

Flanges, Fittings, & Components



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► Flange Systems Overview

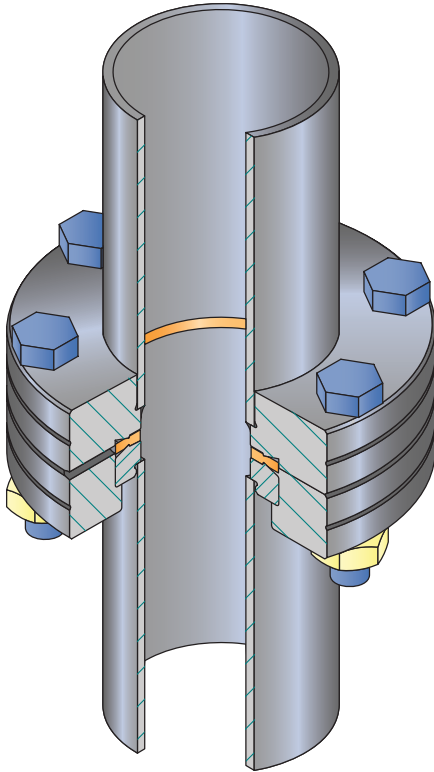


Figure 1: ConFlat Flange Assembly

What are Flanges?

In vacuum technology, flanges are semi-permanent connections to join parts that:

- (a) are frequently or occasionally disassembled;
- (b) are light enough to be moved with available equipment; or
- (c) cannot be welded due to heat sensitivity or replacement needs (e.g., valves, pumps, or gauges).

There are many flange designs:

- Formal standards (e.g., ISO, KF/QF/NW, ASA/ANSI flanges)
- *De facto* standards (e.g., CF/ConFlat® flanges)
- Some are best described as conforming to manufacturer's standards (wire-seal flanges and ASA—as adapted for vacuum use), that is, two flanges from one manufacturer will mate, but may not if from different manufacturers.

Commonly used flange designs have a soft gasket squeezed between harder flange surfaces to form a leak-free seal. The various gasket materials are rubbers, elastomers (springy polymers), soft polymers covering a springy metal (e.g., PTFE covered stainless steel), and soft metal (copper or aluminum). Each flange design has merits.

When planning a new vacuum chamber, the designer should compare all the flange designs available and choose that which:

- Matches the vacuum conditions required
- Matches the temperature conditions required
- Is unaffected by the process's starting materials or products
- Matches OEM fittings and components added to the system
- Is easiest to use in that particular system
- Has the lowest total costs

But note, the CF and ISO/KF types are so convenient, low cost, and widely available that they predominate in practical vacuum systems. Mixing flange types using adapters is possible but not recommended unless necessary to match existing components or fittings. However, using one flange type for chamber-mounted components and another for foreline components is common practice.

CF Flanges

The CF flange (originally called ConFlat) is a sexless design—both flanges are identical.

Typical flange materials are austenitic stainless steel types 304L, 316L, 316LN, and surfaced-hardened aluminum (made from a weldable Al alloy). The seal mechanism is a knife-edge that is machined below the flange's flat surface. As the bolts of a flange-pair are tightened, the knife-edges make annular grooves on each side of a soft metal gasket. The extruded metal fills all the machining marks and surface defects in the flange, yielding a leak-tight seal (Figure 1). The CF seal operates from 760 Torr (10^{13} mbar) to $<1 \times 10^{-13}$ Torr ($<1.3 \times 10^{-13}$ mbar), and within the temperature range -196°C to 450°C . Flange sizes in North America (NA) are determined by outside diameter (O.D.). In Europe and much of Asia (E/A), the internal diameter (I.D.)—actually

the nominal I.D. of the largest tube that can be welded to a bored flange—is used.

The NA sizes are: $1\frac{1}{8}$ " ("mini"), $2\frac{3}{4}$ ", $4\frac{1}{2}$ ", 6", 8", 10", 12", $13\frac{1}{4}$ ", 14" and $16\frac{1}{2}$ " O.D.. The E/A sizes are digits (representing the nominal bore in mm) prefixed with either DN or NW (depending on manufacturer): DN16, DN40, DN63, DN100, DN160, DN200, and DN250. In addition, the NA system has intermediate O.D. sizes to enable the use of "standard" inch dimension tubes. They are $2\frac{1}{8}$ " (1" diameter tube), $3\frac{3}{8}$ " (2"), $4\frac{5}{8}$ " (3"), $6\frac{3}{4}$ " (5"). For other dimensions, see the ordering tables in this catalog.

CF flanges (with identical O.D.s up to 10" inclusive) from different (reputable) manufacturers will almost certainly seal.

The vacuum equipment industry adheres to the *de facto* ConFlat standard.

CF flanges are offered in four distinct versions or combinations thereof:

- Fixed flange (Figure 2): once welded to a fitting, it has its bolt-hole orientation fixed with respect to that fitting.
- Rotatable flange (Figure 3): when welded to a fitting, it enables the bolt-hole ring to rotate.
- Through-hole flange: indicates a mating flange-pair accepts bolts that go through both flanges and is secured by nuts or plate nuts.
- Tapped flange: connected to a through-hole flange using only bolts. Vacuum components with a rough axis of symmetry—e.g., a gate valve—can have fixed CF flanges welded with the bolt holes either split by the axis or in-line with the axis. Regrettably, NA has adopted the former and E/A the latter as standards.



Figure 2: Fixed $2\frac{3}{4}$ " CF Flange

► Flange Systems Overview

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Flanges, Fittings, & Components



Figure 3:
Rotatable 2 1/4" CF Flanges

Positive Pressures

When discussing system pressures, a common question is: What is the maximum internal pressure?

Positive pressures are inherently dangerous and failure comes without warning. In a vacuum system, failure depends on various strength properties of bolts, clamps, chamber walls, welds, feedthroughs, valves, viewports, etc. The only safe answer is that the internal absolute pressure cannot exceed the external absolute pressure.

CF Flange Gaskets

The gasket material sealing two flanges determines the joint's maximum temperature and, to an extent, the base pressure of the vacuum volume.

Metal gaskets are impermeable to gases and withstand moderately high temperatures indefinitely. The normal gaskets for stainless steel CF flanges are punched from 1/4-hard, high-purity, oxygen-free (OFHC) copper stock, chemically cleaned and finished to be scratch- and burr-free.

Bolting the flanges together causes the CF's knife-edges to deform the gasket. Under plastic flow, the copper fills in the knife-edges' imperfections and, in doing so, work-hardens—inducing the “springy” characteristics that keep the seal, even as the knife-edges are cycled from -196° C to 450° C.

Given a correctly cleaned, baked, and pumped CF-flanged chamber, metal gaskets enable base pressures below 1×10^{-13} Torr (1.3×10^{-13} mbar). The work-hardening aspect means metal gaskets are one-time use only. There is strong anecdotal evidence that baking to 550° C for prolonged periods partially anneals the copper from its work-hardened state, since the joints will leak on

cooling. When mounting fragile flanged components—e.g., viewports—fully annealed copper gaskets are recommended.

For systems requiring frequent high-temperature bakeouts, silver-plated copper gaskets are recommended. Without the plating, copper oxide forms on parts of the gasket exposed to air. It may flake into the chamber during flange disassembly.

Aluminum CF flanges must use aluminum gaskets—never copper. However, aluminum gaskets can be used on stainless steel CF flanges if baking is restricted to 200° C.

CF Flange Hardware

Regular nuts and bolts are not suitable for CF flange applications. Various high-tensile strength nut/bolt combinations made from low magnetic permeability, 18-8 stainless steel are used.

It is strongly recommended that all bolt, nut, plate-nut combinations are lubricated, either by one component being silver-plated or the application of a suitable thread lubricant on page 1-56.

Hex Head

Hex-head bolts (socket hex head for the mini flange) are long enough to penetrate two (through-hole) flanges and leave sufficient length for washers, nuts, or plate-nuts. For tapped and blind-tapped flanges, a shorter bolt length is used that does not penetrate the tapped flange or bottom out in a blind-tapped flange.

12-Point

Where high temperature bakeouts and frequent reassemblies are needed, (dry lubricated) 12-point cap screws are the best choice. Note that cap screws do not require special wrenches—the appropriate sized 12-point socket or flat wrench suffices.

Metric

Tapped metric flanges must use metric bolts. While through-hole flanges (built to metric specifications) will accept inch or metric nuts/bolts, it is strongly recommended that, for vacuum systems containing some tapped metric fittings, all nuts and bolts have metric threads.

Studs and Threaded Rods

This hardware is used to:

- Connect double-sided flanges
- Make bolts “emerge” from blind-tapped flanges
- Mount protective plastic covers over glass viewports

Both inch and metric threads are available for these and most other components.

Plate Nuts

These are metal plates with two threaded holes, shaped to match the corresponding CF flange's bolt hole patterns and replace the individual nuts (Figure 4). The plate nut's major advantage is, once two bolts are manually started, the plate nut acts as its own backing wrench and washer—the bolts are tightened using one wrench.



Figure 4: *Plate Nuts for CF Flanges*

► Flange Systems Overview

1 Flanges, Fittings, & Components

■ Wire Seal Flanges

Wire seal flanges are sexed—with male/female flanges forming a mating pair that captures an OFHC copper “o-ring” gasket under extreme compression. The material of choice is 304L stainless although 316L stainless may be available as a custom material.

The flanges’ design constrains the gasket’s flow to form a seal between them. Wire seal flanges can be used over the same temperature/pressure ranges as CF flanges. They are used where tube dimensions exceed those of standard CF flanges.

There are three types:

- Bored ring flanges
- Flat blank flanges
- Domed blank flanges

The last uses a thin gauge spherical cap to blank off a ring flange—a considerable weight-saving device, compared to the flat blank flange. Manufacturers used the flange’s nominal O.D. to define the size.

While wire seal designs are similar among manufacturers, it is unlikely that a male flange from one manufacturer will match a female flange from another.



Ring Wire-Seal Flanges

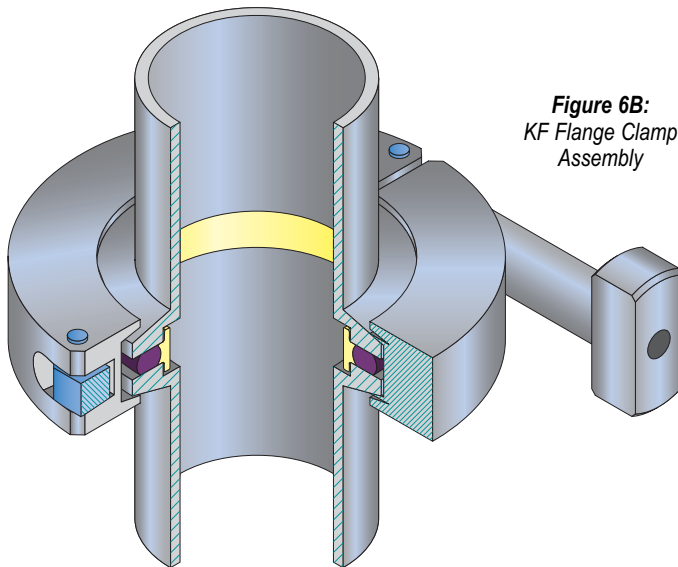


Figure 6B:
KF Flange Clamp
Assembly

The flange is sized by the largest nominal I.D. (in, mm) tube that can be welded to it.

Standards sizes are: KF10, KF16, KF25, KF40, and KF50. Although these sizes are used in North America, the true nominal bore is often that of standard inch dimensioned tubes. Despite dimensional unit differences, KF flanges made by reputable manufacturers in any country will almost certainly mate.

■ KF (QF) Flanges

KF flanges (Figure 6A) are a sexless design—made from 304L or 316L stainless, aluminum, or brass. The seal is a rubber/ elastomeric o-ring mounted in a centering ring, which aligns the flanges and holds the o-ring in position.

Each flange has a chamfered back-surface and is mated by a circumferential clamp (Figure 6B) tightened by wing-nut, thumbscrew, bolt, or over-center lever.

KF flanges are limited (by the o-ring’s properties) to applications with temperatures between ~0° C and 120–180° C, and pressure from atmosphere to ~10⁻⁸ Torr or mbar.

The name KF (for Klein Flansche) was adopted by ISO, DIN, and Pneurop standards organizations. It is also called QF, NW, and occasionally, DN.



Figure 6A:
KF16 Flanges

► Flange Systems Overview

Note: While ISO-K can be converted to (multi-part) ISO-F with an adapter ring, ISO-F flanges cannot be converted to ISO-K (Figure 7D).

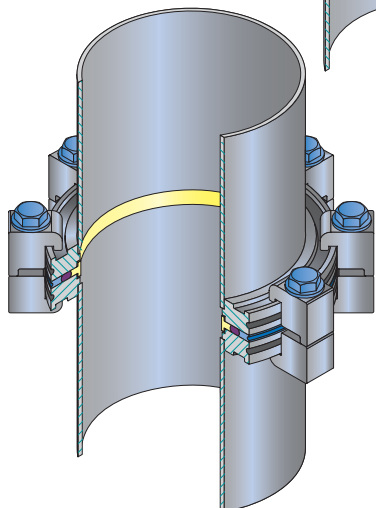


Figure 7A: ISO Double Clamp Nipple Assembly

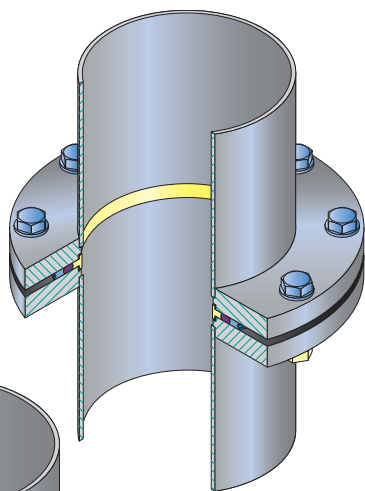


Figure 7B: ISO Bolt Nipple Assembly

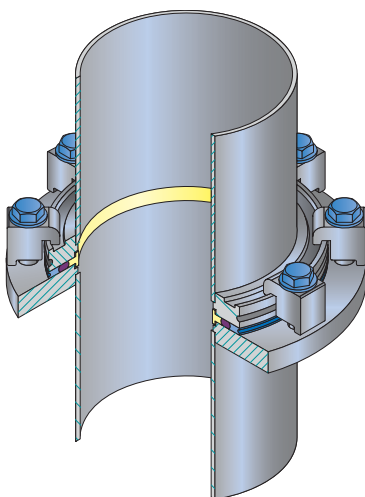


Figure 7C: ISO Single Clamp/Bolt Nipple Assembly

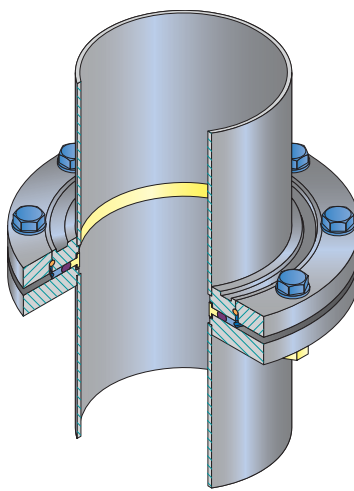


Figure 7D: ISO Bolt Ring Nipple Assembly

■ ISO Flanges

ISO flanges (also called **Large ISO**) have a sexless design and are made from 304L stainless or aluminum.

The design principles of ISO and KF seals are identical. Each flange face is counter-bored or grooved to receive a metal centering ring with an elastomeric o-ring around its O.D. As with KF, the ISO centering ring both aligns the flanges and holds the o-ring in place. However, because the larger diameter ISO o-ring is more likely to "roll off," a spring-loaded retainer holds it externally. ISO flanges are limited (by the o-ring's properties) to applications with temperatures between -0° C and 120-180° C, and pressure from atmosphere to ~10⁻⁸ Torr or mbar. ISO flanges are universally sized by the nominal I.D. (in, mm) of the largest tube that can be welded to the flange. The standard sizes are: 63, 80, 100, 160, 200, 250, 320, 400, 500, and 630.

The ISO-K is convenient and has the smallest flange O.D. for any given tube I.D. The ISO-F offers greater strength when used as a

structural element.

A variety of bolt/clamp options permit joints between mixed ISO-K and -F flanges. The illustrations (Figures 7A-7D) show various possible clamping arrangements.

Two flange "styles":

- ISO-K flanges (Figure 8): use separate clamps placed around the flange's periphery
- ISO-F flanges (Figure 9): use conventional bolt holes and nuts/bolts

Figure 9: ISO63 "F" & "K" Style Flanges



Figure 8: ISO100 K-Style Flange & Hardware



► Flange Systems Overview



Figure 10: ASA Flange

■ ASA Flanges

ASA flanges, adapted decades ago from 150# steam-pipe flanges, are simple, sexed vacuum seals—one flange is grooved to accept an o-ring (Figure 10) while the mating flange is smooth. They are made from 304L stainless or a weldable aluminum alloy.

ASA flanges are limited (by the o-ring's properties) to applications with temperatures between -0°C and $120\text{--}180^{\circ}\text{C}$ and pressure from atmosphere to $\sim 10^{-7}$ Torr or mbar. The poorer vacuum level than other o-ring systems is suggested because ASA flanges are frequently larger in diameter and therefore have a larger gas load from permeation.

These flanges are sized by the connecting pipe's nominal I.D. in inches. The normal range is: 1", 1.5", 2", 3", 4", 6", 8", and 10", although some manufacturers make sizes up to 36". They have large diameter bolt holes through the rim—a legacy from positive pressure uses. Consequently, for any given tube diameter, ASA flanges have much larger O.D.s than other flange types. The adaptation and adjustment to suit vacuum conditions led to a deterioration of standards.

For example:

- (a) "Large bore" flanges, introduced to increase gas conductance, may have a larger I.D. than the o-ring groove in normal bore flanges.
- (b) Bolt holes are sometimes reduced in diameter, causing confusion when bolting flanges together.

As with any sexed flange type, additional issues arise when mating two flanges of the same sex. Here, if the mating pair both have o-ring grooves of identical I.D.s, a thin metal ring is placed between them. If both flanges are smooth, o-rings molded into carriers are installed.

When buying ASA flanged fittings and components, always compare dimensions carefully. When purchasing flanges to mate to an existing item, have that item's flange O.D., I.D., number of bolt holes, bolt circle diameter, and the handy o-ring groove I.D. for quick reference.

■ Elastomeric Gaskets for KF, ISO, & ASA

Elastomeric gaskets, often o-rings of circular cross-section, are convenient, easy-to-use vacuum seals. With flange surface finishes of 32 rms or better, compressing the o-ring by 25% to 35% will form a vacuum seal that should be easily compatible with 10^{-7} Torr or mbar and, with better design/preparation, perhaps 10^{-9} Torr or mbar.

The drawbacks are the elastomer's gas permeability, outgassing rate, and limited temperature compatibility. At elevated temperatures (but well below those causing pyrolysis), elastomeric gaskets have greatly increased permeation rates and have their sealing characteristics slowly compromised by compression set and lack of sealing force retention.

Compression set is the permanent deformation an o-ring exhibits when released from a flange seal. Sealing force retention is a measure of the elastomer's resilience when held under a constant compressive force.

The debate about greasing o-rings is ongoing. Typically, the same vacuum level can be achieved with or without grease. However, when not using grease, the o-ring must be dust- and fiber-free, and the metal surfaces touching the o-ring must have at least a 32 rms finish. Grease permits sealing in less pristine conditions. Greasing o-rings that will reach high temperatures is not recommended. Most greases have a significant vapor pressure at $\sim 200^{\circ}\text{C}$ and almost certainly a grease film will form on every surface of a baked system.

The elastomeric materials most commonly used in vacuum seals are Buna-N (nitrile rubber-NBR), silicone, fluorocarbon (e.g., Viton-FKM), and perfluorocarbon (e.g., Kalrez and Chemraz-FFKM). The specific properties depend on the compounding, the inert materials mixed with the pure elastomer to give it acceptable mechanical properties, and the cross-linking agent used to "cure" it.

The general properties of o-rings made from these material are:

Buna-N

- Least expensive o-ring
- Maximum operating temperature of $\sim 100^{\circ}\text{C}$
- Permeation rate for water vapor ~ 20 times that of Viton
- Its chemical properties roughly match natural rubber and is just as readily attacked by ozone
- Must not be used in any O_2 plasma process
- Shelf-life is one year, but shorter if stored, or used, near an ozone source such as an electric motor with brushes

Silicone

It is commonly thought that silicone has good high temperature characteristics; however, tests (on one unspecified silicone rubber compound) by

DuPont Dow Elastomers indicate a compression set of 87% and a sealing force retention of $\sim 80\%$ after 70 hours at 204°C . In prolonged high temperature operation, much anecdotal evidence points to silicone losing its resilience, hardening, and sticking to the flange surfaces, making replacement difficult. Silicone's permeation for water vapor is extremely high, ~ 200 times that of Viton®.

Viton

- Most commonly used elastomer in vacuum service
- Reasonably low gas permeability (except for helium, which is double that of Buna-N)
- Good performance at high temperatures. The upper temperature limit depends on the compounding with 180°C to 200°C being cited.

DuPont Dow Elastomers tests on Viton indicate a compression set of $\sim 50\%$, and a sealing force retention of $\sim 80\%$ after 70 hours at 204°C .

Kalrez

Kalrez® and Chemraz® o-rings have the best high temperature performance. DuPont Dow Elastomers tests on o-rings made from a particular Kalrez compound showed a compression set of $\sim 50\%$, and a sealing force retention of $\sim 80\%$ after 672 hours at 204°C . After 672 hours at 250°C , the compression set is still only $\sim 63\%$.

Using Elastomeric Seals

When designing or specifying o-ring vacuum seals, some guidelines are:

- A double o-ring seal is no better than a single o-ring if the volume between the two o-rings is not differentially pumped.
- The surface finish of metal parts mating to the o-ring is critical. Scratches on the metal (or glass) that cross from the air-side to the vacuum-side of the o-ring's footprint will cause leaks.
- Before installing o-rings, they should be vacuum baked (without compression). This greatly improves outgassing characteristics.
- Greasing o-rings: Purists tend to avoid it. Pragmatists tend to use it, claiming surface finishes on metal mating to the o-rings are frequently too scratched or rough to support the purist view.
- Do not apply grease with a bare fingertip. Use polyethylene gloves to handle the rings and apply the grease. Apply only the thinnest film possible.
- Choose the grease carefully. Consider its vapor pressure at the joint's temperature, and whether it will liquefy and "surface creep" into the chamber.

► Flanged Components & Fittings

■ Fittings

Vacuum fittings are, essentially, conveniently shaped, flanged devices that can be assembled into complete vacuum envelopes.

While nominally identical fittings from different manufacturers will be similar, there may be small length differences. Where possible, vacuum systems should be designed so they are insensitive to small length changes.

The common construction materials for fittings are 304 stainless and aluminum; however, fittings may be available in 316 stainless.

The pressure and temperature range of any fitting is dictated by the construction material and the flange type. For example, a 304L stainless fitting with CF flanges and copper gaskets is compatible with $<1 \times 10^{-13}$ Torr ($<1.3 \times 10^{-13}$ mbar) and 450° C. An aluminum fitting with fluorocarbon gaskets is compatible with $\sim 10^{-8}$ Torr or mbar and $\sim 180^\circ$ C.

Many types of fittings—full nipples, elbows, 4-way cross, etc.—have one or more identifiable “axis” (a line normal to the flange surface through the tube’s center line).

Flanges using bolts (CF and ASA) might have bolt-hole alignment problems with mating fittings or components. To avoid this, one flange on each axis is made rotatable—a full nipple (1 axis) has one rotatable flange, an elbow (2 axes) has two rotatable flanges, and a 4-way cross (2 axes) has two rotatable flanges, one on each axis.



Figure 11: CF Flanged Half Nipple



Figure 12: CF Flanged Full Nipple



Figure 13: 90° CF Flanged Radius Elbow



Figure 14: 90° CF Flanged Mitered Elbow

Names of Fittings

Half-Nipple

- A length of tube with a flange on one end (Figure 11)

Full-Nipple

- A length of tube with flanges welded to both ends (Figure 12)

Elbows

- Essentially, nipples “bent” through 45° or 90° (when the bend is 180°, the fitting is called a return)
- They are either radius (Figure 13) or miter (Figure 14)

It is commonly believed that the gas conductance of a radius elbow is higher than a miter elbow of the same I.D. While true in continuum and transitional flow regimes, in molecular flow they have identical conductances.



Figure 15: CF Flanged Tee

Tees

- Shaped as the name suggests (Figure 15)
- In the standard tee fitting, all three flanges are identical sizes
- In the reducer tee fitting, the two flanges on the “run” are identical while the tube (and flange) on the “branch” has a smaller bore

Crosses and Cubes

- Available in standard forms as 4-, 5-, and 6-way (Figure 16). Other forms can be custom-made to include many more than 6 entry ports or different flanges sizes on different arms of the cross
- A cube starts as a solid metal block from which the cross is machined
- Cubes are particularly useful when a short distance between flange face and the cross’s center point is important



Figure 16: CF Flanged 6-Way Cross

Flanged Components & Fittings



Figure 17

Adapters Flanges and Gas Fittings

Transitions between one flange size and another size within the same flange type are called reducers, not adapters.

Adapters make transitions between:

- One flange type and another (e.g., ISO to ASA for mounting an ASA-flanged component, Figure 17)
- One flange type to a non-flanged vacuum seal (e.g., KF to quick connect for mounting a tubulated ion gauge, Figure 18)
- One flange type to a small diameter gas tube fitting for gas inlet (e.g., CF to Cajon for connecting a gas supply line to the chamber for sputter process gas, Figure 19)
- One flange type to NPT thread (e.g., KF to NPT for mounting a T/C gauge, Figure 20)

In all adapters, the transition length is made as short as possible to minimize the reduction in gas conductance.



Figure 18

Tubing

Polymeric and rubber tubes (also called hoses) are used in vacuum applications for their flexibility, low cost, and relative ease of installation; however, they have high outgassing properties and are permeable to atmospheric gases with permeation rates rapidly rising with increasing temperature.

With the exception of small diameter thin PTFE tubes, polymers and rubbers are not used in high vacuum conditions. Even at rough vacuum conditions, the commonly used PVC or rubber tubes have a narrow operating temperature range. Below $\sim 10^\circ\text{C}$, the tube has limited flexibility. Above $\sim 50^\circ\text{C}$ the tube may be too soft, too permeable, and too "gassy" to be useful. If the tube is long and its diameter large compared to wall thickness, unsupported tubes may collapse under vacuum, particularly if required to make a sharp bend.



Figure 19

Rubber Tube

Rubber tube is very susceptible to vacuum collapse and an internal spiral wire is recommended. However, this is not a complete solution because the spiral can slip and "flatten," particularly where the tube length exceeds 12" (30 cm).

Plastic Tube

The commonly used plastic tube, polyvinyl chloride (PVC), is not naturally flexible. It is made so by adding a liquid organic plasticizer, usually dinonylphthalate. The presence of this plasticizer limits the ultimate pressure inside the PVC tube and, together with its permeability, confine its use to forelines.

As with rubber, PVC needs internal reinforcement to avoid collapse when evacuated. Fortunately, PVC tubes are available with spiral wire molded into the plastic. Standard length tubes can also be purchased with metal half-nipples already mounted. When mounting to metal tubes, use radiator or hose clamps to secure the PVC tube. Never bake PVC.



Figure 20

PTFE

PTFE is expensive and lacks the resilience and elasticity of rubber or plasticized PVC.

It is not used for forelines.

Unfortunately, it is frequently used, as small diameter tubes, in external gas delivery systems. PTFE's permeability makes it useless for this application. The fact that the internal gas pressure is above atmosphere is no argument. Permeation is a molecular flow phenomenon, and the internal pressure does not affect it.

Suitably outgassed, thin wall PTFE tube, with a loosely fitting internal wire, is a good insulator and has been used at UHV pressures.



Stainless Steel Tube

For rigid tubes, the most commonly used material is 304L stainless steel. It accepts a high internal finish, has good welding properties, is impermeable, and can be outgassed by baking to 450°C —making it UHV compatible.

Its disadvantage is that compared to the flexible tubes noted at left, it requires special skills and welding equipment to install it.

Cautions and Recommendations when Using Rubber Tube

- Tubing manufacturers often powder the tube's internal surfaces. To avoid pump damage, remove the powder completely. The preferred method is to find an outdoor concrete pad, blow compressed air through one end of the tube while "whacking" the other against the pad, reverse the blow-in end and "whack" the other.
- Do not use water as lubricant when stretching rubber over an oversized metal tube. This exacerbates the tube's already bad outgassing. Use a little hydrocarbon vacuum grease.
- Rubber in tension is very susceptible to cracking from ozone attack. Anecdotally, that is particularly true of rubber stretched over copper tube.
- Use radiator or hose clips to clamp rubber tube to metal.
- Do not attempt to bake a rubber tube! At best, the facility will stink of released sulphur compounds.

► Tubing & Bellows

■ Bellows and Hoses

While not everyone agrees, short, wide I.D., flexible metal “tubes” are often called bellows, while long, smaller I.D., flexible metal tubes are often called hoses. Here, all such devices are called bellows. Flexibility is built into a metal “tube” by making its thin wall in the form of an accordion or concertina.

There are two methods:

Hydraulically Formed Bellows (HFBs)

These are made by pressurizing water inside a thin-wall tube mounted inside a die with a concertina surface. HFBs have restricted flexibility and are far from “floppy.” They are used in applications requiring a semi-permanent change of direction or a rugged design. They are often used as foreline connections or to join manifolds to rough pumps.

Edge-Welded Bellows (EWBs)

A stack of thin punched diaphragms are sequentially welded around the inner and then the outer circumferences. EWBs are much more flexible than HFBs, enabling some motion in the X- and Y-directions, in addition to a large motion in the (axial) Z-direction.

They are more easily damaged and must be rigidly supported at the ends to prevent complete collapse on evacuation. If used horizontally, they may need central support. They are used on manipulation devices requiring X, Y, and Z motion. If not significantly bent, the gas conductance of either type of bellows is about the same as a rigid tube of equal I.D. and length.



Wide bore bellows are often proposed as vibration isolation devices between a pump and chamber. However, under vacuum a bellows contracts, often to its minimum possible length. It then acts like a rigid tube with minimal vibration isolation. Any degree of vibration isolation requires some elastomeric component—for instance, rubber blocks—between the flanges to restrict the bellow's collapse. Shortening under vacuum applies to all bellows and, if not recognized, can lead to premature failure.

A KJLC® salesman was present at a customer's facility while a 0.75" I.D. bellows between the chamber and mechanical pump was being replaced by a 1.5" I.D. bellows. When the pump was restarted, the customer's technician shouted, in awe, “The pump's levitating!” Indeed, the pump (which weighed less than the ~26 pounds force being applied) was 3" above the floor.

Bellows Application Factors

- All bellows can be baked, but with limitations
- Do not wrap bellows with heater tape
- Avoid hot/cold spots. Surround the bellows with a box with wallmounted heaters.
- Never connect bellows between loosely mounted components. On evacuation, loose components will move and the bellows may be crushed beyond their minimum rated length.
- When mounting bellows to vibrating pumps, clear all obstructions on which the bellows can jiggle and fret. Remember, bent bellows shorts (moves toward its concave side) under evacuation. Where possible, design the system so the bellows makes a single curve, because multiple bends concentrate stress at minimum radius points. Use of an elbow on one or both bellows' ends often helps eliminate multiple bends.
- If two flanges must mate, but are a short distance apart and non-coaxial, do not force an edge-weld bellow into the gap to “correct” the misalignment. The non-coaxial flanges must be far enough apart to permit the bellows to follow a smooth “S.”



► Glass-to-Metal Seals & Viewports

Cautions when Using GM Seals

- Where glass is the transition between two fixed metal points in a vacuum system, anneal the glass after all parts are clamped in position. The smallest misalignment may cause the glass to shatter under the additional stress of evacuation.
- Do not use a metal bellows GM seal as a substitute for the annealing. Under vacuum, all bellows contract—which puts the glass and metal joint under considerable tension and frequently causes failure.
- For safety, cover the line-of-sight between GM seals and people with a suitably thick, transparent rigid plastic (Lexan®) to stop glass particles that may be released if an implosion or explosion occurs.



Glass-to-Metal Seals

Glass-to-metal (GM) seals are joints between metal and glass tubes. They are often used to observe a process or to provide electrical isolation.

Typically, the metal tube-end is terminated in a variety of standard vacuum flanges.

For a GM seal to work, the coefficients of thermal expansion (CTE) of the glass and metal must match, as in the Kovar-to-7052 glass combination. Where the required tube materials have non-matching CTEs, as in SS-to-7740 Pyrex® or SS-to-quartz, the seal

is called mismatched. To form a mismatched seal, a graded glass seal is formed by fusing together many rings of glass, each with slightly different expansions. The graded seal's one end almost matches the Pyrex (or quartz) expansion coefficient, while the other end almost matches stainless steel. Both matched and mismatched seals have proven reliable in vacuum service if correctly used.

The metal tube GM seals are constructed in the following forms:

- glass tube—metal tube
- glass dome end—metal tube
- glass tube—metal bellows tube
- glass tube—metal tube—glass tube
- metal tube—glass tube—metal tube
- metal bellows—glass tube—metal bellows

Viewports

Viewports are windows installed on vacuum chambers to transmit electromagnetic radiation from ultraviolet, through visible, to infrared—depending on the window material used.

Some of their applications are to:

- Let the operator view a process
- Initiate chemical or physical action using specific wavelengths
- Make measurements of emissions occurring in a process
- Monitor the effects of specific wavelengths, e.g., ellipsometry

Two basic designs:

Zero Length Viewports

- Have a greater field-of-view than top-hat models
- Less subject to accidental damage because the window does not protrude beyond the flange face

Top-Hat Viewports

- Do protrude, but undergo less stress during bolt tightening and chamber heating

All viewports are fragile and should be handled and mounted with extreme caution. Always make small adjustments. For example, when securing a bolted viewport, finger tighten all bolts and then, following the normal pattern for the flange, tighten each bolt no more than a 1/16 turn using a wrench.

For CF flanges, make sure the gasket is a fully annealed type.

Never scratch the viewing area—a weakened viewport may implode (or explode under wrong conditions). Where the viewport is for looking at the process, cover it externally with a thick Lexan disc. Replace three flange bolts with threaded rods and mount the Lexan on those.

Make sure special material viewports are protected from conditions that affect them. For example, protect alkyl halide viewports from water vapor; AgCl from visible light; or MgF₂ from high temperature.

Do not subject viewports to rapid temperature changes or gradients. Opinions vary about maximum heating rate, but there is no penalty for being cautious and using the lowest quoted heating rate of ~2° C/minute. If a viewport is heated at the flange rim, cover it with layers of aluminum foil before bakeout to reduce temperature gradients.

It is critical to observe the caution noted in the sidebar on **positive pressures**. Any chamber equipped with a viewport must not be subject to a positive internal pressure.

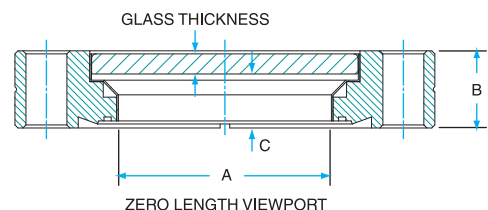
Make sure the “glass” chosen has a reasonable transmission at the wavelengths of interest. And remember, what is not transmitted may be reflected or absorbed. That is, the viewport material may be heated by absorption.

In addition, where film deposition may obscure the viewport, use a shutter mechanism.

Positive Pressures

When discussing system pressures, a common question is: *What is the maximum internal pressure?*

Positive pressures are inherently dangerous and failure comes without warning. In a vacuum system, failure depends on various strength properties of bolts, clamps, chamber walls, welds, feedthroughs, valves, viewports, etc. The only safe answer is the internal absolute pressure cannot exceed the external absolute pressure.



➤ Standard Flanges (304L SS)

CF Flange Cross Reference

Flange O.D. (in.)	Flange O.D. (mm)	Bolt Torque (ft.-lbs.)	Bore (mm)	Tube I.D. (mm)	VAT	Leybold	V.G.	KJLC
1 1/3	34	7	Blank	—	DN16CF	NW16	FC90	F0133X000
			19	16			FC919	F0133X075
2 3/4	70	12	Blank	—	DN40CF	NW35	FC2	F0275X000
			38	35			FC38	F0275X150
			41	38			FC41	F0275X162
4 1/2	114	15	Blank	—	DN63CF	NW63	FC4	F0450X000
			63	60			FC64	F0450X250
6	152	15	Blank	—	DN100CF	NW100	FC6	F0600X000
			102	100			FC100	F0600X400
8	203	15	Blank	—	DN160CF	NW150	FC8	F0800X000
			152	150			FC150	F0600X600
10	254	15	Blank	—	DN200CF	NW200	FC10	F1000X000
			203	200			FC200	F1000X800

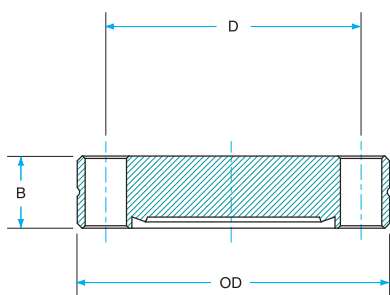


Figure 1 (Fixed Blank Flange)

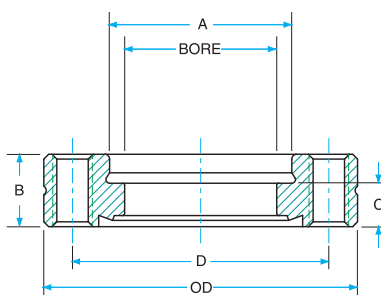


Figure 2 (Fixed Counter Bored Flange)

■ 1" or 25.4 mm O.D. Flanges

Smallest UHV flange on the market!

- Greater choice for system designers
- Metric tube compatibility
- Acceptance of metric washers
- UHV copper gasket seal
- Complements current CF range



Installation Tips

- KJLC® recommends using a high-quality, high-temperature anti-seize thread lubricant on all CF flange fasteners (because galling is common with SS fasteners). For demanding applications where temperatures exceed 200° C, silver-plated bolts are recommended (the silver acts as a lubricant).
- When handling and installing CF components, KJLC recommends the use of lint-free gloves during assembly. The slightest fingerprint or other residue can greatly influence the quality of vacuum.
- Carefully inspect flange mating surfaces for scratches and install the gasket in the recess of the fixed flange and then to the other flange.
- Ensuring that the gasket is seated properly and the flange faces are parallel, align the leak test grooves and install the bolts, tightening finger tight.
- Using a crisscross pattern, tighten the bolts 1/4 to 1/2 turn, (1/16 of a turn for annealed gaskets) one at a time to the appropriate torque value, or until the flange faces are "metal to metal."
- The appropriate value are listed in the table below.

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (mm)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	6	—	17.5	6	3.300	—	1/4	F0100X000N	Call
Fixed	1	Blank	—	6	—	17.5	6	—	M3	1/4	F0100X000NM	Call
Fixed	2	9	10	6	3	17.5	6	3.300	—	1/4	F0100X039N	Call
Fixed	2	9	10	6	3	17.5	6	—	M3	1/4	F0100X039NM	Call

■ Gaskets & Hardware

Description	Flange O.D.	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC Copper Gasket 1/4 Hard	1" CF	10	•	•	•	•	1/4	GA-0100	Call
Bolt & Nut Set M3X16 mm	1" CF	25	•	•	•	•	1/4	SBSM3X16	Call
Bolt Kit M3X12 mm	1" CF	25	•	•	•	•	1/4	SBSM3X12	Call

Standard Flanges (304L SS)

1

Flanges, Fittings, & Components



1 1/8" or 34 mm O.D. Flanges

Figure 1
(Fixed Blank Flange)

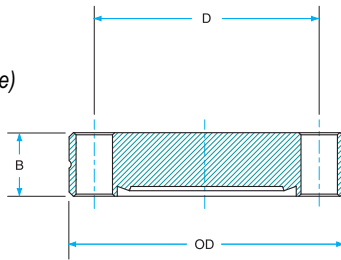


Figure 6
(Rotatable Blank Flange)

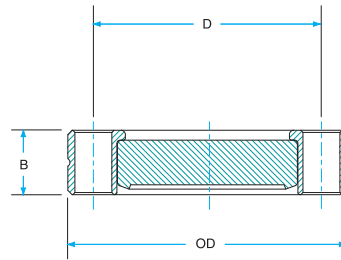


Figure 2
(Fixed Bored Flange)

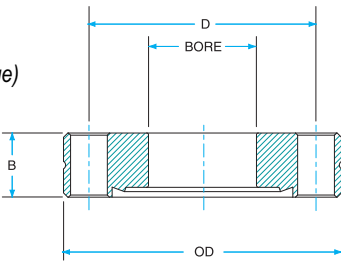


Figure 7
(Rotatable Bored Flange)

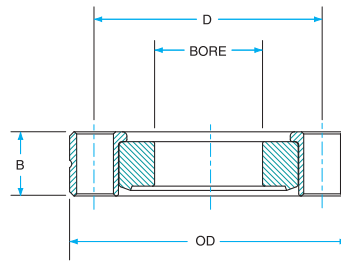


Figure 3
(Fixed Counter Bored Flange)

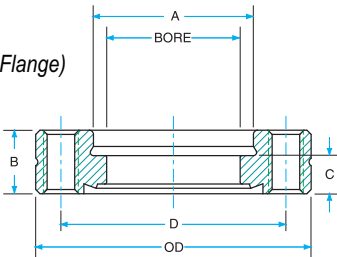


Figure 8
(Rotatable Counter Bored Flange)

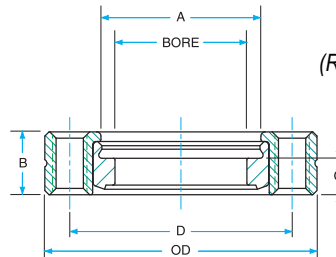


Figure 4
(Fixed Blank Weldneck Flange)

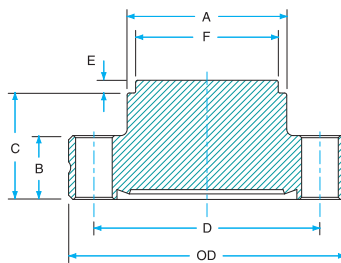


Figure 9
(Rotatable Blank Weldneck Flange)

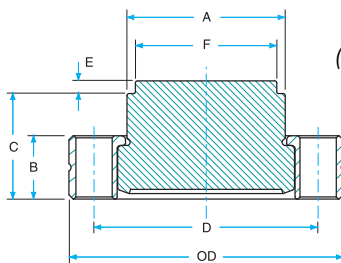


Figure 5
(Fixed Bored Weldneck Flange)

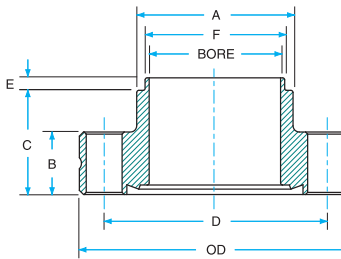
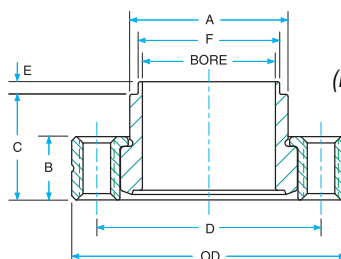


Figure 10
(Rotatable Bored Weldneck Flange)



Standard Flanges (304L SS)

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)						Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D	E	F						
Fixed	1	Blank	—	0.300	—	1.062	—	—	6	0.172	—	1/4	F0133X000N	Call
Fixed	4	Blank	—	0.300	0.50	1.062	0.060	0.670	6	0.172	—	1/4	F0133X000NW	Call
Fixed	2	0.255	—	0.300	—	1.062	—	—	6	0.172	—	1/4	F0133X025N	Call
Fixed	2	0.380	—	0.300	—	1.062	—	—	6	0.172	—	1/4	F0133X037N	Call
Fixed	2	0.505	—	0.300	—	1.062	—	—	6	0.172	—	1/4	F0133X050N	Call
Fixed	3*	0.630	0.760	0.300	0.175	1.062	—	—	6	0.172	—	1/4	F0133X075N	Call
Fixed	5	0.630	—	0.300	0.50	1.062	0.060	0.670	6	0.172	—	1/4	F0133X075NW	Call
Fixed Tapped	1	Blank	—	0.300	—	1.062	—	—	6	—	8-32	1/4	F0133X000NT	Call
Fixed Tapped	4	Blank	—	0.300	0.50	1.062	0.060	0.670	6	—	8-32	1/4	F0133X000NTW	Call
Fixed Tapped	2	0.255	—	0.300	—	1.062	—	—	6	—	8-32	1/4	F0133X025NT	Call
Fixed Tapped	2	0.380	—	0.300	—	1.062	—	—	6	—	8-32	1/4	F0133X037NT	Call
Fixed Tapped	2	0.505	—	0.300	—	1.062	—	—	6	—	8-32	1/4	F0133X050NT	Call
Fixed Tapped	3*	0.630	0.760	0.300	0.175	1.062	—	—	6	—	8-32	1/4	F0133X075NT	Call
Fixed Tapped	5	0.630	—	0.300	0.50	1.062	0.060	0.670	6	—	8-32	1/4	F0133X075NTW	Call
Rotatable	6	Blank	—	0.300	—	1.062	—	—	6	0.172	—	1/4	F0133X000R	Call
Rotatable	9	Blank	—	0.300	0.50	1.062	0.060	0.670	6	0.172	—	1/4	F0133X000RW	Call
Rotatable	7	0.255	—	0.300	—	1.062	—	—	6	0.172	—	1/4	F0133X025R	Call
Rotatable	7	0.380	—	0.300	—	1.062	—	—	6	0.172	—	1/4	F0133X037R	Call
Rotatable	7	0.505	—	0.300	—	1.062	—	—	6	0.172	—	1/4	F0133X050R	Call
Rotatable	8*	0.630	0.760	0.300	0.175	1.062	—	—	6	0.172	—	1/4	F0133X075R	Call
Rotatable	10	0.630	—	0.300	0.50	1.062	0.060	0.670	6	0.172	—	1/4	F0133X075RW	Call
Rotatable Tapped	6	Blank	—	0.300	—	1.062	—	—	6	—	8-32	1/4	F0133X000RT	Call
Rotatable Tapped	9	Blank	—	0.300	0.50	1.062	0.060	0.670	6	—	8-32	1/4	F0133X000RTW	Call
Rotatable Tapped	7	0.255	—	0.300	—	1.062	—	—	6	—	8-32	1/4	F0133X025RT	Call
Rotatable Tapped	7	0.380	—	0.300	—	1.062	—	—	6	—	8-32	1/4	F0133X037RT	Call
Rotatable Tapped	7	0.505	—	0.300	—	1.062	—	—	6	—	8-32	1/4	F0133X050RT	Call
Rotatable Tapped	8*	0.630	0.760	0.300	0.175	1.062	—	—	6	—	8-32	1/4	F0133X075RT	Call
Rotatable Tapped	10	0.630	—	0.300	0.50	1.062	0.060	0.670	6	—	8-32	1/4	F0133X075RTW	Call

Flanges: Metric Dimensions

Type	Figure	Bore	Dimensions (mm)						Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D	E	F						
Fixed	1	Blank	—	7.6	—	26.9	—	—	6	4.3	—	1/4	F0133X000N	Call
Fixed	3*	16.0	19	7.6	4.4	26.9	—	—	6	4.3	—	1/4	F0133X075N	Call
Fixed	5	16.0	—	7.6	12.7	26.9	1.5	17.0	6	4.3	—	1/4	F0133X075NW	Call
Fixed Tapped	1	Blank	—	7.6	—	26.9	—	—	6	—	M4	1/4	F0133X000NM	Call
Fixed Tapped	3*	16.0	19	7.6	4.4	26.9	—	—	6	—	M4	1/4	F0133X075NM	Call
Fixed Tapped	5	16.0	—	7.6	12.7	26.9	1.5	17.0	6	—	M4	1/4	F0133X075NMW	Call
Rotatable	6	Blank	—	7.6	—	26.9	—	—	6	4.3	—	1/4	F0133X000R	Call
Rotatable	8*	16.0	19	7.6	4.4	26.9	—	—	6	4.3	—	1/4	F0133X075R	Call
Rotatable	10	16.0	—	7.6	12.7	26.9	1.5	17.0	6	4.3	—	1/4	F0133X075RW	Call
Rotatable Tapped	6	Blank	—	7.6	—	26.9	—	—	6	—	M4	1/4	F0133X000RM	Call
Rotatable Tapped	8*	16.0	19	7.6	4.4	26.9	—	—	6	—	M4	1/4	F0133X075RM	Call
Rotatable Tapped	10	16.0	—	7.6	12.7	26.9	1.5	17.0	6	—	M4	1/4	F0133X075RMW	Call

*Requires special welding techniques.

Gaskets & Hardware—Standard and Metric

Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC Copper Gasket, 1/4 Hard	10	•	•	•	•	1/4	GA-0133	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	1/4	GA-0133V	Call
Fluorocarbon Gasket (Molded)	2	•	•	•	•	1/4	VZVIT19	Call
Annealed Copper Gasket	5	•	•	•	•	1/4	VZCUA19	Call
Silver-Plated Copper Gasket	1	•	•	•	•	1/4	GA-0133NSP	Call
Bolt & Nut Set, 8-32 x 3/4" (Skt Hd)	25	•	•	•	•	1/4	SBS832075	Call
Plate Nut & Bolt Set, 8-32 x 3/4"	12	•	•	•	•	1/4	PNB-0133	Call
Bolt Kit, 8-32 x 1/2" (Skt Hd)	25	•	•	•	•	1/4	SBK832075	Call
Bolt & Nut Set, M4 x 20 mm	25	•	•	•	•	1/4	SBSM4X20	Call
Plate Nut & Bolt Set, M4 x 20 mm	1 fig	•	•	•	•	1/4	VZNPS133	Call
Bolt Kit, M4 x 16 mm	25	•	•	•	•	1/4	SBKM4X16	Call
Flange Cap	1	•	•	•	•	1/4	F0133CAP	Call

1
Flanges, Fittings, & Components

Standard Flanges (304L SS)

1 Flanges, Fittings, & Components



2 1/8" O.D. Flanges

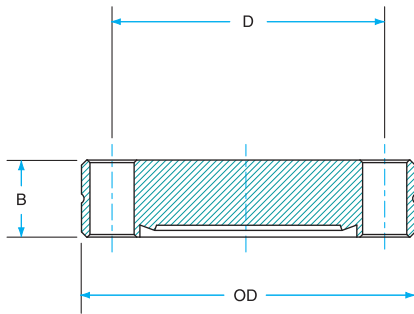


Figure 1 (Fixed Blank Flange)

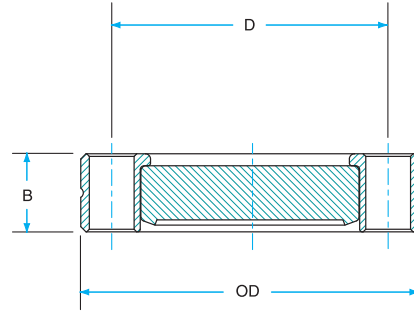


Figure 4 (Rotatable Blank Flange)

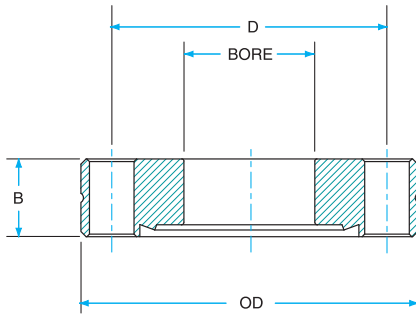


Figure 2 (Fixed Bored Flange)

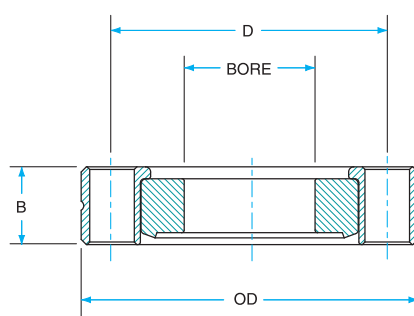


Figure 5 (Rotatable Bored Flange)

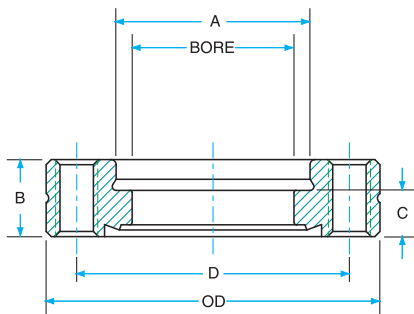


Figure 3 (Fixed Counter Bored Flange)

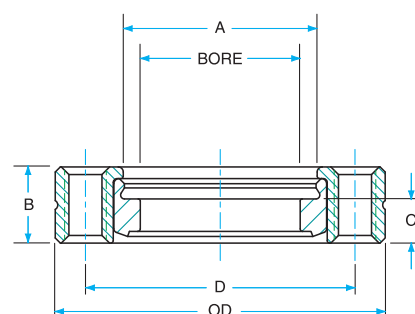


Figure 6 (Rotatable Counter Bored Flange)

NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

► Standard Flanges (304L SS)

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	0.470	—	1.625	4	0.265	—	1/2	F0212X000N	Call
Fixed	2	0.255	—	0.470	—	1.625	4	0.265	—	1/2	F0212X025N	Call
Fixed	2	0.505	—	0.470	—	1.625	4	0.265	—	1/2	F0212X050N	Call
Fixed	3	0.630	0.760	0.470	0.170	1.625	4	0.265	—	1/2	F0212X075N	Call
Fixed	3	0.935	1.010	0.470	0.170	1.625	4	0.265	—	1/2	F0212X100N	Call
Fixed Tapped	1	Blank	—	0.470	—	1.625	4	—	1/4-28	1/2	F0212X000NT	Call
Fixed Tapped	2	0.255	—	0.470	—	1.625	4	—	1/4-28	1/2	F0212X025NT	Call
Fixed Tapped	2	0.505	—	0.470	—	1.625	4	—	1/4-28	1/2	F0212X050NT	Call
Fixed Tapped	3	0.630	0.760	0.470	0.170	1.625	4	—	1/4-28	1/2	F0212X075NT	Call
Fixed Tapped	3	0.935	1.010	0.470	0.170	1.625	4	—	1/4-28	1/2	F0212X100NT	Call
Rotatable	4	Blank	—	0.470	—	1.625	4	0.265	—	1/2	F0212X000R	Call
Rotatable	5	0.255	—	0.470	—	1.625	4	0.265	—	1/2	F0212X025R	Call
Rotatable	5	0.505	—	0.470	—	1.625	4	0.265	—	1/2	F0212X050R	Call
Rotatable	6	0.630	0.760	0.470	0.170	1.625	4	0.265	—	1/2	F0212X075R	Call
Rotatable	6	0.935	1.010	0.470	0.170	1.625	4	0.265	—	1/2	F0212X100R	Call
Rotatable Tapped	4	Blank	—	0.470	—	1.625	4	—	1/4-28	1/2	F0212X000RT	Call
Rotatable Tapped	5	0.255	—	0.470	—	1.625	4	—	1/4-28	1/2	F0212X025RT	Call
Rotatable Tapped	5	0.505	—	0.470	—	1.625	4	—	1/4-28	1/2	F0212X050RT	Call
Rotatable Tapped	6	0.630	0.760	0.470	0.170	1.625	4	—	1/4-28	1/2	F0212X075RT	Call
Rotatable Tapped	6	0.935	1.010	0.470	0.170	1.625	4	—	1/4-28	1/2	F0212X100RT	Call

1 Flanges, Fittings, & Components

■ Gaskets & Hardware



Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC Copper Gasket 1/4 Hard	10	•	•	•	•	1/4	GA-0212	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	1/4	GA-0212V	Call
Silver-Plated Copper Gasket	1	•	•	•	•	1/4	GA-0212NSP	Call
Annealed Copper Gasket	5	•	•	•	•	1/4	VZCUA25	Call
Bolt & Nut Set 1/4-28 x 1 3/8"	25	•	•	•	•	1	HBS25028138	Call
Bolt Kit 1/4-28 x 7/8"	25	•	•	•	•	1	HBK25028088	Call



Kurt J. Lesker

Company

- Quality Products & Services
- On-time Delivery
- Continual Improvement
- Effective Employee Training
- Customer Satisfaction



Providing Quality You Can Trust for Over 55 Years!

Standard Flanges (304L SS)

Flanges, Fittings, & Components

1



2 3/4" or 70 mm O.D. Flanges

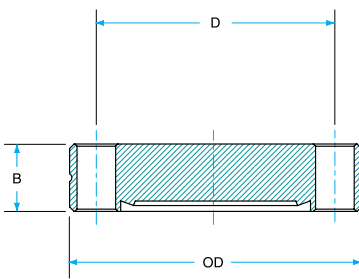


Figure 1 (Fixed Blank Flange)

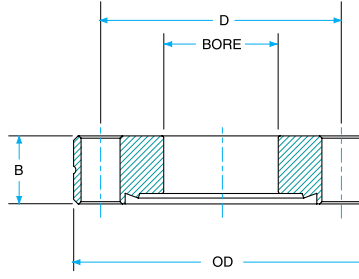


Figure 2 (Fixed Bored Flange)

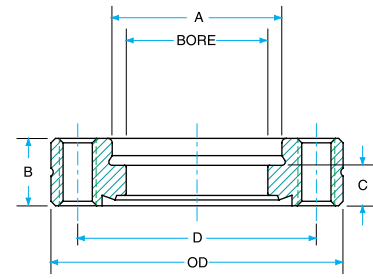


Figure 3 (Fixed Counter Bored Flange)

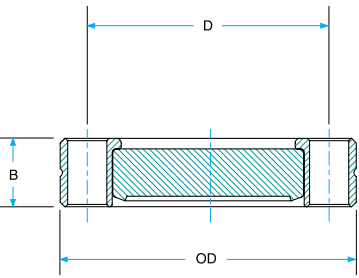


Figure 4 (Rotatable Blank Flange)

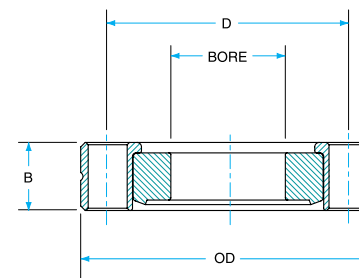


Figure 5 (Rotatable Bored Flange)

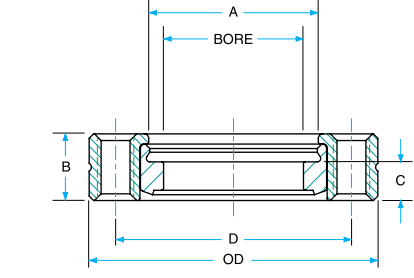


Figure 6 (Rotatable Counter Bored Flange)

NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

Gaskets & Hardware

Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC® Copper Gasket, 1/4 Hard	10	•	•	•	•	1/4	GA-0275	Call
OFHC Copper Gasket, 1/4 Hard, 1.53" (38.9 mm) I.D.*	10	•	•	•	•	1/4	GA-0275LB	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	1/4	GA-0275V	Call
Fluorocarbon Gasket (Molded)	2	•	•	•	•	1/4	VZVIT38	Call
Annealed Copper Gasket	5	•	•	•	•	1/4	VZCUA38	Call
Silver-Plated Copper Gasket	1	•	•	•	•	1/4	GA-0275NSP	Call
Silver-Plated Copper Gasket, 1.53 I.D.*	1	•	•	•	•	1/4	GA-0275LBNSP	Call
Bolt & Nut Set, 1/4-28 x 1 3/8"	25	•	•	•	•	1	HBS25028138	Call
Bolt Kit, 1/4-28 x 7/8"	25	•	•	•	•	1	HBK25028088	Call
Bolt & Nut Set, M6 x 35 mm	25	•	•	•	•	1	HBSM6X35	Call
Bolt Kit, M6 x 25 mm	25	•	•	•	•	1	HBKM6X20	Call
Plate Nut & Bolt Set, 1/4-28 x 1 1/4"	12	•	•	•	•	1	PNB-0275	Call
Plate Nut & Bolt Set, M6 x 35 mm	1 flg	•	•	•	•	1	VZNP52	Call
Flange Cap	1	•	•	•	•	1/4	F0275CAP	Call

*We recommend this gasket with a 1.53" (38.9 mm) I.D. for flanges that accept 1.625" or 1.75" O.D. tubes.

➤ Standard Flanges (304L SS)

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	0.500	—	2.312	6	0.265	—	1	F0275X000N	Call
Fixed	2	0.255	—	0.500	—	2.312	6	0.265	—	3/4	F0275X025N	Call
Fixed	2	0.505	—	0.500	—	2.312	6	0.265	—	3/4	F0275X050N	Call
Fixed	3	0.630	0.760	0.500	0.209	2.312	6	0.265	—	3/4	F0275X075N	Call
Fixed	3	0.935	1.010	0.500	0.209	2.312	6	0.265	—	3/4	F0275X100N	Call
Fixed	3	1.185	1.260	0.500	0.209	2.312	6	0.265	—	3/4	F0275X125N	Call
Fixed	3	1.435	1.510	0.500	0.209	2.312	6	0.265	—	3/4	F0275X150N	Call
Fixed	3	1.560**	1.635	0.500	0.209	2.312	6	0.265	—	3/4	F0275X162N	Call
Fixed	3	1.685**	1.760	0.500	0.209	2.312	6	0.265	—	3/4	F0275X175N	Call
Fixed Tapped	1	Blank	—	0.500	—	2.312	6	—	1/4-28	1	F0275X000NT	Call
Fixed Tapped	2	0.255	—	0.500	—	2.312	6	—	1/4-28	3/4	F0275X025NT	Call
Fixed Tapped	2	0.505	—	0.500	—	2.312	6	—	1/4-28	3/4	F0275X050NT	Call
Fixed Tapped	3	0.630	0.760	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X075NT	Call
Fixed Tapped	3	0.935	1.010	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X100NT	Call
Fixed Tapped	3	1.185	1.260	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X125NT	Call
Fixed Tapped	3	1.435	1.510	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X150NT	Call
Fixed Tapped	3	1.560**	1.635	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X162NT	Call
Fixed Tapped	3	1.685**	1.760	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X175NT	Call
Rotatable	4	Blank	—	0.500	—	2.312	6	0.265	—	1	F0275X000R	Call
Rotatable	5	0.255	—	0.500	—	2.312	6	0.265	—	3/4	F0275X025R	Call
Rotatable	5	0.505	—	0.500	—	2.312	6	0.265	—	3/4	F0275X050R	Call
Rotatable	6	0.630	0.760	0.500	0.209	2.312	6	0.265	—	3/4	F0275X075R	Call
Rotatable	6	0.935	1.010	0.500	0.209	2.312	6	0.265	—	3/4	F0275X100R	Call
Rotatable	6	1.185	1.260	0.500	0.209	2.312	6	0.265	—	3/4	F0275X125R	Call
Rotatable	6	1.435	1.520	0.500	0.209	2.312	6	0.265	—	3/4	F0275X150R	Call
Rotatable	6	1.560**	1.635	0.500	0.209	2.312	6	0.265	—	3/4	F0275X162R	Call
Rotatable	6	1.685**	1.760	0.500	0.209	2.312	6	0.265	—	3/4	F0275X175R	Call
Rotatable Tapped	4	Blank	—	0.500	—	2.312	6	—	1/4-28	1	F0275X000RT	Call
Rotatable Tapped	5	0.255	—	0.500	—	2.312	6	—	1/4-28	3/4	F0275X025RT	Call
Rotatable Tapped	5	0.505	—	0.500	—	2.312	6	—	1/4-28	3/4	F0275X050RT	Call
Rotatable Tapped	6	0.630	0.76	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X075RT	Call
Rotatable Tapped	6	0.935	1.01	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X100RT	Call
Rotatable Tapped	6	1.185	1.26	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X125RT	Call
Rotatable Tapped	6	1.435	1.51	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X150RT	Call
Rotatable Tapped	6	1.560**	1.635	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X162RT	Call
Rotatable Tapped	6	1.685**	1.76	0.500	0.209	2.312	6	—	1/4-28	3/4	F0275X175RT	Call

Flanges: Metric Dimensions

Type	Figure	Bore	Dimensions (mm)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	12.7	—	58.7	6	6.73	—	1	F0275X000N	Call
Fixed	3	36.4	38.1	12.7	5.3	58.7	6	6.73	—	3/4	F0275X150N	Call
Fixed	3	39.6**	41.1	12.7	5.3	58.7	6	6.73	—	3/4	F0275X162N	Call
Fixed	3	42.8**	44.4	12.7	5.3	58.7	6	6.73	—	3/4	F0275X175N	Call
Fixed Tapped	1	Blank	—	12.7	—	58.7	6	—	M6	1	F0275X000NM	Call
Fixed Tapped	3	36.4	38.1	12.7	5.3	58.7	6	—	M6	3/4	F0275X150NM	Call
Fixed Tapped	3	39.6**	41.1	12.7	5.3	58.7	6	—	M6	3/4	F0275X162NM	Call
Fixed Tapped	3	42.8**	44.7	12.7	5.3	58.7	6	—	M6	3/4	F0275X175NM	Call
Rotatable	4	Blank	—	12.7	—	58.7	6	6.73	—	1	F0275X000R	Call
Rotatable	6	36.4	38.1	12.7	5.3	58.7	6	6.73	—	3/4	F0275X150R	Call
Rotatable	6	39.6**	41.1	12.7	5.3	58.7	6	6.73	—	3/4	F0275X162R	Call
Rotatable	6	42.8**	44.7	12.7	5.3	58.7	6	6.73	—	3/4	F0275X175R	Call
Rotatable Tapped	4	Blank	—	12.7	—	58.7	6	—	M6	1	F0275X000RM	Call
Rotatable Tapped	6	36.4	38.1	12.7	5.3	58.7	6	—	M6	3/4	F0275X150RM	Call
Rotatable Tapped	6	39.6**	41.1	12.7	5.3	58.7	6	—	M6	3/4	F0275X162RM	Call
Rotatable Tapped	6	42.8**	44.7	12.7	5.3	58.7	6	—	M6	3/4	F0275X175RM	Call

**We recommend the 1.53" I.D. gasket for use with these flanges.

1
Flanges, Fittings, & Components

► Standard Flanges (304L SS)

1
Flanges, Fittings, & Components



■ 3 3/8" O.D. Flanges

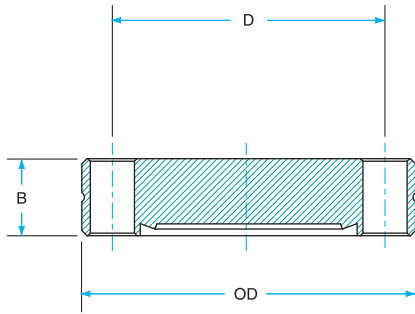


Figure 1 (Fixed Blank Flange)

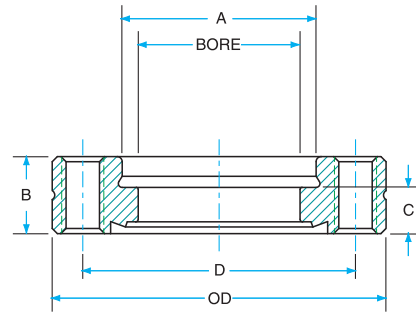


Figure 2 (Fixed Counter Bored Flange)

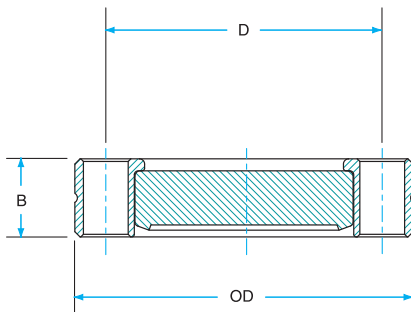


Figure 3 (Rotatable Blank Flange)

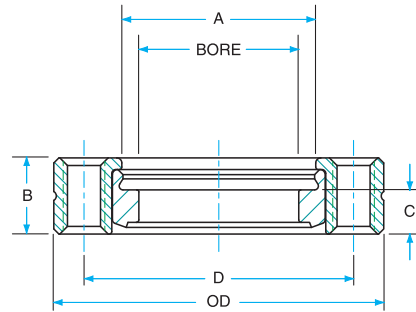


Figure 4 (Rotatable Counter Bored Flange)

NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

► Standard Flanges (304L SS)

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	0.625	—	2.850	8	0.332	—	1½	F0337X000N	Call
Fixed	2	1.435	1.510	0.625	0.225	2.850	8	0.332	—	1	F0337X150N	Call
Fixed	2	1.935	2.010	0.625	0.225	2.850	8	0.332	—	1	F0337X200N	Call
Fixed Tapped	1	Blank	—	0.625	—	2.850	8	—	5/16-24	1½	F0337X000NT	Call
Fixed Tapped	2	1.435	1.510	0.625	0.225	2.850	8	—	5/16-24	1	F0337X150NT	Call
Fixed Tapped	2	1.935	2.010	0.625	0.225	2.850	8	—	5/16-24	1	F0337X200NT	Call
Rotatable	3	Blank	—	0.680	—	2.850	8	0.332	—	1½	F0337X000R	Call
Rotatable	4	1.435	1.510	0.680	0.225	2.850	8	0.332	—	1	F0337X150R	Call
Rotatable	4	1.935	2.010	0.680	0.225	2.850	8	0.332	—	1	F0337X200R	Call
Rotatable Tapped	3	Blank	—	0.680	—	2.850	8	—	5/16-24	1½	F0337X000RT	Call
Rotatable Tapped	4	1.435	1.510	0.680	0.225	2.850	8	—	5/16-24	1	F0337X150RT	Call
Rotatable Tapped	4	1.935	2.010	0.680	0.225	2.850	8	—	5/16-24	1	F0337X200RT	Call

■ Gaskets & Hardware



Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC® Copper Gasket, ¼ Hard (10/pkg.)	10	•	•	•	•	½	GA-0337	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	¼	GA-0337V	Call
Silver-Plated Copper Gasket	1	•	•	•	•	½	GA-0337NSP	Call
Annealed Copper Gasket	5	•	•	•	•	½	VZCUA54	Call
Bolt & Nut Set, 5/16-24 x 1¼"	25	•	•	•	•	2	HBS31224175	Call
Plate Nut & Bolt Set, 5/16-24 x 1¼"	16	•	•	•	•	2	PNB-0337	Call
Bolt Kit, 5/16-24 x 1¼"	25	•	•	•	•	2	HBK31224125	Call
Flange Cap	1	•	•	•	•	¼	F0337CAP	Call

1985

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► Standard Flanges (304L SS)

1
Flanges, Fittings, & Components



■ 4 1/2" or 114 mm O.D. Flanges

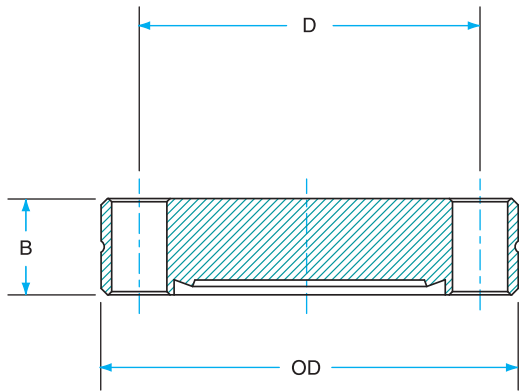


Figure 1 (Fixed Blank Flange)

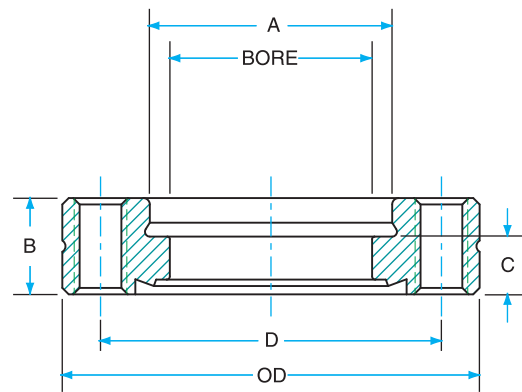


Figure 2 (Fixed Counter Bored Flange)

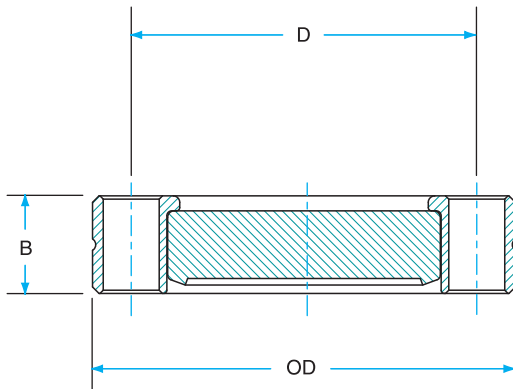


Figure 3 (Rotatable Blank Flange)

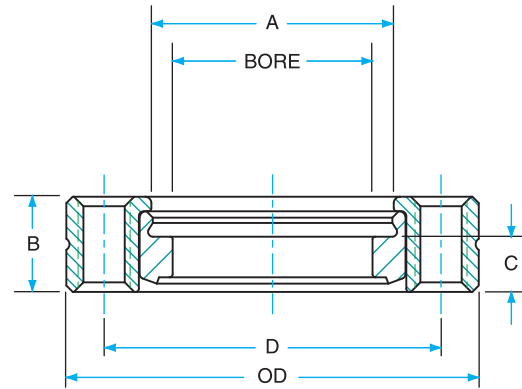


Figure 4 (Rotatable Counter Bored Flange)

NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

► Standard Flanges (304L SS)

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	0.680	—	3.628	8	0.332	—	3	F0450X000N	Call
Fixed	2	1.435	1.510	0.680	0.375	3.628	8	0.332	—	2½	F0450X150N	Call
Fixed	2	1.935	2.010	0.680	0.375	3.628	8	0.332	—	2½	F0450X200N	Call
Fixed	2	2.435	2.510	0.680	0.375	3.628	8	0.332	—	2½	F0450X250N	Call
Fixed Tapped	1	Blank	—	0.680	—	3.628	8	—	5/16-24	3	F0450X000NT	Call
Fixed Tapped	2	1.435	1.510	0.680	0.375	3.628	8	—	5/16-24	2½	F0450X150NT	Call
Fixed Tapped	2	1.935	2.010	0.680	0.375	3.628	8	—	5/16-24	2½	F0450X200NT	Call
Fixed Tapped	2	2.435	2.510	0.680	0.375	3.628	8	—	5/16-24	2½	F0450X250NT	Call
Rotatable	3	Blank	—	0.750	—	3.628	8	0.332	—	3	F0450X000R	Call
Rotatable	4	1.435	1.510	0.750	0.375	3.628	8	0.332	—	2½	F0450X150R	Call
Rotatable	4	1.935	2.010	0.750	0.375	3.628	8	0.332	—	2½	F0450X200R	Call
Rotatable	4	2.435	2.510	0.750	0.375	3.628	8	0.332	—	2½	F0450X250R	Call
Rotatable Tapped	3	Blank	—	0.750	—	3.628	8	—	5/16-24	3	F0450X000RT	Call
Rotatable Tapped	4	1.435	1.510	0.750	0.375	3.628	8	—	5/16-24	2½	F0450X150RT	Call
Rotatable Tapped	4	1.935	2.010	0.750	0.375	3.628	8	—	5/16-24	2½	F0450X200RT	Call
Rotatable Tapped	4	2.435	2.510	0.750	0.375	3.628	8	—	5/16-24	2½	F0450X250RT	Call

