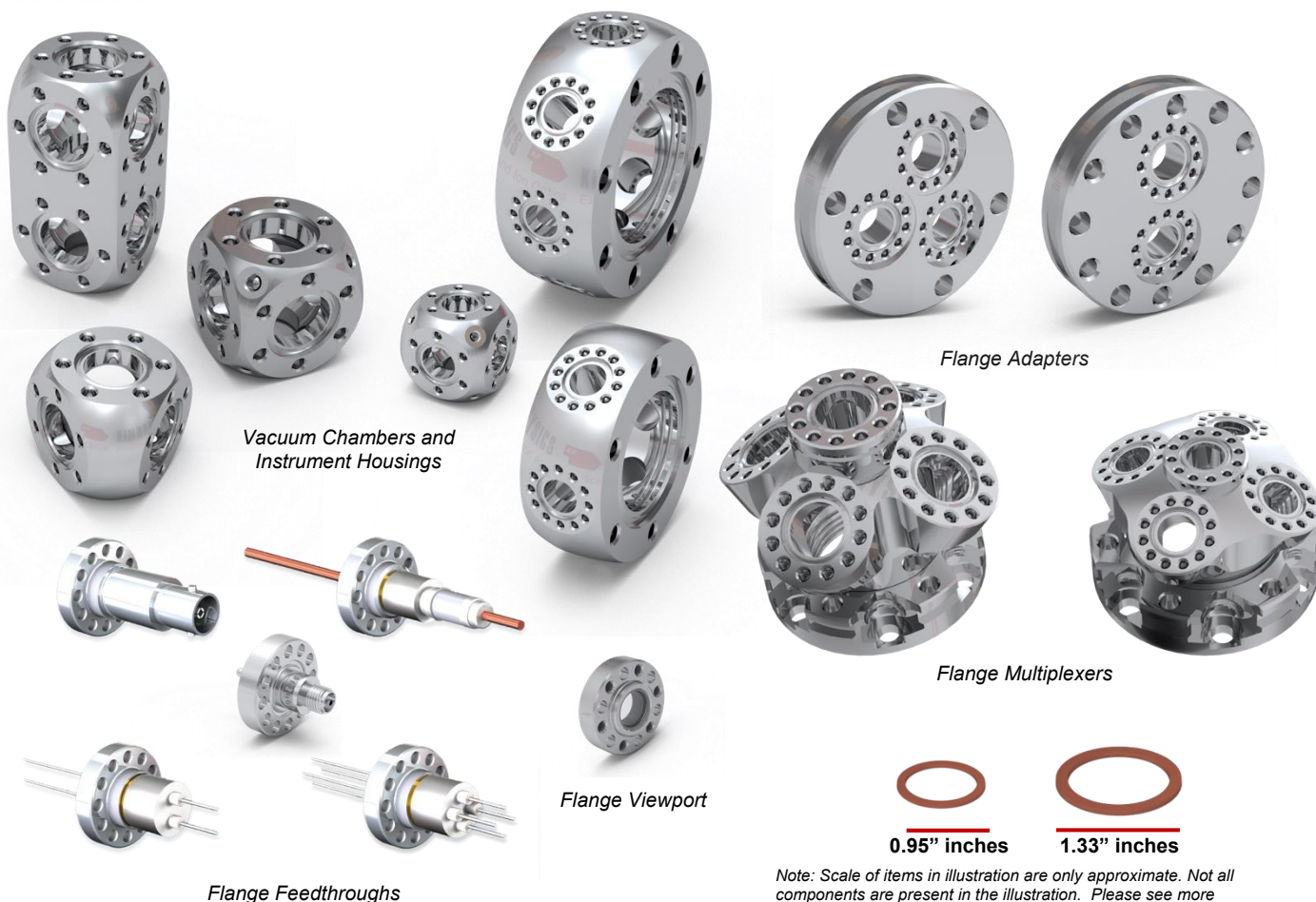


**Overview of Multi-CF™ UHV Vacuum Chambers and Components for Systems
with Miniature (1.33"CF) and Sub-Miniature (0.95"CF) CF Ports**



Note: Scale of items in illustration are only approximate. Not all components are present in the illustration. Please see more components and details in the body of the document.

CHAMBERS and COMPONENTS:

- Miniature and Sub-Miniature UHV vacuum chambers and instrument housings
- 2.75" CF Base Multiplexers with Multiple 1.33" CF or 0.95" CF Secondary Ports
- 0.95" CF Flange Feedthroughs for High Voltage, High Current
- 2.75" Flange Adapters with two or three 0.95" ports
- 0.95" CF Flange Viewports for Visualization and Laser Transmission

APPLICATIONS:

- Cold Physics Experiments
- Compact and Portable Low-Cost UHV Systems
- High-Complexity UHV Subsystems
- UHV Vacuum Manipulator Systems
- UHV Specimen Transfer Systems

Kimball Physics Miniature (Mini) and Sub-Miniature (Sub-Mini) Multi-CF™ Conflat (CF) sealing surface UHV Vacuum System Components bring unique advantages to your research and development projects or commercial products. Chambers with minimized external size and weight provide unique

opportunities for integration into your equipment and systems.

These components include small vacuum chambers and instrument housings, with optimized usable internal volume, which reduces vacuum volume pumping load and conserves

the external volume footprint and weight, especially when these constraints can add significant costs (such as launching your device into space).

We also have a large selection of flange multiplexers, flange adapters, flange feedthroughs, and other mini and sub-mini flange components to make it easy to build your system.

For most research scientists and engineers, the challenge is finding (or creating with significant

costs) the vacuum infrastructure components to create your mini (1.33" CF ports) or sub-mini (0.95" CF ports) UHV system.

Please reach out to Kimball Physics to engage our specialists if you need a custom system for your specific application.

In the sections below, we will cover the details of each of these component categories, including the *most recent* parts that have been introduced to our mini and sub-mini systems.

