.95	1.96	.22	3.06	1	IM50-275-2	636002

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	FLANGE O.D.	FIG.	NO. OF CONN.	CONN. CIRCLE	AIR SIDE	VAC SIDE	CA	WT LB	REFERENCE	PART NUMBER
GROUND SHIELD											
K075	NW16	1.18	1	1	-	2.01	.17	3.11	1/2	K075-IM	636020
K100	NW25	1.57	1	1	-	1.91	.27	3.01	1/2	K100-IM	636021
K150	NW40	2.16	1	1	-	1.91	.27	3.01	1/2	K150-IM	636022
K200	NW50	2.95	1	1	-	1.91	.27	3.01	1/2	K200-IM	636023
K150	NW40	2.16	2	2	.95	2.01	.17	3.11	3/4	K150-2-IM	636024
K200	NW50	2.95	2	2	.95	1.91	.27	3.01	3/4	K200-2-IM	636025

Connectors



DESCRIPTION	PIN DIA.	QTY PER PKG.	WT LBS	REFERENCE	PART NUMBER
PUSH-ON, WITH SET SCREW ¹	.094	10	1/2	POEC-094	991539-01

¹ Wrench included with Push-On connector



Features

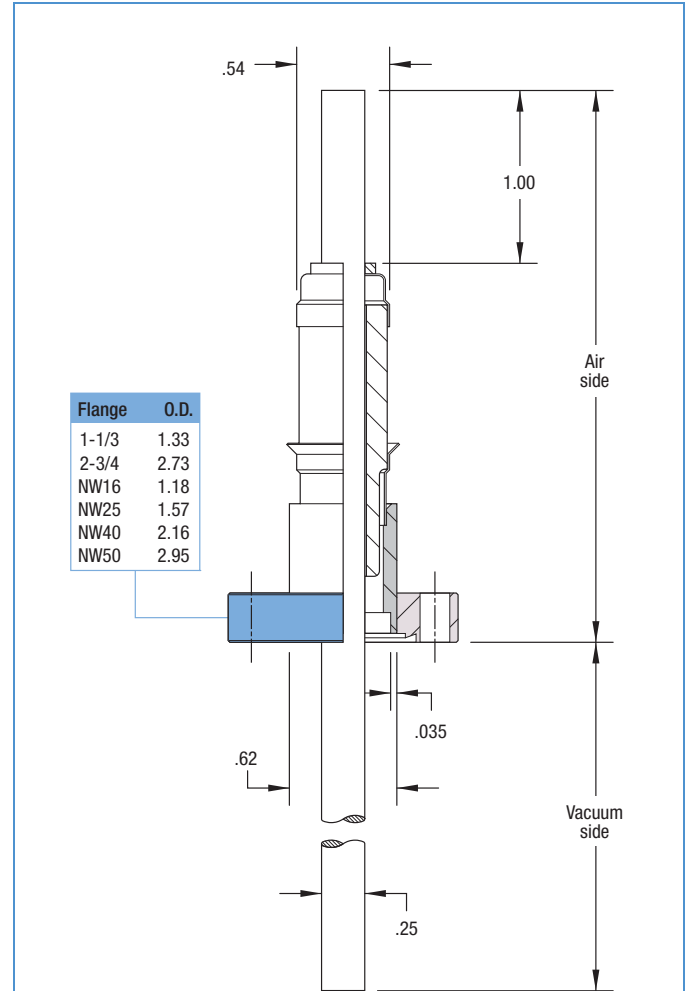
- Medium and high current applications
- Solid or tube conductor
- One to four conductors
- Copper conductor material
- Additional configurations available through MDC - see pages 320-321 for MDC Ceramic Seals contact information

Specifications

Application	Used in a variety of applications including electron beam or resistive evaporation, sample heating and biasing.
Configuration	Solid conductor, ceramic insulated Hollow tube, ceramic insulated
Voltage	5000V DC maximum
Current	Solid Conductor: 150 Amperes maximum Tubular Conductor: Unspecified ¹
Material	
Flanges	304ss
Conductor	OFE copper
Vacuum Range	UHV: 1×10^{-4} to 1×10^{-13} Torr HV: 1×10^{-4} to 1×10^{-8} Torr
Temperature Range	UHV: 450°C maximum HV: 150°C maximum Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table
Connector	Purchased separately

¹ With proper cooling, tubular conductor high current feedthroughs are capable of exceeding solid conductor current ratings.

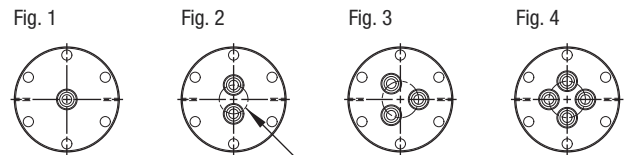
ULTRAHIGH & HIGH VACUUM SERIES



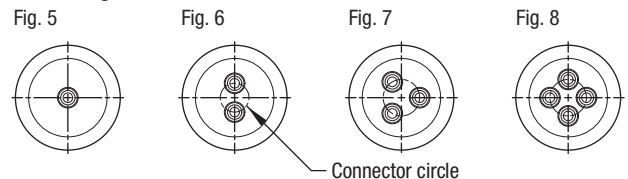
- Shown with solid conductor on 1-1/3" Del-Seal™ CF Mini-flange
- Tubular conductors have 1/4" tubes with .032" walls

End Views - Air Side

Del-Seal™ CF



Kwik-Flange™ KF





Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	FIG.	NO. OF CONN.	CONN. CIRCLE	AIR SIDE	VAC SIDE	WT LB	REFERENCE	PART NUMBER
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SOLID CONDUCTOR

1-1/3	1.062	1	1	-	3.18	4.07	1/2	MMC-150	640000
2-3/4	2.312	1	1	-	3.18	4.07	1	MC-150	640001
2-3/4	2.312	2	2	.95	3.18	4.07	1	MC-152	640002
2-3/4	2.312	3	3	.95	3.18	4.07	1	MC-153	640003
2-3/4	2.312	4	4	.95	3.18	4.07	1	MC-154	640004

TUBULAR CONDUCTOR

1-1/3	1.062	1	1	-	3.18	4.07	1/2	MMCT-150	644000
2-3/4	2.312	1	1	-	3.18	4.07	1	MCT-150	644001
2-3/4	2.312	2	2	.95	3.18	4.07	1	MCT-152	644002
2-3/4	2.312	3	3	.95	3.18	4.07	1	MCT-153	644003
2-3/4	2.312	4	4	.95	3.18	4.07	1	MCT-154	644004

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	FIG.	NO. OF CONN.	CONN. CIRCLE	AIR SIDE	VAC SIDE	WT LB	REFERENCE	PART NUMBER
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SOLID CONDUCTOR

K075	NW16	5	1	-	3.23	4.02	1/2	K075-MC	640020
K100	NW25	5	1	-	3.13	4.12	1/2	K100-MC	640021
K150	NW40	5	1	-	3.13	4.12	1/2	K150-MC	640022
K200	NW50	5	1	-	3.13	4.12	1/2	K200-MC	640023
K150	NW40	6	2	.75	3.13	4.12	1	K150-MC-2	640024
K200	NW50	6	2	.75	3.13	4.12	1	K200-MC-2	640025
K150	NW40	7	3	.95	3.23	4.02	1	K150-MC-3	640026
K200	NW50	7	3	.95	3.13	4.12	1	K200-MC-3	640027
K200	NW50	8	4	.95	3.13	4.12	1	K200-MC-4	640028

TUBULAR CONDUCTOR

K075	NW16	5	1	-	3.23	4.02	1/2	K075-MCT	644020
K100	NW25	5	1	-	3.13	4.12	1/2	K100-MCT	644021
K150	NW40	5	1	-	3.13	4.12	1/2	K150-MCT	644022
K200	NW50	5	1	-	3.13	4.12	1/2	K200-MCT	644023
K150	NW40	6	2	.75	3.13	4.12	1	K150-MCT-2	644024
K200	NW50	6	2	.75	3.13	4.12	1	K200-MCT-2	644025
K150	NW40	7	3	.95	3.23	4.02	1	K150-MCT-3	644026
K200	NW50	7	3	.95	3.13	4.12	1	K200-MCT-3	644027
K200	NW50	8	4	.95	3.13	4.12	1	K200-MCT-4	644028

Connectors



DESCRIPTION	PIN DIA. or CORD RANGE	QTY PER PKG.	WT LBS	REFERENCE	PART NUMBER
INLINE ELECTRICAL CONNECTOR	.250	10	1/4	ILEC-260	991540
INLINE POWER CLAMP	.250	1	1/4	ILPC	991536
RIGHT ANGLE POWER CLAMP	.250	1	1/4	RAPC	991537
PUSH ON	.250	2	1/4	POEC-250	680360
HIGH VOLTAGE SHIELD	0.15 - 0.32	1	2	HVE-1	640050
HIGH VOLTAGE SHIELD	0.23 - 0.47	1	2	HVE-2	640051
HIGH VOLTAGE SHIELD	0.35 - 0.63	1	2	HVE-3	640052
HIGH VOLTAGE SHIELD	0.51 - 0.71	1	2	HVE-4	640053



Features

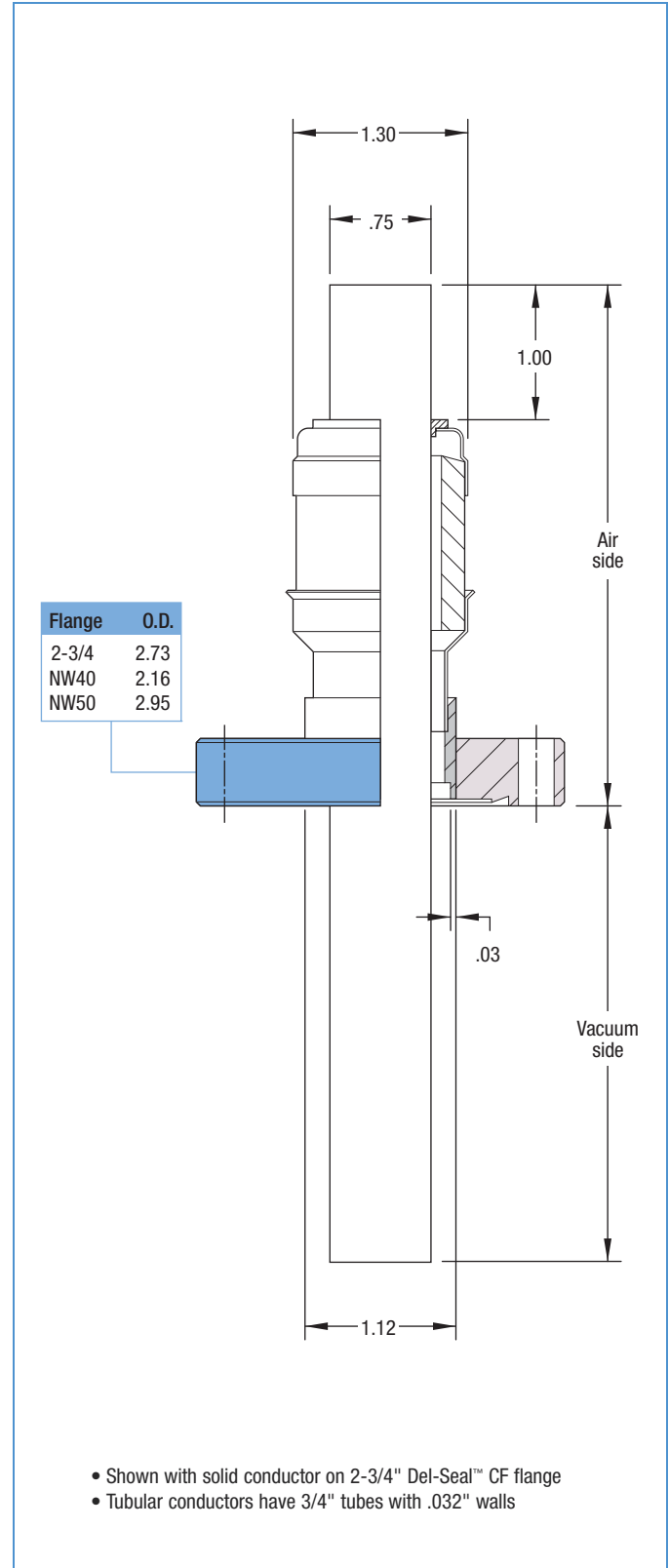
- High current applications
- Solid or tube conductor
- Single conductor
- Copper conductor material
- Additional configurations available through MDC - see pages 320-321 for MDC Ceramic Seals contact information

Specifications

Configuration	Solid conductor, ceramic insulated Hollow tube, ceramic insulated
Voltage	3000V DC maximum
Current	Solid conductor: 600 Amperes maximum Tubular conductor: Unspecified ¹
Material	
Flanges	304ss
Conductor	OFE copper
Vacuum Range	UHV: 1×10^{-4} to 1×10^{-13} Torr HV: 1×10^{-4} to 1×10^{-8} Torr
Temperature Range	UHV: 450°C maximum HV: 150°C maximum Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table
Connector	Purchased separately

¹ With proper cooling, tubular conductor high current feedthroughs are capable of exceeding solid conductor current ratings.