Flanges: Metric Dimensions

Type	Figure	Bore	Dimensions (mm)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	17.2	—	92.2	8	8.4	—	3	F0450X000N	Call
Fixed	2	61.8	63.5	17.2	9.5	92.2	8	8.4	—	2½	F0450X250N	Call
Fixed	2	68.1	70.5	17.2	9.5	92.2	8	8.4	—	2½	F0450X275N	Call
Fixed Tapped	1	Blank	—	17.2	—	92.2	8	—	M8	3	F0450X000NM	Call
Fixed Tapped	2	61.8	63.5	17.2	9.5	92.2	8	—	M8	2½	F0450X250NM	Call
Fixed Tapped	2	68.1	70.5	17.2	9.5	92.2	8	—	M8	2½	F0450X275NM	Call
Rotatable	3	Blank	—	19.1	—	92.2	8	8.4	—	3	F0450X000R	Call
Rotatable	4	61.8	63.5	19.1	9.5	92.2	8	8.4	—	2½	F0450X250R	Call
Rotatable	4	68.1	70.5	19.1	9.5	92.2	8	8.4	—	2½	F0450X275R	Call
Rotatable Tapped	3	Blank	—	19.1	—	92.2	8	—	M8	3	F0450X000RM	Call
Rotatable Tapped	4	61.8	63.5	19.1	9.5	92.2	8	—	M8	2½	F0450X250RM	Call
Rotatable Tapped	4	68.1	70.5	19.1	9.5	92.2	8	—	M8	2½	F0450X275RM	Call

■ Gaskets & Hardware



Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC® Copper Gasket, ¼ Hard	10	•	•	•	•	½	GA-0450	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	¼	GA-0337V	Call
Fluorocarbon Gasket (Molded)	2	•	•	•	•	¼	VZVIT64	Call
Silver-Plated Copper Gasket	1	•	•	•	•	½	GA-0450NSP	Call
Annealed Copper Gasket	5	•	•	•	•	½	VZCUA64	Call
Bolt & Nut Set 5/16-24 x 2"	25	•	•	•	•	2	HBS31224200	Call
Plate Nut & Bolt Set 5/16-24 x 2"	16	•	•	•	•	2	PNB-0450	Call
Bolt Kit 5/16-24 x 1¼"	25	•	•	•	•	2	HBK31224125	Call
Bolt & Nut Set M8 x 45 mm	25	•	•	•	•	2	HBSM8X45	Call
Plate Nut & Bolt Set M8 x 45 mm	1 fig	•	•	•	•	2	VZNPS4	Call
Bolt Kit M 8 x 35 mm	25	•	•	•	•	2	HBKM8X35	Call
Flange Cap	1	•	•	•	•	¼	F0450CAP	Call

1 Flanges, Fittings, & Components

Standard Flanges (304L SS)

1
Flanges, Fittings, & Components



■ 4⁵/₈" O.D. Flanges

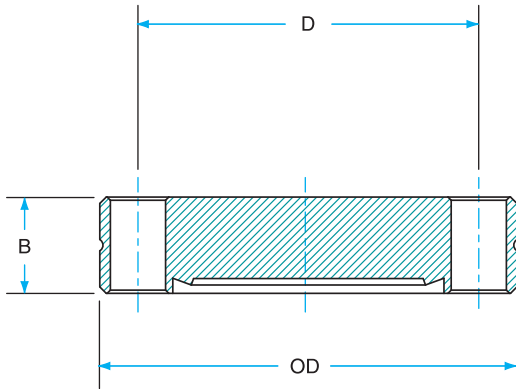


Figure 1 (Fixed Blank Flange)

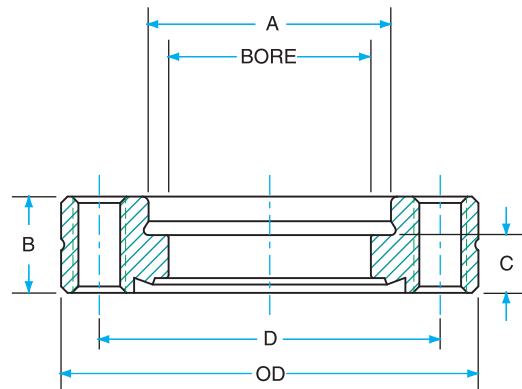


Figure 2 (Fixed Counter Bored Flange)

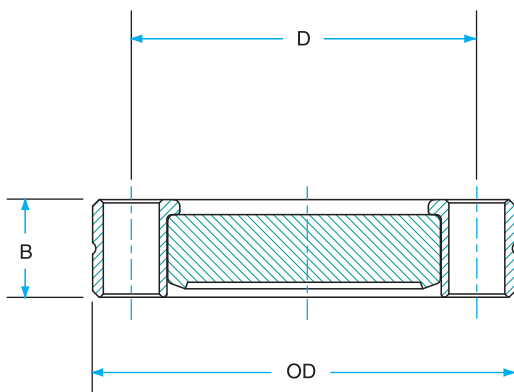


Figure 3 (Rotatable Blank Flange)

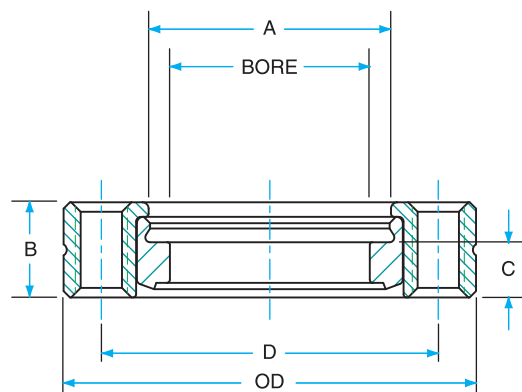


Figure 4 (Rotatable Counter Bored Flange)

NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

► Standard Flanges (304L SS)

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole		Weight (lbs.)	Part No.	Price
			A	B	C	D		Diameter	Thread			
Fixed	1	Blank	—	0.750	—	4.030	10	0.332	—	3½	F0462X000N	Call
Fixed	2	2.435	2.510	0.750	0.375	4.030	10	0.332	—	2½	F0462X250N	Call
Fixed	2	2.935	3.010	0.750	0.375	4.030	10	0.332	—	2½	F0462X300N	Call
Fixed Tapped	1	Blank	—	0.750	—	4.030	10	—	5/16-24	3½	F0462X000NT	Call
Fixed Tapped	2	2.435	2.510	0.750	0.375	4.030	10	—	5/16-24	2½	F0462X250NT	Call
Fixed Tapped	2	2.935	3.010	0.750	0.375	4.030	10	—	5/16-24	2½	F0462X300NT	Call
Rotatable	3	Blank	—	0.810	—	4.030	10	0.332	—	3½	F0462X000R	Call
Rotatable	4	2.435	2.510	0.810	0.375	4.030	10	0.332	—	2½	F0462X250R	Call
Rotatable	4	2.935	3.010	0.810	0.375	4.030	10	0.332	—	2½	F0462X300R	Call
Rotatable Tapped	3	Blank	—	0.810	—	4.030	10	—	5/16-24	3½	F0462X000RT	Call
Rotatable Tapped	4	2.435	2.510	0.810	0.375	4.030	10	—	5/16-24	2½	F0462X250RT	Call
Rotatable Tapped	4	2.935	3.010	0.810	0.375	4.030	10	—	5/16-24	2½	F0462X300RT	Call

■ Gaskets & Hardware



Description	Per Package					Weight (lbs.)	Part No.	Price
		Fixed	Fixed Tapped	Rotatable	Rotatable Tapped			
OFHC® Copper Gasket, ¼ Hard	10	•	•	•	•	1	GA-0462	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	¼	GA-0462V	Call
Silver-Plated Copper Gasket	1	•	•	•	•	1	GA-0462NSP	Call
Annealed Copper Gasket	5	•	•	•	•	1	VZCUA76	Call
Bolt & Nut Set, 5/16-24 x 2"	25	•				2	HBS31224200	Call
Bolt Kit, 5/16-24 x 1¼"	25		•		•	2	HBK31224125	Call
Bolt & Nut Set, 5/16-24 x 2¼"	25			•		2	HBS31224225	Call
Flange Cap	1	•	•	•	•	¼	F0462CAP	Call

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1 Flanges, Fittings, & Components

Standard Flanges (304L SS)

1 Flanges, Fittings, & Components



■ 6" or 152 mm O.D. Flanges

Figure 1 (Fixed Blank Flange)

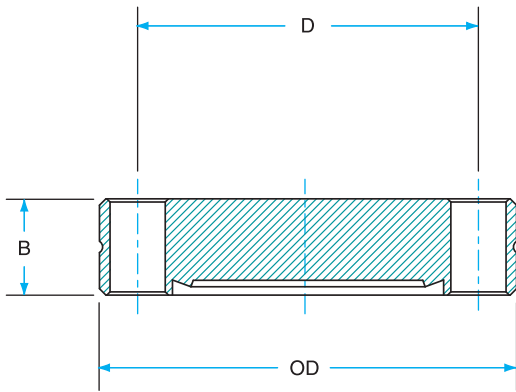


Figure 2 (Fixed Counter Bored Flange)

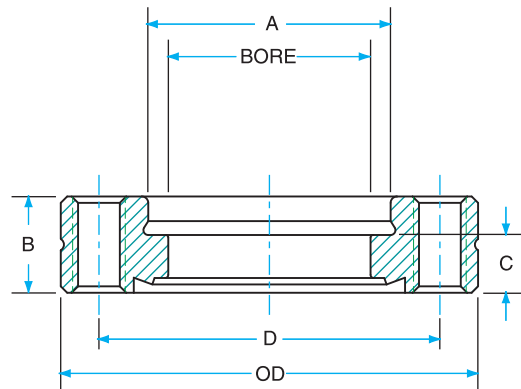


Figure 3 (Rotatable Blank Flange)

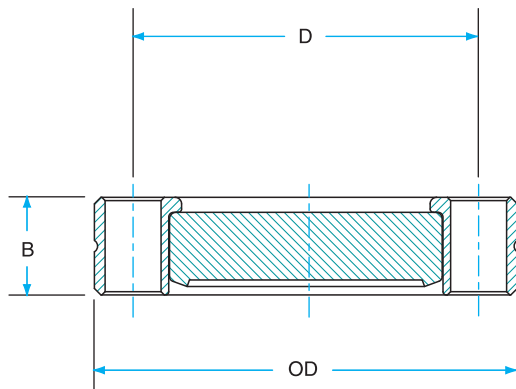
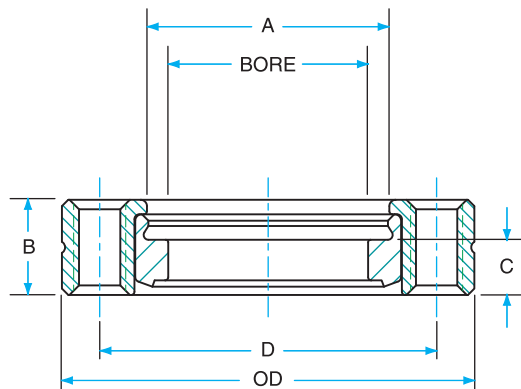


Figure 4 (Rotatable Counter Bored Flange)



NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

► Standard Flanges (304L SS)

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole		Weight (lbs.)	Part No.	Price
			A	B	C	D		Diameter	Thread			
Fixed	1	Blank	—	0.780	—	5.128	16	0.332	—	5½	F0600X000N	Call
Fixed	2	3.917	4.010	0.780	0.437	5.128	16	0.332	—	3½	F0600X400N	Call
Fixed Tapped	1	Blank	—	0.780	—	5.128	16	—	5/16-24	5½	F0600X000NT	Call
Fixed Tapped	2	3.917	4.010	0.780	0.437	5.128	16	—	5/16-24	3½	F0600X400NT	Call
Rotatable	3	Blank	—	0.840	—	5.128	16	0.332	—	5½	F0600X000R	Call
Rotatable	4	3.917	4.010	0.840	0.437	5.128	16	0.332	—	3½	F0600X400R	Call
Rotatable Tapped	3	Blank	—	0.840	—	5.128	16	—	5/16-24	5½	F0600X000RT	Call
Rotatable Tapped	4	3.917	4.010	0.840	0.437	5.128	16	—	5/16-24	3½	F0600X400RT	Call

Flanges: Metric Dimensions

Type	Figure	Bore	Dimensions (mm)				Bolts	Hole		Weight (lbs.)	Part No.	Price
			A	B	C	D		Diameter	Thread			
Fixed	1	Blank	—	19.8	—	130.3	16	8.4	—	5½	F0600X000N	Call
Fixed	2	99.5	101.6	19.8	11.1	130.3	16	8.4	—	3½	F0600X400N	Call
Fixed	2	102.6	104.5	19.8	11.1	130.3	16	8.4	—	3½	F0600X412N	Call
Fixed Tapped	1	Blank	—	19.8	—	130.3	16	—	M8	5½	F0600X000NM	Call
Fixed Tapped	2	99.5	101.6	19.8	11.1	130.3	16	—	M8	3½	F0600X400NM	Call
Fixed Tapped	2	102.6	104.5	19.8	11.1	130.3	16	—	M8	3½	F0600X412NM	Call
Rotatable	3	Blank	—	21.3	—	130.3	16	8.4	—	5½	F0600X000R	Call
Rotatable	4	99.5	101.6	21.3	11.1	130.3	16	8.4	—	3½	F0600X400R	Call
Rotatable	4	102.6	104.5	21.3	11.1	130.3	16	8.4	—	3½	F0600X412R	Call
Rotatable Tapped	3	Blank	—	21.3	—	130.3	16	—	M8	5½	F0600X000RM	Call
Rotatable Tapped	4	99.5	101.6	21.3	11.1	130.3	16	—	M8	3½	F0600X400RM	Call
Rotatable Tapped	4	102.6	104.5	21.3	11.1	130.3	16	—	M8	3½	F0600X412RM	Call

■ Gaskets & Hardware—Standard and Metric

Description	Per Package	Fixed			Rotatable Tapped	Weight (lbs.)	Part No.	Price
		Fixed	Tapped	Rotatable				
OFHC® Copper Gasket, ¼ Hard	10	•	•	•	1½	GA-0600	Call	
Fluorocarbon Gasket (Flat)	1	•	•	•	¼	GA-0600V	Call	
Fluorocarbon Gasket (Molded)	2	•	•	•	¼	VZVIT100	Call	
Annealed Copper Gasket	5	•	•	•	1½	VZCUA100	Call	
Silver-Plated Copper Gasket	1	•	•	•	1½	GA-0600NSP	Call	
Bolt & Nut Set, 5/16-24 x 2¼"	25	•	•	•	2	HBS31224225	Call	
Plate Nut & Bolt Set, 5/16-24 x 2¼"	16	•	•	•	2	PNB-0600	Call	
Bolt Kit, 5/16-24 x 1¼"	25	•	•	•	2	HBK31224125	Call	
Bolt & Nut Set, M8 x 50 mm	25	•	•	•	2	HBSM8X50	Call	
Bolt Kit, M8 x 35 mm	25	•	•	•	2	HBKM8X35	Call	
Flange Cap	1	•	•	•	½	F0600CAP	Call	

1 Flanges, Fittings, & Components

Standard Flanges (304L SS)

1

Flanges, Fittings, & Components



6 3/4" O.D. Flanges

Figure 1 (Fixed Blank Flange)

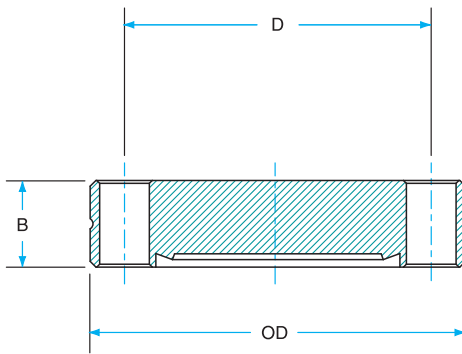


Figure 2 (Fixed Counter Bored Flange)

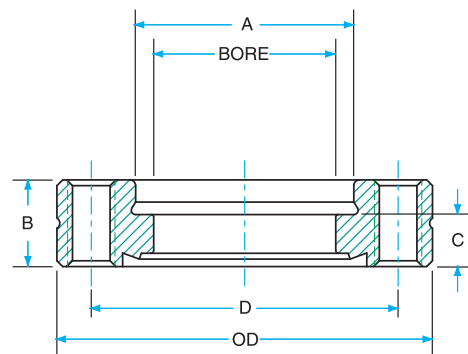


Figure 3 (Rotatable Blank Flange)

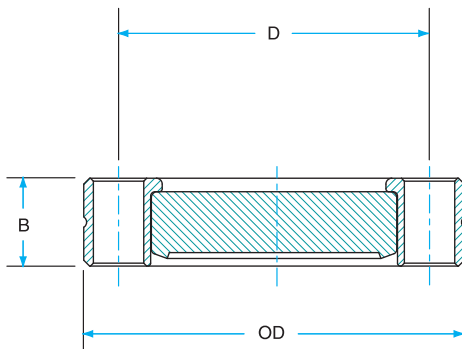
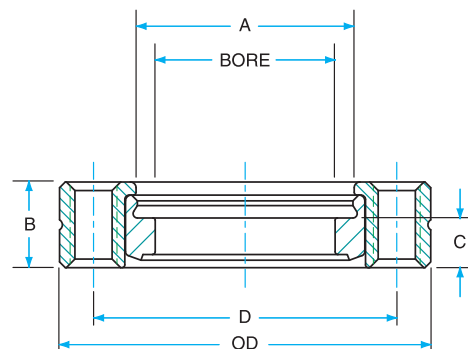


Figure 4 (Rotatable Counter Bored Flange)



NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

► Standard Flanges (304L SS)

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole		Weight (lbs.)	Part No.	Price
			A	B	C	D		Diameter	Thread			
Fixed	1	Blank	—	0.840	—	5.969	18	0.332	—	8	F0675X000N	Call
Fixed	2	3.917	4.010	0.840	0.460	5.969	18	0.332	—	5	F0675X400N	Call
Fixed	2	4.917	5.010	0.840	0.460	5.969	18	0.332	—	3½	F0675X500N	Call
Fixed Tapped	1	Blank	—	0.840	—	5.969	18	—	5/16-24	8	F0675X000NT	Call
Fixed Tapped	2	3.917	4.010	0.840	0.460	5.969	18	—	5/16-24	5	F0675X400NT	Call
Fixed Tapped	2	4.917	5.010	0.840	0.460	5.969	18	—	5/16-24	3½	F0675X500NT	Call
Rotatable	3	Blank	—	0.840	—	5.969	18	0.332	—	8	F0675X000R	Call
Rotatable	4	3.917	4.010	0.840	0.460	5.969	18	0.332	—	5	F0675X400R	Call
Rotatable	4	4.917	5.010	0.840	0.460	5.969	18	0.332	—	3½	F0675X500R	Call
Rotatable Tapped	3	Blank	—	0.840	—	5.969	18	—	5/16-24	8	F0675X000RT	Call
Rotatable Tapped	4	3.917	4.010	0.840	0.460	5.969	18	—	5/16-24	5	F0675X400RT	Call
Rotatable Tapped	4	4.917	5.010	0.840	0.460	5.969	18	—	5/16-24	3½	F0675X500RT	Call

1 Flanges, Fittings, & Components

■ Gaskets & Hardware



Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC® Copper Gasket, 1/4" Hard	10	•	•	•	•	1½	GA-0675	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	¼	GA-0675V	Call
Silver-Plated Copper Gasket, 1/4"	1	•	•	•	•	1½	GA-0675NSP	Call
Bolt & Nut Set, 5/16-24 x 2 1/4"	25	•		•		2	HBS31224225	Call
Bolt Kit, 5/16-24 x 1 1/2"	25		•		•	2	HBK31224150	Call
Flange Cap	1	•	•	•	•	¼	F0675CAP	Call

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► Standard Flanges (304L SS)

1

Flanges, Fittings, & Components



■ 8" or 203 mm O.D. Flanges

Figure 1 (Fixed Blank Flange)

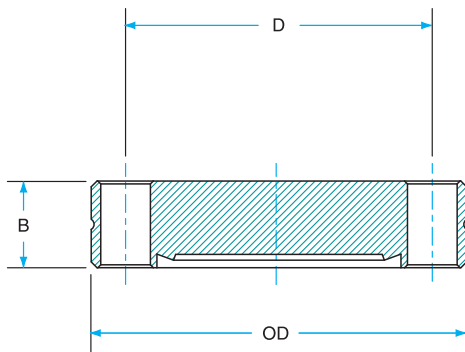


Figure 2 (Fixed Counter Bored Flange)

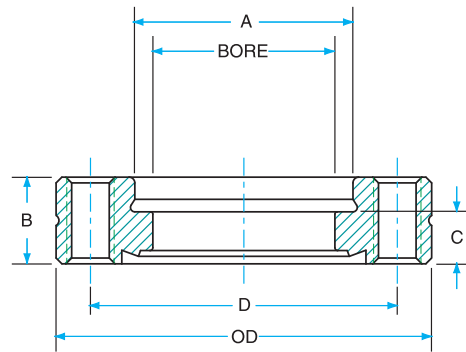


Figure 3 (Rotatable Blank Flange)

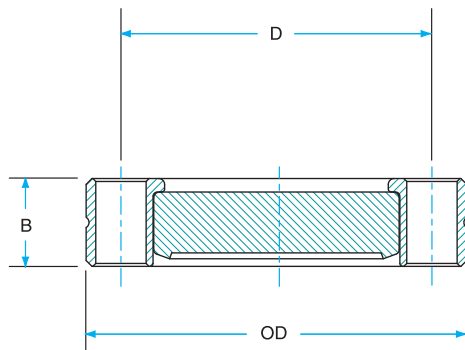
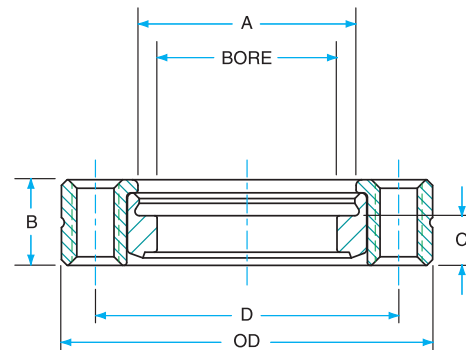


Figure 4 (Rotatable Counter Bored Flange)



NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

► Standard Flanges (304L SS)

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	0.880	—	7.128	20	0.332	—	12	F0800X000N	Call
Fixed	2	5.917	6.020	0.880	0.500	7.128	20	0.332	—	5½	F0800X600N	Call
Fixed Tapped	1	Blank	—	0.880	—	7.128	20	—	5/16-24	12	F0800X000NT	Call
Fixed Tapped	2	5.917	6.020	0.880	0.500	7.128	20	—	5/16-24	5½	F0800X600NT	Call
Rotatable	3	Blank	—	0.940	—	7.128	20	0.332	—	12	F0800X000R	Call
Rotatable	4	5.917	6.020	0.940	0.500	7.128	20	0.332	—	5½	F0800X600R	Call
Rotatable Tapped	3	Blank	—	0.940	—	7.128	20	—	5/16-24	12	F0800X000RT	Call
Rotatable Tapped	4	5.917	6.020	0.940	0.500	7.128	20	—	5/16-24	5½	F0800X600RT	Call

Flanges: Metric Dimensions

Type	Figure	Bore	Dimensions (mm)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	22.4	—	181.1	20	8.4	—	12	F0800X000N	Call
Fixed	2	150.2	152.4	22.4	12.7	181.1	20	8.4	—	5½	F0800X600N	Call
Fixed	2	152.5	154.5	22.4	12.7	181.1	20	8.4	—	5½	F0800X608N	Call
Fixed Tapped	1	Blank	—	22.4	—	181.1	20	—	M8	12	F0800X000NM	Call
Fixed Tapped	2	150.2	152.9	22.4	12.7	181.1	20	—	M8	5½	F0800X600NM	Call
Fixed Tapped	2	152.5	154.5	22.4	12.7	181.1	20	—	M8	5½	F0800X608NM	Call
Rotatable	3	Blank	—	23.9	—	181.1	20	8.4	—	12	F0800X000R	Call
Rotatable	4	150.2	152.4	23.9	12.7	181.1	20	8.4	—	5½	F0800X600R	Call
Rotatable	4	152.5	154.5	23.9	12.7	181.1	20	8.4	—	5½	F0800X608R	Call
Rotatable Tapped	3	Blank	—	23.9	—	181.1	20	—	M8	12	F0800X000RM	Call
Rotatable Tapped	4	150.2	152.4	23.9	12.7	181.1	20	—	M8	5½	F0800X600RM	Call
Rotatable Tapped	4	152.5	154.5	23.9	12.7	181.1	20	—	M8	5½	F0800X608RM	Call

1 Flanges, Fittings, & Components

■ Gaskets & Hardware— Standard and Metric



Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC® Copper Gasket, ¼ Hard	10	•	•	•	•	2	GA-0800	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	¼	GA-0800V	Call
Fluorocarbon Gasket (Molded)	2	•	•	•	•	¼	VZVIT150	Call
Annealed Copper Gasket	5	•	•	•	•	2	VZCUA150	Call
Silver-Plated Copper Gasket	1	•	•	•	•	2	GA-0800NSP	Call
Bolt & Nut Set, 5/16-24 x 2¼"	25	•	•	•	•	2	HBS31224225	Call
Plate Nut & Bolt Set, 5/16-24 x 2¼"	20	•	•	•	•	2	PNB-0800	Call
Bolt Kit, 5/16-24 x 1¾"	25	•	•	•	•	2	HBK31224175	Call
Bolt & Nut Set, M8 x 60 mm	25	•	•	•	•	2	HBSM8X60	Call
Bolt Kit, M8 x 45 mm	25	•	•	•	•	2	HBKM8X45	Call
Flange Cap	1	•	•	•	•	½	F0800CAP	Call

Standard Flanges (304L SS)

1

Flanges, Fittings, & Components



10" or 254 mm O.D. Flanges

Figure 1 (Fixed Blank Flange)

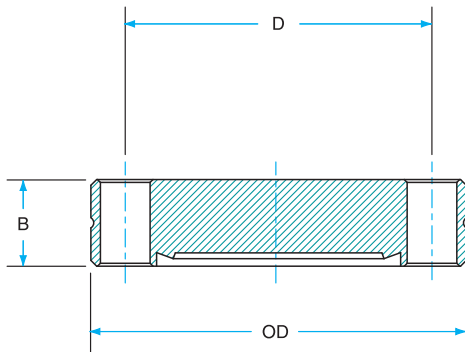


Figure 2 (Fixed Counter Bored Flange)

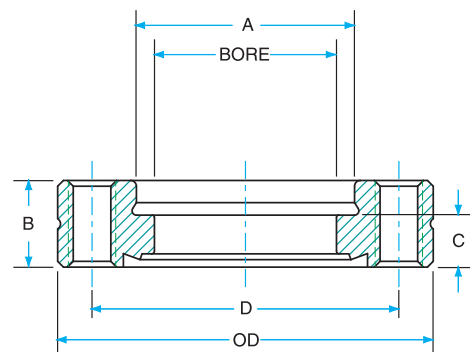


Figure 3 (Rotatable Blank Flange)

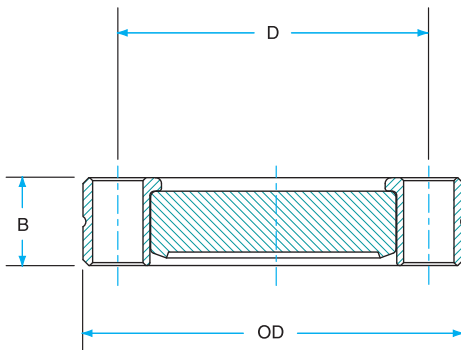
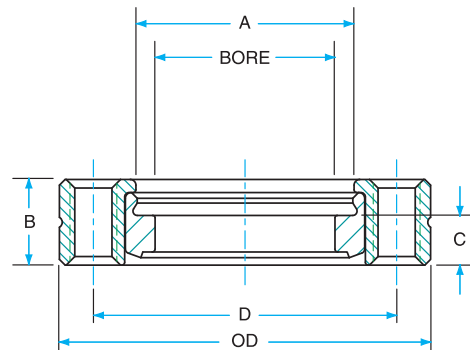


Figure 4 (Rotatable Counter Bored Flange)



NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

► Standard Flanges (304L SS)

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole		Weight (lbs.)	Part No.	Price
			A	B	C	D		Diameter	Thread			
Fixed	1	Blank	—	0.970	—	9.128	24	0.332	—	20	F1000X000N	Call
Fixed	2	7.891	8.020	0.970	0.500	9.128	24	0.332	—	7½	F1000X800N	Call
Fixed Tapped	1	Blank	—	0.970	—	9.128	24	—	5/16-24	20	F1000X000NT	Call
Fixed Tapped	2	7.891	8.020	0.970	0.500	9.128	24	—	5/16-24	7½	F1000X800NT	Call
Rotatable	3	Blank	—	0.970	—	9.128	24	0.332	—	20	F1000X000R	Call
Rotatable	4	7.891	8.020	0.970	0.500	9.128	24	0.332	—	7½	F1000X800R	Call
Rotatable Tapped	3	Blank	—	0.970	—	9.128	24	—	5/16-24	20	F1000X000RT	Call
Rotatable Tapped	4	7.891	8.020	0.970	0.500	9.128	24	—	5/16-24	7½	F1000X800RT	Call

Flanges: Metric Dimensions

Type	Figure	Bore	Dimensions (mm)				Bolts	Hole		Weight (lbs.)	Part No.	Price
			A	B	C	D		Diameter	Thread			
Fixed	1	Blank	—	24.6	—	231.9	24	8.4	—	20	F1000X000N	Call
Fixed	2	200	203.2	24.6	12.7	231.9	24	8.4	—	7½	F1000X800N	Call
Fixed	2	204	206.6	24.6	12.7	231.9	24	8.4	—	7½	F1000X813N	Call
Fixed Tapped	1	Blank	—	24.6	—	231.9	24	—	M8	20	F1000X000NM	Call
Fixed Tapped	2	200	203.2	24.6	12.7	231.9	24	—	M8	7½	F1000X800NM	Call
Fixed Tapped	2	204	206.6	24.6	12.7	231.9	24	—	M8	7½	F1000X813NM	Call
Rotatable	3	Blank	—	24.6	—	231.9	24	8.4	—	20	F1000X000R	Call
Rotatable	4	200	203.2	24.6	12.7	231.9	24	8.4	—	7½	F1000X800R	Call
Rotatable	4	204	206.6	24.6	12.7	231.9	24	8.4	—	7½	F1000X813R	Call
Rotatable Tapped	3	Blank	—	24.6	—	231.9	24	—	M8	20	F1000X000RM	Call
Rotatable Tapped	4	200	203.2	24.6	12.7	231.9	24	—	M8	7½	F1000X800RM	Call
Rotatable Tapped	4	204	206.6	24.6	12.7	231.9	24	—	M8	7½	F1000X813RM	Call

■ Gaskets & Hardware—Standard and Metric

Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
Fluorocarbon Gasket (Flat)	1	•	•	•	•	¼	GA-1000V	Call
Fluorocarbon Gasket (Molded)	2	•	•	•	•	½	VZVIT200	Call
Annealed Copper Gasket	5	•	•	•	•	3	VZCUA200	Call
Silver-Plated Copper Gasket	1	•	•	•	•	3	GA-1000NSP	Call
Bolt & Nut Set, 5/16-24 x 2½"	25	•	•	•	•	2	HBS31224250	Call
Plate Nut & Bolt Set, 5/16-24 x 2¼"	24	•	•	•	•	2	PNB-1000	Call
Bolt Kit, 5/16-24 x 1¾"	25	•	•	•	•	2	HBK31224175	Call
Bolt & Nut Set, M8 x 60 mm	25	•	•	•	•	2	HBSM8X60	Call
Bolt Kit, M8 x 45 mm	25	•	•	•	•	2	HBKM8X45	Call
Flange Cap	1	•	•	•	•	½	F1000CAP	Call

Standard Flanges (304L SS)

1
Flanges, Fittings, & Components



■ 12" or 305 mm O.D. Flanges

Figure 1 (Fixed Blank Flange)

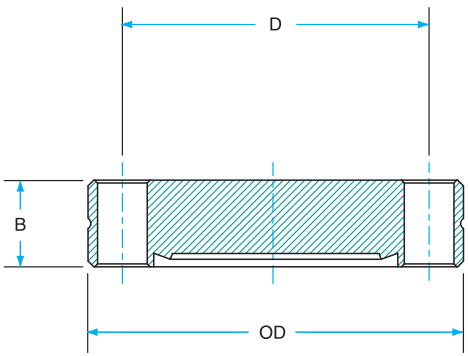


Figure 2 (Fixed Counter Bored Flange)

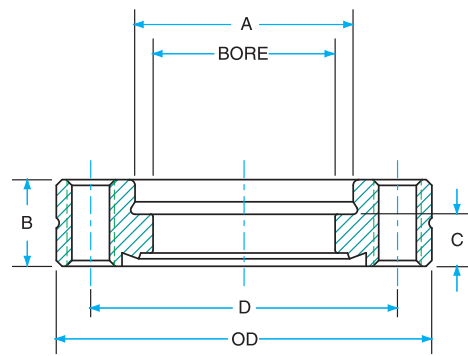


Figure 3 (Rotatable Blank Flange)

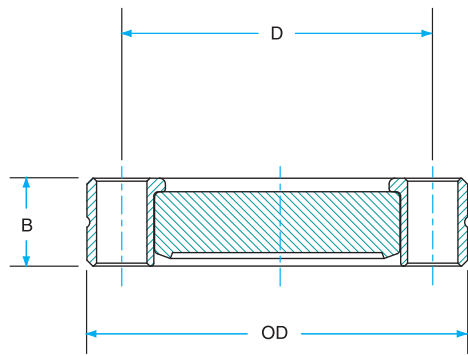
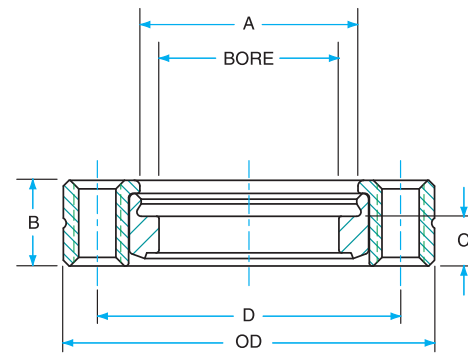


Figure 4 (Rotatable Counter Bored Flange)



NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

► Standard Flanges (304L SS)

1

Flanges, Fittings, & Components

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole		Weight (lbs.)	Part No.	Price
			A	B	C	D		Diameter	Thread			
Fixed	1	Blank	—	1.02	—	11.18	32	0.332	—	34	F1200X000N	Call
Fixed	2	9.88	10.02	1.02	0.500	11.18	32	0.332	—	10	F1200X1000N	Call
Fixed Tapped	1	Blank	—	1.02	—	11.18	32	—	5/16-24	34	F1200X000NT	Call
Fixed Tapped	2	9.88	10.02	1.02	0.500	11.18	32	—	5/16-24	10	F1200X1000NT	Call
Rotatable	3	Blank	—	1.02	—	11.18	32	0.332	—	34	F1200X000R	Call
Rotatable	4	9.88	10.02	1.02	0.500	11.18	32	0.332	—	10	F1200X1000R	Call
Rotatable Tapped	3	Blank	—	1.02	—	11.18	32	—	5/16-24	34	F1200X000RT	Call
Rotatable Tapped	4	9.88	10.02	1.02	0.500	11.18	32	—	5/16-24	10	F1200X1000RT	Call

Flanges: Metric Dimensions

Type	Figure	Bore	Dimensions (mm)				Bolts	Hole		Weight (lbs.)	Part No.	Price
			A	B	C	D		Diameter	Thread			
Fixed	1	Blank	—	25.9	—	284	32	8.4	—	34	F1200X000N	Call
Fixed	2	250.1	254.5	25.9	12.7	284	32	8.4	—	10	F1200X1000N	Call
Fixed Tapped	1	Blank	—	25.9	—	284	32	—	M8	34	F1200X000NM	Call
Fixed Tapped	2	250.1	254.5	25.9	12.7	284	32	—	M8	10	F1200X1000NM	Call
Rotatable	3	Blank	—	25.9	—	284	32	8.4	—	34	F1200X000R	Call
Rotatable	4	250.1	254.5	25.9	12.7	284	32	8.4	—	10	F1200X1000R	Call
Rotatable Tapped	3	Blank	—	25.9	—	284	32	—	M8	34	F1200X000RM	Call
Rotatable Tapped	4	250.1	254.5	25.9	12.7	284	32	—	M8	10	F1200X1000RM	Call

■ Gaskets & Hardware— Standard and Metric



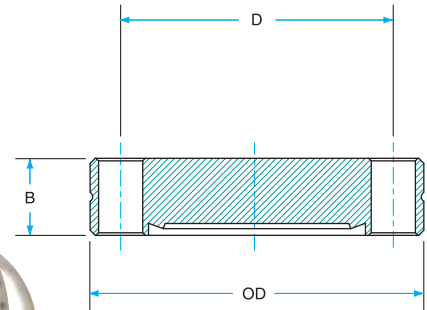
Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC® Copper Gasket, 1/4 Hard	1	•	•	•	•	1/2	GA-1200	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	1/4	GA-1200V	Call
Silver-Plated Copper Gasket	1	•	•	•	•	1/2	GA-1200NSP	Call
Bolt & Nut Set, 5/16-24 x 2 1/2"	32	•	•	•	•	2	HBT31224250	Call
Bolt Kit, 5/16-24 x 1 3/4"	32	•	•	•	•	2	HBL31224175	Call
Bolt & Nut Set, M8 x 65 mm	32	•	•	•	•	2	HBTM8X65	Call
Bolt Kit, M8 x 45 mm	32	•	•	•	•	2	HBLM8X45	Call

► Standard Flanges (304L SS)

1 Flanges, Fittings, & Components



Figure 1 (Fixed Blank Flange)



■ 13 1/4" O.D. Flanges

Figure 2 (Fixed Counter Bored Flange)

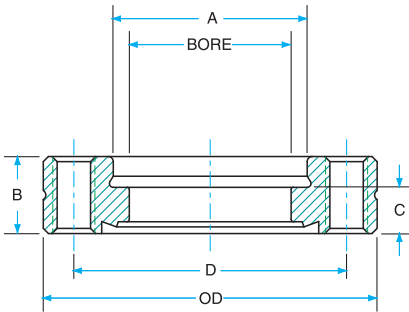


Figure 3 (Rotatable Blank Flange)

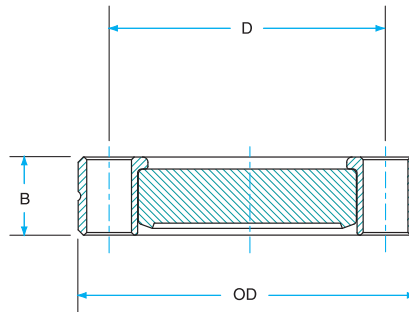
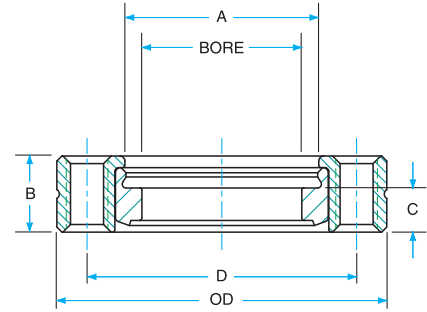


Figure 4 (Rotatable Counter Bored Flange)



NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole		Weight (lbs.)	Part No.	Price
			A	B	C	D		Diameter	Thread			
Fixed	1	Blank	—	1.120	—	12.060	30	0.413	—	41	F1325X000N	Call
Fixed	2	9.88	10.020	1.120	0.500	12.060	30	0.413	—	18	F1325X1000N	Call
Fixed	2	10.630	10.765	1.120	0.500	12.060	30	0.413	—	14	F1325X1075N	Call
Fixed Tapped	1	Blank	—	1.120	—	12.060	30	—	3/8-24	41	F1325X000NT	Call
Fixed Tapped	2	9.88	10.020	1.120	0.500	12.060	30	—	3/8-24	18	F1325X1000NT	Call
Fixed Tapped	2	10.630	10.765	1.120	0.500	12.060	30	—	3/8-24	14	F1325X1075NT	Call
Rotatable	3	Blank	—	1.120	—	12.060	30	0.413	—	41	F1325X000R	Call
Rotatable	4	9.88	10.020	1.120	0.500	12.060	30	0.413	—	18	F1325X1000R	Call
Rotatable	4	10.630	10.765	1.120	0.500	12.060	30	0.413	—	14	F1325X1075R	Call
Rotatable Tapped	3	Blank	—	1.120	—	12.060	30	—	3/8-24	41	F1325X000RT	Call
Rotatable Tapped	4	9.88	10.020	1.120	0.500	12.060	30	—	3/8-24	18	F1325X1000RT	Call
Rotatable Tapped	4	10.630	10.765	1.120	0.500	12.060	30	—	3/8-24	14	F1325X1075RT	Call

■ Gaskets & Hardware

Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC® Copper Gasket, 1/4 Hard	1	•	•	•	•	1/2	GA-1325	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	1/4	GA-1325V	Call
Silver-Plated Copper Gasket	1	•	•	•	•	1/2	GA-1325NSP	Call
Bolt & Nut Set, 3/8-24 x 3"	30	•	•	•	•	3	HBS37524300	Call
Bolt Kit, 3/8-24 x 2"	30	•	•	•	•	3	HBK37524200	Call

► Standard Flanges (304L SS)

■ 14" O.D. Flanges



NOTE: Use figures on page 1-34 as a reference.

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	1.120	—	12.810	30	0.413	—	46	F1400X000N	Call
Fixed	2	11.88	12.020	1.120	0.500	12.810	30	0.413	—	13	F1400X1200N	Call
Fixed Tapped	1	Blank	—	1.120	—	12.810	30	—	3/8-24	46	F1400X000NT	Call
Fixed Tapped	2	11.88	12.020	1.120	0.500	12.810	30	—	3/8-24	13	F1400X1200NT	Call
Rotatable	3	Blank	—	1.120	—	12.810	30	0.413	—	46	F1400X000R	Call
Rotatable	4	11.88	12.020	1.120	0.500	12.810	30	0.413	—	13	F1400X1200R	Call
Rotatable Tapped	3	Blank	—	1.120	—	12.810	30	—	3/8-24	46	F1400X000RT	Call
Rotatable Tapped	4	11.88	12.020	1.120	0.500	12.810	30	—	3/8-24	13	F1400X1200RT	Call

■ Gaskets & Hardware



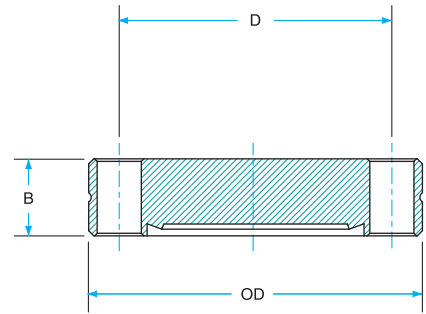
Description	Per Package	Fixed	Fixed Tapped	Rotatable	Rotatable Tapped	Weight (lbs.)	Part No.	Price
OFHC® Copper Gasket, 1/4 Hard	1	•	•	•	•	1	GA-1400	Call
Fluorocarbon Gasket (Flat)	1	•	•	•	•	1/4	GA-1400V	Call
Silver Plated Copper Gasket	1	•	•	•	•	1	GA-1400NSP	Call
Bolt & Nut Set, 3/8-24 x 3"	30	•		•		4	HBS37524300	Call
Bolt Kit, 3/8-24 x 2"	30			•	•	4	HBK37524200	Call

Standard Flanges (304L SS)

1 Flanges, Fittings, & Components



Figure 1 (Fixed Blank Flange)



16 1/2" O.D. Flanges

Figure 2 (Fixed Counter Bored Flange)

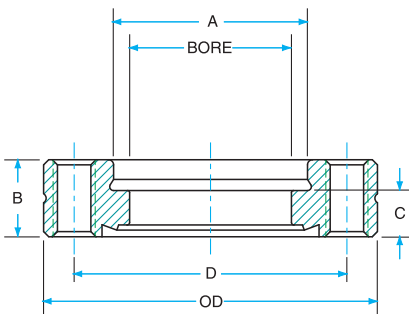


Figure 3 (Rotatable Blank Flange)

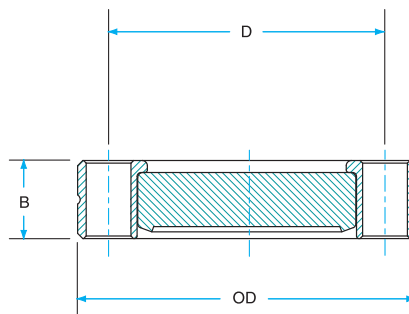
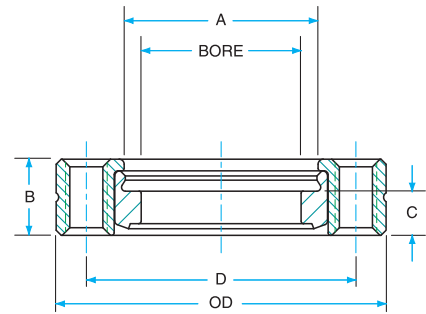


Figure 4 (Rotatable Counter Bored Flange)



NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

Flanges: Standard Dimensions

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	1.120	—	15.310	36	0.413	—	64	F1650X000N	Call
Fixed	2	13.88	14.020	1.120	0.500	15.310	36	0.413	—	18	F1650X1400N	Call
Fixed Tapped	1	Blank	—	1.120	—	15.310	36	—	3/8-24	64	F1650X000NT	Call
Fixed Tapped	2	13.88	14.020	1.120	0.500	15.310	36	—	3/8-24	18	F1650X1400NT	Call
Rotatable	3	Blank	—	1.120	—	15.310	36	0.413	—	64	F1650X000R	Call
Rotatable	4	13.88	14.020	1.120	0.500	15.310	36	0.413	—	18	F1650X1400R	Call
Rotatable Tapped	3	Blank	—	1.120	—	15.310	36	—	3/8-24	64	F1650X000RT	Call
Rotatable Tapped	4	13.88	14.020	1.120	0.500	15.310	36	—	3/8-24	18	F1650X1400RT	Call

Gaskets & Hardware



Description	Per Package	Fixed			Rotatable		Weight (lbs.)	Part No.	Price
		Fixed	Tapped	Rotatable	Tapped				
OFHC® Copper Gasket, 1/4 Hard	1	•	•	•	•	1	GA-1650	Call	
Fluorocarbon Gasket (Flat)	1	•	•	•	•	1/4	GA-1650V	Call	
Silver-Plated Copper Gasket	1	•	•	•	•	1	GA-1650NSP	Call	
Bolt & Nut Set, 3/8-24 x 3"	36	•	•	•	•	5	HBT37524300	Call	
Bolt Kit, 3/8-24 x 2"	36	•	•	•	•	5	HBL37524200	Call	

► Standard Flanges (Al)

IN THIS SECTION ►

Aluminum Flanges

- Lightweight and nonmagnetic
- Good thermal conductivity
- They are good for experiments exceptionally sensitive to any residual magnetic fields of the vacuum system
- Feature lower residual radioactivity than flanges based on ferrous materials
- Less affected by high doses of radiation
- Surface preparation and general properties of aluminum ensure that these flanges have extremely low outgassing rates
- All aluminum flange knife edges are coated with CrN for added hardness
- Must use aluminum gaskets and mounting hardware

Aluminum Flanges—Blank



Nominal O.D.	O.D. (mm)	Thickness (mm)	BCD (mm)	Holes	Part No.	Price
1 1/3"	34	8	27	6	F0133A000N	Call
2 3/4"	70	13	58.7	6	F0275A000N	Call
4 1/2"	114	18	92.1	8	F0450A000N	Call
6"	152	21	130.2	16	F0600A000N	Call
8"	203	22	181	20	F0800A000N	Call
10"	254	25	231.8	24	F1000A000N	Call

Aluminum Flanges—Weldable Neck



Nominal O.D.	O.D. (mm)	Bore (mm)	Wall (mm)	Thickness (mm)	Length (mm)	Part No.	Price
1 1/3"	34	14	3	8	50	F0133A055W	Call
2 3/4"	70	37	3	13	100	F0275A150W	Call
4 1/2"	114	64	3	18	100	F0450A250W	Call
6"	152	100	5	21	100	F0600A400W	Call
8"	203	150	5	22	100	F0800A600W	Call
10"	254	200	5	25	65	F1000A800W	Call

Aluminum Gaskets & Hardware

- Packaged in stacks of 10

Gasket Reference*	Bolt Set Reference*
GA-0133AL	HBSM4X22A
GA-0275AL	HBSM6X35A
GA-0450AL	HBSM8X48A
GA-0600AL	HBSM8X50A
GA-0800AL	HBSM8X55A
GA-1000AL	HBSM8X60A

Flange O.D.	Part No.	Price
1 1/3"	GA-0133AL	Call
2 3/4"	GA-0275AL	Call
3 3/8"	GA-0337AL	Call
4 1/2"	GA-0450AL	Call
4 5/8"	GA-0462AL	Call
6"	GA-0600AL	Call
8"	GA-0800AL	Call
10"	GA-1000AL	Call

NOTE: Gaskets may be ordered separately from flanges.

Standard Flanges (316LN SS)

1 Flanges, Fittings, & Components

IN THIS SECTION ➤

The 316LN Difference

What makes Type 316LN stainless steel flanges different from Type 304 stainless steel flanges?

- 316LN flanges are harder (170 Brinell Hardness) and their knife edge doesn't roll over as quickly, making them ideal for frequently dismantled chamber ports or critical beam-line flanges.
- 316LN is fired at 950° C nitrogen to purge hydrogen from the steel matrix, producing a much lower hydrogen partial pressure at ultimate vacuum.
- 316LN flanges are electroslag refined (ESR) to eliminate gross macro segregation and improve grain homogeneity.
- A 316LN system with 316LN flanges can be temperature cycled from -190° C through 450° C.
- For systems with heat-sensitive components, 316LN flanges reach the same base pressure as 304 flanges, but at lower bakeout temperatures.
- For applications susceptible to magnetic fields, 316LN is virtually ferrite-free and offers lower magnetic permeability (1.001, versus 1.03 for 304).
- 316L is also available. Contact us for prices and availability.

Figure 1 (Fixed Blank Flange)

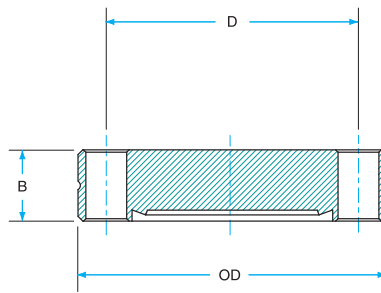


Figure 2 (Fixed Counter Bored Flange)

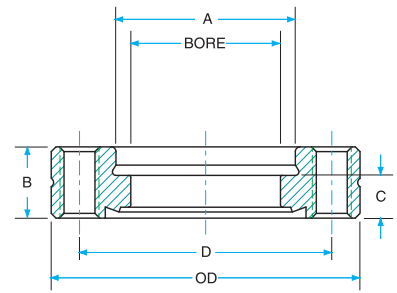


Figure 3 (Rotatable Blank Flange)

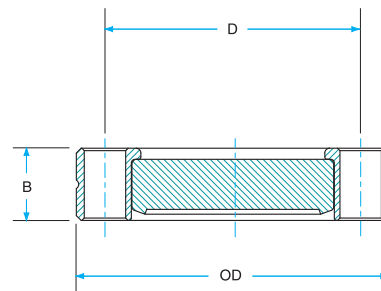
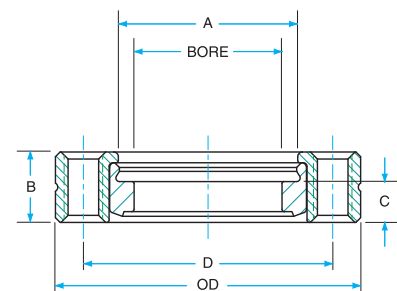


Figure 4 (Rotatable Counter Bored Flange)



NOTE: Figures on this page are for dimensional reference only. They do not show the correct thickness-to-diameter ratio.

1 1/3" O.D. Flanges

Type	Figure	Bore	Dimensions (in.)				Hole Diameter	Thread	Weight (lbs.)	Part No.	Price	
			A	B	C	D						
Fixed	1	Blank	—	0.285	—	1.062	6	0.17	—	1/4	F0133N000NLN	Call
Fixed	2	0.65	0.76	0.285	0.173	1.062	6	0.17	—	1/4	F0133N075NLN	Call
Fixed Tapped	1	Blank	—	0.285	—	1.062	6	—	8-32	1/4	F0133N000TLN	Call
Fixed Tapped	2	0.65	0.76	0.285	0.173	1.062	6	—	8-32	1/4	F0133N075TLN	Call
Rotatable	3	Blank	—	0.285	—	1.062	6	0.17	—	1/4	F0133N000RLN	Call
Rotatable Tapped	3	Blank	—	0.285	—	1.062	6	—	8-32	1/4	F0133N000RTL	Call

2 3/4" O.D. Flanges

Type	Figure	Bore	Dimensions (in.)				Hole Diameter	Thread	Weight (lbs.)	Part No.	Price	
			A	B	C	D						
Fixed	1	Blank	—	0.5	—	2.312	6	0.27	—	1	F0275N000NLN	Call
Fixed	2	0.96	1.01	0.5	0.209	2.312	6	0.27	—	3/4	F0275N100NLN	Call
Fixed	2	1.46	1.51	0.5	0.209	2.312	6	0.27	—	3/4	F0275N150NLN	Call
Fixed	2	1.58	1.63	0.5	0.209	2.312	6	0.27	—	3/4	F0275N162NLN	Call
Fixed	2	1.58	1.76	0.5	0.394	2.312	6	0.27	—	3/4	F0275N175NLN	Call
Fixed Tapped	1	Blank	—	0.5	—	2.312	6	—	1/4-28	1	F0275N000TLN	Call
Fixed Tapped	2	0.96	1.01	0.5	0.209	2.312	6	—	1/4-28	3/4	F0275N100TLN	Call
Fixed Tapped	2	1.46	1.51	0.5	0.209	2.312	6	—	1/4-28	3/4	F0275N150TLN	Call
Fixed Tapped	2	1.58	1.63	0.5	0.209	2.312	6	—	1/4-28	3/4	F0275N162TLN	Call
Fixed Tapped	2	1.58	1.76	0.5	0.394	2.312	6	—	1/4-28	3/4	F0275N175TLN	Call
Rotatable	3	Blank	—	0.5	—	2.312	6	0.27	—	1	F0275N000RLN	Call
Rotatable	4	0.96	1.01	0.5	0.209	2.312	6	0.27	—	3/4	F0275N100RLN	Call
Rotatable	4	1.46	1.51	0.5	0.209	2.312	6	0.27	—	3/4	F0275N150RLN	Call
Rotatable	4	1.58	1.63	0.5	0.209	2.312	6	0.27	—	3/4	F0275N162RLN	Call
Rotatable Tapped	3	Blank	—	0.5	—	2.312	6	—	1/4-28	1	F0275N000RTL	Call
Rotatable Tapped	4	0.96	1.01	0.5	0.209	2.312	6	—	1/4-28	3/4	F0275N100RTL	Call
Rotatable Tapped	4	1.46	1.51	0.5	0.209	2.312	6	—	1/4-28	3/4	F0275N150RTL	Call
Rotatable Tapped	4	1.58	1.63	0.5	0.209	2.312	6	—	1/4-28	3/4	F0275N162RTL	Call

➤ Standard Flanges (316LN SS)

1 Flanges, Fittings, & Components

■ 4 1/2" O.D. Flanges

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	0.68	—	3.63	8	0.34	—	3	F0450N000NLN	Call
Fixed	2	2.41	2.51	0.68	0.374	3.63	8	0.34	—	2 1/2	F0450N250NLN	Call
Fixed	2	2.68	2.76	0.68	0.374	3.63	8	0.34	—	2 1/2	F0450N275NLN	Call
Fixed Tapped	1	Blank	—	0.68	—	3.63	8	—	5/16-24	3	F0450N000TLN	Call
Fixed Tapped	2	2.41	2.51	0.68	0.374	3.63	8	—	5/16-24	2 1/2	F0450N250TLN	Call
Fixed Tapped	2	2.68	2.76	0.68	0.374	3.63	8	—	5/16-24	2 1/2	F0450N275TLN	Call
Rotatable	3	Blank	—	0.75	—	3.63	8	0.34	—	3	F0450N000RLN	Call
Rotatable	4	2.41	2.51	0.75	0.374	3.63	8	0.34	—	2 1/2	F0450N250RLN	Call
Rotatable	4	2.68	2.76	0.75	0.374	3.63	8	0.34	—	2 1/2	F0450N275RLN	Call
Rotatable Tapped	3	Blank	—	0.75	—	3.63	8	—	5/16-24	3	F0450N000RTL	Call
Rotatable Tapped	4	2.41	2.51	0.75	0.374	3.63	8	—	5/16-24	2 1/2	F0450N250RTL	Call

■ 6" O.D. Flanges

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	0.78	—	5.13	16	0.34	—	5 1/2	F0600N000NLN	Call
Fixed	2	3.91	4.01	0.78	0.437	5.13	16	0.34	—	3 1/2	F0600N400NLN	Call
Fixed Tapped	1	Blank	—	0.78	—	5.13	16	—	5/16-24	5 1/2	F0600N000TLN	Call
Fixed Tapped	2	3.91	4.01	0.78	0.437	5.13	16	—	5/16-24	3 1/2	F0600N400TLN	Call
Rotatable	3	Blank	—	0.84	—	5.13	16	0.34	—	5 1/2	F0600N000RLN	Call
Rotatable	4	3.91	4.01	0.84	0.437	5.13	16	0.34	—	3 1/2	F0600N400RLN	Call
Rotatable Tapped	3	Blank	—	0.84	—	5.13	16	—	5/16-24	5 1/2	F0600N000RTL	Call
Rotatable Tapped	4	3.91	4.01	0.84	0.437	5.13	16	—	5/16-24	3 1/2	F0600N400RTL	Call

■ 8" O.D. Flanges

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	0.88	—	7.13	20	0.34	—	12	F0800N000NLN	Call
Fixed	2	5.89	6.01	0.88	0.5	7.13	20	0.34	—	5 1/2	F0800N600NLN	Call
Fixed Tapped	1	Blank	—	0.88	—	7.13	20	—	5/16-24	12	F0800N000TLN	Call
Fixed Tapped	2	5.89	6.01	0.88	0.5	7.13	20	—	5/16-24	5 1/2	F0800N600TLN	Call
Rotatable	3	Blank	—	0.94	—	7.13	20	0.34	—	12	F0800N000RLN	Call
Rotatable	4	5.89	6.01	0.94	0.5	7.13	20	0.34	—	5 1/2	F0800N600RLN	Call
Rotatable Tapped	3	Blank	—	0.94	—	7.13	20	—	5/16-24	12	F0800N000RTL	Call
Rotatable Tapped	4	5.89	6.01	0.94	0.5	7.13	20	—	5/16-24	5 1/2	F0800N600RTL	Call

■ 10" O.D. Flanges

Type	Figure	Bore	Dimensions (in.)				Bolts	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	0.97	—	9.13	24	0.34	—	20	F1000N000NLN	Call
Fixed	2	7.89	8.01	0.97	0.5	9.13	24	0.34	—	7 1/2	F1000N800NLN	Call
Fixed Tapped	1	Blank	—	0.97	—	9.13	24	—	5/16-24	20	F1000N000TLN	Call
Fixed Tapped	2	7.89	8.01	0.97	0.5	9.13	24	—	5/16-24	7 1/2	F1000N800TLN	Call
Rotatable	3	Blank	—	0.97	—	9.13	24	0.34	—	20	F1000N000RLN	Call
Rotatable	4	7.89	8.01	0.97	0.5	9.13	24	0.34	—	7 1/2	F1000N800RLN	Call
Rotatable Tapped	3	Blank	—	0.97	—	9.13	24	—	5/16-24	20	F1000N000RTL	Call
Rotatable Tapped	4	7.89	8.01	0.97	0.5	9.13	24	—	5/16-24	7 1/2	F1000N800RTL	Call

► Standard Flanges (316LN SS)

1
Flanges, Fittings, & Components

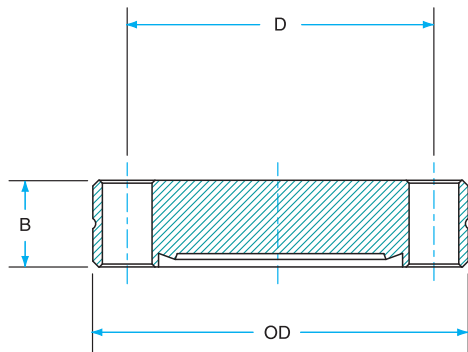


Figure 1
(Fixed Blank Flange)

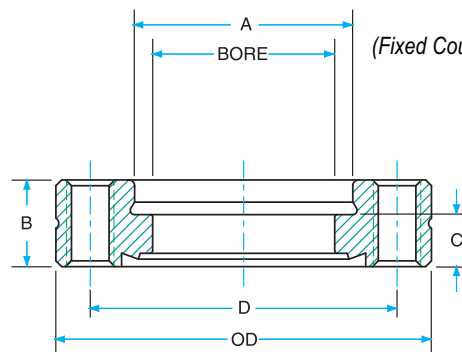


Figure 2
(Fixed Counter Bored Flange)

■ 12" O.D. Flanges

Type	Figure	Bore	Dimensions (in.)				Boles	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	1.02	—	11.18	32	0.34	—	34	F1200N000NLN	Call
Fixed	2	9.87	10.02	1.02	0.5	11.18	32	0.34	—	10	F1200N100NLN	Call
Fixed Tapped	1	Blank	—	1.02	—	11.18	32	—	5/16-24	34	F1200N000TLN	Call
Fixed Tapped	2	9.87	10.02	1.02	0.5	11.18	32	—	5/16-24	10	F1200N100TLN	Call

■ 13 1/4" O.D. Flanges

Type	Figure	Bore	Dimensions (in.)				Boles	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	1.12	—	12.06	30	0.39	—	41	F1325N000NLN	Call
Fixed	2	9.86	10.02	1.12	0.5	12.06	30	0.39	—	18	F1325N100NLN	Call
Fixed	2	10.63	12.02	1.12	0.5	12.06	30	0.39	—	41	F1325N120NLN	Call
Fixed Tapped	1	Blank	—	1.12	—	12.06	30	—	3/8-24	18	F1325N000TLN	Call
Fixed Tapped	2	9.86	10.02	1.12	0.5	12.06	30	—	3/8-24	41	F1325N100TLN	Call
Fixed Tapped	2	10.63	12.02	1.12	0.5	12.06	30	—	3/8-24	18	F1325N120TLN	Call

■ 14" O.D. Flanges

Type	Figure	Bore	Dimensions (in.)				Boles	Hole Diameter	Thread	Weight (lbs.)	Part No.	Price
			A	B	C	D						
Fixed	1	Blank	—	1.12	—	12.81	30	0.39	—	46	F1400N000NLN	Call
Fixed	2	11.75	12.02	1.12	0.5	12.81	30	0.39	—	13	F1400N120NLN	Call
Fixed Tapped	1	Blank	—	1.12	—	12.81	30	—	3/8-24	46	F1400N000TLN	Call
Fixed Tapped	2	11.75	12.02	1.12	0.5	12.81	30	—	3/8-24	13	F1400N120TLN	Call

➤ Reducer Flanges (304L SS)

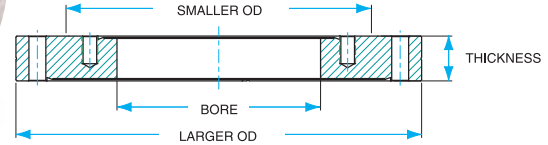
■ Zero-Length Reducer Flanges

Adapt two different-size knife-edge flanges that need to be bolted together.

- All small flanges have blind tapped bolt holes—most large flanges have through-holes (where the two flanges have similar diameters, both are tapped)
- Part numbers ending with the letter "T" represent double-tapped flanges
- The maximum I.D. of the small flange limits the bore



NOTE: Flanges listed below with the nominal O.D. of the smaller flange given first. (The combination's "true" O.D. is that of the larger flange.) The part number is the flange diameter expressed as decimal numbers, giving the large flange first.



Small Flange (O.D.)	Large Flange (O.D.)	Bore	Thickness	Flange Thread (Small/Large)	Weight (lbs.)	Part No.	Price
1 1/2"	2.125"	0.62"	0.47"	8-32 & 1/4-28*	1/2	RF212X133T	Call
1 1/2"	2.75"	0.62"	0.5"	8-32 & TH	3/4	RF275X133	Call
1 1/2"	3.375"	0.62"	0.62"	8-32 & TH	1 1/2	RF337X133	Call
1 1/2"	4.5"	0.62"	0.68"	8-32 & TH	3	RF450X133	Call
1 1/2"	4.625"	0.62"	0.75"	8-32 & TH	3 1/2	RF462X133	Call
1 1/2"	6"	0.62"	0.78"	8-32 & TH	6	RF600X133	Call
1 1/2"	6.75"	0.62"	0.84"	8-32 & TH	8	RF675X133	Call
1 1/2"	8"	0.62"	0.88"	8-32 & TH	12	RF800X133	Call
1 1/2"	10"	0.62"	0.97"	8-32 & TH	20	RF1000X133	Call
1 1/2"	13.25"	0.62"	1.12"	8-32 & TH	41	RF1325X133	Call
2 1/8"	2.75"	1"	0.5"	1/4-28 & 1/4-28*	3/4	RF275X212T	Call
2 1/8"	3.375"	1"	0.62"	1/4-28 & 5/16-24*	1 1/2	RF337X212T	Call
2 1/8"	4.5"	1"	0.68"	1/4-28 & TH	3	RF450X212	Call
2 1/8"	4.625"	1"	0.75"	1/4-28 & TH	3	RF462X212	Call
2 1/8"	6"	1"	0.78"	1/4-28 & TH	5 1/2	RF600X212	Call
2 1/8"	6.75"	1"	0.84"	1/4-28 & TH	8	RF675X212	Call
2 1/8"	8"	1"	0.88"	1/4-28 & TH	12	RF800X212	Call
2 1/8"	10"	1"	0.97"	1/4-28 & TH	20	RF1000X212	Call
2 1/8"	13.25"	1"	1.12"	1/4-28 & TH	41	RF1325X212	Call
2 3/4"	3.375"	1.5"	0.62"	1/4-28 & 5/16-24*	1	RF337X275T	Call
2 3/4"	4.5"	1.5"	0.68"	1/4-28 & TH	2 1/2	RF450X275	Call
2 3/4"	4.625"	1.5"	0.75"	1/4-28 & TH	3	RF462X275	Call
2 3/4"	6"	1.5"	0.78"	1/4-28 & TH	5 1/2	RF600X275	Call
2 3/4"	6.75"	1.5"	0.84"	1/4-28 & TH	7 1/2	RF675X275	Call
2 3/4"	8"	1.5"	0.88"	1/4-28 & TH	11 1/2	RF800X275	Call
2 3/4"	10"	1.5"	0.97"	1/4-28 & TH	20	RF1000X275	Call
2 3/4"	13.25"	1.5"	1.12"	1/4-28 & TH	41	RF1325X275	Call
3 3/8"	4.5"	2"	0.68"	5/16-24 & 5/16-24*	2 1/2	RF450X337T	Call
3 3/8"	4.625"	2"	0.75"	5/16-24 & TH	2 1/2	RF462X337	Call
3 3/8"	6"	2"	0.78"	5/16-24 & TH	5	RF600X337	Call
3 3/8"	6.75"	2"	0.84"	5/16-24 & TH	7	RF675X337	Call
3 3/8"	8"	2"	0.88"	5/16-24 & TH	11	RF800X337	Call
3 3/8"	10"	2"	0.97"	5/16-24 & TH	20	RF1000X337	Call
3 3/8"	13.25"	2"	1.12"	5/16-24 & TH	40	RF1325X337	Call
4 1/2"	6"	2.5"	0.78"	5/16-24 & TH	4 1/2	RF600X450	Call
4 1/2"	6.75"	2.5"	0.84"	5/16-24 & TH	6 1/2	RF675X450	Call
4 1/2"	8"	2.5"	0.88"	5/16-24 & TH	10 1/2	RF800X450	Call
4 1/2"	10"	2.5"	0.97"	5/16-24 & TH	18 1/2	RF1000X450	Call
4 1/2"	13.25"	2.5"	1.12"	5/16-24 & TH	39	RF1325X450	Call
4 5/8"	6"	3"	0.78"	5/16-24 & TH	4	RF600X462	Call
4 5/8"	6.75"	3"	0.84"	5/16-24 & TH	6	RF675X462	Call
4 5/8"	8"	3"	0.88"	5/16-24 & TH	10	RF800X462	Call
4 5/8"	10"	3"	0.97"	5/16-24 & TH	18 1/2	RF1000X462	Call
4 5/8"	13.25"	3"	1.12"	5/16-24 & TH	39	RF1325X462	Call
6"	6.75"	4"	0.84"	5/16-24 & 5/16-24*	5	RF675X600T	Call
6"	8"	4"	0.88"	5/16-24 & TH	8 1/2	RF800X600	Call
6"	10"	4"	0.97"	5/16-24 & TH	17	RF1000X600	Call
6"	13.25"	4"	1.12"	5/16-24 & TH	37	RF1325X600	Call
8"	10"	6"	0.97"	5/16-24 & TH	15 1/2	RF1000X800	Call
8"	13.25"	6"	1.12"	5/16-24 & TH	34	RF1325X800	Call
10"	13.25"	8"	1.12"	5/16-24 & TH	30	RF1325X1000	Call

* Both sets of bolt holes are tapped. The smaller thread size applies to the smaller flange mounting where applicable.
TH=Through Hole

1
Flanges, Fittings, & Components

➤ Reducer Flanges (304L SS)

■ Reducer Flange Gaskets

- Individually bagged in quantities of 10 (except for 13 1/4" gasket, which is sold individually)



Reducer Flange (size)	Per Pkg.	Part No.	Price
1 1/2"	10	GA-0133	Call
2 1/8"	10	GA-0212	Call
2 3/4"	10	GA-0275	Call
3 3/8"	10	GA-0337	Call
4 1/2"	10	GA-0450	Call
4 5/8"	10	GA-0462	Call
6"	10	GA-0600	Call
6 3/4"	10	GA-0675	Call
8"	10	GA-0800	Call
10"	10	GA-1000	Call
13 1/4"	1	GA-1325	Call

■ Bolts for Reducer Flanges



Large Flange (O.D.)	Part No.	Price
2 3/4"	HBS25028138	Call
3 3/8"	HBS31224175	Call
4 1/2"	HBS31224200	Call
4 5/8"	HBS31224200	Call
6"	HBS31224225	Call
6 3/4"	HBS31224225	Call
8"	HBS31224225	Call
10"	HBS31224250	Call
13 1/4"	HBS31224300	Call

Small Flange (O.D.)	Part No.	Price
1 1/2"	SBK832075	Call
2 1/8"	HBK25028088	Call
2 3/4"	HBK25028088	Call
3 3/8"	HBK31224125	Call
4 1/2"	HBK31224125	Call
4 5/8"	HBK31224125	Call
6"	HBK31224125	Call
8"	HBK31224125	Call
10"	HBK31224125	Call

NOTE: Bolt sets for "Large Flange" not appropriate for Reducer Flange part numbers ending in "T". Please call for assistance.

NOTE: Please read the Technical Notes in this section before ordering hardware. Unless otherwise noted, the following kits contain 25 stainless steel bolts and washers for tapped flanges.

2001

iPod®

On October 23, 2001 Apple Computers publicly announced their portable music digital player — the iPod, created under project codename Dulcimer.

Kurt J. Lesker Company moved into their new 60,000 square foot factory in Southwestern Pennsylvania. This facility would accommodate manufacturing expansion, as well as sales and marketing.

Flanges, Fittings, & Components

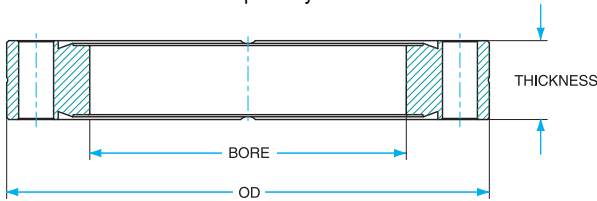
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► Double-Faced Flanges (304L SS)

■ Double-Faced Flanges

Feature the same-sized knife-edged sealing surfaces on both sides.

- Different from reducing flanges, which accommodate different-sized flanges
- Gaskets and bolts sold separately



NOTE: We also offer tapped flanges. Please call for more information.