Kimball Physics provides the components for Miniature and Sub-Miniature Systems, including:

- 1) Multi-CF™ sealing surface UHV Vacuum Chambers and Housings with 1.33" and 0.95" CF sealing surface ports included (with some exceptions).
- 2) Multi-CF™ Multiplexers, with 2.75" CF base and either five (5) 1.33" CF ports or five (5) 0.95" CF ports. Other configurations are also available.
- 3) 0.95" Conflat Flange (CF) Feedthroughs to provide high voltage, high current electrical connections for powering, controlling, or acquiring the data from your system or device
- 4) CF Flanges, including flange blanks, flange adapters, and extended flanges
- 5) 0.95" CF Viewports with UV Grade Sapphire
- 6) Internal Mounting System (internal grooves, mounting clamps, and eV Parts) for internally mounting components and creating prototypes to be placed inside the vacuum space (when a 2.75" CF port or larger is incorporated into the system)
- 7) External mounting options

Multi-CF™ Port CF Sealing Surface UHV Mini and Sub-Mini Vacuum Chambers

Kimball Physics UHV (Ultra-high Vacuum) Vacuum Chambers are precise, modular, multi-port fittings and housings that utilize integrated ConFlat® (CF) sealing surfaces at each port. We refer to them as MCF™ or Multi-CF™ vacuum chambers (also referred to as fittings or housings) and they are available in several sizes and configurations. These compact designs are generally compatible with most other vacuum fittings in the industry with the bottom line of facilitating the efficient creation of clean reliable vacuum environments.

Several miniature "Mini" MCF™ Multi-CF sealing surface UHV Vacuum Chamber configurations have been available from Kimball Physics for

nearly two decades in miniature sizes that include main or primary 1.33" CF ports, such as our 1.33" Spherical Cubes and Triangles. Most of our other larger vacuum chambers include 1.33" CF secondary ports in their design.



Examples of 1.33" CF Spherical Cube and Triangle miniature vacuum chambers.

In addition, we have several MCF™ chambers that are based on 2.75" CF main sealing surfaces, in the form of spherical triangles, cubes, hexagons, and octagon geometries that we also consider as miniature chambers, with many of them also including 1.33" CF secondary ports. The 2.75" CF port enables them to be compatible with our flange multiplexers, which cost-efficiently increase the number of ports available.

The 2.75" CF ports also include annular channels, or Grabber Grooves, that provide the convenient capability for internal mounting of your devices and that are compatible with Kimball Physics Groove Grabber Clamps and our eV Part set for prototyping your concepts or connecting and mounting your devices within the chamber or housing.



Examples of various 2.75" CF Spherical Cubes, Spherical Hexagons, and Spherical Triangle UHV miniature vacuum chambers

We continue to evolve our MCF™ designs and have recently introduced chambers with main or primary 0.95" CF ports as well as chambers with 3.38" CF and 2.75" CF main port designs with multiple 0.95" CF secondary ports. MCF™ chambers are available in our versatile and popular design configurations (Spherical Cubes, Spherical Hexagons, and Spherical Octagons) and we provide more detail in the section below.



Examples of 0.95" CF Spherical Cube, 2.75" CF Spherical Hexagon and 3.38" CF Spherical Octagon UHV sub-miniature vacuum chambers with 0.95" CF ports.

Kimball Physics' Multi-CF™ UHV fittings are designed as both instrument housings and as vacuum chambers, with the specific design intent to:

- 1) Conveniently support a diversity of internal apparatus
- 2) Permit complex port arrangements
- 3) Maximize interior functional volume while remaining compact to minimize their external footprint
- 4) Provide convenient internal access
- 5) Improve pumping efficiency
- 6) Follow a modular dimensioning system
- 7) Cluster together in proximity

The Multi-CF™ chambers are typically precision CNC fabricated from a monolithic (single piece) of 316L stainless steel with the CF sealing surfaces directly machined into this global structure. Custom chambers of similar configurations can also be fabricated from various grades of titanium. This design approach optimizes 1) weight to structure (with high stiffness and resonant frequency), 2) the functional internal volume with minimized internal surface area and outgassing in high vacuum experiments, and 3) reduced external dimension for a given functional internal volume.

Titanium chambers, although more expensive, add significant additional benefits including very low magnetic permeability and minimized outgassing of hydrogen when pumping to

extreme vacuum (XHV) levels. With titanium about half the density of stainless steel and similar in structural properties, these systems are also significantly reduced in weight.

This efficient use of volume to surface area (a spherical form) minimizes *unusable* internal space and allows more efficient pumping, while also minimizing the components external dimension footprint.

As previously noted, the ConFlat® flange (CF) sealing surfaces are machined directly into the single global structure. This sealing surface, which utilizes a knife-edge geometry, is used with an interposed malleable copper gasket and provides both a seal and a stable structural connection between the flanges of various components. Predictable seals for ultra-high vacuums (UHV) and even extremely high vacuums (XHV) that accompany very low

pressure ($< 10^{-11}$ torr) applications can be reliably obtained over a broad range of temperatures.

Other features of our vacuum chambers that optimize UHV and XHV applications include highly polished mirror-like surfaces, with smooth rounded contour surfaces to minimize internal surface area and with few or no welds within the vacuum space (any welds, if present, are welded from the inner surface).

In the tables below, explore further information about the mini and sub-mini vacuum chambers that are available.

Please reach out to Kimball Physics to engage our specialists if you need a custom system for your specific application.