ULTRAHIGH & HIGH VACUUM SERIES





Del-Seal™ CF



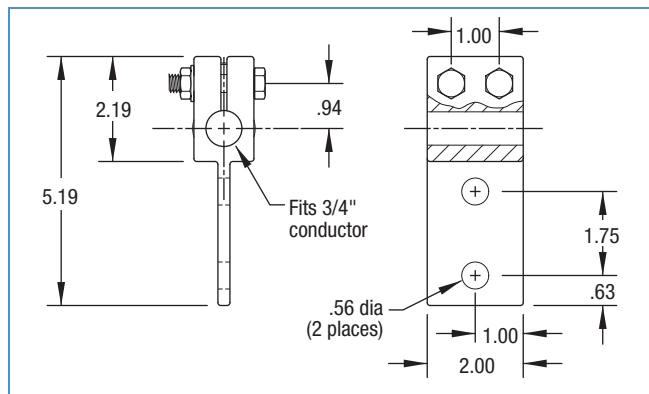
FLANGE SIZE	BOLT CIRCLE	AIR SIDE	VAC SIDE	WT LB	REFERENCE	PART NUMBER
SOLID CONDUCTOR						
2-3/4	2.312	3.90	3.35	1-1/2	MC-600	641000
TUBULAR CONDUCTOR						
2-3/4	2.312	3.90	3.35	1-1/2	MCT-600	645000

Kwik-Flange™ KF



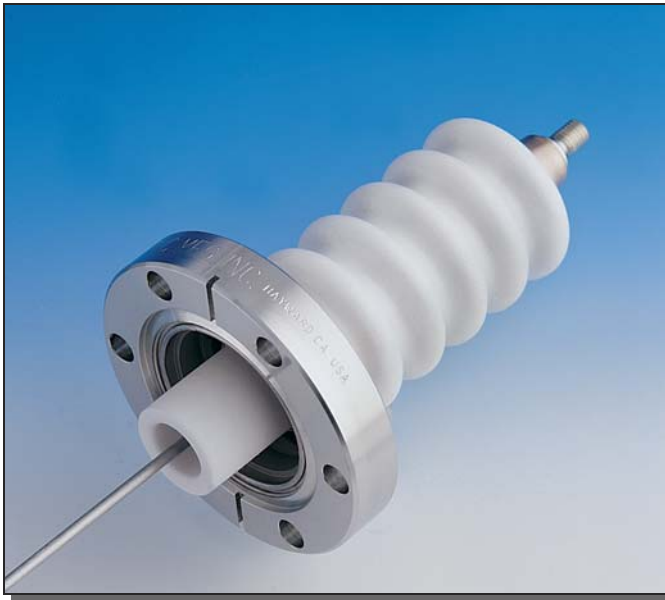
FLANGE SIZE	ISO REF.	AIR SIDE	VAC SIDE	WT LB	REFERENCE	PART NUMBER
SOLID CONDUCTOR						
K150	NW40	3.85	3.40	1-1/2	K150-MC600	641020
K200	NW50	3.85	3.40	1-1/2	K200-MC600	641021
TUBULAR CONDUCTOR						
K150	NW40	3.85	3.40	1-1/2	K150-MCT600	645020
K200	NW50	3.85	3.40	1-1/2	K200-MCT600	645021

Connector



REFERENCE	PART NUMBER
HCC-750	640070

Clamp connectors for high current power feedthroughs are made of OFE copper and are silver plated to minimize oxidation and contact resistance. Each connector includes two .375-16 stainless steel hex-head bolts and nuts. They are designed for use with .750" diameter conductors and have two 9/16" holes used for fastening eyelet-fitted input power cables. Sold individually.



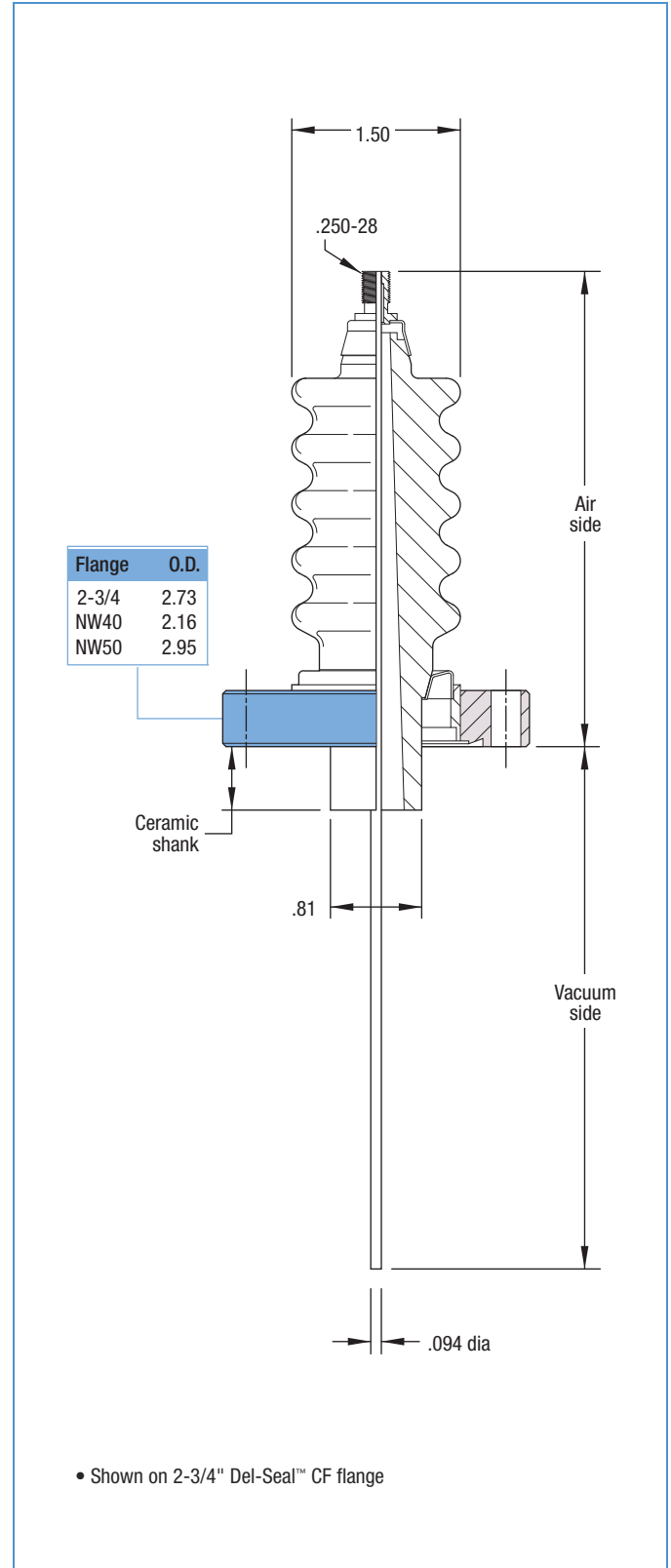
Features

- High voltage applications
- Single solid conductor
- Stainless steel conductor material
- Additional configurations available through MDC - see pages 320-321 for MDC Ceramic Seals contact information

Specifications

Configuration	Solid conductor, ceramic insulated
Voltage	30000V DC maximum
Current	1 Amperes maximum
Material	
Flanges	304ss
Conductor	Stainless steel
Vacuum Range	UHV: 1×10^{-4} to 1×10^{-13} Torr HV: 1×10^{-4} to 1×10^{-8} Torr
Temperature Range	UHV: 450°C maximum HV: 150°C maximum Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table
Connector	Purchased separately

ULTRAHIGH & HIGH VACUUM SERIES





Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	AIR SIDE	VAC SIDE	CERAMIC SHANK	WT LB	REFERENCE	PART NUMBER
2-3/4	2.312	4.12	4.76	.64	1	HVC-150	642000

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	AIR SIDE	VAC SIDE	CERAMIC SHANK	WT LB	REFERENCE	PART NUMBER
K150	NW40	4.17	4.71	.59	1	K150-HVC	642020
K200	NW50	4.07	4.81	.69	1	K200-HVC	642021

Connectors



DESCRIPTION	PIN DIA. or CORD RANGE	QTY PER PKG.	WT LBS	REFERENCE	PART NUMBER
PUSH ON, WITH SET SCREW	.094	10	1/4	POEC-094	991539-01
HIGH VOLTAGE SHIELD	0.15 - 0.32	1	2	HVE-1	640050
HIGH VOLTAGE SHIELD	0.23 - 0.47	1	2	HVE-2	640051
HIGH VOLTAGE SHIELD	0.35 - 0.63	1	2	HVE-3	640052
HIGH VOLTAGE SHIELD	0.51 - 0.71	1	2	HVE-4	640053



HIGH VACUUM SERIES

Description

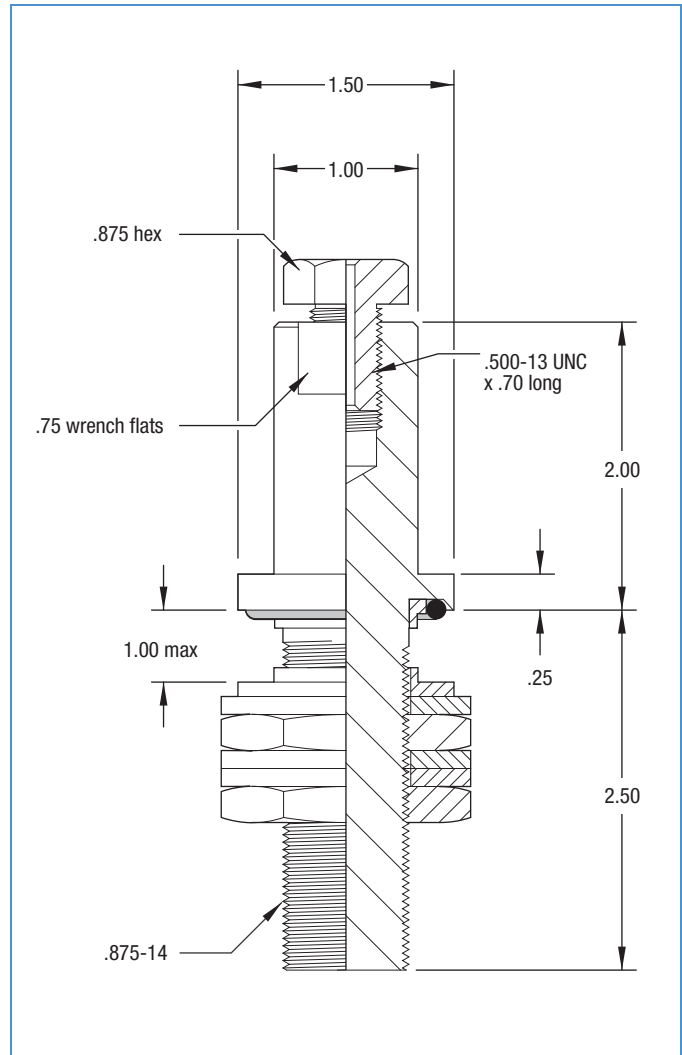
The FHC-400 is designed for the transmission of up to 400 amps at 50 volts into a vacuum system with standard one-inch diameter baseplate through-hole mounting. Water cooling is not required. Units are constructed of oxygen-free copper and brass with Teflon® insulators for strength and durability. Bakeable to 200°C.

Features

- Solid conductor
- 400 Ampere, 50 Volt maximum
- Standard 1" diameter baseplate mounting
- Air and vacuum connectors included
- Bakeable to 200°C

Specifications

Configuration	Solid conductor, ceramic insulated
Voltage	50V DC maximum
Current	400 Amperes maximum
Material	
Baseplate mount	Brass
Conductor	OFE Copper
Vacuum Range	1x10 ⁻⁴ to 1x10 ⁻⁸ Torr
Temperature Range	200°C maximum, intermittent, 150°C maximum, sustained Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table
Connector	Air and vacuum connectors included



DESCRIPTION	WT LB	REFERENCE	PART NUMBER
400 AMP	1	FHC-400	648001



Features

- Watercooled conductor
- 1000 Ampere, 50 Volt maximum
- Standard 1" diameter baseplate mounting
- Accepts 1/4" polypropylene tubing
- Air and vacuum connectors included
- Bakeable to 200°C

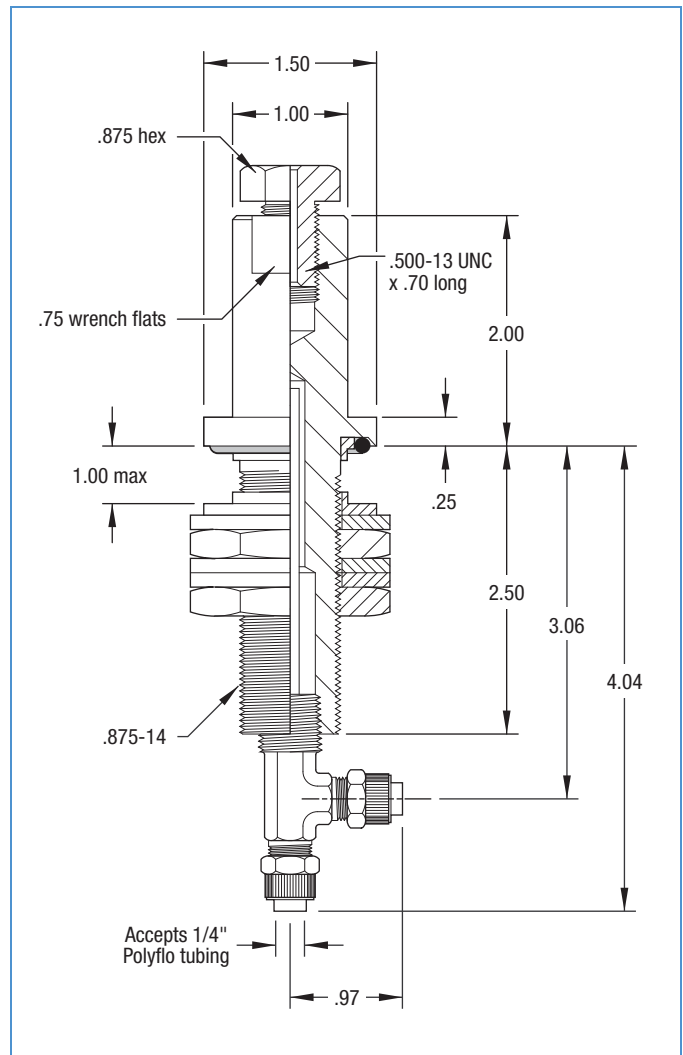
Specifications

Configuration	Watercooled conductor, ceramic insulated
Voltage	50V DC maximum
Current	1000 Amperes maximum
Material	
Baseplate mount	Brass
Conductor	OFE Copper
Vacuum Range	1×10^{-4} to 1×10^{-8} Torr
Temperature Range	200°C maximum, intermittent, 150°C maximum, sustained Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table
Connector	Air and vacuum connectors included

HIGH VACUUM SERIES

Description

The FHC-1000 is a high-current, low-voltage electrical baseplate feedthrough for the transmission of up to 1000 amps at 50 volts into a vacuum system. It is designed for standard one-inch diameter through-hole mounting. Units are constructed of oxygen-free copper and brass with Teflon insulators for strength and durability. One-piece construction eliminates any possibility of water leakage through welded parts. Waterline connectors accept 1/4" polypropylene tubing. Bakeable to 200°C.