Nom. O.D.	Bore (in.)	Thickness (in.)	Gasket Reference*	Bolt Set Reference*	Weight (lbs.)	Part No.	Price
1 1/8"	Blank	0.28	GA-0133	SBS832125	1/2	DFE133X000	Call
1 1/8"	0.63	0.28	GA-0133	SBS832125	1/2	DFE133X062	Call
2 1/8"	Blank	0.47	GA-0212	HBS25028200	3/4	DFE212X000	Call
2 1/8"	1.00	0.47	GA-0212	HBS25028200	3/4	DFE212X100	Call
2 3/4"	Blank	0.50	GA-0275	HBS25028200	3/4	DFE275X000	Call
2 3/4"	1.51	0.50	GA-0275	HBS25028200	3/4	DFE275X150	Call
2 3/4"	1.51	0.75	GA-0275	HBS25028225	3/4	DFE275X150S	Call
2 3/4"	1.51	1.00	GA-0275	HBS25028225	1	DFE275X150SS	Call
3 3/8"	Blank	0.62	GA-0337	HBS31224225	1 1/2	DFE337X000	Call
3 3/8"	2.01	0.62	GA-0337	HBS31224225	1	DFE337X200	Call
4 1/2"	Blank	0.68	GA-0450	HBS31224250	3	DFE450X000	Call
4 1/2"	2.51	0.68	GA-0450	HBS31224250	2 1/2	DFE450X250	Call
4 5/8"	Blank	0.75	GA-0462	HBS31224250	3 1/2	DFE462X000	Call
4 5/8"	3.01	0.75	GA-0462	HBS31224250	2 1/2	DFE462X300	Call
6"	Blank	0.78	GA-0600	HBS31224300	5 1/2	DFE600X000	Call
6"	4.01	0.78	GA-0600	HBS31224300	3 1/2	DFE600X400	Call
6 3/4"	Blank	0.84	GA-0675	HBS31224225	8	DFE675X000	Call
6 3/4"	5.01	0.84	GA-0675	HBS31224225	5	DFE675X500	Call
8"	Blank	0.87	GA-0800	HBS31224300	12	DFE800X000	Call
8"	6.02	0.87	GA-0800	HBS31224300	5 1/2	DFE800X600	Call
10"	Blank	0.97	GA-1000	HBS31224350	20	DFE1000X000	Call
10"	8.02	0.97	GA-1000	HBS31224350	7 1/2	DFE1000X800	Call
13 1/4"	Blank	1.12	GA-1325	HBL37524400	41	DFE1325X000	Call
13 1/4"	10.03	1.12	GA-1325	HBL37524400	18	DFE1325X1000	Call

*Part numbers for reference only

■ Special 2.75" O.D. CF Flanges

- Gaskets and bolts sold separately



■ Gaskets

- Individually packaged in quantities of 10

Flange	Part No.	Price
2 3/4"	GA-0275	Call

I.D.	Sides	Hole(s) Orientation	Thread or Attachment	Thickness	Gasket Reference*	Bolt Set Reference*	Part No.	Price
Blank	Single	1 x Axial	1/8" NPT	0.500"	GA-0275	HBS25028138	F0275XFNPT2	Call
1 1/2"	Double	1 x Radial	1/8" NPT	0.500"	GA-0275	HBS25028225	DFE275X1NPT	Call
1 1/2"	Double	2 x Radial (180°)	1/8" NPT	0.500"	GA-0275	HBS25028225	DFE2752NPT18	Call
1 1/2"	Double	1 x Radial	Vent Valve	0.500"	GA-0275	HBS25028225	DFE275XVALVE	Call
1 1/2"	Double	2 x Radial (180°)	1/8" NPT & Vent Valve	0.500"	GA-0275	HBS25028225	DFE275XVNPT	Call

*Part numbers for reference only

Flanged Nipples

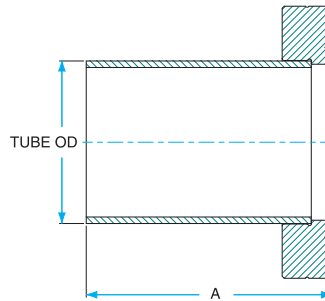
Flanges, Fittings, & Components

1

IN THIS SECTION ➤ CF Flanged Components

- We fabricate our components for UHV systems from 304L stainless steel tubing and flanges.
- We provide quick, low-cost solutions to requests for uncommon sizes, special fittings, and multiport specials. Call or fax your drawing to 412-384-2573 for a price quote.

■ Half Nipples



Flange O.D.	Style	Tube O.D.	A	Gasket Reference*	Bolt Set Reference*	Weight (lbs.)	Part No.	Price
1 1/8"	Fixed	3/4"	1.50"	GA-0133	SBS832075	1/2	HN-0133	Call
1 1/8"	Rotatable	3/4"	1.50"	GA-0133	SBS832075	1/2	HN-0133R	Call
1 1/8"	Rotatable Tapped	3/4"	1.50"	GA-0133	SBS832075	1/2	HN-0133RT	Call
1 1/8"	Fixed Tapped	3/4"	1.50"	GA-0133	SBS832075	1/2	HN-0133T	Call
2 1/8"	Fixed	1"	2.05"	GA-0212	HBS25028138	1/2	HN-0212	Call
2 1/8"	Rotatable	1"	2.05"	GA-0212	HBS25028138	1/2	HN-0212R	Call
2 1/8"	Rotatable Tapped	1"	2.05"	GA-0212	HBS25028138	1/2	HN-0212RT	Call
2 1/8"	Fixed Tapped	1"	2.05"	GA-0212	HBS25028138	1/2	HN-0212T	Call
2 3/4"	Fixed	1 1/2"	2.46"	GA-0275	HBS25028138	1	HN-0275	Call
2 3/4"	Rotatable	1 1/2"	2.46"	GA-0275	HBS25028138	1	HN-0275R	Call
2 3/4"	Rotatable Tapped	1 1/2"	2.46"	GA-0275	HBS25028138	1	HN-0275RT	Call
2 3/4"	Fixed Tapped	1 1/2"	2.46"	GA-0275	HBS25028138	1	HN-0275T	Call
2 3/4"	Fixed	1 5/8"	2.46"	GA-0275LB	HBS25028138	1	HN-0275S	Call
2 3/4"	Rotatable	1 5/8"	2.46"	GA-0275LB	HBS25028138	1	HN-0275SR	Call
2 3/4"	Fixed Tapped	1 5/8"	2.46"	GA-0275LB	HBS25028138	1	HN-0275ST	Call
2 3/4"	Rotatable Tapped	1 5/8"	2.46"	GA-0275LB	HBS25028138	1	HN-0275SRT	Call
2 3/4"	Fixed	1 3/4"	2.46"	GA-0275LB	HBS25028138	1	HN-0275SS	Call
2 3/4"	Rotatable	1 3/4"	2.46"	GA-0275LB	HBS25028138	1	HN-0275SSR	Call
2 3/4"	Rotatable Tapped	1 3/4"	2.46"	GA-0275LB	HBS25028138	1	HN-0275SSRT	Call
2 3/4"	Fixed Tapped	1 3/4"	2.46"	GA-0275LB	HBS25028138	1	HN-0275SST	Call
3 3/8"	Fixed	2"	3.21"	GA-0337	HBS31224175	1 1/2	HN-0337	Call
3 3/8"	Rotatable	2"	3.21"	GA-0337	HBS31224175	1 1/2	HN-0337R	Call
3 3/8"	Rotatable Tapped	2"	3.21"	GA-0337	HBS31224175	1 1/2	HN-0337RT	Call
3 3/8"	Fixed Tapped	2"	3.21"	GA-0337	HBS31224175	1 1/2	HN-0337T	Call
4 1/2"	Fixed	2 1/2"	4.12"	GA-0450	HBS31224200	3	HN-0450	Call
4 1/2"	Rotatable	2 1/2"	4.12"	GA-0450	HBS31224200	3	HN-0450R	Call
4 1/2"	Rotatable Tapped	2 1/2"	4.12"	GA-0450	HBS31224200	3	HN-0450RT	Call
4 1/2"	Fixed Tapped	2 1/2"	4.12"	GA-0450	HBS31224200	3	HN-0450T	Call
4 5/8"	Fixed	3"	3.53"	GA-0462	HBS31224200	3	HN-0462	Call
4 5/8"	Rotatable	3"	3.53"	GA-0462	HBS31224200	3	HN-0462R	Call
4 5/8"	Rotatable Tapped	3"	3.53"	GA-0462	HBS31224200	3	HN-0462RT	Call
4 5/8"	Fixed Tapped	3"	3.53"	GA-0462	HBS31224200	3	HN-0462T	Call
6"	Fixed	4"	5.31"	GA-0600	HBS31224225	4	HN-0600	Call
6"	Rotatable	4"	5.31"	GA-0600	HBS31224225	4	HN-0600R	Call
6"	Rotatable Tapped	4"	5.31"	GA-0600	HBS31224225	4	HN-0600RT	Call
6"	Fixed Tapped	4"	5.31"	GA-0600	HBS31224225	4	HN-0600T	Call
6 3/4"	Fixed	5"	4.32"	GA-0675	HBS31224225	5	HN-0675	Call
6 3/4"	Rotatable	5"	4.32"	GA-0675	HBS31224225	5	HN-0675R	Call
6 3/4"	Rotatable Tapped	5"	4.32"	GA-0675	HBS31224225	5	HN-0675RT	Call
6 3/4"	Fixed Tapped	5"	4.32"	GA-0675	HBS31224225	5	HN-0675T	Call
8"	Fixed	6"	6.56"	GA-0800	HBS31224225	7 1/2	HN-0800	Call
8"	Rotatable	6"	6.56"	GA-0800	HBS31224225	7 1/2	HN-0800R	Call
8"	Rotatable Tapped	6"	6.56"	GA-0800	HBS31224225	7 1/2	HN-0800RT	Call
8"	Fixed Tapped	6"	6.56"	GA-0800	HBS31224225	7 1/2	HN-0800T	Call
10"	Fixed	8"	8.00"	GA-1000	HBS31224250	11	HN-1000	Call
10"	Rotatable	8"	8.00"	GA-1000	HBS31224250	11	HN-1000R	Call
10"	Rotatable Tapped	8"	8.00"	GA-1000	HBS31224250	11	HN-1000RT	Call
10"	Fixed Tapped	8"	8.00"	GA-1000	HBS31224250	11	HN-1000T	Call
13 1/4"	Fixed	10"	10.00"	GA-1325	HBS37524300	28	HN-1325	Call

*Part numbers for reference only.

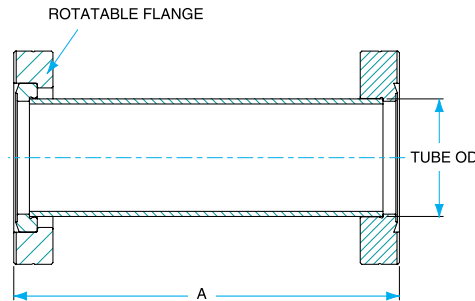
Flanged Nipples

1

Flanges, Fittings, & Components

Full Nipples

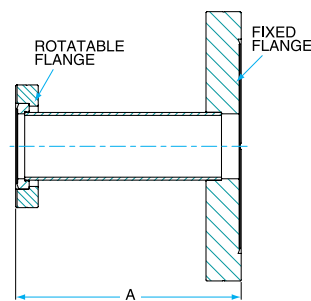
- Feature one rotatable flange



Flange O.D.	Tube O.D.	A	Gasket Reference*	Bolt Set Reference*	Weight (lbs.)	Part No.	Price
1 1/8"	3/4"	3.00"	GA-0133	SBS832075	1/2	FN-0133	Call
2 1/8"	1"	4.10"	GA-0212	HBS25028138	1	FN-0212	Call
2 3/4"	1 1/2"	4.93"	GA-0275	HBS25028138	1 1/2	FN-0275	Call
2 3/4"	1 5/8"	4.93"	GA-0275LB	HBS25028138	1 1/2	FN-0275S	Call
3 3/8"	2"	6.43"	GA-0337	HBS31224175	2 1/2	FN-0337	Call
4 1/2"	2 1/2"	8.25"	GA-0450	HBS31224200	3	FN-0450	Call
4 5/8"	3"	7.06"	GA-0462	HBS31224200	5 1/2	FN-0462	Call
6"	4"	10.62"	GA-0600	HBS31224225	9 1/2	FN-0600	Call
6 3/4"	5"	9.87"	GA-0675	HBS31224225	11	FN-0675	Call
8"	6"	13.12"	GA-0800	HBS31224225	16	FN-0800	Call
10"	8"	16.00"	GA-1000	HBS31224250	27 1/2	FN-1000	Call
13 1/4"	10"	20.00"	GA-1325	HBS37524300	58	FN-1325	Call

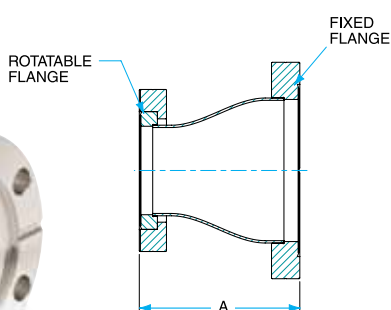
*Part numbers for reference only

Straight Reducer Nipples



Small Flange	Large Flange	Bore	A	Weight (lbs.)	Part No.	Price
2 3/4"	6" (DN100CF)	1.37"	5"	6	RN0600X275	Call
2 3/4"	8" (DN160CF)	1.37"	5"	12	RN0800X275	Call
2 3/4"	10" (DN200CF)	1.37"	5"	22	RN1000X275	Call
4 1/2"	8" (DN160CF)	2.37"	5"	14	RN0800X450	Call
4 1/2"	10" (DN200CF)	2.37"	5"	24	RN1000X450	Call
6"	8" (DN160CF)	3.83"	5"	16	RN0800X600	Call
6"	10" (DN200CF)	3.83"	5"	24	RN1000X600	Call
6"	13 1/4"	3.83"	5"	43	RN1325X600	Call
8"	10" (DN200CF)	5.83"	5"	26	RN1000X800	Call
8"	13 1/4"	5.83"	5"	45	RN1325X800	Call
10"	13 1/4"	7.76"	5"	46	RN1325X1000	Call

Conical Reducer Nipples



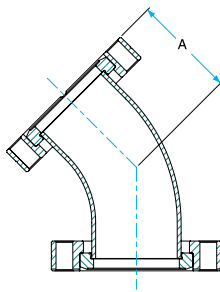
Small Flange	Large Flange	Bore	A	Weight (lbs.)	Part No.	Price
1 1/8"	2 1/8"	0.62"	2.04"	1	CRN212X133	Call
1 1/8"	2 3/4"	0.62"	3.08"	1 1/2	CRN275X133	Call
2 1/8"	2 3/4"	0.87"	2.75"	2	CRN275X212	Call
2 1/8"	3 3/8"	0.87"	2.77"	3	CRN337X212	Call
2 3/4"	3 3/8"	1.37"	2.81"	2 1/2	CRN337X275	Call
2 3/4"	4 1/2"	1.37"	2.96"	4	CRN450X275	Call
2 3/4"	4 5/8"	1.37"	4.12"	5	CRN462X275	Call
3 3/8"	4 1/2"	1.87"	2.98"	5	CRN450X337	Call
3 3/8"	4 5/8"	1.87"	4.13"	6	CRN462X337	Call
3 3/8"	6"	1.87"	4.28"	8	CRN600X337	Call
4 1/2"	4 5/8"	2.37"	4.28"	7	CRN462X450	Call
4 1/2"	6"	2.37"	4.43"	9	CRN600X450	Call

► **Elbows**

1 Flanges, Fittings, & Components

■ **Radius 45° Elbows**

- Feature one rotatable flange on each axis

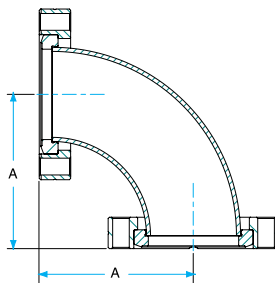


*Part numbers for reference only

Flange O.D.	Tube O.D.	A	Gasket Reference*	Bolt Set Reference*	Weight (lbs.)	Part No.	Price
1 1/8"	3/4"	0.94"	GA-0133	SBS832075	1/2	L45-0133	Call
2 1/8"	1"	1.14"	GA-0212	HBS25028138	1	L45-0212	Call
2 3/4"	1 1/2"	1.74"	GA-0275	HBS25028138	1 1/2	L45-0275	Call
3 3/8"	2"	2.07"	GA-0337	HBS31224175	3 1/2	L45-0337	Call
4 1/2"	2 1/2"	3.37"	GA-0450	HBS31224200	5	L45-0450	Call
4 5/8"	3"	3.96"	GA-0462	HBS31224200	6	L45-0462	Call
6"	4"	5.22"	GA-0600	HBS31224225	10	L45-0600	Call

■ **Radius 90° Elbows**

- Radius or miter design
- Both flanges rotatable with through-hole bolt holes

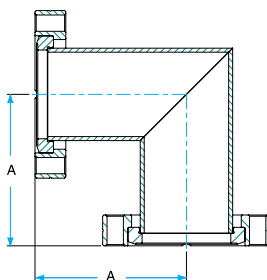


*Part numbers for reference only

Flange O.D.	Tube O.D.	A	Gasket Reference*	Bolt Set Reference*	Weight (lbs.)	Part No.	Price
1 1/8"	3/4"	1.50"	GA-0133	SBS832075	1/2	L-0133	Call
2 1/8"	1"	1.99"	GA-0212	HBS25028138	1	L-0212	Call
2 3/4"	1 1/2"	2.46"	GA-0275	HBS25028138	1 1/2	L-0275	Call
3 3/8"	2"	3.22"	GA-0337	HBS31224175	3 1/2	L-0337	Call
4 1/2"	2 1/2"	4.12"	GA-0450	HBS31224200	5	L-0450	Call
4 5/8"	3"	4.88"	GA-0462	HBS31224200	5 1/2	L-0462	Call
6"	4"	6.44"	GA-0600	HBS31224225	11	L-0600	Call
8"	6"	9.50"	GA-0800	HBS31224225	19	L-0800	Call

■ **Miter 90° Elbows**

- Feature one rotatable flange on each axis



*Part numbers for reference only

Flange O.D.	Tube O.D.	A	Gasket Reference*	Bolt Set Reference*	Weight (lbs.)	Part No.	Price
1 1/8"	3/4"	1.5"	GA-0133	SBS832075	1/2	L-0133M	Call
2 1/8"	1"	2.05"	GA-0212	HBS25028138	1	L-0212M	Call
2 3/4"	1 1/2"	2.46"	GA-0275	HBS25028138	1 1/2	L-0275M	Call
3 3/8"	2"	3.22"	GA-0337	HBS31224175	3 1/2	L-0337M	Call
4 1/2"	2 1/2"	3.38"	GA-0450	HBS31224200	5	L-0450M	Call
4 1/2"	2 1/2"	4.12"	GA-0450	HBS31224200	5 1/2	L-0450ML	Call
4 5/8"	3"	3.34"	GA-0462	HBS31224200	6	L-0462M	Call
6"	4"	4.32"	GA-0600	HBS31224225	11	L-0600M	Call
6"	4"	5.31"	GA-0600	HBS31224225	11 1/2	L-0600ML	Call
6 3/4"	5"	4.71"	GA-0675	HBS31224225	11	L-0675M	Call
8"	6"	5.50"	GA-0800	HBS31224225	19	L-0800M	Call
8"	6"	6.56"	GA-0800	HBS31224225	19 1/2	L-0800ML	Call
10"	8"	7.50"	GA-1000	HBS31224250	27	L-1000M	Call
13 1/4"	10"	10.00"	GA-1325	HBS37524300	56	L-1325M	Call



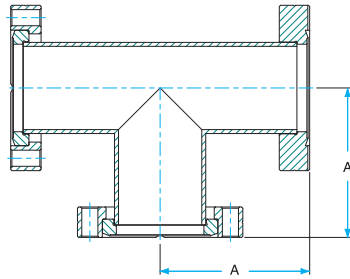
► **Tees**

1

Flanges, Fittings, & Components

■ **Tees**

- Feature one rotatable flange on each axis

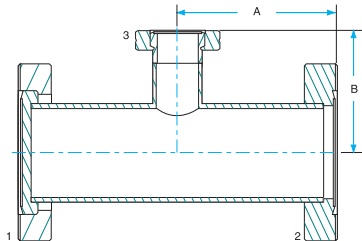


Flange O.D.	Tube O.D.	A	Gasket Reference*	Bolt Set Reference*	Weight (lbs.)	Part No.	Price
1 1/8"	3/4"	1.50"	GA-0133	SBS832075	1/2	T-0133	Call
2 1/8"	1"	2.05"	GA-0212	HBS25028138	1 1/2	T-0212	Call
2 3/4"	1 1/2"	2.46"	GA-0275	HBS25028138	2	T-0275	Call
3 3/8"	2"	3.22"	GA-0337	HBS31224175	4	T-0337	Call
4 1/2"	2 1/2"	4.12"	GA-0450	HBS31224200	8	T-0450	Call
4 1/2"	2 1/2"	3.38"	GA-0450	HBS31224200	8	T-0450S	Call
4 5/8"	3"	3.63"	GA-0462	HBS31224200	9	T-0462	Call
6"	4"	5.31"	GA-0600	HBS31224225	15	T-0600	Call
6"	4"	4.32"	GA-0600	HBS31224225	15	T-0600S	Call
6 3/4"	5"	4.71"	GA-0675	HBS31224225	16	T-0675	Call
8"	6"	6.56"	GA-0800	HBS31224225	25	T-0800	Call
8"	6"	5.50"	GA-0800	HBS31224225	24	T-0800S	Call
10"	8"	7.50"	GA-1000	HBS31224250	26	T-1000	Call
13 3/4"	10"	10.0"	GA-1325	HBS37524300	38	T-1325	Call

*Part numbers for reference only.

■ **Reducing Tees**

- Feature one rotatable flange on each axis



Flanges 1 & 2		Flange 3		Dimensions (in.)		Weight (lbs.)	Part No.	Price
Flange O.D.	Tube O.D.	Flange O.D.	Tube O.D.	A	B			
2 3/4"	1 1/2"	1 1/8"	3/4"	2.46	1.87	2	T-0275-133	Call
2 3/4"	1 1/2"	2 1/8"	1"	2.46	2.29	2	T-0275-212	Call
3 3/8"	2"	1 1/8"	3/4"	3.22	2.13	2 1/2	T-0337-133	Call
3 3/8"	2"	2 3/4"	1 1/2"	3.22	2.71	3 1/2	T-0337-275	Call
4 1/2"	2 1/2"	2 3/4"	1 1/2"	3.38	2.96	3 1/2	T-0450-275	Call
4 1/2"	2 1/2"	3 3/8"	2"	3.38	3.48	4 1/2	T-0450-337	Call
4 5/8"	3"	3 3/8"	2"	3.63	3.73	7	T-0462-337	Call
4 5/8"	3"	4 1/2"	2 1/2"	3.63	3.63	8 1/2	T-0462-450	Call
6"	4"	2 3/4"	1 1/2"	4.32	3.71	9 1/2	T-0600-275	Call
6"	4"	3 3/8"	2"	4.32	4.23	10	T-0600-337	Call
6"	4"	4 1/2"	2 1/2"	4.32	4.13	11	T-0600-450	Call
6"	4"	4 5/8"	3"	4.32	4.13	12 1/2	T-0600-462	Call
6 3/4"	5"	6"	4"	4.71	4.82	15	T-0675-600	Call
8"	6"	2 3/4"	1 1/2"	5.50	4.71	16 1/2	T-0800-275	Call
8"	6"	3 3/8"	2"	5.50	5.23	17	T-0800-337	Call
8"	6"	4 1/2"	2 1/2"	5.50	5.13	18	T-0800-450	Call
8"	6"	6"	4"	5.50	5.32	19	T-0800-600	Call
10"	8"	8"	6"	7.50	6.50	25	T-1000-800	Call

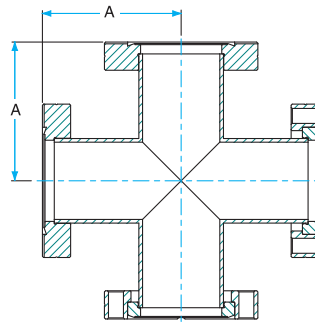
► Crosses

1

Flanges, Fittings, & Components

■ 4-Way Crosses

- Feature one rotatable flange on each axis

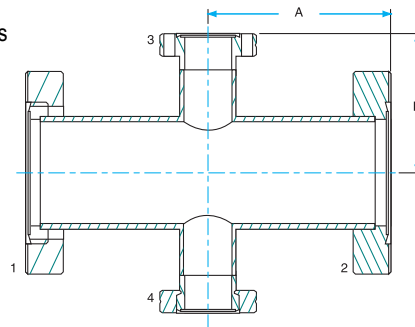


Flange O.D.	Tube O.D.	A	Gasket Reference*	Bolt Set Reference*	Weight (lbs.)	Part No.	Price
1 1/8"	3/4"	1.50"	GA-0133	SBS832075	1/2	C-0133	Call
2 1/8"	1"	2.05"	GA-0212	HBS25028138	1 3/4	C-0212	Call
2 3/4"	1 1/2"	2.46"	GA-0275	HBS25028138	2 1/2	C-0275	Call
3 3/8"	2"	3.22"	GA-0337	HBS31224175	4 1/2	C-0337	Call
4 1/2"	2 1/2"	4.12"	GA-0450	HBS31224200	4 1/2	C-0450	Call
4 1/2"	2 1/2"	3.38"	GA-0450	HBS31224200	4 1/2	C-0450S	Call
4 5/8"	3"	3.63"	GA-0462	HBS31224200	6	C-0462	Call
6"	4"	5.31"	GA-0600	HBS31224225	15	C-0600	Call
6"	4"	4.32"	GA-0600	HBS31224225	14 1/2	C-0600S	Call
6 3/4"	5"	4.71"	GA-0675	HBS31224225	21	C-0675	Call
8"	6"	6.56"	GA-0800	HBS31224225	32	C-0800	Call
8"	6"	5.50"	GA-0800	HBS31224225	32	C-0800S	Call
10"	8"	7.50"	GA-1000	HBS31224250	47	C-1000	Call
13 1/4"	10"	10"	GA-1325	HBS37524300	60	C-1325	Call

*Part numbers for reference only.

■ Reducing 4-Way Crosses

- Feature one rotatable flange on each axis

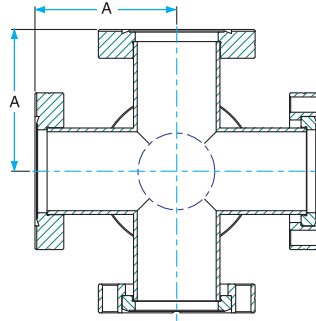


Flanges 1 & 2		Flanges 3 & 4		Dimensions (in.)		Weight (lbs.)	Part No.	Price
Flange O.D.	Tube O.D.	Flange O.D.	Tube O.D.	A	B			
2 3/4"	1 1/2"	1 1/8"	3/4"	2.46	1.87	2 1/2	C-0275-133	Call
2 3/4"	1 1/2"	2 1/8"	1"	2.46	2.29	2 1/2	C-0275-212	Call
3 3/8"	2"	1 1/8"	3/4"	3.22	2.13	3 1/2	C-0337-133	Call
3 3/8"	2"	2 3/4"	1 1/2"	3.22	2.71	4 1/2	C-0337-275	Call
4 1/2"	2 1/2"	2 3/4"	1 1/2"	3.38	2.96	5	C-0450-275	Call
4 1/2"	2 1/2"	3 3/8"	2"	3.38	3.48	6	C-0450-337	Call
4 5/8"	3"	3 3/8"	2"	3.53	3.73	8 1/2	C-0462-337	Call
4 5/8"	3"	4 1/2"	2 1/2"	3.53	3.63	8 1/2	C-0462-450	Call
6"	4"	2 3/4"	1 1/2"	4.32	3.71	12	C-0600-275	Call
6"	4"	3 3/8"	2"	4.32	4.23	12 1/2	C-0600-337	Call
6"	4"	4 1/2"	2 1/2"	4.32	4.13	13	C-0600-450	Call
6"	4"	4 5/8"	3"	4.32	4.03	14	C-0600-462	Call
6 3/4"	5"	6"	4"	4.71	4.82	16	C-0675-600	Call
8"	6"	2 3/4"	1 1/2"	5.50	4.71	17	C-0800-275	Call
8"	6"	3 3/8"	2"	5.50	5.23	18	C-0800-337	Call
8"	6"	4 1/2"	2 1/2"	5.50	5.13	20	C-0800-450	Call
8"	6"	6"	4"	5.50	5.32	24	C-0800-600	Call
10"	8"	8"	6"	7.50	6.50	33	C-1000-800	Call

► **Crosses**

■ **5-Way Crosses**

- Feature one rotatable flange on each axis

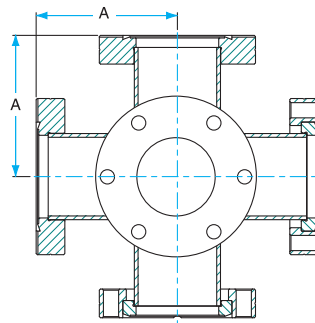


Flange O.D.	Tube O.D.	A	Gasket Reference*	Bolt Set Reference*	Weight (lbs.)	Part No.	Price
1 1/3"	3/4"	1.50"	GA-0133	SBS832075	3/4	C5-0133	Call
2 1/8"	1"	2.05"	GA-0212	HBS25028138	2	C5-0212	Call
2 3/4"	1 1/2"	2.46"	GA-0275	HBS25028138	3 1/2	C5-0275	Call
3 3/8"	2"	3.22"	GA-0337	HBS31224175	6 1/2	C5-0337	Call
4 1/2"	2 1/2"	4.12"	GA-0450	HBS31224200	13	C5-0450	Call
4 1/2"	2 1/2"	3.38"	GA-0450	HBS31224200	12 1/2	C5-0450S	Call
4 5/8"	3"	3.63"	GA-0462	HBS31224200	14	C5-0462	Call
6"	4"	5.31"	GA-0600	HBS31224225	33	C5-0600	Call
6"	4"	4.32"	GA-0600	HBS31224225	33	C5-0600S	Call
6 3/4"	5"	4.71"	GA-0675	HBS31224225	34	C5-0675	Call
8"	6"	6.56"	GA-0800	HBS31224225	37	C5-0800	Call
8"	6"	5.50"	GA-0800	HBS31224225	56	C5-0800S	Call
10"	8"	7.50"	GA-1000	HBS31224250	58	C5-1000	Call
13 1/4"	10"	10"	GA-1325	HBS37524300	92	C5-1325	Call

*Part numbers for reference only.

■ **6-Way Crosses**

- Feature one rotatable flange on each axis



Flange O.D.	Tube O.D.	A	Gasket Reference*	Bolt Set Reference*	Weight (lbs.)	Part No.	Price
1 1/3"	3/4"	1.50"	GA-0133	SBS832075	3/4	C6-0133	Call
2 1/8"	1"	2.05"	GA-0212	HBS25028138	2 1/2	C6-0212	Call
2 3/4"	1 1/2"	2.46"	GA-0275	HBS25028138	3 1/2	C6-0275	Call
3 3/8"	2"	3.22"	GA-0337	HBS31224175	7	C6-0337	Call
4 1/2"	2 1/2"	4.12"	GA-0450	HBS31224200	16 1/2	C6-0450	Call
4 1/2"	2 1/2"	3.38"	GA-0450	HBS31224200	16	C6-0450S	Call
4 5/8"	3"	3.63"	GA-0462	HBS31224200	17 1/2	C6-0462	Call
6"	4"	5.31"	GA-0600	HBS31224225	27	C6-0600	Call
6"	4"	4.32"	GA-0600	HBS31224225	26	C6-0600S	Call
6 3/4"	5"	4.71"	GA-0675	HBS31224225	40	C6-0675	Call
8"	6"	6.56"	GA-0800	HBS31224225	43	C6-0800	Call
8"	6"	5.50"	GA-0800	HBS31224225	41	C6-0800S	Call
10"	8"	7.50"	GA-1000	HBS31224250	70	C6-1000	Call
13 1/4"	10"	10"	GA-1325	HBS37524300	120	C6-1325	Call

* Part numbers for reference only.

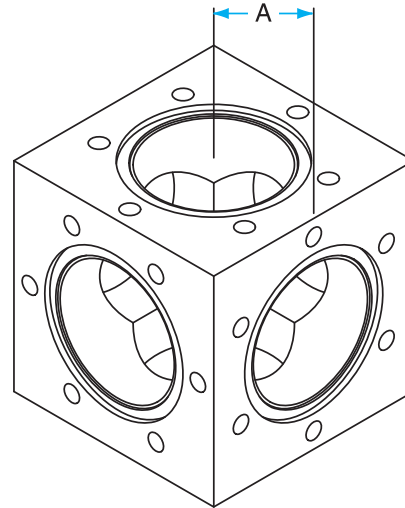
1
Flanges, Fittings, & Components

➤ **Cubes**

Flanges, Fittings, & Components

1

■ **6-Way Cubes**



Flange O.D.	A	Gasket Reference*	Part No.	Price
1 1/8"	0.67"	GA-0133	CU6-0133	Call
2 3/4"	1.38"	GA-0275	CU6-0275	Call
3 3/8"	1.68"	GA-0337	CU6-0337	Call
4 1/2"	2.23"	GA-0450	CU6-0450	Call
6"	2.98"	GA-0600	CU6-0600	Call
8"	3.98"	GA-0800	CU6-0800	Call
10"	4.98"	GA-1000	CU6-1000	Call

*Part numbers for reference only.

■ **Stud Sets for 6-Way Cubes**

- Each stud in the set comes with a matching nut and washer



Quantity Per Set	Stud Size	Part No.	Price
36	8-32 x 3/4"	CUB-0133	Call
36	1/4-28 x 1.25"	CUB-0275	Call
48	5/16-24 x 1.50"	CUB-0337	Call
48	5/16-24 x 1.75"	CUB-0450	Call
96	5/16-24 x 1.75"	CUB-0600	Call
120	5/16-24 x 2.00"	CUB-0800	Call
144	5/16-24 x 2.00"	CUB-1000	Call

NOTE: Part numbers correspond to the part numbers for the 6-way cubes to which the studs fit (simply replace the B of the part number with a 6 to find the corresponding cube).

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➤ CF Gaskets

1

Flanges, Fittings, & Components



NOTE: All OFHC Copper, Silver-Plated and Annealed gaskets are individually packaged.

NOTE: For detailed information about the advantages of the various materials used to make gaskets, see the Technical Information Section regarding Gaskets.

■ Standard OFHC Copper CF Gaskets 1/4 Hard



Flange O.D.	Per Package	Weight (lbs.)	Part No.	Price
1 1/3"	10	1/4	GA-0133	Call
2 1/8"	10	1/4	GA-0212	Call
2 3/4"	10	1/4	GA-0275	Call
2 3/4" *	10	1/4	GA-0275S	Call
2 3/4" **	10	1/4	GA-0275LB	Call
3 3/8"	10	1/2	GA-0337	Call
4 1/2"	10	3/4	GA-0450	Call
4 1/2" **	10	3/4	GA-0450LB	Call
4 5/8"	10	1	GA-0462	Call
6"	10	1 1/2	GA-0600	Call
6 3/4"	10	1 1/2	GA-0675	Call
8"	10	2	GA-0800	Call
10"	10	3	GA-1000	Call
12"	1	1/4	GA-1200	Call
13 1/4"	1	1/4	GA-1325	Call
14"	1	1/4	GA-1400	Call
16 1/2"	1	1/2	GA-1650	Call

* Blank Gasket

** Large Bore Gasket

■ Aluminum CF Gaskets



Flange O.D.	Per Package	Weight (lbs.)	Part No.	Price
1 1/3"	10	1/4	GA-0133AL	Call
2 3/4"	10	1/4	GA-0275AL	Call
3 3/8"	10	1/4	GA-0337AL	Call
4 1/2"	10	1/4	GA-0450AL	Call
6"	10	1/2	GA-0600AL	Call
8"	10	1/2	GA-0800AL	Call
10"	10	1/2	GA-1000AL	Call

■ Molded Fluorocarbon CF Gaskets



Flange O.D.	Per Package	Weight (lbs.)	Part No.	Price
1 1/3"	2	1/4	VZVIT19	Call
2 3/4"	2	1/2	VZVIT38	Call
4 1/2"	2	3/4	VZVIT64	Call
6"	2	1	VZVIT100	Call
8"	2	1 1/4	VZVIT150	Call
10"	2	1 1/2	VZVIT200	Call

NOTE: Easy to use. Gaskets stay in place when using on vertical flange's faces.

■ Flat Fluorocarbon CF Gaskets



Flange O.D.	Per Package	Weight (lbs.)	Part No.	Price
1 1/3"	1	1/4	GA-0133V	Call
2 1/8"	1	1/4	GA-0212V	Call
2 3/4"	5	1/4	GA-0275V	Call
3 3/8"	1	1/4	GA-0337V	Call
4 1/2"	1	1/4	GA-0450V	Call
4 5/8"	1	1/4	GA-0462V	Call
6"	1	1/4	GA-0600V	Call
6 3/4"	1	1/4	GA-0675V	Call
8"	1	1/4	GA-0800V	Call
10"	1	1/4	GA-1000V	Call
12"	1	1/4	GA-1200V	Call
13 1/4"	1	1/4	GA-1325V	Call
14"	1	1/4	GA-1400V	Call
16"	1	1/4	GA-1650V	Call

➤ CF Gaskets

1
Flanges, Fittings, & Components

■ Gold-Plated Copper CF Gaskets



Flange O.D.	Per Package	Weight (lbs.)	Part No.	Price
1 1/8"	1	1/4	GA-0133G	Call
2 1/8"	1	1/4	GA-0212G	Call
2 3/4"	1	1/4	GA-0275G	Call
2 3/4" **	1	1/4	GA-0275LBG	Call
3 3/8"	1	1/4	GA-0337G	Call
4 1/2"	1	1/4	GA-0450G	Call
4 1/2" **	1	1/4	GA-0450LBG	Call
4 5/8"	1	1/4	GA-0462G	Call
6"	1	1/4	GA-0600G	Call
6 3/4"	1	1/4	GA-0675G	Call
8"	1	1/4	GA-0800G	Call
10"	1	1/4	GA-1000G	Call
12"	1	1/4	GA-1200G	Call
13 1/4"	1	1/4	GA-1325G	Call
14"	1	1/4	GA-1400G	Call
16 1/2"	1	1/4	GA-1650G	Call

** Large Bore Gasket

■ Silver-Plated Copper CF Gaskets



Flange O.D.	Per Package	Weight (lbs.)	Part No.	Price
1 1/8"	1	1/4	GA-0133NSP	Call
2 1/8"	1	1/4	GA-0212NSP	Call
2 3/4"	1	1/4	GA-0275NSP	Call
2 3/4" *	1	1/4	GA-0275LBNSP	Call
3 3/8"	1	1/4	GA-0337NSP	Call
4 1/2"	1	1/4	GA-0450NSP	Call
4 1/2" *	1	1/4	GA-0450LBNSP	Call
4 5/8"	1	1/4	GA-0462NSP	Call
6"	1	1/4	GA-0600NSP	Call
6 3/4"	1	1/4	GA-0675NSP	Call
8"	1	1/4	GA-0800NSP	Call
10"	1	1/4	GA-1000NSP	Call
12"	1	1/2	GA-1200NSP	Call
13 1/4"	1	1/2	GA-1325NSP	Call
14"	1	1/2	GA-1400NSP	Call
16 1/2"	1	1/2	GA-1650NSP	Call

* Large Bore Gasket

■ Annealed Copper CF Gaskets



Flange O.D.	Per Package	Weight (lbs.)	Part No.	Price
1 1/8"	5	1/4	VZCUA19	Call
2 1/8"	5	1/4	VZCUA25	Call
2 3/4"	5	1/4	VZCUA38	Call
3 3/8"	5	1/4	VZCUA54	Call
4 1/2"	5	1/4	VZCUA64	Call
4 5/8"	5	1/4	VZCUA76	Call
6"	5	3/4	VZCUA100	Call
8"	5	1	VZCUA150	Call
10"	5	1 1/2	VZCUA200	Call
12"	5	1 1/2	VZCUA250	Call

■ Annealed Nickel CF Gaskets



Flange O.D.	Per Package	Weight (lbs.)	Part No.	Price
1 1/8"	1	1/4	GA-0133NIA	Call
2 3/4"	1	1/4	GA-0275NIA	Call
4 1/2"	1	1/4	GA-0450NIA	Call
6"	1	1/4	GA-0600NIA	Call
8"	1	1/4	GA-0800NIA	Call

■ CF Gasket Accessories

Description	Weight (lbs.)	Part No.	Price
Gasket Removal Tool	1/4	VZGRT	Call
Gasket Clips, 10 per package	1/4	VGC0275S	Call

► Hardware Sets for Through Hole Flanges

IN THIS SECTION ►

Hardware Sets for Through Holes Flanges

- Please review the Technical Notes before ordering hardware. The sets below fit through hole flanges. Unless otherwise noted, contents of sets are stainless steel and include 25 bolts, 25 nuts, and 50 washers.



■ **Hex Head Bolt/Nut Sets**

Diameter	TPI	Length	Used on Flanges with O.D.s	No. of Sets	Weight (lbs.)	Part No.	Price
#8 (skt)	32	0.75"	1 1/3"	25	1/4	SBS832075	Call
#8 (skt)	32	1.25"	1 1/3" DF	25	1/4	SBS832125	Call
1/4"	28	1.375"	2 1/8", 2 3/4"	25	1	HBS25028138	Call
1/4"	28	2"	2 1/8" DF, 2 3/4" DF	25	1 1/4	HBS25028200	Call
1/4"	28	2.25"	2 3/4" DF	25	1 1/2	HBS25028225	Call
5/16"	24	1.75"	3 3/8"	25	2	HBS31224175	Call
5/16"	24	2"	4 1/2", 4 5/8", 6" NR	25	2	HBS31224200	Call
5/16"	24	2.25"	6"R, 6 3/4", 8", 3 3/8" DF	25	2	HBS31224225	Call
5/16"	24	2.5"	10", 4 1/2" DF, 4 5/8" DF	25	2	HBS31224250	Call
5/16"	24	2.5"	12"	32	2	HBT31224250	Call
5/16"	24	3"	6" DF, 8" DF	25	2	HBS31224300	Call
5/16"	24	3.5"	10" DF	25	3	HBS31224350	Call
3/8"	24	3"	13 1/4", 14"	30	4	HBS37524300	Call
3/8"	24	4"	13 1/4" DF	30	4	HBS37524400	Call
3/8"	24	3"	16 1/2"	36	4	HBT37524300	Call

DF = Double Faced
NR = Non-Rotatable
R = Rotatable

■ **Hex Head Bolts/Plate-Nut Sets**

Used on Flanges with O.D.s	No. of Plate Nuts	Sufficient for Flanges	Bolt Length	Weight (lbs.)	Part No.	Price
1 1/3"	12	4	0.75"	1/2	PNB-0133	Call
2 3/4"	12	4	1.25"	1	PNB-0275	Call
3 3/8"	16	4	1.75"	2	PNB-0337	Call
4 1/2"	16	4	2"	2	PNB-0450	Call
6"	16	2	2.25"	2	PNB-0600	Call
8"	20	2	2.25"	2 1/2	PNB-0800	Call
10"	24	2	2.5"	3	PNB-1000	Call

■ **Metric Hex Head Bolts/Plate-Nut Sets**

Used on Flanges with O.D.s	No. of Plate Nuts	Sufficient for Flanges	Bolt Length (mm)	Weight (lbs.)	Part No.	Price
1 1/3"	12	4	20	1/2	PNB-0133M	Call
2 3/4"	12	4	35	1	PNB-0275M	Call
4 1/2"	16	4	45	2	PNB-0450M	Call
6"	16	2	50	2	PNB-0600M	Call
8"	20	2	60	2 1/2	PNB-0800M	Call
10"	24	2	60	3	PNB-1000M	Call

► Hardware Sets for Through Hole Flanges

1 ■ 12-Point Cap Screw/Nut Sets

Stainless Steel							
Diameter (in.)	TPI	Length	Used on Flanges with O.D.s	No. of Sets	Weight (lbs.)	Part No.	Price
1/4	28	1.25"	2 1/8", 2 3/4"	25	1	TBS25028125	Call
1/4	28	2.125"	2 3/4" DF	25	1	TBS25028212	Call
5/16	24	1.75"	3 3/8"	25	2	TBS31224175	Call
5/16	24	2"	4 1/2", 4 5/8", 6" NR	25	2	TBS31224200	Call
5/16	24	2.25"	6"R, 6 3/4", 8"	25	2	TBS31224225	Call
5/16	24	2.50"	10"	25	2	TBS31224250	Call
Silver Plated							
1/4	28	1.25"	2 1/8", 2 3/4"	25	1	TBS25028125P	Call
1/4	28	2.125"	2 3/4" DF	25	1	TBS25028212P	Call
5/16	24	1.75"	3 3/8"	25	2	TBS31224175P	Call
5/16	24	2"	4 1/2", 4 5/8", 6" NR	25	2	TBS31224200P	Call
5/16	24	2.25"	6"R, 6 3/4", 8"	25	2	TBS31224225P	Call
5/16	24	2.5"	10"	25	2	TBS31224250P	Call

DF = Double Faced, NR = Non-Rotatable, R = Rotatable

■ Metric Hex Head Bolt/Nut Sets

Stainless Steel							
Used on Flanges with O.D.s	Thread Size	Length	Pkg. Qty.	Weight (lbs.)	Part No.	Price	
34 mm	M4	20	25	1/4	HBSM4X20	Call	
70 mm	M6	35	25	1/2	HBSM6X35	Call	
114 mm	M8	45	25	1	HBSM8X45	Call	
152 mm	M8	50	25	2	HBSM8X50	Call	
203 mm & 254 mm	M8	60	25	2	HBSM8X60	Call	
34 mm DF	M4	35	25	1/4	HBSM4X35	Call	
70 mm DF	M6	50	25	1/2	HBSM6X50	Call	
114 mm DF	M8	60	25	2	HBSM8X60	Call	
152 mm DF	M8	70	25	2	HBSM8X70	Call	
Aluminum							
34 mm	M4	22	6	1/4	HBSM4X22A	Call	
70 mm	M6	35	6	1	HBSM6X35A	Call	
114 mm	M8	48	8	2	HBSM8X48A	Call	
152 mm	M8	50	16	2	HBSM8X50A	Call	
203 mm	M8	55	20	2	HBSM8X55A	Call	
254 mm	M8	60	24	2	HBSM8X60A	Call	
305 mm	M8	70	32	2	HBSM8X70A	Call	

DF = Double Faced

► Hardware Kits for Tapped Flanges

1

Flanges, Fittings, & Components

Hex Head Bolt Kits

- For imperial (inch) tapped-hole flanges



IN THIS SECTION ►

Hardware Kits for Tapped Holes

- Please review the Technical Notes (pages 1-2 through 1-11) before ordering hardware. The hardware kits below fit tapped-hole flanges. Unless otherwise noted, contents of sets are stainless steel and include 25 bolts and 25 washers.
- Not for use with small flange of zero length reducers! See page 1-42 for more information.

Used on Flanges with O.D.s	Diameter	TPI	Length	Qty./Kit	Weight (lbs.)	Part No.	Price
1 1/8"	#8	32	0.5"	25	1/4	SBK832075	Call
2 1/8", 2 3/4"	1/4"	28	0.875"	25	1/2	HBK25028088	Call
3 3/8", 4 1/2", 4 5/8", 6"	5/16"	24	1.25"	25	1 1/2	HBK31224125	Call
6 3/4"	5/16"	24	1.5"	25	1 1/2	HBK31224150	Call
8", 10"	5/16"	24	1.75"	25	1 1/2	HBK31224175	Call
12"	5/16"	24	1.75"	32	2	HBL31224175	Call
13 1/4", 14"	3/8"	24	2"	30	3	HBK37524200	Call
16 1/2"	3/8"	24	2"	36	3	HBL37524200	Call

12-Point Cap Screw Kits

- For imperial (inch) tapped-hole flanges



Stainless Steel							
Used on Flanges with O.D.s	Diameter	TPI	Length	Qty./Kit	Weight (lbs.)	Part No.	Price
2 3/4"	1/4"	28	0.875"	25	1/2	TBK25028088	Call
3 3/8", 4 1/2", 4 5/8", 6"	5/16"	24	1.25"	25	1 1/2	TBK31224125	Call
8", 10"	5/16"	24	1.75"	25	1 1/2	TBK31224175	Call
Silver-Plated							
2 3/4"	1/4"	28	0.875"	25	1/2	TBK25028088P	Call
3 3/8", 4 1/2", 4 5/8", 6"	5/16"	24	1.25"	25	1 1/2	TBK31224125P	Call
8", 10"	5/16"	24	1.75"	25	1 1/2	TBK31224175P	Call

Metric Hex Head Bolt Kits

- For metric tapped-hole flanges

Used on Flanges with O.D.s	Thread	Length (mm)	Qty./Kit	Weight (lbs.)	Part No.	Price
34 mm	M4	16	25	1/2	SBKM4X16	Call
70 mm	M6	25	25	1 1/4	HBKM6X20	Call
114 mm & 152 mm	M8	35	25	1 1/2	HBKM8X35	Call
203 mm & 254 mm	M8	40	25	1 1/2	HBKM8X45	Call

➤ Hardware Kits for Tapped Flanges

➤ Miscellaneous Hardware

1

Flanges, Fittings, & Components

■ Threaded Rods, Nuts, & Washers

- For imperial (inch) tapped-hole flanges

Diameter	TPI	Item	Weight (lbs.)	Part No.	Price
1/4"	28	6-ft. Rod	1 1/2	TR1/4-28X6	Call
5/16"	24	6-ft. Rod	2	TR5/16-24X6	Call
3/8"	24	6-ft. Rod	2	TR3/8-24X6	Call
1/4"	28	100 Nuts	2	N1/4-28X100	Call
5/16"	24	100 Nuts	2	N5/16-24X100	Call
1/2"	—	100 Washers — 1/4"	1/2	W1/4-100	Call
5/16"	—	100 Washers — 5/16"	1/2	W5/16-100	Call

■ Studs

- Hex key head for easy installation

Diameter	TPI	Length	Per Package	Weight (lbs.)	Part No.	Price
#8 (skt)	32	3/4"	1	1/4	SS832075	Call
1/4"	28	3/8"	1	1/4	SS25028037	Call
5/16"	24	1 3/4"	1	1/4	SS31224175	Call
5/16"	24	2"	1	1/4	SS31224200	Call
5/16"	24	2.25"	1	1/4	SS31224225	Call
5/16"	24	2.5"	1	1/4	SS31224250	Call
3/8"	24	3"	1	1/4	SS37524300	Call

■ Metric Studs

Thread Size	Length (mm)	Per Package	Weight (lbs.)	Part No.	Price
M4	20	1	1/4	SSM4X20	Call
M6	35	1	1/4	SSM6X35	Call
M8	45	1	1/4	SSM8X45	Call
M8	50	1	1/4	SSM8X50	Call
M8	60	1	1/4	SSM8X60	Call

■ Anti-Seize Thread Lubricant

Specially formulated, copper-based lubricant for nuts and bolts external to the vacuum chamber.

- Always use a high quality thread lubricant on all stainless steel threads
- Ideal for UHV chambers where bakeout temperatures reach 450° C
- Protects parts against seizure and galling
- Meets or exceeds Mil Spec A907E



Description	Size	Part No.	Price
Anti-Seize Thread Lube	1 oz. Tube	VZTL	Call

► Miscellaneous Hardware

■ Plate Nuts—Bulk

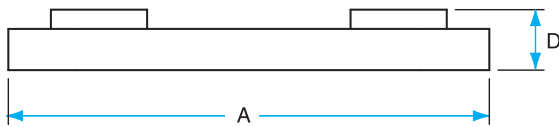
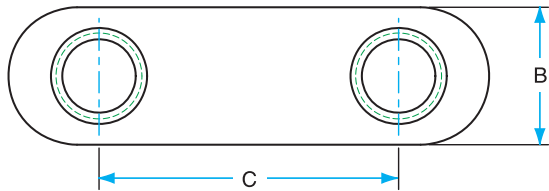
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Flanges, Fittings, & Components

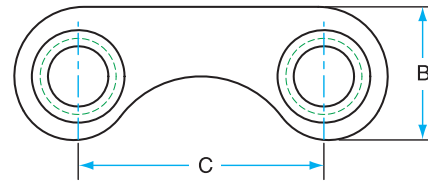


NOTE: Please review the Technical Notes before ordering hardware. These sets fit through hole flanges. Each set contains 24 stainless steel plate nuts.

NOTE: For kits including bolts and washers, please see accessories listed for the specific flange sizes.



FOR 3-3/8" AND LARGER OD FLANGES



FOR 1-1/3" AND 2-3/4" OD FLANGED

Used on Flanges with O.D.s	Thread Size	Dimensions (in.)				Pkg. Qty.	Weight (lbs.)	Part No.	Price
		A	B	C	D				
1 1/3" CF	8-32	0.8	0.3	0.53	0.15	24	1/4	PN-0133	Call
2 3/4" CF	1/4-28	1.41	0.5	1.16	0.18	24	1/2	PN-0275	Call
3 3/8" CF	5/16-24	1.75	0.5	1.09	0.22	24	1/2	PN-0337	Call
4 1/2" CF	5/16-24	2.03	0.5	1.39	0.22	24	1/2	PN-0450	Call
6" CF	5/16-24	1.64	0.5	1	0.22	24	1/2	PN-0600	Call
8" CF	5/16-24	1.75	0.5	1.12	0.22	24	1/2	PN-0800	Call
10" CF	5/16-24	1.75	0.5	1.19	0.22	24	3/4	PN-1000	Call

Used on Flanges with O.D.s	Thread Size	Dimensions (mm)				Pkg. Qty.	Weight (lbs.)	Part No.	Price
		A	B	C	D				
34 mm CF	M4	20	7	13	3	24	1/4	PN-0133M	Call
70 mm CF	M6	35	12	29	4	24	1/2	PN-0275M	Call
114 mm CF	M8	51	12	35	5	24	1/2	PN-0450M	Call
152 mm CF	M8	41	12	25	5	24	1/2	PN-0600M	Call
203 mm CF	M8	44	12	28	5	24	1/2	PN-0800M	Call
254 mm CF	M8	44	12	30	5	24	3/4	PN-1000M	Call

► Domed Blank & Ring Flanges

■ UHV Wire-Seal Flanges

Our UHV wire-seal flanges should be bought in male/female sets (denoted in Part No. by M= male; and F=female) with a copper wire gasket forming the seal between them.

Because no international standards exist for wire-seal flanges of any size, we have designed ours to fit with flanges from other major manufacturers. However, to guarantee compatibility, you must purchase both male and female flanges from the same manufacturer.

We offer two types of blank flanges:

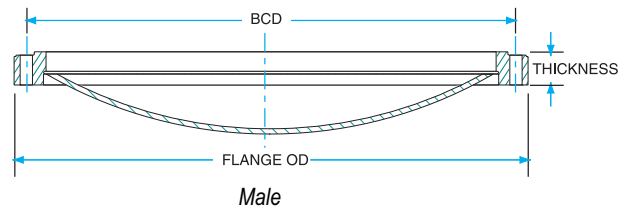
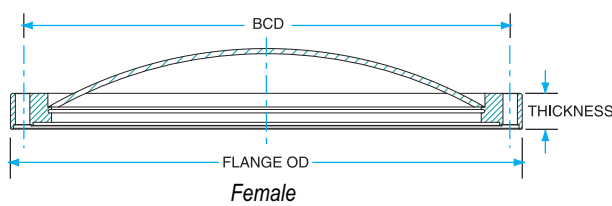
- Flat blank flange with a uniform thickness
- A much lighter blank flange with a thick ring for bolts and seal, blanked by a domed light-gauge centerpiece

Additional characteristics:

- The seal is OFHC® copper wire, 0.080" (2mm) in diameter, and repeatedly bakeable to 450° C

NOTE: We also offer clamped flange sets, but we recommend bolted flanges. Unless the number of clamps is correct and their spacing even, a flange pair may not seal reliably. We have reusable fluorocarbon o-rings for non-bakeout applications and larger wire seal flanges available on special order. Please contact us for price and delivery.

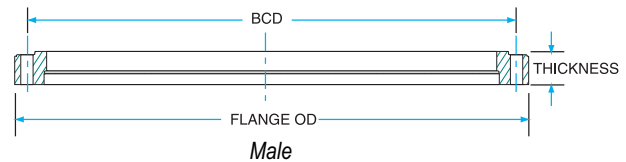
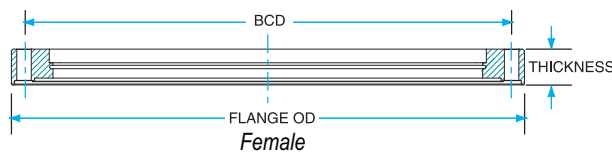
■ Domed Blank Wire-Seal Flanges



Tube O.D.	Flange O.D.	Thickness	BCD	Bolt Holes	Weight (lbs.)	Part No.*	Price
16"	19 ⁹ / ₁₆ "	1.31"	17.87"	36	41	WSFB19X000MD	Call
16"	19 ⁹ / ₁₆ "	1.31"	17.87"	36	41	WSFB19X000FD	Call
18"	22 ¹ / ₈ "	1.50"	20.18"	36	61	WSFB22X000MD	Call
18"	22 ¹ / ₈ "	1.50"	20.18"	36	61	WSFB22X000FD	Call
24"	27 ¹ / ₈ "	1.75"	25.84"	40	76	WSFB27X000MD	Call
24"	27 ¹ / ₈ "	1.75"	25.84"	40	76	WSFB27X000FD	Call

* "MD" at end of Part No. means male surfaces; "FD" means female.

■ Ring Wire-Seal Flanges



Tube O.D.	Flange O.D.	Thickness	BCD	Bolt Holes	Weight (lbs.)	Part No.*	Price
16"	19 ⁹ / ₁₆ "	1.31"	17.87"	36	34	WSFB19X1600M	Call
16"	19 ⁹ / ₁₆ "	1.31"	17.87"	36	34	WSFB19X1600F	Call
18"	22 ¹ / ₈ "	1.5"	20.18"	36	51	WSFB22X1800M	Call
18"	22 ¹ / ₈ "	1.5"	20.18"	36	51	WSFB22X1800F	Call
24"	27 ¹ / ₈ "	1.75"	25.84"	40	60	WSFB27X2400M	Call
24"	27 ¹ / ₈ "	1.75"	25.84"	40	60	WSFB27X2400F	Call

* "M" at end of Part No. means male surfaces; "F" means female.

► Solid Blank Flanges & Hardware

■ Solid Blank Wire-Seal Flanges

1

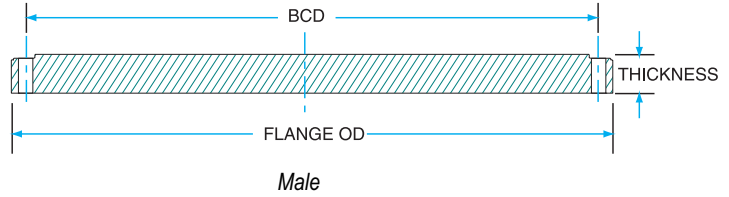
Flanges, Fittings, & Components



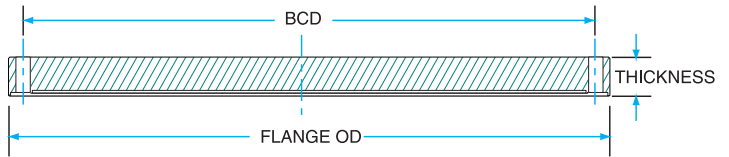
Male

Female

Ring Wire-Seal Flanges



Male



Female

Tube O.D.	Flange O.D.	Thickness	BCD	Bolt Holes	Weight (lbs.)	Part No.*	Price
16"	19 ⁹ / ₁₆ "	1.31"	17.87"	36	105	WSFB19X000M	Call
16"	19 ⁹ / ₁₆ "	1.31"	17.87"	36	105	WSFB19X000F	Call
18"	22 ¹ / ₈ "	1.5"	20.18"	36	155	WSFB22X000M	Call
18"	22 ¹ / ₈ "	1.5"	20.18"	36	155	WSFB22X000F	Call
24"	27 ¹ / ₈ "	1.75"	25.84"	40	276	WSFB27X000M	Call
24"	27 ¹ / ₈ "	1.75"	25.84"	40	276	WSFB27X000F	Call

* "M" at end of Part No. means male surfaces; "F" means female.

■ Wire-Seal Hardware

- Fits UHV wire-seal flanges



Copper Wire Gaskets			
Flange Size	Weight (lbs.)	Part No.	Price
19 ⁹ / ₁₆ "	1	WSFG-19	Call
22 ¹ / ₈ "	1	WSFG-22	Call
27 ¹ / ₈ "	1	WSFG-27	Call

Bolt/Nut Sets				
Flange Size	No. per Set	Weight (lbs.)	Part No.	Price
19 ⁹ / ₁₆ "	36	12	WSFBS-19	Call
22 ¹ / ₈ "	36	18	WSFBS-22	Call
27 ¹ / ₈ "	40	22	WSFBS-27	Call

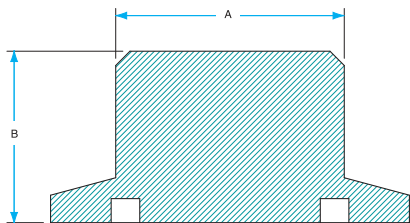
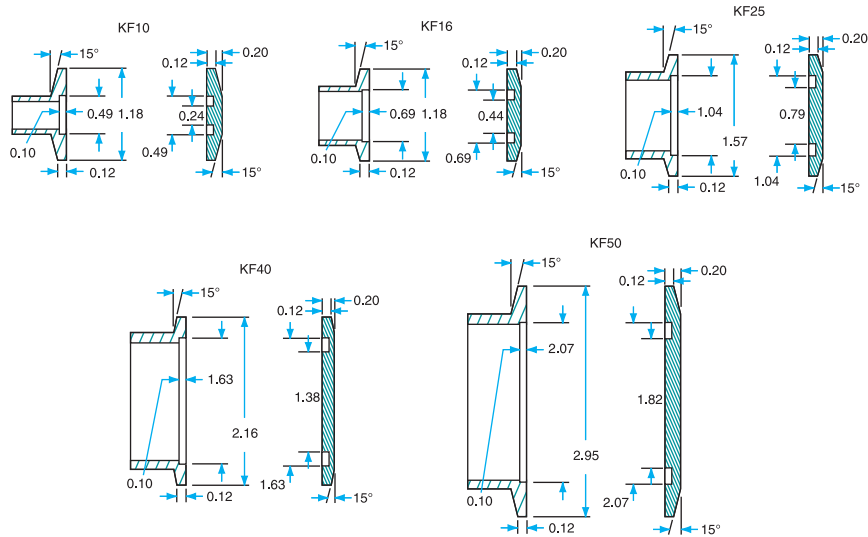
➤ KF (QF) Flanges

■ KF (QF) Flanges

1

KF flanges are equal to the flanges known as KF (or Klein Flansche) by the International Standards Organization.

- KF fittings are used for through or foreline vacuum plumbing and simple HV (10^{-8} Torr) chambers
- Elastomeric o-ring limits the connection's temperature range and ultimate vacuum
- 304L stainless steel fittings work in adverse temperatures and corrosive conditions
- Aluminum or brass fittings work in more general applications



■ Stainless Steel Blank Stubs

KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
10	0.75	0.75	1/4	QF10-050-US	Call
16	0.75	0.75	1/4	QF16-075-US	Call
25	1	0.75	1/4	QF25-100-US	Call
40	1.5	1	1/4	QF40-150-US	Call
50	2	1	1/4	QF50-200-US	Call

■ Aluminum Blank Stubs

KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
10	0.75	0.75	1/4	QF10-050-UA	Call
16	0.75	0.75	1/4	QF16-075-UA	Call
25	1	0.75	1/4	QF25-100-UA	Call
40	1.5	1	1/4	QF40-150-UA	Call
50	2	1	1/4	QF50-200-UA	Call

■ Brass Blank Stubs

KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
10	0.75	0.75	1/4	QF10-050-UB	Call
16	0.75	0.75	1/4	QF16-075-UB	Call
25	1	0.75	1/4	QF25-100-UB	Call
40	1.5	1	1/4	QF40-150-UB	Call
50	2	1	1/4	QF50-200-UB	Call

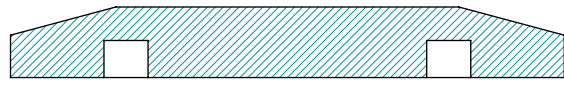


NOTE: Though our KF flanges are compatible for vacuum sealing with KF flanges from European manufacturers, we give the KF fitting tube diameters in inches.

NOTE: Flanges also available in 316L Stainless Steel.

► **Blank & Bored KF (QF) Flanges**

1
Flanges, Fittings, & Components



■ **Stainless Steel Blank Flanges**

KF	Weight (lbs.)	Part No.	Price
10	1/4	QF10-050-SB	Call
16	1/4	QF16-075-SB	Call
25	1/4	QF25-100-SB	Call
40	1/4	QF40-150-SB	Call
50	1/4	QF50-200-SB	Call

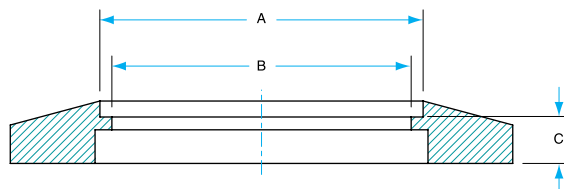
■ **Aluminum Blank Flanges**

KF	Weight (lbs.)	Part No.	Price
10	1/4	QF10-050-AB	Call
16	1/4	QF16-075-AB	Call
25	1/4	QF25-100-AB	Call
40	1/4	QF40-150-AB	Call
50	1/4	QF50-200-AB	Call

■ **Brass Blank Flanges**

KF	Weight (lbs.)	Part No.	Price
10	1/4	QF10-050-BB	Call
16	1/4	QF16-075-BB	Call
25	1/4	QF25-100-BB	Call
40	1/4	QF40-150-BB	Call
50	1/4	QF50-200-BB	Call

■ **Bored Stainless Steel Flanges**



NOTE: Flanges also available in 316L Stainless Steel.

KF	Dimensions (in.)			Weight (lbs.)	Part No.	Price
	A	B	C			
10	0.255	0.255	N/A	1/4	QF10-025-SBB	Call
10	0.505	0.451	0.150	1/4	QF10-050-SBB	Call
16	0.255	0.255	N/A	1/4	QF16-025-SBB	Call
16	0.380	0.380	0.150	1/4	QF16-037-SBB	Call
16	0.505	0.451	0.164	1/4	QF16-050-SBB	Call
16	0.760	0.685	0.140	1/4	QF16-075-SBB	Call
25	0.255	0.255	N/A	1/4	QF25-025-SBB	Call
25	0.380	0.380	N/A	1/4	QF25-037-SBB	Call
25	0.505	0.505	0.120	1/4	QF25-050-SBB	Call
25	0.760	0.715	0.120	1/4	QF25-075-SBB	Call
25	1.010	0.935	0.145	1/4	QF25-100-SBB	Call
40	0.255	0.255	N/A	1/4	QF40-025-SBB	Call
40	0.380	0.380	N/A	1/4	QF40-037-SBB	Call
40	0.505	0.466	0.120	1/4	QF40-050-SBB	Call
40	0.760	0.715	0.120	1/4	QF40-075-SBB	Call
40	1.010	0.935	0.120	1/4	QF40-100-SBB	Call
40	1.510	1.435	0.150	1/4	QF40-150-SBB	Call
50	0.255	0.255	N/A	1/4	QF50-025-SBB	Call
50	0.505	0.505	N/A	1/4	QF50-050-SBB	Call
50	0.760	0.715	0.120	1/4	QF50-075-SBB	Call
50	1.010	0.935	0.120	1/4	QF50-100-SBB	Call
50	1.510	1.435	0.120	1/4	QF50-150-SBB	Call
50	2.010	1.935	0.150	1/4	QF50-200-SBB	Call

KF	Dimensions (metric.)			Weight (lbs.)	Part No.	Price
	A	B	C			
10	14.2	10	4	1/4	QF10-055-SBB	Call
16	20.2	16	3.3	1/4	QF16-079-SBB	Call
25	28.2	24	3.5	1/4	QF25-110-SBB	Call
40	44.7	40	3.5	1/4	QF40-175-SBB	Call
50	57.2	50	4.4	1/4	QF50-224-SBB	Call

► Braze & Weld KF (QF) Flanges

■ KF (QF) Flanges

KF flanges are equal to the flanges known as KF (or Klein Flange) by the International Standards Organization.

- KF fittings are used for through or foreline vacuum plumbing and simple HV (10^{-8} Torr) chambers
- Elastomeric o-ring limits the connection's temperature range and ultimate vacuum
- 304L stainless steel fittings work in adverse temperatures and corrosive conditions
- Aluminum or brass fittings work in more general applications

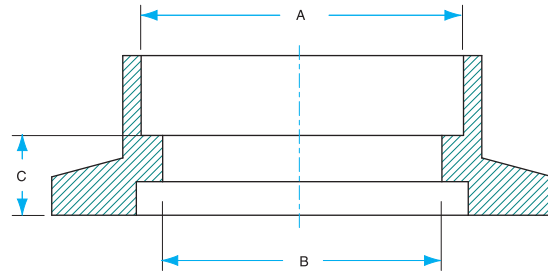
NOTE: Though our KF flanges are compatible for vacuum sealing with KF flanges from European manufacturers, we give the KF fitting tube diameters in inches.

NOTE: Flanges also available in 316L Stainless Steel.

Flanges, Fittings, & Components

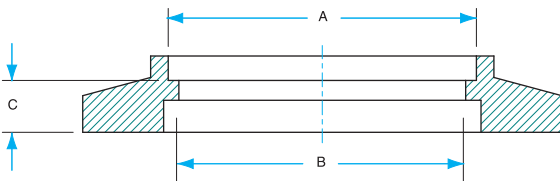
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■ Brass Braze Flanges



KF	Nominal Tube O.D.	Dimensions (in.)			Weight (lbs.)	Part No.	Price
		A	B	C			
16	1/2	0.51	0.375	0.25	1/4	QF16-050-BF	Call
16	5/8	0.64	0.500	0.25	1/4	QF16-062-BF	Call
16	3/4	0.76	0.625	0.25	1/4	QF16-075-BF	Call
25	1	1.01	0.875	0.25	1/4	QF25-100-BF	Call
25	1 1/8	1.14	0.875	0.25	1/4	QF25-112-BF	Call
40	1 1/2	1.51	1.375	0.25	1/4	QF40-150-BF	Call
40	1 5/8	1.64	1.560	0.25	1/4	QF40-162-BF	Call
50	2	2.01	1.875	0.25	1/4	QF50-200-BF	Call
50	2 1/8	2.14	1.875	0.25	1/4	QF50-212-BF	Call

■ Stainless Steel Weld Ring Flanges



KF	Nominal Tube O.D.	Dimensions (in.)			Weight (lbs.)	Part No.	Price
		A	B	C			
16	3/4	0.76	0.625	0.17	1/4	QF16-075-RF	Call
25	1	1.01	0.935	0.17	1/4	QF25-100-RF	Call
40	1 1/2	1.51	1.435	0.17	1/4	QF40-150-RF	Call
50	2	2.01	1.935	0.17	1/4	QF50-200-RF	Call

► Weld KF (QF) Flanges

■ Stainless Steel Weld Flanges

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Flanges, Fittings, & Components

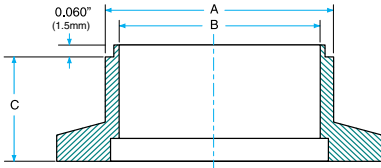


Figure 1

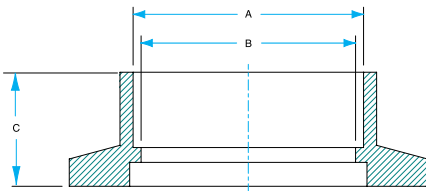


Figure 2



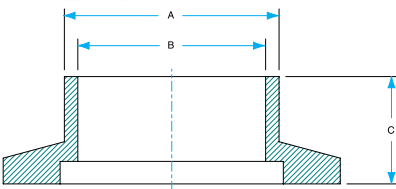
NOTE: Also available in 316L Stainless Steel.

KF	Nominal Tube		Dimensions (in.)			Weight (lbs.)	Part No.	Price
	O.D. (inch)	Figure	A	B	C			
10	½	1	0.50	0.375	0.50	¼	QF10-050-SF	Call
16	½	1	0.50	0.375	0.50	¼	QF16-050-SF	Call
16	¾	1	0.75	0.625	0.50	¼	QF16-075-SF	Call
25	1	2	1.01	0.935	0.50	¼	QF25-100-SF	Call
40	1½	2	1.51	1.435	0.50	¼	QF40-150-SF	Call
50	2	2	2.01	1.935	0.62	¼	QF50-200-SF	Call

■ Stainless Steel Weld Stubs



KF	Nominal Tube		Dimensions (in.)			Weight (lbs.)	Part No.	Price
	O.D. (inch)		A	B	C			
10	½		0.50	0.375	0.50	¼	QF10-050-SS	Call
16	½		0.50	0.375	0.50	¼	QF16-050-SS	Call
16	¾		0.75	0.625	0.50	¼	QF16-075-SS	Call
25	1		1.00	0.875	0.50	¼	QF25-100-SS	Call
40	1½		1.50	1.335	0.75	¼	QF40-150-SS	Call
40	1½		1.50	1.37	0.75	¼	QF40-150-SST	Call
50	2		2.00	1.835	0.75	¼	QF50-200-SS	Call
50	2		2.00	1.87	0.75	¼	QF50-200-SST	Call



NOTE: Also available in 316L Stainless Steel.

KF	Nominal Tube		Dimensions (mm)			Weight (lbs.)	Part No.	Price
	O.D. (mm)		A	B	C			
10	14 mm		14	12	30	¼	QF10-055-SS	Call
16	20 mm		20	18	30	¼	QF16-079-SS	Call
25	28 mm		28	26	30	¼	QF25-110-SS	Call
40	44.5 mm		44.5	42.5	30	¼	QF40-175-SS	Call
50	57 mm		57	54	30	¼	QF50-224-SS	Call

➤ KF (QF) Half Nipples

■ KF (QF) Half Nipples

A straight tube terminating at one end with a KF flange.