Category	Product Description	Model	Other Features	Port Code, Dimension (inches) and Number of Ports					
				X 0.95"	A 1.33"	C 2.75"	D 3.38"	E 4.5"	F 6.0"
MCF™ Chambers									
NEW	0.95" Spherical Cube	MCF095-SphCube-X6		6					
	1.33" Spherical Cube	MCF133--SphCube-A6			6				
	1.33" Spherical Cube Double	MCF133-DbISphCube-A10	Double		10				
	1.33" Spherical Triangle	MCF133-SphTri-A5			5				
NEW	2.75" Spherical Hexagon	MCF275-SphHex-C2X6		6		2			
	2.75" Spherical Cube	MCF275-SphCube-C6				6			
	2.75" Spherical Cube Alt Config 1	MCF275-SphCube-C5A4	Alt Config 1		4	5			
	2.75" Spherical Cube Alt Config 2	MCF275-SphCube-C4A8	Alt Config 2		8	4			
	2.75" Spherical Cube Expanded	MCF275-ExpCube-C6A8	Expanded		8	6			
	2.75" Spherical Cube Double	MCF275-DbISphCube-C10	Double			10			
	2.75" Spherical Octagon	MCF275-SphOct-C2A8	Ext Mounting Channel		8	2			
NEW	3.38" Spherical Octagon	MCF338-SphOct-D2X8		8			2		
	2.75" Spherical Triangle	MCF275-SphTri-C5				5			

Mini and Sub-Mini MCF™ Vacuum Chambers

		
0.95" CF Spherical Cube MCF095-SphCube-X6	1.33" CF Spherical Cube MCF133-SphCube-A6	1.33" CF Double Spherical Cube MCF133-DbISphCube-A10
		
1.33" CF Spherical Triangle MCF133-SphTri-A5	2.75" CF Spherical Hexagon MCF275-SphHex-C2X6	2.75" CF Spherical Cube MCF275-SphCube-C6
		
2.75" CF Spherical Cube MCF275-SphCube-C5A4	2.75" CF Spherical Cube MCF275-SphCube-C4A8	2.75" CF Expanded Spherical Cube MCF275-ExpCube-C6A8
		
2.75" CF Double Spherical Cube MCF275-DbISphCube-C10	2.75" CF Spherical Octagon MCF275-SphOct-C2A8	3.38" CF Spherical Octagon MCF338-SphOct-D2X8
		
2.75" CF Spherical Triangle MCF275-SphOct-C5		

Mini and Sub-Miniature MCF™ Vacuum Chamber Table Notes:

-Images are *not* to scale.

- Product Code (MCFXXX- YYY-ZZZ): 1) XXX = Largest Main or Primary port dimensions (095 = 0.95", 133=1.33", 275= 2.75", 338 = 3.38"), 2) YYY= Overall Geometry (e.g. SphCube= Spherical Cube, SphOct = Spherical Octagon), 3) ZZZ = Port Sizes and Number (X=0.95" , A =1.33", C=2.75", D=3.38"), 4) Example- MCF275-SphHex-C2X6 is a Spherical Hexagon with two (2) 2.75" main CF ports and six (6) 0.95" CF secondary ports.

MCF™ Flange Multiplexers

The basic goal of the multiplexer is to cost-effectively increase the number of ports available to interface the vacuum system.



Examples of Flange Multiplexers available from Kimball Physics.

Kimball Physics **multiplexers** have evolved since their original introduction (not patented) in 1983, to now include:

- 1) rigid unitary stainless steel 316L precision CNC construction with reduction in the number of welds from eight to only one (the rotatable flange)
- 2) the ability to use arbitrary bolt lengths (two sets of bolt holes, either threaded or clear provide user flexibility in the mode of attachment)
- 3) inclusion of internal mounting annular grooves (Grabber Grooves) on the 2.75" CF port for internal mounting capability
- 4) better ultra-high vacuum (UHV) cleanliness

The bolt ring is confined such that it cannot slide axially back from the sealing surface. Thus, the 2.75" CF sealing surface is not exposed to potential damage (as is the normal with ordinary rotatable flanges). These design features are included in all our multiplexer designs.

Useable interior space has been greatly increased over previous designs. Each 2.75" CF sealing surface has one pair of Grabber Grooves for internal mounting capability.

Our most recent design, the **MCF275-FlgMplxr-Cr1X5**, includes a rotatable 2.75" CF (C) base port, with five (5) secondary sub-mini 0.95" CF ports to enable an increase from one to five ports. The 0.95" CF (X) ports are compatible with Kimball Physics sub-miniature feedthroughs, flanges, and Viewports.

Multi-CF™ UHV Flange Multiplexer:
Single Rotatable Base 2.75" CF Port with
Multiple (5) 0.95" CF Ports



Flange Multiplexer MCF275-FlgMplxr-Cr1X5 with 2.75" (C) CF rotatable base and five (5) 0.95" (X) CF secondary ports.

Our other MCF™ multiplexers are based on a 2.75" (C) CF rotatable base that then may include various combinations of additional 2.75" CF ports and multiple 1.33" (A) CF secondary ports.

The 2.75" CF ports will also have internal mounting channels or grabber grooves that enable use of our extensive system for internal mounting of your apparatus, device or interfacing to our eV Part System that provides a diverse toolkit for concept prototyping and making custom mounting fixtures for your devices.

In the tables below, we provide more details about our various flange multiplexer components.

Category	Product Description	Model	Other Features	Port Code, Dimension (inches) and Number of Ports					
				X 0.95"	A 1.33"	C 2.75"	D 3.38"	E 4.5"	F 6.0"
MCF™ Flange Multiplexer									
NEW	2.75" Flange Multiplexer	MCF275-FlgMplx-Cr1X5	1 rotatable 2.75" port	5		1			
	2.75" Flange Multiplexer	MCF275-FlgMplx-Cr1A5	1 rotatable 2.75" port		5	1			
	2.75" Flange Multiplexer	MCF275-FlgMplx-C1r1A4	1 rotatable 2.75" port		4	2			
	2.75" Flange Multiplexer	MCF275-TestFlgMplx-C2A4			4	2			
	2.75" Flange Multiplexer	MCF275-FlgMplx-C1r2A4	2 rotatable 2.75" ports		4	3			

Multi-CF™ Flange Multiplexers		
		
2.75" CF Flange Multiplexer <i>MCF275-FlgMplx-Cr1X5</i>	2.75" CF Flange Multiplexer <i>MCF275-FlgMplx-Cr1A5</i>	2.75" CF Flange Multiplexer <i>MCF275-FlgMplx-C1r1A4</i>
		
2.75" CF Flange Multiplexer <i>MCF275-TestFlgMplx-C2A4</i>	2.75" CF Flange Multiplexer <i>MCF275-FlgMplx-C1r2A4</i>	
Notes: -Images are not to scale.		