DESCRIPTION	WT LB	REFERENCE	PART NUMBER
1000 AMP	1	FHC-1000	648000



ULTRAHIGH & HIGH VACUUM SERIES

Description

MDC RF-Power feedthroughs are state of the art ceramic to metal seal components. They are constructed entirely of non-magnetic materials, *i.e.* copper and stainless steel, which enhance their performance in RF induction fields. These feedthroughs are used primarily in high power and high frequency induction load applications. One of the most common applications being induction coil vacuum heaters. Depending on the application, heater designs can take on numerous configurations. Even though some feedthroughs are sold and detailed as single components, they should be used in pairs; one lead brings power and coolant in to the system and the other takes them out.

Features

- High power, high frequency applications
- Single tube conductor: 35kW @ 13.5 MHz
- Dual tube conductors: 10kW @ 450 KHz
- OFE copper conductor material
- Additional configurations available through MDC - see pages 320-321 for MDC Ceramic Seals contact information

Specifications

Configuration	Hollow tubes, ceramic insulated
Voltage	One tube: 10000V maximum
	Two tubes: 8000V maximum
Power	One tube: 35kW maximum
	Two tubes: 10kW maximum
Frequency	One tube: 13.5 MHz maximum
	Two tubes: 450 KHz maximum
Material	
Flanges	304ss
Conductor	OFE copper
Vacuum Range	UHV: 1×10^{-4} to 1×10^{-13} Torr
	HV: 1×10^{-4} to 1×10^{-8} Torr
Temperature Range	UHV: 300°C maximum
	HV: 200°C maximum, intermittent, 150°C maximum, sustained
	Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table

Figure 1

35kW @ 13.5 MHz

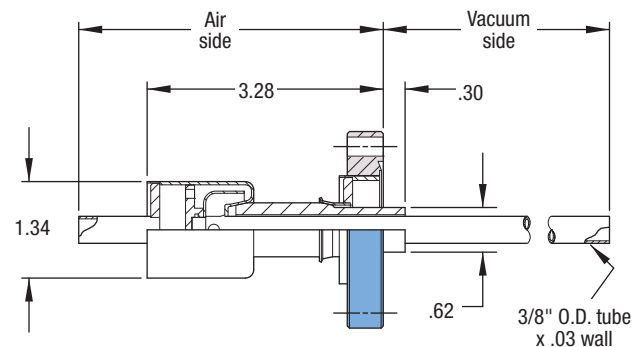
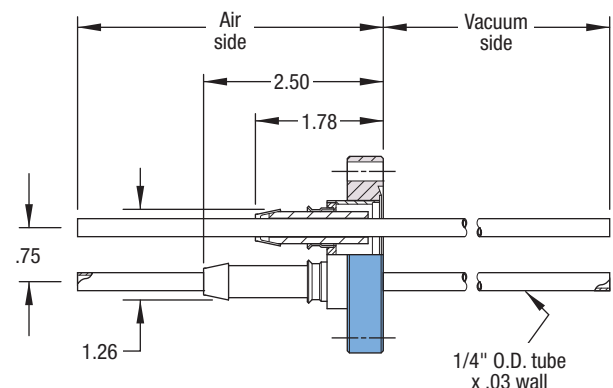


Figure 2

10kW @ 450 KHz





Description *(continued)*

The use of an open or closed loop cooling system is an essential requirement when using these components. The characteristic “skin effect” of RF at these power and frequency levels makes cooling of ceramic to metal seal interfaces imperative. The absence of cooling will generate sufficient heat to damage ceramic to metal seals. Note that practical coolant flow rates should be determined by the customer for each application, based on the heat dissipating capacity of the coolant in use.



FLANGE SIZE	RATING	FLANGE O.D.	FIGURE	AIR SIDE	VACUUM SIDE	WT LB	REFERENCE	PART NUMBER
ONE CONDUCTOR								
2-3/4	35 kW	2.73	1	4.23	4.52	1	RF-35KW	620001
TWO CONDUCTOR								
2-3/4	10 kW	2.73	2	4.25	4.14	1	RF-10KW	620000



FLANGE SIZE	RATING	FLANGE O.D.	ISO REF.	FIGURE	AIR SIDE	VACUUM SIDE	WT LB	REFERENCE	PART NUMBER
ONE CONDUCTOR									
K200	35 kW	2.95	NW50	1	4.18	4.57	1	K200-35KW	620022
TWO CONDUCTOR									
K150	10 kW	2.16	NW40	2	4.29	4.10	1	K150-10KW	620020
K200	10 kW	2.95	NW50	2	4.19	4.20	1	K200-10KW	620021



Description

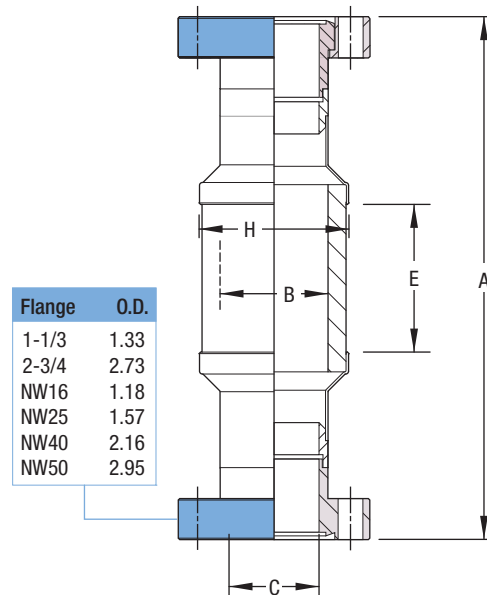
MDC Ceramic to Metal Adapters are recommended for high and ultrahigh vacuum system applications requiring high-voltage insulation. They feature high reliability, leak tightness at 1×10^{-10} atm. cc/sec helium, and maximum voltage ratings as noted in the tables below. "Break" style adapters are either 3/4" or 1-1/4" nominal diameter, and "Envelope" style adapters are 2-1/2" nominal diameter and above. They are made with ceramic insulator material having a minimum aluminum oxide content of 90%. Ceramic-to-Kovar[®] and Kovar[®]-to-stainless steel seals are made with vacuum tube grade silver bearing braze alloy. Del-Seal[™] CF adapters are supplied with one rotatable and one non-rotatable flange for easy installation. UHV series are bakeable to 450°C maximum. HV series can be baked to 200°C intermittent and are usable to 150°C sustained temperature.

Specifications

Configuration	UHV: One rotatable, one nonrotatable Del-Seal [™] CF flange HV: Identical ISO flanges each end
Voltage Rating	Breaks: 10kVDC and 15kVDC Envelopes: 8kVDC and 15kVDC
Material	
Flanges	304ss
Sleeves	Kovar
Vacuum Range	UHV: 1×10^{-4} to 1×10^{-13} Torr HV: 1×10^{-4} to 1×10^{-8} Torr
Temperature Range	UHV: 450°C maximum HV: 150°C maximum Gradient: 25°C per minute maximum
Weight and Dimensions	See table

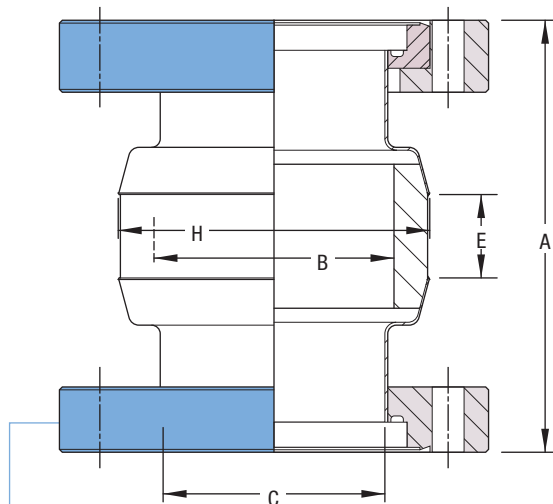
ULTRAHIGH & HIGH VACUUM SERIES

Breaks 3/4" and 1-1/4"



Flange	O.D.
1-1/3	1.33
2-3/4	2.73
NW16	1.18
NW25	1.57
NW40	2.16
NW50	2.95

Envelopes 2-1/2" through 7-3/4"



Flange	O.D.
4-1/2	4.47
6	5.97
8	7.97
10	9.97
NW63	3.74
NW100	5.12
NW160	7.09

• LF Large-Flange[™] sizes NW63 through NW160 are claw clamp style flanges



Del-Seal™ CF



FLANGE SIZE	VOLTAGE RATING	NOM A	B	C	NOM E	NOM H	WT LB	REFERENCE	PART NUMBER
BREAKS									
1-1/3	10kV	3.62	.75	.63	1.00	1.04	1	CB-075	464000
2-3/4	15kV	4.22	1.25	1.37	2.00	1.66	1	CB-125	464001
ENVELOPES									
4-1/2	8kV	4.50	2.50	2.31	.75	3.23	6	CE-250	465000
6	8kV	4.62	3.50	3.75	.75	4.25	8	CE-350	465001
8	15kV	5.50	6.00	6.00	1.50	6.92	16	CE-600	465002
10	15kV	5.75	7.75	7.75	1.50	8.80	21	CE-775	465003

ISO KF & ISO LF



FLANGE SIZE	ISO REF.	VOLTAGE RATING	NOM A	B	C	NOM E	NOM H	WT LB	REFERENCE	PART NUMBER
BREAKS										
K075	NW16	10kV RMS	3.62	.75	.63	1.00	1.04	1	K075-CB	464020
K100	NW25	10kV RMS	2.94	.75	.63	1.00	1.04	1	K100-CB	464021
K150	NW40	15kV RMS	4.22	1.25	1.37	2.00	1.66	1-1/2	K150-CB	464022
K200	NW50	15kV RMS	4.00	1.25	1.37	2.00	1.66	1-1/2	K200-CB	464023
ENVELOPES										
L250	NW63	8kV RMS	4.25	2.50	2.31	.75	3.23	6	L250-CE	465020
L400	NW100	8kV RMS	4.37	3.50	3.75	.75	4.25	14	L400-CE	465021
L600	NW160	15kV RMS	5.25	6.00	6.00	1.50	6.92	16	L600-CE	465022

LF Large-Flange™ sizes NW63 through NW160 are claw clamp style flanges



Features

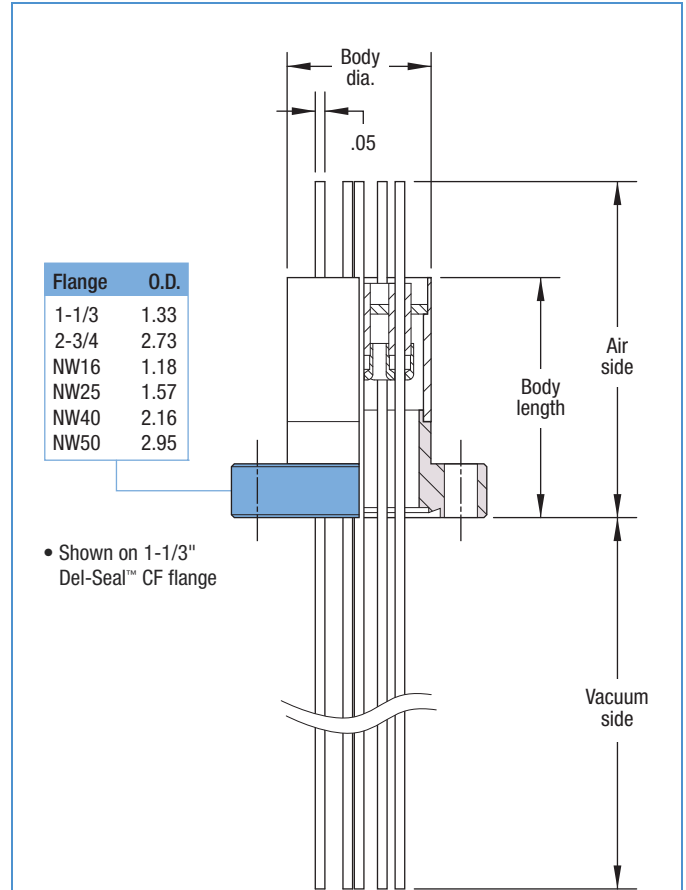
- Medium power applications
- Eight conductors
- Solid or tubular configuration
- Additional configurations available through MDC - see pages 320-321 for MDC Ceramic Seals contact information

Specifications

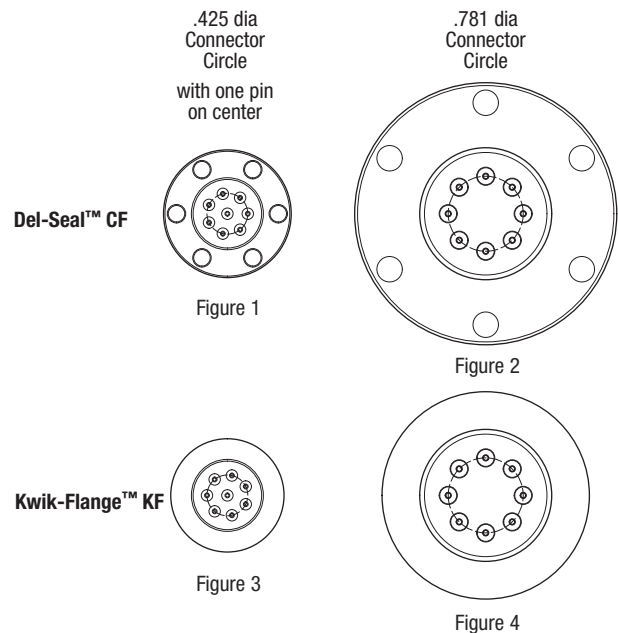
Application	Used in a variety of applications including sample heating and biasing.
Configuration	Solid conductor, ceramic insulated Tube conductor, ceramic insulated
Voltage	1000V DC maximum
Current	Solid conductor: 7 Amperes per pin maximum Tube conductor: Unspecified ¹
Material	
Flanges	304ss
Conductor	Solid: Kovar® Tube: 304ss
Vacuum Range	UHV: 1x10 ⁻⁴ to 1x10 ⁻¹³ Torr HV: 1x10 ⁻⁴ to 1 x 10 ⁻⁸ Torr
Temperature Range	UHV: 450°C maximum HV: 150°C maximum Gradient: 25°C per minute maximum
Weight and Dimensions	See drawing and table
Connector	Purchased separately
Caution	Do not attempt to shorten conductor pins. Damage may occur to ceramic material. Use Short Pin Series or contact factory.