1

Flanges, Fittings, & Components

■ Stainless Steel

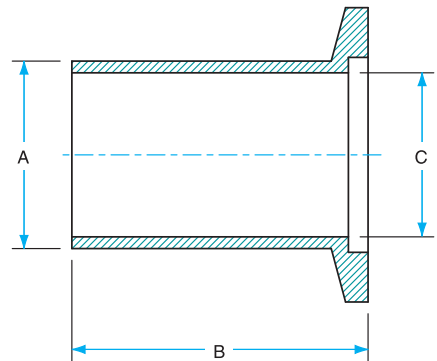
KF	Nominal	Dimensions (in.)			Weight (lbs.)	Part No.	Price
	Tube O.D.	A	B	C			
10	1/2"	0.50	1.575	0.375	1/4	QF10-050-LF	Call
16	1/2"	0.50	1.575	0.375	1/4	QF16-050-LF	Call
16	3/4"	0.75	1.575	0.625	1/4	QF16-075-LF	Call
25	1"	1.00	1.575	0.875	1/4	QF25-100-LF	Call
40	1 1/2"	1.50	1.575	1.335	1/4	QF40-150-LF	Call
40	1 1/2"	1.50	1.575	1.375	1/4	QF40-150-LFT	Call
50	2"	2.00	1.575	1.835	1/4	QF50-200-LF	Call
50	2"	2.00	1.575	1.875	1/4	QF50-200-LFT	Call



KF	Nominal Tube	Dimensions (mm)			Weight (lbs.)	Part No.	Price
	O.D.(mm)	A	B	C			
10	14	14	70	12	1/4	QF10-055-LF	Call
16	20	20	70	18	1/4	QF16-079-LF	Call
25	28	28	70	26	1/4	QF25-110-LF	Call
40	44.5	44.5	70	42.5	1/4	QF40-175-LF	Call
50	57	57	70	54	1/4	QF50-224-LF	Call

■ Aluminum

KF	Nominal	Dimensions (in.)			Weight (lbs.)	Part No.	Price
	Tube O.D.	A	B	C			
10	1/2"	0.50	1.575	0.375	1/4	QF10-050-LFA	Call
16	1/2"	0.50	1.575	0.375	1/4	QF16-050-LFA	Call
16	3/4"	0.75	1.575	0.625	1/4	QF16-075-LFA	Call
25	1"	1.00	1.575	0.875	1/4	QF25-100-LFA	Call
40	1 1/2"	1.50	1.575	1.335	1/4	QF40-150-LFA	Call
50	2"	2.00	1.575	1.835	1/4	QF50-200-LFA	Call



■ Brass

KF	Nominal	Dimensions (in.)			Weight (lbs.)	Part No.	Price
	Tube O.D.	A	B	C			
16	1/2"	0.50	1	0.375	1/4	QF16-050-LFB	Call
—	5/8"	0.62	1	0.500	1/4	QF16-062-LFB	Call
—	3/4"	0.75	1	0.625	1/4	QF16-075-LFB	Call
—	7/8"	0.87	1	0.750	1/4	QF16-087-LFB	Call
25	1"	1.00	1.38	0.875	1/4	QF25-100-LFB	Call
—	1 1/8"	1.13	1.38	1.000	1/4	QF25-112-LFB	Call
40	1 1/2"	1.50	1.575	1.335	1/4	QF40-150-LFB	Call
—	1 5/8"	1.63	1.575	1.460	1/4	QF40-162-LFB	Call
50	2"	2.00	1.575	1.835	1/4	QF50-200-LFB	Call
—	2 1/4"	2.13	1.575	1.960	1/4	QF50-212-LFB	Call

NOTE: These flanges are identical to the ISO (International Standards Organization) NW flange standard (also known as the KF [or Klein Flange]). While the flanges are compatible with those made by European manufacturers, the tube diameter is in inches.

NOTE: Also available in 316L Stainless Steel.

➤ KF (QF) Full Nipples

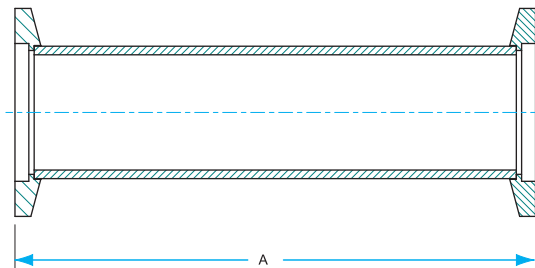
■ KF (QF) Full Nipples

A KF Nipple is a straight tube connecting two KF flanges.

NOTE: These flanges are identical to the ISO (International Standards Organization) NW flange standard (also known as the KF [or Klein Flange]). While the flanges are compatible with those made by European manufacturers, the tube diameter is in inches.

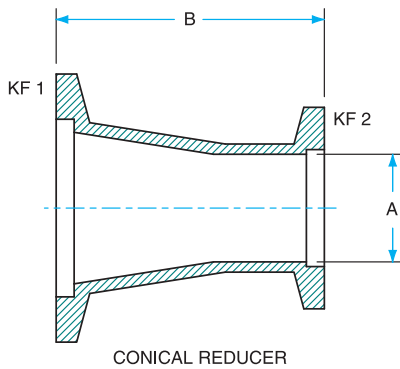


■ Stainless Steel Straight Nipples



KF	A	Weight (lbs.)	Part No.	Price
16	3.15"	1/2	QF16-075-N	Call
16	12.60"	3/4	QF16-075-NL	Call
25	3.94"	1/2	QF25-100-N	Call
25	12.60"	3/4	QF25-100-NL	Call
40	5.12"	1/2	QF40-150-N	Call
40	12.60"	1	QF40-150-NL	Call
50	5.51"	1	QF50-200-N	Call
50	12.60"	1 1/2	QF50-200-NL	Call

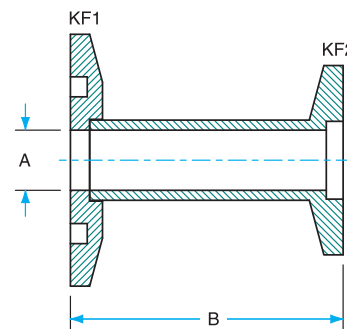
■ Stainless Steel Conical Reducer Nipples



CONICAL REDUCER

KF1/KF2	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
25/16	0.63	1.57	3/4	QF25XQF16C	Call
40/16	0.63	1.57	1	QF40XQF16C	Call
50/16	0.63	1.57	1	QF50XQF16C	Call
40/25	0.88	1.57	1	QF40XQF25C	Call
50/25	0.88	1.57	1	QF50XQF25C	Call
50/40	1.63	1.57	1	QF50XQF40C	Call

■ Stainless Steel Straight Reducer Nipples



STRAIGHT REDUCER

KF1/KF2	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
25/16	0.63	1.70	1/2	QF25XQF16	Call
40/16	0.63	1.70	1/2	QF40XQF16	Call
50/16	0.63	1.70	3/4	QF50XQF16	Call
40/25	0.88	1.70	1/2	QF40XQF25	Call
50/25	0.88	1.70	3/4	QF50XQF25	Call
50/40	1.38	1.70	3/4	QF50XQF40	Call
50/10	0.43	1.70	3/4	QF50XQF10	Call
40/10	0.43	1.70	1/2	QF40XQF10	Call
25/10	0.43	1.70	1/2	QF25XQF10	Call

■ Aluminum Conical Reducer Nipples

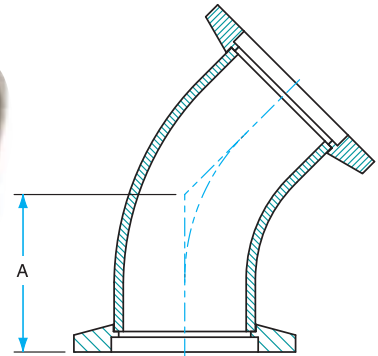
KF1/KF2	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
25/16	0.63	1.57	1/2	QF25XQF16CA	Call
40/16	0.63	1.57	1/2	QF40XQF16CA	Call
50/16	0.63	1.57	1/2	QF50XQF16CA	Call
40/25	0.88	1.57	1/2	QF40XQF25CA	Call
50/25	0.88	1.57	1/2	QF50XQF25CA	Call
50/40	1.63	1.57	1/2	QF50XQF40CA	Call

► 45° & 90° KF (QF) Elbows

1
Flanges, Fittings, & Components

■ 45° Stainless Steel Radius Elbows

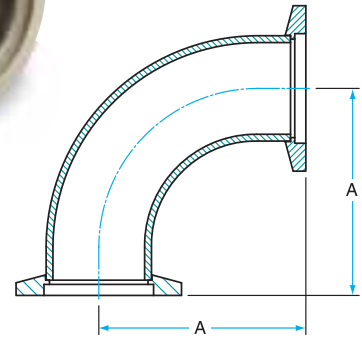
KF	A	Weight (lbs.)	Part No.	Price
16	0.91"	1/2	QF16-075-E45	Call
25	1.12"	1/2	QF25-100-E45	Call
40	1.68"	1/2	QF40-150-E45	Call
50	1.99"	3/4	QF50-200-E45	Call



NOTE: The flanges on these pages are identical to the ISO (International Standards Organization) NW flange standard (also known as the KF [or Klein Flange]). While the flanges are compatible with those made by European manufacturers, the tube diameter is in inches.

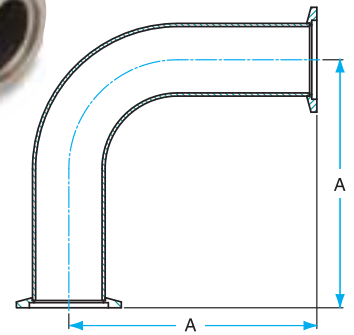
■ 90° Stainless Steel Radius Elbows

KF	A	Weight (lbs.)	Part No.	Price
16	1.57"	1/2	QF16-075-E90	Call
25	1.97"	1/2	QF25-100-E90	Call
40	2.56"	1/2	QF40-150-E90	Call
50	3.17"	3/4	QF50-200-E90	Call



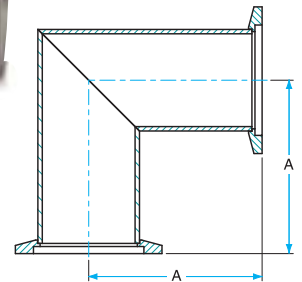
■ Long 90° Stainless Steel Radius Elbows

KF	A	Weight (lbs.)	Part No.	Price
16	2.70"	1/2	QF16-E90-LR	Call
25	3.64"	3/4	QF25-E90-LR	Call
40	5.12"	1	QF40-E90-LR	Call
50	5.52"	1 1/2	QF50-E90-LR	Call



■ 90° Mitered Elbows

Stainless Steel				
KF	A	Weight (lbs.)	Part No.	Price
16	1.57"	1/2	QF16-075E90M	Call
25	1.97"	1/2	QF25-100E90M	Call
40	2.56"	1/2	QF40-150E90M	Call
50	2.76"	3/4	QF50-200E90M	Call
Aluminum				
16	1.57"	1/2	QF16-075-EAL	Call
25	1.97"	1/2	QF25-100-EAL	Call
40	2.56"	1/2	QF40-150-EAL	Call

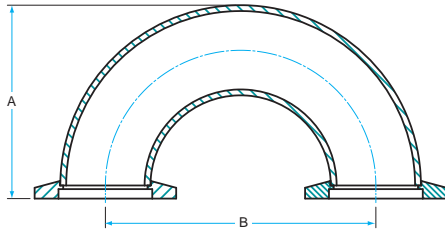


➤ **KF (QF) Tees & Reducer Tees**

1

Flanges, Fittings, & Components

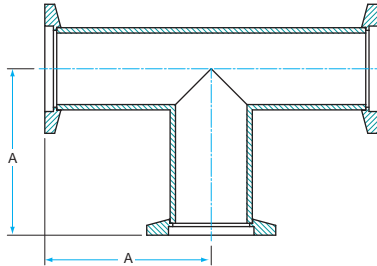
■ **180° Stainless Steel Returns**



KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
16	1.67	2.25	1	QF16-075E180	Call
25	2.17	3.00	1	QF25-100E180	Call
40	3.17	4.50	1	QF40-150E180	Call
50	4.17	6.00	1½	QF50-200E180	Call

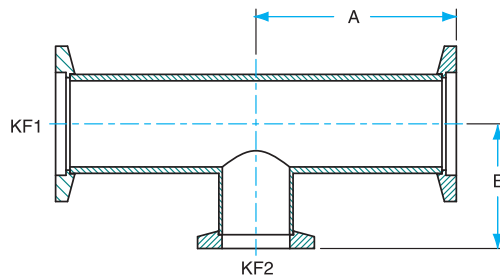
NOTE: The flanges on these pages are identical to the ISO (International Standards Organization) NW flange standard (also known as the KF [or Klein Flange]). While the flanges are compatible with those made by European manufacturers, the tube diameter is in inches.

■ **Tees**



Stainless Steel					
KF	A	Weight (lbs.)	Part No.	Price	
16	1.57"	½	QF16-075-T	Call	
25	1.97"	½	QF25-100-T	Call	
40	2.56"	½	QF40-150-T	Call	
50	2.76"	1	QF50-200-T	Call	
Aluminum					
16	1.57"	½	QF16-075-TAL	Call	
25	1.97"	½	QF25-100-TAL	Call	
40	2.56"	½	QF40-150-TAL	Call	

■ **Stainless Steel Reducer Tees**



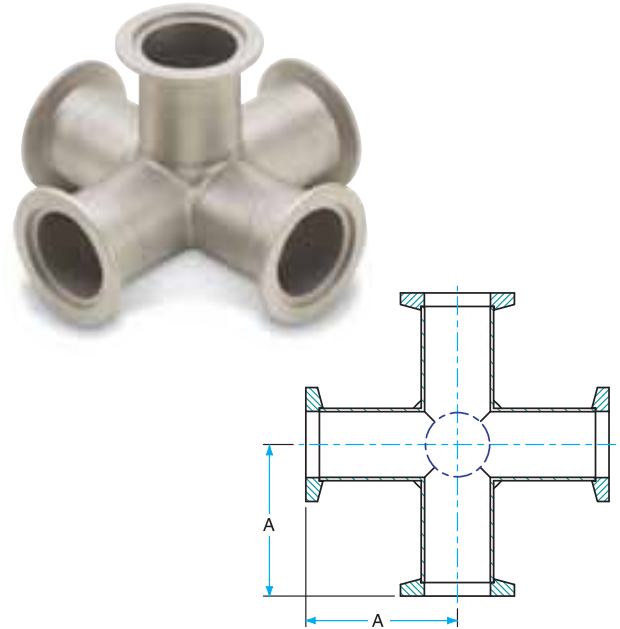
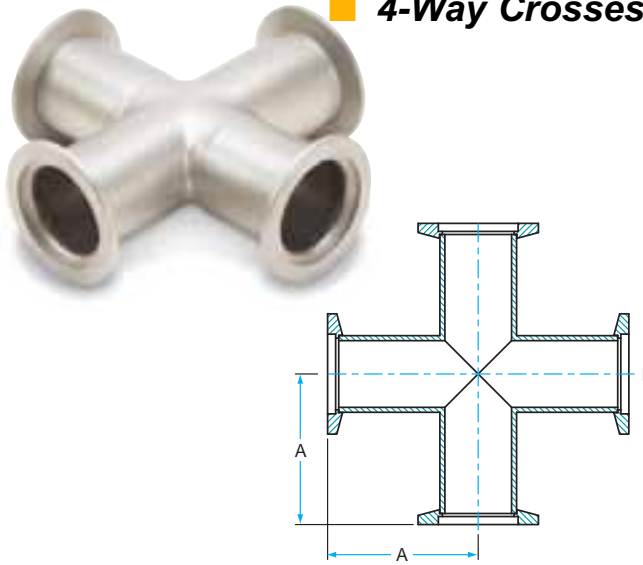
KF1/KF2	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
25/16	1.97	1.08	½	QF25X16T	Call
40/16	2.56	1.95	½	QF40X16T	Call
40/25	2.56	2.22	½	QF40X25T	Call
50/16	2.75	1.58	¾	QF50X16T	Call
50/25	2.75	2.47	1	QF50X25T	Call
50/40	2.75	2.81	1	QF50X40T	Call

➤ KF (QF) Crosses & Reducer Crosses

■ 4-Way Crosses

■ 5-Way Stainless Steel Crosses

1
Flanges, Fittings, & Components

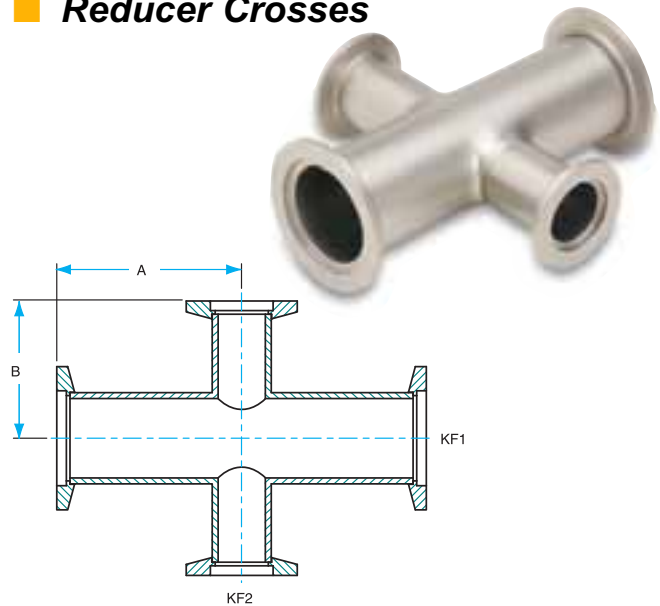
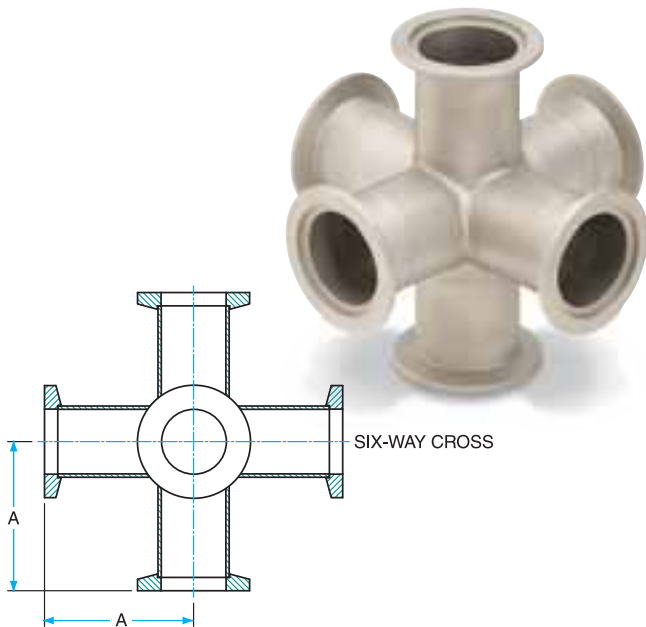


Stainless Steel				
KF	A	Weight (lbs.)	Part No.	Price
16	1.57"	1/2	QF16-075-X	Call
25	1.97"	1/2	QF25-100-X	Call
40	2.56"	1/2	QF40-150-X	Call
50	2.76"	1	QF50-200-X	Call
Aluminum				
16	1.57"	1/2	QF16-075-XAL	Call
25	1.97"	1/2	QF25-100-XAL	Call
40	2.56"	1/2	QF40-150-XAL	Call

KF	A	Weight (lbs.)	Part No.	Price
16	1.57"	1/2	QF16-075-5X	Call
25	1.97"	1	QF25-100-5X	Call
40	2.56"	1	QF40-150-5X	Call
50	2.76"	2	QF50-200-5X	Call

■ 6-Way Stainless Steel Crosses

■ Reducer Crosses



KF	A	Weight (lbs.)	Part No.	Price
16	1.57"	1/2	QF16-075-6X	Call
25	1.97"	1	QF25-100-6X	Call
40	2.56"	1	QF40-150-6X	Call
50	2.76"	2	QF50-200-6X	Call

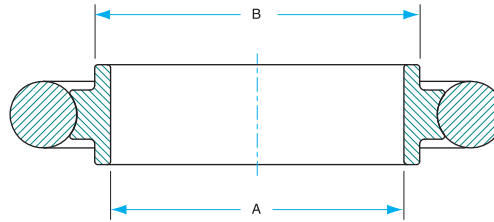
KF1/KF2	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
25/16	1.97	1.70	3/4	QF25X16X	Call
40/16	2.56	1.95	1	QF40X16X	Call
40/25	2.56	2.22	1	QF40X25X	Call
50/16	2.75	2.20	1 1/2	QF50X16X	Call
50/25	2.75	2.47	1 1/2	QF50X25X	Call
50/40	2.75	2.81	2	QF50X40X	Call

➤ KF (QF) Centering Rings

1
Flanges, Fittings, & Components

■ Centering Rings

- We offer centering rings in stainless steel, aluminum, and brass
- All stainless steel and aluminum centering rings come with either fluorocarbon or Buna-N o-rings
- Brass centering rings come equipped with Buna-N o-rings



CENTERING RING

■ Stainless Steel Centering Rings

KF	Dimensions (in.)		O-Ring Material	Weight (lbs.)	Part No.	Price
	A	B				
10	0.370	0.470	Viton®	1/4	QF10-050-SRV	Call
16	0.635	0.670	Viton	1/4	QF16-075-SRV	Call
25	0.925	1.025	Viton	1/4	QF25-100-SRV	Call
40	1.510	1.610	Viton	1/4	QF40-150-SRV	Call
50	1.945	2.045	Viton	1/4	QF50-200-SRV	Call
10	0.370	0.470	Buna-N	1/4	QF10-050-SRB	Call
16	0.635	0.670	Buna-N	1/4	QF16-075-SRB	Call
25	0.925	1.025	Buna-N	1/4	QF25-100-SRB	Call
40	1.510	1.610	Buna-N	1/4	QF40-150-SRB	Call
50	1.945	2.045	Buna-N	1/4	QF50-200-SRB	Call



Centering Rings

■ Aluminum Centering Rings

KF	Dimensions (in.)		O-Ring Material	Weight (lbs.)	Part No.	Price
	A	B				
10	0.370	0.470	Buna-N	1/4	QF10-050-ARB	Call
16	0.635	0.670	Buna-N	1/4	QF16-075-ARB	Call
25	0.925	1.025	Buna-N	1/4	QF25-100-ARB	Call
40	1.510	1.610	Buna-N	1/4	QF40-150-ARB	Call
50	1.945	2.045	Buna-N	1/4	QF50-200-ARB	Call
10	0.370	0.470	Viton	1/4	QF10-050-ARV	Call
16	0.635	0.670	Viton	1/4	QF16-075-ARV	Call
25	0.925	1.025	Viton	1/4	QF25-100-ARV	Call
40	1.510	1.610	Viton	1/4	QF40-150-ARV	Call
50	1.945	2.045	Viton	1/4	QF50-200-ARV	Call



■ Brass Centering Rings

KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
10	0.370	0.470	1/4	QF10-050-BRB	Call
16	0.635	0.670	1/4	QF16-075-BRB	Call
25	0.925	1.025	1/4	QF25-100-BRB	Call
40	1.510	1.610	1/4	QF40-150-BRB	Call
50	1.945	2.045	1/4	QF50-200-BRB	Call

➤ KF (QF) Centering Rings

1
Flanges, Fittings, & Components

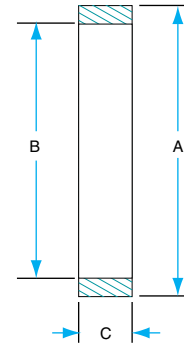


Over Pressure Rings

Over Pressure Rings fit around the outside diameter of a centering ring to help retain the o-ring if a system is exposed to a sudden burst of pressure.

Important:

- KJLC does not warrant positive pressure applications



KF	Dimensions (in.)			Weight (lbs.)	Part No.	Price
	A	B	C			
16	1.25	1.19	0.35	1/4	QF16-075-OPR	Call
25	1.66	1.58	0.35	1/4	QF25-100-OPR	Call
40	2.25	2.17	0.35	1/4	QF40-150-OPR	Call
50	2.75	2.62	0.15	1/4	QF50-200-OPR	Call



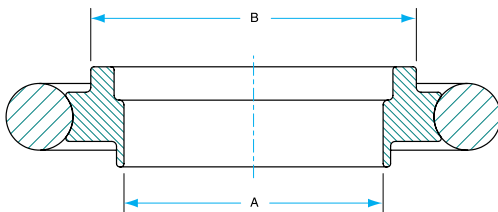
Stainless Steel Adaptive Centering Ring

Adaptive Centering Rings

- Allow the mating of two close, but different-sized, KF flanges
- Stainless steel centering rings come with fluorocarbon o-rings
- Aluminum centering rings come with Buna-N o-rings

Stainless Steel Adaptive Centering Rings

KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
10-16	0.398	0.675	1/4	QF10-16-ASRV	Call
20-25	0.810	1.025	1/4	QF20-25-ASRV	Call
32-40	1.260	1.611	1/4	QF32-40-ASRV	Call



ADAPTIVE CENTERING RING

NOTE: We indicate mating part sizes in the part number (e.g., centering ring QF20-25-ASRV mates a KF20 with a KF25).

Aluminum Adaptive Centering Rings

KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
10-16	0.398	0.675	1/4	QF10-16-AARB	Call
20-25	0.810	1.025	1/4	QF20-25-AARB	Call
32-40	1.260	1.611	1/4	QF32-40-AARB	Call

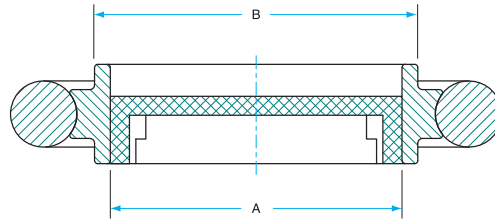
➤ KF (QF) Centering Rings KF (QF) Replacement O-Rings

1

Flanges, Fittings, & Components

Centering Rings with 72 Mesh Screen (Stainless Steel)

- Used at the inlet of mechanical pumps
- Prevent the passage of loose pieces of debris

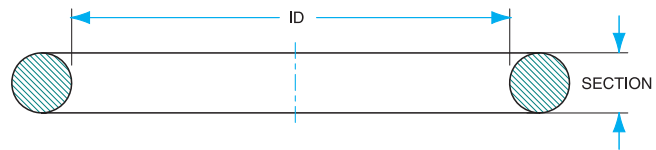


CENTERING RING W/ SCREEN



KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	A	B			
16	0.50	0.670	1/4	QF16-SRV-SM	Call
25	0.86	1.025	1/4	QF25-SRV-SM	Call
40	1.45	1.610	1/4	QF40-SRV-SM	Call
50	1.88	2.045	1/4	QF50-SRV-SM	Call

Replacement O-Rings



Buna-N O-Rings

KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	I.D.	Section			
10	0.60	0.210	1/4	O-B312	Call
16	0.72	0.210	1/4	O-B314	Call
25	1.10	0.210	1/4	O-B320	Call
40	1.60	0.210	1/4	O-B326	Call
50	2.10	0.210	1/4	O-B330	Call

Silicone O-Rings

KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	I.D.	Section			
10	0.60	0.210	1/4	O-S312	Call
16	0.72	0.210	1/4	O-S314	Call
25	1.10	0.210	1/4	O-S320	Call
40	1.60	0.210	1/4	O-S326	Call
50	2.10	0.210	1/4	O-S330	Call

Fluorocarbon O-Rings

KF	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	I.D.	Section			
10	0.60	0.210	1/4	O-V312	Call
16	0.72	0.210	1/4	O-V314	Call
25	1.10	0.210	1/4	O-V320	Call
40	1.60	0.210	1/4	O-V326	Call
50	2.10	0.210	1/4	O-V330	Call

NOTE: We list only the more popular O-ring diameters and sections for vacuum service. We can supply other sizes at your request. For information, or for assistance in choosing the best o-ring for an application, contact us.

► KF (QF) Machined & Cast Clamps

1
Flanges, Fittings, & Components



■ Clamps

We offer five types of KF clamps:

- Machined or Cast Clamp—a hinged two-part device, closed with a thumb screw and used with an o-ring/centering ring
- Lever Clamp—a two-part device, closed with a lever and used with an o-ring/centering ring
- Bolt Clamp—a three-part device, closed with socket head screws and used with replaceable metal seals for UHV
- Chain Clamp—a multi-link device, excellent for tight spaces
- Bulkhead Clamp—to attach components to KF bolt hole profiles



Cast Clamp

■ Machined and Cast Clamps

Aluminum Cast Clamps			
KF	Weight (lbs.)	Part No.	Price
10-16	1/2	QF16-075-C	Call
25	1/2	QF25-100-C	Call
40	3/4	QF40-150-C	Call
50	3/4	QF50-200-C	Call

Aluminum Machined Clamps			
KF	Weight (lbs.)	Part No.	Price
10-16	1/2	QF16-075-MC	Call
25	1/2	QF25-100-MC	Call
40	3/4	QF40-150-MC	Call
50	3/4	QF50-200-MC	Call

Stainless Steel Machined Clamps			
KF	Weight (lbs.)	Part No.	Price
10-16	3/4	QF16-075-CS	Call
25	1	QF25-100-CS	Call
40	1 1/2	QF40-150-CS	Call
50	2	QF50-200-CS	Call



Machined Clamps



■ Flange Caps

Plastic Flange Caps protect the flange's sealing surface from unwanted damage.

KF	Weight (lbs.)	Part No.	Price
16	1/4	QF16CAP	Call
25	1/4	QF25CAP	Call
40	1/4	QF40CAP	Call
50	1/4	QF50CAP	Call

► KF (QF) Bolt Clamps, Seal Discs, Lever Clamps, & Support Rings

1

Flanges, Fittings, & Components

■ Lever Clamps

Aluminum			
KF	Weight (lbs.)	Part No.	Price
10-16	1/2	QF16-075-CHA	Call
25	3/4	QF25-100-CHA	Call
40	3/4	QF40-150-CHA	Call

Polymer			
KF	Weight (lbs.)	Part No.	Price
10-16	1/2	QF16-075-CHP	Call
25	1/2	QF25-100-CHP	Call
40	3/4	QF40-150-CHP	Call
50	3/4	QF50-200-CHP	Call



■ Aluminum Bolt Clamp Components

NOTE: Bolt clamps for KF flanges require a corresponding outer support ring and replaceable seal discs. The necessary corresponding parts are identified by KF flange type.

KF	Weight (lbs.)	Part No.	Price
16	1	QF16-075-CC	Call
25	1	QF25-100-CC	Call
40	1 1/2	QF40-150-CC	Call



■ Aluminum Seal Discs (Set of 3)

KF	Weight (lbs.)	Part No.	Price
16	1/2	QF16-075-CCD	Call
25	1/2	QF25-100-CCD	Call
40	1/2	QF40-150-CCD	Call



■ Outer Support Rings

KF	Weight (lbs.)	Part No.	Price
16	1/4	QF16-075-OSR	Call
25	1/4	QF25-100-OSR	Call
40	1/4	QF40-150-OSR	Call



► KF (QF) Clamps, Seal Discs, & Support Rings

1
Flanges, Fittings, & Components



■ KF (QF) Chain Clamps

Excellent quick fasteners for sealing KF components.

These clamps feature the following characteristics:

- Pressure die-cast aluminum alloy with black anodized coating
- Stainless steel pins
- Quick opening and closing
- Suitable for utmost leak tightness
- Allow high sealing forces
- Safe turnbuckle—cannot be tripped unintentionally
- Long life cycle

SPECIFICATIONS

KF	Weight (lbs.)	Part No.	Price
10/16	1/4	QF16-075-CCL	Call
25	1/4	QF25-100-CCL	Call
40	1/2	QF40-150-CCL	Call
50	1/2	QF50-200-CCL	Call

Maximum Temperature Withstanding = 150° C

Flange Type	Torque (N-m)
KF 10/16	0.75
KF 25	1.1
KF 40	1.7
KF 50	2.0



■ Single Claw Clamp Kit for KF (QF)

For bolting KF flanges to bulkheads.

- Cast steel construction
- Includes spring-loaded lock-washers
- Can be used instead of bulkhead clamps
- M6-20 thread

KF	Per Pkg.	Weight (lbs.)	Part No.	Price
KF10 to KF50	4	0.11	VKF1050CCS	Call



■ KF (QF) Bulkhead Clamps

- Aluminum construction
- Stainless steel bolts and washers included (10⁻³² x 5/8")
- Adapts to a baseplate or fixed flange
- Standard KF seal assembly

KF	Thickness	Clamp O.D.	Bolt Circle Diameter	No. of Bolts	Weight (lbs.)	Part No.	Price
16	0.36	2.00	1.50	6	1/4	QF16-075-BC	Call
25	0.39	2.38	1.89	6	1/4	QF25-100-BC	Call
40	0.37	2.94	2.44	6	1/4	QF40-150-BC	Call
50	0.40	3.75	3.25	8	1/4	QF50-200-BC	Call

► ISO-K and ISO-F Dimensions

■ Centering Ring Dimensions

Size	Lip O.D. in. (mm)	Lip I.D. in. (mm)	Thickness in. (mm)
ISO 63	2.756 (70)	2.63 (66.8)	0.154 (3.9)
ISO 80	3.268 (83)	3.14 (79.8)	0.154 (3.9)
ISO 100	4.016 (102)	3.89 (98.8)	0.154 (3.9)
ISO 160	6.024 (153)	5.90 (149.9)	0.154 (3.9)
ISO 200	8.386 (213)	8.26 (209.8)	0.154 (3.9)
ISO 250	10.276 (261)	10.14 (257.6)	0.154 (3.9)
ISO 320	12.520 (318)	12.30 (312.4)	0.220 (5.6)
ISO 400	15.748 (400)	15.53 (394.5)	0.220 (5.6)
ISO 500	19.724 (501)	19.51 (495.6)	0.220 (5.6)
ISO 630	25.630 (651)	25.41 (645.4)	0.220 (5.6)



1

Flanges, Fittings, & Components

■ ISO-K Style Flange Dimensions

Flange Size	Tube O.D. (in.)	Flange O.D. in. (mm)	Flange Thickness in. (mm)	Number of Clamps		Assembly Diameter in. (mm)
				Minimal	Optimal	
ISO 63	2½	3.74 (95)	0.47 (12)	3	4	5.00 (127)
ISO 80	3	4.33 (110)	0.47 (12)	4	8	5.59 (142)
ISO 100	4	5.12 (130)	0.47 (12)	4	8	6.38 (162)
ISO 160	6	7.09 (180)	0.47 (12)	4	8	8.35 (212)
ISO 200	8	9.45 (240)	0.47 (12)	6	12	10.71 (272)
ISO 250	10	11.42 (290)	0.47 (12)	6	12	12.68 (322)
ISO 320	12¾	14.57 (370)	0.67 (17)	8	12	16.73 (425)
ISO 400	16	17.72 (450)	0.67 (17)	8	16	20.08 (510)
ISO 500	20	21.65 (550)	0.67 (17)	12	16	24.02 (610)
ISO 630	24	27.17 (690)	0.86 (22)	14	18	29.53 (750)

■ ISO-F Style Flange Dimensions

Flange Size	Tube O.D. (in.)	Flange O.D. in. (mm)	Flange Thickness in. (mm)	No. of Bolts	Holes Diameter in. (mm)	BCD in. (mm)
ISO 63	2½	5.12 (130)	0.47 (12)	4	0.35 (9)	4.33 (110)
ISO 80	3	5.71 (145)	0.47 (12)	8	0.35 (9)	4.92 (125)
ISO 100	4	6.50 (165)	0.47 (12)	8	0.35 (9)	5.71 (145)
ISO 160	6	8.86 (225)	0.63 (16)	8	0.43 (11)	7.87 (200)
ISO 200	8	11.22 (285)	0.63 (16)	12	0.43 (11)	10.24 (260)
ISO 250	10	13.19 (335)	0.63 (16)	12	0.43 (11)	12.20 (310)
ISO 320	12¾	16.73 (425)	0.79 (20)	12	0.55 (14)	15.55 (395)
ISO 400	16	20.08 (510)	0.79 (20)	16	0.55 (14)	18.90 (480)
ISO 500	20	24.02 (610)	0.79 (20)	16	0.55 (14)	22.83 (580)
ISO 630	24	29.53 (750)	0.95 (24)	20	0.55 (14)	28.35 (720)

ISO-K Blank & Weld Flanges

IN THIS SECTION

ISO Flanges & Components

- ISO-K flanges use double claw clamp fasteners to connect two flange surfaces together
- ISO-F flanges use nuts and bolts to connect the two flange surfaces together
- Blank flanges are available in 304 stainless steel or aluminum
- Weld flanges are available in stainless steel
- ISO components are made of stainless steel

NOTE: The "Blanks Tube" column indicates the diameter of the tube that would normally be used with that size flange.



Weld Flanges



ISO-K Blank Flanges



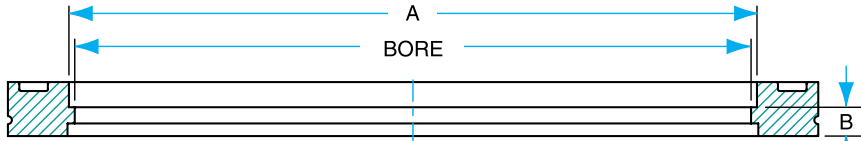
Aluminum

ISO Flange Size (mm)	Blanks Tube	Weight (lbs.)	Part No.	Price
63	2.5"	1/2	QF63-ABK	Call
80	3"	1/2	QF80-ABK	Call
100	4"	1	QF100-ABK	Call
160	6"	2 1/2	QF160-ABK	Call
200	8"	4	QF200-ABK	Call
250	10"	6	QF250-ABK	Call
320	12.75"	15	QF320-ABK	Call
400	16"	23	QF400-ABK	Call
500	20"	34	QF500-ABK	Call
630	26"	40	QF630-ABK	Call

Stainless Steel

ISO Flange Size (mm)	Blanks Tube	Weight (lbs.)	Part No.	Price
63	2.5"	1	QF63-BK	Call
80	3"	1	QF80-BK	Call
100	4"	3	QF100-BK	Call
160	6"	5	QF160-BK	Call
200	8"	8	QF200-BK	Call
250	10"	13	QF250-BK	Call
320	12.75"	32	QF320-BK	Call
400	16"	45	QF400-BK	Call
500	20"	69	QF500-BK	Call
630	26"	80	QF630-BK	Call

Stainless Steel ISO-K Weld Flanges



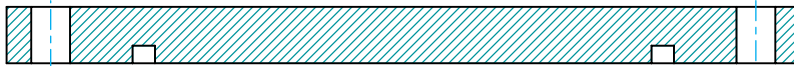
ISO Flange Size (mm)	Tube O.D.	Dimensions (in.)			Weight (lbs.)	Part No.	Price
		Bore	A	B			
63	2.5"	2.435	2.51	0.25	1/2	QF63-SWK	Call
80	3"	2.935	3.01	0.25	1/2	QF80-SWK	Call
100	4"	3.917	4.01	0.25	1/2	QF100-SWK	Call
160	6"	5.917	6.02	0.25	1 1/2	QF160-SWK	Call
200	8"	7.880	8.02	0.25	2	QF200-SWK	Call
250	10"	9.880	10.02	0.25	3	QF250-SWK	Call
320	12.75"	12.630	12.77	0.375	8	QF320-SWK	Call
400	16"	15.62	16.02	0.375	10	QF400-SWK	Call
500	20"	19.880	20.02	0.375	12	QF500-SWK	Call
630	24"	23.810	24.02	0.500	18	QF630-SWK	Call

ISO Flange Size (mm)	Tube O.D.	Dimensions (mm)			Weight (lbs.)	Part No.	Price
		Bore	A	B			
63	76	73	76	6.35	1/2	QF63-SWK-M	Call
80	89	86	89	6.35	1/2	QF80-SWK-M	Call
100	108	105	108	6.35	1/2	QF100-SWK-M	Call
160	159	156	159	6.35	1 1/2	QF160-SWK-M	Call
200	219	216	219	6.35	2	QF200-SWK-M	Call
250	267	264	267	6.35	3	QF250-SWK-M	Call
320	324	319.5	324	9.53	4	QF320-SWK-M	Call
400	406	401	406	9.53	5	QF400-SWK-M	Call
500	508	503	508	9.53	6	QF500-SWK-M	Call
630	660	655.5	660	12.7	7	QF630-SWK-M	Call

ISO-F Blank & Weld Flanges

1 Flanges, Fittings, & Components

ISO-F Blank Flanges



Aluminum

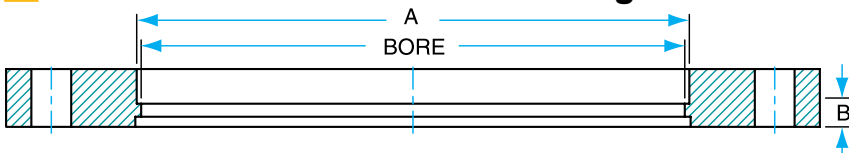
ISO Flange Size (mm)	Blanks Tube	Weight (lbs.)	Part No.	Price
63	2.5"	1½	QF63-ABF	Call
80	3"	1½	QF80-ABF	Call
100	4"	2	QF100-ABF	Call
160	6"	3.5	QF160-ABF	Call
200	8"	5.5	QF200-ABF	Call
250	10"	7.5	QF250-ABF	Call
320	12.75"	16.5	QF320-ABF	Call
400	16"	25	QF400-ABF	Call
500	20"	37	QF500-ABF	Call
630	26"	45	QF630-ABF	Call

Stainless Steel

ISO Flange Size (mm)	Blanks Tube	Weight (lbs.)	Part No.	Price
63	2.5"	4	QF63-BF	Call
80	3"	4	QF80-BF	Call
100	4"	4	QF100-BF	Call
160	6"	11	QF160-BF	Call
200	8"	18	QF200-BF	Call
250	10"	25	QF250-BF	Call
320	12.75"	50	QF320-BF	Call
400	16"	75	QF400-BF	Call
500	20"	95	QF500-BF	Call
630	26"	130	QF630-BF	Call



Stainless Steel ISO-F Weld Flanges



ISO Flange Size (mm)	Tube O.D.	Dimensions (in.)			Weight (lbs.)	Part No.	Price
		Bore	A	B			
63	2.5"	2.435	2.51	0.25	3	QF63-SWF	Call
80	3"	2.935	3.01	0.25	3	QF80-SWF	Call
100	4"	3.917	4.01	0.25	3	QF100-SWF	Call
160	6"	5.917	6.02	0.25	5	QF160-SWF	Call
200	8"	7.880	8.02	0.25	8	QF200-SWF	Call
250	10"	9.880	10.02	0.25	10	QF250-SWF	Call
320	12.75"	12.630	12.77	0.375	25	QF320-SWF	Call
400	16"	15.62	16.02	0.375	25	QF400-SWF	Call
500	20"	19.880	20.02	0.375	55	QF500-SWF	Call
630	24"	23.810	24.02	0.500	75	QF630-SWF	Call

ISO Flange Size (mm)	Tube O.D.	Dimensions (mm)			Weight (lbs.)	Part No.	Price
		Bore	A	B			
63	76	73	76	6.35	½	QF63-SWF-M	Call
80	89	86	89	6.35	½	QF80-SWF-M	Call
100	108	105	108	6.35	½	QF100-SWF-M	Call
160	159	156	159	6.35	1½	QF160-SWF-M	Call
200	219	216	219	6.35	2	QF200-SWF-M	Call
250	267	264	267	6.35	3	QF250-SWF-M	Call
320	324	319.5	324	9.53	4	QF320-SWF-M	Call
400	406	401	406	9.53	5	QF400-SWF-M	Call
500	508	503	508	9.53	6	QF500-SWF-M	Call
630	660	655.5	660	12.7	7	QF630-SWF-M	Call



► ISO-K & ISO-F Nipples

1
Flanges, Fittings, & Components

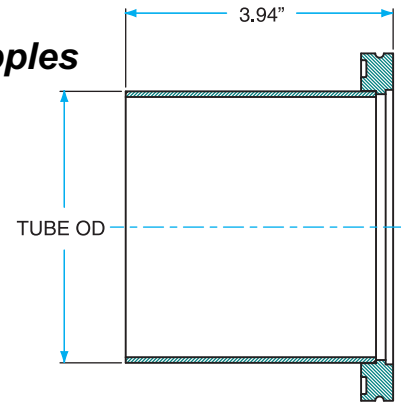


ISO-K Flanged Half Nipple



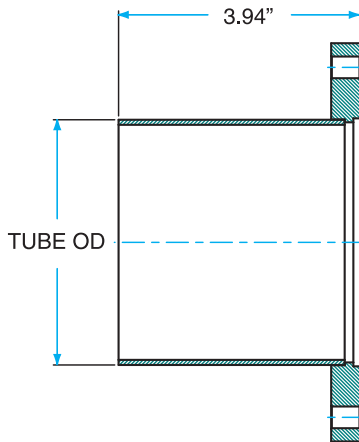
ISO-F Flanged Half Nipple

■ ISO-K Flanged Half Nipples



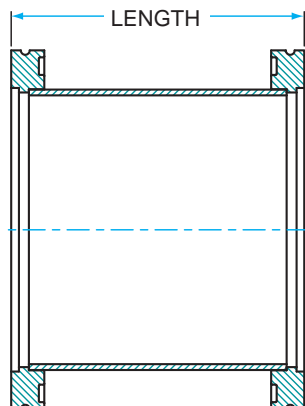
ISO (mm)	Tube O.D.	Bore	Weight (lbs.)	Part No.	Price
63	2.5"	2.37"	1	QF63-LBK	Call
80	3"	2.87"	1	QF80-LBK	Call
100	4"	3.87"	2	QF100-LBK	Call
160	6"	5.83"	4	QF160-LBK	Call
200	8"	7.76"	5	QF200-LBK	Call
250	10"	9.75"	13	QF250-LBK	Call
320	12.75"	12.42"	14	QF320-LBK	Call
400	16"	15.62"	17	QF400-LBK	Call
500	20"	19.62"	22	QF500-LBK	Call
630	24"	23.50"	30	QF630-LBK	Call

■ ISO-F Flanged Half Nipples



ISO (mm)	Tube O.D.	Bore	Weight (lbs.)	Part No.	Price
63	2.5"	2.37"	4	QF63-LBF	Call
80	3"	2.87"	4	QF80-LBF	Call
100	4"	3.87"	5	QF100-LBF	Call
160	6"	5.83"	7	QF160-LBF	Call
200	8"	7.76"	12	QF200-LBF	Call
250	10"	9.75"	15	QF250-LBF	Call
320	12.75"	12.42"	34	QF320-LBF	Call
400	16"	15.62"	40	QF400-LBF	Call
500	20"	19.62"	74	QF500-LBF	Call
630	24"	23.50"	95	QF630-LBF	Call

■ ISO-K Flanged Full Nipples



ISO (mm)	Tube O.D.	Length	Weight (lbs.)	Part No.	Price
63	2.5"	4.18"	2	QF63-250-N	Call
63	2.5"	6.92"	3	QF63-250-NL	Call
80	3"	4.18"	3	QF80-300-N	Call
80	3"	7.72"	4	QF80-300-NL	Call
100	4"	4.18"	3	QF100-400-N	Call
100	4"	8.5"	4	QF100-400-NL	Call
160	6"	4.18"	9	QF160-600-N	Call
160	6"	10.86"	10	QF160-600-NL	Call
200	8"	4.18"	10	QF200-800-N	Call
200	8"	13.22"	12	QF200-800-NL	Call
250	10"	4.18"	12	QF250-1000-N	Call
250	10"	16.38"	15	QF250-1000NL	Call

► ISO-K Straight & Conical Reducer Nipples

■ Reducers with ISO-K Flanges

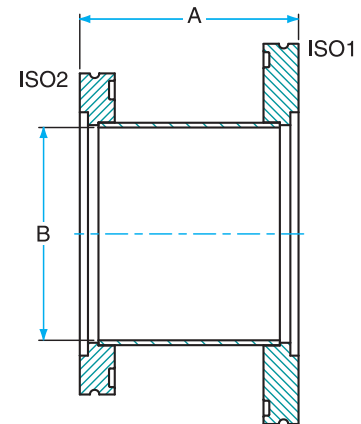
Adapt two different-size flanges that must be connected.



ISO-K Flanged to ISO Conical Reducers

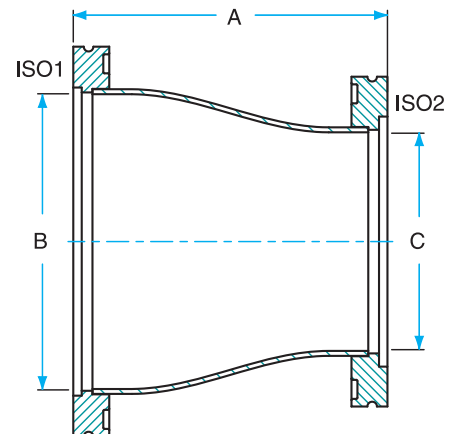
■ ISO-K Flanged ISO to ISO Straight Reducers

ISO 1 (mm)	ISO 2 (mm)	Dimensions (in.)			Weight (lbs.)	Part No.	Price
		A	B				
80	63	2.95	2.37		3	QF80XQF63	Call
100	63	2.95	2.37		4½	QF100XQF63	Call
160	63	2.95	2.37		6	QF160XQF63	Call
100	80	2.95	2.87		5	QF100XQF80	Call
160	100	2.95	3.83		10½	QF160XQF100	Call
200	160	2.95	5.83		13½	QF200XQF160	Call
250	160	2.95	5.83		15	QF250XQF160	Call
250	200	2.95	7.76		18	QF250XQF200	Call



■ ISO-K Flanged ISO to ISO Conical Reducers

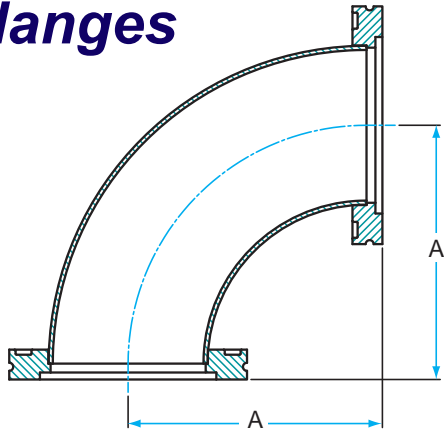
ISO 1 (mm)	ISO 2 (mm)	Dimensions (in.)			Weight (lbs.)	Part No.	Price
		A	B	C			
80	63	4.12	2.87	2.37	3½	QF80XQF63C	Call
100	63	4.12	3.83	2.37	4½	QF100XQF63C	Call
160	63	4.12	3.83	2.37	4½	QF160XQF63C	Call
100	80	4.12	3.83	2.87	5	QF100XQF80C	Call
160	80	4.12	3.83	2.87	5	QF160XQF80C	Call
160	100	6.00	5.76	3.76	5	QF160XQF100C	Call



► 90° & 45° Elbows with ISO-K Flanges

1

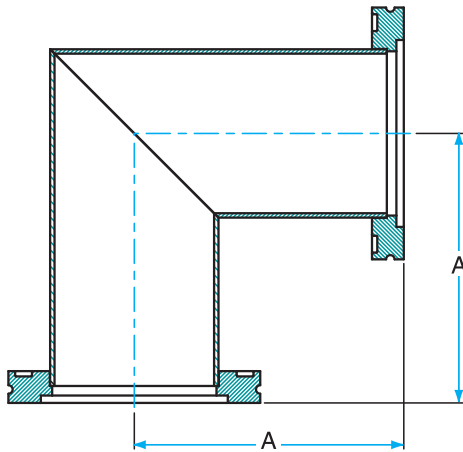
Flanges, Fittings, & Components



■ K-Style 90° Radius Elbows

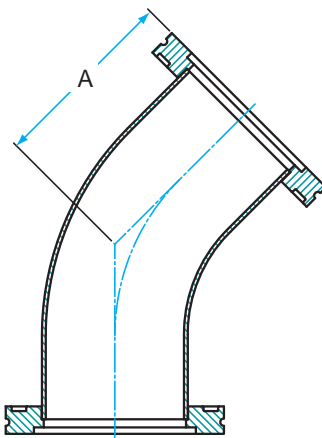
ISO (mm)	Tube O.D.	A	Weight (lbs.)	Part No.	Price
63	2.5"	4.00"	2	QF63-E90KR	Call
80	3"	4.75"	4	QF80-E90KR	Call
100	4"	6.25"	6	QF100-E90KR	Call
160	6"	9.25"	12	QF160-E90KR	Call
200	8"	12.25"	14	QF200-E90KR	Call
250	10"	15.25"	20	QF250-E90KR	Call

■ K-Style 90° Mitered Elbows



ISO (mm)	Tube O.D.	A	Weight (lbs.)	Part No.	Price
63	2.5"	3.46"	4	QF63-E90K	Call
80	3"	3.86"	5	QF80-E90K	Call
100	4"	4.25"	6	QF100-E90K	Call
160	6"	5.43"	10	QF160-E90K	Call
200	8"	6.61"	14	QF200-E90K	Call
250	10"	8.19"	20	QF250-E90K	Call

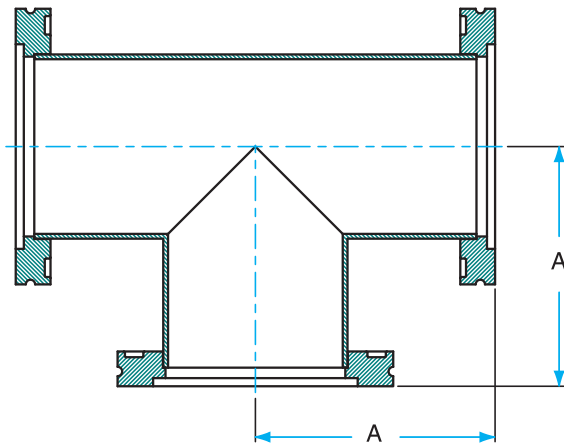
■ K-Style 45° Radius Elbows



ISO (mm)	Tube O.D.	A	Weight (lbs.)	Part No.	Price
63	2.5"	3.25"	2	QF63-E45KR	Call
80	3"	3.93"	4	QF80-E45KR	Call
100	4"	5.02"	6	QF100-E45KR	Call
160	6"	9.71"	10	QF160-E45KR	Call

► **ISO-K Tees**

■ **Tees with ISO-K Flanges**



1 Flanges, Fittings, & Components

NOTE: We offer tees in larger sizes up to ISO 500. Please call for specifications.

ISO (mm)	Tube O.D.	A	Weight (lbs.)	Part No.	Price
63	2.5"	3.25"	3	QF63-TK	Call
80	3"	3.50"	5	QF80-TK	Call
100	4"	4.13"	8	QF100-TK	Call
160	6"	5.25"	13	QF160-TK	Call
200	8"	7.25"	18	QF200-TK	Call
250	10"	9.75"	24	QF250-TK	Call

Deposition Materials

**Manufactured & Distributed by
Kurt J. Lesker Company**

Novel manufacturing techniques for conductive oxides.

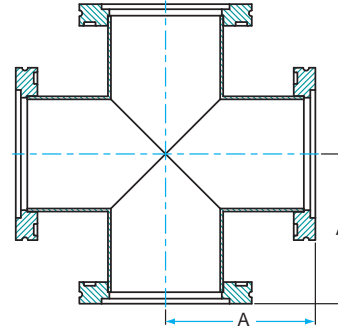
Optical materials such as Ta, Nb, and Si, designed for optimal thin film processing.

High volume production of aluminum targets & tungsten filaments for automotive lighting.

► Crosses with ISO-K Flanges

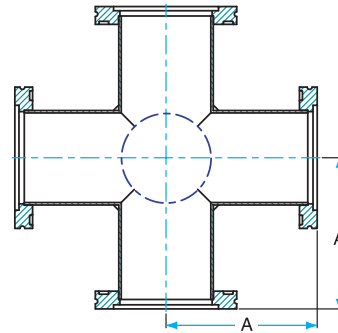
1
Flanges, Fittings, & Components

■ 4-Way Crosses



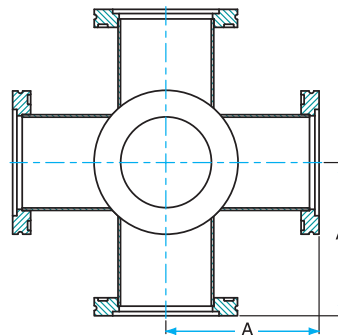
ISO (mm)	Tube O.D.	A	Weight (lbs.)	Part No.	Price
63	2.5"	3.25"	6	QF63-XK	Call
80	3"	3.50"	8	QF80-XK	Call
100	4"	4.13"	10	QF100-XK	Call
160	6"	5.25"	15	QF160-XK	Call
200	8"	7.25"	21	QF200-XK	Call
250	10"	9.75"	25	QF250-XK	Call

■ 5-Way Crosses



ISO (mm)	Tube O.D.	A	Weight (lbs.)	Part No.	Price
63	2.5"	4.00"	8	QF63-5XK	Call
80	3"	3.50"	10	QF80-5XK	Call
100	4"	5.12"	12	QF100-5XK	Call
160	6"	6.31"	18	QF160-5XK	Call
200	8"	7.25"	22	QF200-5XK	Call
250	10"	9.75"	28	QF250-5XK	Call

■ 6-Way Crosses



ISO (mm)	Tube O.D.	A	Weight (lbs.)	Part No.	Price
63	2.5"	4.00"	9	QF63-6XK	Call
80	3"	3.50"	11	QF80-6XK	Call
100	4"	5.12"	13	QF100-6XK	Call
160	6"	6.31"	18	QF160-6XK	Call
200	8"	7.25"	21	QF200-6XK	Call
250	10"	9.75"	32	QF250-6XK	Call

► ISO Replacement O-Rings

■ Fluorocarbon O-Rings

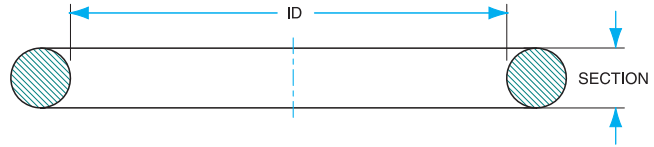
ISO Flange Size (mm)	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	I.D.	Section			
63	2.85	0.210	1/4	O-V336	Call
80	3.35	0.210	1/4	O-V340	Call
100	4.10	0.210	1/4	O-V346	Call
160	5.98	0.210	1/4	O-V361	Call
200	8.48	0.210	1/4	O-V371	Call
250	10.48	0.210	1/4	O-V378	Call
320	12.48	0.275	1/4	O-V454	Call
400	15.48	0.275	1/4	O-V460	Call
500	19.46	0.275	1/4	O-V468	Call
630	24.94	0.275	1/4	O-V474	Call

■ Buna-N O-Rings

ISO Flange Size (mm)	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	I.D.	Section			
63	2.85	0.210	1/4	O-B336	Call
80	3.35	0.210	1/4	O-B340	Call
100	4.10	0.210	1/4	O-B346	Call
160	5.98	0.210	1/4	O-B361	Call
200	8.48	0.210	1/4	O-B371	Call
250	10.48	0.210	1/4	O-B378	Call
320	12.48	0.275	1/4	O-B454	Call
400	15.48	0.275	1/4	O-B460	Call
500	19.46	0.275	1/4	O-B468	Call
630	24.94	0.275	1/4	O-B474	Call

■ Silicone O-Rings

ISO Flange Size (mm)	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	I.D.	Section			
63	2.85	0.210	1/4	O-S336	Call
80	3.35	0.210	1/4	O-S340	Call
100	4.10	0.210	1/4	O-S346	Call
160	5.98	0.210	1/4	O-S361	Call
200	8.48	0.210	1/4	O-S371	Call
250	10.48	0.210	1/4	O-S378	Call
320	12.48	0.275	1/4	O-S454	Call
400	15.48	0.275	1/4	O-S460	Call
500	19.46	0.275	1/4	O-S468	Call
630	24.94	0.275	1/4	O-S474	Call



NOTE: We list only the more popular o-ring diameters and sections for vacuum service. We can supply other sizes at your request. For information, or for assistance in choosing the best o-ring for an application, contact us.

Kurt J. Lesker
Company

Fomblin & Galden

THE Source of Solvay Solexis Vacuum Fluids and Greases in North America and Europe.

► ISO Centering Rings

■ ISO Centering Rings

ISO uses the same centering and o-rings for both “K” and “F” flanges.

- Made of aluminum or an aluminum outer/304 stainless steel inner combination
- Include o-ring



*Stainless Steel/Aluminum Centering Rings
with Fluorocarbon O-Rings*

■ Stainless Steel/Aluminum Centering Rings with Fluorocarbon O-Rings

ISO Flange Size (mm)	Weight (lbs.)	Part No.	Price
63	1	QF63-SAVR	Call
80	1	QF80-SAVR	Call
100	1	QF100-SAVR	Call
160	1	QF160-SAVR	Call
200	1	QF200-SAVR	Call
250	1	QF250-SAVR	Call
320	2	QF320-SAVR	Call
400	2	QF400-SAVR	Call
500	2	QF500-SAVR	Call
630	3	QF630-SAVR	Call

■ Aluminum Centering Rings with Fluorocarbon O-Rings

ISO Flange Size (mm)	Weight (lbs.)	Part No.	Price
63	1	QF63-AAVR	Call
80	1	QF80-AAVR	Call
100	1	QF100-AAVR	Call
160	1	QF160-AAVR	Call
200	1	QF200-AAVR	Call
250	1	QF250-AAVR	Call
320	2	QF320-AAVR	Call
400	2	QF400-AAVR	Call
500	2	QF500-AAVR	Call
630	3	QF630-AAVR	Call

■ Stainless Steel/Aluminum Centering Rings with Buna-N O-Rings

ISO Flange Size (mm)	Weight (lbs.)	Part No.	Price
63	1	QF63-SABR	Call
80	1	QF80-SABR	Call
100	1	QF100-SABR	Call
160	1	QF160-SABR	Call
200	1	QF200-SABR	Call
250	1	QF250-SABR	Call
320	2	QF320-SABR	Call
400	2	QF400-SABR	Call
500	2	QF500-SABR	Call
630	3	QF630-SABR	Call

■ Aluminum Centering Rings with Buna-N O-Rings

ISO Flange Size (mm)	Weight (lbs.)	Part No.	Price
63	1	QF63-AABR	Call
80	1	QF80-AABR	Call
100	1	QF100-AABR	Call
160	1	QF160-AABR	Call
200	1	QF200-AABR	Call
250	1	QF250-AABR	Call
320	2	QF320-AABR	Call
400	2	QF400-AABR	Call
500	2	QF500-AABR	Call
630	3	QF630-AABR	Call

► ISO-F Nuts & Bolts

1

Flanges, Fittings, & Components

■ ISO-F Bolts

- The tables indicate the appropriate bolt size for each flange
- The bolt rings in the table **below** include retaining rings



■ ISO-F Flange Bolt Kits (Tapped)

ISO Flange Size (mm)	Thread	Length (mm)	Per Pkg.	Weight (lbs.)	Part No.	Price
63	M8	30	4	1	HBKM8X30-4	Call
80/100	M8	30	8	1	HBKM8X30-8	Call
160	M10	35	8	2	HBKM10X35-8	Call
200/250	M10	35	12	2	HBKM10X35-12	Call
320	M12	45	12	2	HBKM10X45-12	Call
400/500	M12	45	16	4	HBKM12X45-16	Call
630	M12	55	20	4	HBKM12X55-20	Call

■ ISO-F Flange Bolt Sets (Untapped)

ISO Flange Size (mm)	Thread	Length (mm)	Per Pkg.	Weight (lbs.)	Part No.	Price
63	M8	40	4	1	HBSM8X40-4	Call
80/100	M8	40	8	1	HBSM8X40-8	Call
160	M10	50	8	2	HBSM10X50-8	Call
200/250	M10	50	12	2	HBSM10X50-12	Call
320	M12	60	12	2	HBSM12X60-12	Call
400/500	M12	60	16	4	HBSM12X60-16	Call
630	M12	65	20	4	HBSM12X65-20	Call

■ Aluminum Bolt Rings

- Retaining ring included

ISO Flange Size (mm)	Weight (lbs.)	Part No.	Price
63	2	QF63-RF	Call
80	2	QF80-RF	Call
100	2	QF100-RF	Call
160	3	QF160-RF	Call
200	6	QF200-RF	Call
250	10	QF250-RF	Call
320	12	QF320-RF	Call
400	30	QF400-RF	Call
500	35	QF500-RF	Call



■ Retaining Rings (only)

ISO Flange Size (mm)	Weight (lbs.)	Part No.	Price
63	1/4	QF63-RR	Call
80	1/4	QF80-RR	Call
100	1/4	QF100-RR	Call
160	1/4	QF160-RR	Call
200	1/4	QF200-RR	Call
250	1/4	QF250-RR	Call
320	1/4	QF320-RR	Call
400	1/4	QF400-RR	Call
500	1/4	QF500-RR	Call

▶ ISO Clamps

■ ISO Clamps

- Made of aluminum or cold steel
- Double clamps are used on "K" flanges only
- Single clamps connect "K" and "F" flanges together



■ Metric Aluminum Single Clamps

ISO Flange Size (mm)	Thread	Weight (lbs.)	Part No.	Price
63-100	M8	1/4	QF-SSC-ALM	Call
160-250	M10	1/4	QF-MSC-ALM	Call
320	M12	1/4	QF-PSC-ALM	Call
400-500	M12	1/4	QF-LSC-ALM	Call
630*	M12	1/4	QF-XSC-ALM	Call

* Claw made from steel.

■ Aluminum Single Clamps*

ISO Flange Size (mm)	Thread	Weight (lbs.)	Part No.	Price
63-100	5/16-18	1/4	QF-SSC-ALI	Call
160-250	5/16-18	1/4	QF-SSC-ALJ	Call
320	7/16-14	1/4	QF-SSC-ALL	Call
400-500	7/16-14	1/4	QF-SSC-ALK	Call

* Features aluminum claw, stainless steel bolt and washer. Imperial thread bolt.

NOTE: Metric Aluminum single clamps standard for tapped ISO "F" style flanges.



■ Aluminum Double Clamps

ISO Flange Size (mm)	Weight (lbs.)	Part No.	Price
63-100	1/4	QF-SDC-AL1	Call
160-250	1/4	QF-SDC-AL2	Call
320-500	1/4	QF-SDC-AL3	Call



■ Steel Double Clamps

ISO Flange Size (mm)	Package	Weight (lbs.)	Part No.	Price
63-250	1	1/4	QF-LDC-CS1	Call
320-500	1	1/2	QF-LDC-CS2	Call
630	1	3/4	QF-LDC-CS3	Call

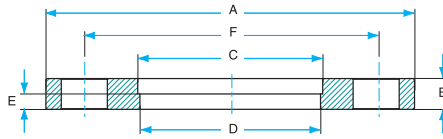
ASA Flanges

1 Flanges, Fittings, & Components

IN THIS SECTION **ASA Flanges & Components**

- ASA flanges have either a flat surface or an o-ring groove machined into it
- Features a series of holes for bolts
- Most flanges and hardware are made from 304 stainless steel
- Most useful to pressures slightly better than 1×10^{-7} Torr
- The outgassing or porosity of the o-ring material limits the ultimate pressure

ASA Flanges—Fixed Flat



NOTE: Compare all dimensions carefully when constructing a system requiring ASA flanges, particularly the bolt circle and the I.D. of mating flanges. Flanges are sized by the nominal inside diameter (I.D.) and o-ring placement of the tube to which they are welded, and have much larger O.D.s (outside diameters) than CF or ISO -K flanges for the same tube diameter.