Multi-CF™ Feedthrough Flanges: Sub-Mini 0.95" CF

Kimball Physics Multi-CF™ 0.95" Sub-mini UHV Flange Feedthroughs enable reliable high voltage and high current electrical connection to your apparatus inside the vacuum chamber or instrument housing.

The 0.95" CF flange is precision CNC fabricated from 316L stainless steel with options for various pin materials (Cu, Moly) and pin numbers (1, 2, 4), with a BNC and SMA connection also an option.

Pin diameter and spacing allow for high voltage and current capabilities (5kV and 55 Amps with the single copper pin and 2kV and 8.5 Amps with the two (2) and four (4) pin Moly connectors). The BNC connector option allows up to 500 V and 3 Amps.

All Feedthroughs are UHV compatible with Bakeout temperatures up to 450°C.

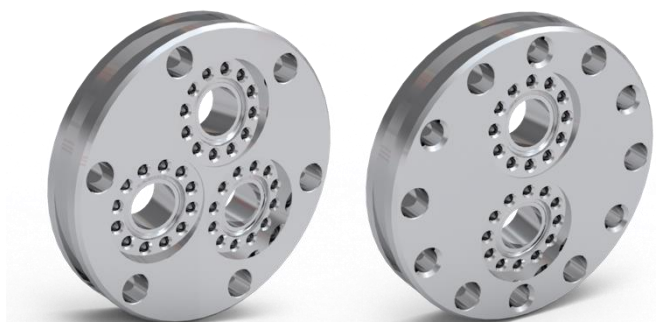
Multi-CF™ Feedthrough Flange	
	
0.95" CF Feedthrough Flange <i>MCF095-FeedThru-P1-5KV</i>	0.95" CF Feedthrough Flange <i>MCF095-FeedThru-P2-2KV</i>
	
0.95" CF Feedthrough Flange <i>MCF095-FeedThru-P4-2KV</i>	0.95" CF Feedthrough Flange <i>MCF095-FeedThru-BNC-.5KV</i>
	
0.95" CF Feedthrough Flange <i>MCF095-FeedThru-SMA-0.7KV</i>	
Notes: -Images are not to scale.	

	MCF095-FeedThru-P1-5KV	MCF095-FeedThru-P2-2KV	MCF095-FeedThru-P4-2KV	MCF095-FeedThru-BNC-.5KV	MCF095-FeedThru-SMA-.7KV
Multi-CF™ FITTING	0.95" CF Sub-Mini Feedthrough Flange				
COMMON APPLICATION	High Voltage and Current Feedthrough				
FLANGE CONSTRUCTION / MATERIAL	Stainless Steel 316L				
0.95" CF SEALING SURFACES	-Twelve* (12) 0.120" thru holes equally spaced. -Use #4-40 Socket Head Cap Screws -Flange Thickness 0.230"	-Twelve* (12) 0.120" thru holes equally spaced. -Use #4-40 Socket Head Cap Screws -Flange Thickness 0.230"	-Twelve* (12) 0.120" thru holes equally spaced. -Use #4-40 Socket Head Cap Screws -Flange Thickness 0.230"	-Twelve* (12) 0.120" thru holes equally spaced. -Use #4-40 Socket Head Cap Screws -Flange Thickness 0.230"	-Twelve* (12) 0.120" thru holes equally spaced. -Use #4-40 Socket Head Cap Screws -Flange Thickness 0.230"
ELECTRICAL SPECS	Max: 5kV, 55 Amps	Max: 2kV, 8.5 Amps	Max: 2kV, 8.5 Amps	Max: 500V, 3 Amps	Max 700V, 1 Amps
PIN CHARACTERISTICS	(1) Copper Pin (0.094" dia)	(2) Moly Pins (0.032" dia)	(4) Moly Pins (0.032" dia)	BNC Feedthrough (0.93" dia)	SMA Feedthrough (0.93" dia)
BAKEOUT	Max: 450° C	Max: 450° C	Max: 450° C	Max: 450° C	Max: 450° C
Notes: * Only six (6) of the twelve(12) holes required for CF seal. Other holes provided for redundancy.					

Multi-CF™ UHV Flange Adapters: 2.75" to 0.95" CF Ports

The **MCF275-FlgAdptr-C1X2** and **MCF275-FlgAdptr-C1X3** Flange Adapters enable a single 2.75" CF port to provide either two (2) or three (3) 0.95" CF sub-miniature ports. The flange adapters also provide an external outside diameter OD channel that can be used for external mounting.

The flange adapters are precision CNC fabricated from a single piece of stainless steel and are UHV compatible. The axis of the sub-mini ports is slightly angled radially outward to provide more clearance for any attachments, such as electrical connectors to our 0.95" CF sub-mini feedthroughs.