¹ Tubular feedthroughs accept .032 diameter wire.

ULTRAHIGH & HIGH VACUUM SERIES



End Views - Air Side





Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	FIG.	BODY DIMEN. LENGTH	BODY DIMEN. DIA.	AIR SIDE	VACUUM SIDE	WT LB	REFERENCE	PART NUMBER
STANDARD PIN									
1-1/3	1.062	1	1.25	.75	1.75	3.50	1/2	MMC-8P	643001
2-3/4	2.312	2	1.05	1.37	1.80	3.90	1/2	MC-8P	643000
SHORT PIN									
1-1/3	1.062	1	1.25	.75	1.75	2.00	1/2	MMC-8PS	643002
2-3/4	2.312	2	1.05	1.37	1.80	2.45	1/2	MC-8PS	643003
TUBULAR									
1-1/3	1.062	1	1.25	.75	1.75	3.50	2	MMC-8T	646000
2-3/4	2.312	2	1.05	1.37	1.80	3.90	2	MC-8T	646001

Do not attempt to shorten pins; see caution page 344

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	FIG.	BODY DIMEN. LENGTH	BODY DIMEN. DIA.	AIR SIDE	VACUUM SIDE	WT LB	REFERENCE	PART NUMBER
STANDARD PIN									
K075	NW16	3	1.25	.75	1.75	3.50	1/2	K075-8P	643020
K100	NW25	3	.75	.75	1.25	4.00	1/2	K100-8P	643021
K150	NW40	4	1.00	1.37	1.75	3.95	1/2	K150-8P	643022
K200	NW50	4	1.00	1.37	1.75	3.95	1/2	K200-8P	643023
SHORT PIN									
K075	NW16	3	1.25	.75	1.75	2.00	1/2	K075-8PS	643024
K100	NW25	3	.75	.75	1.25	2.50	1/2	K100-8PS	643025
K150	NW40	4	1.00	1.37	1.75	2.50	1/2	K150-8PS	643026
K200	NW50	4	1.00	1.37	1.75	2.50	1/2	K200-8PS	643027
TUBULAR									
K075	NW16	3	1.25	.75	1.75	3.50	1	K075-8T	646020
K100	NW25	3	.75	.75	1.25	4.00	1	K100-8T	646021
K150	NW40	4	1.00	1.37	1.75	3.95	1	K150-8T	646022
K200	NW50	4	1.00	1.37	1.75	3.95	1	K200-8T	646023

Do not attempt to shorten pins; see caution page 344

Connectors



DESCRIPTION	PIN DIA.	QTY PER PKG.	WT LBS	REFERENCE	PART NUMBER
PUSH-ON, WITH SET SCREW ¹	.050	10	1/2	POEC-050	991539

¹ Wrench included with Push-On connector



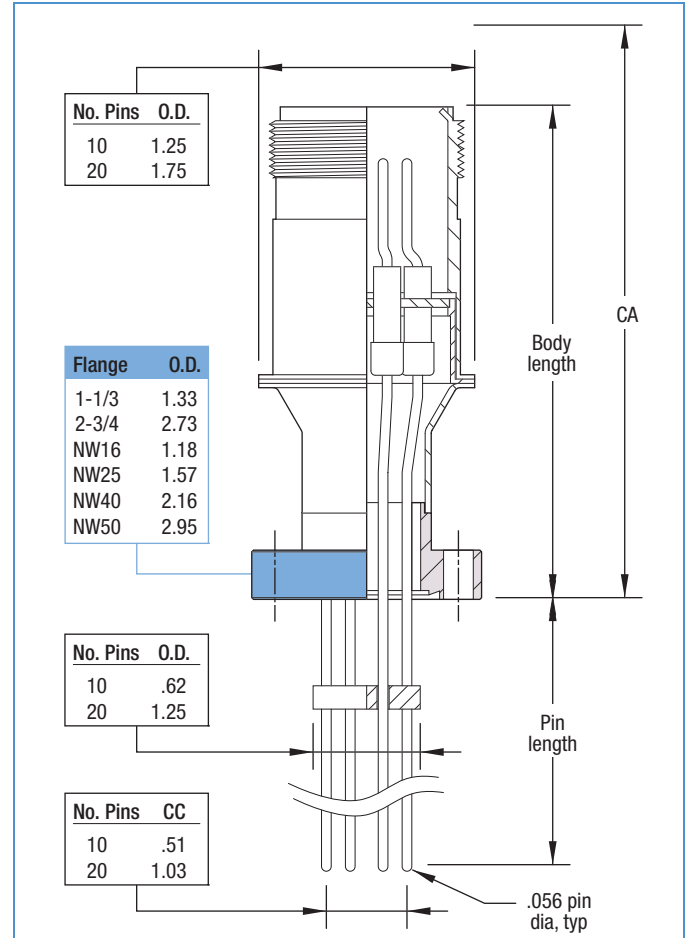
Features

- 10 or 20 pin configuration
- Short pin series available for special applications
- Additional configurations available through MDC - see pages 320-321 for MDC Ceramic Seals contact information

Specifications

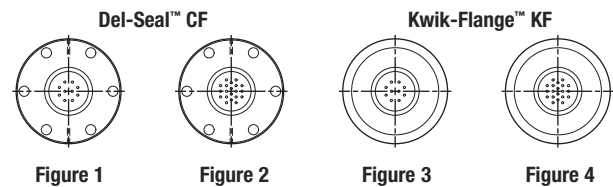
Application	Used for the transmission of electrical signals or low power applications.
Configuration	Single ended multi-pin, Standard pin or Short pin
Voltage	700V DC maximum
Current	10 Amperes maximum
All pins loaded	10 pins: 50 Amperes maximum 20 pins: 75 Amperes maximum
Material	
Flanges	304ss
Conductor	Alumel
Vacuum Range	UHV: 1×10^{-4} to 1×10^{-13} Torr HV: 1×10^{-4} to 1×10^{-8} Torr
Temperature Range	UHV: 450°C maximum, without connector HV: 150°C maximum, without connector Connector: 65°C maximum Gradient: 25°C per minute maximum
Weight and Dimensions	See table
Connector	All feedthroughs supplied with air-side mating connector, MIL-C-5015 spec
Caution	Do not attempt to shorten conductor pins. Damage may occur to ceramic material. Use Short Pin Series or contact factory.

ULTRAHIGH & HIGH VACUUM SERIES

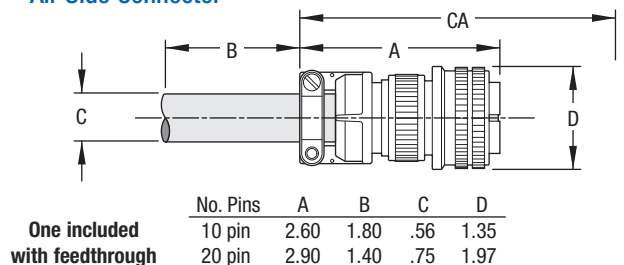


• Shown on 1-1/3" Del-Seal™ CF flange

End Views - Air Side



Air Side Connector





Del-Seal™ CF



FLANGE SIZE	NO. OF PINS	END VIEW FIGURE	BODY LENGTH	PIN LENGTH	CA	WT LB	REFERENCE	PART NUMBER	PRICE \$
STANDARD PIN									
1-1/3	10	1	2.70	2.70	4.53	1	IF10-133	647050	340
2-3/4	10	1	2.25	3.14	4.08	1-1/2	IF10-275	647051	350
2-3/4	20	2	2.58	3.45	4.83	1-1/2	IF20-275	647052	435
SHORT PIN									
1-1/3	10	1	2.70	2.00	4.53	1	IF10-133-S	647053	340
2-3/4	10	1	2.25	2.45	4.08	1-1/2	IF10-275-S	647054	350
2-3/4	20	2	2.58	2.45	4.83	1-1/2	IF20-275-S	647055	435

Do not attempt to shorten pins; see caution page 346

Kwik-Flange™ KF



FLANGE SIZE	NO. OF PINS	END VIEW FIGURE	BODY LENGTH	PIN LENGTH	CA	WT LB	REFERENCE	PART NUMBER	PRICE \$
STANDARD PIN									
K075	10	3	2.70	2.70	4.53	1	K075-IF10	647056	340
K100	10	3	2.20	3.19	4.03	1	K100-IF10	647057	340
K150	10	3	2.20	3.19	4.03	1	K150-IF10	647058	345
K200	10	3	2.20	3.19	4.03	1	K200-IF10	647059	345
K150	20	4	2.53	3.50	4.78	1	K150-IF20	647060	425
K200	20	4	2.53	3.50	4.78	1	K200-IF20	647061	435
SHORT PIN									
K075	10	3	2.70	2.00	4.53	1	K075-IF10-S	647062	340
K100	10	3	2.20	2.50	4.03	1	K100-IF10-S	647063	340
K150	10	3	2.20	2.50	4.03	1	K150-IF10-S	647064	345
K200	10	3	2.20	2.50	4.03	1	K200-IF10-S	647065	345
K150	20	4	2.53	2.50	4.78	1	K150-IF20-S	647066	425
K200	20	4	2.53	2.50	4.78	1	K200-IF20-S	647067	435

Do not attempt to shorten pins; see caution page 346

Connectors



DESCRIPTION	PIN DIA.	QTY PER PKG.	WT LBS	REFERENCE	PART NUMBER	PRICE \$
CRIMP CONNECTOR	.056	5	1/4	TC-CRIMP	991538	60
CERAMIC SPACER, 10 PIN	.056	1	1/4	CS10-2	680620	11
CERAMIC SPACER, 20 PIN	.056	1	1/4	CS20-2	680621	11
CERAMIC BEAD	.056, TIGHT FIT	85 ¹	1/4	CB-2	680601	33
CERAMIC BEAD	.056, LOOSE FIT	73 ¹	1/4	CB-3	680602	33

¹ Equivalent to one linear foot



Complete air-to-vacuum instrumentation connectivity

Features

- Ultrahigh Vacuum compatible
- Type-D Subminiature air-side connector
- PEEK in-vacuum connector
- Kapton® coated UHV ribbon cable
- Gold plated pins
- Del-Seal™ CF flange, Conflat® compatible design

Description

Feedthroughs and Air-side connector

Type-D subminiature connectors offer UHV feedthroughs with nine, fifteen or twenty-five pins hermetically sealed and electrically insulated using glass ceramic bonding. Feedthroughs are offered on Del-Seal™ CF Conflat® compatible metal seal flanges as well as ISO-NW elastomer seal Kwik-Flanges™. One air-side Type-D connector and snap on cover is included with each feedthrough. See page 349.

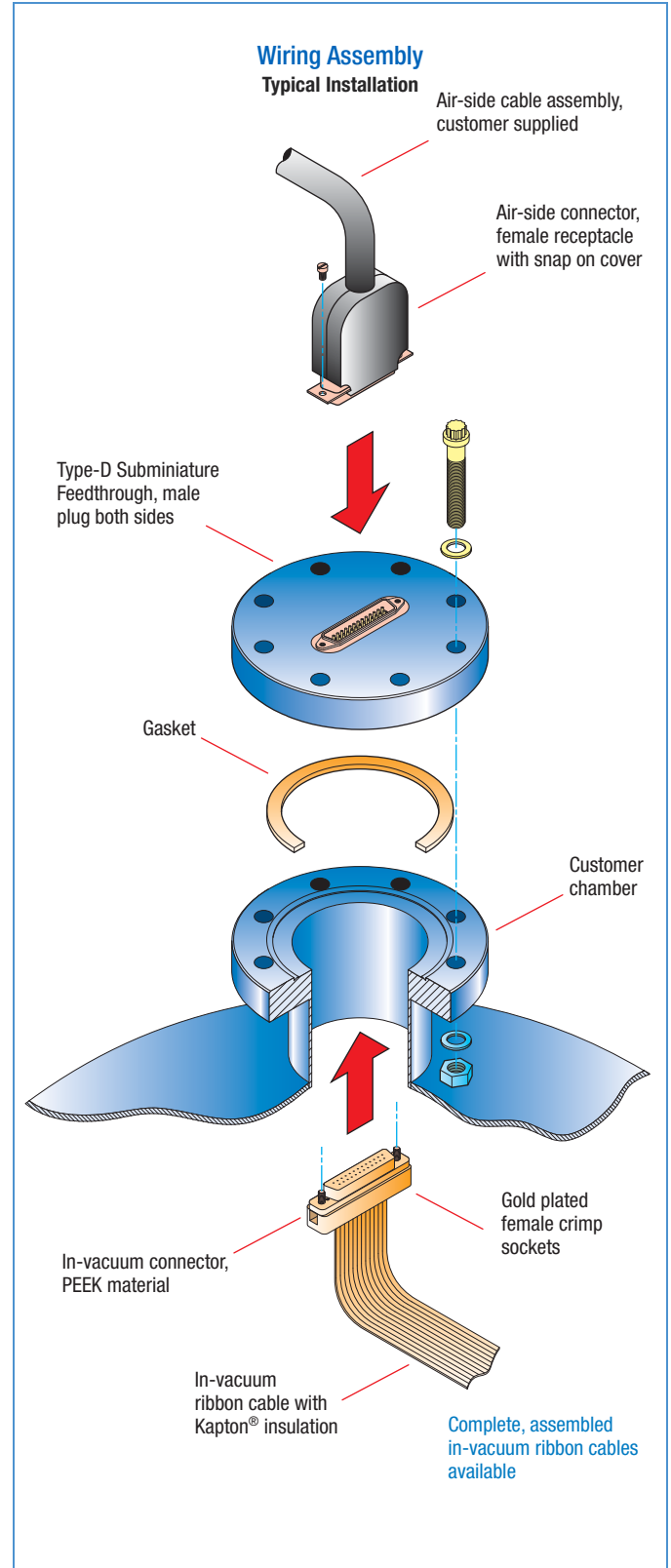
In-vacuum connector and insulated wire

For vacuum side connections a Kapton® insulated in-vacuum ribbon cable and PEEK material Type-D connectors meet the rigorous demands of UHV environments. In-vacuum cables and connectors are not included in the feedthrough assembly price and must be purchased separately. See the following pages for in-vacuum cables and connectors beginning on page 350.