ASA Size	Dimensions (in.)						Bolt Holes No.	Diameter (in.)	Weight (lbs.)	Part No.	Price
	A	B	C	D	E	F					
1	4.25	0.5	Blank	—	—	3.125	4	0.625	1	ASA425X00	Call
1	4.25	0.5	1.010	0.935	0.25	3.125	4	0.625	1	ASA425X10	Call
1	4.25	0.5	1.510	1.435	0.25	3.125	4	0.625	1	ASA425X15	Call
1.5	5	0.5	Blank	—	—	3.88	4	0.625	2	ASA500X00	Call
1.5	5	0.5	1.510	1.435	0.25	3.88	4	0.625	2	ASA500X15	Call
1.5	5	0.5	2.010	1.935	0.25	3.88	4	0.625	2	ASA500X20	Call
1.5	5	0.5	2.510	2.435	0.25	3.88	4	0.625	2	ASA500X25	Call
2	6	0.5	Blank	—	—	4.75	4	0.75	3	ASA600X00	Call
2	6	0.5	2.010	1.935	0.25	4.75	4	0.75	2	ASA600X20	Call
2	6	0.5	2.510	2.435	0.25	4.75	4	0.75	2	ASA600X25	Call
2	6	0.5	3.010	2.935	0.25	4.75	4	0.75	2	ASA600X30	Call
2	6	0.5	3.510	3.435	0.25	4.75	4	0.75	2	ASA600X35	Call
3	7.5	0.5	Blank	—	—	6	4	0.75	6	ASA750X00	Call
3	7.5	0.5	3.010	2.935	0.25	6	4	0.75	4	ASA750X30	Call
3	7.5	0.5	3.510	3.435	0.25	6	4	0.75	4	ASA750X35	Call
3	7.5	0.5	4.010	3.917	0.25	6	4	0.75	4	ASA750X40	Call
4	9	0.5	Blank	—	—	7.5	8	0.75	9	ASA900X00	Call
4	9	0.5	4.010	3.917	0.25	7.5	8	0.75	5	ASA900X40	Call
4	9	0.5	6.020	5.917	0.25	7.5	8	0.75	5	ASA900X60	Call
6	11	0.75	Blank	—	—	9.5	8	0.812	19	ASA1100X00	Call
6	11	0.75	6.020	5.917	0.375	9.5	8	0.812	10	ASA1100X60	Call
6	11	0.75	8.020	7.880	0.375	9.5	8	0.812	9	ASA1100X80	Call
8	13.5	0.75	Blank	—	—	11.75	8	0.812	40	ASA1350X00	Call
8	13.5	0.75	8.020	7.880	0.375	11.75	8	0.812	18	ASA1350X80	Call
8	13.5	0.75	10.020	9.880	0.375	11.75	8	0.812	15	ASA1350X10	Call
10	16	0.75	Blank	—	—	14.25	12	0.812	55	ASA1600X00	Call
10	16	0.75	10.020	9.880	0.375	14.25	12	0.812	23	ASA1600X10	Call
10	16	0.75	12.020	11.880	0.375	14.25	12	0.812	20	ASA1600X12	Call

Fluorocarbon O-Rings



ASA Size	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	I.D.	Section			
1	1.61	0.139	1/4	O-V223	Call
1.5	2.48	0.139	1/4	O-V231	Call
2	3.48	0.139	1/4	O-V238	Call
3	4.61	0.139	1/4	O-V247	Call
4	5.98	0.139	1/4	O-V258	Call
6	7.98	0.139	1/4	O-V266	Call
8	9.98	0.139	1/4	O-V274	Call
10	11.98	0.139	1/4	O-V278	Call

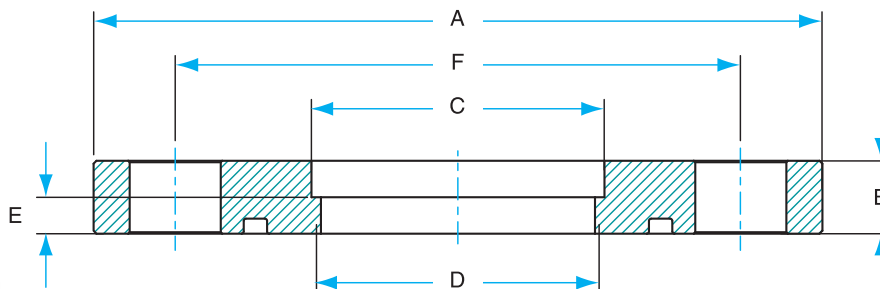
ASA Bolt Sets

ASA Size	Thread	Length	Qty.	Weight (lbs.)	Part No.	Price
2 & 3	5/8-11	1.75"	4	1	HBS625111754	Call
4	5/8-11	1.75"	8	1 1/2	HBS625111758	Call
6 & 8	3/4-10	2.50"	8	2	HBS751025008	Call
10	3/4-10	2.50"	12	2 1/2	HBS751025012	Call

ASA Flanges

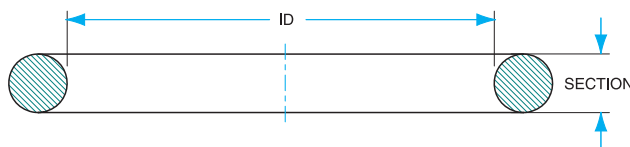
ASA Flanges—Fixed Grooved

1 Flanges, Fittings, & Components



ASA Size	A	B	Dimensions (in.)				Bolt Holes	Weight	Part No.	Price	
			C	D	E	F	No.	Diameter (in.)	(lbs.)		
1	4.25	0.5	Blank	—	—	3.125	4	0.625	1	ASA425X00G	Call
1	4.25	0.5	1.010	0.935	0.25	3.125	4	0.625	1	ASA425X10G	Call
1	4.25	0.5	1.510	1.435	0.25	3.125	4	0.625	1	ASA425X15G	Call
1.5	5	0.5	Blank	—	—	3.88	4	0.625	2	ASA500X00G	Call
1.5	5	0.5	1.510	1.435	0.25	3.88	4	0.625	2	ASA500X15G	Call
1.5	5	0.5	2.010	1.935	0.25	3.88	4	0.625	2	ASA500X20G	Call
1.5	5	0.5	2.510	2.435	0.25	3.88	4	0.625	2	ASA500X25G	Call
2	6	0.5	Blank	—	—	4.75	4	0.75	3	ASA600X00G	Call
2	6	0.5	2.010	1.935	0.25	4.75	4	0.75	2	ASA600X20G	Call
2	6	0.5	2.510	2.435	0.25	4.75	4	0.75	2	ASA600X25G	Call
2	6	0.5	3.010	2.935	0.25	4.75	4	0.75	2	ASA600X30G	Call
2	6	0.5	3.510	3.435	0.25	4.75	4	0.75	2	ASA600X35G	Call
3	7.5	0.5	Blank	—	—	6	4	0.75	6	ASA750X00G	Call
3	7.5	0.5	3.010	2.935	0.25	6	4	0.75	4	ASA750X30G	Call
3	7.5	0.5	3.510	3.435	0.25	6	4	0.75	4	ASA750X35G	Call
3	7.5	0.5	4.010	3.917	0.25	6	4	0.75	4	ASA750X40G	Call
4	9	0.5	Blank	—	—	7.5	8	0.75	9	ASA900X00G	Call
4	9	0.5	4.010	3.917	0.25	7.5	8	0.75	5	ASA900X40G	Call
4	9	0.5	6.020	5.917	0.25	7.5	8	0.75	5	ASA900X60G	Call
6	11	0.75	Blank	—	—	9.5	8	0.812	19	ASA1100X00G	Call
6	11	0.75	6.020	5.917	0.375	9.5	8	0.812	10	ASA1100X60G	Call
6	11	0.75	8.020	7.880	0.375	9.5	8	0.812	9	ASA1100X80G	Call
8	13.5	0.75	Blank	—	—	11.75	8	0.812	40	ASA1350X00G	Call
8	13.5	0.75	8.020	7.880	0.375	11.75	8	0.812	18	ASA1350X80G	Call
8	13.5	0.75	10.020	9.880	0.375	11.75	8	0.812	15	ASA1350X10G	Call
10	16	0.75	Blank	—	—	14.25	12	0.812	55	ASA1600X00G	Call
10	16	0.75	10.020	9.880	0.375	14.25	12	0.812	23	ASA1600X10G	Call
10	16	0.75	12.020	11.880	0.375	14.25	12	0.812	20	ASA1600X12G	Call

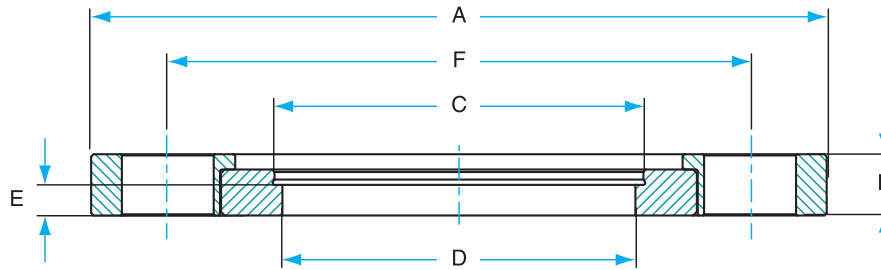
Fluorocarbon O-Rings



ASA Size	Dimensions (in.)		Weight	Part No.	Price
	I.D.	Section	(lbs.)		
1	1.61	0.139	1/4	O-V223	Call
1.5	2.48	0.139	1/4	O-V231	Call
2	3.48	0.139	1/4	O-V238	Call
3	4.61	0.139	1/4	O-V247	Call
4	5.98	0.139	1/4	O-V258	Call
6	7.98	0.139	1/4	O-V266	Call
8	9.98	0.139	1/4	O-V274	Call
10	11.98	0.139	1/4	O-V278	Call

► **ASA Flanges**

■ **ASA Flanges—Rotatable Flat**



ASA Size	Dimensions (in.)						Bolt Holes		Weight (lbs.)	Part No.	Price
	A	B	C	D	E	F	No.	Diameter (in.)			
1	4.25	0.5	Blank	—	—	3.125	4	0.625	1	ASA425X00R	Call
1	4.25	0.5	1.010	0.935	0.25	3.125	4	0.625	1	ASA425X10R	Call
1	4.25	0.5	1.510	1.435	0.25	3.125	4	0.625	1	ASA425X15R	Call
1.5	5	0.5	Blank	—	—	3.88	4	0.625	2	ASA500X00R	Call
1.5	5	0.5	1.510	1.435	0.25	3.88	4	0.625	2	ASA500X15R	Call
1.5	5	0.5	2.010	1.935	0.25	3.88	4	0.625	2	ASA500X20R	Call
1.5	5	0.5	2.510	2.435	0.25	3.88	4	0.625	2	ASA500X25R	Call
2	6	0.5	Blank	—	—	4.75	4	0.75	3	ASA600X00R	Call
2	6	0.5	2.010	1.935	0.25	4.75	4	0.75	2	ASA600X20R	Call
2	6	0.5	2.510	2.435	0.25	4.75	4	0.75	2	ASA600X25R	Call
2	6	0.5	3.010	2.935	0.25	4.75	4	0.75	2	ASA600X30R	Call
2	6	0.5	3.510	3.435	0.25	4.75	4	0.75	2	ASA600X35R	Call
3	7.5	0.5	Blank	—	—	6	4	0.75	6	ASA750X00R	Call
3	7.5	0.5	3.010	2.935	0.25	6	4	0.75	4	ASA750X30R	Call
3	7.5	0.5	3.510	3.435	0.25	6	4	0.75	4	ASA750X35R	Call
3	7.5	0.5	4.010	3.917	0.25	6	4	0.75	4	ASA750X40R	Call
4	9	0.5	Blank	—	—	7.5	8	0.75	9	ASA900X00R	Call
4	9	0.5	4.010	3.917	0.25	7.5	8	0.75	5	ASA900X40R	Call
4	9	0.5	6.020	5.917	0.25	7.5	8	0.75	5	ASA900X60R	Call
6	11	0.75	Blank	—	—	9.5	8	0.812	19	ASA1100X00R	Call
6	11	0.75	6.020	5.880	0.375	9.5	8	0.812	10	ASA1100X60R	Call
6	11	0.75	8.020	7.880	0.375	9.5	8	0.812	9	ASA1100X80R	Call
8	13.5	0.75	Blank	—	—	11.75	8	0.812	40	ASA1350X00R	Call
8	13.5	0.75	8.020	7.880	0.375	11.75	8	0.812	18	ASA1350X80R	Call
8	13.5	0.75	10.020	9.880	0.375	11.75	8	0.812	15	ASA1350X10R	Call
10	16	0.75	Blank	—	—	14.25	12	0.812	55	ASA1600X00R	Call
10	16	0.75	10.020	9.880	0.375	14.25	12	0.812	23	ASA1600X10R	Call
10	16	0.75	12.020	11.880	0.375	14.25	12	0.812	20	ASA1600X12R	Call

■ **ASA Bolt Sets**

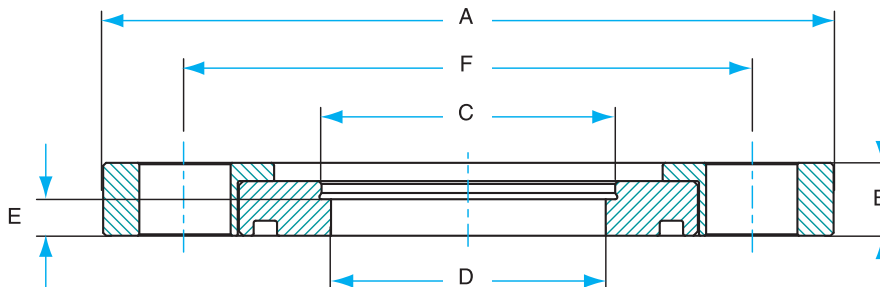
ASA Size	Thread	Length	Quantity	Weight (lbs.)	Part No.	Price
1 & 1.5	9/16-12	1.50"	4	3/4	HBS563121504	Call
2 & 3	5/8-11	1.75"	4	1	HBS625111754	Call
4	5/8-11	1.75"	8	1 1/2	HBS625111758	Call
6 & 8	3/4-10	2.50"	8	2	HBS751025008	Call
10	3/4-10	2.50"	12	2 1/2	HBS751025012	Call

1 Flanges, Fittings, & Components

ASA Flanges

ASA Flanges—Rotatable Grooved

1 Flanges, Fittings, & Components



ASA Size	Dimensions (in.)						Bolt Holes	Weight	Part No.	Price	
	A	B	C	D	E	F	No.	Diameter (in.)	(lbs.)		
1	4.25	0.5	Blank	—	—	3.125	4	0.625	1	ASA425X00GR	Call
1	4.25	0.5	1.010	0.935	0.25	3.125	4	0.625	1	ASA425X10GR	Call
1	4.25	0.5	1.510	1.435	0.25	3.125	4	0.625	1	ASA425X15GR	Call
1.5	5	0.5	Blank	—	—	3.88	4	0.625	2	ASA500X00GR	Call
1.5	5	0.5	1.510	1.435	0.25	3.88	4	0.625	2	ASA500X15GR	Call
1.5	5	0.5	2.010	1.935	0.25	3.88	4	0.625	2	ASA500X20GR	Call
1.5	5	0.5	2.510	2.435	0.25	3.88	4	0.625	2	ASA500X25GR	Call
2	6	0.5	Blank	—	—	4.75	4	0.75	3	ASA600X00GR	Call
2	6	0.5	2.010	1.935	0.25	4.75	4	0.75	2	ASA600X20GR	Call
2	6	0.5	2.510	2.435	0.25	4.75	4	0.75	2	ASA600X25GR	Call
2	6	0.5	3.010	2.935	0.25	4.75	4	0.75	2	ASA600X30GR	Call
2	6	0.5	3.510	3.435	0.25	4.75	4	0.75	2	ASA600X35GR	Call
3	7.5	0.5	Blank	—	—	6	4	0.75	6	ASA750X00GR	Call
3	7.5	0.5	3.010	2.935	0.25	6	4	0.75	4	ASA750X30GR	Call
3	7.5	0.5	3.510	3.435	0.25	6	4	0.75	4	ASA750X35GR	Call
3	7.5	0.5	4.010	3.917	0.25	6	4	0.75	4	ASA750X40GR	Call
4	9	0.5	Blank	—	—	7.5	8	0.75	9	ASA900X00GR	Call
4	9	0.5	4.010	3.917	0.25	7.5	8	0.75	5	ASA900X40GR	Call
4	9	0.5	6.020	5.917	0.25	7.5	8	0.75	5	ASA900X60GR	Call
6	11	0.75	Blank	—	—	9.5	8	0.812	19	ASA1100X00GR	Call
6	11	0.5	6.020	5.917	0.375	9.5	8	0.812	10	ASA1100X60GR	Call
6	11	0.5	8.020	7.880	0.375	9.5	8	0.812	9	ASA1100X80GR	Call
8	13.5	0.75	Blank	—	—	11.75	8	0.812	40	ASA1350X00GR	Call
8	13.5	0.75	8.020	7.880	0.375	11.75	8	0.812	18	ASA1350X80GR	Call
8	13.5	0.75	10.020	9.880	0.375	11.75	8	0.812	15	ASA1350X10GR	Call
10	16	0.75	Blank	—	—	14.25	12	0.812	55	ASA1600X00GR	Call
10	16	0.75	10.020	9.880	0.375	14.25	12	0.812	23	ASA1600X10GR	Call
10	16	0.75	12.020	11.880	0.375	14.25	12	0.812	20	ASA1600X12GR	Call

ASA Bolt Sets

ASA Size	Thread	Length	Quantity	Weight (lbs.)	Part No.	Price
1 & 1.5	9/16-12	1.50"	4	3/4	HBS563121504	Call
2 & 3	5/8-11	1.75"	4	1	HBS625111754	Call
4	5/8-11	1.75"	8	1 1/2	HBS625111758	Call
6 & 8	3/4-10	2.50"	8	2	HBS751025008	Call
10	3/4-10	2.50"	12	2 1/2	HBS751025012	Call

► **Nipples**

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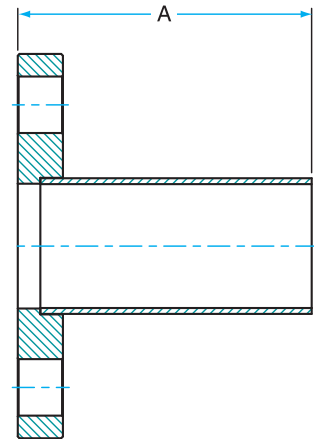
Flanges, Fittings, & Components

■ **Half Nipple with Flat Flange**

ASA Size	Flange O.D.	Tube O.D.	A	Part No.	Price
1	4.25"	1"	3.25"	AFH04X010	Call
1	4.25"	1.5"	3.25"	AFH04X015	Call
1.5	5"	1.5"	3.25"	AFH05X015	Call
1.5	5"	2"	3.25"	AFH05X020	Call
1.5	5"	2.5"	3.25"	AFH05X025	Call
2	6"	2"	3.5"	AFH06X020	Call
2	6"	2.5"	3.5"	AFH06X025	Call
2	6"	3"	3.5"	AFH06X030	Call
3	7.5"	3"	4.13"	AFH07X030	Call
3	7.5"	4"	4.13"	AFH07X040	Call
4	9"	4"	4.13"	AFH09X040	Call
4	9"	6"	5.25"	AFH09X060	Call
6	11"	6"	5.38"	AFH11X060	Call
6	11"	8"	7.38"	AFH11X080	Call
8	13.5"	8"	7.75"	AFH13X080	Call
8	13.5"	10"	9.88"	AFH13X100	Call
10	16"	10"	9.88"	AFH16X100	Call
10	16"	12"	9.88"	AFH16X120	Call



Half Nipple

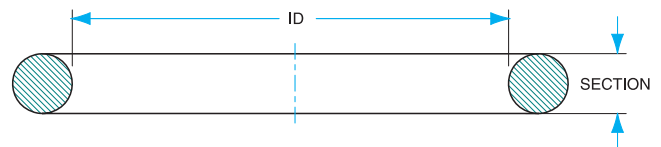


■ **Half Nipple with Grooved Flange**

ASA Size	Flange O.D.	Tube O.D.	A	Part No.	Price
1	4.25"	1"	3.25"	AFH04X010G	Call
1	4.25"	1.5"	3.25"	AFH04X015G	Call
1.5	5"	1.5"	3.25"	AFH05X015G	Call
1.5	5"	2"	3.25"	AFH05X020G	Call
1.5	5"	2.5"	3.25"	AFH05X025G	Call
2	6"	2"	3.5"	AFH06X020G	Call
2	6"	2.5"	3.5"	AFH06X025G	Call
2	6"	3"	3.5"	AFH06X030G	Call
3	7.5"	3"	4.13"	AFH07X030G	Call
3	7.5"	4"	4.13"	AFH07X040G	Call
4	9"	4"	4.13"	AFH09X040G	Call
4	9"	6"	5.25"	AFH09X060G	Call
6	11"	6"	5.38"	AFH11X060G	Call
6	11"	8"	7.38"	AFH11X080G	Call
8	13.5"	8"	7.75"	AFH13X080G	Call
8	13.5"	10"	9.88"	AFH13X100G	Call
10	16"	10"	9.88"	AFH16X100G	Call
10	16"	12"	9.88"	AFH16X120G	Call

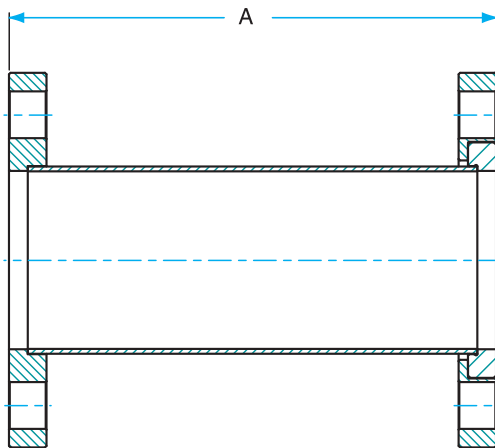
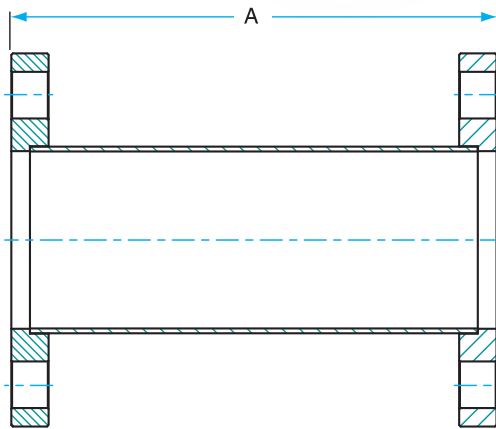
■ **Fluorocarbon O-Rings**

ASA Size	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	I.D.	Section			
1	1.61	0.139	1/4	O-V223	Call
1.5	2.48	0.139	1/4	O-V231	Call
2	3.48	0.139	1/4	O-V238	Call
3	4.61	0.139	1/4	O-V247	Call
4	5.98	0.139	1/4	O-V258	Call
6	7.98	0.139	1/4	O-V266	Call
8	9.98	0.139	1/4	O-V274	Call
10	11.98	0.139	1/4	O-V278	Call



► **Nipples**

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Flanges, Fittings, & Components



■ **Fixed Full Nipples with Flat and/or Grooved Flanges**

ASA Size	Flange O.D.	Tube O.D.	A
1	4.25"	1"	6.5"
1	4.25"	1.5"	6.5"
1	4.25"	1.5"	8"
1.5	5"	1.5"	6.5"
1.5	5"	2"	6.5"
1.5	5"	2.5"	6.5"
1.5	5"	2.5"	8"
2	6"	2"	7"
2	6"	2.5"	7"
2	6"	3"	7"
2	6"	3"	8.5"
3	7.5"	3"	8.26"
3	7.5"	3"	9.75"
3	7.5"	4"	8.26"
3	7.5"	4"	10.24"
4	9"	4"	8.26"
4	9"	4"	10.24"
4	9"	6"	10.5"
4	9"	6"	12.62"
6	11"	6"	10.76"
6	11"	6"	12.88"
6	11"	8"	10.76"
6	11"	8"	14.76"
8	13.5"	8"	15.5"
8	13.5"	10"	19.76"
10	16"	10"	19.76"
10	16"	12"	19.76"

■ **Rotatable Full Nipples with Flat and/or Grooved Flanges**

ASA Size	Flange O.D.	Tube O.D.	A
1	4.25"	1"	6.5"
1	4.25"	1.5"	6.5"
1	4.25"	1.5"	8"
1.5	5"	1.5"	6.5"
1.5	5"	2"	6.5"
1.5	5"	2.5"	6.5"
1.5	5"	2.5"	8"
2	6"	2"	7"
2	6"	2.5"	7"
2	6"	3"	7"
2	6"	3"	8.5"
3	7.5"	3"	8.26"
3	7.5"	3"	9.75"
3	7.5"	4"	8.26"
3	7.5"	4"	10.24"
4	9"	4"	8.26"
4	9"	4"	10.24"
4	9"	6"	10.5"
4	9"	6"	12.62"
6	11"	6"	10.76"
6	11"	6"	12.88"
6	11"	8"	10.76"
6	11"	8"	14.76"
8	13.5"	8"	15.5"
8	13.5"	10"	19.76"
10	16"	10"	19.76"
10	16"	12"	19.76"

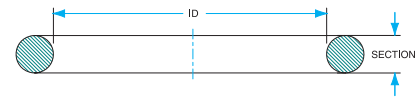
► **Nipples**

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Flanges, Fittings, & Components

Both Flat		One Grooved		Both Grooved	
Part No.	Price	Part No.	Price	Part No.	Price
AFN04X010	Call	AFN04X010G1	Call	AFN04X010G2	Call
AFN04X015	Call	AFN04X015G1	Call	AFN04X015G2	Call
AFN04X015L	Call	AFN04X015LG1	Call	AFN04X015LG2	Call
AFN05X015	Call	AFN05X015G1	Call	AFN05X015G2	Call
AFN05X020	Call	AFN05X020G1	Call	AFN05X020G2	Call
AFN05X025	Call	AFN05X025G1	Call	AFN05X025G2	Call
AFN05X025L	Call	AFN05X025LG1	Call	AFN05X025LG2	Call
AFN06X020	Call	AFN06X020G1	Call	AFN06X020G2	Call
AFN06X025	Call	AFN06X025G1	Call	AFN06X025G2	Call
AFN06X030	Call	AFN06X030G1	Call	AFN06X030G2	Call
AFN06X030L	Call	AFN06X030LG1	Call	AFN06X030LG2	Call
AFN07X030	Call	AFN07X030G1	Call	AFN07X030G2	Call
AFN07X030L	Call	AFN07X030LG1	Call	AFN07X030LG2	Call
AFN07X040	Call	AFN07X040G1	Call	AFN07X040G2	Call
AFN07X040L	Call	AFN07X040LG1	Call	AFN07X040LG2	Call
AFN09X040	Call	AFN09X040G1	Call	AFN09X040G2	Call
AFN09X040L	Call	AFN09X040LG1	Call	AFN09X040LG2	Call
AFN09X060	Call	AFN09X060G1	Call	AFN09X060G2	Call
AFN09X060L	Call	AFN09X060LG1	Call	AFN09X060LG2	Call
AFN11X060	Call	AFN11X060G1	Call	AFN11X060G2	Call
AFN11X060L	Call	AFN11X060LG1	Call	AFN11X060LG2	Call
AFN11X080	Call	AFN11X080G1	Call	AFN11X080G2	Call
AFN11X080L	Call	AFN11X080LG1	Call	AFN11X080LG2	Call
AFN13X080	Call	AFN13X080G1	Call	AFN13X080G2	Call
AFN13X100	Call	AFN13X100G1	Call	AFN13X100G2	Call
AFN16X100	Call	AFN16X100G1	Call	AFN16X100G2	Call
AFN16X120	Call	AFN16X120G1	Call	AFN16X120G2	Call

■ **Fluorocarbon O-Rings**



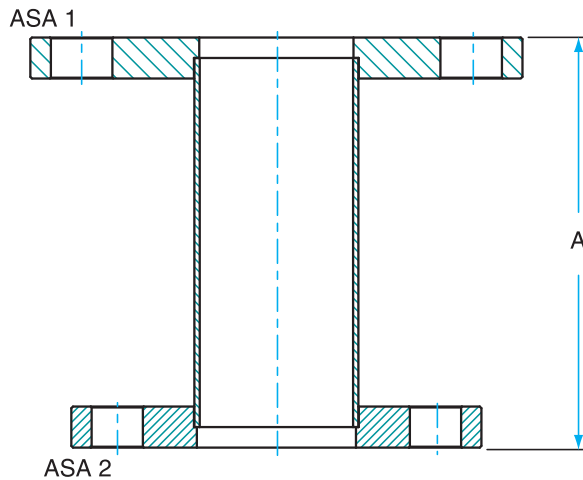
ASA Size	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	I.D.	Section			
1	1.61	0.139	1/4	O-V223	Call
1.5	2.48	0.139	1/4	O-V231	Call
2	3.48	0.139	1/4	O-V238	Call
3	4.61	0.139	1/4	O-V247	Call
4	5.98	0.139	1/4	O-V258	Call
6	7.98	0.139	1/4	O-V266	Call
8	9.98	0.139	1/4	O-V274	Call
10	11.98	0.139	1/4	O-V278	Call

Both Flat		One Grooved		Both Grooved	
Part No.	Price	Part No.	Price	Part No.	Price
AFN04X010R	Call	AFN04X010G1R	Call	AFN04X010G2R	Call
AFN04X015R	Call	AFN04X015G1R	Call	AFN04X015G2R	Call
AFN04X015LR	Call	—	—	—	—
AFN05X015R	Call	AFN05X015G1R	Call	AFN05X015G2R	Call
AFN05X020R	Call	AFN05X020G1R	Call	AFN05X020G2R	Call
AFN05X025R	Call	AFN05X025G1R	Call	AFN05X025G2R	Call
AFN05X025LR	Call	—	—	—	—
AFN06X020R	Call	AFN06X020G1R	Call	AFN06X020G2R	Call
AFN06X025R	Call	AFN06X025G1R	Call	AFN06X025G2R	Call
AFN06X030R	Call	AFN06X030G1R	Call	AFN06X030G2R	Call
AFN06X030LR	Call	—	—	—	—
AFN07X030R	Call	AFN07X030G1R	Call	AFN07X030G2R	Call
AFN07X030LR	Call	—	—	—	—
AFN07X040R	Call	AFN07X040G1R	Call	AFN07X040G2R	Call
AFN07X040LR	Call	—	—	—	—
AFN09X040R	Call	AFN09X040G1R	Call	AFN09X040G2R	Call
AFN09X040LR	Call	—	—	—	—
AFN09X060R	Call	AFN09X060G1R	Call	AFN09X060G2R	Call
AFN09X060LR	Call	—	—	—	—
AFN11X060R	Call	AFN11X060G1R	Call	AFN11X060G2R	Call
AFN11X060LR	Call	—	—	—	—
AFN11X080R	Call	AFN11X080G1R	Call	AFN11X080G2R	Call
AFN11X080LR	Call	—	—	—	—
AFN13X080R	Call	AFN13X080G1R	Call	AFN13X080G2R	Call
AFN13X100R	Call	AFN13X100G1R	Call	AFN13X100G2R	Call
AFN16X100R	Call	AFN16X100G1R	Call	AFN16X100G2R	Call
AFN16X120R	Call	AFN16X120G1R	Call	AFN16X120G2R	Call

► **Nipples**

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Flanges, Fittings, & Components



■ **Fixed Reducers with Flat and/or Grooved Flanges**

- All fixed reducers feature two sizes of ASA flange

ASA Size	Flange 1 O.D.	Flange 2 O.D.	Tube O.D.	A
1.5	5"	4.25"	1.5"	5"
2	6"	4.25"	1.5"	5"
2	6"	5"	2"	5"
3	7.5"	4.25"	1.5"	5"
3	7.5"	5"	2"	5"
3	7.5"	6"	3"	5"
4	9"	5"	2"	5"
4	9"	6"	3"	5"
4	9"	7.5"	4"	5"
6	11"	5"	2"	5"
6	11"	6"	3"	5"
6	11"	7.5"	4"	5"
6	11"	9"	6"	5"
8	13.5"	5"	2"	5"
8	13.5"	6"	3"	5"
8	13.5"	7.5"	4"	5"
8	13.5"	9"	6"	5"
8	13.5"	11"	8"	5"
10	16"	5"	2"	5"
10	16"	6"	3"	5"
10	16"	7.5"	4"	5"
10	16"	9"	6"	5"
10	16"	11"	8"	5"
10	16"	13.5"	10"	5"

■ **Rotatable Reducers with Flat and/or Grooved Flanges**

ASA Size	Flange 1 O.D.	Flange 2 O.D.	Tube O.D.	A
1.5	5"	4.25"	1.5"	5"
2	6"	4.25"	1.5"	5"
2	6"	5"	2"	5"
3	7.5"	4.25"	1.5"	5"
3	7.5"	5"	2"	5"
3	7.5"	6"	3"	5"
4	9"	5"	2"	5"
4	9"	6"	3"	5"
4	9"	7.5"	4"	5"
6	11"	5"	2"	5"
6	11"	6"	3"	5"
6	11"	7.5"	4"	5"
6	11"	9"	6"	5"
8	13.5"	5"	2"	5"
8	13.5"	6"	3"	5"
8	13.5"	7.5"	4"	5"
8	13.5"	9"	6"	5"
8	13.5"	11"	8"	5"
10	16"	5"	2"	5"
10	16"	6"	3"	5"
10	16"	7.5"	4"	5"
10	16"	9"	6"	5"
10	16"	11"	8"	5"
10	16"	13.5"	10"	5"

► **Nipples**

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Flanges, Fittings, & Components

Flat Flanges		Grooved #1 (Larger)		Grooved #2 (Smaller)		Both Grooved	
Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price
AFR05X04	Call	AFR05X04G1	Call	AFR05X04G2	Call	AFR05X04GB	Call
AFR06X04	Call	AFR06X04G1	Call	AFR06X04G2	Call	AFR06X04GB	Call
AFR06X05	Call	AFR06X05G1	Call	AFR06X05G2	Call	AFR06X05GB	Call
AFR07X04	Call	AFR07X04G1	Call	AFR07X04G2	Call	AFR07X04GB	Call
AFR07X05	Call	AFR07X05G1	Call	AFR07X05G2	Call	AFR07X05GB	Call
AFR07X06	Call	AFR07X06G1	Call	AFR07X06G2	Call	AFR07X06GB	Call
AFR09X05	Call	AFR09X05G1	Call	AFR09X05G2	Call	AFR09X05GB	Call
AFR09X06	Call	AFR09X06G1	Call	AFR09X06G2	Call	AFR09X06GB	Call
AFR09X07	Call	AFR09X07G1	Call	AFR09X07G2	Call	AFR09X07GB	Call
AFR11X05	Call	AFR11X05G1	Call	AFR11X05G2	Call	AFR11X05GB	Call
AFR11X06	Call	AFR11X06G1	Call	AFR11X06G2	Call	AFR11X06GB	Call
AFR11X07	Call	AFR11X07G1	Call	AFR11X07G2	Call	AFR11X07GB	Call
AFR11X09	Call	AFR11X09G1	Call	AFR11X09G2	Call	AFR11X09GB	Call
AFR13X05	Call	AFR13X05G1	Call	AFR13X05G2	Call	AFR13X05GB	Call
AFR13X06	Call	AFR13X06G1	Call	AFR13X06G2	Call	AFR13X06GB	Call
AFR13X07	Call	AFR13X07G1	Call	AFR13X07G2	Call	AFR13X07GB	Call
AFR13X09	Call	AFR13X09G1	Call	AFR13X09G2	Call	AFR13X09GB	Call
AFR13X11	Call	AFR13X11G1	Call	AFR13X11G2	Call	AFR13X11GB	Call
AFR16X05	Call	AFR16X05G1	Call	AFR16X05G2	Call	AFR16X05GB	Call
AFR16X06	Call	AFR16X06G1	Call	AFR16X06G2	Call	AFR16X06GB	Call
AFR16X07	Call	AFR16X07G1	Call	AFR16X07G2	Call	AFR16X07GB	Call
AFR16X09	Call	AFR16X09G1	Call	AFR16X09G2	Call	AFR16X09GB	Call
AFR16X11	Call	AFR16X11G1	Call	AFR16X11G2	Call	AFR16X11GB	Call
AFR16X13	Call	AFR16X13G1	Call	AFR16X13G2	Call	AFR16X13GB	Call

NOTE: The smaller of the two flanges (ASA 2) is rotatable; the larger is fixed (ASA 1).

Flat Flanges		Grooved #1 (Larger)		Grooved #2 (Smaller)		Both Grooved	
Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price
AFR05X04R	Call	AFR05X04G1R	Call	AFR05X04G2R	Call	AFR05X04GBR	Call
AFR06X04R	Call	AFR06X04G1R	Call	AFR06X04G2R	Call	AFR06X04GBR	Call
AFR06X05R	Call	AFR06X05G1R	Call	AFR06X05G2R	Call	AFR06X05GBR	Call
AFR07X04R	Call	AFR07X04G1R	Call	AFR07X04G2R	Call	AFR07X04GBR	Call
AFR07X05R	Call	AFR07X05G1R	Call	AFR07X05G2R	Call	AFR07X05GBR	Call
AFR07X06R	Call	AFR07X06G1R	Call	AFR07X06G2R	Call	AFR07X06GBR	Call
AFR09X05R	Call	AFR09X05G1R	Call	AFR09X05G2R	Call	AFR09X05GBR	Call
AFR09X06R	Call	AFR09X06G1R	Call	AFR09X06G2R	Call	AFR09X06GBR	Call
AFR09X07R	Call	AFR09X07G1R	Call	AFR09X07G2R	Call	AFR09X07GBR	Call
AFR11X05R	Call	AFR11X05G1R	Call	AFR11X05G2R	Call	AFR11X05GBR	Call
AFR11X06R	Call	AFR11X06G1R	Call	AFR11X06G2R	Call	AFR11X06GBR	Call
AFR11X07R	Call	AFR11X07G1R	Call	AFR11X07G2R	Call	AFR11X07GBR	Call
AFR11X09R	Call	AFR11X09G1R	Call	AFR11X09G2R	Call	AFR11X09GBR	Call
AFR13X05R	Call	AFR13X05G1R	Call	AFR13X05G2R	Call	AFR13X05GBR	Call
AFR13X06R	Call	AFR13X06G1R	Call	AFR13X06G2R	Call	AFR13X06GBR	Call
AFR13X07R	Call	AFR13X07G1R	Call	AFR13X07G2R	Call	AFR13X07GBR	Call
AFR13X09R	Call	AFR13X09G1R	Call	AFR13X09G2R	Call	AFR13X09GBR	Call
AFR13X11R	Call	AFR13X11G1R	Call	AFR13X11G2R	Call	AFR13X11GBR	Call
AFR16X05R	Call	AFR16X05G1R	Call	AFR16X05G2R	Call	AFR16X05GBR	Call
AFR16X06R	Call	AFR16X06G1R	Call	AFR16X06G2R	Call	AFR16X06GBR	Call
AFR16X07R	Call	AFR16X07G1R	Call	AFR16X07G2R	Call	AFR16X07GBR	Call
AFR16X09R	Call	AFR16X09G1R	Call	AFR16X09G2R	Call	AFR16X09GBR	Call
AFR16X11R	Call	AFR16X11G1R	Call	AFR16X11G2R	Call	AFR16X11GBR	Call
AFR16X13R	Call	AFR16X13G1R	Call	AFR16X13G2R	Call	AFR16X13GBR	Call

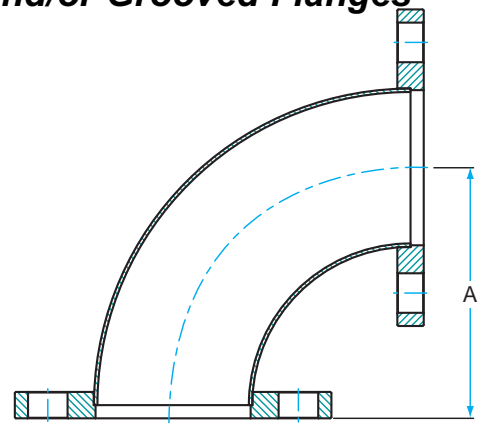
► Fixed & Rotatable Elbows

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Flanges, Fittings, & Components

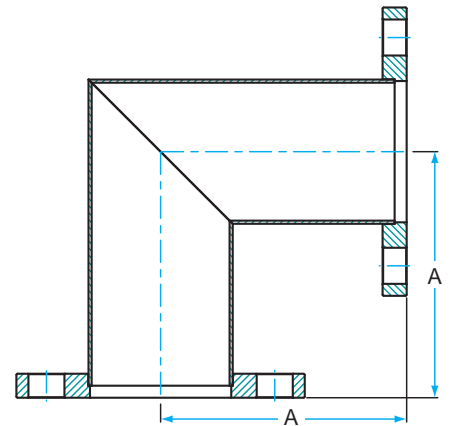
■ Radius with Flat and/or Grooved Flanges

- Feature two ASA flanges



ASA Size	Flange O.D.	Tube O.D.	A	Part No.	Price
1	4.25"	1.5"	2.66"	AFER04X15	Call
1.5	5"	2"	3.25"	AFER05X20	Call
2	6"	3"	4.75"	AFER06X30	Call
3	7.5"	4"	6.25"	AFER07X40	Call
4	9"	4"	6.25"	AFER09X40	Call

■ Miter with Flat and/or Grooved Flanges

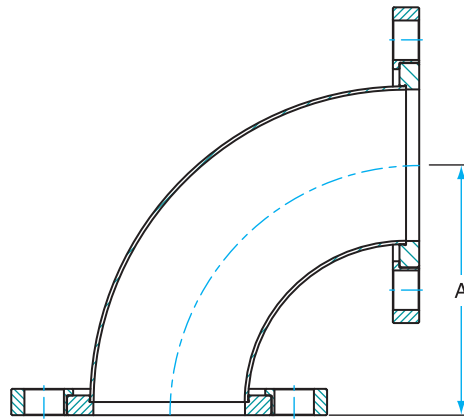


ASA Size	Flange O.D.	Tube O.D.	A	Part No.	Price
1	4.25"	1.5"	3.25"	AFEM04X15	Call
1.5	5"	1.5"	3.25"	AFEM05X15	Call
1.5	5"	2.5"	3.25"	AFEM05X25	Call
2	6"	3"	5.12"	AFEM06X30	Call
3	7.5"	3"	5.12"	AFEM07X30	Call
3	7.5"	4"	5.12"	AFEM07X40	Call
4	9"	4"	5.12"	AFEM09X40	Call
4	9"	6"	5.25"	AFEM09X60	Call
6	11"	6"	6.44"	AFEM11X60	Call
6	11"	8"	7.38"	AFEM11X80	Call
8	13.5"	8"	7.75"	AFEM13X80	Call
8	13.5"	10"	9.88"	AFEM13X10	Call
10	16"	10"	9.88"	AFEM16X10	Call

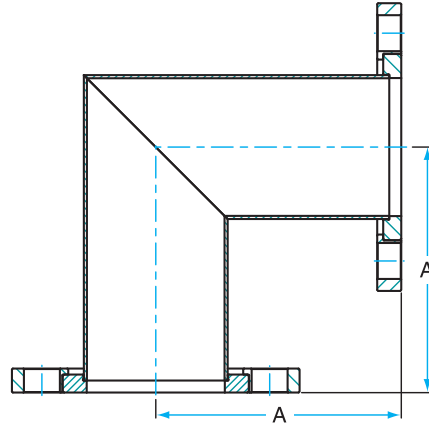
► **Fixed & Rotatable Elbows**

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Flanges, Fittings, & Components



One Grooved		Fixed		Both Grooved		Rotatable		Both Grooved	
Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price
AFER04X15G	Call	AFER04X15GB	Call	AFER04X15R	Call	AFER04X15GR	Call	AFER04X15GBR	Call
AFER05X20G	Call	AFER05X20GB	Call	AFER05X20R	Call	AFER05X20GR	Call	AFER05X20GBR	Call
AFER06X30G	Call	AFER06X30GB	Call	AFER06X30R	Call	AFER06X30GR	Call	AFER06X30GBR	Call
AFER07X40G	Call	AFER07X40GB	Call	AFER07X40R	Call	AFER07X40GR	Call	AFER07X40GBR	Call
AFER09X40G	Call	AFER09X40GB	Call	AFER09X40R	Call	AFER09X40GR	Call	AFER09X40GBR	Call

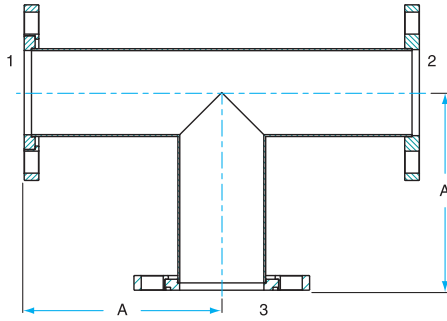


One Grooved		Fixed		Both Grooved		Rotatable		Both Grooved	
Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price
AFEM04X15G	Call	AFEM04X15GB	Call	AFEM04X15R	Call	AFEM04X15GR	Call	AFEM04X15GBR	Call
AFEM05X15G	Call	AFEM05X15GB	Call	AFEM05X15R	Call	AFEM05X15GR	Call	AFEM05X15GBR	Call
AFEM05X25G	Call	AFEM05X25GB	Call	AFEM05X25R	Call	AFEM05X25GR	Call	AFEM05X25GBR	Call
AFEM06X30G	Call	AFEM06X30GB	Call	AFEM06X30R	Call	AFEM06X30GR	Call	AFEM06X30GBR	Call
AFEM07X30G	Call	AFEM07X30GB	Call	AFEM07X30R	Call	AFEM07X30GR	Call	AFEM07X30GBR	Call
AFEM07X40G	Call	AFEM07X40GB	Call	AFEM07X40R	Call	AFEM07X40GR	Call	AFEM07X40GBR	Call
AFEM09X40G	Call	AFEM09X40GB	Call	AFEM09X40R	Call	AFEM09X40GR	Call	AFEM09X40GBR	Call
AFEM09X60G	Call	AFEM09X60GB	Call	AFEM09X60R	Call	AFEM09X60GR	Call	AFEM09X60GBR	Call
AFEM11X60G	Call	AFEM11X60GB	Call	AFEM11X60R	Call	AFEM11X60GR	Call	AFEM11X60GBR	Call
AFEM11X80G	Call	AFEM11X80GB	Call	AFEM11X80R	Call	AFEM11X80GR	Call	AFEM11X80GBR	Call
AFEM13X80G	Call	AFEM13X80GB	Call	AFEM13X80R	Call	AFEM13X80GR	Call	AFEM13X80GBR	Call
AFEM13X10G	Call	AFEM13X10GB	Call	AFEM13X10R	Call	AFEM13X10GR	Call	AFEM13X10GBR	Call
AFEM16X10G	Call	AFEM16X10GB	Call	AFEM16X10R	Call	AFEM16X10GR	Call	AFEM16X10GBR	Call

▶ Rotatable Tees & 4-Way Crosses

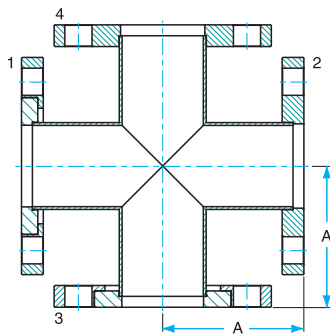
■ Tees with Flat and/or Grooved Flanges

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Flanges, Fittings, & Components



ASA Size	Flange O.D.	Tube O.D.	A	Part No.	Price
1	4.25"	1.50"	2.50"	AFT04X15R	Call
1.5	5.00"	2.00"	3.25"	AFT05X20R	Call
1.5	5.00"	2.50"	3.25"	AFT05X25R	Call
2	6.00"	3.00"	3.50"	AFT06X30R	Call
3	7.50"	4.00"	5.12"	AFT07X40R	Call
4	9.00"	4.00"	5.12"	AFT09X40R	Call
4	9.00"	6.00"	5.25"	AFT09X60R	Call
6	11.00"	6.00"	6.44"	AFT11X60R	Call
6	11.00"	8.00"	7.38"	AFT11X80R	Call
8	13.50"	8.00"	7.75"	AFT13X80R	Call
8	13.50"	10.00"	9.88"	AFT13X10R	Call
10	16.00"	10.00"	9.88"	AFT16X10R	Call

■ 4-Way Crosses with Flat and/or Grooved Flanges



ASA Size	Flange O.D.	Tube O.D.	A	Part No.	Price
1	4.25"	1.50"	2.50"	AF4C04X15R	Call
1.5	5.00"	2.00"	3.25"	AF4C05X20R	Call
1.5	5.00"	2.50"	3.25"	AF4C05X25R	Call
2	6.00"	3.00"	3.50"	AF4C06X30R	Call
3	7.50"	4.00"	5.12"	AF4C07X40R	Call
4	9.00"	4.00"	5.12"	AF4C09X40R	Call
4	9.00"	6.00"	5.25"	AF4C09X60R	Call
6	11.00"	6.00"	6.44"	AF4C11X60R	Call
6	11.00"	8.00"	7.38"	AF4C11X80R	Call
8	13.50"	8.00"	7.75"	AF4C13X80R	Call
8	13.50"	10.00"	9.88"	AF4C13X10R	Call
10	16.00"	10.00"	9.88"	AF4C16x10R	Call

➤ **Rotatable Tees & 4-Way Crosses**

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Flanges, Fittings, & Components

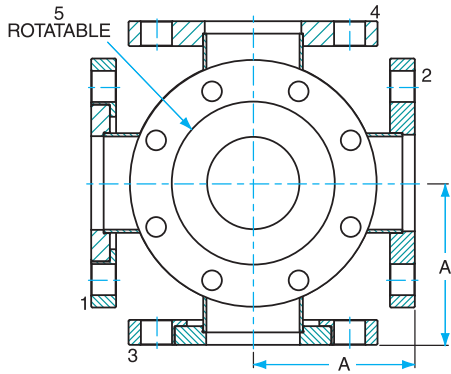
Grooved Flanges									
Flange 1 Grooved		Flange 3 Grooved		Flanges 1 & 2 Grooved		Flanges 1 & 3 Grooved		Flanges 1, 2, & 3 Grooved	
Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price
AFT04X15G1R	Call	AFT04X15G2R	Call	AFT04X15G3R	Call	AFT04X15G4R	Call	AFT04X15G5R	Call
AFT05X20G1R	Call	AFT05X20G2R	Call	AFT05X20G3R	Call	AFT05X20G4R	Call	AFT05X20G5R	Call
AFT05X25G1R	Call	AFT05X25G2R	Call	AFT05X25G3R	Call	AFT05X25G4R	Call	AFT05X25G5R	Call
AFT06X30G1R	Call	AFT06X30G2R	Call	AFT06X30G3R	Call	AFT06X30G4R	Call	AFT06X30G5R	Call
AFT07X40G1R	Call	AFT07X40G2R	Call	AFT07X40G3R	Call	AFT07X40G4R	Call	AFT07X40G5R	Call
AFT09X40G1R	Call	AFT09X40G2R	Call	AFT09X40G3R	Call	AFT09X40G4R	Call	AFT09X40G5R	Call
AFT09X60G1R	Call	AFT09X60G2R	Call	AFT09X60G3R	Call	AFT09X60G4R	Call	AFT09X60G5R	Call
AFT11X60G1R	Call	AFT11X60G2R	Call	AFT11X60G3R	Call	AFT11X60G4R	Call	AFT11X60G5R	Call
AFT11X80G1R	Call	AFT11X80G2R	Call	AFT11X80G3R	Call	AFT11X80G4R	Call	AFT11X80G5R	Call
AFT13X80G1R	Call	AFT13X80G2R	Call	AFT13X80G3R	Call	AFT13X80G4R	Call	AFT13X80G5R	Call
AFT13X10G1R	Call	AFT13X10G2R	Call	AFT13X10G3R	Call	AFT13X10G4R	Call	AFT13X10G5R	Call
AFT16X10G1R	Call	AFT16X10G2R	Call	AFT16X10G3R	Call	AFT16X10G4R	Call	AFT16X10G5R	Call

Grooved Flanges									
Flange 1 Grooved		Flanges 1 & 2 Grooved		Flanges 1 & 3 Grooved		Flanges 1, 2, & 3 Grooved		Flanges 1, 2, 3, & 4 Grooved	
Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price
AF4C04X15G1R	Call	AF4C04X15G2R	Call	AF4C04X15G3R	Call	AF4C04X15G4R	Call	AF4C04X15G5R	Call
AF4C05X20G1R	Call	AF4C05X20G2R	Call	AF4C05X20G3R	Call	AF4C05X20G4R	Call	AF4C05X20G5R	Call
AF4C05X25G1R	Call	AF4C05X25G2R	Call	AF4C05X25G3R	Call	AF4C05X25G4R	Call	AF4C05X25G5R	Call
AF4C06X30G1R	Call	AF4C06X30G2R	Call	AF4C06X30G3R	Call	AF4C06X30G4R	Call	AF4C06X30G5R	Call
AF4C07X40G1R	Call	AF4C07X40G2R	Call	AF4C07X40G3R	Call	AF4C07X40G4R	Call	AF4C07X40G5R	Call
AF4C09X40G1R	Call	AF4C09X40G2R	Call	AF4C09X40G3R	Call	AF4C09X40G4R	Call	AF4C09X40G5R	Call
AF4C09X60G1R	Call	AF4C09X60G2R	Call	AF4C09X60G3R	Call	AF4C09X60G4R	Call	AF4C09X60G5R	Call
AF4C11X60G1R	Call	AF4C11X60G2R	Call	AF4C11X60G3R	Call	AF4C11X60G4R	Call	AF4C11X60G5R	Call
AF4C11X80G1R	Call	AF4C11X80G2R	Call	AF4C11X80G3R	Call	AF4C11X80G4R	Call	AF4C11X80G5R	Call
AF4C13X80G1R	Call	AF4C13X80G2R	Call	AF4C13X80G3R	Call	AF4C13X80G4R	Call	AF4C13X80G5R	Call
AF4C13X10G1R	Call	AF4C13X10G2R	Call	AF4C13X10G3R	Call	AF4C13X10G4R	Call	AF4C13X10G5R	Call
AF4C16X10G1R	Call	AF4C16X10G2R	Call	AF4C16X10G3R	Call	AF4C16X10G4R	Call	AF4C16X10G5R	Call

▶ Rotatable 5-Way Crosses

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Flanges, Fittings, & Components



■ 5-Way Crosses with Flat and/or Grooved Flanges

Flat Flanges					
ASA Size	Flange O.D.	Tube O.D.	A	Part No.	Price
1	4.25"	1.50"	2.50"	AF5C04X15R	Call
1.5	5.00"	2.00"	2.50"	AF5C05X20R	Call
1.5	5.00"	2.50"	2.50"	AF5C05X25R	Call
2	6.00"	3.00"	3.50"	AF5C06X30R	Call
3	7.50"	4.00"	5.12"	AF5C07X40R	Call
4	9.00"	4.00"	5.12"	AF5C09X40R	Call
4	9.00"	6.00"	5.25"	AF5C09X60R	Call
6	11.00"	6.00"	5.38"	AF5C11X60R	Call
6	11.00"	8.00"	7.38"	AF5C11X80R	Call
8	13.50"	8.00"	7.38"	AF5C13X80R	Call
8	13.50"	10.00"	9.88"	AF5C13X10R	Call
10	16.00"	10.00"	9.88"	AF5C16X10R	Call

■ 5-Way Crosses with Flat and/or Grooved Flanges (Continued)

Flat Flanges					
ASA Size	Flange O.D.	Tube O.D.	A	Part No.	Price
1	4.25"	1.50"	2.50"	AF5C04X15R	Call
1.5	5.00"	2.00"	2.50"	AF5C05X20R	Call
1.5	5.00"	2.50"	2.50"	AF5C05X25R	Call
2	6.00"	3.00"	3.50"	AF5C06X30R	Call
3	7.50"	4.00"	5.12"	AF5C07X40R	Call
4	9.00"	4.00"	5.12"	AF5C09X40R	Call
4	9.00"	6.00"	5.25"	AF5C09X60R	Call
6	11.00"	6.00"	5.38"	AF5C11X60R	Call
6	11.00"	8.00"	7.38"	AF5C11X80R	Call
8	13.50"	8.00"	7.38"	AF5C13X80R	Call
8	13.50"	10.00"	9.88"	AF5C13X10R	Call
10	16.00"	10.00"	9.88"	AF5C16X10R	Call

➤ Rotatable 5-Way Crosses

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Flanges, Fittings, & Components

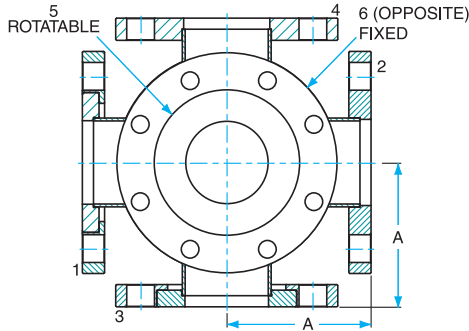
Grooved Flanges											
Flange 1 Grooved		Flange 5 Grooved		Flanges 1 & 2 Grooved		Flanges 1 & 3 Grooved		Flanges 1, & 5 Grooved		Flanges 1, 2, & 3 Grooved	
Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price
AF5C04X15G1R	Call	AF5C04X15G2R	Call	AF5C04X15G3R	Call	AF5C04X15G4R	Call	AF5C04X15G5R	Call	AF5C04X15G6R	Call
AF5C05X20G1R	Call	AF5C05X20G2R	Call	AF5C05X20G3R	Call	AF5C05X20G4R	Call	AF5C05X20G5R	Call	AF5C05X20G6R	Call
AF5C05X25G1R	Call	AF5C05X25G2R	Call	AF5C05X25G3R	Call	AF5C05X25G4R	Call	AF5C05X25G5R	Call	AF5C05X25G6R	Call
AF5C06X30G1R	Call	AF5C06X30G2R	Call	AF5C06X30G3R	Call	AF5C06X30G4R	Call	AF5C06X30G5R	Call	AF5C06X30G6R	Call
AF5C07X40G1R	Call	AF5C07X40G2R	Call	AF5C07X40G3R	Call	AF5C07X40G4R	Call	AF5C07X40G5R	Call	AF5C07X40G6R	Call
AF5C09X40G1R	Call	AF5C09X40G2R	Call	AF5C09X40G3R	Call	AF5C09X40G4R	Call	AF5C09X40G5R	Call	AF5C09X40G6R	Call
AF5C09X60G1R	Call	AF5C09X60G2R	Call	AF5C09X60G3R	Call	AF5C09X60G4R	Call	AF5C09X60G5R	Call	AF5C09X60G6R	Call
AF5C11X60G1R	Call	AF5C11X60G2R	Call	AF5C11X60G3R	Call	AF5C11X60G4R	Call	AF5C11X60G5R	Call	AF5C11X60G6R	Call
AF5C11X80G1R	Call	AF5C11X80G2R	Call	AF5C11X80G3R	Call	AF5C11X80G4R	Call	AF5C11X80G5R	Call	AF5C11X80G6R	Call
AF5C13X80G1R	Call	AF5C13X80G2R	Call	AF5C13X80G3R	Call	AF5C13X80G4R	Call	AF5C13X80G5R	Call	AF5C13X80G6R	Call
AF5C13X10G1R	Call	AF5C13X10G2R	Call	AF5C13X10G3R	Call	AF5C13X10G4R	Call	AF5C13X10G5R	Call	AF5C13X10G6R	Call
AF5C16X10G1R	Call	AF5C16X10G2R	Call	AF5C16X10G3R	Call	AF5C16X10G4R	Call	AF5C16X10G5R	Call	AF5C16X10G6R	Call

Grooved Flanges											
Flanges 1, 2, & 5 Grooved		Flanges 1, 3, & 5 Grooved		Flanges 2, 3, & 5 Grooved		Flanges 1, 2, 3 & 4 Grooved		Flanges 1, 2, 3, & 5 Grooved		Flanges 1, 2, 3, 4, & 5 Grooved	
Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price
AF5C04X15G7R	Call	AF5C04X15G8R	Call	AF5C04X15G9R	Call	AF5C04X15GAR	Call	AF5C04X15GBR	Call	AF5C04X15GCR	Call
AF5C05X20G7R	Call	AF5C05X20G8R	Call	AF5C05X20G9R	Call	AF5C05X20GAR	Call	AF5C05X20GBR	Call	AF5C05X20GCR	Call
AF5C05X25G7R	Call	AF5C05X25G8R	Call	AF5C05X25G9R	Call	AF5C05X25GAR	Call	AF5C05X25GBR	Call	AF5C05X25GCR	Call
AF5C06X30G7R	Call	AF5C06X30G8R	Call	AF5C06X30G9R	Call	AF5C06X30GAR	Call	AF5C06X30GBR	Call	AF5C06X30GCR	Call
AF5C07X40G7R	Call	AF5C07X40G8R	Call	AF5C07X40G9R	Call	AF5C07X40GAR	Call	AF5C07X40GBR	Call	AF5C07X40GCR	Call
AF5C09X40G7R	Call	AF5C09X40G8R	Call	AF5C09X40G9R	Call	AF5C09X40GAR	Call	AF5C09X40GBR	Call	AF5C09X40GCR	Call
AF5C09X60G7R	Call	AF5C09X60G8R	Call	AF5C09X60G9R	Call	AF5C09X60GAR	Call	AF5C09X60GBR	Call	AF5C09X60GCR	Call
AF5C11X60G7R	Call	AF5C11X60G8R	Call	AF5C11X60G9R	Call	AF5C11X60GAR	Call	AF5C11X60GBR	Call	AF5C11X60GCR	Call
AF5C11X80G7R	Call	AF5C11X80G8R	Call	AF5C11X80G9R	Call	AF5C11X80GAR	Call	AF5C11X80GBR	Call	AF5C11X80GCR	Call
AF5C13X80G7R	Call	AF5C13X80G8R	Call	AF5C13X80G9R	Call	AF5C13X80GAR	Call	AF5C13X80GBR	Call	AF5C13X80GCR	Call
AF5C13X10G7R	Call	AF5C13X10G8R	Call	AF5C13X10G9R	Call	AF5C13X10GAR	Call	AF5C13X10GBR	Call	AF5C13X10GCR	Call
AF5C16X10G7R	Call	AF5C16X10G8R	Call	AF5C16X10G9R	Call	AF5C16X10GAR	Call	AF5C16X10GBR	Call	AF5C16X10GCR	Call

▶ Rotatable 6-Way Crosses

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Flanges, Fittings, & Components



■ 6-Way Crosses with Flat and/or Grooved Flanges

ASA Size	Flange O.D.	Tube O.D.	A	Flat Flanges	
				Part No.	Price
1	4.25"	1.50"	2.50"	AF6C04X15R	Call
1.5	5.00"	2.00"	2.50"	AF6C05X20R	Call
2	6.00"	3.00"	3.50"	AF6C06X30R	Call
3	7.50"	4.00"	5.12"	AF6C07X40R	Call
4	9.00"	4.00"	5.12"	AF6C09X40R	Call
4	9.00"	6.00"	5.25"	AF6C09X60R	Call
6	11.00"	6.00"	6.44"	AF6C11X60R	Call
6	11.00"	8.00"	7.38"	AF6C11X80R	Call
8	13.50"	8.00"	7.75"	AF6C13X80R	Call
8	13.50"	10.00"	9.88"	AF6C13X10R	Call
10	16.00"	10.00"	9.88"	AF6C16X10R	Call

■ 6-Way Crosses with Flat and/or Grooved Flanges (Continued)

ASA Size	Flange O.D.	Tube O.D.	A	Flat Flanges	
				Part No.	Price
1	4.25"	1.50"	2.50"	AF6C04X15R	Call
1.5	5.00"	2.00"	2.50"	AF6C05X20R	Call
2	6.00"	3.00"	3.50"	AF6C06X30R	Call
3	7.50"	4.00"	5.12"	AF6C07X40R	Call
4	9.00"	4.00"	5.12"	AF6C09X40R	Call
4	9.00"	6.00"	5.25"	AF6C09X60R	Call
6	11.00"	6.00"	6.44"	AF6C11X60R	Call
6	11.00"	8.00"	7.38"	AF6C11X80R	Call
8	13.50"	8.00"	7.75"	AF6C13X80R	Call
8	13.50"	10.00"	9.88"	AF6C13X10R	Call
10	16.00"	10.00"	9.88"	AF6C16X10R	Call

➤ Rotatable 6-Way Crosses

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Flanges, Fittings, & Components

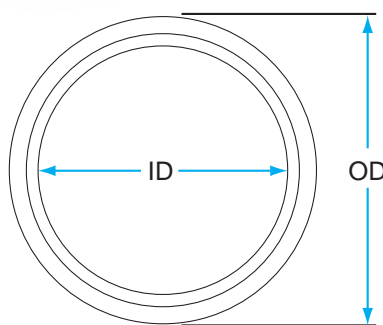
Grooved Flanges									
Flange 1 Grooved		Flanges 1 & 2 Grooved		Flanges 1 & 3 Grooved		Flanges 1, 2, & 3 Grooved		Flanges 1, 3, & 5 Grooved	
Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price
AF6C04X15G1R	Call	AF6C04X15G2R	Call	AF6C04X15G3R	Call	AF6C04X15G4R	Call	AF6C04X15G5R	Call
AF6C05X20G1R	Call	AF6C05X20G2R	Call	AF6C05X20G3R	Call	AF6C05X20G4R	Call	AF6C05X20G5R	Call
AF6C06X30G1R	Call	AF6C06X30G2R	Call	AF6C06X30G3R	Call	AF6C06X30G4R	Call	AF6C06X30G5R	Call
AF6C07X40G1R	Call	AF6C07X40G2R	Call	AF6C07X40G3R	Call	AF6C07X40G4R	Call	AF6C07X40G5R	Call
AF6C09X40G1R	Call	AF6C09X40G2R	Call	AF6C09X40G3R	Call	AF6C09X40G4R	Call	AF6C09X40G5R	Call
AF6C09X60G1R	Call	AF6C09X60G2R	Call	AF6C09X60G3R	Call	AF6C09X60G4R	Call	AF6C09X60G5R	Call
AF6C11X60G1R	Call	AF6C11X60G2R	Call	AF6C11X60G3R	Call	AF6C11X60G4R	Call	AF6C11X60G5R	Call
AF6C11X80G1R	Call	AF6C11X80G2R	Call	AF6C11X80G3R	Call	AF6C11X80G4R	Call	AF6C11X80G5R	Call
AF6C13X80G1R	Call	AF6C13X80G2R	Call	AF6C13X80G3R	Call	AF6C13X80G4R	Call	AF6C13X80G5R	Call
AF6C13X10G1R	Call	AF6C13X10G2R	Call	AF6C13X10G3R	Call	AF6C13X10G4R	Call	AF6C13X10G5R	Call
AF6C16X10G1R	Call	AF6C16X10G2R	Call	AF6C16X10G3R	Call	AF6C16X10G4R	Call	AF6C16X10G5R	Call

Grooved Flanges							
Flanges 1, 2, 3, & 4 Grooved		Flanges 1, 2, 3, & 5 Grooved		Flanges 1, 2, 3, 4, & 5 Grooved		Flanges 1, 2, 3, 4, 5, & 6 Grooved	
Part No.	Price	Part No.	Price	Part No.	Price	Part No.	Price
AF6C04X15G6R	Call	AF6C04X15G7R	Call	AF6C04X15G8R	Call	AF6C04X15G9R	Call
AF6C05X20G6R	Call	AF6C05X20G7R	Call	AF6C05X20G8R	Call	AF6C05X20G9R	Call
AF6C06X30G6R	Call	AF6C06X30G7R	Call	AF6C06X30G8R	Call	AF6C06X30G9R	Call
AF6C07X40G6R	Call	AF6C07X40G7R	Call	AF6C07X40G8R	Call	AF6C07X40G9R	Call
AF6C09X40G6R	Call	AF6C09X40G7R	Call	AF6C09X40G8R	Call	AF6C09X40G9R	Call
AF6C09X60G6R	Call	AF6C09X60G7R	Call	AF6C09X60G8R	Call	AF6C09X60G9R	Call
AF6C11X60G6R	Call	AF6C11X60G7R	Call	AF6C11X60G8R	Call	AF6C11X60G9R	Call
AF6C11X80G6R	Call	AF6C11X80G7R	Call	AF6C11X80G8R	Call	AF6C11X80G9R	Call
AF6C13X80G6R	Call	AF6C13X80G7R	Call	AF6C13X80G8R	Call	AF6C13X80G9R	Call
AF6C13X10G6R	Call	AF6C13X10G7R	Call	AF6C13X10G8R	Call	AF6C13X10G9R	Call
AF6C16X10G6R	Call	AF6C16X10G7R	Call	AF6C16X10G8R	Call	AF6C16X10G9R	Call

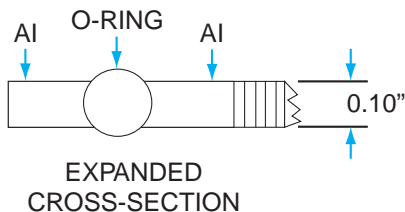
➤ Ring Seals

1

Flanges, Fittings, & Components



TOP VIEW



■ Captured O-Ring Gaskets

- These gaskets are made for sealing two ungrooved flanges
- A normal O-Ring, of either Buna®-N or Viton®-A, is captured and located between two aluminum retaining rings. The O-Ring is included, and the standard O-Ring dash number designator is included for convenient replacement.
- The thickness of the aluminum retaining rings is 0.10 inches and the O-Ring cross section diameter is 0.139 inches
- When two flat (without o-ring grooves) ASA flanges must be mated using these Econo-Rings, consisting of a Buna-N or Viton O-ring, it can serve as the required O-ring

■ Buna-N

ASA Size	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	O.D.	I.D.			
2	2.97	2.25	1/4	ECB-2	Call
3	5.25	3.75	1/4	ECB-3	Call
4	6.75	5.25	1/4	ECB-4	Call
6	8.63	7.00	1/4	ECB-6	Call

■ Viton

ASA Size	Dimensions (in.)		Weight (lbs.)	Part No.	Price
	O.D.	I.D.			
2	2.97	2.25	1/4	ECV-2	Call
3	5.25	3.75	1/4	ECV-3	Call
4	6.75	5.25	1/4	ECV-4	Call
6	8.63	7.00	1/4	ECV-6	Call

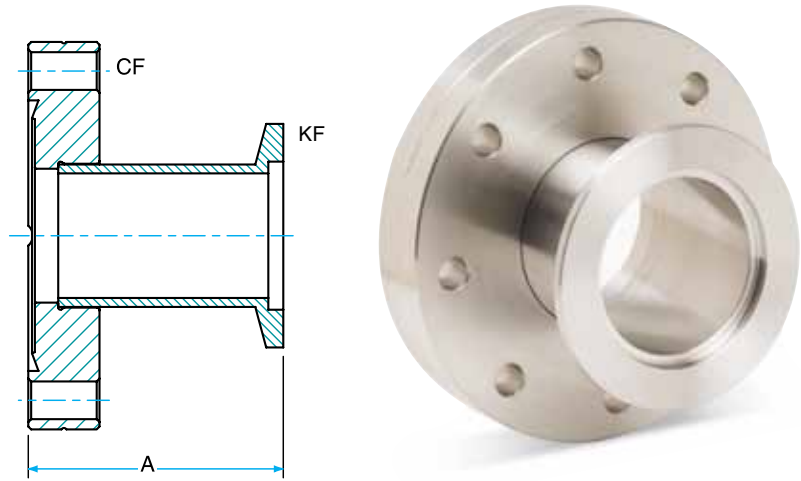
➤ Flange to Flange Adapters

IN THIS SECTION ➤

Adapters

- Our components for UHV systems are fabricated from 304L stainless steel tubing and flanges
- Adapter flanges mate one type of flange system to another. We offer them for all major systems.
- Unless otherwise noted, all adapters are stainless steel.

■ CF to KF (QF) Adapter Flanges

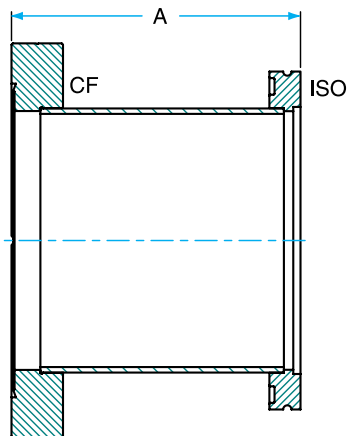


CF Flange O.D.	Tube O.D.	KF	A	Weight (lbs.)	Part No.	Price
1.33"	3/4"	16	1.75"	1/2	F0133XQF16	Call
2.75"	3/4"	16	1.79"	1/2	F0275XQF16	Call
2.75"	1"	25	1.79"	1	F0275XQF25	Call
2.75"	1 1/2"	40	1.79"	1	F0275XQF40	Call
3.38"	1 1/2"	40	1.8"	2	F0337XQF40	Call
4.5"	1 1/2"	40	1.95"	3	F0450XQF40	Call
4.5"	2"	50	1.95"	3	F0450XQF50	Call

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Flanges, Fittings, & Components

■ CF to ISO Adapter Flanges



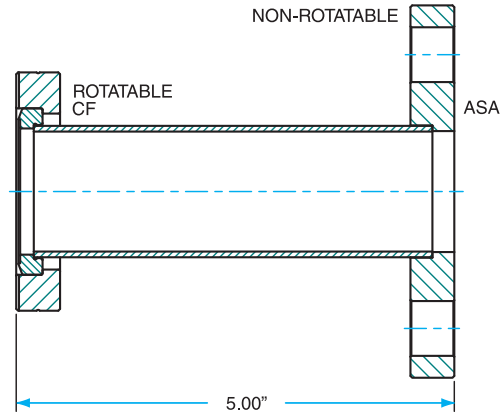
CF Flange O.D.	Tube O.D.	ISO	A	Weight (lbs.)	Part No.	Price
4.5"	2.5"	63	4.31"	3	F0450XQF63	Call
6"	3"	80	4.37"	4	F0600XQF80	Call
6"	4"	100	4.37"	5	F0600XQF100	Call
8"	6"	160	4.44"	9	F0800XQF160	Call
10"	8"	200	4.44"	16	F1000XQF200	Call

► Flange to Flange Adapters

■ CF to ASA Nipple—Flat & Grooved

1

Flanges, Fittings, & Components



Flat ASA Flange						
CF O.D.	ASA Size	ASA O.D.	Tube O.D.	Weight (lbs.)	Part No.	Price
1.33"	1	4.25"	0.75"	1½	AN0133XAS4	Call
1.33"	1.5	5"	0.75"	3	AN0133XAS5	Call
1.33"	2	6"	0.75"	4	AN0133XAS6	Call
1.33"	3	7.5"	0.75"	7	AN0133XAS7	Call
1.33"	4	9"	0.75"	10	AN0133XAS9	Call
1.33"	6	11"	0.75"	20	AN0133XAS11	Call
2.12"	1	4.25"	1"	2	AN0212XAS4	Call
2.12"	1.5	5"	1"	3	AN0212XAS5	Call
2.75"	1	4.25"	1.5"	4	AN0275XAS4	Call
2.75"	1.5	5"	1.5"	4	AN0275XAS5	Call
2.75"	2	6"	1.5"	6	AN0275XAS6	Call
2.75"	3	7.5"	1.5"	9	AN0275XAS7	Call
2.75"	4	9"	1.5"	12	AN0275XAS9	Call
2.75"	6	11"	1.5"	22	AN0275XAS11	Call
2.75"	8	13.5"	1.5"	40	AN0275XAS13	Call
2.75"	10	16"	1.5"	57	AN0275XAS16	Call
4.5"	2	6"	2.5"	7	AN0450XAS6	Call
4.5"	3	7.5"	2.5"	10	AN0450XAS7	Call
4.5"	4	9"	2.5"	13	AN0450XAS9	Call
4.5"	6	11"	2.5"	23	AN0450XAS11	Call
4.5"	8	13.5"	2.5"	41	AN0450XAS13	Call
4.5"	10	16"	2.5"	58	AN0450XAS16	Call
6"	4	9"	4"	15	AN0600XAS9	Call
6"	6	11"	4"	25	AN0600XAS11	Call
6"	8	13.5"	4"	43	AN0600XAS13	Call
6"	10	16"	4"	60	AN0600XAS16	Call
8"	6	11"	6"	27	AN0800XAS11	Call
8"	8	13.5"	6"	45	AN0800XAS13	Call
8"	10	16"	6"	62	AN0800XAS16	Call
10"	8	13.5"	8"	47	AN1000XAS13	Call
10"	10	16"	8"	65	AN1000XAS16	Call

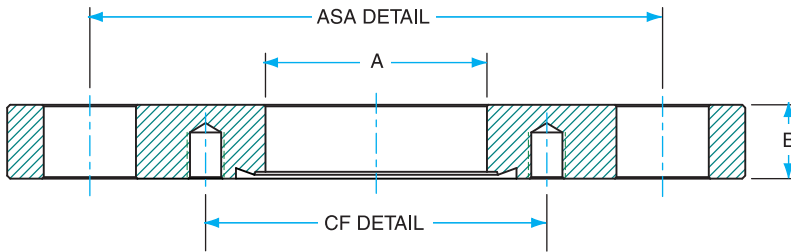
Grooved ASA Flange						
CF O.D.	ASA Size	ASA O.D.	Tube O.D.	Weight (lbs.)	Part No.	Price
1.33"	1	4.25"	0.75"	1½	AN0133XAS4G	Call
1.33"	1.5	5"	0.75"	3	AN0133XAS5G	Call
1.33"	2	6"	0.75"	4	AN0133XAS6G	Call
1.33"	3	7.5"	0.75"	7	AN0133XAS7G	Call
1.33"	4	9"	0.75"	10	AN0133XAS9G	Call
1.33"	6	11"	0.75"	20	AN0133XAS11G	Call
2.12"	1	4.25"	1"	2	AN0212XAS4G	Call
2.12"	1.5	5"	1"	3	AN0212XAS5G	Call
2.75"	1	4.25"	1.5"	4	AN0275XAS4G	Call
2.75"	1.5	5"	1.5"	4	AN0275XAS5G	Call
2.75"	2	6"	1.5"	6	AN0275XAS6G	Call
2.75"	3	7.5"	1.5"	9	AN0275XAS7G	Call
2.75"	4	9"	1.5"	12	AN0275XAS9G	Call
2.75"	6	11"	1.5"	22	AN0275XAS11G	Call
2.75"	8	13.5"	1.5"	40	AN0275XAS13G	Call
2.75"	10	16"	1.5"	57	AN0275XAS16G	Call
4.5"	2	6"	2.5"	7	AN0450XAS6G	Call
4.5"	3	7.5"	2.5"	10	AN0450XAS7G	Call
4.5"	4	9"	2.5"	13	AN0450XAS9G	Call
4.5"	6	11"	2.5"	23	AN0450XAS11G	Call
4.5"	8	13.5"	2.5"	41	AN0450XAS13G	Call
4.5"	10	16"	2.5"	58	AN0450XAS16G	Call
6"	4	9"	4"	15	AN0600XAS9G	Call
6"	6	11"	4"	25	AN0600XAS11G	Call
6"	8	13.5"	4"	43	AN0600XAS13G	Call
6"	10	16"	4"	60	AN0600XAS16G	Call
8"	6	11"	6"	27	AN0800XAS11G	Call
8"	8	13.5"	6"	45	AN0800XAS13G	Call
8"	10	16"	6"	62	AN0800XAS16G	Call
10"	8	13.5"	8"	47	AN1000XAS13G	Call
10"	10	16"	8"	65	AN1000XAS16G	Call

► Flange to Flange Adapters

■ CF to ASA Adapter Flanges—Flat

1

Flanges, Fittings, & Components



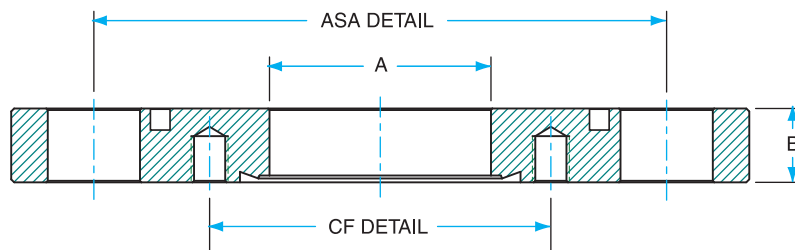
NOTE: Most flange systems have been adapted to ASA flanges. We list only the most popular adapters here, but we can provide many variations and modifications to suit individual requirements. Please call us if you need any type of ASA adapter.

CF O.D.	ASA Size	ASA O.D.	Flat Flange Dimensions (in.)		Weight (lbs.)	Part No.	Price
			A	B			
1.33"	1	4.25"	0.62	0.5	1½	AF0133XAS4	Call
1.33"	1.5	5"	0.62	0.5	3	AF0133XAS5	Call
1.33"	2	6"	0.62	0.5	3	AF0133XAS6	Call
1.33"	3	7.5"	0.62	0.5	5	AF0133XAS7	Call
1.33"	4	9"	0.62	0.5	9	AF0133XAS9	Call
1.33"	6	11"	0.62	0.75	19	AF0133XAS11	Call
2.12"	1	4.25"	1	0.5	½	AF0212XAS4	Call
2.12"	1.5	5"	1	0.5	3	AF0212XAS5	Call
2.12"	2	6"	1	0.5	3	AF0212XAS6	Call
2.12"	3	7.5"	1	0.5	5	AF0212XAS7	Call
2.12"	4	9"	1	0.5	9	AF0212XAS9	Call
2.12"	6	11"	1	0.75	19	AF0212XAS11	Call
2.75"	1.5	5"	1.5	0.5	2	AF0275XAS5	Call
2.75"	2	6"	1.5	0.5	3	AF0275XAS6	Call
2.75"	3	7.5"	1.5	0.5	4	AF0275XAS7	Call
2.75"	4	9"	1.5	0.5	8	AF0275XAS9	Call
2.75"	6	11"	1.5	0.75	19	AF0275XAS11	Call
3.38"	2	6"	2	0.5	3	AF0337XAS6	Call
3.38"	3	7.5"	2	0.5	4	AF0337XAS7	Call
3.38"	4	9"	2	0.5	8	AF0337XAS9	Call
3.38"	6	11"	2	0.75	19	AF0337XAS11	Call
4.5"	3	7.5"	2.5	0.5	4	AF0450XAS7	Call
4.5"	4	9"	2.5	0.5	8	AF0450XAS9	Call
4.5"	6	11"	2.5	0.75	18	AF0450XAS11	Call
4.62"	4	9"	3	0.5	8	AF0462XAS9	Call
4.62"	6	11"	3	0.75	18	AF0462XAS11	Call
6"	4	9"	4	0.5	7	AF0600XAS9	Call
6"	6	11"	4	0.75	15	AF0600XAS11	Call
8"	6	11"	6	0.75	13	AF0800XAS11	Call

► Flange to Flange Adapters

■ CF to ASA Adapter Flanges—Grooved

1
Flanges, Fittings, & Components



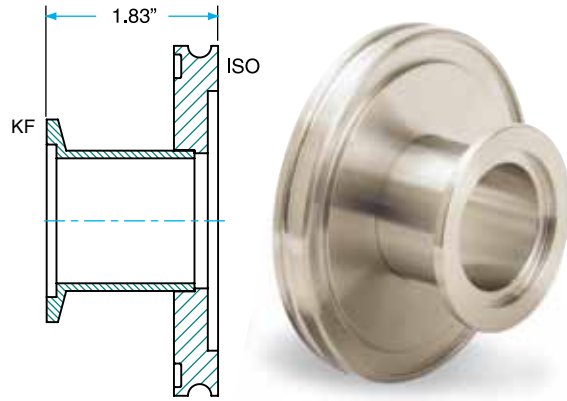
NOTE: Most flange systems have been adapted to ASA flanges. We list only the most popular adapters here, but we can provide many variations and modifications to suit individual requirements. Please call us if you need any type of ASA adapter.