Flange Adapters MCF275-FlgAdptr-C1X3 and MCF275-FlgAdptr-C1X2 (left and right) with 2.75" CF base and with either three or two 0.95" CF sub-mini ports

	MCF275-FlgAdptr-C1X2	MCF275-FlgAdptr-C1X3
Multi-CF™ Fitting	Flange Adapter	
COMMON APPLICATION	Increase Number of Ports External Mounting	
CONSTRUCTION / MATERIAL	Unitary Stainless Steel 316L (Titanium available as option)	
0.95" CF SEALING SURFACES	Two (2) 0.95" CF Sealing Surfaces each with (12) #4-40 tapped bolt holes. No Grabber Grooves available.	Three (3) 0.95" CF Sealing Surfaces each with (12) #4-40 tapped bolt holes. No Grabber Grooves available.
2.75" CF SEALING SURFACES	-One (1) 2.75" sealing surface with six (6) tapped alternating with six (6) clear (1/4-28 bolt holes) -Flange thickness 0.50"	-One (1) 2.75" sealing surface with six (6) clear (1/4-28 bolt holes) -Flange thickness 0.50"
EXTERNAL MOUNTING	Yes, external mounting channel.	Yes, external mounting channel.
INTERNAL MOUNTING	No	No
WEIGHT	0.63 lbs	0.62 lbs

Multi-CF™ UHV Flange Adapters: 2.75" to 1.33" CF Ports

The **MCF275-FlgAdptr-C1A1** Flange Adapter enables a single 2.75" CF port to be converted to a 1.33" CF port. The flange adapter also provides an external channel that can be used for external mounting. The 2.75" CF flange includes alternating clear and tapped holes (1/4-28 bolts) with annular grabber grooves along the port bore to enable use of Kimball Physics internal mounting clamps and eV Parts.

The 1.33" CF port has twelve (12) tapped holes that accept #8-32 bolts with a depth of 0.24". No annular grabber grooves are present.

The flange adapters are precision CNC fabricated from a single piece of stainless steel and are UHV compatible.



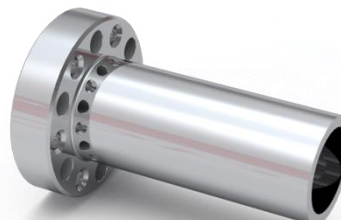
Flange Adapter MCF275-FlgAdptr-C1A1

	MCF275-FlgAdptr-C1A1
Multi-CF™ Fitting	Flange Adapter
COMMON APPLICATION	Conversion of Port Size
CONSTRUCTION / MATERIAL	Unitary Stainless Steel 316L
1.33" CF SEALING SURFACES	One (1) 1.33" CF Sealing Surfaces each with (12) #8-32 tapped bolt holes.
2.75" CF SEALING SURFACES	One (1) 2.75" sealing surface with six (6) tapped 1/4-28 bolt holes and six (6) clear holes (0.266") -Flange thickness 0.5" -Grabber Grooves available.
EXTERNAL MOUNTING	Yes, external mounting channel.
INTERNAL MOUNTING	Grabber Grooves available 2.75" port only.
WEIGHT	0.59 lbs (0.27kg)

Multi-CF™ UHV Sub-Mini Flanges: 0.95" CF Port Flange Extensions

Kimball Physics has several variations of Multi-CF™ 0.95" Sub-Mini Flanges, including various lengths, combinations of clear and tapped holes, and the option to weld cylindrical eV Parts components to the flanges with a weldlip option.

These flanges are precision fabricated from 316L stainless steel. Please refer to the table below for the various options available.



*Sub-Mini Flange Extension
MCF095-FlgExt-X1/ Xc1-L1500*

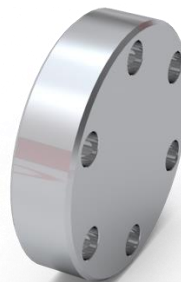
Sub-Mini Flange 0.95" CF Model	Part Examples	Notes
MCF095-FlgExt-X1/ Xc1-L1500		-Extended 0.950" CF Sub-Mini Flange -Length 1.50" -<i>Alternating Tapped and Clear holes</i>- Uses #4-40 Socket Head Caps Screws -Flange Thickness 0.230" -Seals to 0.5" Ø fittings
MCF095-FlgExt-X1/ L1500		-Extended 0.950" CF Sub-Mini Flange -Length 1.50" -<i>Tapped holes</i>- Uses #4-40 Socket Head Caps Screws -Flange Thickness 0.230" -Seals to 0.5" Ø fittings
Notes	- Parts Not to Scale	

Multi-CF™ UHV Sub-Mini and Mini Flanges: 0.95" and 1.33" CF Port Flange Blanks and Thin Flanges

The Kimball Physics Multi-CF™ 0.95" Sub-Mini UHV Flange Blanks can be used to terminate (seal off) a CF port. They have one CF sealing surface.

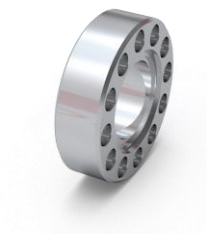
The 1.33" Mini UHV Thin Flanges can be used to seal a CF port, but with sealing surfaces on both sides, can optionally provide structure within the port diameter for creating custom apertures or mounting additional experimental apparatus on this metallic infrastructure.

Please refer to the table below for addition information.



Sub-Mini 0.95" CF Flanges, Flange Blank

Multi-CF™ Flange Blanks	Part Examples	Notes
Sub-Mini 0.95"CF MCF095-FlgBlank-Xc1		- 0.950" CF Sub-Mini Flange Blank -Clear holes (6)- Uses #4-40 Socket Head Caps Screws (Ø 0.120) -Thickness 0.230"
Mini 1.33"CF MCF133-ThnFlg-A2-175		-1.33"CF 0.155" actual thickness -Can be used as a spacer in a UHV system -Double density clear bolt holes -Machine custom apertures to allow for: - Calibration of the pumping speed of a vacuum pump - Determination of the out-gassing rate of a vacuum chamber - Differential pumping. -Provide a platform for mounting experimental apparatus directly to the membrane -Made from 316L stainless steel
Mini 1.33"CF MCF133-ThinFlg-A2-400		-1.33"CF 0.380" actual thickness -Can be used as a spacer in a UHV system -Double density clear bolt holes -Machine custom apertures to allow for: - Calibration of the pumping speed of a vacuum pump - Determination of the out-gassing rate of a vacuum chamber - Differential pumping. -Provide a platform for mounting experimental apparatus directly to the membrane -Made from 316L stainless steel
Notes	- Parts Not to Scale	