Type-D hardware

Additional hardware may be purchased separately for expansion or replacement of system components. Refer to page 351.

ULTRAHIGH & HIGH VACUUM SERIES



ULTRAHIGH & HIGH VACUUM SERIES

Features

- UHV and HV compatible materials
- UHV temperature rated to 250°C
- MIL-C-24308 pin arrangement
- Gold plated pins
- Air side connector with snap on housing included
- Conflat® and ISO compatible designs

Hermetic Type-D subminiature feedthroughs are high density multi-pin instrumentation feedthroughs constructed with pin arrangements designed to meet MIL-C-24308 specifications. Nine, fifteen or twenty-five gold plated pins are hermetically sealed and electrically insulated in a stainless steel shell using the latest in glass ceramic bonding techniques. Each feedthrough assembly is supplied with an atmosphere side connector which requires customer wiring. Connector details are found on page 351, and additional units may be purchased as stand-alone items. UHV in-vacuum mating connectors and ribbon cable assemblies are available, but must be purchased separately. In-vacuum ribbon cable assemblies are on the next page.

Specifications

Voltage ¹	300VDC maximum
Current	5 Amperes maximum at 20°C
Material	
Shell	Stainless steel
Pins	Ni-Fe alloy, gold plated
Insulation / Seal	Glass ceramic
Vacuum Range UHV / HV	1x10 ⁻¹⁰ Torr / 1x10 ⁻⁸ Torr
Temperature Range ²	
Feedthrough	250°C
Del-Seal™ CF flange	450°C
Kwik-Flange™ ISO KF flange, continuous / intermittent	150°C / 200°C
Air side connector	60°C
Vacuum side connector	250°C
Thermal Gradient	25°C / minute maximum
Weight	See table
Dimensions	See table and drawing

¹ Electrical ratings are maximum test values. Feedthroughs are intended for instrumentation applications carrying low level signal voltages and currents.

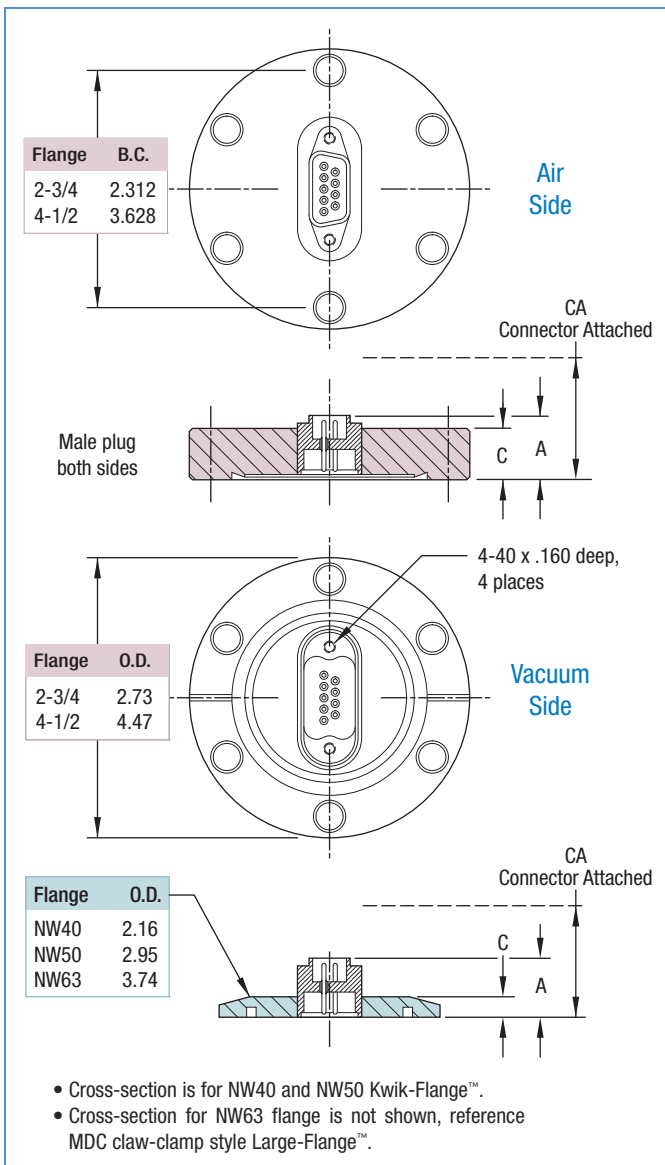
² Overall assembly ratings must be adjusted to that of the lowest rated component.

NO. PINS	FLG	A	C	CA	WT LB	REFERENCE	PART NUMBER
9	2-3/4	.63	.50	2.56	1	D9-275	633000
15	4-1/2	.78	.68	2.71	3	D15-450	633001
25	4-1/2	.78	.68	2.71	3	D25-450	633002

NO. PINS	FLG	A	C	CA	WT LB	REFERENCE	PART NUMBER
9	NW40	.58	.20	2.51	1	D9-K150	633003
15	NW50	.58	.20	2.51	3	D15-K200	633004
25	NW63	.58	.47	2.51	3	D25-L250	633005

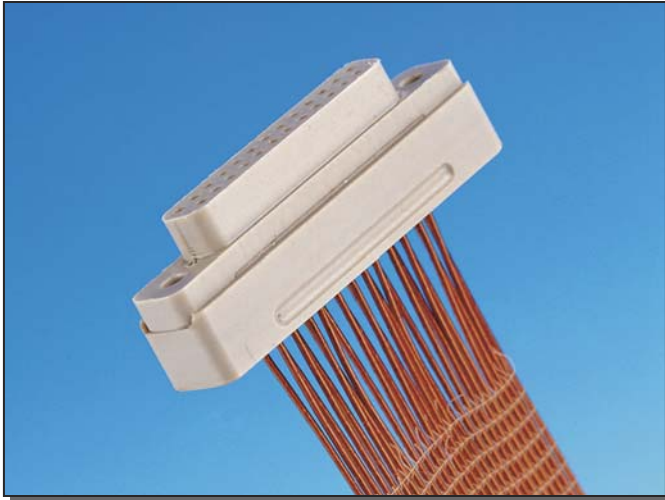


Type-D subminiature feedthroughs: 9-Pin on 2-3/4" Del-Seal™ CF flange, 15-Pin on ISO NW50 Kwik-Flange™, and 25-Pin on 4-1/2" Del-Seal™ CF flange. Air-side connector with snap on housing included, not shown above.





KAP-R25-19S In-Vacuum Ribbon Cable with crimp sockets installed



KAP-R25-19SC In-Vacuum Ribbon Cable with PEEK connector installed

In-vacuum ribbon cable assemblies are designed to complement the Type-D hermetic feedthrough product line. They are offered in two standard configurations pictured above. In-vacuum ribbon cable assemblies are constructed with UHV compatible materials including PEEK (polyether-etherketone) thermoplastic connectors and Kapton® wire insulation. Individual conductors are electrically insulated by wrapping them with a Kapton® insulating film. Insulated conductors are then bundled into ribbon cable form by weaving the conductors with PEEK monofilament. These connectors are fitted with gold plated female crimp contacts which mate with male pins on MDC Type-D feedthroughs. Cable assemblies are available standard with termination on one end and no termination on opposite end. Custom termination of second end is available at an additional charge. PEEK connectors are secured to the UHV side of a Type-D feedthrough using the two 4-40 vented cap screws provided. Individual in-vacuum insulated stranded and coaxial wires are found on page 352.

ULTRAHIGH VACUUM

Features

- UHV compatible materials
- 250°C bakeout temperature
- Kapton® insulated wires
- PEEK ribbon weave and connector material
- Available with 9, 15 and 25 conductors
- Use with MDC Type-D Subminiature Feedthroughs

Specifications

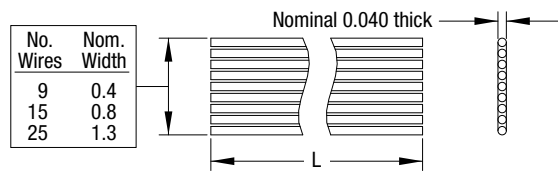
Construction	Ribbon cable	Kapton® insulation, PEEK weave
	In-vacuum connector	PEEK
	Crimp sockets	Gold plated
Connectors		Compatible with industry standard Type-D subminiature connectors or MDC in-vacuum UHV connectors
Conductor		7 / .005" Stranded silver plated copper
Temperature Range		250°C Maximum
Vacuum Range		3.75x10 ⁻¹¹ Torr
Electrical Rating		4kV DC, 1kV rms, 1Amp maximum
Number of Wires		9, 15 and 25

Kapton® is a Registered Trademark of DuPont Dow Elastomers

NO. WIRES	LENGTH INCHES	WT LB	REFERENCE	PART NUMBER
CRIMP SOCKETS ONLY				
9	19	1	KAP-R9-19S	680520
9	39	1	KAP-R9-39S	680521
15	19	1	KAP-R15-19S	680522
15	39	1	KAP-R15-39S	680523
25	19	1	KAP-R25-19S	680524
25	39	1	KAP-R25-39S	680525
SOCKETS AND CONNECTOR				
9	19	1	KAP-R9-19SC	680530
9	39	1	KAP-R9-39SC	680531
15	19	1	KAP-R15-19SC	680532
15	39	1	KAP-R15-39SC	680533
25	19	1	KAP-R25-19SC	680534
25	39	1	KAP-R25-39SC	680535



In-vacuum ribbon



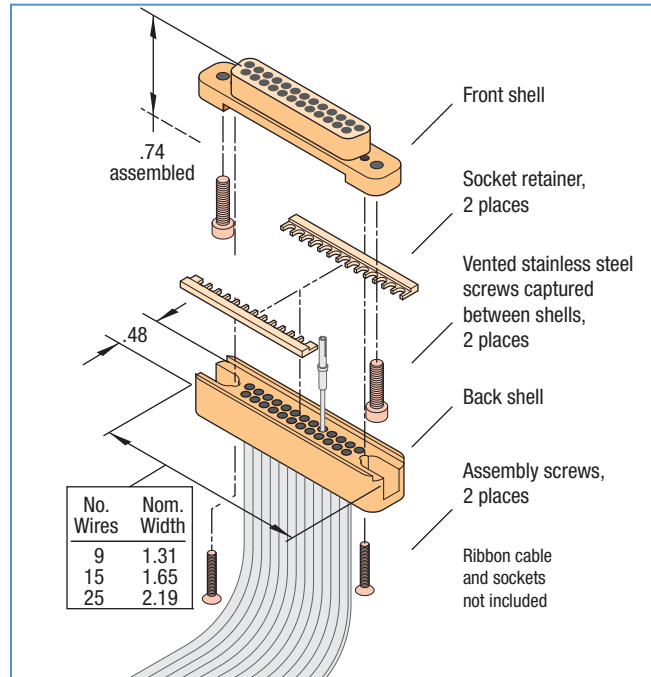
Available with 9, 15 or 25 wires in standard lengths of 19, 39 and 98 inches. Locate part number for ordering from the reference number.

Example: KAP-R25-39

25 wires — 39 inches

REFERENCE	PART NUMBER
KAP-R9-19	680560
KAP-R9-39	680566
KAP-R9-98	680561
KAP-R15-19	680562
KAP-R15-39	680567
KAP-R15-98	680563
KAP-R25-19	680564
KAP-R25-39	680568
KAP-R25-98	680565

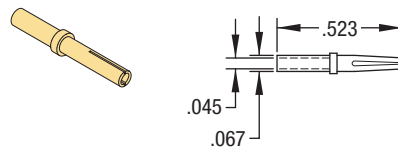
In-vacuum connector



REFERENCE	PART NUMBER
D9-PCC	680540
D15-PCC	680541
D25-PCC	680542

MDC in-vacuum connectors are ideally suited for UHV Type-D instrumentation connection applications. They consist of a four part PEEK housing which captures gold plated crimp sockets. These connectors include two 4-40 x 3/8" socket head screws used to secure the connector to the Type-D feedthrough flange assembly. In-vacuum ribbon and sockets must be purchased separately.

In-vacuum sockets

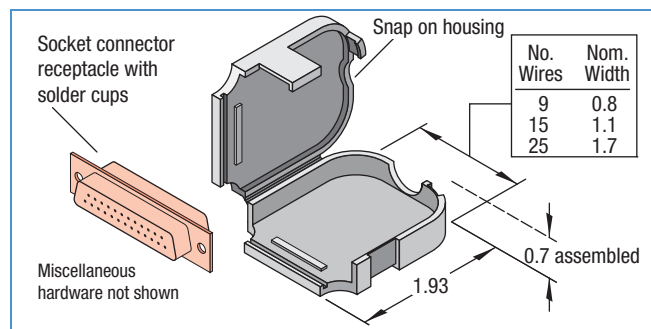


Use the following tools for crimp socket installation:
Crimp Tool - Mil-Spec Ref M22520/2-01
Contact Positioner - Mil-Spec Ref M22520/2-08

REFERENCE	PART NUMBER
DGCS-10	680509

Gold plated crimp sockets are sold in packages of 10. They provide a simple push-on connection to 0.040" diameter male pins. Sockets are mechanically crimped to ribbon cable conductors using military specification crimping and positioning tools.