CF O.D.	ASA Size	ASA O.D.	Grooved Flange Dimensions (in.)		Weight (lbs.)	Part No.	Price
			A	B			
1.33"	1	4.25"	0.62	0.5	1½	AF0133XAS4G	Call
1.33"	1.5	5"	0.62	0.5	3	AF0133XAS5G	Call
1.33"	2	6"	0.62	0.5	3	AF0133XAS6G	Call
1.33"	3	7.5"	0.62	0.5	5	AF0133XAS7G	Call
1.33"	4	9"	0.62	0.5	9	AF0133XAS9G	Call
1.33"	6	11"	0.62	0.75	19	AF0133XAS11G	Call
2.12"	1	4.25"	1	0.5	1½	AF0212XAS4G	Call
2.12"	1.5	5"	1	0.5	3	AF0212XAS5G	Call
2.12"	2	6"	1	0.5	3	AF0212XAS6G	Call
2.12"	3	7.5"	1	0.5	5	AF0212XAS7G	Call
2.12"	4	9"	1	0.5	9	AF0212XAS9G	Call
2.12"	6	11"	1	0.75	19	AF0212XAS11G	Call
2.75"	1.5	5"	1.5	0.5	2	AF0275XAS5G	Call
2.75"	2	6"	1.5	0.5	3	AF0275XAS6G	Call
2.75"	3	7.5"	1.5	0.5	4	AF0275XAS7G	Call
2.75"	4	9"	1.5	0.5	8	AF0275XAS9G	Call
2.75"	6	11"	1.5	0.75	19	AF0275XAS11G	Call
3.38"	2	6"	2	0.5	3	AF0337XAS6G	Call
3.38"	3	7.5"	2	0.5	4	AF0337XAS7G	Call
3.38"	4	9"	2	0.5	8	AF0337XAS9G	Call
3.38"	6	11"	2	0.75	19	AF0337XAS11G	Call
4.5"	3	7.5"	2.5	0.5	4	AF0450XAS7G	Call
4.5"	4	9"	2.5	0.5	8	AF0450XAS9G	Call
4.5"	6	11"	2.5	0.75	18	AF0450XAS11G	Call
4.62"	4	9"	3	0.5	8	AF0462XAS9G	Call
4.62"	6	11"	3	0.75	18	AF0462XAS11G	Call
6"	4	9"	4	0.5	7	AF0600XAS9G	Call
6"	6	11"	4	0.75	15	AF0600XAS11G	Call
8"	6	11"	6	0.75	13	AF0800XAS11G	Call

➤ Flange to Flange Adapters

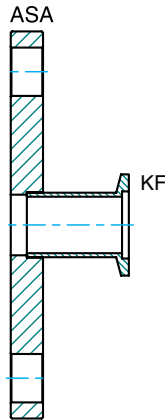
■ KF (QF) to ISO-K Adapters

Tube O.D.	KF	ISO	Weight (lbs.)	Part No.	Price
3/4"	16	63	1	QF63XQF16	Call
1"	25	63	1	QF63XQF25	Call
1 1/2"	40	63	1	QF63XQF40	Call
2"	50	63	1	QF63XQF50	Call
3/4"	16	80	1	QF80XQF16	Call
1"	25	80	1 1/2	QF80XQF25	Call
1 1/2"	40	80	1 1/2	QF80XQF40	Call
2"	50	80	2	QF80XQF50	Call
3/4"	16	100	1 1/2	QF100XQF16	Call
1"	25	100	1 3/4	QF100XQF25	Call
1 1/2"	40	100	2	QF100XQF40	Call
2"	50	100	2	QF100XQF50	Call



1
Flanges, Fittings, & Components

■ KF (QF) to ASA Adapters—Flat & Grooved



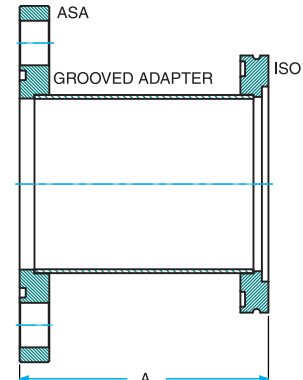
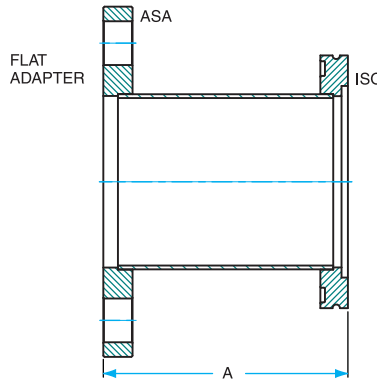
KF	Tube O.D.	ASA O.D.	Flat Flange		Part No.	Price
			ASA Size	Weight (lbs.)		
16	3/4"	4 1/4"	1"	2	QF16XASA4	Call
16	3/4"	5"	1 1/2"	3	QF16XASA5	Call
16	3/4"	6"	2"	3	QF16XASA6	Call
16	3/4"	7 1/2"	3"	5	QF16XASA7	Call
16	3/4"	9"	4"	9	QF16XASA9	Call
16	3/4"	11"	6"	19	QF16XASA11	Call
25	1"	6"	2"	3	QF25XASA6	Call
25	1"	7 1/2"	3"	5	QF25XASA7	Call
25	1"	9"	4"	9	QF25XASA9	Call
25	1"	11"	6"	19	QF25XASA11	Call
40	1 1/2"	5"	1 1/2"	3	QF40XASA5	Call
40	1 1/2"	6"	2"	3	QF40XASA6	Call
40	1 1/2"	7 1/2"	3"	5	QF40XASA7	Call
40	1 1/2"	9"	4"	9	QF40XASA9	Call
40	1 1/2"	11"	6"	19	QF40XASA11	Call
50	2"	5"	1 1/2"	3	QF50XASA5	Call
50	2"	6"	2"	3	QF50XASA6	Call
50	2"	7 1/2"	3"	5	QF50XASA7	Call
50	2"	9"	4"	9	QF50XASA9	Call
50	2"	11"	6"	19	QF50XASA11	Call

KF	Tube O.D.	ASA O.D.	Grooved Flange		Part No.	Price
			ASA Size	Weight (lbs.)		
16	3/4"	4 1/4"	1"	2	QF16XASA4G	Call
16	3/4"	5"	1 1/2"	3	QF16XASA5G	Call
16	3/4"	6"	2"	3	QF16XASA6G	Call
16	3/4"	7 1/2"	3"	5	QF16XASA7G	Call
16	3/4"	9"	4"	9	QF16XASA9G	Call
16	3/4"	11"	6"	19	QF16XASA11G	Call
25	1"	6"	2"	3	QF25XASA6G	Call
25	1"	7 1/2"	3"	5	QF25XASA7G	Call
25	1"	9"	4"	9	QF25XASA9G	Call
25	1"	11"	6"	19	QF25XASA11G	Call
40	1 1/2"	5"	1 1/2"	3	QF40XASA5G	Call
40	1 1/2"	6"	2"	3	QF40XASA6G	Call
40	1 1/2"	7 1/2"	3"	5	QF40XASA7G	Call
40	1 1/2"	9"	4"	9	QF40XASA9G	Call
40	1 1/2"	11"	6"	19	QF40XASA11G	Call
50	2"	5"	1 1/2"	3	QF50XASA5G	Call
50	2"	6"	2"	3	QF50XASA6G	Call
50	2"	7 1/2"	3"	5	QF50XASA7G	Call
50	2"	9"	4"	9	QF50XASA9G	Call
50	2"	11"	6"	19	QF50XASA11G	Call

► Flange to Flange Adapters

■ ISO to ASA Adapter Flanges—Flat and Grooved

1
Flanges, Fittings, & Components



ISO (mm)	Tube O.D.	ASA O.D.	Weight (lbs.)	Part No.	Price
63	2 1/2"	6"	4.19"	QF63XASA6	Call
63	2 1/2"	7.5"	4.19"	QF63XASA7	Call
80	3"	6"	4.19"	QF80XASA6	Call
80	3"	7.5"	4.19"	QF80XASA7	Call
100	3"	6"	4.19"	QF100XASA6	Call
100	4"	7.5"	4.19"	QF100XASA7	Call
100	4"	9"	4.19"	QF100XASA9	Call
100	4"	11"	4.19"	QF100XASA11	Call
160	6"	9"	4.31"	QF160XASA9	Call
160	6"	11"	4.31"	QF160XASA11	Call
200	8"	11"	4.31"	QF200XASA11	Call

ISO (mm)	Tube O.D.	ASA O.D.	Weight (lbs.)	Part No.	Price
63	2 1/2"	6"	4.19"	QF63XASA6G	Call
63	2 1/2"	7.5"	4.19"	QF63XASA7G	Call
80	3"	6"	4.19"	QF80XASA6G	Call
80	3"	7.5"	4.19"	QF80XASA7G	Call
100	3"	6"	4.19"	QF100XASA6G	Call
100	4"	7.5"	4.19"	QF100XASA7G	Call
100	4"	9"	4.19"	QF100XASA9G	Call
100	4"	11"	4.31"	QF100XASA11G	Call
160	6"	9"	4.19"	QF160XASA9G	Call
160	6"	11"	4.31"	QF160XASA11G	Call
200	8"	11"	4.31"	QF200XASA11G	Call



Kurt J. Lesker Company

- Quality Products & Services
- On-time Delivery
- Continual Improvement
- Effective Employee Training
- Customer Satisfaction



Providing Quality You Can Trust for Over 55 Years!

► Flange to Coupling Adapters

■ CF to Quick-Connect Couplings

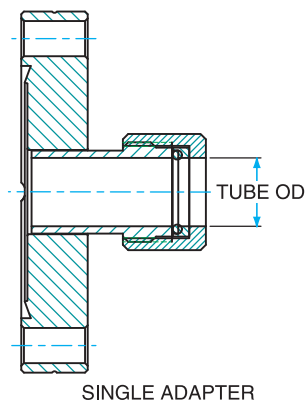
For chambers with 2³/₄" O.D. ConFlat® compatible flanges, we offer feedthrough couplings welded to CFs.

- Made from 304 stainless steel
- We recommend high quality thread lubricant on all stainless steel threads



■ Single Quick-Connect Coupling to CF

Connects a tubular ion gauge to a chamber at a spare flange.

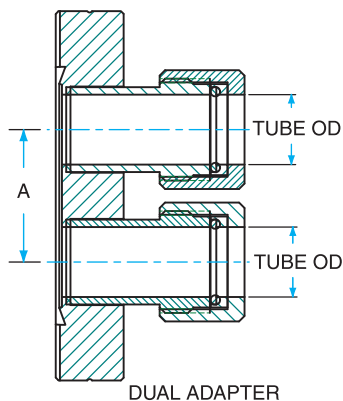


Tube O.D.	CF Flange O.D.	Weight (lbs.)	Part No.	Price
1/8"	1 1/3"	1/2	F0133XVC012	Call
1/4"	1 1/3"	1/2	F0133XVC025	Call
3/8"	1 1/3"	1/2	F0133XVC037	Call
1/2"	1 1/3"	1/2	F0133XVC050	Call
1/8"	2 3/4"	1	F0275XVC012	Call
1/4"	2 3/4"	1	F0275XVC025	Call
5/16"	2 3/4"	1	F0275XVC031	Call
3/8"	2 3/4"	1	F0275XVC037	Call
1/2"	2 3/4"	1	F0275XVC050	Call
5/8"	2 3/4"	1	F0275XVC062	Call
3/4"	2 3/4"	1	F0275XVC075	Call
7/8"	2 3/4"	1	F0275XVC087	Call
1"	2 3/4"	1	F0275XVC100	Call
1 1/8"	2 3/4"	1	F0275XVC112	Call
1 1/4"	2 3/4"	1	F0275XVC125	Call
1 3/8"	2 3/4"	1	F0275XVC137	Call
1 1/2"	2 3/4"	1	F0275XVC150	Call
1"	3 3/8"	1 1/2	F0337XVC150	Call
3/4"	4 1/2"	3	F0450XVC075	Call
1"	4 1/2"	3	F0450XVC100	Call
1 1/2"	4 1/2"	3	F0450XVC150	Call
3/4"	6"	5 1/2	F0600XVC075	Call
1 1/8"	6"	5 1/2	F0600XVC112	Call
1 1/2"	6"	5 1/2	F0600XVC150	Call
3/4"	6 3/4"	8	F0675XVC075	Call
3/4"	8"	12	F0800XVC075	Call

1
Flanges, Fittings, & Components

■ Dual Quick-Connect Coupling to CF

Makes fluid circulation through the vacuum volume easy.



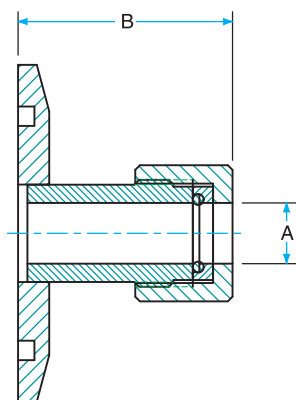
Tube O.D.	CF Flange O.D.	A	Weight (lbs.)	Part No.	Price
0.25"	2.75"	0.93"	1 1/2	F0275X2VC025	Call
0.375"	2.75"	0.98"	1 1/2	F0275X2VC037	Call

► Flange to Coupling Adapters

■ KF (QF) to Quick-Connect Couplings

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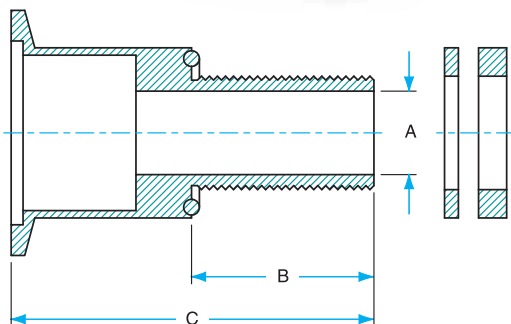
Flanges, Fittings, & Components



Mates a KF with an o-ring quick coupling.

- Made from 304 stainless steel
- Make a vacuum joint with any smooth-surfaced standard O.D. tube
- Most commonly used to attach tubulated ion or thermocouple gauges to a system

KF	Tube O.D.	Dimensions (in.)		Weight (lbs.)	Part No.	Price
		A	B			
10	0.5"	0.515	1.5	1/4	QF10XVC050	Call
16	0.25"	0.265	1.4	1/4	QF16XVC025	Call
16	0.5"	0.515	1.5	1/4	QF16XVC050	Call
16	0.75"	0.765	1.8	1/2	QF16XVC075	Call
25	0.5"	0.515	1.5	1/4	QF25XVC050	Call
25	0.625"	0.750	1.7	1/2	QF25XVC062	Call
25	0.75"	0.765	1.8	1/2	QF25XVC075	Call
25	1"	1.015	2.0	1/2	QF25XVC100	Call
25	1.125"	1.140	2.0	1/2	QF25XVC112	Call
40	0.5"	0.515	1.5	1/2	QF40XVC050	Call
40	0.75"	0.765	1.8	1/2	QF40XVC075	Call
40	1"	1.015	2.0	1/2	QF40XVC100	Call
40	1.125"	1.140	2.0	1/2	QF40XVC112	Call
40	1.25"	1.265	2.0	1/2	QF40XVC125	Call
40	1.375"	1.425	2.1	1/2	QF40XVC137	Call
40	1.5"	1.515	2.4	1/2	QF40XVC150	Call
50	0.5"	0.515	1.5	1/2	QF50XVC050	Call
50	0.75"	0.765	1.8	1/2	QF50XVC075	Call
50	1"	1.015	2.0	1/2	QF50XVC100	Call
50	1.125"	1.140	2.0	1/2	QF50XVC112	Call
50	1.5"	1.515	2.4	3/4	QF50XVC150	Call
50	2"	2.015	2.4	1	QF50XVC200	Call



■ KF (QF) to 1" Baseplate Port

Component fits through a 1" diameter hole in a baseplate or flat chamber wall.

- Terminates in a KF flange
- Used for connecting a roughing pump or attaching a KF flanged component to the chamber

KF	Dimensions (in.)			Weight (lbs.)	Part No.	Price
	A	B	C			
25	0.75	1.62	2.88	2	QF25-100-FT	Call
40	0.75	1.62	3.12	2	QF40-150-FT	Call

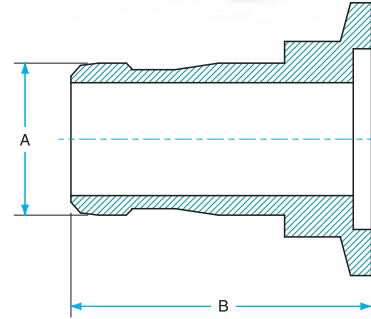
► Flange to Coupling Adapters

■ KF (QF) to Hose Tubulations

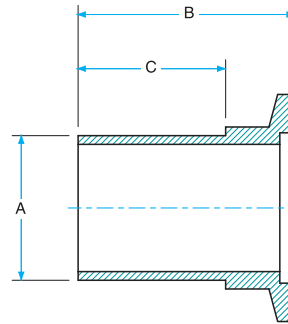
- Hose adapters are made from aluminum or stainless steel
- Feature a flange at one end and a rubber or plastic tubing adapter at the other
- Tubing adapter fits standard vacuum hose bores



KF	Hose I.D.	Dimensions (in.)		Weight (lbs.)	Part No.	Price
		A	B			
10	1/2" or 5/8"	0.625	1.65	1/4	QF10-050-H	Call
16	1/2" or 5/8"	0.625	1.65	1/4	QF16-050-H	Call
16	5/8" or 3/4"	0.75	1.65	1/4	QF16-075-H	Call
25	3/4" or 7/8"	0.875	1.73	1/4	QF25-100-H	Call
40	1 1/2" or 1 5/8"	1.63	2.17	1/4	QF40-150-H	Call
50	1 1/2" or 1 5/8"	1.63	2.17	1/4	QF50-200-H	Call



KF	Hose I.D.	Dimensions (in.)			Weight (lbs.)	Part No.	Price
		A	B	C			
10	0.5"	0.5	1.26	0.79	1/4	QF10-050-SH	Call
16	0.5"	0.5	1.26	0.79	1/4	QF16-050-SH	Call
16	0.75"	0.75	1.26	0.79	1/4	QF16-075-SH	Call
25	1"	1	1.5	1.02	1/4	QF25-100-SH	Call
40	1.5"	1.5	1.97	1.5	1/4	QF40-150-SH	Call
50	2"	2	2.17	1.61	1/4	QF50-200-SH	Call

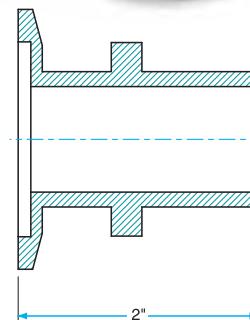


■ KF (QF) to Test Port Adapter

A KF flange terminating in a tube with an O.D. that fits 1 1/8" and 2" test ports.

- Made of stainless steel

KF	Test Port O.D.	Weight (lbs.)	Part No.	Price
16	1.125"	1/4	QF16-112LD	Call
25	1.125"	1/4	QF25-112LD	Call
40	1.125"	1/4	QF40-112LD	Call
50	1.125"	1/2	QF50-112LD	Call
16	2"	1/4	QF16-200LD	Call
25	2"	1/4	QF25-200LD	Call
40	2"	1/4	QF40-200LD	Call
50	2"	1/2	QF50-200LD	Call

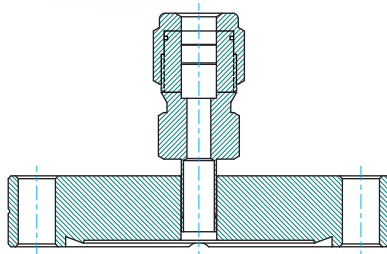


➤ Flange to Fitting Adapters

■ CF to Swagelok® Adapter Flanges

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Flanges, Fittings, & Components

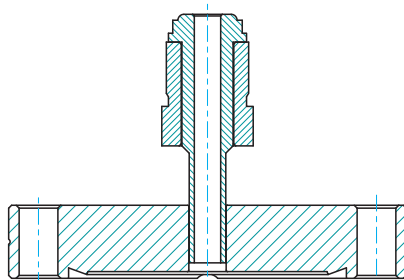


SWAGelok-CF

- Swagelok fittings provide a torque-free seal at all tubing connections
- They eliminate hazardous leaks in instrumentation and process tubing

NOTE: The table below lists the most popular Swagelok to CF adapters. We offer other combinations upon request.

Swagelok End	Flange End	Weight (lbs.)	Part No.	Price
1/16"	1 1/3"	1/2	F0133X1SWG	Call
1/8"	1 1/3"	1/2	F0133X2SWG	Call
1/4"	1 1/3"	1/2	F0133X4SWG	Call
3/8"	1 1/3"	1/2	F0133X6SWG	Call
1/2"	1 1/3"	1/2	F0133X8SWG	Call
1/16"	2 3/4"	1	F0275X1SWG	Call
1/8"	2 3/4"	1	F0275X2SWG	Call
1/4"	2 3/4"	1	F0275X4SWG	Call
3/8"	2 3/4"	1	F0275X6SWG	Call
1/2"	2 3/4"	1	F0275X8SWG	Call

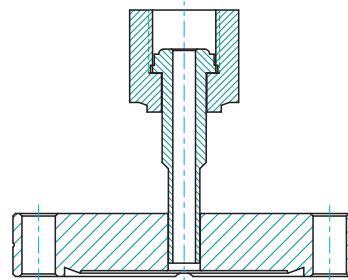


MALE VCR - CF

■ CF to VCR® Adapter Flanges

VCR adapters connect a male or female VCR component to an existing flange system.

- VCRs seal by the compression of a gasket (usually copper) between two highly polished beads on the surfaces of the VCR connectors
- These adapter assemblies are UHV compatible
- These adapters terminate in CF flanges



FEMALE VCR - CF

Male				
VCR End	CF Flange End	Weight (lbs.)	Part No.	Price
1/8"	1 1/3"	1/2	F0133X2MVCR	Call
	2 3/4"	1	F0275X2MVCR	Call
1/4"	1 1/3"	1/2	F0133X4MVCR	Call
	2 3/4"	1	F0275X4MVCR	Call
3/8"	1 1/3"	1/2	F0133X6MVCR	Call
	2 3/4"	1	F0275X6MVCR	Call
1/2"	1 1/3"	1/2	F0133X8MVCR	Call
	2 3/4"	1	F0275X8MVCR	Call

Female				
VCR End	CF Flange End	Weight (lbs.)	Part No.	Price
1/8"	1 1/3"	1/2	F0133X2FVCR	Call
	2 3/4"	1	F0275X2FVCR	Call
1/4"	1 1/3"	1/2	F0133X4FVCR	Call
	2 3/4"	1	F0275X4FVCR	Call
3/8"	1 1/3"	1/2	F0133X6FVCR	Call
	2 3/4"	1	F0275X6FVCR	Call
1/2"	1 1/3"	1/2	F0133X8FVCR	Call
	2 3/4"	1	F0275X8FVCR	Call

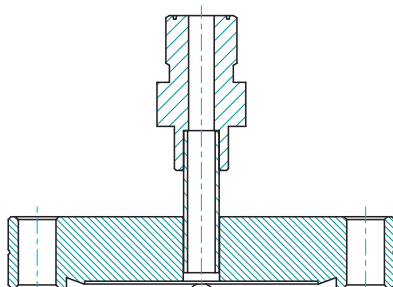
➤ Flange to Fitting Adapters

■ CF to VCO® Adapter Flanges

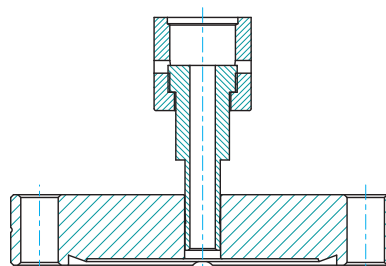
VCO connections differ from VCR connections in the sealing mechanism used.

- Feature an o-ring, seated in a groove on the face of the male fitting, that compresses against the surface of the gland

NOTE: Since VCO connections use o-rings, do not use in UHV systems.



MALE VCO - CF



FEMALE VCO - CF

Male				
VCO End	CF Flange End	Weight (lbs.)	Part No.	Price
1/8"	1 1/3"	1/2	F0133X2MVCO	Call
1/8"	2 3/4"	1	F0275X2MVCO	Call
1/4"	1 1/3"	1/2	F0133X4MVCO	Call
1/4"	2 3/4"	1	F0275X4MVCO	Call
3/8"	1 1/3"	1/2	F0133X6MVCO	Call
3/8"	2 3/4"	1	F0275X6MVCO	Call
1/2"	1 1/3"	1/2	F0133X8MVCO	Call
1/2"	2 3/4"	1	F0275X8MVCO	Call

Female				
VCO End	CF Flange End	Weight (lbs.)	Part No.	Price
1/8"	1 1/3"	1/2	F0133X2FVCO	Call
1/8"	2 3/4"	1	F0275X2FVCO	Call
1/4"	1 1/3"	1/2	F0133X4FVCO	Call
1/4"	2 3/4"	1	F0275X4FVCO	Call
3/8"	1 1/3"	1/2	F0133X6FVCO	Call
3/8"	2 3/4"	1	F0275X6FVCO	Call
1/2"	1 1/3"	1/2	F0133X8FVCO	Call
1/2"	2 3/4"	1	F0275X8FVCO	Call

■ CF to NPT Adapters

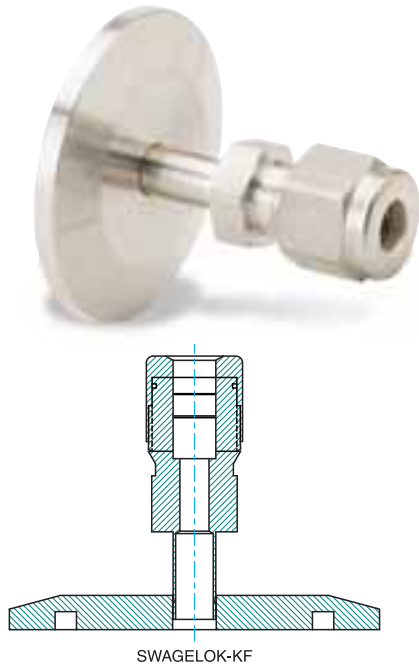
Flange O.D.	NPT Size	Weight (lbs.)	Part No.	Price
1.33"	1/8"	1/4	F0133XFNPT2	Call
1.33"	1/8"	1/4	F0133XFNPT4	Call
2.75"	1/8"	3/4	F0275XFNPT2	Call
2.75"	1/4"	3/4	F0275XFNPT4	Call



► Flange to Fitting Adapters

■ KF (QF) to Swagelok® Adapter Flanges

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Flanges, Fittings, & Components



- Swagelok fittings provide a torque-free seal at all tubing connections
- They eliminate hazardous leaks in instrumentation and process tubing

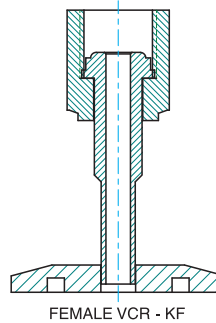
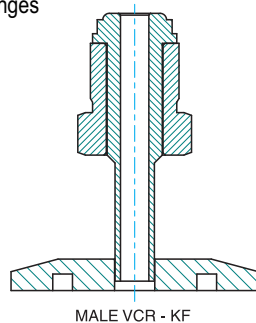
NOTE: The table below lists the most popular Swagelok to KF adapters. We offer other combinations upon request.

Swagelok End	KF Flange End	Weight (lbs.)	Part No.	Price
1/16"	16	1/4	QF16X1SWG	Call
1/16"	25	1/4	QF25X1SWG	Call
1/16"	40	1/4	QF40X1SWG	Call
1/8"	16	1/4	QF16X2SWG	Call
1/8"	25	1/4	QF25X2SWG	Call
1/8"	40	1/4	QF40X2SWG	Call
1/4"	16	1/4	QF16X4SWG	Call
1/4"	25	1/4	QF25X4SWG	Call
1/4"	40	1/4	QF40X4SWG	Call
3/8"	16	1/4	QF16X6SWG	Call
3/8"	25	1/4	QF25X6SWG	Call
3/8"	40	1/4	QF40X6SWG	Call
1/2"	16	1/4	QF16X8SWG	Call
1/2"	25	1/4	QF25X8SWG	Call
1/2"	40	1/4	QF40X8SWG	Call

■ KF (QF) to VCR® Adapter Flanges

VCR adapters connect a male or female VCR component to an existing flange system.

- VCRs seal by the compression of a gasket (usually copper) between two highly polished beads on the surfaces of the VCR connectors
- These adapters terminate in KF flanges



Male				
VCR End	KF Flange End	Weight (lbs.)	Part No.	Price
1/8"	16	1/4	QF16X2MVCR	Call
	25	1/4	QF25X2MVCR	Call
	40	1/4	QF40X2MVCR	Call
1/4"	16	1/4	QF16X4MVCR	Call
	25	1/4	QF25X4MVCR	Call
	40	1/4	QF40X4MVCR	Call
3/8"	16	1/4	QF16X6MVCR	Call
	25	1/4	QF25X6MVCR	Call
	40	1/4	QF40X6MVCR	Call
1/2"	16	1/4	QF16X8MVCR	Call
	25	1/4	QF25X8MVCR	Call
	40	1/4	QF40X8MVCR	Call

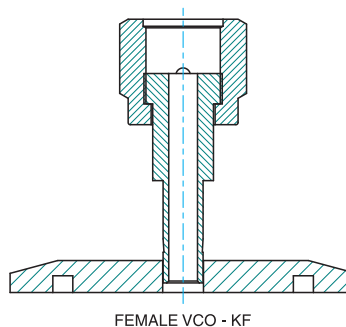
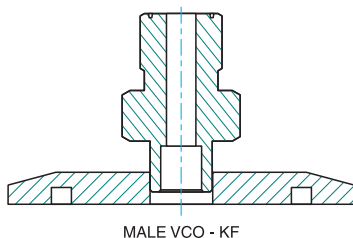
Female				
VCR End	KF Flange End	Weight (lbs.)	Part No.	Price
1/8"	16	1/4	QF16X2FVCR	Call
	25	1/4	QF25X2FVCR	Call
	40	1/4	QF40X2FVCR	Call
1/4"	16	1/4	QF16X4FVCR	Call
	25	1/4	QF25X4FVCR	Call
	40	1/4	QF40X4FVCR	Call
3/8"	16	1/4	QF16X6FVCR	Call
	25	1/4	QF25X6FVCR	Call
	40	1/4	QF40X6FVCR	Call
1/2"	16	1/4	QF16X8FVCR	Call
	25	1/4	QF25X8FVCR	Call
	40	1/4	QF40X8FVCR	Call

➤ Flange to Thread Adapters

■ KF (QF) to VCO® Adapter Flanges

VCO connections differ from VCR connections in the sealing mechanism used.

- Feature an o-ring, seated in a groove on the face of the male fitting, that compresses against the surface of the gland

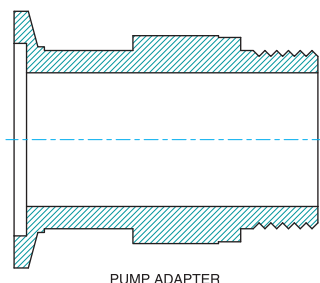


Male				
VCR End	KF Flange End	Weight (lbs.)	Part No.	Price
1/8"	16	1/4	QF16X2MVCO	Call
1/8"	25	1/4	QF25X2MVCO	Call
1/8"	40	1/4	QF40X2MVCO	Call
1/4"	16	1/4	QF16X4MVCO	Call
1/4"	25	1/4	QF25X4MVCO	Call
1/4"	40	1/4	QF40X4MVCO	Call
3/8"	16	1/4	QF16X6MVCO	Call
3/8"	25	1/4	QF25X6MVCO	Call
3/8"	40	1/4	QF40X6MVCO	Call
1/2"	16	1/4	QF16X8MVCO	Call
1/2"	25	1/4	QF25X8MVCO	Call
1/2"	40	1/4	QF40X8MVCO	Call

Female				
VCR End	KF Flange End	Weight (lbs.)	Part No.	Price
1/8"	16	1/4	QF16X2FVCO	Call
1/8"	25	1/4	QF25X2FVCO	Call
1/8"	40	1/4	QF40X2FVCO	Call
1/4"	16	1/4	QF16X4FVCO	Call
1/4"	25	1/4	QF25X4FVCO	Call
1/4"	40	1/4	QF40X4FVCO	Call
3/8"	16	1/4	QF16X6FVCO	Call
3/8"	25	1/4	QF25X6FVCO	Call
3/8"	40	1/4	QF40X6FVCO	Call
1/2"	16	1/4	QF16X8FVCO	Call
1/2"	25	1/4	QF25X8FVCO	Call
1/2"	40	1/4	QF40X8FVCO	Call

■ KF (QF) to Welch Pump Adapters

- Substitutes for the regular intake hose coupling on the pump
- Threads into the pump inlet, enabling direct connection to the foreline by KF flange



NOTE: Due to some design changes to the pumps, both new- and old-style adapters are listed.

New-Style Adapters (Pump's oil sight glass is "pressed" into the pump body)

KF	Welch Pump No.	Intake & Exhaust Port Threads	Weight (lbs.)	Part No.	Price
16	1399, 1400, 1405	3/4"-20	1	QF16-075-W1N	Call
25	1373, 1376, 1380, 1402	1-20	1	QF25-100-W1N	Call
40	1397	1 3/4"-20	2	QF40-150-W2N	Call

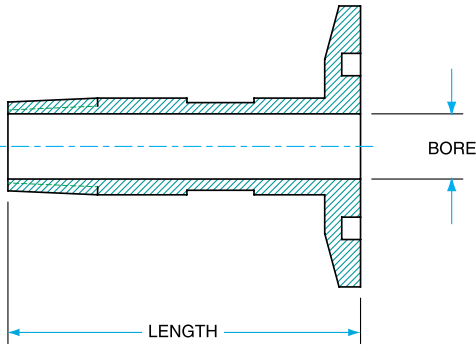
Old-Style Adapters (Pump's oil sight glass is held in place with a bolt ring)

KF	Welch Pump No.	Intake & Exhaust Port Threads	Weight (lbs.)	Part No.	Price
16	1399, 1400, 1410	5/8"-18	1	QF16-075-WP1	Call
16	1405	3/4"-20	1	QF16-075-WP2	Call
25	1380, 1402, 1403, 8806, 8811, 8816, 8821	1-20	1	QF25-100-WP1	Call
40	1373, 1376, 8831	1 1/2"-12	2	QF40-150-WP1	Call
40	1374, 1397, 8851	1 3/4"-20	2	QF40-150-WP2	Call

Flange to Thread Adapters

KF (QF) to Male NPT Adapters

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Flanges, Fittings, & Components



NOTE: Use PTFE tape for sealing threaded joints.

Flanged stubs that terminate in tapered thread ranging from 1/8" to 1".

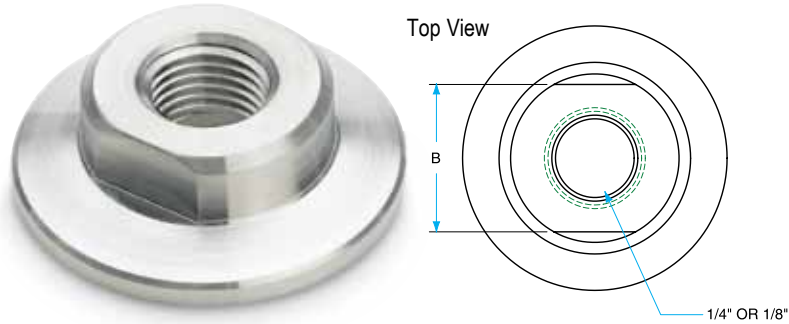
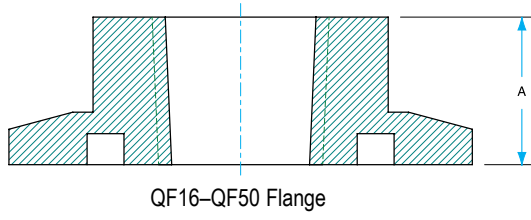
- 304 stainless steel

KF	Male NPT	Dimensions (in.)		Weight (lbs.)	Part No.	Price
		Length	Bore			
16	1/8"	1.57	0.255	1/4	QF16XMNPT2	Call
16	1/4"	1.97	0.36	1/4	QF16XMNPT4	Call
25	1/8"	1.57	0.255	1/4	QF25XMNPT2	Call
25	1/4"	1.97	0.36	1/4	QF25XMNPT4	Call
25	1/2"	2.95	0.625	1/4	QF25XMNPT8	Call
25	3/4"	2.95	0.825	1/4	QF25XMNPT12	Call
40	1/8"	1.57	0.255	1/4	QF40XMNPT2	Call
40	1/4"	1.97	0.36	1/4	QF40XMNPT4	Call
40	1/2"	2.95	0.625	1/4	QF40XMNPT8	Call
40	3/4"	2.95	0.825	1/4	QF40XMNPT12	Call
40	1"	2.95	1.05	1/4	QF40XMNPT16	Call
50	1/8"	1.57	0.255	1/4	QF50XMNPT2	Call
50	1/4"	1.97	0.36	1/4	QF50XMNPT4	Call
50	1/2"	2.95	0.625	1/4	QF50XMNPT8	Call
50	3/4"	2.95	0.825	1/4	QF50XMNPT12	Call
50	1"	2.95	1.05	1/4	QF50XMNPT16	Call

KF (QF) to Female NPT Adapters

These adapters enable insertion of an NPT-threaded pressure gauge or up-to-air valve into a foreline. Often a KF tee is inserted into the foreline joint and an adapter closes the port.

- 304 stainless steel, aluminum, and brass



KF Flange to 1/8" NPT (F) Adapters						
Material	Flange	Dimensions (in.)		Weight (lbs.)	Part No.	Price
		A	B			
Stainless Steel	10	0.5	0.625	1/4	QF10XFNPT2	Call
Stainless Steel	16	0.5	0.625	1/4	QF16XFNPT2	Call
Stainless Steel	25	0.5	0.875	1/4	QF25XFNPT2	Call
Stainless Steel	40	0.5	1.25	1/4	QF40XFNPT2	Call
Stainless Steel	50	0.62	1.75	1/2	QF50XFNPT2	Call
Aluminum	10	0.5	0.625	1/4	QF10XFNPT2A	Call
Aluminum	16	0.5	0.625	1/4	QF16XFNPT2A	Call
Aluminum	25	0.5	0.875	1/4	QF25XFNPT2A	Call
Aluminum	40	0.5	1.25	1/4	QF40XFNPT2A	Call
Aluminum	50	0.62	1.75	1/2	QF50XFNPT2A	Call
Brass	10	0.5	0.625	1/4	QF10XFNPT2B	Call
Brass	16	0.5	0.625	1/4	QF16XFNPT2B	Call
Brass	25	0.5	0.875	1/4	QF25XFNPT2B	Call
Brass	40	0.5	1.25	1/4	QF40XFNPT2B	Call
Brass	50	0.62	1.75	1/2	QF50XFNPT2B	Call

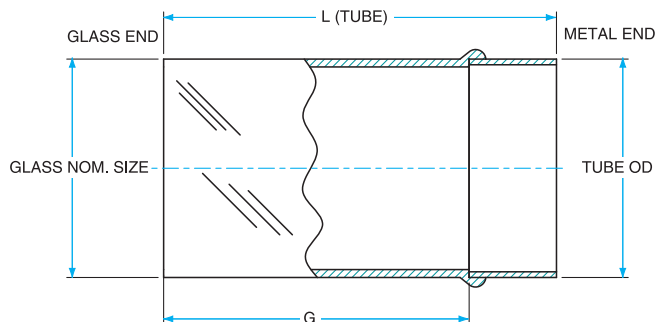
KF Flange to 1/4" NPT (F) Adapters						
Material	Flange	Dimensions (in.)		Weight (lbs.)	Part No.	Price
		A	B			
Stainless Steel	10	0.5	0.625	1/4	QF10XFNPT4	Call
Stainless Steel	16	0.5	0.625	1/4	QF16XFNPT4	Call
Stainless Steel	25	0.5	0.875	1/4	QF25XFNPT4	Call
Stainless Steel	40	0.5	1.25	1/4	QF40XFNPT4	Call
Stainless Steel	50	0.62	1.75	1/2	QF50XFNPT4	Call
Aluminum	10	0.5	0.625	1/4	QF10XFNPT4A	Call
Aluminum	16	0.5	0.625	1/4	QF16XFNPT4A	Call
Aluminum	25	0.5	0.875	1/4	QF25XFNPT4A	Call
Aluminum	40	0.5	1.25	1/4	QF40XFNPT4A	Call
Aluminum	50	0.62	1.75	1/2	QF50XFNPT4A	Call
Brass	10	0.5	0.625	1/4	QF10XFNPT4B	Call
Brass	16	0.5	0.625	1/4	QF16XFNPT4B	Call
Brass	25	0.5	0.875	1/4	QF25XFNPT4B	Call
Brass	40	0.5	1.25	1/4	QF40XFNPT4B	Call
Brass	50	0.62	1.75	1/2	QF50XFNPT4B	Call



► Glass to Metal Tube Adapters

■ Kovar® to Pyrex® Tube Adapters

Glass-metal (GM) seals use a graded glass seal to join a metal tube—usually stainless steel or Kovar—to a glass tube.



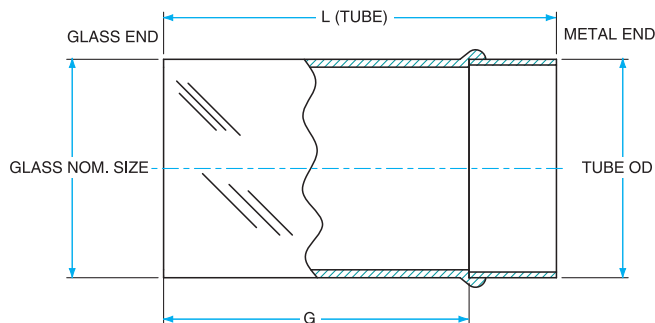
NOTE: We also offer nonstandard sizes, larger sizes, and custom seals upon request. Please call us for details.

Glass Nom. Size	Dimensions (in.)		Tube O.D.	Part No.	Price
	L	G			
1/8"	5 1/4	4 1/8	1/8"	GMPK012TE	Call
3/16"	5 1/4	4 1/8	3/16"	GMPK018TE	Call
1/4"	5 1/4	4 1/8	1/4"	GMPK025TE	Call
5/16"	5 1/4	4 1/8	5/16"	GMPK031TE	Call
3/8"	5 1/4	4 1/8	3/8"	GMPK037TE	Call
1/2"	5 1/4	4 1/8	1/2"	GMPK050TE	Call
5/8"	5 1/4	4 1/8	5/8"	GMPK062TE	Call
3/4"	5 1/4	4 1/8	3/4"	GMPK075TE	Call
7/8"	5 1/4	4 1/8	7/8"	GMPK087TE	Call
1"	5 1/4	4 1/8	1"	GMPK100TE	Call
1 1/8"	5 1/4	4 1/8	1 1/8"	GMPK112TE	Call
1 1/4"	5 1/4	4 1/8	1 1/4"	GMPK125TE	Call
1 3/8"	5 1/4	4 1/8	1 3/8"	GMPK137TE	Call
1 1/2"	5 1/4	4 1/8	1 1/2"	GMPK150TE	Call
1 3/4"	5 1/4	4 1/8	1 3/4"	GMPK175TE	Call
2"	5 3/4	4 1/8	2"	GMPK200TE	Call
2 1/4"	5 3/4	4 1/8	2 1/4"	GMPK225TE	Call
2 1/2"	7 3/8	5 3/4	2 1/2"	GMPK250TE	Call
3"	7 3/8	5 3/4	3"	GMPK300TE	Call
4"	10	8	4"	GMPK400TE	Call
5"	10 1/2	8	5"	GMPK500TE	Call
6"	10 1/2	8	6"	GMPK600TE	Call

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Flanges, Fittings, & Components

■ Kovar to 7052 Glass Tube Adapters

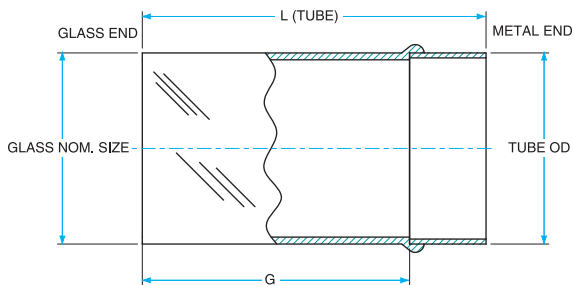


Glass Nom. Size	Dimensions (in.)		Tube O.D.	Part No.	Price
	L	G			
1/8"	5 1/4	4 1/8	1/8"	GMGK012TE	Call
3/16"	5 1/4	4 1/8	3/16"	GMGK018TE	Call
1/4"	5 1/4	4 1/8	1/4"	GMGK025TE	Call
5/16"	5 1/4	4 1/8	5/16"	GMGK031TE	Call
3/8"	5 1/4	4 1/8	3/8"	GMGK037TE	Call
1/2"	5 1/4	4 1/8	1/2"	GMGK050TE	Call
5/8"	5 1/4	4 1/8	5/8"	GMGK062TE	Call
3/4"	5 1/4	4 1/8	3/4"	GMGK075TE	Call
7/8"	5 1/4	4 1/8	7/8"	GMGK087TE	Call
1"	5 1/4	4 1/8	1"	GMGK100TE	Call
1 1/8"	5 1/4	4 1/8	1 1/8"	GMGK112TE	Call
1 1/4"	5 1/4	4 1/8	1 1/4"	GMGK125TE	Call
1 3/8"	5 1/4	4 1/8	1 3/8"	GMGK137TE	Call
1 1/2"	5 1/4	4 1/8	1 1/2"	GMGK150TE	Call
2"	5 3/4	4 1/8	2"	GMGK200TE	Call
2 1/4"	7 3/8	5 3/4	2 1/4"	GMGK250TE	Call
3"	7 3/8	5 3/4	3"	GMGK300TE	Call
4"	10	8	4"	GMGK400TE	Call
5"	10 1/2	8	5"	GMGK500TE	Call
6"	10 1/2	8	6"	GMGK600TE	Call

► Glass to Metal Tube Adapters

■ Stainless Steel to 7740 Pyrex® Tube Adapters

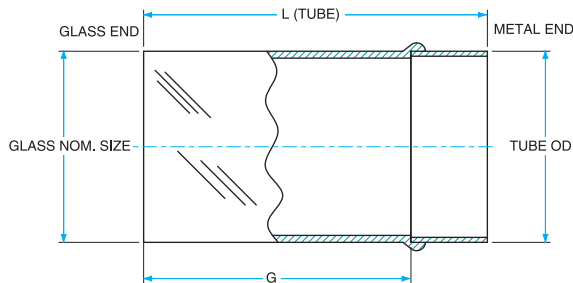
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Flanges, Fittings, & Components



NOTE: To compensate for misalignments, we also offer adapters with flexible stainless steel bellows. These bellows can be compressed axially or expanded between 25% and 33% of their nominal lengths (depending upon the size of the bellows).

Glass Nom.	Dimensions (in.)		Tube O.D.	Part No.	Price
	L	G			
1/8"	4 3/4	3	1/8"	GMPS012TE	Call
3/16"	4 3/4	3	3/16"	GMPS018TE	Call
1/4"	4 3/4	3	1/4"	GMPS025TE	Call
5/16"	4 3/4	3	5/16"	GMPS031TE	Call
3/8"	4 3/4	3	3/8"	GMPS037TE	Call
1/2"	4 3/4	3	1/2"	GMPS050TE	Call
5/8"	4 3/4	3	5/8"	GMPS062TE	Call
3/4"	4 3/4	3	3/4"	GMPS075TE	Call
7/8"	4 3/4	3	7/8"	GMPS087TE	Call
1"	4 3/4	3	1"	GMPS100TE	Call
1 1/8"	4 3/4	3	1 1/8"	GMPS112TE	Call
1 1/4"	4 3/4	3	1 1/4"	GMPS125TE	Call
1 3/8"	4 3/4	3	1 3/8"	GMPS137TE	Call
1 1/2"	4 3/4	3	1 1/2"	GMPS150TE	Call
1 5/8"	4 3/4	3	1 5/8"	GMPS162TE	Call
1 3/4"	4 3/4	3	1 3/4"	GMPS175TE	Call
2"	5 1/4	3	2"	GMPS200TE	Call
2 1/4"	5 1/4	3	2 1/4"	GMPS225TE	Call
2 1/2"	5 1/4	3	2 1/2"	GMPS250TE	Call
2 3/4"	5 1/4	3	2 3/4"	GMPS275TE	Call
3"	6 1/4	4	3"	GMPS300TE	Call
3 1/4"	6 1/4	4	3 1/4"	GMPS325TE	Call
3 1/2"	6 1/4	4	3 1/2"	GMPS350TE	Call
3 3/4"	6 1/4	4	3 3/4"	GMPS375TE	Call
4"	6 1/4	4	4"	GMPS400TE	Call
5"	8 1/4	6	5"	GMPS500TE	Call
6"	8 1/4	6	6"	GMPS600TE	Call

■ Stainless Steel to Quartz Tube Adapters

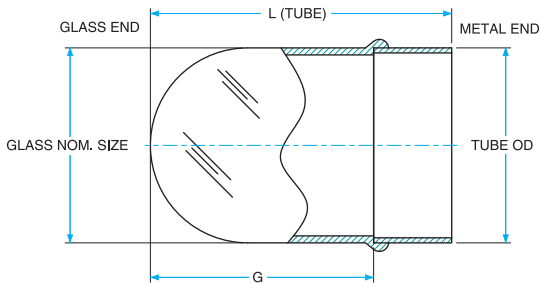


Glass Nom.	Dimensions (in.)		Tube O.D.	Part No.	Price
	L	G			
1/8"	5 1/4	3 1/2	1/8"	GMQS012TE	Call
3/16"	5 1/4	3 1/2	3/16"	GMQS018TE	Call
1/4"	5 1/4	3 1/2	1/4"	GMQS025TE	Call
5/16"	5 1/4	3 1/2	5/16"	GMQS031TE	Call
3/8"	5 1/2	3 3/4	3/8"	GMQS037TE	Call
1/2"	5 1/2	3 3/4	1/2"	GMQS050TE	Call
5/8"	5 7/8	4 1/8	5/8"	GMQS062TE	Call
3/4"	6	4 1/4	3/4"	GMQS075TE	Call
7/8"	6 1/4	4 1/2	7/8"	GMQS087TE	Call
1"	6 3/8	4 5/8	1"	GMQS100TE	Call
1 1/8"	6 3/8	4 5/8	1 1/8"	GMQS112TE	Call
1 1/4"	6 5/8	4 7/8	1 1/4"	GMQS125TE	Call
1 3/8"	6 5/8	4 7/8	1 3/8"	GMQS137TE	Call
1 1/2"	6 3/4	5	1 1/2"	GMQS150TE	Call
1 5/8"	6 3/4	5	1 5/8"	GMQS162TE	Call
1 3/4"	7 1/2	5 1/2	1 3/4"	GMQS175TE	Call
2"	8	5 3/4	2"	GMQS200TE	Call
2 1/4"	8	5 3/4	2 1/4"	GMQS225TE	Call
2 1/2"	8 1/4	6	2 1/2"	GMQS250TE	Call
3"	8 1/2	6 1/4	3"	GMQS300TE	Call

► Glass to Metal Tube Adapters

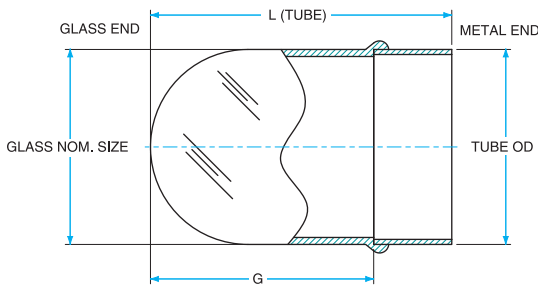
■ Stainless Steel to Pyrex® Dome Tube Adapters

NOTE: The closed end seals listed provide adequate terminations for otherwise open-ended tubes.



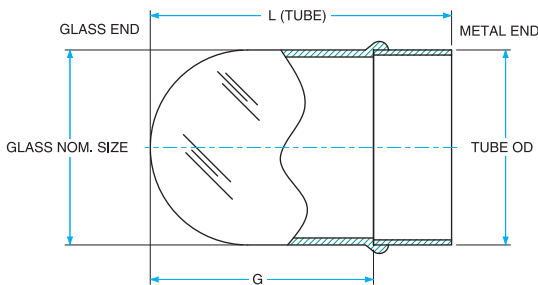
Glass Nom.	Dimensions (in.)		Tube O.D.	Part No.	Price
	L	G			
1/2"	6 1/2	4 3/4	1/2"	GMPS050TERN	Call
3/4"	6 1/2	4 3/4	3/4"	GMPS075TERN	Call
1"	6 1/2	4 3/4	1"	GMPS100TERN	Call
1 1/2"	6 1/2	4 3/4	1 1/2"	GMPS150TERN	Call
2"	6 1/2	4 1/4	2"	GMPS200TERN	Call
2 1/2"	6	4 1/4	2 1/2"	GMPS250TERN	Call
3"	6 1/2	4 1/4	3"	GMPS300TERN	Call
4"	6	4 1/4	4"	GMPS400TERN	Call

■ Stainless Steel to Quartz Dome Tube Adapters



Glass Nom.	Dimensions (in.)		Tube O.D.	Part No.	Price
	L	G			
1/2"	6 1/2	4 3/4	1/2"	GMQS050TERN	Call
3/4"	7 1/4	5 1/2	3/4"	GMQS075TERN	Call
1"	7 3/8	5 5/8	1"	GMQS100TERN	Call
1 1/2"	7 1/4	6	1 1/2"	GMQS150TERN	Call
2"	8 1/2	6 1/4	2"	GMQS200TERN	Call

■ Kovar® to 7052 Glass Dome Tube Adapters

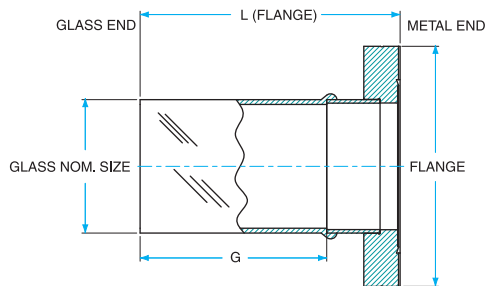


Glass Nom.	Dimensions (in.)		Tube O.D.	Part No.	Price
	L	G			
1/2"	5 1/8	4 3/4	1/2"	GMGK050TERN	Call
3/4"	5 1/8	4 3/4	3/4"	GMGK075TERN	Call
1"	5 1/8	4 3/4	1"	GMGK100TERN	Call
1 1/2"	5 1/8	4 3/4	1 1/2"	GMGK150TERN	Call
2"	5 1/8	4 1/4	2"	GMGK200TERN	Call
2 1/2"	5 1/8	4 1/4	2 1/2"	GMGK250TERN	Call
3"	5 1/8	4 1/4	3"	GMGK300TERN	Call
4"	5 1/8	3 7/8	4"	GMGK400TERN	Call
5"	5 1/8	3 7/8	5"	GMGK500TERN	Call
6"	5 1/8	3 7/8	6"	GMGK600TERN	Call

► Glass to Metal Flanged Adapters

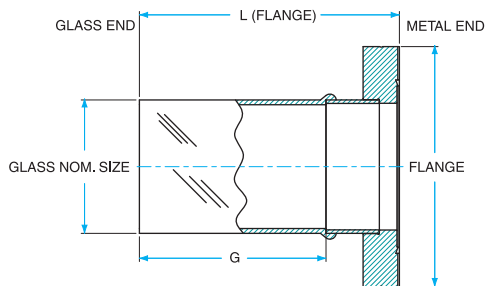
■ Stainless Steel to 7740 Pyrex® CF Adapters

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Flange O.D.	Glass Nom. Size	Dimensions (in.)		Part No.	Price
		L	G		
1 1/3"	1/8"	4 7/8	3	GMPS012F1	Call
1 1/3"	3/16"	4 7/8	3	GMPS018F1	Call
1 1/3"	1/4"	4 7/8	3	GMPS025F1	Call
1 1/3"	5/16"	4 7/8	3	GMPS031F1	Call
1 1/3"	3/8"	4 7/8	3	GMPS037F1	Call
1 1/3"	1/2"	4 7/8	3	GMPS050F1	Call
1 1/3"	5/8"	4 7/8	3	GMPS062F1	Call
1 1/3"	3/4"	4 7/8	3	GMPS075F1	Call
2 3/4"	3/4"	4 7/8	3	GMPS075F3	Call
2 3/4"	7/8"	4 7/8	3	GMPS087F3	Call
2 1/8"	1"	4 7/8	3	GMPS100F2	Call
2 3/4"	1"	4 7/8	3	GMPS100F3	Call
2 3/4"	1 1/8"	4 7/8	3	GMPS112F3	Call
2 3/4"	1 1/4"	4 7/8	3	GMPS125F3	Call
2 3/4"	1 3/8"	4 7/8	3	GMPS137F3	Call
2 3/4"	1 1/2"	4 7/8	3	GMPS150F3	Call
3 3/8"	1 1/2"	4 7/8	3	GMPS150F4	Call
3 3/8"	1 5/8"	4 7/8	3	GMPS162F4	Call
3 3/8"	1 3/4"	4 7/8	3	GMPS175F4	Call
3 3/8"	2"	5 3/8	3	GMPS200F4	Call
4 1/2"	2"	5 3/8	3	GMPS200F5	Call
4 1/2"	2 1/4"	5 3/8	3	GMPS225F5	Call
4 1/2"	2 1/2"	5 3/8	3	GMPS250F5	Call
4 5/8"	2 3/4"	5 3/8	3	GMPS275F6	Call
4 3/8"	3"	6 3/8	4	GMPS300F6	Call
6"	3"	6 3/8	4	GMPS300F7	Call
6"	3 1/4"	6 3/8	4	GMPS325F7	Call
6"	3 1/2"	6 3/8	4	GMPS350F7	Call
6"	3 3/4"	6 3/8	4	GMPS375F7	Call
6"	4"	6 3/8	4	GMPS400F7	Call
6 3/4"	5"	8 3/8	6	GMPS500F8	Call
8"	6"	8 3/8	6	GMPS600F9	Call

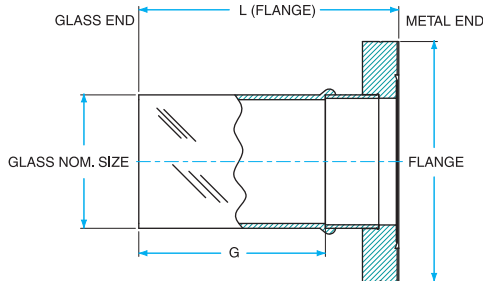
■ Stainless Steel to Pyrex KF (QF) Adapters



Flange	Glass Nom. Size	Dimensions (in.)		Part No.	Price
		L	G		
KF16	1/4"	4 7/8	3	GMPS025Q2	Call
KF16	5/16"	4 7/8	3	GMPS031Q2	Call
KF16	1/2"	4 7/8	3	GMPS050Q2	Call
KF16	3/4"	4 7/8	3	GMPS075Q2	Call
KF25	1"	4 7/8	3	GMPS100Q3	Call
KF40	1 1/2"	4 7/8	3	GMPS150Q4	Call
KF50	2"	5 3/8	3	GMPS200Q5	Call
ISO63-K	2 1/4"	5 3/8	3	GMPS225Q6	Call
ISO100-K	4"	6 3/8	4	GMPS400Q8	Call
ISO160-K	5"	8 3/8	6	GMPS500Q9	Call
ISO200-K	5"	8 3/8	6	GMPS500QA	Call
ISO160-K	6"	8 3/8	6	GMPS600Q9	Call
ISO200-K	6"	8 3/8	6	GMPS600QA	Call

➤ Glass to Metal Flanged Adapters

■ Stainless Steel to Quartz CF Adapters

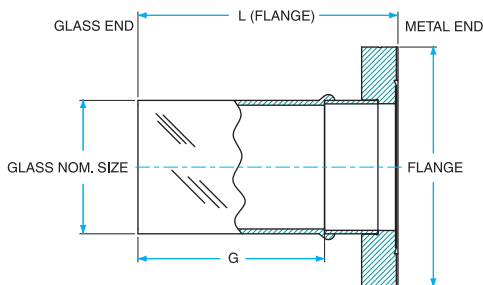


Flange O.D.	Glass Nom. Size	Dimensions (in.)		Part No.	Price
		L	G		
1 1/3"	1/8"	5 3/8	3 1/2	GMQS012F1	Call
1 1/3"	3/16"	5 3/8	3 1/2	GMQS018F1	Call
1 1/3"	1/4"	5 3/8	3 1/2	GMQS025F1	Call
1 1/3"	5/16"	5 3/8	3 1/2	GMQS031F1	Call
1 1/3"	3/8"	5 3/8	3 3/4	GMQS037F1	Call
1 1/3"	1/2"	5 3/8	3 3/4	GMQS050F1	Call
1 1/3"	5/8"	6	4 1/8	GMQS062F1	Call
1 1/3"	3/4"	6 1/8	4 1/4	GMQS075F1	Call
2 3/4"	7/8"	6 3/8	4 1/2	GMQS087F3	Call
2 3/4"	1"	6 1/2	4 3/8	GMQS100F3	Call
2 3/4"	1 1/8"	6 1/2	4 3/8	GMQS112F3	Call
2 3/4"	1 1/4"	6 3/4	4 3/8	GMQS125F3	Call
2 3/4"	1 3/8"	6 3/4	4 3/8	GMQS137F3	Call
2 3/4"	1 1/2"	6 7/8	5	GMQS150F3	Call
3 3/8"	1 1/2"	6 7/8	5	GMQS150F4	Call
3 3/8"	1 5/8"	6 7/8	5	GMQS162F4	Call
2 3/4"	1 3/4"	7 3/8	5 1/2	GMQS175F3	Call
3 3/8"	1 3/4"	7 3/8	5 1/2	GMQS175F4	Call
3 3/8"	2"	8 1/8	5 1/4	GMQS200F4	Call
4 1/2"	2"	8 1/8	5 3/4	GMQS200F5	Call
4 1/2"	2 1/4"	8 1/8	5 3/4	GMQS225F5	Call
4 1/2"	2 1/2"	8 3/8	6	GMQS250F5	Call
4 5/8"	2 1/2"	8 3/8	6	GMQS250F6	Call
4 5/8"	3"	8 5/8	6 1/4	GMQS300F6	Call
6"	3"	8 5/8	6 1/4	GMQS300F7	Call

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Flanges, Fittings, & Components

■ Stainless Steel to Quartz KF (QF) Adapters

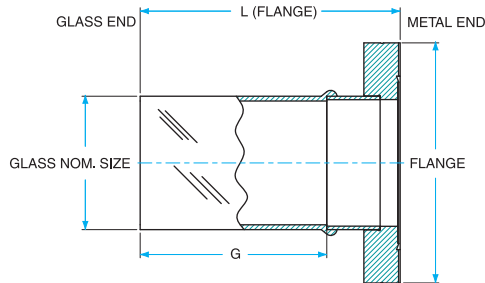


Flange	Glass Nom.	Dimensions (in.)		Part No.	Price
		L	G		
KF16	1/2"	5 3/8	3 3/4	GMQS050Q2	Call
KF16	5/8"	6	4 1/8	GMQS062Q2	Call
KF16	3/4"	6 1/8	4 1/4	GMQS075Q2	Call
KF25	7/8"	6 3/8	4 1/2	GMQS087Q3	Call
KF25	1"	6 1/2	4 3/8	GMQS100Q3	Call
KF40	1 1/2"	6 7/8	5	GMQS150Q4	Call
ISO63-K	2 1/2"	8 1/8	5 3/4	GMQS250Q6	Call

► Glass to Metal Flanged Adapters

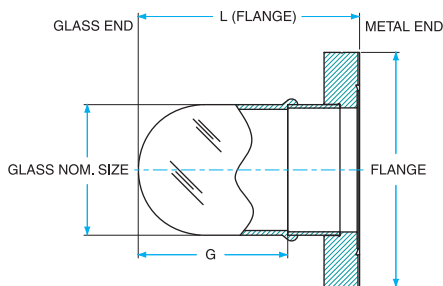
■ Kovar® to 7740 Pyrex® CF Adapters

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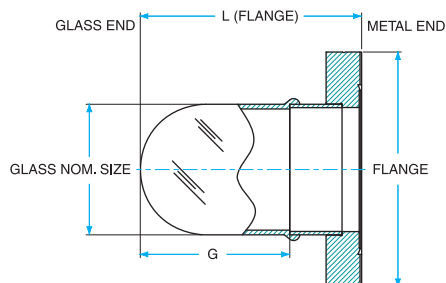
Flange O.D.	Glass Nom. Size	Dimensions (in.)		Part No.	Price
		L	G		
1 1/3"	1/4"	5 3/8	4 1/8	GMPK025F1	Call
1 1/3"	3/8"	5 3/8	4 1/8	GMPK037F1	Call
1 1/3"	1/2"	5 3/8	4 1/8	GMPK050F1	Call
1 1/3"	5/8"	5 3/8	4 1/8	GMPK062F1	Call
1 1/3"	3/4"	5 3/8	4 1/8	GMPK075F1	Call
2 3/4"	1"	5 3/8	4 1/8	GMPK100F3	Call
2 3/4"	1 1/8"	5 3/8	4 1/8	GMPK112F3	Call
2 3/4"	1 1/4"	5 3/8	4 1/8	GMPK125F3	Call
2 3/4"	1 3/8"	5 3/8	4 1/8	GMPK137F3	Call
4 1/2"	2 1/4"	5 3/8	4 1/8	GMPK225F5	Call
4 1/2"	2 1/2"	7 1/2	5 3/4	GMPK250F5	Call

■ Stainless Steel to Pyrex Dome CF Adapters



Flange O.D.	Glass Nom. Size	Dimensions (in.)		Part No.	Price
		L	G		
1 1/3"	1/2"	6 5/8	4 3/4	GMPS050F1RN	Call
1 1/3"	3/4"	6 5/8	4 3/4	GMPS075F1RN	Call
2 3/4"	1"	6 5/8	4 3/4	GMPS100F3RN	Call
2 3/4"	1 1/2"	6 5/8	4 3/4	GMPS150F3RN	Call
3 3/8"	1 1/2"	6 5/8	4 3/4	GMPS150F4RN	Call
3 3/8"	2"	6 5/8	4 1/4	GMPS200F4RN	Call
4 1/2"	2"	6 5/8	4 1/4	GMPS200F5RN	Call
4 1/2"	2 1/2"	6 5/8	4 1/4	GMPS250F5RN	Call
4 5/8"	3"	6 5/8	4 1/4	GMPS300F6RN	Call
6"	3"	6 5/8	4 1/4	GMPS300F7RN	Call
6"	4"	6 5/8	4 1/4	GMPS400F7RN	Call

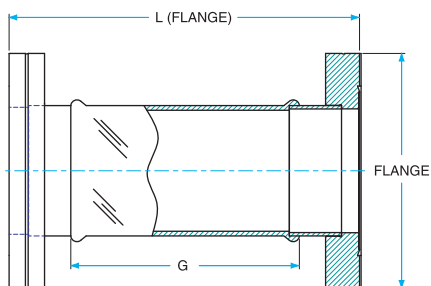
■ Stainless Steel to Quartz Dome CF Adapters



Flange O.D.	Glass Nom. Size	Dimensions (in.)		Part No.	Price
		L	G		
1 1/3"	1/2"	6 5/8	4 3/4	GMQS050F1RN	Call
1 1/3"	3/4"	7 3/8	5 1/2	GMQS075F1RN	Call
2 3/4"	1"	7 1/2	5 5/8	GMQS100F3RN	Call
2 3/4"	1 1/2"	7 7/8	6	GMQS150F3RN	Call
3 3/8"	1 1/2"	7 7/8	6	GMQS150F4RN	Call
3 3/8"	2"	8 5/8	6 1/4	GMQS200F4RN	Call
4 1/2"	2"	8 5/8	6 1/4	GMQS200F5RN	Call

➤ Glass to Metal Flanged Adapters

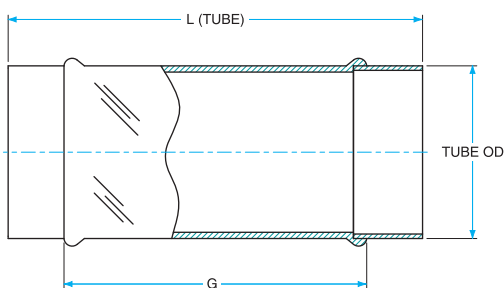
■ Stainless/Pyrex®/Stainless Double Tube CF Adapters



NOTE: In addition to the seals listed, we offer nonstandard sizes, larger sizes, and custom seals upon request. Please call for details.

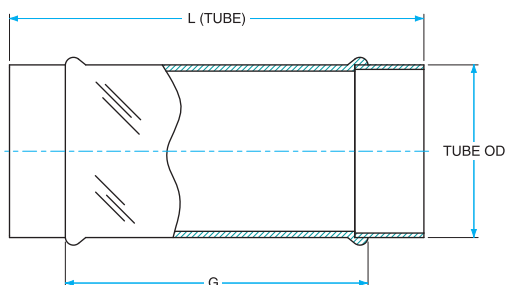
Flange O.D.	Glass Nom. Size	Dimensions (in.)		Part No.	Price
		L	G		
1 1/3"	1/2"	4 3/8	1	GMPS050F1DE	Call
1 1/3"	3/4"	4 3/8	1	GMPS075F1DE	Call
2 3/4"	1"	4 3/8	1	GMPS100F3DE	Call
2 1/4"	1 1/2"	4 3/8	1	GMPS150F3DE	Call
3 3/8"	1 1/2"	4 3/8	1	GMPS150F4DE	Call
3 3/8"	2"	5 1/8	1	GMPS200F4DE	Call
4 1/2"	2"	5 1/8	1	GMPS200F5DE	Call
4 1/2"	2 1/2"	5 1/8	1	GMPS250F5DE	Call
4 5/8"	3"	5 1/8	1	GMPS300F6DE	Call
6"	4"	5 1/8	1	GMPS400F7DE	Call

■ Kovar®/7052 Glass/Kovar Double Tube Adapters



Tube O.D.	Glass Nom. Size	Dimensions (in.)		Part No.	Price
		L	G		
1/2"	1/2"	2 7/8	1	GMGK050TEDE	Call
3/4"	3/4"	2 7/8	1	GMGK075TEDE	Call
1"	1"	2 7/8	1	GMGK100TEDE	Call
1 1/2"	1 1/2"	2 7/8	1	GMGK150TEDE	Call
2"	2"	3 3/8	1	GMGK200TEDE	Call
2 1/2"	2 1/2"	4 3/8	1 3/4	GMGK250TEDE	Call
3"	3"	4 3/8	2	GMGK300TEDE	Call
4"	4"	4 3/8	1	GMGK400TEDE	Call
5"	5"	4 3/8	1	GMGK500TEDE	Call
6"	6"	4 3/8	1	GMGK600TEDE	Call

■ Stainless/Pyrex/Stainless Double Tube Adapters



Tube O.D.	Dimensions (in.)		Part No.	Price
	L	G		
1/2"	4 1/4	1	GMPS050TEDE	Call
3/4"	4 1/4	1	GMPS075TEDE	Call
1"	4 1/4	1	GMPS100TEDE	Call
1 1/2"	4 1/4	1	GMPS150TEDE	Call
2"	5	1	GMPS200TEDE	Call
2 1/2"	5	1	GMPS250TEDE	Call
3"	5	1	GMPS300TEDE	Call
4"	5	1	GMPS400TEDE	Call

Quick Connect Couplings

1 Flanges, Fittings, & Components



Quick Couplings

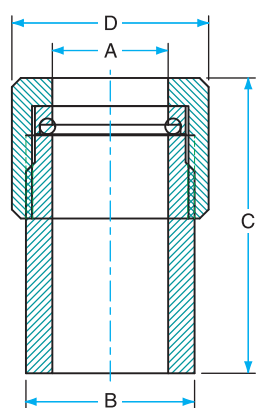
Seal common-size tubing to vacuum manifolds or chambers.

- No tools required for inserting/removing tubes
- Ideal for frequently changed components or for sealing a glass tube to a metal vacuum chamber, as in glass ion gauges

More about couplings:

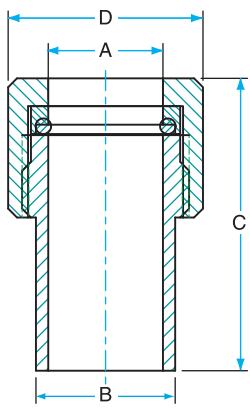
- Sized by the O.D. of the tube they seal
- Available in brass, 304 stainless steel body with 303 stainless steel nut, or stainless steel body with brass knurled nut and brass retaining ring
- Available in "thin wall" and "thick wall" styles
- Always use thread lubricant on stainless steel threads

NOTE: We do not recommend soft soldering for anything but a temporary joint in a rough vacuum environment.