Multi-CF™ Flange Blanks	Part Examples	Notes
1.33"CF MCF133-ThnFlg-A2-400-ID640		-1.33" CF 0.400" Thickness -Bore Internal Diameter 0.640" -Can be used as a spacer in a UHV system -Double density clear holes -Made from 316L Stainless Steel -Weight: 0.08 lbs (0.04 kg)
1.33"CF MCF133-ThnFlg-A2-175-ID640		-1.33" CF 0.175" Thickness -Bore Internal Diameter 0.640" -Can be used as a spacer in a UHV system -Double density clear holes -Made from 316L Stainless Steel -Weight: 0.03 lbs (0.01 kg)
Notes	- Parts Not to Scale	

Multi-CF™ Viewport Flanges: Sub-Mini 0.95" CF and Mini 2.75" CF

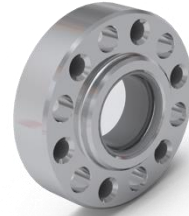
The Kimball Physics Multi-CF™ 0.95" Sub-mini UHV Flange Viewport **MCF095-SapphVP-X1** enables visual observation and measurement (e.g., pyrometer) inside the vacuum chamber or instrument housing.

The flange is precision CNC fabricated from 316L stainless steel, with the optical window for the 0.95" CF Viewport made from *UV Grade Sapphire*. It has twelve (12) #4-40 alternating tapped and clear holes.

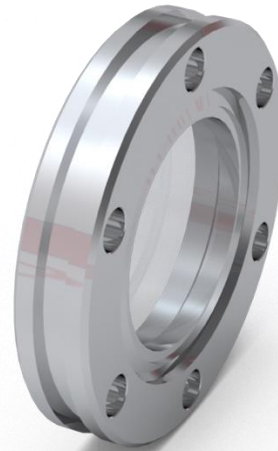
The larger 2.75" CF **MCF275-MtgFlg-C1VP** Mounting Flange Viewport is CNC precision machined from stainless steel with a *Corning Type 7056 glass*. It also includes an outside diameter OD mounting groove for external mounting brackets. The flange has six (6) clear holes to accept 1/4-28 bolts for mounting to 2.75" CF flanges. Grabber grooves are not available on viewports.

Note: Caution should be used when handling viewports as they are susceptible to scratching and weak under stress points.

The Viewports are UHV compatible with Bakeout temperatures up to 450°C, with a bake-out rate ramp rate of 20°C per minute max.



Viewport Sub-Mini 0.95" CF Flange
MCF095-MtgFlg-X1VP



Viewport 2.75" CF Mounting Flange
MCF275-MtgFlg-C1VP

Internal Mounting: The Groove-Grabber/ Grabber-Groove System

The Groove-Grabber/Grabber-Groove internal apparatus attachment or mounting system greatly increases the capability (and user flexibility) of the Multi-CF™ Vacuum Chambers and other Multi-CF™ Fittings.

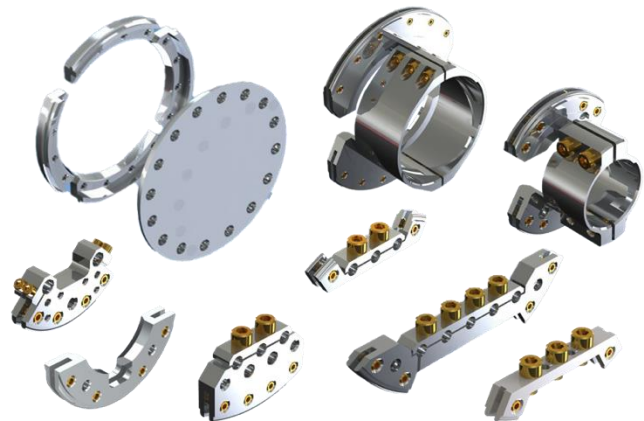
Internal circumferential (annular) channels, that we refer to as “*Grabber Grooves*”, are precisely machined along the inside bore of the aperture in CF (Conflat®) ports with sealing surfaces between 2.75” inches and 10.00” in diameter (see figure right). These Grabber Groove contours provide the mechanical features used to securely attach (mount) various instruments, devices, apparatus and concept prototypes (fabricated from eV parts) to the inside of the chamber using our matching “*Grove Grabber*” mounting clamps. *Grabber grooves are not available in 0.95” and 1.33” CF ports.*

Typically, one pair of Grabber Grooves is present at each aperture, and in some components, additional grooves are provided for even more flexibility. With the axial symmetry of the circumferential grooves, the mounted device can be easily positioned at any desired angular orientation about the CF port axis.

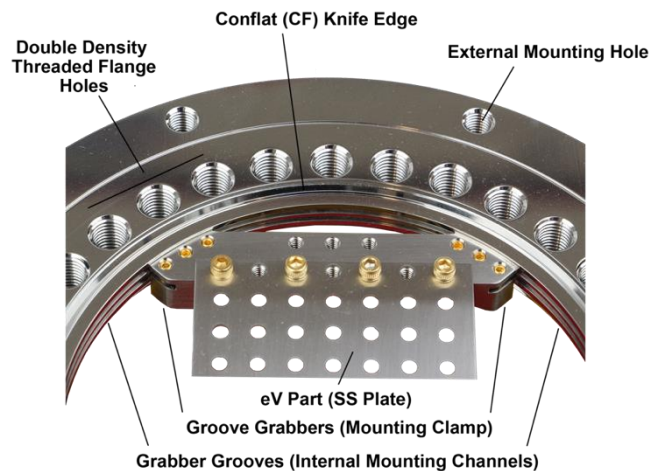
Most Groove Grabber Clamps, fabricated from 316L Stainless Steel, expand to lock into the Grabber Grooves by tightening the easily accessible axial set screws.