Air-side connector



REFERENCE	PART NUMBER
D9-C	680511
D15-C	680512
D25-C	680513

MDC air-side Type-D connectors include solder cup female receptacle, snap on plastic housing and all fastening and strain relief hardware. Cables must be supplied and wired by the user.



ULTRAHIGH VACUUM SERIES

Features

- High strength Kapton® Type F film insulation
- Silver plated copper conductor
- Single strand unshielded configurations
- Single strand or coaxial configurations
- Bakeable to 260°C

Description

MDC In-Vacuum Insulated Wire is designed for high and ultrahigh vacuum use to 260°C. All conductors and shields are silver plated copper wire. Insulation is Kapton® Type F film which is applied and heat treated to effectively minimize trapped volumes of gas and maintain mechanical strength. KAP1 through KAP4 supplied in 10m (30-foot) rolls, KAP5 supplied in 5m (15-foot) rolls.

Note that all specifications and dimensions for the In-Vacuum Insulated Wire are metric.

Specifications

Mechanical

Initial Tear	13.4 kg/mm
Tensile Strength	0.97 Pa x 10 ⁻⁷
Elongation	75%

Electrical

Dielectric Constant	2.9
Dielectric Strength	80kV/mm
Dissipation Factor	.001

Thermal / Chemical

Moisture Absorption	0.4% @ 50% RH
Radiation Resistance	107 Rads

Material

Conductor	Silver plated copper
Insulator	Kapton® Type F film

Vacuum Range	1x10 ⁻¹¹ Torr
---------------------	--------------------------

Temperature Range	260°C maximum
	Gradient: 25°C per minute maximum

Weight	See table
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Dimensions	See drawing - All units metric
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Wire Strippers



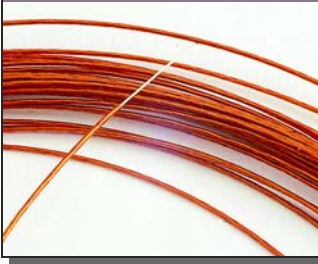
Wire strippers include precise wire diameter settings on an easy to read dial. Adjustable stops ensure repeatable stripping lengths.

Two sizes cover the full range of In-Vacuum Insulated Wire offered in this catalog.

DESCRIPTION	REFERENCE	PART NUMBER
.12 to .40mm WIRE STRIPPER	KAP-S1	680569
.25 to .80mm WIRE STRIPPER	KAP-S2	680570



Single Strand

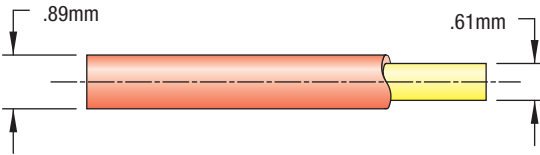
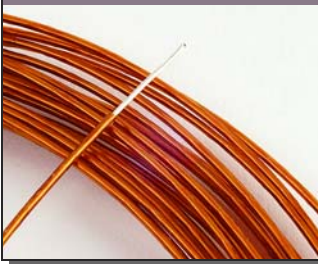


- Conductor Cross-Section .049 sq mm

REFERENCE	PART NUMBER
KAP1	680500

AWG	30
Resistance	375.8Ω/Km
Voltage	600V RMS 2kV DC
Current	1.5 Amps
Quantity per roll	30-ft (10m)

Single Strand

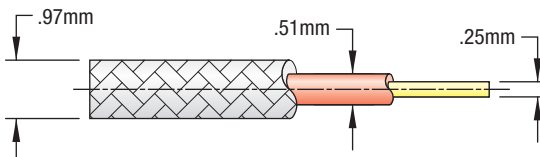
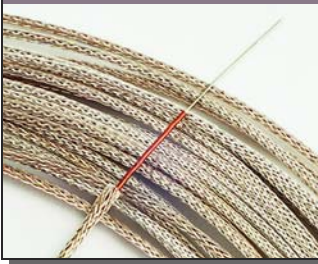


- Conductor Cross-Section .283 sq mm

REFERENCE	PART NUMBER
KAP2	680501

AWG	22
Resistance	64.0Ω/Km
Voltage	600V RMS 2kV DC
Current	5.5 Amps
Quantity per roll	30-ft (10m)

Coaxial, Single Strand

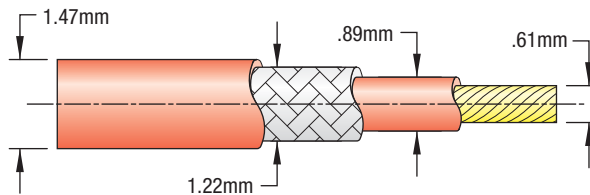


- Conductor Cross-Section .049 sq mm

REFERENCE	PART NUMBER
KAP3	680502

AWG	30
Resistance	375.8Ω/Km
Voltage	600V RMS 2kV DC
Current	1.5 Amps
Nom. Capacitance	180 pf/m
Quantity per roll	30-ft (10m)

Coaxial, Seven Strand

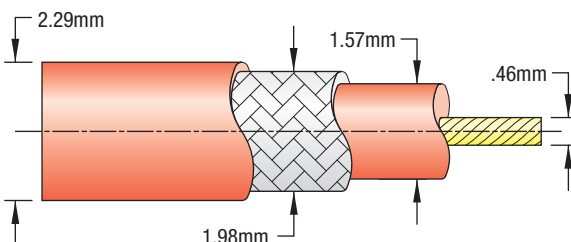
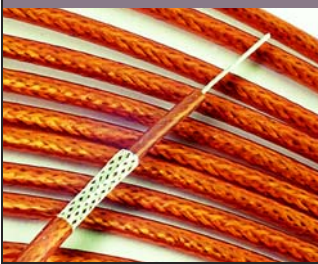


- Seven strands, each .20mm dia
- Conductor Cross-Section .220 sq mm

REFERENCE	PART NUMBER
KAP4	680503

AWG	24
Resistance	87.2Ω/Km
Voltage	600V RMS 2kV DC
Current	4.5 Amps
Nom. Capacitance	300 pf/m
Quantity per roll	30-ft (10m)

Coaxial, Seven Strand



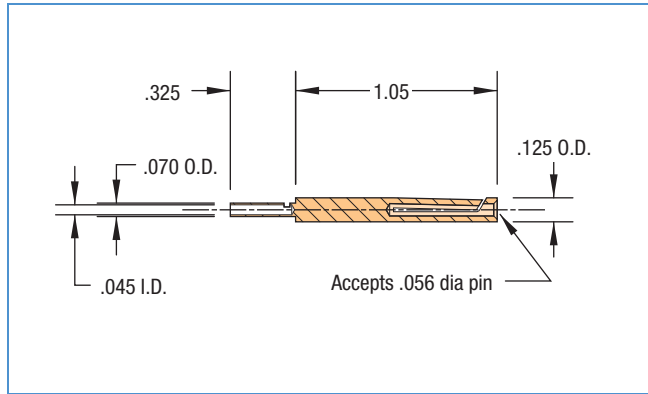
- Seven strands, each .15mm dia
- Conductor Cross-Section .120 sq mm

REFERENCE	PART NUMBER
KAP5	680505

AWG	26
Impedance	50Ω
Resistance	155.0Ω/Km
Voltage	600V RMS 2kV DC
Current	2.5 Amps
Nom. Capacitance	95 pf/m
Quantity per roll	15-ft (5m)



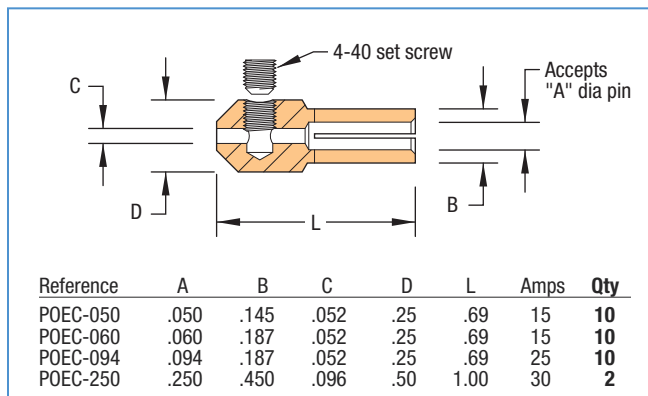
Crimp Type



REFERENCE	PART NUMBER
TC-CRIMP	991538

Crimp connectors accept a .056" diameter pin. They are constructed of Nickel-200 material and are capable of withstanding a maximum temperature of 200°C in vacuum and 150°C in air. They are offered in packages of 5.

Push On

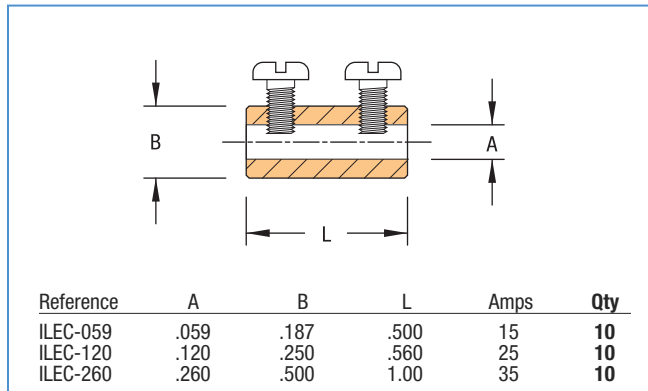


Reference	A	B	C	D	L	Amps	Qty
POEC-050	.050	.145	.052	.25	.69	15	10
POEC-060	.060	.187	.052	.25	.69	15	10
POEC-094	.094	.187	.052	.25	.69	25	10
POEC-250	.250	.450	.096	.50	1.00	30	2

REFERENCE	PART NUMBER
POEC-050	991539
POEC-060	680361
POEC-094	991539-01
POEC-250	680360

Push On connectors are constructed of Beryllium-Copper material and gold-plated. Capable of maximum temperatures of 200°C in vacuum and 150°C in air. Each connector includes one stainless steel set screw. One wrench included per kit.

Inline Electrical

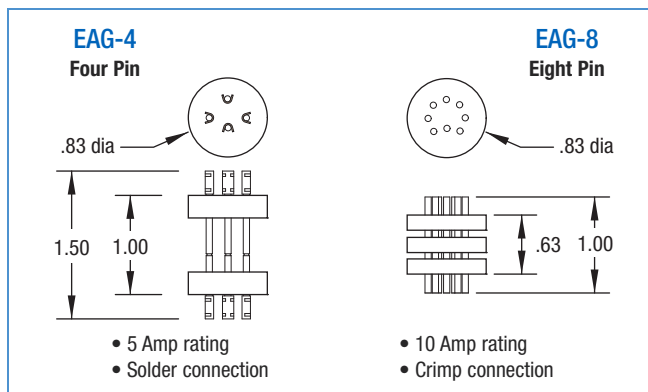


Reference	A	B	L	Amps	Qty
ILEC-059	.059	.187	.500	15	10
ILEC-120	.120	.250	.560	25	10
ILEC-260	.260	.500	1.00	35	10

REFERENCE	PART NUMBER
ILEC-059	680370
ILEC-120	680371
ILEC-260	991540

Constructed of Beryllium-Copper material and gold-plated. Capable of maximum temperatures of 400°C in vacuum and 150°C in air. Packages of 10 connectors include two 6-32 stainless steel screws for each connector.

Multipin

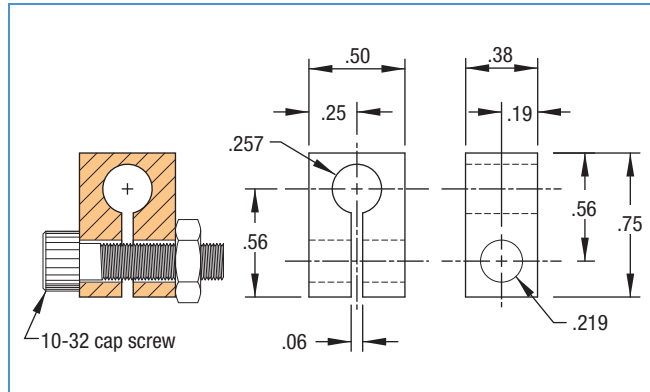


REFERENCE	PART NUMBER
EAG-4	680350
EAG-8	680351

EAG connectors are for in-vacuum use with instrumentation feedthroughs. Includes Pyrex® 7740 body with gold-plated pins. All materials are UHV compatible for use at 10⁻¹¹ Torr and bakeable to 250°C. Quantity of 1.



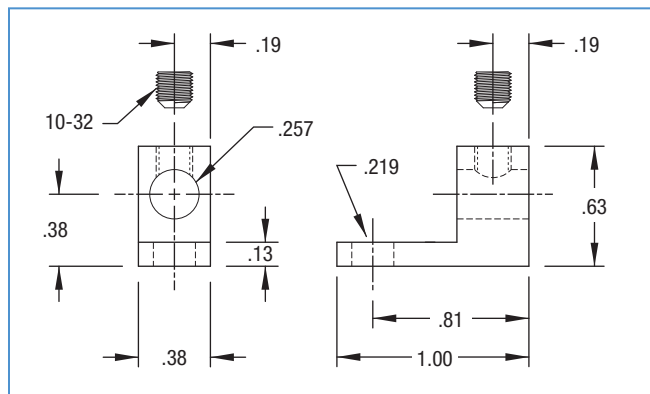
Inline Clamp



REFERENCE	PART NUMBER
ILPC	991536

Inline Power Clamps are made of OFE Copper material. Each clamp includes one 10-32 x 7/8" long stainless steel HD cap screw and nut. Sold individually.