Thick Wall Couplings

Thick Wall Brass, Stainless Steel and Combination Couplings											
Tube O.D.	O-Ring	Dimensions (in.)				Brass		Stainless Steel		Combination	
		A	B	C	D	Part No.	Price	Part No.	Price	Part No.	Price
1/4	O-V010	0.265	0.500	1.313	0.625	B-025-K	Call	S-025-K	Call	SB-025-K	Call
5/16	O-V011	0.328	0.500	1.313	0.875	B-031-K	Call	S-031-K	Call	SB-031-K	Call
3/8	O-V012	0.390	0.625	1.313	0.875	B-037-K	Call	S-037-K	Call	SB-037-K	Call
1/2	O-V014	0.515	0.750	1.313	0.875	B-050-K	Call	S-050-K	Call	SB-050-K	Call
5/8	O-V114	0.640	0.875	1.500	1.188	B-062-K	Call	S-062-K	Call	SB-062-K	Call
3/4	O-V116	0.765	1.125	1.625	1.375	B-075-K	Call	S-075-K	Call	SB-075-K	Call
7/8	O-V118	0.890	1.250	1.625	1.375	B-087-K	Call	S-087-K	Call	SB-087-K	Call
1	O-V120	1.015	1.375	1.875	1.625	B-100-K	Call	S-100-K	Call	SB-100-K	Call
1 1/8	O-V216	1.140	1.500	1.875	1.875	B-112-K	Call	S-112-K	Call	SB-112-K	Call
1 1/4	O-V218	1.265	2.000	2.000	1.875	B-125-K	Call	S-125-K	Call	SB-125-K	Call
1 3/8	O-V220	1.390	2.125	2.125	2.000	B-137-K	Call	S-137-K	Call	SB-137-K	Call
1 1/2	O-V222	1.515	2.125	2.250	2.250	B-150-K	Call	S-150-K	Call	SB-150-K	Call
1 5/8	O-V223	1.640	2.125	2.250	2.375	B-162-K	Call	S-162-K	Call	SB-162-K	Call
2	O-V226	2.015	2.125	2.250	2.750	B-200-K	Call	S-200-K	Call	SB-200-K	Call



Thin Wall Couplings

Thin Wall Brass, Stainless Steel and Combination Couplings											
Tube O.D.	O-Ring	Dimensions (in.)				Brass		Stainless Steel		Combination	
		A	B	C	D	Part No.	Price	Part No.	Price	Part No.	Price
1/16	O-V003	0.072	0.375	1.313	0.500	B-006-KM	Call	S-006-KM	Call	SB-006-KM	Call
1/8	O-V006	0.136	0.375	1.313	0.500	B-012-KM	Call	S-012-KM	Call	SB-012-KM	Call
3/16	O-V008	0.199	0.375	1.313	0.625	B-018-KM	Call	S-018-KM	Call	SB-018-KM	Call
1/4	O-V010	0.265	0.375	1.313	0.625	B-025-KM	Call	S-025-KM	Call	SB-025-KM	Call
3/8	O-V012	0.390	0.500	1.313	0.875	B-037-KM	Call	S-037-KM	Call	SB-037-KM	Call
1/2	O-V014	0.515	0.625	1.375	0.875	B-050-KM	Call	S-050-KM	Call	SB-050-KM	Call
5/8	O-V114	0.640	0.750	1.500	1.188	B-062-KM	Call	S-062-KM	Call	SB-062-KM	Call
3/4	O-V116	0.765	0.875	1.625	1.375	B-075-KM	Call	S-075-KM	Call	SB-075-KM	Call
7/8	O-V118	0.890	1.000	1.313	1.375	B-087-KM	Call	S-087-KM	Call	SB-087-KM	Call
1	O-V120	1.015	1.125	1.875	1.625	B-100-KM	Call	S-100-KM	Call	SB-100-KM	Call
1 1/8	O-V216	1.140	1.250	1.875	1.625	B-112-KM	Call	S-112-KM	Call	SB-112-KM	Call
1 1/4	O-V218	1.265	1.500	2.000	1.875	B-125-KM	Call	S-125-KM	Call	SB-125-KM	Call
1 3/8	O-V220	1.390	1.625	2.125	2.000	B-137-KM	Call	S-137-KM	Call	SB-137-KM	Call
1 1/2	O-V222	1.515	1.750	2.250	2.250	B-150-KM	Call	S-150-KM	Call	SB-150-KM	Call
1 5/8	O-V223	1.640	1.875	2.250	2.375	B-162-KM	Call	S-162-KM	Call	SB-162-KM	Call
2	O-V226	2.015	2.250	2.250	2.750	B-200-KM	Call	S-200-KM	Call	SB-200-KM	Call



► Baseplate Couplings

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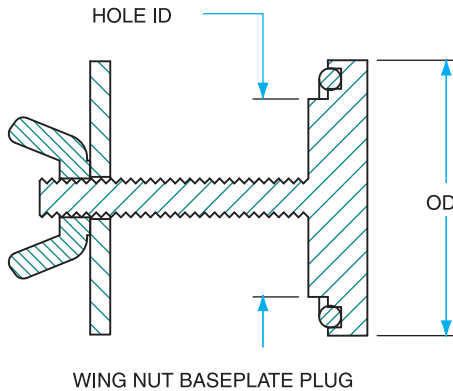
Flanges, Fittings, & Components

■ Baseplate Plugs

“Blank off” a standard-size hole or feedthrough port in a chamber wall.

How it's used:

Feedthrough ports have a smooth, finished area on the inner, vacuum surface. The plug's o-ring sits on the finished area, with the wing nut on the atmosphere side.



Hole I.D.	Plug O.D.	Part No.	Price
0.75"	1.5"	FBH-075B	Call
0.75"	1.5"	FBH-075S	Call
1"	1.5"	FBH-100AL	Call
1"	1.5"	FBH-100B	Call
1"	1.5"	FBH-100S	Call
1.25"	1.75"	FBH-125B	Call
1.25"	1.75"	FBH-125S	Call
1.5"	2"	FBH-150B	Call
1.5"	2"	FBH-150S	Call
1.75"	2.25"	FBH-175B	Call
1.75"	2.25"	FBH-175S	Call

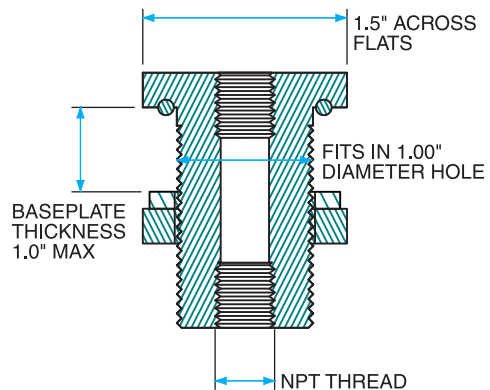
NOTE: We supply feedthrough plugs complete with o-rings.

NOTE: The final letters in the part numbers indicate the material of the plug or coupling. B=brass, S and SS=stainless steel.

■ Baseplate/NPT Couplings

Feedthrough couplings suit vacuum walls thicker than 1/4" and thinner than 1 1/4".

- Connect a tube to a chamber at a standard 1" diameter feedthrough port
- Mounts in the feedthrough port with the o-ring on the inside of the chamber
- Tube connects into the coupling with either a compression o-ring or a female NPT thread fitting

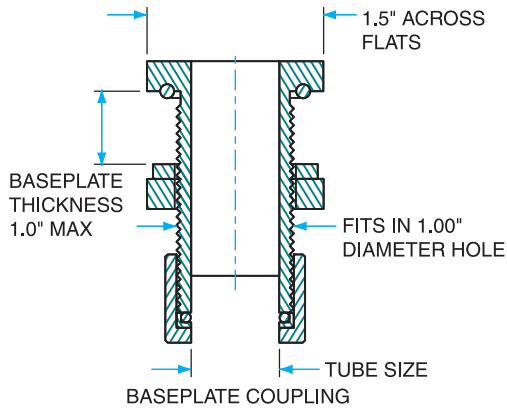


NOTE: The final letters in the part numbers indicate the material of the plug or coupling. B=brass, S and SS=stainless steel.

NPT	Part No.	Price
0.125"	FCH-1/8NPTB	Call
0.125"	FCH-1/8NPTSS	Call

► Baseplate Couplings

1
Flanges, Fittings, & Components



■ Feedthrough Baseplate Coupling Connectors

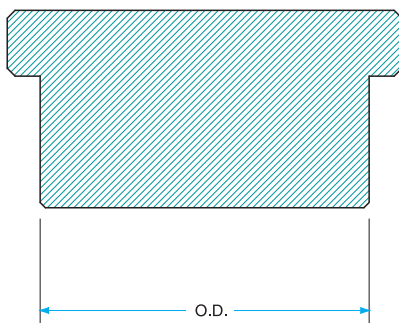
Feedthrough couplings suit vacuum walls thicker than 1/4" and thinner than 1 1/4".

- Connect a tube to a chamber at a standard 1" diameter baseplate port
- Mounts in the baseplate port with the o-ring on the inside of the chamber
- Tube connects into the coupling with a compression o-ring or a female NPT thread fitting
- We recommend high quality thread lubricant on all stainless steel threads

Aluminum Couplings		
Tube O.D.	Part No.	Price
1/8"	FCH-012	Call
1/4"	FCH-025	Call
3/8"	FCH-037	Call
1/2"	FCH-050	Call
5/8"	FCH-062	Call
3/4"	FCH-075	Call
1"	FCH-100	Call
Stainless Steel Couplings		
Tube O.D.	Part No.	Price
1/8"	FCH-012S	Call
1/4"	FCH-025S	Call
3/8"	FCH-037S	Call
1/2"	FCH-050S	Call
5/8"	FCH-062S	Call
3/4"	FCH-075S	Call
1"	FCH-100S	Call

* Although coupling accepts 1" O.D. tube, the through-hole measures 3/4" only.

■ Feedthrough Baseplate Coupling Plugs



NOTE: We supply feedthrough plugs complete with o-rings.

Brass Plugs		
O.D.	Part No.	Price
1/16"	B-006-P	Call
1/8"	B-012-P	Call
3/16"	B-018-P	Call
1/4"	B-025-P	Call
5/16"	B-031-P	Call
3/8"	B-037-P	Call
1/2"	B-050-P	Call
5/8"	B-062-P	Call
3/4"	B-075-P	Call
7/8"	B-087-P	Call
1"	B-100-P	Call
1 1/8"	B-112-P	Call
1 1/4"	B-125-P	Call
1 3/8"	B-137-P	Call
1 1/2"	B-150-P	Call
1 5/8"	B-162-P	Call
2"	B-200-P	Call
Stainless Steel Plugs		
O.D.	Part No.	Price
1/16"	S-006-P	Call
1/8"	S-012-P	Call
3/16"	S-018-P	Call
1/4"	S-025-P	Call
5/16"	S-031-P	Call
3/8"	S-037-P	Call
1/2"	S-050-P	Call
5/8"	S-062-P	Call
3/4"	S-075-P	Call
7/8"	S-087-P	Call
1"	S-100-P	Call
1 1/8"	S-112-P	Call
1 1/4"	S-125-P	Call
1 3/8"	S-137-P	Call
1 1/2"	S-150-P	Call
1 5/8"	S-162-P	Call
2"	S-200-P	Call

► **Bellows**

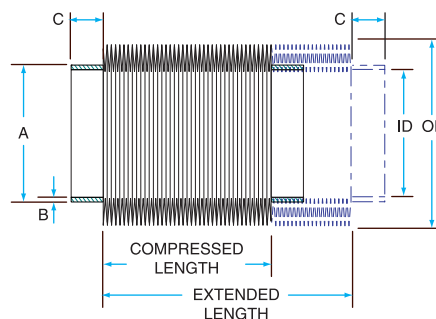
■ **Flex Metal Bellows—Edge Welded with Tube Ends**

- Made from type 347 stainless steel welded to type 304 stainless steel end tubes
- Very flexible
- Spring back to natural length (typically midway between their extended and compressed lengths) when not under vacuum



NOTE: The compressed and extended lengths given in the table are for the bellows only. To calculate total overall length, add the dimensions of the terminations. The bellows' stroke can be calculated by subtracting the compressed length from the extended length. The free or relaxed length is approximately equal to the stroke.

NOTE: We can supply other terminations such as ConFlat-compatible, KF (QF or NW), or ISO vacuum flanges. The lengths listed are for one segment; longer or shorter bellows are available on request. Other sizes up to 9 1/2" O.D. and 8 1/2" I.D. are also available.



O.D.	I.D.	Extended Length	Compressed Length	Dimensions (in.)			Weight (lbs.)	Part No.	Price
				A	B	C			
0.375"	0.125"	0.21"	0.06"	0.25	0.035	0.3	1/4	MEW0370121E	Call
0.396"	0.2"	0.21"	0.08"	0.25	0.035	0.3	1/4	MEW0400201E	Call
0.638"	0.338"	0.32"	0.08"	0.437	0.035	0.407	1/4	MEW0650341E	Call
0.75"	0.25"	0.53"	0.16"	0.5	0.035	0.43	1/4	MEW0750251E	Call
0.835"	0.515"	0.34"	0.08"	0.562	0.035	0.43	1/4	MEW0840521E	Call
1.03"	0.55"	0.5"	0.16"	0.687	0.035	0.43	1/4	MEW1030551E	Call
1.125"	0.5"	0.79"	0.19"	0.75	0.035	0.375	1/4	MEW1120501E	Call
1.25"	0.75"	0.53"	0.16"	0.875	0.035	0.43	1/4	MEW1250751E	Call
1.355"	0.54"	1.2"	0.22"	0.937	0.035	0.43	1/4	MEW1360541E	Call
1.375"	0.83"	0.69"	0.19"	1	0.035	0.43	1/4	MEW1380831E	Call
1.5"	0.96"	0.57"	0.12"	1.125	0.035	0.43	1/4	MEW1500961E	Call
1.625"	0.75"	0.92"	0.2"	1	0.035	0.435	1/4	MEW1620751E	Call
1.89"	1.39"	0.74"	0.17"	1.5	0.035	0.435	1/4	MEW1891391E	Call
2"	1.25"	0.79"	0.2"	1.25	0.035	0.435	1/2	MEW2001251E	Call
2.2"	1.04"	1.22"	0.2"	1.5	0.035	0.435	1/2	MEW2201041E	Call
2.25"	1.5"	0.79"	0.16"	1.5	0.035	0.435	1/2	MEW2251501E	Call
2.49"	1.53"	1.01"	0.2"	1.625	0.035	0.435	1/2	MEW2491531E	Call
2.5"	1.75"	0.79"	0.2"	1.875	0.035	0.435	1/2	MEW2501751E	Call
2.625"	1.25"	1.44"	0.24"	1.875	0.035	0.435	1/2	MEW2621251E	Call
2.75"	1.75"	1.05"	0.2"	1.875	0.035	0.435	1/2	MEW2751751E	Call
3"	2"	1.05"	0.2"	2.125	0.065	0.59	3/4	MEW3002001E	Call
3.25"	2.25"	1.05"	0.24"	2.25	0.065	0.59	3/4	MEW3252251E	Call
3.5"	2"	1.58"	0.24"	2.375	0.065	0.59	3/4	MEW3502001E	Call
3.5"	2.5"	1.05"	0.16"	2.625	0.065	0.59	3/4	MEW3502501E	Call
3.86"	3.26"	0.76"	0.19"	3.25	0.065	0.59	3/4	MEW3863261E	Call
3.99"	2.69"	1.37"	0.24"	2.75	0.065	0.59	3/4	MEW3992691E	Call
4.25"	3.2"	1.1"	0.28"	3.75	0.065	0.59	1	MEW4253201E	Call
4.35"	3.64"	0.75"	0.16"	3.75	0.065	0.59	1	MEW4353641E	Call
4.75"	3.75"	1.05"	0.2"	4	0.065	0.59	1	MEW4753751E	Call
4.97"	4"	1.12"	0.22"	4.25	0.065	0.59	1	MEW4974001E	Call

► Bellows



■ Flex Metal Bellows—Edge Welded with CF Flanges

- Very flexible
- Spring back to natural length (typically midway between their extended and compressed lengths) when not under vacuum

NOTE: The compressed and extended lengths given in the table apply to the whole assembly. The bellows' stroke can be calculated by subtracting the compressed length from the extended length. The free or relaxed length approximately equals the stroke. Additional segments can be custom ordered to facilitate more stroke.

NOTE: These hoses and bellows terminate in 304L stainless steel CF (ConFla® compatible) flanges (one fixed, one rotatable). We can supply other terminations, such as tube ends, and KF or ISO vacuum flanges. The lengths listed are for one segment; we offer longer or shorter bellows on request. The last numeral in the part number refers to the flange style bellows as shown in Figures 1, 2, & 3.

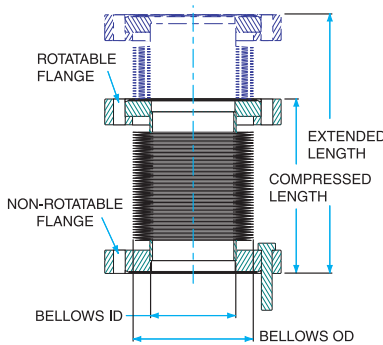


Figure 1

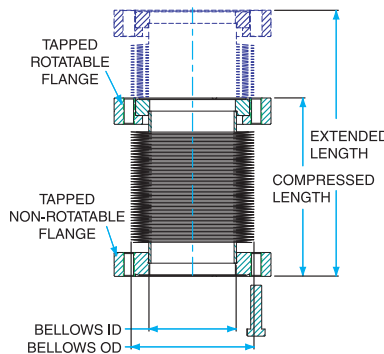


Figure 2

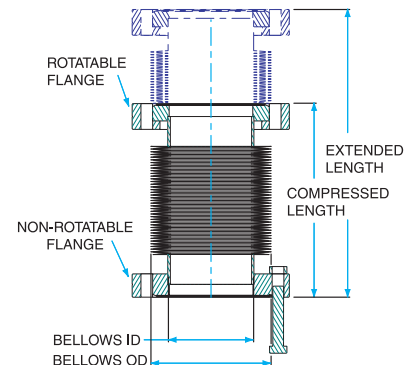


Figure 3

Figure	Flange O.D.	Bellows O.D.	Bellows I.D.	Overall Dimensions		Part No.	Price
				Extended	Compressed		
1	1 1/8"	0.75"	0.25"	1.37"	1"	MEW0750251C1	Call
2	1 1/8"	1.03"	0.55"	1.34"	1"	MEW1030551C2	Call
3	1 1/8"	1.03"	0.55"	1.84"	1.5"	MEW1030551C3	Call
1	2 3/4"	1.5"	0.96"	1.85"	1.4"	MEW1500961C1	Call
2	2 3/4"	1.89"	1.39"	2.02"	1.45"	MEW1891391C2	Call
3	2 3/4"	1.89"	1.39"	2.62"	2.05"	MEW1891391C3	Call
2	2 3/4"	2.25"	1.5"	2.07"	1.44"	MEW2251501C2	Call
3	2 3/4"	2.25"	1.5"	2.67"	2.04"	MEW2251501C3	Call
1	3 3/8"	2"	1.25"	2.43"	1.84"	MEW2001251C1	Call
2	3 3/8"	3"	2"	2.75"	1.9"	MEW3002001C2	Call
3	3 3/8"	3"	2"	3.35"	2.5"	MEW3002001C3	Call
1	4 1/2"	2.75"	1.75"	2.89"	2.04"	MEW2751751C1	Call
2	4 1/2"	3.5"	2.5"	2.89"	2"	MEW3502501C2	Call
3	4 1/2"	3.5"	2.5"	3.49"	2.6"	MEW3502501C3	Call
3	6"	4.97"	4"	3.94"	3.04"	MEW4974001C3	Call
3	8"	7.5"	6"	4.6"	3.26"	MEW7506001C3	Call
3	10"	9.5"	8.5"	4.13"	3.32"	MEW9508501C3	Call

► **Hydraulically Formed Bellows**

■ **Standard Thick Wall Tube Ends**

MH-Series Bellows:

- Fabricated from thin 300 Series stainless steel
- Withstand many flexing cycles

Unbraided Hoses:

- Extend up to 15% beyond their live length and compress up to 20%

Braided Hoses:

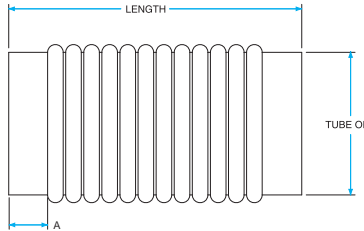
- Braided sheath helps protect convoluted hose from damage

Short Hoses:

- Often used to correct minor component misalignments

Longer Hoses:

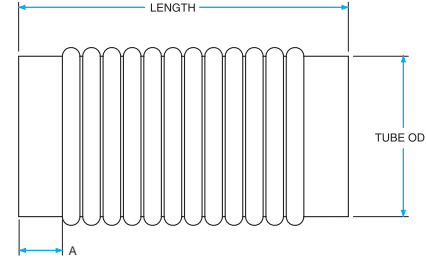
- Work as roughing lines



Standard Wall Thickness											
Tube O.D.	A	Length	Standard Wall	Part No.	Price	Tube O.D.	A	Length	Standard Wall	Part No.	Price
1/4"	1/2"	3"	0.008"	MH-TE-X03	Call	3/4"	1/2"	36"	0.008"	MH-TE-A36	Call
1/4"	1/2"	6"	0.008"	MH-TE-X06	Call	3/4"	1/2"	40"	0.008"	MH-TE-A40	Call
1/4"	1/2"	10"	0.008"	MH-TE-X10	Call	3/4"	1/2"	48"	0.008"	MH-TE-A48	Call
1/4"	1/2"	12"	0.008"	MH-TE-X12	Call	1"	1/2"	3"	0.008"	MH-TE-B03	Call
1/4"	1/2"	18"	0.008"	MH-TE-X18	Call	1"	1/2"	6"	0.008"	MH-TE-B06	Call
1/4"	1/2"	20"	0.008"	MH-TE-X20	Call	1"	1/2"	10"	0.008"	MH-TE-B10	Call
1/4"	1/2"	24"	0.008"	MH-TE-X24	Call	1"	1/2"	12"	0.008"	MH-TE-B12	Call
1/4"	1/2"	30"	0.008"	MH-TE-X30	Call	1"	1/2"	18"	0.008"	MH-TE-B18	Call
1/4"	1/2"	36"	0.008"	MH-TE-X36	Call	1"	1/2"	20"	0.008"	MH-TE-B20	Call
1/4"	1/2"	40"	0.008"	MH-TE-X40	Call	1"	1/2"	24"	0.008"	MH-TE-B24	Call
1/4"	1/2"	48"	0.008"	MH-TE-X48	Call	1"	1/2"	30"	0.008"	MH-TE-B30	Call
3/8"	1/2"	3"	0.008"	MH-TE-Y03	Call	1"	1/2"	36"	0.008"	MH-TE-B36	Call
3/8"	1/2"	6"	0.008"	MH-TE-Y06	Call	1"	1/2"	40"	0.008"	MH-TE-B40	Call
3/8"	1/2"	10"	0.008"	MH-TE-Y10	Call	1"	1/2"	48"	0.008"	MH-TE-B48	Call
3/8"	1/2"	12"	0.008"	MH-TE-Y12	Call	1 1/2"	1/2"	3"	0.01"	MH-TE-C03	Call
3/8"	1/2"	18"	0.008"	MH-TE-Y18	Call	1 1/2"	1/2"	6"	0.01"	MH-TE-C06	Call
3/8"	1/2"	20"	0.008"	MH-TE-Y20	Call	1 1/2"	1/2"	10"	0.01"	MH-TE-C10	Call
3/8"	1/2"	24"	0.008"	MH-TE-Y24	Call	1 1/2"	1/2"	12"	0.01"	MH-TE-C12	Call
3/8"	1/2"	30"	0.008"	MH-TE-Y30	Call	1 1/2"	1/2"	18"	0.01"	MH-TE-C18	Call
3/8"	1/2"	36"	0.008"	MH-TE-Y36	Call	1 1/2"	1/2"	20"	0.01"	MH-TE-C20	Call
3/8"	1/2"	40"	0.008"	MH-TE-Y40	Call	1 1/2"	1/2"	24"	0.01"	MH-TE-C24	Call
3/8"	1/2"	48"	0.008"	MH-TE-Y48	Call	1 1/2"	1/2"	30"	0.01"	MH-TE-C30	Call
1/2"	1/2"	3"	0.008"	MH-TE-Z03	Call	1 1/2"	1/2"	36"	0.01"	MH-TE-C36	Call
1/2"	1/2"	6"	0.008"	MH-TE-Z06	Call	1 1/2"	1/2"	40"	0.01"	MH-TE-C40	Call
1/2"	1/2"	10"	0.008"	MH-TE-Z10	Call	1 1/2"	1/2"	48"	0.01"	MH-TE-C48	Call
1/2"	1/2"	12"	0.008"	MH-TE-Z12	Call	2"	1/2"	4"	0.012"	MH-TE-D04	Call
1/2"	1/2"	18"	0.008"	MH-TE-Z18	Call	2"	1/2"	6"	0.012"	MH-TE-D06	Call
1/2"	1/2"	20"	0.008"	MH-TE-Z20	Call	2"	1/2"	10"	0.012"	MH-TE-D10	Call
1/2"	1/2"	24"	0.008"	MH-TE-Z24	Call	2"	1/2"	12"	0.012"	MH-TE-D12	Call
1/2"	1/2"	30"	0.008"	MH-TE-Z30	Call	2"	1/2"	18"	0.012"	MH-TE-D18	Call
1/2"	1/2"	36"	0.008"	MH-TE-Z36	Call	2"	1/2"	20"	0.012"	MH-TE-D20	Call
1/2"	1/2"	40"	0.008"	MH-TE-Z40	Call	2"	1/2"	24"	0.012"	MH-TE-D24	Call
1/2"	1/2"	48"	0.008"	MH-TE-Z48	Call	2"	1/2"	30"	0.012"	MH-TE-D30	Call
3/4"	1/2"	3"	0.008"	MH-TE-A03	Call	2"	1/2"	36"	0.012"	MH-TE-D36	Call
3/4"	1/2"	6"	0.008"	MH-TE-A06	Call	2"	1/2"	40"	0.012"	MH-TE-D40	Call
3/4"	1/2"	10"	0.008"	MH-TE-A10	Call	2"	3/4"	48"	0.012"	MH-TE-D48	Call
3/4"	1/2"	12"	0.008"	MH-TE-A12	Call	2 1/2"	3/4"	6"	0.012"	MH-TE-E06	Call
3/4"	1/2"	18"	0.008"	MH-TE-A18	Call	3"	3/4"	6"	0.014"	MH-TE-F06	Call
3/4"	1/2"	20"	0.008"	MH-TE-A20	Call	4"	3/4"	6"	0.015"	MH-TE-G06	Call
3/4"	1/2"	24"	0.008"	MH-TE-A24	Call	5"	1"	6"	0.015"	MH-TE-H06	Call
3/4"	1/2"	30"	0.008"	MH-TE-A30	Call	6"	1"	8"	0.015"	MH-TE-J08	Call

► Hydraulically Formed Bellows

■ Standard Thin Wall Tube Ends



NOTE: Hoses listed terminate in tube ends. We can supply almost any termination that can be welded to 304 stainless steel.

Flanges, Fittings, & Components

1

Tube O.D.	A	Length	Thin Wall	Part No.	Price
1/4"	1/2"	3"	0.004"	MHT-TE-X03	Call
3/8"	1/2"	3"	0.004"	MHT-TE-Y03	Call
1/2"	1/2"	3"	0.005"	MHT-TE-Z03	Call
3/4"	1/2"	3"	0.006"	MHT-TE-A03	Call
3/4"	1/2"	6"	0.006"	MHT-TE-A06	Call
3/4"	1/2"	10"	0.006"	MHT-TE-A10	Call
3/4"	1/2"	12"	0.006"	MHT-TE-A12	Call
3/4"	1/2"	18"	0.006"	MHT-TE-A18	Call
3/4"	1/2"	20"	0.006"	MHT-TE-A20	Call
3/4"	1/2"	24"	0.006"	MHT-TE-A24	Call
3/4"	1/2"	30"	0.006"	MHT-TE-A30	Call
3/4"	1/2"	36"	0.006"	MHT-TE-A36	Call
1"	1/2"	3"	0.006"	MHT-TE-B03	Call
1"	1/2"	6"	0.006"	MHT-TE-B06	Call
1"	1/2"	10"	0.006"	MHT-TE-B10	Call
1"	1/2"	12"	0.006"	MHT-TE-B12	Call
1"	1/2"	18"	0.006"	MHT-TE-B18	Call
1"	1/2"	20"	0.006"	MHT-TE-B20	Call
1"	1/2"	24"	0.006"	MHT-TE-B24	Call
1"	1/2"	30"	0.006"	MHT-TE-B30	Call
1"	1/2"	36"	0.006"	MHT-TE-B36	Call
1"	1/2"	40"	0.006"	MHT-TE-B40	Call
1"	1/2"	48"	0.006"	MHT-TE-B48	Call
1 1/2"	1/2"	3"	0.006"	MHT-TE-C03	Call
1 1/2"	1/2"	6"	0.006"	MHT-TE-C06	Call
1 1/2"	1/2"	10"	0.006"	MHT-TE-C10	Call
1 1/2"	1/2"	12"	0.006"	MHT-TE-C12	Call
1 1/2"	1/2"	18"	0.006"	MHT-TE-C18	Call
1 1/2"	1/2"	20"	0.006"	MHT-TE-C20	Call
1 1/2"	1/2"	24"	0.006"	MHT-TE-C24	Call
1 1/2"	1/2"	30"	0.006"	MHT-TE-C30	Call
1 1/2"	1/2"	36"	0.006"	MHT-TE-C36	Call
1 1/2"	1/2"	40"	0.006"	MHT-TE-C40	Call
1 1/2"	1/2"	48"	0.006"	MHT-TE-C48	Call
2"	1/2"	4"	0.006"	MHT-TE-D04	Call
2"	1/2"	6"	0.006"	MHT-TE-D06	Call
2"	1/2"	10"	0.006"	MHT-TE-D10	Call
2"	1/2"	12"	0.006"	MHT-TE-D12	Call
2"	1/2"	18"	0.006"	MHT-TE-D18	Call
2"	1/2"	20"	0.006"	MHT-TE-D20	Call
2"	1/2"	24"	0.006"	MHT-TE-D24	Call
2"	1/2"	30"	0.006"	MHT-TE-D30	Call
2"	1/2"	36"	0.006"	MHT-TE-D36	Call
2"	1/2"	40"	0.006"	MHT-TE-D40	Call
2"	1/2"	48"	0.006"	MHT-TE-D48	Call
2 1/2"	3/4"	6"	0.006"	MHT-TE-E06	Call
3"	3/4"	6"	0.008"	MHT-TE-F06	Call
4"	3/4"	6"	0.010"	MHT-TE-G06	Call
5"	1"	6"	0.010"	MHT-TE-H06	Call

■ KF (QF) Flanged Bellows (Standard Wall)

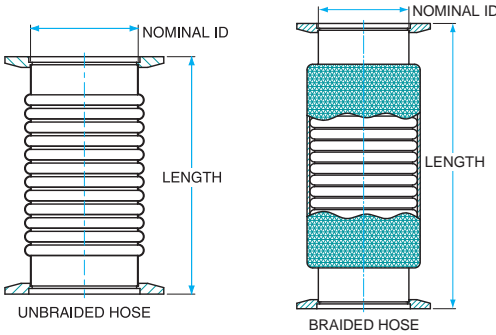
Standard Wall Unbraided Bellows					
KF Flanges (mm)	Nominal I.D.	Length	Thickness	Part No.	Price
16	3/4"	3"	0.008"	MH-QF-A03	Call
16	3/4"	6"	0.008"	MH-QF-A06	Call
16	3/4"	10"	0.008"	MH-QF-A10	Call
16	3/4"	12"	0.008"	MH-QF-A12	Call
16	3/4"	18"	0.008"	MH-QF-A18	Call
16	3/4"	20"	0.008"	MH-QF-A20	Call
16	3/4"	24"	0.008"	MH-QF-A24	Call
16	3/4"	30"	0.008"	MH-QF-A30	Call
16	3/4"	36"	0.008"	MH-QF-A36	Call
16	3/4"	40"	0.008"	MH-QF-A40	Call
16	3/4"	48"	0.008"	MH-QF-A48	Call
25	1"	3"	0.008"	MH-QF-B03	Call
25	1"	6"	0.008"	MH-QF-B06	Call
25	1"	10"	0.008"	MH-QF-B10	Call
25	1"	12"	0.008"	MH-QF-B12	Call
25	1"	18"	0.008"	MH-QF-B18	Call
25	1"	20"	0.008"	MH-QF-B20	Call
25	1"	24"	0.008"	MH-QF-B24	Call
25	1"	30"	0.008"	MH-QF-B30	Call
25	1"	36"	0.008"	MH-QF-B36	Call
25	1"	40"	0.008"	MH-QF-B40	Call
25	1"	48"	0.008"	MH-QF-B48	Call
40	1 1/2"	3"	0.01"	MH-QF-C03	Call
40	1 1/2"	6"	0.01"	MH-QF-C06	Call
40	1 1/2"	10"	0.01"	MH-QF-C10	Call
40	1 1/2"	12"	0.01"	MH-QF-C12	Call
40	1 1/2"	18"	0.01"	MH-QF-C18	Call
40	1 1/2"	20"	0.01"	MH-QF-C20	Call
40	1 1/2"	24"	0.01"	MH-QF-C24	Call
40	1 1/2"	30"	0.01"	MH-QF-C30	Call
40	1 1/2"	36"	0.01"	MH-QF-C36	Call
40	1 1/2"	40"	0.01"	MH-QF-C40	Call
40	1 1/2"	48"	0.01"	MH-QF-C48	Call
50	2"	4"	0.012"	MH-QF-D04	Call
50	2"	6"	0.012"	MH-QF-D06	Call
50	2"	10"	0.012"	MH-QF-D10	Call
50	2"	12"	0.012"	MH-QF-D12	Call
50	2"	18"	0.012"	MH-QF-D18	Call
50	2"	20"	0.012"	MH-QF-D20	Call
50	2"	24"	0.012"	MH-QF-D24	Call
50	2"	30"	0.012"	MH-QF-D30	Call
50	2"	36"	0.012"	MH-QF-D36	Call
50	2"	40"	0.012"	MH-QF-D40	Call
50	2"	48"	0.012"	MH-QF-D48	Call

► **Hydraulically Formed Bellows**

■ **KF (QF) Flanged Bellows**

- Thin wall hose and bellow assemblies are fabricated from Series 300 stainless steel
- Hoses can be made compatible with KF or ISO "K" terminations

NOTE: We offer thicker walls on request. Please call us for details.



Thin Wall Unbraided Bellows					
KF Flanges (mm)	Nominal I.D. (in.)	Length	Thickness	Part No.	Price
16	3/4"	3"	0.006"	MHT-QF-A03	Call
16	3/4"	6"	0.006"	MHT-QF-A06	Call
16	3/4"	10"	0.006"	MHT-QF-A10	Call
16	3/4"	12"	0.006"	MHT-QF-A12	Call
16	3/4"	18"	0.006"	MHT-QF-A18	Call
16	3/4"	20"	0.006"	MHT-QF-A20	Call
16	3/4"	24"	0.006"	MHT-QF-A24	Call
16	3/4"	30"	0.006"	MHT-QF-A30	Call
16	3/4"	36"	0.006"	MHT-QF-A36	Call
25	1"	3"	0.006"	MHT-QF-B03	Call
25	1"	6"	0.006"	MHT-QF-B06	Call
25	1"	10"	0.006"	MHT-QF-B10	Call
25	1"	12"	0.006"	MHT-QF-B12	Call
25	1"	18"	0.006"	MHT-QF-B18	Call
25	1"	20"	0.006"	MHT-QF-B20	Call
25	1"	24"	0.006"	MHT-QF-B24	Call
25	1"	30"	0.006"	MHT-QF-B30	Call
25	1"	36"	0.006"	MHT-QF-B36	Call
25	1"	40"	0.006"	MHT-QF-B40	Call
25	1"	48"	0.006"	MHT-QF-B48	Call
40	1 1/2"	3"	0.006"	MHT-QF-C03	Call
40	1 1/2"	6"	0.006"	MHT-QF-C06	Call
40	1 1/2"	10"	0.006"	MHT-QF-C10	Call
40	1 1/2"	12"	0.006"	MHT-QF-C12	Call
40	1 1/2"	18"	0.006"	MHT-QF-C18	Call
40	1 1/2"	20"	0.006"	MHT-QF-C20	Call
40	1 1/2"	24"	0.006"	MHT-QF-C24	Call
40	1 1/2"	30"	0.006"	MHT-QF-C30	Call
40	1 1/2"	36"	0.006"	MHT-QF-C36	Call
40	1 1/2"	40"	0.006"	MHT-QF-C40	Call
40	1 1/2"	48"	0.006"	MHT-QF-C48	Call
50	2"	4"	0.006"	MHT-QF-D04	Call
50	2"	6"	0.006"	MHT-QF-D06	Call
50	2"	10"	0.006"	MHT-QF-D10	Call
50	2"	12"	0.006"	MHT-QF-D12	Call
50	2"	18"	0.006"	MHT-QF-D18	Call
50	2"	20"	0.006"	MHT-QF-D20	Call
50	2"	24"	0.006"	MHT-QF-D24	Call
50	2"	30"	0.006"	MHT-QF-D30	Call
50	2"	36"	0.006"	MHT-QF-D36	Call
50	2"	40"	0.006"	MHT-QF-D40	Call
50	2"	48"	0.006"	MHT-QF-D48	Call

Braided Bellows					
KF Flanges (mm)	Nominal I.D.	Length	Thickness	Part No.	Price
16	3/4"	3"	0.008"	MHB-QF-A03	Call
16	3/4"	6"	0.008"	MHB-QF-A06	Call
16	3/4"	10"	0.008"	MHB-QF-A10	Call
16	3/4"	12"	0.008"	MHB-QF-A12	Call
16	3/4"	18"	0.008"	MHB-QF-A18	Call
16	3/4"	20"	0.008"	MHB-QF-A20	Call
16	3/4"	24"	0.008"	MHB-QF-A24	Call
16	3/4"	30"	0.008"	MHB-QF-A30	Call
16	3/4"	36"	0.008"	MHB-QF-A36	Call
16	3/4"	40"	0.008"	MHB-QF-A40	Call
16	3/4"	48"	0.008"	MHB-QF-A48	Call
25	1"	3"	0.008"	MHB-QF-B03	Call
25	1"	6"	0.008"	MHB-QF-B06	Call
25	1"	10"	0.008"	MHB-QF-B10	Call
25	1"	12"	0.008"	MHB-QF-B12	Call
25	1"	18"	0.008"	MHB-QF-B18	Call
25	1"	20"	0.008"	MHB-QF-B20	Call
25	1"	24"	0.008"	MHB-QF-B24	Call
25	1"	30"	0.008"	MHB-QF-B30	Call
25	1"	36"	0.008"	MHB-QF-B36	Call
25	1"	40"	0.008"	MHB-QF-B40	Call
25	1"	48"	0.008"	MHB-QF-B48	Call
40	1 1/2"	3"	0.01"	MHB-QF-C03	Call
40	1 1/2"	6"	0.01"	MHB-QF-C06	Call
40	1 1/2"	10"	0.01"	MHB-QF-C10	Call
40	1 1/2"	12"	0.01"	MHB-QF-C12	Call
40	1 1/2"	18"	0.01"	MHB-QF-C18	Call
40	1 1/2"	20"	0.01"	MHB-QF-C20	Call
40	1 1/2"	24"	0.01"	MHB-QF-C24	Call
40	1 1/2"	30"	0.01"	MHB-QF-C30	Call
40	1 1/2"	36"	0.01"	MHB-QF-C36	Call
40	1 1/2"	40"	0.01"	MHB-QF-C40	Call
40	1 1/2"	48"	0.01"	MHB-QF-C48	Call
50	2"	4"	0.012"	MHB-QF-D04	Call
50	2"	6"	0.012"	MHB-QF-D06	Call
50	2"	10"	0.012"	MHB-QF-D10	Call
50	2"	12"	0.012"	MHB-QF-D12	Call
50	2"	18"	0.012"	MHB-QF-D18	Call
50	2"	20"	0.012"	MHB-QF-D20	Call
50	2"	24"	0.012"	MHB-QF-D24	Call
50	2"	30"	0.012"	MHB-QF-D30	Call
50	2"	36"	0.012"	MHB-QF-D36	Call
50	2"	40"	0.012"	MHB-QF-D40	Call
50	2"	48"	0.012"	MHB-QF-D48	Call

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Flanges, Fittings, & Components

► Hydraulically Formed Bellows

■ CF Flanged Bellows

MH-Series Bellows:

- Fabricated from thin 300 Series stainless steel
- Withstand many flexing cycles
- Hose terminates with two CF flanges—one fixed, one rotatable

Unbraided Hoses:

- Extend up to 15% beyond their live length and compress up to 20%

Braided Hoses:

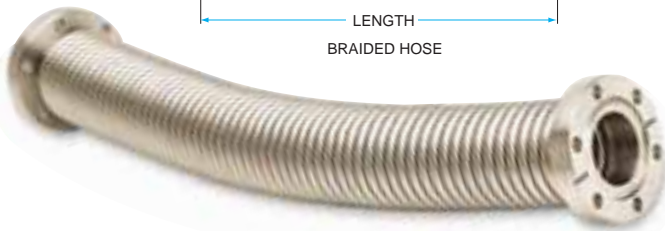
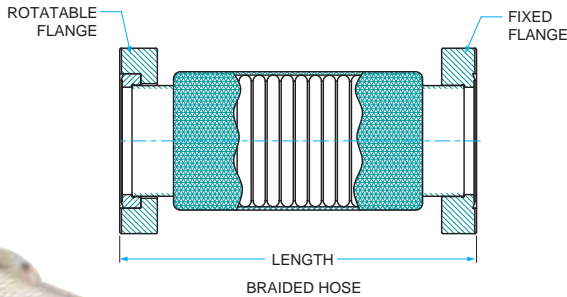
- Braided sheath helps protect convoluted hose from damage

Short Hoses:

- Often used to correct minor component misalignments

Longer Hoses:

- Work as roughing lines



Standard Wall Unbraided Bellows					
Flange	Length	Nominal I.D.	Standard Wall	Part No.	Price
1.33"	3"	3/4"	0.008"	MH-CF-A03	Call
1.33"	6"	3/4"	0.008"	MH-CF-A06	Call
1.33"	10"	3/4"	0.008"	MH-CF-A10	Call
1.33"	12"	3/4"	0.008"	MH-CF-A12	Call
1.33"	18"	3/4"	0.008"	MH-CF-A18	Call
1.33"	20"	3/4"	0.008"	MH-CF-A20	Call
1.33"	24"	3/4"	0.008"	MH-CF-A24	Call
1.33"	30"	3/4"	0.008"	MH-CF-A30	Call
1.33"	36"	3/4"	0.008"	MH-CF-A36	Call
1.33"	40"	3/4"	0.008"	MH-CF-A40	Call
1.33"	48"	3/4"	0.008"	MH-CF-A48	Call
2.75"	3"	1 1/2"	0.010"	MH-CF-C03	Call
2.75"	6"	1 1/2"	0.010"	MH-CF-C06	Call
2.75"	10"	1 1/2"	0.010"	MH-CF-C10	Call
2.75"	12"	1 1/2"	0.010"	MH-CF-C12	Call
2.75"	18"	1 1/2"	0.010"	MH-CF-C18	Call
2.75"	20"	1 1/2"	0.010"	MH-CF-C20	Call
2.75"	24"	1 1/2"	0.010"	MH-CF-C24	Call
2.75"	30"	1 1/2"	0.010"	MH-CF-C30	Call
2.75"	36"	1 1/2"	0.010"	MH-CF-C36	Call
2.75"	40"	1 1/2"	0.010"	MH-CF-C40	Call
2.75"	48"	1 1/2"	0.010"	MH-CF-C48	Call
2.125"	6"	1"	0.008"	MH-CF-B06	Call
3.375"	6"	2"	0.010"	MH-CF-D06	Call
4.5"	6"	2 1/2"	0.012"	MH-CF-E06	Call
6"	6"	4"	0.015"	MH-CF-G06	Call
6.75"	6"	5"	0.015"	MH-CF-H06	Call
8"	6"	6"	0.015"	MH-CF-J06	Call

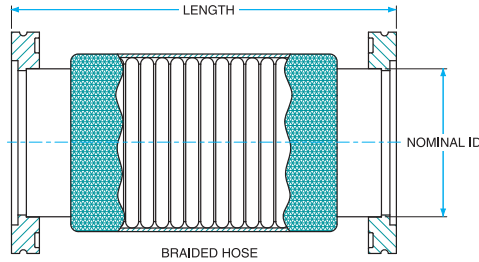
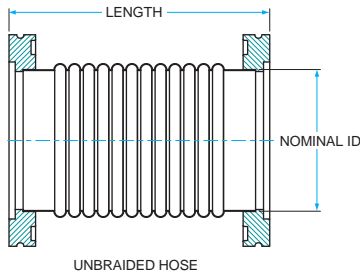
NOTE: Before using any hose, please read the Technical Notes on correct installation.

Thin Wall Unbraided Bellows					
Flange	Length	Nominal I.D.	Thin Wall	Part No.	Price
1.33"	3"	3/4"	0.006"	MHT-CF-A03	Call
1.33"	6"	3/4"	0.006"	MHT-CF-A06	Call
1.33"	10"	3/4"	0.006"	MHT-CF-A10	Call
1.33"	12"	3/4"	0.006"	MHT-CF-A12	Call
1.33"	18"	3/4"	0.006"	MHT-CF-A18	Call
1.33"	20"	3/4"	0.006"	MHT-CF-A20	Call
1.33"	24"	3/4"	0.006"	MHT-CF-A24	Call
1.33"	30"	3/4"	0.006"	MHT-CF-A30	Call
1.33"	36"	3/4"	0.006"	MHT-CF-A36	Call
2.75"	3"	1 1/2"	0.006"	MHT-CF-C03	Call
2.75"	6"	1 1/2"	0.006"	MHT-CF-C06	Call
2.75"	10"	1 1/2"	0.006"	MHT-CF-C10	Call
2.75"	12"	1 1/2"	0.006"	MHT-CF-C12	Call
2.75"	18"	1 1/2"	0.006"	MHT-CF-C18	Call
2.75"	20"	1 1/2"	0.006"	MHT-CF-C20	Call
2.75"	24"	1 1/2"	0.006"	MHT-CF-C24	Call
2.75"	30"	1 1/2"	0.006"	MHT-CF-C30	Call
2.75"	36"	1 1/2"	0.006"	MHT-CF-C36	Call
2.75"	40"	1 1/2"	0.006"	MHT-CF-C40	Call
2.75"	48"	1 1/2"	0.006"	MHT-CF-C48	Call
2.125"	6"	1"	0.006"	MHT-CF-B06	Call
3.375"	6"	2"	0.006"	MHT-CF-D06	Call
4.5"	6"	2 1/2"	0.006"	MHT-CF-E06	Call
6"	6"	4"	0.010"	MHT-CF-G06	Call
6.75"	6"	5"	0.010"	MHT-CF-H06	Call
8"	6"	6"	0.010"	MHT-CF-J06	Call

Braided Bellows				
Flange	Length	Nominal I.D.	Part No.	Price
1.33"	3"	3/4"	MHB-CF-A03	Call
1.33"	6"	3/4"	MHB-CF-A06	Call
1.33"	10"	3/4"	MHB-CF-A10	Call
1.33"	12"	3/4"	MHB-CF-A12	Call
1.33"	18"	3/4"	MHB-CF-A18	Call
1.33"	20"	3/4"	MHB-CF-A20	Call
1.33"	24"	3/4"	MHB-CF-A24	Call
1.33"	30"	3/4"	MHB-CF-A30	Call
1.33"	36"	3/4"	MHB-CF-A36	Call
2.75"	3"	1 1/2"	MHB-CF-C03	Call
2.75"	6"	1 1/2"	MHB-CF-C06	Call
2.75"	10"	1 1/2"	MHB-CF-C10	Call
2.75"	12"	1 1/2"	MHB-CF-C12	Call
2.75"	18"	1 1/2"	MHB-CF-C18	Call
2.75"	20"	1 1/2"	MHB-CF-C20	Call
2.75"	24"	1 1/2"	MHB-CF-C24	Call
2.75"	30"	1 1/2"	MHB-CF-C30	Call
2.75"	36"	1 1/2"	MHB-CF-C36	Call
2.75"	40"	1 1/2"	MHB-CF-C40	Call
2.75"	48"	1 1/2"	MHB-CF-C48	Call
2.12"	6"	1"	MHB-CF-B06	Call
3.37"	6"	2"	MHB-CF-D06	Call
4.5"	6"	2 1/2"	MHB-CF-E06	Call
6"	6"	4"	MHB-CF-G06	Call
6.75"	6"	5"	MHB-CF-H06	Call
8"	6"	6"	MHB-CF-J06	Call

► Hydraulically Formed Bellows

■ ISO Flanged Bellows



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Flanges, Fittings, & Components

Standard Wall Unbraided				
ISO Flange (mm)	Nominal I.D.	Length	Part No.	Price
63	2.5"	6"	MH-QF-E06	Call
63	2.5"	10"	MH-QF-E10	Call
63	2.5"	12"	MH-QF-E12	Call
63	2.5"	18"	MH-QF-E18	Call
63	2.5"	20"	MH-QF-E20	Call
63	2.5"	24"	MH-QF-E24	Call
63	2.5"	30"	MH-QF-E30	Call
63	2.5"	36"	MH-QF-E36	Call
63	2.5"	40"	MH-QF-E40	Call
63	2.5"	48"	MH-QF-E48	Call
80	3"	6"	MH-QF-F06	Call
80	3"	10"	MH-QF-F10	Call
80	3"	12"	MH-QF-F12	Call
80	3"	18"	MH-QF-F18	Call
80	3"	20"	MH-QF-F20	Call
80	3"	24"	MH-QF-F24	Call
80	3"	30"	MH-QF-F30	Call
80	3"	36"	MH-QF-F36	Call
80	3"	40"	MH-QF-F40	Call
80	3"	48"	MH-QF-F48	Call
100	4"	6"	MH-QF-G06	Call
100	4"	10"	MH-QF-G10	Call
100	4"	12"	MH-QF-G12	Call
160	6"	6"	MH-QF-H06	Call
160	6"	10"	MH-QF-H10	Call
160	6"	12"	MH-QF-H12	Call

Braided Bellows				
ISO Flange (mm)	Nominal I.D.	Length	Part No.	Price
63	2.5"	6"	MHB-QF-E06	Call
63	2.5"	10"	MHB-QF-E10	Call
63	2.5"	12"	MHB-QF-E12	Call
63	2.5"	18"	MHB-QF-E18	Call
63	2.5"	20"	MHB-QF-E20	Call
63	2.5"	24"	MHB-QF-E24	Call
63	2.5"	30"	MHB-QF-E30	Call
63	2.5"	36"	MHB-QF-E36	Call
63	2.5"	40"	MHB-QF-E40	Call
63	2.5"	48"	MHB-QF-E48	Call
80	3"	6"	MHB-QF-F06	Call
80	3"	10"	MHB-QF-F10	Call
80	3"	12"	MHB-QF-F12	Call
80	3"	18"	MHB-QF-F18	Call
80	3"	20"	MHB-QF-F20	Call
80	3"	24"	MHB-QF-F24	Call
80	3"	30"	MHB-QF-F30	Call
80	3"	36"	MHB-QF-F36	Call
80	3"	40"	MHB-QF-F40	Call
80	3"	48"	MHB-QF-F48	Call
100	4"	6"	MHB-QF-G06	Call
100	4"	10"	MHB-QF-G10	Call
100	4"	12"	MHB-QF-G12	Call
160	6"	6"	MHB-QF-H06	Call
160	6"	10"	MHB-QF-H10	Call
160	6"	12"	MHB-QF-H12	Call

REMANUFACTURED PUMPS

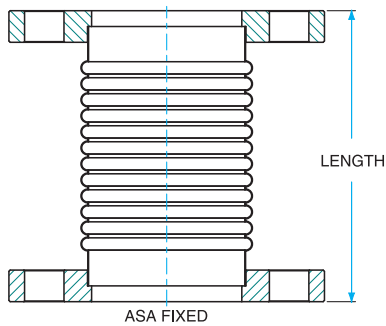
100% REBUILT AND CERTIFIED
12 MONTH WARRANTY ON ALL PUMPS
PUMP EXCHANGE PROGRAM

Cryo Turbo Rotary Vane
Scroll Rotary Piston Ion
Diffusion Screw Blower Dry Process

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► Hydraulically Formed Bellows

1
Flanges, Fittings, & Components



■ ASA Fixed Bellows

- Have either a flat surface or an o-ring groove machined in it
- Useful to pressures slightly better than 1×10^{-7} Torr

Bellows with Flat ASA Flanges						
ASA Size	Flange O.D.	Bellows I.D.	Free	Part No.	Price	
1	4 1/4"	1"	4	AFB04X010	Call	
1	4 1/4"	1 1/2"	4	AFB04X015	Call	
1 1/2	5"	2"	4	AFB05X020	Call	
1 1/2	5"	2 1/2"	6	AFB05X025	Call	
2	6"	3"	6	AFB06X030	Call	
3	7 1/2"	4"	6	AFB07X040	Call	
4	9"	4"	6	AFB09X040	Call	
4	9"	6"	8	AFB09X060	Call	
6	11"	6"	8	AFB11X060	Call	

Bellows with One Grooved ASA Flanges						
ASA Size	Flange O.D.	Bellows I.D.	Free	Part No.	Price	
1	4 1/4"	1"	4	AFB04X010G	Call	
1	4 1/4"	1 1/2"	4	AFB04X015G	Call	
1 1/2	5"	2"	4	AFB05X020G	Call	
1 1/2	5"	2 1/2"	6	AFB05X025G	Call	
2	6"	3"	6	AFB06X030G	Call	
3	7 1/2"	4"	6	AFB07X040G	Call	
4	9"	4"	6	AFB09X040G	Call	
4	9"	6"	8	AFB09X060G	Call	
6	11"	6"	8	AFB11X060G	Call	

Bellows with Both ASA Flanges Grooved						
ASA Size	Flange O.D.	Bellows I.D.	Free	Part No.	Price	
1	4 1/4"	1"	4	AFB04X010GB	Call	
1	4 1/4"	1 1/2"	4	AFB04X015GB	Call	
1 1/2	5"	2"	4	AFB05X020GB	Call	
1 1/2	5"	2 1/2"	6	AFB05X025GB	Call	
2	6"	3"	6	AFB06X030GB	Call	
3	7 1/2"	4"	6	AFB07X040GB	Call	
4	9"	4"	8	AFB09X040GB	Call	
4	9"	6"	8	AFB09X060GB	Call	
6	11"	6"	8	AFB11X060GB	Call	

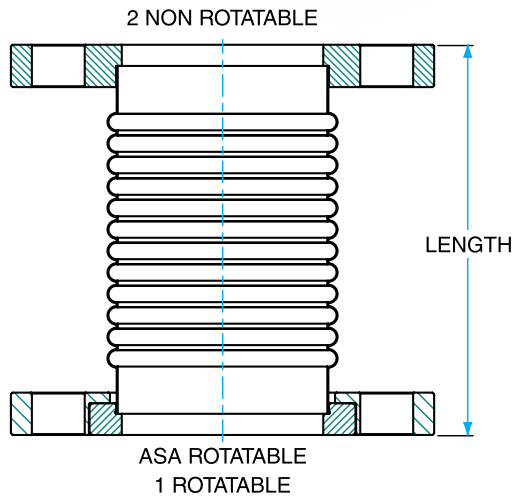
► **Hydraulically Formed Bellows**

■ **ASA Rotatable Bellows**

Features one rotatable flange.

About ASA flanges:

- ASA flanges have either a flat surface or an o-ring groove machined in it
- Useful to pressures slightly better than 1×10^{-7} Torr
- The outgassing or porosity of the o-ring material limits the ultimate pressure



NOTE: The shaded or crosshatched portions of the diagrams indicate rotating parts.

Bellows with Flat Flanges					
ASA Size	Flange O.D.	Bellows I.D.	Free	Part No.	Price
1	4 1/4"	1"	4	AFB04X010R	
1	4 1/4"	1 1/2"	4	AFB04X015R	
1 1/2	5"	2"	4	AFB05X020R	
1 1/2	5"	2 1/2"	6	AFB05X025R	
2	6"	3"	6	AFB06X030R	
3	7 1/2"	4"	6	AFB07X040R	
4	9"	4"	6	AFB09X040R	
4	9"	6"	8	AFB09X060R	
6	11"	6"	8	AFB11X060R	
Bellows with Grooved Rotatable Flange					
1	4 1/4"	1"	4	AFB04X010G1R	
1	4 1/4"	1 1/2"	4	AFB04X015G1R	
1 1/2	5"	2"	4	AFB05X020G1R	
1 1/2	5"	2 1/2"	6	AFB05X025G1R	
2	6"	3"	6	AFB06X030G1R	
4	9"	6"	8	AFB09X060G1R	
6	11"	6"	8	AFB11X060G1R	
Bellows with Grooved Fixed Flange					
1	4 1/4"	1"	4	AFB04X010G2R	
1	4 1/4"	1 1/2"	4	AFB04X015G2R	
1 1/2	5"	2"	4	AFB05X020G2R	
1 1/2	5"	2 1/2"	6	AFB05X025G2R	
2	6"	3"	6	AFB06X030G2R	
3	7 1/2"	4"	6	AFB07X040G2R	
4	9"	4"	6	AFB09X040G2R	
4	9"	6"	8	AFB09X060G2R	
6	11"	6"	8	AFB11X060G2R	
Bellows with Both Flanges Grooved					
1	4 1/4"	1"	4	AFB04X010GBR	
1	4 1/4"	1 1/2"	4	AFB04X015GBR	
1 1/2	5"	2"	4	AFB05X020GBR	
1 1/2	5"	2 1/2"	6	AFB05X025GBR	
2	6"	3"	6	AFB06X030GBR	
3	7 1/2"	4"	6	AFB07X040GBR	
4	9"	4"	6	AFB09X040GBR	
4	9"	6"	8	AFB09X060GBR	
6	11"	6"	8	AFB11X060GBR	

1
Flanges, Fittings, & Components

► Hydraulically Formed Bellows

1

Flanges, Fittings, & Components

■ VCR® Terminations



Process Lines—Unbraided					
Connector	Nominal Tube	Length	Weight (lbs.)	Part No.	Price
Female VCR	1/4"	6"	0.25	MH-VCR-X06FF	Call
Female VCR	1/4"	12"	0.5	MH-VCR-X12FF	Call
Female VCR	1/4"	18"	0.5	MH-VCR-X18FF	Call
Female VCR	1/4"	24"	0.75	MH-VCR-X24FF	Call
Female VCR	1/4"	36"	1	MH-VCR-X36FF	Call
Male VCR	1/4"	6"	0.25	MH-VCR-X06MM	Call
Male VCR	1/4"	12"	0.5	MH-VCR-X12MM	Call
Male VCR	1/4"	18"	0.5	MH-VCR-X18MM	Call
Male VCR	1/4"	24"	0.75	MH-VCR-X24MM	Call
Male VCR	1/4"	36"	1	MH-VCR-X36MM	Call
Male/Female VCR	1/4"	6"	0.25	MH-VCR-X06MF	Call
Male/Female VCR	1/4"	12"	0.5	MH-VCR-X12MF	Call
Male/Female VCR	1/4"	18"	0.5	MH-VCR-X18MF	Call
Male/Female VCR	1/4"	24"	0.75	MH-VCR-X24MF	Call
Male/Female VCR	1/4"	36"	1	MH-VCR-X36MF	Call
Female VCR	3/8"	6"	0.25	MH-VCR-Y06FF	Call
Female VCR	3/8"	12"	0.5	MH-VCR-Y12FF	Call
Female VCR	3/8"	18"	0.5	MH-VCR-Y18FF	Call
Female VCR	3/8"	24"	0.75	MH-VCR-Y24FF	Call
Female VCR	3/8"	36"	1	MH-VCR-Y36FF	Call
Male VCR	3/8"	6"	0.25	MH-VCR-Y06MM	Call
Male VCR	3/8"	12"	0.5	MH-VCR-Y12MM	Call
Male VCR	3/8"	18"	0.5	MH-VCR-Y18MM	Call
Male VCR	3/8"	24"	0.75	MH-VCR-Y24MM	Call
Male VCR	3/8"	36"	1	MH-VCR-Y36MM	Call
Male/Female VCR	3/8"	6"	0.25	MH-VCR-Y06MF	Call
Male/Female VCR	3/8"	12"	0.5	MH-VCR-Y12MF	Call
Male/Female VCR	3/8"	18"	0.5	MH-VCR-Y18MF	Call
Male/Female VCR	3/8"	24"	0.75	MH-VCR-Y24MF	Call
Male/Female VCR	3/8"	36"	1	MH-VCR-Y36MF	Call
Female VCR	1/2"	6"	0.25	MH-VCR-Z06FF	Call
Female VCR	1/2"	12"	0.5	MH-VCR-Z12FF	Call
Female VCR	1/2"	18"	0.5	MH-VCR-Z18FF	Call
Female VCR	1/2"	24"	0.75	MH-VCR-Z24FF	Call
Female VCR	1/2"	36"	1	MH-VCR-Z36FF	Call
Male VCR	1/2"	6"	0.25	MH-VCR-Z06MM	Call
Male VCR	1/2"	12"	0.5	MH-VCR-Z12MM	Call
Male VCR	1/2"	18"	0.5	MH-VCR-Z18MM	Call
Male VCR	1/2"	24"	0.75	MH-VCR-Z24MM	Call
Male VCR	1/2"	36"	1	MH-VCR-Z36MM	Call
Male/Female VCR	1/2"	6"	0.25	MH-VCR-Z06MF	Call
Male/Female VCR	1/2"	12"	0.5	MH-VCR-Z12MF	Call
Male/Female VCR	1/2"	18"	0.5	MH-VCR-Z18MF	Call
Male/Female VCR	1/2"	24"	0.75	MH-VCR-Z24MF	Call
Male/Female VCR	1/2"	36"	1	MH-VCR-Z36MF	Call

Process Lines—Braided					
Connector	Nominal Tube	Length	Weight (lbs.)	Part No.	Price
Female VCR	1/4"	6"	0.25	MHB-VCRX06FF	Call
Female VCR	1/4"	12"	0.5	MHB-VCRX12FF	Call
Female VCR	1/4"	18"	0.5	MHB-VCRX18FF	Call
Female VCR	1/4"	24"	0.75	MHB-VCRX24FF	Call
Female VCR	1/4"	36"	1	MHB-VCRX36FF	Call
Male VCR	1/4"	6"	0.25	MHB-VCRX06MM	Call
Male VCR	1/4"	12"	0.5	MHB-VCRX12MM	Call
Male VCR	1/4"	18"	0.5	MHB-VCRX18MM	Call
Male VCR	1/4"	24"	0.75	MHB-VCRX24MM	Call
Male VCR	1/4"	36"	1	MHB-VCRX36MM	Call
Male/Female VCR	1/4"	6"	0.25	MHB-VCRX06MF	Call
Male/Female VCR	1/4"	12"	0.5	MHB-VCRX12MF	Call
Male/Female VCR	1/4"	18"	0.5	MHB-VCRX18MF	Call
Male/Female VCR	1/4"	24"	0.75	MHB-VCRX24MF	Call
Male/Female VCR	1/4"	36"	1	MHB-VCRX36MF	Call
Female VCR	3/8"	6"	0.25	MHB-VCRY06FF	Call
Female VCR	3/8"	12"	0.5	MHB-VCRY12FF	Call
Female VCR	3/8"	18"	0.5	MHB-VCRY18FF	Call
Female VCR	3/8"	24"	0.75	MHB-VCRY24FF	Call
Female VCR	3/8"	36"	1	MHB-VCRY36FF	Call
Male VCR	3/8"	6"	0.25	MHB-VCRY06MM	Call
Male VCR	3/8"	12"	0.5	MHB-VCRY12MM	Call
Male VCR	3/8"	18"	0.5	MHB-VCRY18MM	Call
Male VCR	3/8"	24"	0.75	MHB-VCRY24MM	Call
Male VCR	3/8"	36"	1	MHB-VCRY36MM	Call
Male/Female VCR	3/8"	6"	0.25	MHB-VCRY06MF	Call
Male/Female VCR	3/8"	12"	0.5	MHB-VCRY12MF	Call
Male/Female VCR	3/8"	18"	0.5	MHB-VCRY18MF	Call
Male/Female VCR	3/8"	24"	0.75	MHB-VCRY24MF	Call
Male/Female VCR	3/8"	36"	1	MHB-VCRY36MF	Call
Female VCR	1/2"	6"	0.25	MHB-VCRZ06FF	Call
Female VCR	1/2"	12"	0.5	MHB-VCRZ12FF	Call
Female VCR	1/2"	18"	0.5	MHB-VCRZ18FF	Call
Female VCR	1/2"	24"	0.75	MHB-VCRZ24FF	Call
Female VCR	1/2"	36"	1	MHB-VCRZ36FF	Call
Male VCR	1/2"	6"	0.25	MHB-VCRZ06MM	Call
Male VCR	1/2"	12"	0.5	MHB-VCRZ12MM	Call
Male VCR	1/2"	18"	0.5	MHB-VCRZ18MM	Call
Male VCR	1/2"	24"	0.75	MHB-VCRZ24MM	Call
Male VCR	1/2"	36"	1	MHB-VCRZ36MM	Call
Male/Female VCR	1/2"	6"	0.25	MHB-VCRZ06MF	Call
Male/Female VCR	1/2"	12"	0.5	MHB-VCRZ12MF	Call
Male/Female VCR	1/2"	18"	0.5	MHB-VCRZ18MF	Call
Male/Female VCR	1/2"	24"	0.75	MHB-VCRZ24MF	Call
Male/Female VCR	1/2"	36"	1	MHB-VCRZ36MF	Call

► **Hydraulically Formed Bellows**

1 Flanges, Fittings, & Components

■ **Swagelok® Terminations**

Process Lines Unbraided					
Connector	Nominal Tube	Length	Weight (lbs.)	Part No.	Price
Swagelok	1/4"	6"	1/4	MH-SWG-X06	Call
Swagelok	1/4"	12"	1/2	MH-SWG-X12	Call
Swagelok	1/4"	18"	1/2	MH-SWG-X18	Call
Swagelok	1/4"	24"	3/4	MH-SWG-X24	Call
Swagelok	1/4"	36"	1	MH-SWG-X36	Call
Swagelok	3/8"	6"	1/4	MH-SWG-Y06	Call
Swagelok	3/8"	12"	1/2	MH-SWG-Y12	Call
Swagelok	3/8"	18"	1/2	MH-SWG-Y18	Call
Swagelok	3/8"	24"	3/4	MH-SWG-Y24	Call
Swagelok	3/8"	36"	1	MH-SWG-Y36	Call
Swagelok	1/2"	6"	1/4	MH-SWG-Z06	Call
Swagelok	1/2"	12"	1/2	MH-SWG-Z12	Call
Swagelok	1/2"	18"	1/2	MH-SWG-Z18	Call
Swagelok	1/2"	24"	3/4	MH-SWG-Z24	Call
Swagelok	1/2"	36"	1	MH-SWG-Z36	Call

Process Lines Braided					
Connector	Nominal Tube	Length	Weight (lbs.)	Part No.	Price
Swagelok	1/4"	6"	1/4	MHB-SWG-X06	Call
Swagelok	1/4"	12"	1/2	MHB-SWG-X12	Call
Swagelok	1/4"	18"	1/2	MHB-SWG-X18	Call
Swagelok	1/4"	24"	3/4	MHB-SWG-X24	Call
Swagelok	1/4"	36"	1	MHB-SWG-X36	Call
Swagelok	3/8"	6"	1/4	MHB-SWG-Y06	Call
Swagelok	3/8"	12"	1/2	MHB-SWG-Y12	Call
Swagelok	3/8"	18"	1/2	MHB-SWG-Y18	Call
Swagelok	3/8"	24"	3/4	MHB-SWG-Y24	Call
Swagelok	3/8"	36"	1	MHB-SWG-Y36	Call
Swagelok	1/2"	6"	1/4	MHB-SWG-Z06	Call
Swagelok	1/2"	12"	1/2	MHB-SWG-Z12	Call
Swagelok	1/2"	18"	1/2	MHB-SWG-Z18	Call
Swagelok	1/2"	24"	3/4	MHB-SWG-Z24	Call
Swagelok	1/2"	36"	1	MHB-SWG-Z36	Call

► **Stainless Steel Tubing (304 L)**

■ **Standard Finish**

304L grade stainless steel tubing features a standard bright, annealed finish (through 4" O.D.), and mill finish (5" O.D. and 12" O.D.).

- We offer continuous lengths up to 20'



Nominal Tube O.D.	Wall	Weight (lbs.)	Part No.	Price (per in.)
1/16"	0.010"	1/8	SST-0006I	Call
1/8"	0.028"	1/8	SST-0012I	Call
3/16"	0.028"	1/8	SST-0018I	Call
1/4"	0.028"	1/8	SST-0025I	Call
3/8"	0.028"	1/8	SST-0037I	Call
1/2"	0.035"	1/8	SST-0050I	Call
5/8"	0.035"	1/8	SST-0062I	Call
3/4"	0.035"	1/8	SST-0075I	Call
1"	0.065"	1/2	SST-0100I	Call
1 1/4"	0.065"	3/4	SST-0125I	Call
1 1/2"	0.065"	1	SST-0150I	Call
1 5/8"	0.065"	1	SST-0162I	Call
1 3/4"	0.065"	1 1/2	SST-0175I	Call
2"	0.065"	1 1/2	SST-0200I	Call
2 1/2"	0.065"	1 3/4	SST-0250I	Call
2 3/4"	0.065"	2	SST-0275I	Call
3"	0.065"	2	SST-0300I	Call
4"	0.083"	3 1/2	SST-0400I	Call
5"	0.083"	4 1/2	SST-0500I	Call
12"	0.125"	17	SST-1200I	Call

■ **Brushed Finish**

304L grade stainless steel tubing has a brushed, 180 grit finish on both the O.D. and I.D.

- A cost-effective alternative for customers who previously finished the tubing surface themselves

NOTE: Cutting charge—add \$5.00 per cut.

Nominal Tube O.D.	Wall	Weight (lbs.)	Part No.	Price (per in.)
6"	0.083"	5	SST-0600PI	Call
8"	0.109"	10 1/2	SST-0800PI	Call
10"	0.109"	12 1/2	SST-1000PI	Call

NOTE: We offer other grades, finishes, wall thicknesses, and electropolished tubing upon request. Please call for price and delivery. UPS will deliver a maximum length of 8'. Lengths over 8' require special packaging and shipping (motor freight) at an additional nominal cost. While pricing is per inch, we only sell tubing in increments of 12" (1').

➤ Rubber, PVC, PTFE Tubing & Accessories



Tube I.D.	Wall	Tube O.D.	Weight (lbs.)	Part No.	Price (per ft.)
1/8"	1/8"	3/8"	1/4	T012	Call
3/16"	3/16"	9/16"	1/4	T018	Call
1/4"	1/4"	3/4"	1/4	T025	Call
5/16"	1/4"	9/16"	1/4	T031	Call
3/8"	1/4"	7/8"	1/4	T038	Call
7/16"	5/16"	11/16"	1/4	T044	Call
1/2"	3/8"	1 1/4"	1/4	T050	Call
5/8"	3/8"	1 3/8"	1/4	T063	Call
3/4"	3/8"	1 1/2"	1/4	T075	Call
13/16"	3/8"	1 9/16"	1/4	T081	Call
7/8"	1/2"	1 7/8"	1/4	T088	Call
1"	1/2"	2"	1/2	T100	Call
1 1/4"	1/2"	2 1/4"	1/2	T125	Call
1 1/2" *	1/2"	2 1/2"	1/2	T150	Call
1 5/8" *	11/16"	3"	1/2	T163	Call
2" *	1/4"	2 1/2"	1	T200	Call
2 1/2" *	1/4"	3"	1	T250	Call
3" *	1/4"	3 1/2"	1	T300	Call
4" *	1/8"	4 1/4"	1	T400	Call

*Rubber tubing with an I.D. greater than 1 1/4" requires an internal spring.

■ Rubber Tubing

Rubber tubing up to 1 1/4" I.D. supports itself in foreline vacuum applications.

- Tubing with I.D.s of 1 1/2" or larger will collapse unless supported by an internal metal spring
- Because long lengths may collapse even with a spring, we do not recommend the use of lengths greater than 1 foot
- For longer lengths, consider PVC tubing with a molded-in spring

NOTE: We sell rubber tubing by the foot, ordered in multiples of the part number. For example, to order 5' of 2" I.D. rubber tubing, order 5 x T200.

■ Rubber Tubing Stiffener Springs

Rubber tubing with I.D.s of 1 1/2" or larger, or in lengths over 6" will collapse unless supported by an internal metal spring.

Rubber Tube I.D.	Weight (lbs.)	Tube Part No.*	Part No.	Price
1.5"	1/4	T150	SPRING150	Call
1 5/8"	1/4	T163	SPRING163	Call
2"	1/4	T200	SPRING200	Call
2.5"	1/2	T250	SPRING250	Call
3"	1/2	T300	SPRING300	Call
4"	1	T400	SPRING400	Call

* Tubing not included.

NOTE: The table lists springs that support rubber tubing.

■ PVC Tubing with Embedded Spring

Suits foreline or rough pump connections.

- Clear
- Features a glass-smooth interior to reduce particulate buildup
- Suitable for temperatures between 25° F and 150° F
- Molded-in metal reinforcing wire (also called embedded spring)



Tube I.D.	Wall	Tube O.D.	Weight (lbs.)	Part No.	Price per Foot
1/4"	3/32"	7/16"	1/4	PT025	Call
3/8"	3/32"	9/16"	1/4	PT037	Call
1/2"	3/32"	3/4"	1/4	PT050	Call
5/8"	1/8"	7/8"	1/2	PT063	Call
3/4"	1/8"	1"	1/2	PT075	Call
1"	1/8"	1 1/4"	1	PT100	Call
1 1/4"	5/32"	1 9/16"	1	PT125	Call
1 1/2"	5/32"	1 13/16"	1	PT150	Call
2"	3/16"	2 3/8"	1 1/2	PT200	Call
2 1/2"	1/4"	3"	2	PT250	Call
3"	1/4"	3 1/2"	2	PT300	Call
4"	1/4"	4 1/2"	3	PT400	Call
5"	1/4"	5 1/2"	3	PT500	Call

NOTE: We sell PVC tubing by the foot in continuous lengths up to 100'; up to 50' for those >2.5" I.D. To order more than 1', order multiples of the part number. For example, to order 16' of 1" I.D. plastic tube, order 16 x PT100.

➤ Rubber, PVC, PTFE Tubing & Accessories

■ PVC Tubing with KF (QF) Flanges

Suits foreline or rough pump connections.



NOTE: Chart lists popular tube lengths.

NOTE: We sell PVC tubing by the foot in continuous lengths up to 50'. Order by adding the number of feet as an extension to the part number. For example, to get 18 feet of 1 1/2" tubing with QF40 terminations, order PT150QF40-18.