Basic designs are included for 1) Split Axial Clamping, 2) Reverse Split Axial Clamping, 3) Transverse Tapped Mounting 4) Center Mounting, 5) Heavy Duty with Blank Mounting, and 6) Large Load Axial Mounting.

Most of the Groove Grabber clamps are compatible with our “eV Parts” prototyping system that consists of numerous components (solid and perforated plates, clamping plate assemblies, metal and ceramic rods and tubes, various brackets and locking rings and more ...) that can be used to create adapters to your device or apparatus, or else be used to rapidly create and prototype new concepts without the delays and expense encountered trying to design and fabricate your own parts. eV Parts are discussed in the next section of this document.



Examples of Multi-CF™ Groove Grabber Mounting Clamp Designs and Sizes



View of internal mounting “Grabber Groove” channels along the CF port internal bore, with a Groove Grabber mounting clamp engaging the mounting channels to securely support the internal apparatus. Other features of Kimball Physics CF ports shown including double density threaded flange holes, external mounting holes, and prototyping “eV” parts.

eV Parts

To provide numerous options to mount your apparatus using the internal mounting channels or grabber grooves inside the MCF™ chamber housing, or to construct a custom prototype or functional device, we have a complete line of “eV Parts”, which are often referred to as a virtual “erector or play set” for scientists.

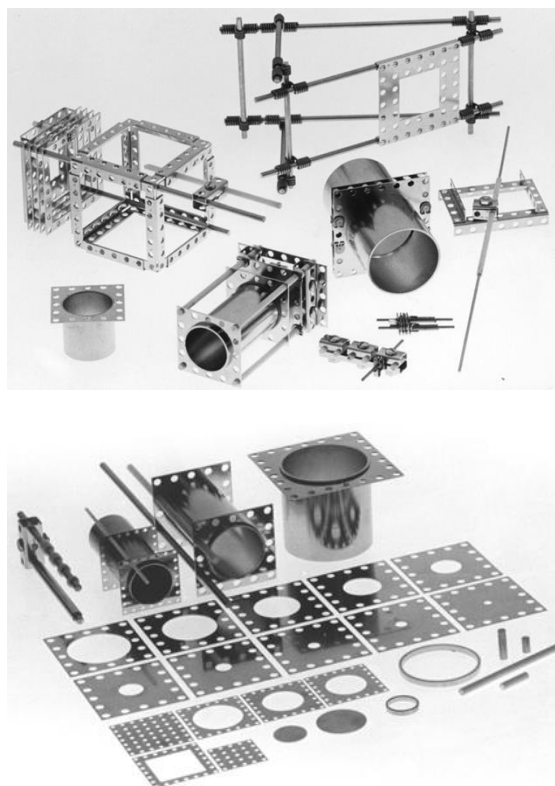
eV Parts are a group more than 350+ standardized parts, including ceramic and metal rods, perforated plates in various geometries, and a variety of fasteners, clamps and other parts that enable construction of all types of surface physics devices and high vacuum apparatus.

These versatile parts are made from high quality materials to build rigid, self-supporting, self-aligning and dimensionally stable assemblies that allow accurate alignment of lenses, slits and apertures. eV Parts are self-aligning by virtue of their mounting holes and remain locked in place even over extended bakeouts. Parts are typically assembled on centerless-ground ceramic rods and secured using a wide variety of fasteners.

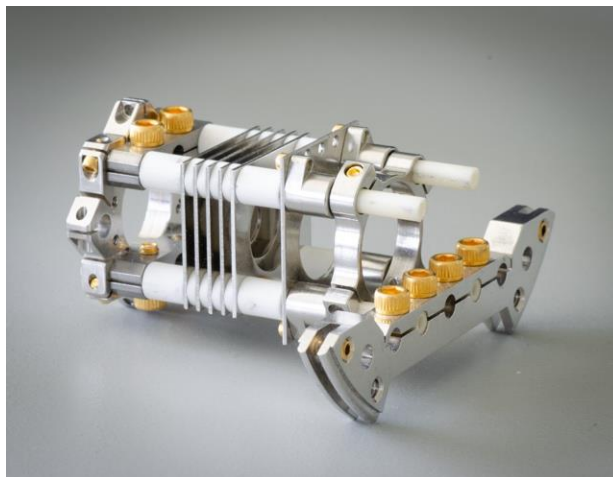
Ordinary hand tools are the only additional tools needed to use eV Parts. For permanent applications, a laboratory spot-welder may be used.

The eV Part assemblies also interface to our mounting connectors (groove grabbers) to enable you to create custom prototype devices, or interface to your own devices and securely mount them inside the chambers. These eV parts save time and money by bypassing the need to design and custom machine these parts.

Please refer to our website and search for the “eV Parts Kit” to explore this option and for more in-depth discussion of the scope and capabilities of this product.



Assortment of various metallic and ceramic eV Parts available for mounting your apparatus or creating prototype devices.



Split Axial Groove Grabber with eV Part construct mounted parallel to the CF Port Axis.