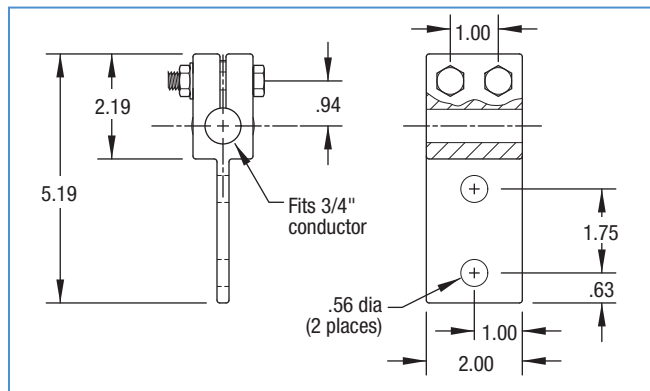
Angle Clamp



REFERENCE	PART NUMBER
RAPC	991537

Right Angle Power Clamps are made of OFE Copper material. Each clamp includes one 10-32 stainless steel socket head screw. Sold individually.

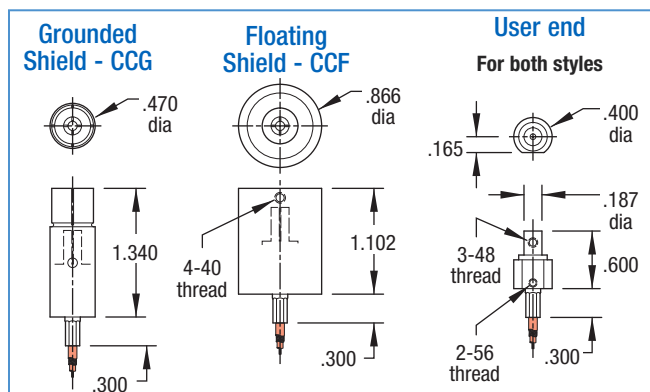
Connector



REFERENCE	PART NUMBER
HCC-750	640070

Connectors for high current power feedthroughs are made of silver plated OFE copper material. Each clamp includes two .375-16 stainless steel hex head bolts and nuts. Fits 3/4" conductor rod. See page 335 for additional information. Sold individually.

BNC Coaxial Cable

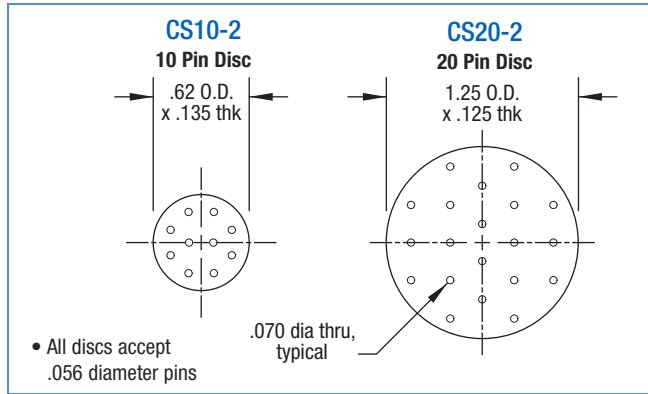


REFERENCE	PART NUMBER
CCG-094-19	640080
CCG-094-39	640081
CCF-094-19	640082
CCF-094-39	640083

BeCu contacts inside 304ss shell. Accepts .094 pins. Prewired with KAP5 coaxial wire. User end can be grounded using 2-56 thread; contact accepts up to 50 mil wire. Reference choice of 19" or 39" nominal length.



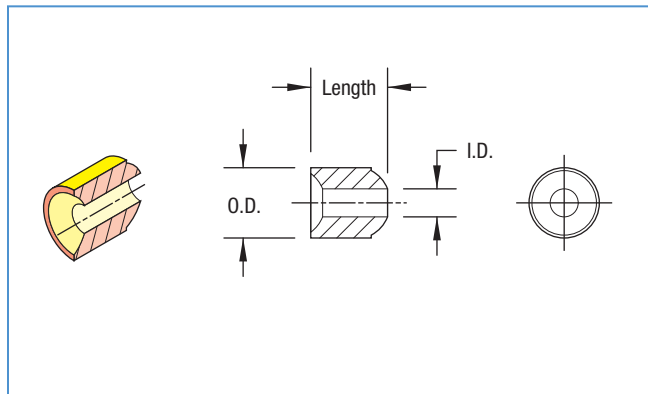
Ceramic Spacers



REFERENCE	PART NUMBER
CS10-2	680620
CS20-2	680621

MDC Ceramic Spacers are fabricated using high purity alumina, 95% Al₂O₃. They are used for spacing bare wires in air or vacuum systems from 10- or 20-pin instrumentation feedthroughs. The spacers can be baked to 450°C. Price is per individual spacer.

Ceramic Beads

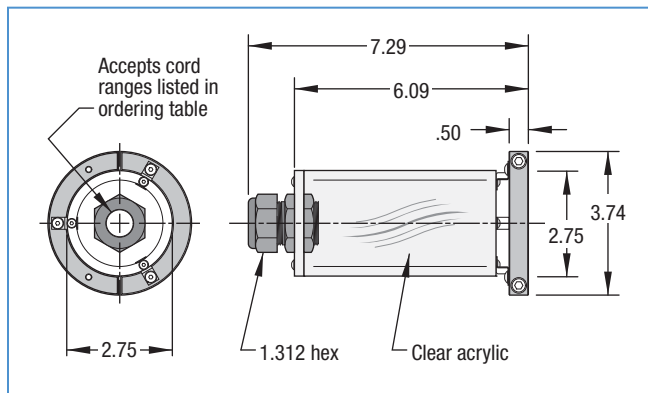


MDC Ceramic Beads are fabricated using high purity alumina, 95% Al₂O₃. They are ideal for insulating bare wires in air or vacuum systems. The short cylindrical tubes, with one end concave and the other convex, are stacked to provide continuous insulation. The beads can be baked to 450°C. Price is per linear foot of beads.

DESCRIPTION	ACCEPTS WIRE DIA.	BEADS PER FOOT	BEAD LENGTH	BEAD O.D.	BEAD I.D.	WT LB
1-FOOT LENGTH	.045	125	.110	.100	.053	1
1-FOOT LENGTH	.050	85	.170	.156	.068	1
1-FOOT LENGTH	.064	73	.185	.183	.087	1
1-FOOT LENGTH	.102	56	.260	.239	.107	1
1-FOOT LENGTH	.128	53	.260	.240	.144	1
1-FOOT LENGTH	.128	38	.400	.366	.146	1

REFERENCE	PART NUMBER
CB-1	680600
CB-2	680601
CB-3	680602
CB-4	680603
CB-5	680604
CB-6	680605

High Voltage Shields



HVE Series Electrical Shields comply with most electrical safety codes. The shields fit over the outside diameter of 2-3/4" Del-Seal™ CF style flanges and are secured by tightening two bolts in the shield's split clamp-ring. A small air gap is provided between the acrylic shield and split clamp-ring to dissipate heat. Shields can be installed on existing equipment without breaking vacuum. Sold individually.

FLANGE SIZE	FLANGE O.D.	CORD RANGE	WT LB
2-3/4	2.73	0.15 - 0.32	2
2-3/4	2.73	0.23 - 0.47	2
2-3/4	2.73	0.35 - 0.63	2
2-3/4	2.73	0.51 - 0.71	2

REFERENCE	PART NUMBER
HVE-1	640050
HVE-2	640051
HVE-3	640052
HVE-4	640053



Fluid feedthroughs for water and liquid nitrogen service

Features

- UHV compatible
- Del-Seal™ CF mounts
- Kwik-Flange™ ISO KF mounts
- 1" Baseplate bolt mount
- Water service
- Liquid nitrogen service
- Swagelok® and VCR® fittings

MDC fluid feedthroughs are designed for the transmission of gasses or coolants into high and ultrahigh vacuum environments. They are constructed from 300 series stainless steel and available with single or dual tube configurations. All feedthrough versions are fitted with 1/4 inch tubes and terminated with industry standard tube fittings including Swagelok® and VCR® brand tube fittings.

VCR® Tube fittings are designed for rapid make-up in tube, pipe and welded systems. They are zero clearance fittings, ideal for installation in limited space. Sealing is accomplished with the compression of a removable copper metal gasket. This type of fitting is ideally suited for gas admission into UHV systems.

Swagelok® compression fittings are an economical alternative to the VCR® fitting. They do not require gaskets and seal by swaging the stainless steel tube to which they are mated.

The MDC fluid feedthrough product line is divided into two main categories, general service and cryogenic service. General service fluid feedthroughs are .035 inch single wall tube construction and designed for the transmission of water as a cooling medium. Watercooled fluid feedthroughs are an economical and reliable method of introducing water into a vacuum system. They are available with either style of tube fitting as described above. Cryogenic service fluid feedthroughs are designed for transmission of liquid nitrogen as the cooling medium. Because of the extreme thermal gradients encountered with liquid nitrogen, these feedthroughs are constructed with dual and coaxial tube geometries. The coaxial cavity between these tubes is on the vacuum side of the feedthrough assembly

and provides a thermal barrier that reduces condensation and ice buildup on the atmosphere side of the assembly. Ice buildup at the mounting flange interface would be detrimental to flange mount seal integrity especially in the case of elastomer seal types.

Three vacuum mount styles are available for all versions of fluid feedthroughs including Del-Seal™ CF metal seal flanges, Kwik-Flange™ ISO KF elastomer gasket seal flanges and 1" bolt baseplate mounts with elastomer gasket seals.

Del-Seal™ CF metal seal flanges employ a Conflat® compatible knife-edge sealing mechanism that produces a cold-flow deformation of a metal copper gasket. They are ideally suited for use in ultrahigh vacuum environments to 1×10^{-13} Torr and 450°C bakeout.

Kwik-Flange™ ISO KF flanges are ideal for vacuum environments requiring frequent assembly and disassembly. Fastening and sealing is achieved by a hinged radial clamp, which provides compression of an elastomer gasket. Kwik-Flange™ mounts comply with all ISO specifications for vacuum mount hardware. This style of mount is suitable for high vacuum service to 1×10^{-8} Torr and 150°C bakeout.

The baseplate bolt mount is a self contained vacuum mount that includes everything necessary for installation and sealing. The only requirement is that the chamber or baseplate wall must have a 1 inch clearance bore with a flat and smooth 1-3/4 inch diameter spot face for elastomer sealing. For a more detailed discussion of these specific vacuum mounts consult page 161 in the Flanges & Fittings section.



Swagelok® compression tube fittings page 358

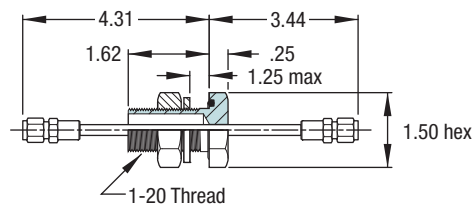
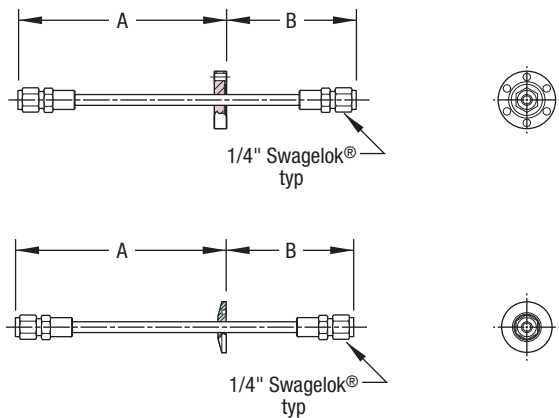


VCR® metal gasket tube fittings page 360

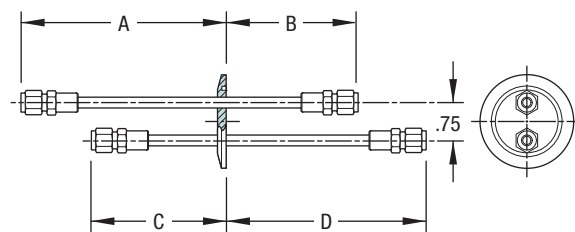
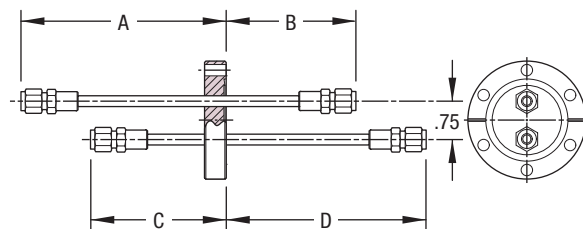


ULTRAHIGH & HIGH VACUUM SERIES

Single tube



Dual tube



- Length dimensions taken from sealing surface of flange
- All tubes .250 O.D. x .035 wall

Features

- Use with non-cryogenic fluids and gases
- Three mounting styles
- Custom configurations available
- Units with VCR® fittings on page 360
- Stainless steel construction

Specifications

Application	Used for water or other non-cryogenic liquids.
Configuration	1/4" Swagelok® connectors, unshrouded
Material	
Flanges and tubes	304ss
Connectors	316ss
Vacuum Range	UHV: 1×10^{-13} Torr HV: 1×10^{-8} Torr
Temperature Range	UHV: 450°C maximum HV: 200°C maximum, intermittent, 150°C maximum, sustained
Weight and Dimensions	See table



Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	NO. OF TUBES	A	B	C	D	WT LB	REFERENCE	PART NUMBER
1-1/3	1.062	1	4.75	3.00	-	-	3/4	LF-133	610000
2-3/4	2.312	1	4.75	3.00	-	-	3/4	LF-275	610001
2-3/4	2.312	2	4.75	3.00	3.12	4.63	1	LF-275-2	610002