External Mounting

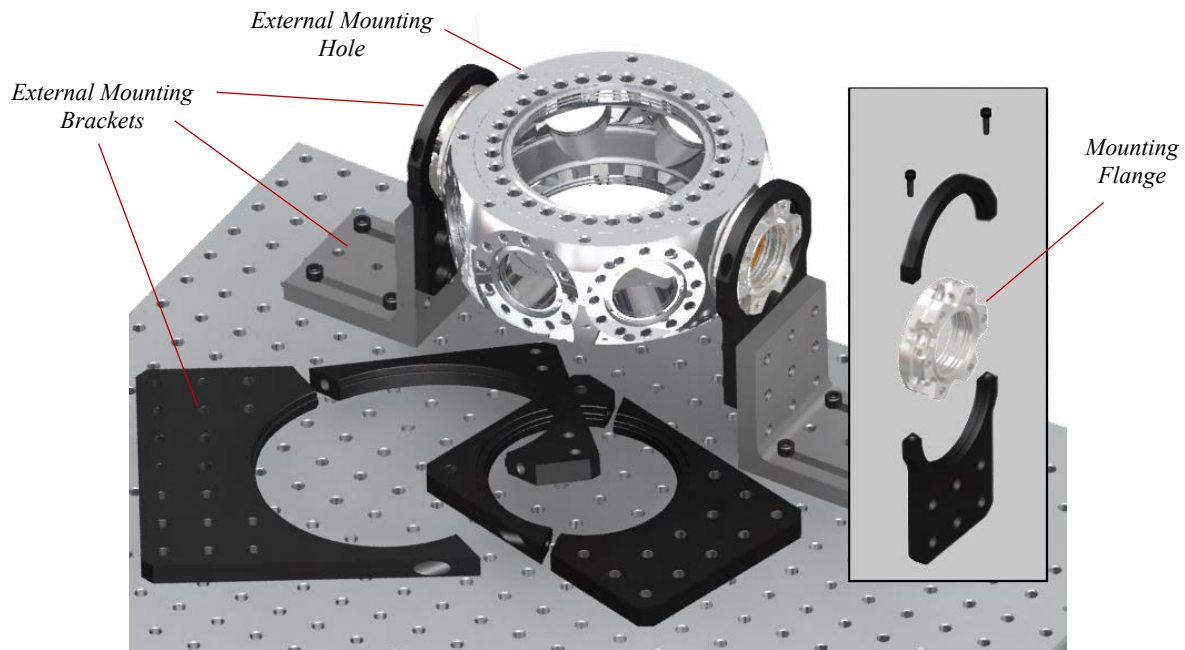
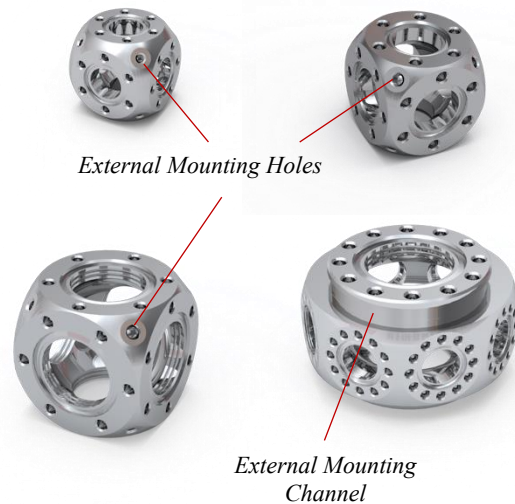
ConFlat® CF fitting vacuum chambers are frequently supported or mounted to an optical bench or apparatus by placing auxiliary mounting brackets under the bolt heads of the flange gasket compression bolts. Unfortunately, the varying loads on the brackets can cause non-uniform loading on the bolts, which in turn causes variable loads on the gasket that may reduce seal uniformity and reliability.

Kimball Physics has several alternatives to enable external mounting without compromising the CF gasket seal integrity. These include 1) additional threaded holes on the external surface of MCF chambers, 2) external channels on the MCF chambers to independently engage the mounting structures or 3) mounting flanges with an outer diameter circumferential channel to engage mounting brackets.

When space is available, many of the MCF designs will have independently placed threaded anchorage points that are not involved with the flange. This provides an ideal solution for external mounting. Bakeout heaters can also

be attached by means of these extra holes.

When space is available, externally placed channels can be integrated into the MCF surface and provide favorable structure for external mounting brackets without placing any loads on the sealing surface. We also have *Mounting Flanges* and *Flange Adapters* that can provide an external mounting channel. Please refer to our website for more information about external mounting options.



Examples of external mounting holes and an external mounting channel in Multi-CF™ Vacuum chambers (above right). External mounting brackets connected to Spherical Octagon vacuum chamber and mounted to an optical table (lower figure). Example of how a Mounting Flange would interface to External Mounting Bracket is shown lower right.

Summary

Kimball Physics Miniature (Mini) and Sub-Miniature (Sub-Mini) Multi-CF™ UHV Vacuum System Components bring unique and important advantages to your research and development projects and commercial products.

Dimensioned drawings, for most of the parts presented, are available on the Kimball Physics website to further assist you in selecting your best solution. References are also provided below for additional documentation.

3D CAD Model STEP files are also available for most products presented and can be accessed from the Kimball Physics website. These models add an additional resource to planning your system, enabling you to virtually assemble and evaluate the various design options in your CAD Software.

Please reach out to Kimball Physics with any questions or to speak with our engineers and physicists about custom designs and applications.

References

For more information about Multi-Port CF (MCF™) Vacuum Chambers and Accessories, visit our website at: [MCF™ Vacuum Chambers](#)

Other References (PDF)

[Multi-CF™ UHV Vacuum Chambers OVERVIEW](#)

[Multi-CF™ Fittings Flange Multiplexers](#)

[Multi-CF™ Thin Flanges](#)

[Multi-CF™ Flange Adapters](#)

[Multi-CF™ Fittings Groove Grabbers \(Internal Mounting System\)](#)

[Multi-CF™ External Mounting System Overview](#)

Notes:

1. Cautions for Multi-CF™ Chambers

- Silver Plated Bolts or Equivalent Lubrication must be used.
- Please measure the hole depth and other flange / copper ring / part thicknesses
- Choose a correct bolt length such that the bolt doesn't bottom in the tapped hole prior to tightening the structure.

2. Specifications Subject to Change Without Notice.

3. Images are not to scale unless noted.

4. DE Altobelli 03/11/2024

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