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	NO. OF TUBES	A	B	C	D	WT LB	REFERENCE	PART NUMBER
K075	NW16	1	4.75	3.00	-	-	3/4	K075-LF	610020
K100	NW25	1	4.75	3.00	-	-	3/4	K100-LF	610021
K150	NW40	1	4.75	3.00	-	-	1	K150-LF	610022
K150	NW40	2	4.75	3.00	3.12	4.63	1	K150-LF-2	610024
K200	NW50	1	4.75	3.00	-	-	1	K200-LF	610023
K200	NW50	2	4.75	3.00	3.12	4.63	1	K200-LF-2	610025

Baseplate



BASEPLATE SIZE	NO. OF TUBES	WT LB	REFERENCE	PART NUMBER
1-INCH I.D.	1	SEE DRAWING FOR DIMENSIONS	LF-BP	610041



Features

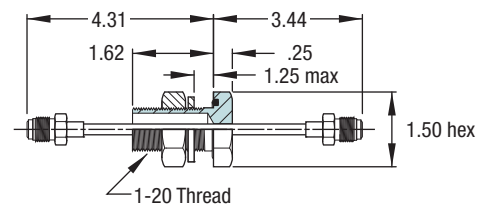
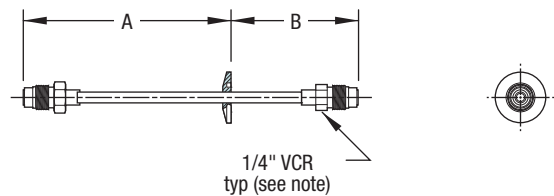
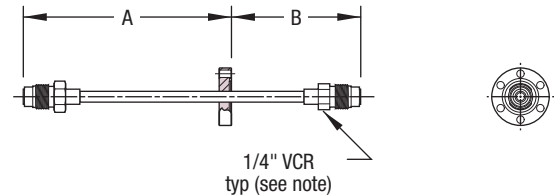
- Use with non-cryogenic fluids and gases
- Three mounting styles
- Custom configurations available
- Units with Swagelok® fittings on page 358
- Stainless steel construction

Specifications

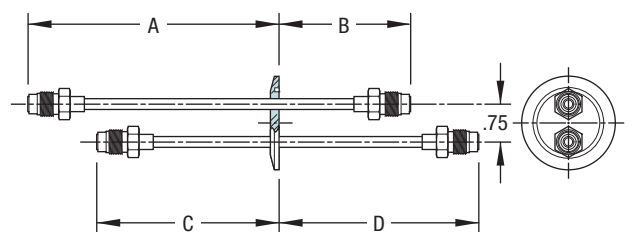
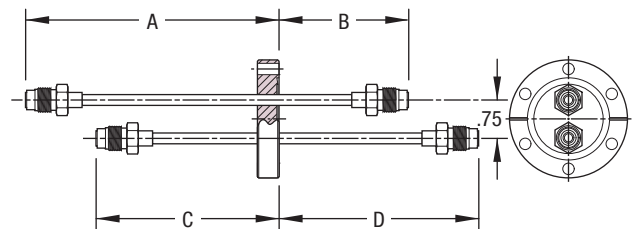
Application	Used for water or other non-cryogenic liquids.
Configuration	1/4" VCR® connectors, unshrouded
Material	
Flanges and tubes	304ss
Connectors	316ss
Vacuum Range	UHV: 1×10^{-13} Torr HV: 1×10^{-8} Torr
Temperature Range	UHV: 450°C maximum HV: 200°C maximum, intermittent, 150°C maximum, sustained
Weight and Dimensions	See table

ULTRAHIGH & HIGH VACUUM SERIES

Single tube



Dual tube



- Length dimensions taken from sealing surface of flange
- All tubes .250 O.D. x .035 wall
- Smallest sizes: 5/8" hex nuts modified to 1/2" flats, vacuum side only



Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	NO. OF TUBES	A	B	C	D	WT LB	REFERENCE	PART NUMBER
1-1/3	1.062	1	4.75	3.00	-	-	3/4	LF-133VCR	610003
2-3/4	2.312	1	4.75	3.00	-	-	3/4	LF-275VCR	610004
2-3/4	2.312	2	4.75	3.00	3.12	4.63	1	LF-275-2VCR	610005

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	NO. OF TUBES	A	B	C	D	WT LB	REFERENCE	PART NUMBER
K075	NW16	1	4.75	3.00	-	-	3/4	K075-LFVCR	610026
K100	NW25	1	4.75	3.00	-	-	3/4	K100-LFVCR	610027
K150	NW40	1	4.75	3.00	-	-	1	K150-LFVCR	610028
K150	NW40	2	4.75	3.00	3.12	4.63	1	K150-LF-2VCR	610029
K200	NW50	1	4.75	3.00	-	-	1	K200-LFVCR	610030
K200	NW50	2	4.75	3.00	3.12	4.63	1	K200-LF-2VCR	610031

Baseplate

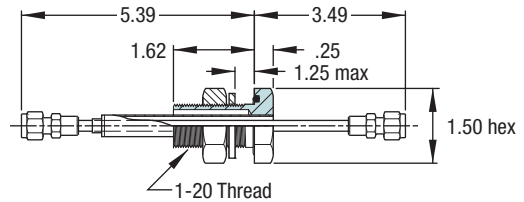
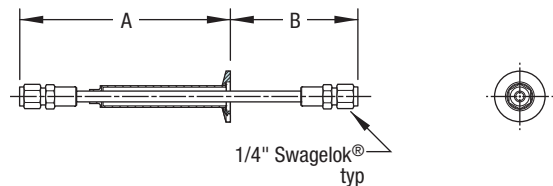
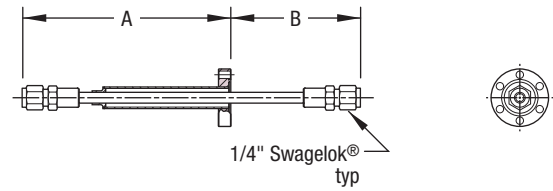


BASEPLATE SIZE	NO. OF TUBES	REFERENCE	PART NUMBER
1-INCH I.D.	1	SEE DRAWING FOR DIMENSIONS	610042

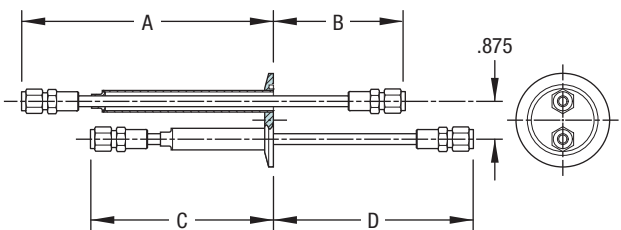
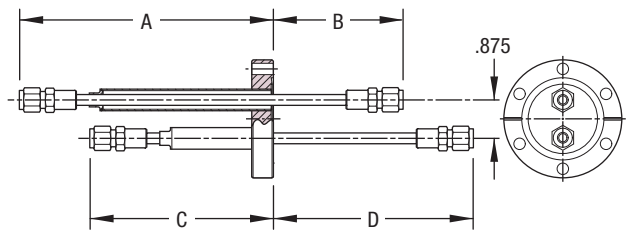


ULTRAHIGH & HIGH VACUUM SERIES

Single tube

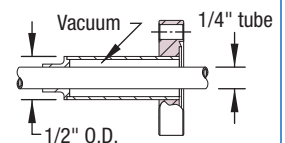


Dual tube



Shroud detail

- Length dimensions taken from sealing surface of flange
- All tubes .250 O.D. x .035 wall



Features

- Use with cryogenic fluids
- Three mounting styles
- Custom configurations available
- Units with VCR® fittings on page 364
- Stainless steel construction

Specifications

Application	Liquid nitrogen or other cryogenic liquids
Configuration	1/4" Swagelok® connectors, shrouded
Material	
Flanges and tubes	304ss
Connectors	316ss
Vacuum Range	UHV: 1×10^{-13} Torr HV: 1×10^{-8} Torr
Temperature Range	UHV: -200°C to 450°C maximum HV: -20°C to 200°C maximum, intermittent ¹ 150°C maximum, sustained
Weight and Dimensions	See table

¹ With FKM / FPM fluoroelastomer seal; refer to Section 1.2 for temperature specifications for other elastomers.



Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	NO. OF TUBES	A	B	C	D	WT LB	REFERENCE	PART NUMBER
1-1/3	1.062	1	5.88	3.00	-	-	3/4	LN-133	611000
2-3/4	2.312	1	5.88	3.00	-	-	3/4	LN-275	611001
2-3/4	2.312	2	5.88	3.00	4.25	4.63	1	LN-275-2	611002

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	NO. OF TUBES	A	B	C	D	WT LB	REFERENCE	PART NUMBER
K075	NW16	1	5.93	2.95	-	-	3/4	K075-LN	611020
K100	NW25	1	5.83	3.05	-	-	3/4	K100-LN	611021
K150	NW40	1	5.83	3.05	-	-	1	K150-LN	611022
K150	NW40	2	5.83	3.05	4.20	4.68	1	K150-LN-2	611024
K200	NW50	1	5.83	3.05	-	-	1	K200-LN	611023
K200	NW50	2	5.83	3.05	4.20	4.68	1	K200-LN-2	611025

Baseplate

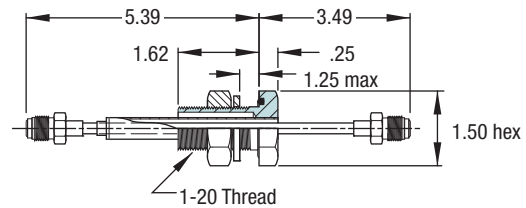
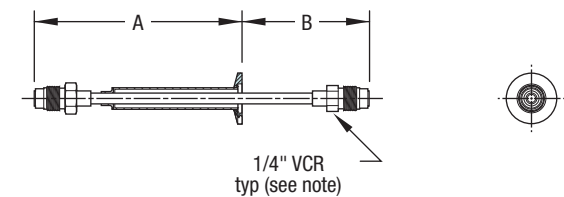
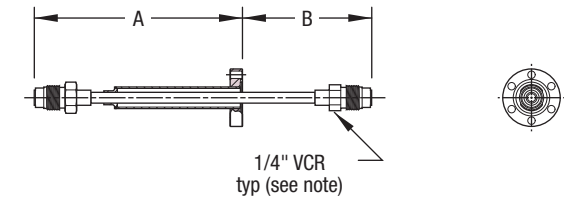


BASEPLATE SIZE	NO. OF TUBES	REFERENCE	PART NUMBER
1-INCH I.D.	1	SEE DRAWING FOR DIMENSIONS	611041

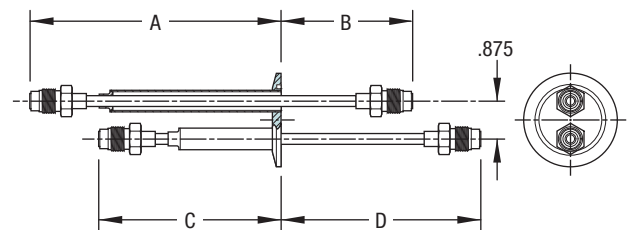
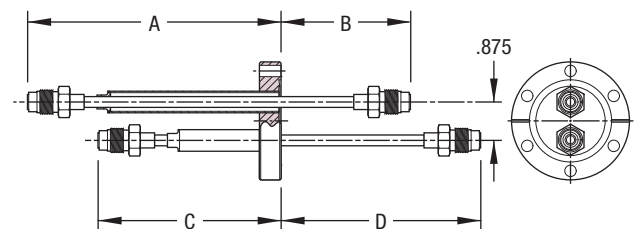


ULTRAHIGH & HIGH VACUUM SERIES

Single tube

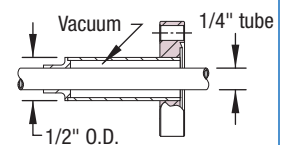


Dual tube



Shroud detail

- Length dimensions taken from sealing surface of flange
- All tubes .250 O.D. x .035 wall
- Smallest sizes: 5/8" hex nuts modified to 1/2" flats, vacuum side only



Features

- Use with cryogenic fluids
- Three mounting styles
- Custom configurations available
- Units with Swagelok® fittings on page 362
- Stainless steel construction

Specifications

Application	Liquid nitrogen or other cryogenic liquids
Configuration	1/4" VCR® connectors, unshrouded
Material	
Flanges and tubes	304ss
Connectors	316ss
Vacuum Range	UHV: 1×10^{-13} Torr HV: 1×10^{-8} Torr
Temperature Range	UHV: -200°C to 450°C maximum HV: -20°C to 200°C maximum, intermittent ¹ 150°C maximum, sustained
Weight and Dimensions	See table

¹ With FKM / FPM fluoroelastomer seal; refer to Section 1.2 for temperature specifications for other elastomers.



Del-Seal™ CF



FLANGE SIZE	BOLT CIRCLE	NO. OF TUBES	A	B	C	D	WT LB	REFERENCE	PART NUMBER
1-1/3	1.062	1	5.88	3.00	-	-	3/4	LN-133VCR	611003
2-3/4	2.312	1	5.88	3.00	-	-	3/4	LN-275VCR	611004
2-3/4	2.312	2	5.88	3.00	4.25	4.63	1	LN-275-2VCR	611005

Kwik-Flange™ KF



FLANGE SIZE	ISO REF.	NO. OF TUBES	A	B	C	D	WT LB	REFERENCE	PART NUMBER
K075	NW16	1	5.93	2.95	-	-	3/4	K075-LNVCR	611026
K100	NW25	1	5.83	3.05	-	-	3/4	K100-LNVCR	611027
K150	NW40	1	5.83	3.05	-	-	1	K150-LNVCR	611028
K150	NW40	2	5.83	3.05	4.20	4.68	1	K150-LN-2VCR	611029
K200	NW50	1	5.83	3.05	-	-	1	K200-LNVCR	611030
K200	NW50	2	5.83	3.05	4.20	4.68	1	K200-LN-2VCR	611031

Baseplate



BASEPLATE SIZE	NO. OF TUBES	REFERENCE	PART NUMBER
1-INCH I.D.	1	SEE DRAWING FOR DIMENSIONS	611042