- Clear
- Features a glass-smooth interior to reduce particulate buildup
- Suitable for temperatures between 25° F and 150° F
- Molded-in metal reinforcing wire (also called embedded spring)

KF Size	Tube I.D.	Tube Length	Weight (lbs.)	Part No.	Price
16	3/4"	2'	1	PT075QF16-2	Call
16	3/4"	10'	2	PT075QF16-10	Call
16	3/4"	15'	3	PT075QF16-15	Call
16	3/4"	40'	8	PT075QF16-40	Call
25	1"	2'	1	PT100QF25-2	Call
25	1"	10'	6	PT100QF25-10	Call
25	1"	15'	9	PT100QF25-15	Call
25	1"	50'	30	PT100QF25-50	Call
40	1 1/2"	2'	2	PT150QF40-2	Call
40	1 1/2"	10'	7	PT150QF40-10	Call
40	1 1/2"	15'	11	PT150QF40-15	Call
40	1 1/2"	50'	35	PT150QF40-50	Call
50	2"	2'	2	PT200QF50-2	Call
50	2"	5'	7	PT200QF50-5	Call
50	2"	10'	14	PT200QF50-10	Call
50	2"	40'	55	PT200QF50-40	Call

■ PVC & Rubber Hose Clamps



Weight (lbs.)	Tube I.D.	Part No.	Price
1/4	1/4	CLP037	Call
1/4	3/8	CLP050	Call
1/4	1/2	CLP050	Call
1/4	5/8	CLP087	Call
1/4	3/4	CLP100	Call
1/4	1	CLP125	Call
1/4	1 1/4	CLP150	Call
1/4	1 1/2	CLP200	Call
1/4	2	CLP200	Call
1/4	2 1/2	CLP300	Call
1/4	3	CLP350	Call
1/4	3 1/2	CLP400	Call
1/2	4	CLP450	Call
1/2	5	CLP550	Call

■ PVC Tubing with Nylon Braided

SPECIFICATIONS

Reinforcement: Nylon braid
Connections: Cajon® hose connectors
Uses: Water lines around system

Description	Tube I.D.	Part No.	Price
PVC Tubing	1/4"	PVCBT025	Call
PVC Tubing	3/8"	PVCBT038	Call

■ PTFE Tubing

SPECIFICATIONS

Connections: Cajon hose connectors
Uses: Electrically isolated water lines

Description	Tube O.D.	Part No.	Price
PTFE Tubing	1/4"	TT025	Call
PTFE Tubing	3/8"	TT038	Call

Weld Tube Fittings

Flanges, Fittings, & Components

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IN THIS SECTION ➔

Weld Tube Fittings

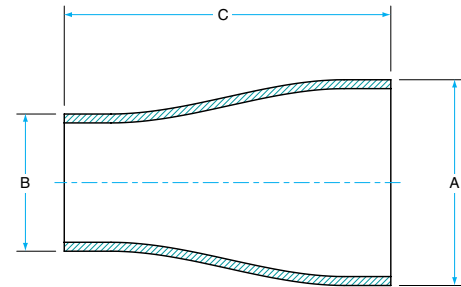
- Used in vacuum roughing lines on semiconductor process equipment, and for forelines and pump exhaust lines in semiconductor subfabs.
- Available in 304 stainless steel.



NOTE: Conical adapter nipples are available with various flange combinations. Other reducer combinations can be supplied upon request. Contact us for more information.

Conical Reducers

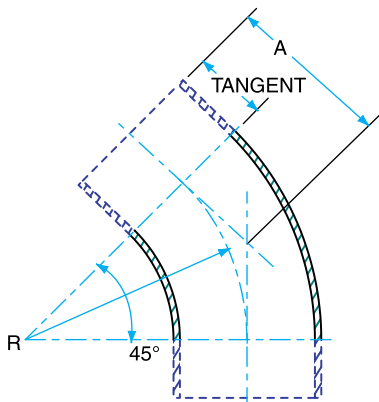
Provide a compact means of adapting to a smaller diameter tube with minimal loss in conductance.



SPECIFICATIONS

Vacuum Range: $\geq 1 \times 10^{-13}$ Torr
Temperature Range: -200° to 450° C

Tube O.D. A	Tube O.D. B	Length C	Thickness	Wall (lbs.)	Weight Part No.	Price
1"	3/4"	1.38"	0.065"	1/4	B-31W100-075	Call
1 1/2"	3/4"	2.38"	0.065"	1/4	B-31W150-075	Call
1 1/2"	1"	2.38"	0.065"	1/4	B-31W150-100	Call
2"	1"	2.38"	0.065"	1/2	B-31W200-100	Call
2"	1 1/2"	2.38"	0.065"	1/2	B-31W200-150	Call
2 1/2"	1 1/2"	2.38"	0.065"	1/2	B-31W250-150	Call
2 1/2"	2"	2.38"	0.065"	1/2	B-31W250-200	Call
3"	1 1/2"	3.62"	0.065"	1	B-31W300-150	Call
3"	2"	3.62"	0.065"	1	B-31W300-200	Call
3"	2 1/2"	3.62"	0.065"	1	B-31W300-250	Call
4"	1 1/2"	3.62"	0.065"	2	B-31W400-150	Call
4"	2"	3.62"	0.065"	2	B-31W400-200	Call
4"	2 1/2"	3.62"	0.065"	2	B-31W400-250	Call
4"	3"	3.62"	0.065"	2	B-31W400-300	Call
6"	3"	5.50"	0.065"	4	B-31W600-300	Call
6"	4"	5.50"	0.065"	4	B-31W600-400	Call



NOTE: Elbows are also available with various flange combinations. Contact us for information.

Elbows

- Radius elbows offer the highest conductance geometry in a tube bend
- Some elbows feature a tangent

SPECIFICATIONS

Vacuum Range: $\geq 1 \times 10^{-13}$ Torr
Temperature Range: -200° to 450° C

45° Radius Elbows

Tube O.D.	Wall Thickness	Dimensions (in.)		Tangent	Weight (lbs.)	Part No.	Price
1/2"	0.049"	0.31	0.75		1/4	G-2WK-050	Call
3/4"	0.035"	0.41	1.00		1/4	G-2WK-075	Call
3/4"	0.065"	0.41	1.13		1/4	G-2WK-075T	Call
3/4"	0.035"	0.76	1.00	•	1/4	G-2KL-075	Call
1"	0.065"	0.62	1.50		1/4	G-2WK-100	Call
1"	0.065"	0.97	1.50	•	1/4	G-2KL-100	Call
1"	0.065"	1.19	1.50	•	1/4	G-2KL-100HW	Call
1 1/2"	0.065"	0.93	2.25		1/4	G-2WK-150	Call
1 1/2"	0.065"	1.53	2.25	•	1/4	G-2KL-150	Call
1 1/2"	0.065"	1.63	2.25	•	1/4	G-2KL-150HW	Call
2"	0.065"	1.24	3.00		3/4	G-2WK-200	Call
2"	0.065"	1.84	3.00	•	3/4	G-2KL-200	Call
2"	0.065"	2.31	3.00	•	3/4	G-2KL-200HW	Call
2 1/2"	0.065"	1.55	3.75		1	G-2WK-250	Call
2 1/2"	0.065"	3.00	3.75	•	1	G-2KL-250	Call
3"	0.065"	1.86	4.50		2	G-2WK-300	Call
3"	0.065"	3.68	4.50	•	2	G-2KL-300	Call
4"	0.083"	2.49	6.00		3	G-2WK-400	Call
4"	0.083"	4.78	6.00	•	3	G-2KL-400	Call
4"	0.083"	4.81	6.00	•	3	G-2KL-400HW	Call

► **Weld Tube Fittings**

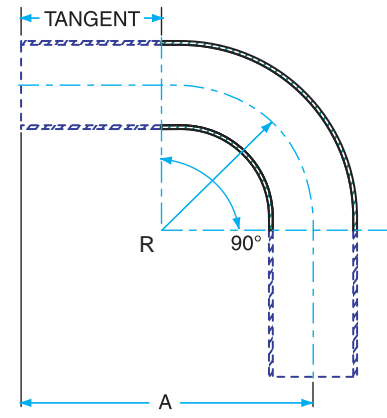
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Flanges, Fittings, & Components

■ **90° Radius Elbows**



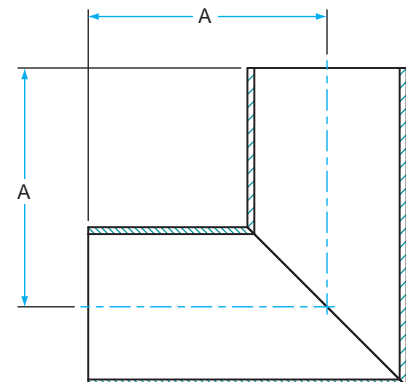
Tube O.D.	Wall Thickness	Dimensions (in.)		Tangent	Weight (lbs.)	Part No.	Price
		A	R				
1/2"	0.049"	0.75	0.75		1/4	G-2WC-050	Call
3/4"	0.035"	1.00	1.00		1/4	G-2WC-075	Call
3/4"	0.035"	1.42	1.00	•	1/4	G-2WC-075H	Call
1"	0.065"	1.50	1.50		1/4	G-2WC-100	Call
1"	0.065"	1.82	1.50	•	1/4	G-2WC-100H	Call
1"	0.065"	2.06	1.50	•	1/4	G-2WC-100HW	Call
1 1/2"	0.065"	2.25	2.25		1/2	G-2WC-150	Call
1 1/2"	0.065"	2.41	2.25	•	1/2	G-2WC-150H	Call
1 1/2"	0.065"	2.94	2.25	•	1/2	G-2WC-150HW	Call
1 1/2"	0.065"	4.97	2.25	•	1/2	G-2WC-150HL	Call
2"	0.065"	3.00	3.00		3/4	G-2WC-200	Call
2"	0.065"	4.06	3.00	•	3/4	G-2WC-200H	Call
2"	0.065"	5.36	3.00	•	3/4	G-2WC-200HL	Call
2 1/2"	0.065"	3.75	3.75		1	G-2WC-250	Call
2 1/2"	0.065"	5.19	3.75	•	1	G-2WC-250H	Call
3"	0.065"	4.50	4.50		2	G-2WC-300	Call
3"	0.065"	6.31	4.50	•	2	G-2WC-300H	Call
4"	0.083"	6.00	6.00		4	G-2WC-400	Call
4"	0.083"	8.31	6.00	•	4	G-2WC-400H	Call



■ **90° Mitered Elbows**



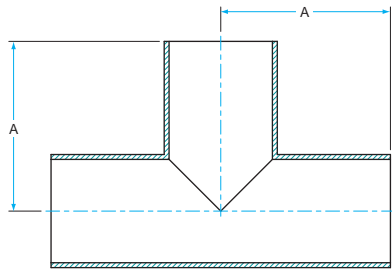
Tube O.D.	Wall Thickness	A	Weight (lbs.)	Part No.	Price
3/4"	0.035"	1.00"	1/4	E-075M	Call
1"	0.065"	1.88"	1/4	E-100M	Call
1 1/2"	0.065"	2.25"	1/2	E-150M	Call
1 1/2"	0.065"	2.41"	1/2	E-150MH	Call
2"	0.065"	3.00"	3/4	E-200M	Call
2"	0.065"	2.61"	3/4	E-200MH	Call
2 1/2"	0.065"	3.00"	1	E-250M	Call
2 1/2"	0.065"	3.75"	1	E-250MV	Call
3"	0.065"	3.25"	2	E-300M	Call
4"	0.083"	3.88"	4	E-400M	Call
4"	0.083"	4.87"	4 1/2	E-400MV	Call
5"	0.083"	4.25"	5	E-500M	Call
6"	0.083"	5.00"	7	E-600M	Call
6"	0.083"	6.06"	8	E-600MV	Call
8"	0.120"	7.00"	13	E-800M	Call
10"	0.120"	9.50"	19	E-1000M	Call



Weld Tube Fittings

Flanges, Fittings, & Components

1



Tees

- Fabricated with the pulled-port technique and full penetration welds
- Features crevice-free weld joints
- Maximum cleanliness for UHV applications

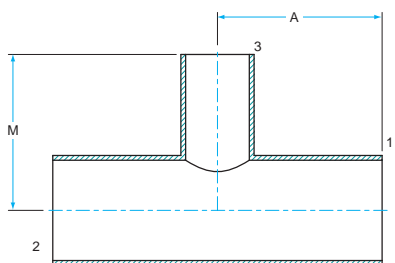
SPECIFICATIONS

Vacuum Range: $\geq 1 \times 10^{-13}$ Torr
 Temperature Range: -200° to 450° C

NOTE: These fittings are also offered with various flange combinations. Other sizes are available on request. Contact us for information.

Tube O.D.	Wall Thickness	A	Weight (lbs.)	Part No.	Price
1/2"	0.049"	0.75"	1/4	G-7W-050	Call
3/4"	0.035"	1.00"	1/4	G-7W-075	Call
3/4"	0.065"	1.88"	1/4	G-7W-075HW	Call
3/4"	0.065"	1.00"	1/4	G-7W-075T	Call
1"	0.065"	1.88"	1/4	G-7W-100	Call
1 1/2"	0.065"	2.25"	1/2	G-7W-150	Call
1 1/2"	0.065"	2.41"	1/2	G-7W-150H	Call
2"	0.065"	3.00"	1	G-7W-200	Call
2"	0.065"	2.61"	1	G-7W-200H	Call
2 1/2"	0.065"	3.00"	2	G-7W-250	Call
2 1/2"	0.065"	3.75"	2	G-7W-250V	Call
3"	0.065"	3.25"	3	G-7W-300	Call
4"	0.083"	3.88"	5	G-7W-400	Call
4"	0.083"	4.87"	5	G-7W-400V	Call
5"	0.083"	4.25"	5	G-7W-500	Call
6"	0.083"	5.00"	7	G-7W-600	Call
6"	0.083"	6.06"	7	G-7W-600V	Call
8"	0.120"	7.00"	15	G-7W-800	Call
10"	0.120"	9.50"	23	G-7W-1000	Call

Reducer Tees



Tube 1 & 2 Arm O.D.	Tube 3 Leg O.D.	Dimensions (in.)		Weight (lbs.)	Part No.	Price
		A	B			
1"	1/2"	1.88	1.00	1/2	G-7WR-100050	Call
1"	3/4"	1.88	1.12	1/2	G-7WR-100075	Call
1 1/2"	1/2"	2.25	1.25	1/2	G-7WR-1500050	Call
1 1/2"	3/4"	2.25	1.38	1/2	G-7WR-150075	Call
1 1/2"	1"	2.25	2.13	1/2	G-7WR-150100	Call
2"	1/2"	3.00	1.50	3/4	G-7WR-200050	Call
2"	3/4"	3.00	1.63	3/4	G-7WR-200075	Call
2"	1"	3.00	2.38	1	G-7WR-200100	Call
2"	1 1/2"	3.00	2.50	1	G-7WR-200150	Call
2 1/2"	1 1/2"	3.00	2.75	2 1/2	G-7WR-250150	Call
2 1/2"	2"	3.00	3.25	3	G-7WR-250200	Call
3"	1 1/2"	3.25	3.00	3	G-7WR-300150	Call
3"	2"	3.25	3.50	3	G-7WR-300200	Call
3"	2 1/2"	3.25	3.25	3	G-7WR-300250	Call
4"	1 1/2"	3.88	3.50	4	G-7WR-400150	Call
4"	2"	3.88	4.00	4	G-7WR-400200	Call
4"	2 1/2"	3.88	3.75	4	G-7WR-400250	Call
4"	3"	3.88	3.75	4	G-7WR-400300	Call
5"	4"	4.25	4.38	6	G-7WR-500400	Call
6"	1 1/2"	5.00	4.50	8	G-7WR-600150	Call
6"	2"	5.00	5.00	8	G-7WR-600200	Call
6"	2 1/2"	5.00	4.75	8	G-7WR-600250	Call
6"	4"	5.00	4.88	8	G-7WR-600400	Call
6"	5"	5.00	4.75	8	G-7WR-600500	Call
8"	6"	7.00	6.00	10	G-7WR-800600	Call

Weld Tube Fittings

1 Flanges, Fittings, & Components

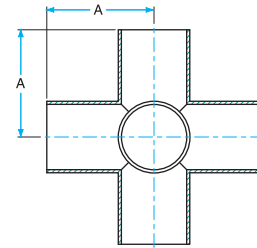
Crosses

- Fabricated with pulled-port technique and full penetration butt welds
- Maximum cleanliness for UHV applications
- Features crevice-free weld joints

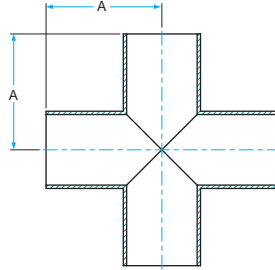
SPECIFICATIONS

Vacuum Range: $\geq 1 \times 10^{-13}$ Torr
Temperature Range: -200° to 450° C

NOTE: These fittings are also offered with various flange combinations. Other sizes and reducer combinations are available on request. Contact us for information.



"A" SAME FOR 5TH & 6TH LEG

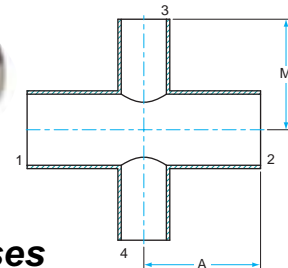


4-Way Crosses

Tube O.D.	Wall Thickness	A	Weight (lbs.)	Part No.	Price
1/2"	0.049"	0.75"	1/4	G-9W-050	Call
3/4"	0.035"	1.00"	1/4	G-9W-075	Call
1"	0.065"	1.88"	1/4	G-9W-100	Call
1 1/2"	0.065"	2.25"	3/4	G-9W-150	Call
1 1/2"	0.065"	2.41"	1	G-9W-150H	Call
2"	0.065"	3.00"	1	G-9W-200	Call
2"	0.065"	2.61"	2	G-9W-200H	Call
2 1/2"	0.065"	3.00"	3	G-9W-250	Call
2 1/2"	0.065"	3.75"	3	G-9W-250V	Call
3"	0.065"	3.25"	4	G-9W-300	Call
4"	0.083"	3.88"	6	G-9W-400	Call
4"	0.083"	4.87"	6	G-9W-400V	Call
5"	0.083"	4.25"	8	G-9W-500	Call
6"	0.083"	5.00"	10	G-9W-600	Call
6"	0.083"	6.06"	11	G-9W-600V	Call
8"	0.120"	7.00"	17	G-9W-800	Call
10"	0.120"	9.50"	20	G-9W-1000	Call

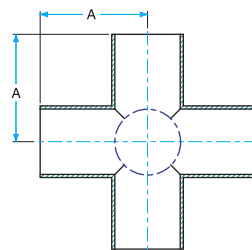
6-Way Crosses

Tube O.D.	Wall Thickness	A	Weight (lbs.)	Part No.	Price
3/4"	0.035"	1.00"	1/4	G-11W-075	Call
1"	0.065"	1.88"	1/2	G-11W-100	Call
1 1/2"	0.065"	2.25"	1	G-11W-150	Call
2"	0.065"	3.00"	2	G-11W-200	Call
2 1/2"	0.065"	3.00"	3	G-11W-250	Call
2 1/2"	0.065"	3.75"	3	G-11W-250V	Call
3"	0.065"	3.25"	3	G-11W-300	Call
4"	0.083"	3.88"	6	G-11W-400	Call
4"	0.083"	4.87"	6	G-11W-400V	Call
5"	0.083"	4.25"	8	G-11W-500	Call
6"	0.083"	5.00"	11	G-11W-600	Call
6"	0.083"	6.06"	12	G-11W-600V	Call
8"	0.120"	7.00"	19	G-11W-800	Call
10"	0.120"	9.50"	22	G-11W-1000	Call



Reducer Crosses

Tube O.D.	Tube O.D.	Dimensions (in.)		Weight (lbs.)	Part No.	Price
Large	Small	A	M			
1"	1/2"	1.88	1.00	1/2	G-9WR-100050	Call
1"	3/4"	1.88	1.12	3/4	G-9WR-100075	Call
1 1/2"	1/2"	2.25	1.25	3/4	G-9WR-150050	Call
1 1/2"	3/4"	2.25	1.38	3/4	G-9WR-150075	Call
1 1/2"	1"	2.25	2.13	3/4	G-9WR-150100	Call
2"	1/2"	3.00	1.50	1	G-9WR-200050	Call
2"	3/4"	3.00	1.63	1	G-9WR-200075	Call
2"	1 1/2"	3.00	2.50	1	G-9WR-200150	Call
2 1/2"	1 1/2"	3.00	2.75	3	G-9WR-250150	Call
2 1/2"	2"	3.00	3.25	3	G-9WR-250200	Call
3"	1 1/2"	3.25	3.00	3	G-9WR-300150	Call
3"	2"	3.25	3.50	3	G-9WR-300200	Call
3"	2 1/2"	3.25	3.25	3	G-9WR-300250	Call
4"	1 1/2"	3.88	3.50	5	G-9WR-400150	Call
4"	2"	3.88	4.00	5	G-9WR-400200	Call
4"	2 1/2"	3.88	3.75	5	G-9WR-400250	Call
4"	3"	3.88	3.75	5	G-9WR-400300	Call
5"	4"	4.25	4.38	7	G-9WR-500400	Call
6"	1 1/2"	5.00	4.50	8	G-9WR-600150	Call
6"	2"	5.00	5.00	8	G-9WR-600200	Call
6"	2 1/2"	5.00	4.75	8	G-9WR-600250	Call
6"	3"	5.00	4.75	9	G-9WR-600300	Call
6"	4"	5.00	4.88	9	G-9WR-600400	Call
6"	5"	5.00	4.75	9	G-9WR-600500	Call
8"	6"	7.00	6.00	12	G-9WR-800600	Call



"A" SAME FOR 5TH LEG

5-Way Crosses

Tube O.D.	Wall Thickness	A	Weight (lbs.)	Part No.	Price
3/4"	0.035"	1.00"	1/4	G-10W-075	Call
1"	0.065"	1.88"	1/2	G-10W-100	Call
1 1/2"	0.065"	2.25"	1	G-10W-150	Call
2"	0.065"	3.00"	1	G-10W-200	Call
2 1/2"	0.065"	3.00"	2	G-10W-250	Call
2 1/2"	0.065"	3.75"	3	G-10W-250V	Call
3"	0.065"	3.25"	3	G-10W-300	Call
4"	0.083"	3.88"	6	G-10W-400	Call
4"	0.083"	4.87"	6	G-10W-400V	Call
5"	0.083"	4.25"	8	G-10W-500	Call
6"	0.083"	5.00"	10	G-10W-600	Call
6"	0.083"	6.06"	11	G-10W-600V	Call
8"	0.120"	7.00"	18	G-10W-800	Call
10"	0.120"	9.50"	21	G-10W-1000	Call

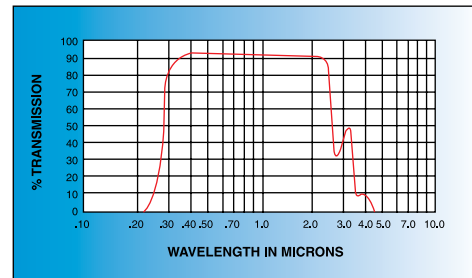
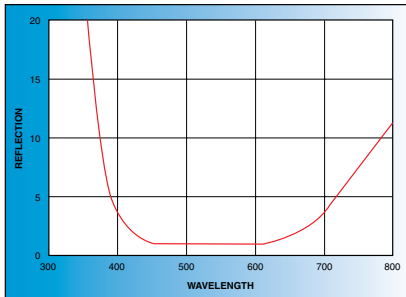
Viewports

CF Flanged Zero Length Kodial Glass Viewports

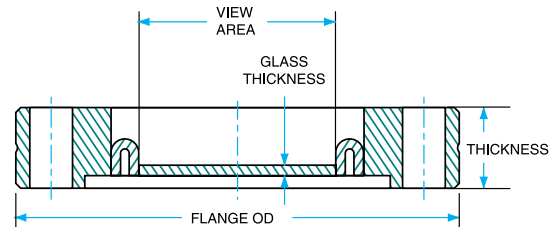
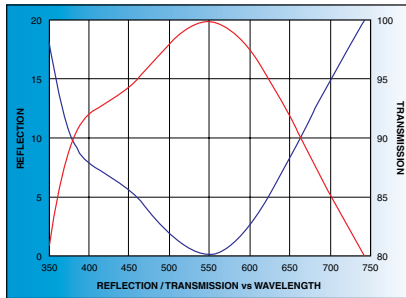
NOTE: It is strongly recommended that the user read the Technical Notes at the beginning of this section before baking any viewport.

NOTE: All stainless-steel-flanged viewports should be connected to system flanges using fully annealed copper gaskets.

- Compatible with UHV pressures to 1×10^{-10} Torr
- Offer a relatively large distortion-free viewing area with no interior voids that might create virtual leaks or dirt traps
- Optical discs are commercial grade and fully annealed
- Kodial glass (alkali borosilicate 7056)
- Glass is sealed to a Kovar® transition piece before welding to the 304 stainless steel flange
- Withstand repeated bakeout cycles to 350° C (heating rate should not exceed 2–3° C per minute, nor should the viewport be exposed to direct thermal radiation)



Kodial



CF Flange Size	Glass Type	Feature	Flange Thickness	Glass Thickness	View Area	Part No.	Price
10"	Kodial	Standard	0.97"	8.0 mm	136 mm	VPZL-1000	Call
1 1/8"	Kodial	Standard	0.5"	1.6 mm	16 mm	VPZL-133	Call
1 1/8"	Kodial	AR Coating Optimized @ 550nm	0.5"	1 mm	16 mm	VPZL-133AR	Call
1 1/8"	Kodial	Broadband AR Coating, 400-600nm	0.5"	1 mm	16 mm	VPZL-133BBAR	Call
1 1/8"	Kodial	ITO Coating	0.5"	1 mm	16 mm	VPZL-133ITO	Call
1 1/8"	Kodial	Lead Glass Disc	0.5"	1 mm	16 mm	VPZL-133LG	Call
2 1/8"	Kodial	Standard	0.5"	1.6 mm	16 mm	VPZL-212	Call
2 3/4"	Kodial	Standard	0.5"	3.0 mm	38 mm	VPZL-275	Call
2 3/4"	Kodial	AR Coating Optimized @ 550nm	0.5"	2.5 mm	32 mm	VPZL-275AR	Call
2 3/4"	Kodial	Broadband AR Coating, 400-600nm	0.5"	2.5 mm	32 mm	VPZL-275BBAR	Call
2 3/4"	Kodial	ITO Coating	0.5"	2.5 mm	32 mm	VPZL-275ITO	Call
2 3/4"	Kodial	Lead Glass Disc	0.5"	2.5 mm	32 mm	VPZL-275LG	Call
3 3/8"	Kodial	Standard	0.625"	3.5 mm	38 mm	VPZL-337	Call
4 1/2"	Kodial	Standard	0.68"	3.5 mm	63 mm	VPZL-450	Call
4 1/2"	Kodial	AR Coating Optimized @ 550nm	0.68"	3 mm	63 mm	VPZL-450AR	Call
4 1/2"	Kodial	Broadband AR Coating, 400-600nm	0.68"	3 mm	63 mm	VPZL-450BBAR	Call
4 1/2"	Kodial	ITO Coating	0.68"	3 mm	63 mm	VPZL-450ITO	Call
4 1/2"	Kodial	Lead Glass Disc	0.68"	3 mm	63 mm	VPZL-450LG	Call
4 5/8"	Kodial	Standard	0.75"	3.5 mm	63 mm	VPZL-463	Call
6"	Kodial	Standard	0.78"	6.0 mm	89 mm	VPZL-600	Call
6 3/4"	Kodial	Standard	0.84"	6.0 mm	89 mm	VPZL-675	Call
8"	Kodial	Standard	0.88"	8.0 mm	136 mm	VPZL-800	Call

► Viewports

■ CF Flanged Zero Length Optical Glass Viewports

- Built from the highest-quality 304 stainless steel to UHV standards
- Compatible with pressure system capable of reaching pressures below 1×10^{-10} Torr

Normal Quartz:

- Bonded through a lead-silver alloy sealed to non-magnetic transition metal
- Limited 200° C bakeout

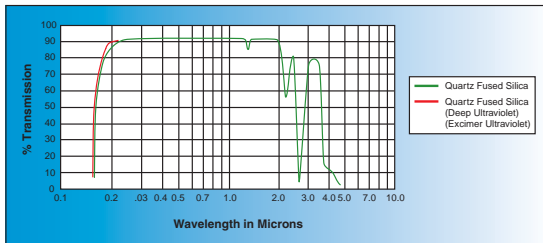
Sapphire:

- Brazed to a magnetic transition piece (42% Ni/Fe alloy) that's welded to a flange
- Will withstand 350° C

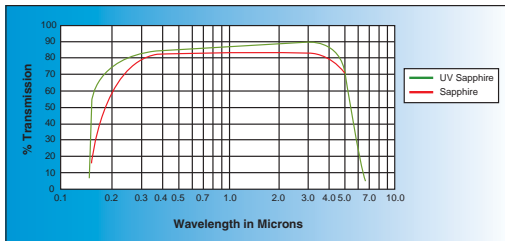
Also...

- Viewports should be sealed with fully annealed copper gaskets to reduce induced strain
- We cannot guarantee quartz and sapphire viewports free from strain or polarization effects
- The viewing angle listed will be impaired if the mounting port is longer than the recommended length
- If the process deposits material, we strongly recommend a viewport shutter because some deposits will cause permanent damage to the special windows

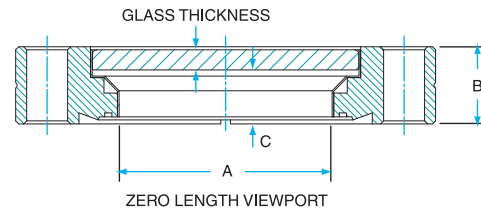
CAUTION: Although sapphire has a reasonable thermal conductivity, for safety, we strongly recommend that no viewport is exposed to a temperature ramp of greater than 2–3° C per minute, and that no viewport be exposed to direct thermal radiation. To limit thermal gradients when heating viewports, we recommend the viewing area and the flange be covered with many layers of aluminum foil to act as a reflective shield.



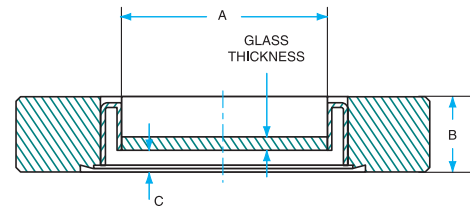
Quartz Viewports



Sapphire Viewports



Quartz Viewports

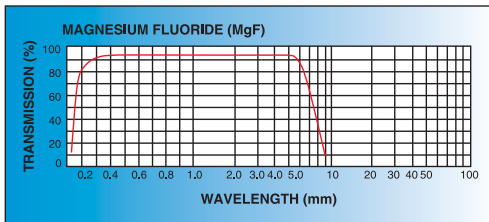
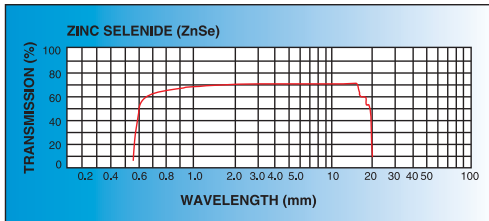
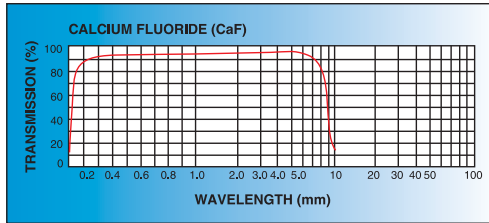


Sapphire Viewports

Material	Mounting	Dimensions (in.)			Glass	Part No.	Price
Quartz Viewports:	CF Flange	A	B	C	Thickness		
Quartz Fused Silica	1 1/8"	0.63	0.29	0.17	0.10"	VPZL-133Q	Call
Quartz Fused Silica	2 3/4"	1.40	0.50	0.35	0.13"	VPZL-275Q	Call
Quartz Fused Silica (Deep Ultraviolet)	2 3/4"	1.40	0.50	0.35	0.13"	VPZL-275DU	Call
Quartz Fused Silica (Excimer Ultraviolet)	2 3/4"	1.40	0.50	0.35	0.13"	VPZL-275EU	Call
Quartz Fused Silica	3 5/8"	1.40	0.62	0.35	0.13"	VPZL-337Q	Call
Quartz Fused Silica	4 1/2"	2.69	0.68	0.41	0.25"	VPZL-450Q	Call
Quartz Fused Silica	6"	3.88	0.78	0.51	0.25"	VPZL-600Q	Call
Quartz Fused Silica	8"	5.38	0.88	0.48	0.37"	VPZL-800Q	Call
Quartz Fused Silica	10"	7.78	0.97	0.53	0.37"	VPZL-1000Q	Call

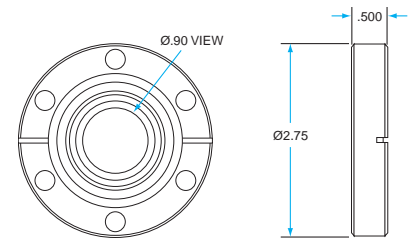
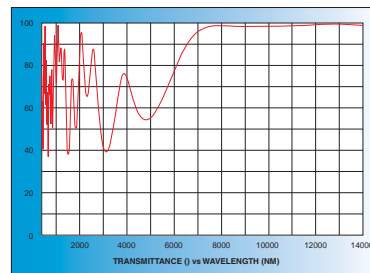
Material	Mounting	Flange	Dimensions (in.)			Glass	Part No.	Price
Sapphire Viewports:	CF Flange	O.D.	A	B	C	Thickness		
UV Sapphire	2 3/4"	2 3/4"	0.94	0.5	0.08	0.080"	VPZL-275S	Call
UV Sapphire	4 1/2"	4 1/2"	1.44	0.68	0.13	0.080"	VPZL-450S	Call
Sapphire	4 1/2"	4 1/2"	1.94	0.68	0.10	0.094"	VPZL-450SW	Call
Sapphire	6"	6"	1.94	0.78	0.10	0.094"	VPZL-600S200	Call

Viewports



CF Flanged Zero Length Exotic Glass Viewports

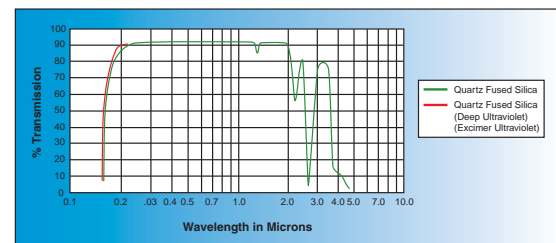
- UHV compatible 304L stainless steel CF flange
- Optical discs available in zinc selenide, magnesium fluoride, calcium fluoride, and zinc selenide
- Parallelism less than 3 arc seconds
- Flatness of $\lambda/4$



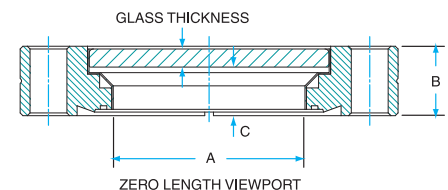
CF Flange Size	View Area	Coating	Window Material	Window Thickness	Max Bakeout	Part No.	Price
2 $\frac{3}{4}$ "	0.90"	N/A	Calcium Fluoride (20-10 Finish)	0.10"	200° C	VPZL-275UC	Call
2 $\frac{3}{4}$ "	0.90"	N/A	Magnesium Fluoride (20-10 Finish)	0.10"	200° C	VPZL-275UM	Call
2 $\frac{3}{4}$ "	0.90"	N/A	Zinc Selenide (40-20 Finish)	0.10"	200° C	VPZL-275UZ	Call
2 $\frac{3}{4}$ "	0.90"	8-12 Microns, R (avg) < 0.5% Per Surface (Coated Both Sides)	Zinc Selenide (40-20 Finish)	0.10"	150° C	VPZL-275UZC	Call
4 $\frac{1}{2}$ "	1.88"	N/A	Calcium Fluoride (20-10 Finish)	0.15"	200° C	VPZL-450UC	Call
4 $\frac{1}{2}$ "	1.88"	N/A	Magnesium Fluoride (20-10 Finish)	0.15"	200° C	VPZL-450UM	Call
4 $\frac{1}{2}$ "	1.88"	N/A	Zinc Selenide (40-20 Finish)	0.15"	200° C	VPZL-450UZ	Call
4 $\frac{1}{2}$ "	1.88"	8-12 Microns, R (avg) < 0.5% Per Surface (Coated Both Sides)	Zinc Selenide (40-20 Finish)	0.15"	150° C	VPZL-450UZC	Call

CF Flanged Zero Length Non-Magnetic Quartz Viewports

- UHV compatible
- Large viewing area (viewing angle may be impaired if the mounting port is longer than the recommended length)
- Optical discs are constructed from quartz glass
- Quartz glass is bonded to a titanium sleeve and mounted to a 316LN stainless steel CF flange
- Bakeout limited to 200° C (heating rate should not exceed 2-3° C per minute)
- Quartz viewports may exhibit strain or polarization effects



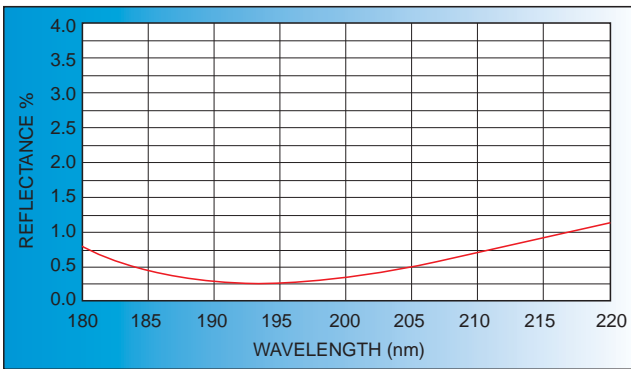
CF Flange Size	Glass Type	Dimensions (in.)			Glass Thickness	Part No.	Price
		A	B	C			
1 $\frac{1}{8}$ "	Quartz Fused Silica	0.63"	0.35"	0.23"	0.10"	VPZL-133QNM	Call
2 $\frac{1}{4}$ "	Quartz Fused Silica	1.40"	0.50"	0.35"	0.13"	VPZL-275QNM	Call



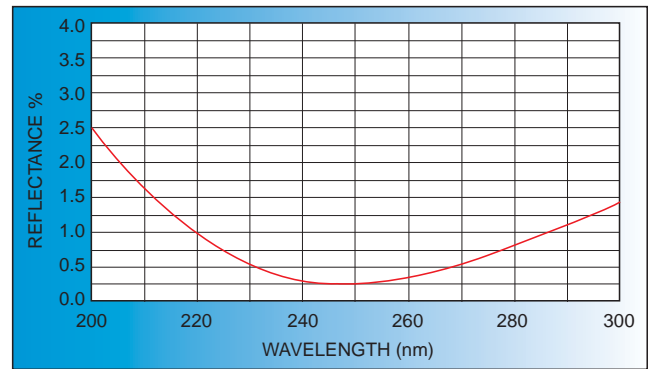
► Viewports

■ **CF Flanged Zero Length Laser Transmission Viewports**

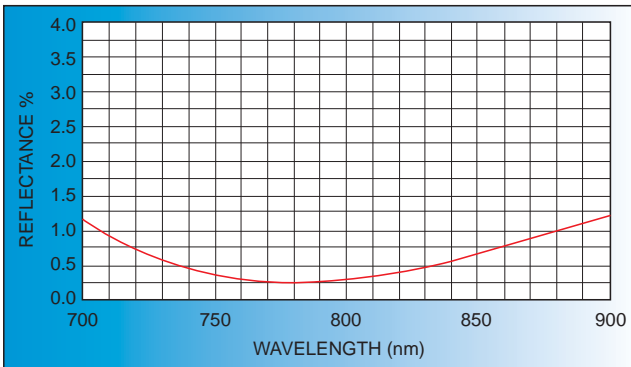
- UHV compatible 304L stainless steel CF flange
- Corning HPFS 7980 fused silica glass construction has 20/10 scratch-dig surface finish
- Parallelism less than 3 arc seconds
- Flatness of $\lambda/4$
- Maximum 200° C bakeout



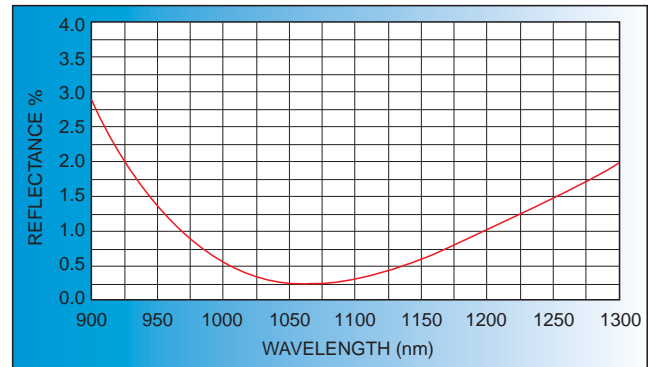
LARF



LKRF



LDIO

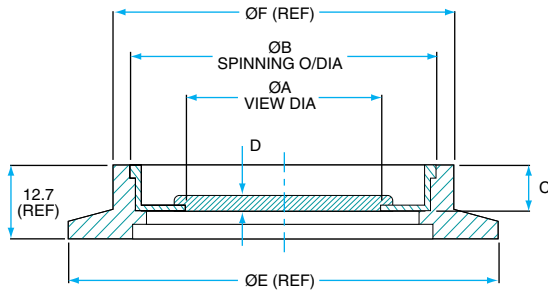


LYAG

CF Flange Size	Glass Type	View Area	Coating	Transmission Grade	Threshold (102ns pulse)	Part No.	Price
2 3/4"	193 nm ArF Excimer Laser	1.4"	V-Coat 193 nm	Excimer Grade	1 J/cm ²	VPZL-275LARF	Call
2 3/4"	780 nm Diode Laser	1.4"	V-Coat 780 nm	DUV Grade	10 J/cm ²	VPZL-275LDIO	Call
2 3/4"	248 nm KrF Excimer Laser	1.4"	V-Coat 248 nm	DUV Grade	1 J/cm ²	VPZL-275LKRF	Call
2 3/4"	1064 nm YAG Laser	1.4"	V-Coat 1064 nm	IR Grade	10 J/cm ²	VPZL-275LYAG	Call
4 1/2"	193 nm ArF Excimer Laser	2.69"	V-Coat 193 nm	Excimer Grade	1 J/cm ²	VPZL-450LARF	Call
4 1/2"	780 nm Diode Laser	2.69"	V-Coat 780 nm	DUV Grade	10 J/cm ²	VPZL-450LDIO	Call
4 1/2"	248 nm KrF Excimer Laser	2.69"	V-Coat 248 nm	DUV Grade	1 J/cm ²	VPZL-450LKRF	Call
4 1/2"	1064 nm YAG Laser	2.69"	V-Coat 1064 nm	IR Grade	10 J/cm ²	VPZL-450LYAG	Call

Viewports

KF (QF) Flanged Kodial Glass Viewports



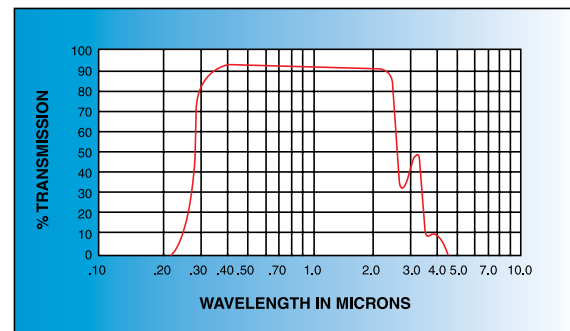
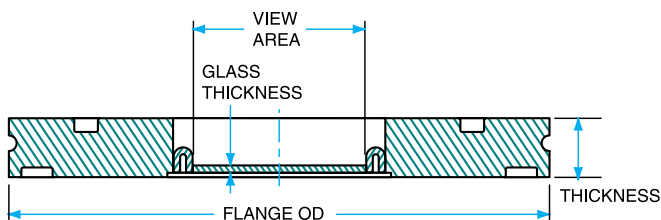
- Made from 304 stainless steel and Kodial glass sealed with a fluorocarbon o-ring
- Due to the performance of fluorocarbon o-rings, the maximum temperature allowed is 200° C

KF Flange Size	Dimensions (mm)						Part No.	Price
	A	B	C	D	E	F		
16	16	19	8.5	1.6	30	22	QF16-075-VP	Call
25	16	19	8.5	1.6	40	25.4	QF25-100-VP	Call
40	32	42	8.5	3.0	55	44.5	QF40-150-VP	Call
50	32	42	7.0	3.0	75	50.5	QF50-200-VP	Call

ISO Flanged Zero Length Kodial Glass Viewports

NOTE: It is strongly recommended that the user read the Technical Notes at the beginning of this section before baking any viewport.

- Offer a relatively large distortion-free viewing area with no interior voids that might create virtual leaks or dirt traps
- Optical discs are commercial grade and fully annealed
- Kodial glass (alkali borosilicate 7056)
- Glass is sealed to a Kovar® transition piece before welding to the 304 stainless steel flange
- Due to the performance of fluorocarbon o-rings, the maximum temperature allowed is 200° C

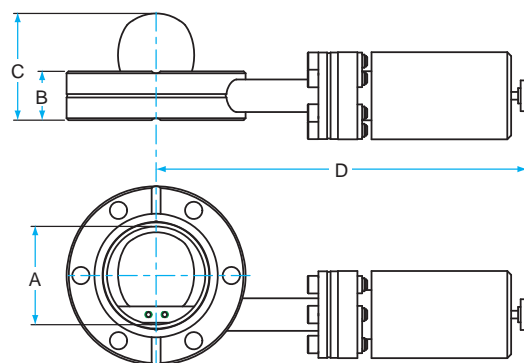


ISO-K Mounting Flange	Flange O.D. (mm)	Thickness (mm)	View Area (mm)	Glass Thickness (mm)	Glass Description	Part No.	Price
63	95	12	32	2.5	Kodial	VPZL-63	Call
80	110	12	32	2.5	Kodial	VPZL-80	Call
100	130	12	63	3	Kodial	VPZL-100	Call
160	180	12	89	4	Kodial	VPZL-160	Call

▶ Viewport Shutters

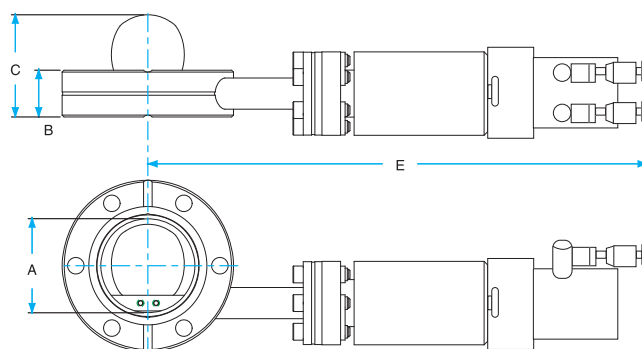
■ KJLC Viewport Shutters

- Prevent deposition materials from depositing on and ruining viewports
- Shutters are opened in safe conditions, closed while deposition occurs
- Operate to base pressures below 10^{-9} Torr
- Bakeable to 250° C



■ Manual Viewport Shutters

- Feature a circular flapper plate 90° mounted on a tangential axis, sweeping through
- Flapper plate is rotated by a magnetic rotary drive feedthrough
- Feedthrough knob houses a thumb screw to keep the flapper open in a desired position and to adjust the drive torque



■ Pneumatic Viewport Shutters

- Solenoid-operated spool valve switches compressed gas between actuator ports (energized to sweep, de-energized to return [not Included])
- Pneumatic actuator has adjustable stops for sweep adjustment
- Flow regulators are installed at each port to regulate air pressure
- Actuator assembly is easily removable with two cap screws for bakeout
- 98 psi maximum input air pressure

NOTE: We strongly recommend shutters for evaporation and sputtering systems in which material may deposit on the viewport viewing area.

NOTE: The "E" dimension is applicable to only the pneumatic viewport shutters, whereas the "D" dimension is applicable to the manual viewport shutters.

Shutter Type	CF Flange O.D.	Mating Viewports*	Gasket Reference* (2 Required)	Bolt Set Reference*	Dimensions (in.)					Part No.	Price
					A	B	C	D	E		
Manual	2 ³ / ₄ "	VPZL-275	VZCUA38	HBS25028225	1.51	0.75	1.75	5.63	N/A	DS275VPS	Call
Pneumatic	2 ³ / ₄ "	VPZL-275	VZCUA38	HBS25028225	1.51	0.75	1.75	N/A	8.38	DS275VPS-P	Call
Manual	4 ¹ / ₂ "	VPZL-450	VZCUA64	HBS31224250	2.51	0.68	2.38	6.50	N/A	DS450VPS	Call
Pneumatic	4 ¹ / ₂ "	VPZL-450	VZCUA64	HBS31224250	2.51	0.68	2.38	N/A	9.25	DS450VPS-P	Call
Manual	4 ⁵ / ₈ "	VPZL-463	VZCUA76	HBS31224250	3.01	0.75	2.50	6.56	N/A	DS462VPS	Call
Pneumatic	4 ⁵ / ₈ "	VPZL-463	VZCUA76	HBS31224250	3.01	0.75	2.50	N/A	9.31	DS462VPS-P	Call
Manual	6"	VPZL-600	VZCUA100	HBS31224300	4.01	0.78	3.19	7.19	N/A	DS600VPS	Call
Pneumatic	6"	VPZL-600	VZCUA100	HBS31224300	4.01	0.78	3.19	N/A	9.94	DS600VPS-P	Call
Manual	8"	VPZL-800	VZCUA150	HBS31224300	6.02	0.87	5.41	7.88	N/A	DS800VPS	Call
Pneumatic	8"	VPZL-800	VZCUA150	HBS31224300	6.02	0.87	5.41	N/A	10.63	DS800VPS-P	Call

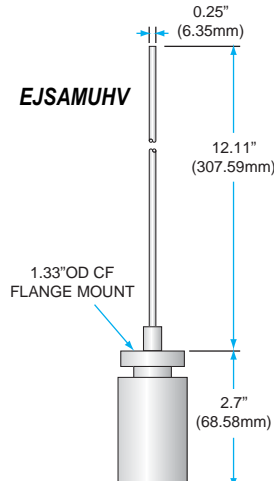
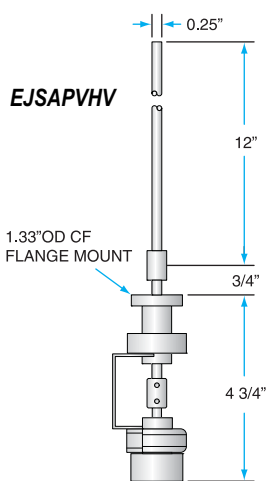
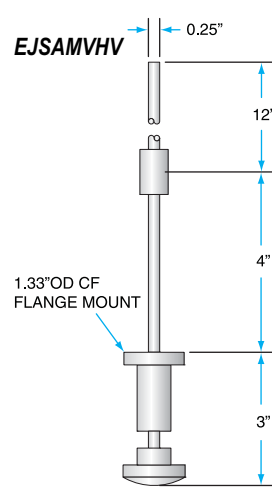
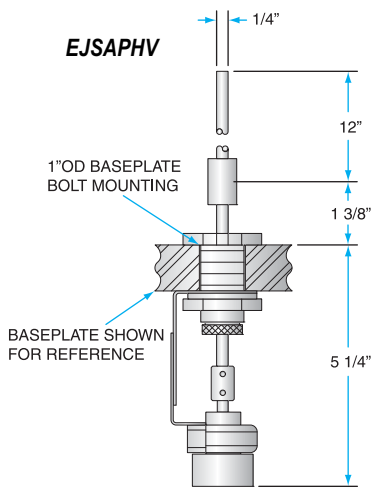
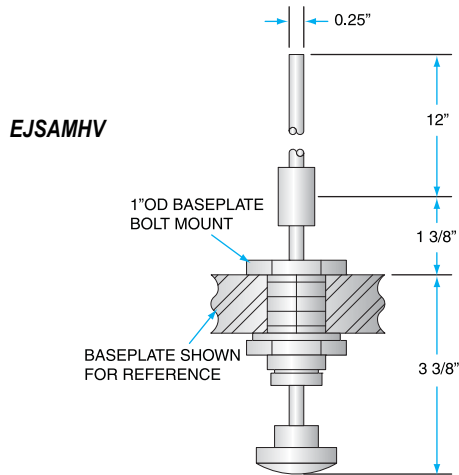
* Part numbers for reference only, not included.

Shutters

Shutter Actuators

1

Flanges, Fittings, & Components



For thin film deposition processes, the operator must be able to cut off the flow of target material to the substrate at any instant. Typically, switching off the power to the deposition source is too slow and may be undesirable if the user wishes to form another film with that target material a short time later. Shutters, actuated by some external action, are used to obstruct material flow.

Kurt J. Lesker Company offers several models of shutter actuators for HV, VHV, and UHV conditions:

- High vacuum models: Feature o-ring seals for the rotating shaft that moves the shutter. They are often mounted on baseplate holes
- Very high vacuum models: Utilize Ferro Magnetic Fluid Sealed Drives that use magnetic liquid o-rings
- Ultra-high vacuum models: Mounted on CF flanges and sealed with either bellows (on the mini model) or a MagiDrive™ mechanism

Shutter actuators can be ordered in manual or pneumatic versions.

Description	Part No.	Price
HV Manual Shutter Actuator, O-Ring Sealed, Baseplate Mount	EJSAMHV	Call
HV Pneumatic Shutter Actuator, O-Ring Sealed, Baseplate Mount	EJSAPHV	Call
VHV Manual Shutter Actuator, Ferro Magnetic Fluid Sealed, CF Mount Flange	EJSAMVHV	Call
VHV Pneumatic Shutter Actuator, Ferro Magnetic Fluid Sealed, CF Flange Flange	EJSAPVHV	Call
UHV Manual Shutter Actuator, MagiDrive Sealed, CF Flange Mount	EJSAMUHV	Call
UHV Pneumatic Shutter Actuator, MagiDrive Sealed, CF Flange Mount	EJSAPUHV	Call

NOTE: Descriptions of rotary drive mechanisms, such as Ferro Magnetic Drives and MagiDrive, are found in the Technical Notes section of Rotary Motion Feedthroughs.

NOTE: Shutter blades, extension shafts, bolts, or shutter arms are not included in the cost of a shutter actuator in the prices listed.

■ **Shutter Blade Kits**

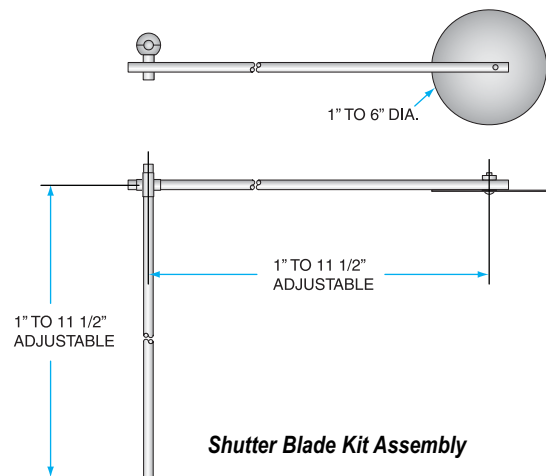
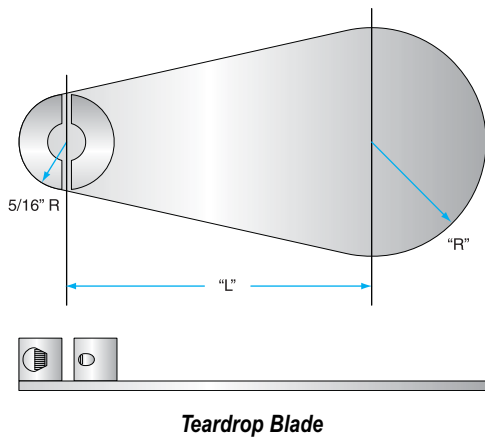
For thin film deposition processes, the operator must be able to cut off the flow of target material at any moment, often without shutting off the power to the deposition source. Shutters obstruct material flow by external action.

Shutter blade kit contents:

- Six blades (1", 2", 3", 4", 5", and 6" diameter sizes)
- Shutter arm
- Shutter extension shaft
- Special 90° coupling
- A bolt, nut, and washer

Kit ships unassembled, enabling the user to configure it for the application.

When assembled, the shaft extends from the shutter actuator (not included with the kit) and holds the shutter arm in place. The 90° coupling connects to the arm with the bolt, nut, and washer and holds the shutter blade.



NOTE: Custom teardrop-shaped blades are also available. Please specify the "L" & "R" dimensions, and KJLC will provide a quotation.

Description	Part No.	Price
Shutter Blade Kit	EJSHUTTERKIT	Call
Custom Teardrop Blade, 1/4" Shaft Mount (Please Specify L & R Dimensions Required)	EJBLADE-XXX	Call

► Cajon® VCR® Fittings

■ Cajon VCR Fittings

- Make excellent low-pressure gas connections
- Ideal for "lecture bottle" gas cylinders, standard helium checks, and general gas plumbing
- Withstand bakeout to 538° C (with stainless steel gaskets—204° C with copper gaskets)
- Compatible with UHV pressures



■ Nuts, Caps, & Plugs

Description	Fits Gland or Body for Tube	Part No.	Price
Female Nut	1/8"	2FVCR-N	Call
Female Nut	1/4"	4FVCR-N	Call
Female Nut	1/2"	8FVCR-N	Call
Male Nut	1/8"	2MVCR-N	Call
Male Nut	1/4"	4MVCR-N	Call
Male Nut	1/2"	8MVCR-N	Call
Plug	1/8"	2MVCR-P	Call
Plug	1/4"	4MVCR-P	Call
Plug	1/2"	8MVCR-P	Call
Cap	1/4"	4FVCR-CP	Call
Cap	1/2"	8FVCR-CP	Call

NOTE: We offer a number of VCR connections welded to standard couplings and flanges. See pages 1-114 through 1-117.

■ Socket Weld Glands

Fits Tube O.D.	Part No.	Price
1/8"	2FVCR-GL	Call
1/4"	4FVCR-GL	Call
3/8"	6FVCR-GL	Call
1/2"	8FVCR-GL	Call



■ Copper (Cu) Gaskets

Description	For Connectors to Fit Tube O.D.	Part No.	Price
Gasket	1/8"	2XVCR-GAC	Call
Gasket	1/4"	4XVCR-GAC	Call
Gasket	1/2"	8XVCR-GAC	Call
Retainer Assembly	1/4"	4XVCR-GACR	Call
Retainer Assembly	1/2"	8XVCR-GACR	Call



► Cajon® VCR® Union & Adapter Fittings

■ Cajon VCR Union Fittings

- Make excellent low pressure gas connections
- Ideal for “lecture bottle” gas cylinders, standard helium checks, and general gas plumbing
- Withstand bakeout to 538° C (with stainless steel gasket) —204° C (with copper gaskets)
- Compatible with UHV pressures

NOTE: We offer a number of VCR connections welded to standard couplings and flanges. See pages 1-114 through 1-117.



Male Union

■ Male Unions

Description	One End Tube O.D.	Other End Tube O.D.	Part No.	Price
Double Male Union	1/8"	1/8"	2MVCR-2MVCR	Call
Double Male Union	1/4"	1/4"	4MVCR-4MVCR	Call
Double Male Union	1/2"	1/2"	8MVCR-8MVCR	Call
Double Male Reducing Union	1/8"	1/4"	2MVCR-4MVCR	Call
Double Male Reducing Union	1/4"	1/2"	4MVCR-8MVCR	Call
Male Bulkhead Union	1/4"	1/4"	4MVCR-BU	Call
Male Bulkhead Union	1/2"	1/2"	8MVCR-BU	Call



Female Union

■ Female Unions

Description	One End Tube O.D.	Other End Tube O.D.	Part No.	Price
Double Female Union	1/8"	1/8"	2FVCR-2FVCR	Call
Double Female Union	1/4"	1/4"	4FVCR-4FVCR	Call
Double Female Union	1/2"	1/2"	8FVCR-8FVCR	Call
Double Female Reducing Union	1/8"	1/4"	2FVCR-4FVCR	Call
Double Female Reducing Union	1/4"	1/2"	4FVCR-8FVCR	Call

■ Reducing Adapters



Male End Tube O.D.	Female End Tube O.D.	Part No.	Price
1/8"	1/4"	2MVCR-4FVCR	Call
1/4"	1/2"	4MVCR-8FVCR	Call

■ Male Tee Unions



Description	Tube O.D.	Part No.	Price
Tee Union	1/8"	2MVCR-T	Call
Tee Union	1/4"	4MVCR-T	Call
Tee Union	1/2"	8MVCR-T	Call

■ Male Elbow Unions

Description	Tube O.D.	Part No.	Price
Elbow Union	1/8"	2MVCR-E	Call
Elbow Union	1/4"	4MVCR-E	Call
Elbow Union	1/2"	8MVCR-E	Call

■ Male Cross Unions



Description	Tube O.D.	Part No.	Price
Cross Union	1/8"	2MVCR-CS	Call
Cross Union	1/4"	4MVCR-CS	Call
Cross Union	1/2"	8MVCR-CS	Call

➤ Swagelok® Adapter & Union Fittings

1 Flanges, Fittings, & Components

IN THIS SECTION ➤

Swagelok Tube Fittings

- Provide leak-proof, torque-free seals at all tubing connections
- Eliminate costly, hazardous leaks in instrumentation and process tubing
- Stainless steel fittings are used for gas systems
- Brass fittings are used in water systems



Male Adapter



Male Elbow

■ Swagelok to Male NPT Adapters

NPT Stainless Steel			
Tube O.D.	Pipe Size	Part No.	Price
1/8"	1/8"	SS-200-1-2	Call
1/8"	1/4"	SS-200-1-4	Call
1/4"	1/8"	SS-400-1-2	Call
1/4"	1/4"	SS-400-1-4	Call
3/8"	1/8"	SS-600-1-2	Call
3/8"	1/4"	SS-600-1-4	Call
NPT Brass			
1/4"	1/8"	B-400-1-2	Call
1/4"	1/4"	B-400-1-4	Call
3/8"	1/8"	B-600-1-2	Call
3/8"	1/4"	B-600-1-4	Call

■ Swagelok to Male NPT Elbow

NPT Stainless Steel			
Tube O.D.	Pipe Size	Part No.	Price
1/16"	1/16"	SS-100-2-1	Call
1/16"	1/8"	SS-100-2-2	Call
1/8"	1/8"	SS-200-2-2	Call
1/8"	1/4"	SS-200-2-4	Call
1/4"	1/8"	SS-400-2-2	Call
1/4"	1/4"	SS-400-2-4	Call
3/8"	1/8"	SS-600-2-2	Call
3/8"	1/4"	SS-600-2-4	Call
NPT Brass			
1/4"	1/8"	B-400-2-2	Call
1/4"	1/4"	B-400-2-4	Call
3/8"	1/8"	B-600-2-2	Call
3/8"	1/4"	B-600-2-4	Call



Female Adapter



Straight Union

■ Swagelok to Female NPT Adapters

NPT Stainless Steel			
Tube O.D.	Pipe Size	Part No.	Price
1/8"	1/8"	SS-200-7-2	Call
1/8"	1/4"	SS-200-7-4	Call
1/4"	1/8"	SS-400-7-2	Call
1/4"	1/4"	SS-400-7-4	Call
3/8"	1/8"	SS-600-7-2	Call
3/8"	1/4"	SS-600-7-4	Call
NPT Brass			
1/4"	1/8"	B-400-7-2	Call
1/4"	1/4"	B-400-7-4	Call
3/8"	1/8"	B-600-7-2	Call
3/8"	1/4"	B-600-7-4	Call

■ Swagelok Straight Unions

Stainless Steel		
Tube O.D.	Part No.	Price
1/16"	SS-100-6	Call
1/8"	SS-200-6	Call
1/4"	SS-400-6	Call
3/8"	SS-600-6	Call
Brass		
1/8"	B-200-6	Call
1/4"	B-400-6	Call
3/8"	B-600-6	Call

► Swagelok® Union Fittings

1

Flanges, Fittings, & Components



Bulkhead Union



Union Elbow

■ Swagelok Straight Reducing Unions

Stainless Steel			
Tube O.D.	Part No.	Price	
3/16"–1/16"	SS-300-6-1	Call	
3/16"–1/8"	SS-300-6-2	Call	
1/4"–1/16"	SS-400-6-1	Call	
1/4"–1/8"	SS-400-6-2	Call	
1/4"–3/16"	SS-400-6-3	Call	
5/16"–1/4"	SS-500-6-4	Call	
3/8"–1/4"	SS-600-6-4	Call	
Brass			
3/16"–1/8"	B-300-6-2	Call	
1/4"–3/16"	B-400-6-3	Call	
3/8"–1/4"	B-600-6-4	Call	
1/2"–3/8"	B-810-6-6	Call	

■ Swagelok Union Elbows

Stainless Steel			
Tube O.D.	Part No.	Price	
1/16"	SS-100-9	Call	
1/8"	SS-200-9	Call	
1/4"	SS-400-9	Call	
3/8"	SS-600-9	Call	
Brass			
Tube O.D.	Part No.	Price	
1/4"	B-400-9	Call	
3/8"	B-600-9	Call	



Union Tee



Union Cross

■ Swagelok Union Tees

Stainless Steel			
Tube O.D.	Part No.	Price	
1/16"	SS-100-3	Call	
1/8"	SS-200-3	Call	
1/4"	SS-400-3	Call	
3/8"	SS-600-3	Call	
Brass			
1/4"	B-400-3	Call	
3/8"	B-600-3	Call	

■ Swagelok Union Crosses

Stainless Steel			
Tube O.D.	Part No.	Price	
1/8"	SS-200-4	Call	
1/4"	SS-400-4	Call	
3/8"	SS-600-4	Call	
Brass			
1/4"	B-400-4	Call	
3/8"	B-600-4	Call	

■ Swagelok Bulkhead Unions

Stainless Steel			
Tube O.D.	Part No.	Price	
1/16"	SS-100-61	Call	
1/8"	SS-200-61	Call	
1/4"	SS-400-61	Call	
3/8"	SS-600-61	Call	
Brass			
1/4"	B-400-61	Call	
3/8"	B-600-61	Call	

➤ Swagelok® Fittings & Hose Connectors

1 Flanges, Fittings, & Components

■ Swagelok Caps & Plugs

Stainless Steel			
Description	Tube O.D.	Part No.	Price
Cap	3/8"	SS-200-C	Call
Cap	1/4"	SS-400-C	Call
Cap	3/8"	SS-600-C	Call
Plug	1/8"	SS-200-P	Call
Plug	1/4"	SS-400-P	Call
Plug	3/8"	SS-600-P	Call
Brass			
Cap	1/4"	B-400-C	Call
Cap	3/8"	B-600-C	Call
Plug	1/4"	B-400-P	Call
Plug	3/8"	B-600-P	Call



Caps & Plugs

■ Ferrule Sets

Stainless Steel			
Tube O.D.		Part No.	Price
1/8"		SS-200-SETS	Call
1/4"		SS-400-SETS	Call
3/8"		SS-600-SETS	Call
Brass			
1/4"		B-400-SETS	Call
3/8"		B-600-SETS	Call



Ferrule Sets



Port Connectors

■ Swagelok Nuts

Stainless Steel			
Tube O.D.		Part No.	Price
1/16"		SS-102-1	Call
1/8"		SS-202-1	Call
1/4"		SS-402-1	Call
3/8"		SS-602-1	Call
Brass			
1/4"		B-402-1	Call
3/8"		B-602-1	Call

■ Swagelok Port Connectors

Stainless Steel			
Tube O.D.		Part No.	Price
1/8"		SS-201-PC	Call
1/4"		SS-401-PC	Call
3/8"		SS-601-PC	Call
Brass			
1/4"		B-401-PC	Call
3/8"		B-601-PC	Call

■ Hose Connectors

Stainless Steel			
Connection	Hose I.D.	Part No.	Price
Male NPT	1/4"	SS-4HC-1-4	Call
Male NPT	3/8"	SS-6HC-1-4	Call
Tube Adapter	1/4"	SS-4HC-A-401	Call
Tube Adapter	1/4"	SS-4HC-A-601	Call
Tube Adapter	3/8"	SS-6HC-A-601	Call

Brass			
Connection	Hose I.D.	Part No.	Price
Male NPT	1/4"	B-4HC-1-4	Call
Male NPT	3/8"	B-6HC-1-4	Call
Tube Adapter	1/4"	B-4HC-A-401	Call
Tube Adapter	1/4"	B-4HC-A-601	Call
Tube Adapter	3/8"	B-6HC-A-601	Call

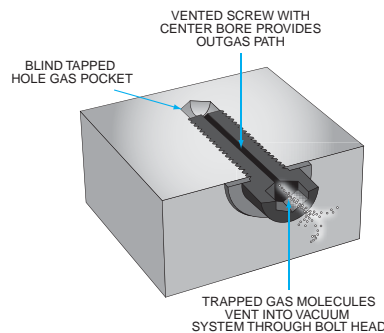
➤ Vented Hardware & O-Rings

■ Vented Hardware

Available vented hardware includes:

- Socket head cap bolts
- 6-point hex bolts
- Set screws
- Spring-lock washers

We recommend against using regular bolts and fasteners inside a vacuum chamber because they trap small air pockets under their threads. These pockets can take many months to pump down because of their small gas conductance. Our vented hardware is designed specifically for vacuum use—preventing gas pockets from forming, resulting in a quicker pump down of your vacuum chamber.



Contact us for more information on pricing and availability, or visit our web site using these quick links, listed by fastener type:

- **Socket Head Cap Bolts:** www.lesker.com/vh-socketbolt.cfm
- **6-Point Hex Bolts:** www.lesker.com/vh-hexbolt.cfm
- **Set Screws:** www.lesker.com/vh-setscrew.cfm
- **Spring-Lock Washers:** www.lesker.com/vh-lockwasher.cfm

■ O-Rings (Elastomeric Gaskets)

We stock hundreds of o-rings rated for vacuum use in a variety of diameters, cross sectional areas, and materials.

- Standard Diameters: range from fractions of an inch to over 2 feet
- Materials consist of:
 - Viton® (fluorocarbon), Durometer = 75;
 - Buna-N (nitrile), Durometer = 70; or
 - Silicone rubber, Durometer = 70
- For common sizes typically used in KF, ISO, and ASA components, please see listings in those sections or visit our web site.



NOTE: The material most commonly used is fluorocarbon, due to its low porosity to most gases and its tolerance to high temperatures over short periods. Refer to the Technical Notes in this section on Elastomeric Gaskets for more information on o-ring selection.

Section Sizes 0.040" to 0.070"

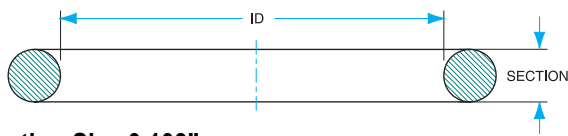
Dimensions (in.)		Buna-N		Fluorocarbon		Silicone	
I.D.	Section	Part No.	Price	Part No.	Price	Part No.	Price
0.029	0.040	O-B001	Call	O-V001	Call	O-S001	Call
0.042	0.050	O-B002	Call	O-V002	Call	O-S002	Call
0.056	0.060	O-B003	Call	O-V003	Call	O-S003	Call
0.070	0.070	O-B004	Call	O-V004	Call	O-S004	Call
0.101	0.070	O-B005	Call	O-V005	Call	O-S005	Call
0.114	0.070	O-B006	Call	O-V006	Call	O-S006	Call
0.145	0.070	O-B007	Call	O-V007	Call	O-S007	Call
0.176	0.070	O-B008	Call	O-V008	Call	O-S008	Call
0.208	0.070	O-B009	Call	O-V009	Call	O-S009	Call
0.239	0.070	O-B010	Call	O-V010	Call	O-S010	Call
0.301	0.070	O-B011	Call	O-V011	Call	O-S011	Call
0.364	0.070	O-B012	Call	O-V012	Call	O-S012	Call
0.426	0.070	O-B013	Call	O-V013	Call	O-S013	Call
0.489	0.070	O-B014	Call	O-V014	Call	O-S014	Call
0.551	0.070	O-B015	Call	O-V015	Call	O-S015	Call
0.614	0.070	O-B016	Call	O-V016	Call	O-S016	Call
0.676	0.070	O-B017	Call	O-V017	Call	O-S017	Call
0.739	0.070	O-B018	Call	O-V018	Call	O-S018	Call
0.801	0.070	O-B019	Call	O-V019	Call	O-S019	Call
0.864	0.070	O-B020	Call	O-V020	Call	O-S020	Call
0.926	0.070	O-B021	Call	O-V021	Call	O-S021	Call
0.989	0.070	O-B022	Call	O-V022	Call	O-S022	Call
1.051	0.070	O-B023	Call	O-V023	Call	O-S023	Call
1.114	0.070	O-B024	Call	O-V024	Call	O-S024	Call
1.176	0.070	O-B025	Call	O-V025	Call	O-S025	Call

Section Sizes 0.040" to 0.070" (Continued)

Dimensions (in.)		Buna-N		Fluorocarbon		Silicone	
I.D.	Section	Part No.	Price	Part No.	Price	Part No.	Price
1.239	0.070	O-B026	Call	O-V026	Call	O-S026	Call
1.301	0.070	O-B027	Call	O-V027	Call	O-S027	Call
1.364	0.070	O-B028	Call	O-V028	Call	O-S028	Call
1.489	0.070	O-B029	Call	O-V029	Call	O-S029	Call
1.614	0.070	O-B030	Call	O-V030	Call	O-S030	Call
1.739	0.070	O-B031	Call	O-V031	Call	O-S031	Call
1.864	0.070	O-B032	Call	O-V032	Call	O-S032	Call
1.989	0.070	O-B033	Call	O-V033	Call	O-S033	Call
2.114	0.070	O-B034	Call	O-V034	Call	O-S034	Call
2.239	0.070	O-B035	Call	O-V035	Call	O-S035	Call
2.364	0.070	O-B036	Call	O-V036	Call	O-S036	Call
2.489	0.070	O-B037	Call	O-V037	Call	O-S037	Call
2.614	0.070	O-B038	Call	O-V038	Call	O-S038	Call
2.739	0.070	O-B039	Call	O-V039	Call	O-S039	Call
2.864	0.070	O-B040	Call	O-V040	Call	O-S040	Call
2.989	0.070	O-B041	Call	O-V041	Call	O-S041	Call
3.239	0.070	O-B042	Call	O-V042	Call	O-S042	Call
3.489	0.070	O-B043	Call	O-V043	Call	O-S043	Call
3.739	0.070	O-B044	Call	O-V044	Call	O-S044	Call
3.989	0.070	O-B045	Call	O-V045	Call	O-S045	Call
4.239	0.070	O-B046	Call	O-V046	Call	O-S046	Call
4.489	0.070	O-B047	Call	O-V047	Call	O-S047	Call
4.739	0.070	O-B048	Call	O-V048	Call	O-S048	Call
4.989	0.070	O-B049	Call	O-V049	Call	O-S049	Call
5.239	0.070	O-B050	Call	O-V050	Call	O-S050	Call

O-Rings

1



Section Size 0.103"

Dimensions (in.)		Buna-N		Fluorocarbon		Silicone	
I.D.	Section	Part No.	Price	Part No.	Price	Part No.	Price
0.049	0.103	O-B102	Call	O-V102	Call	O-S102	Call
0.081	0.103	O-B103	Call	O-V103	Call	O-S103	Call
0.112	0.103	O-B104	Call	O-V104	Call	O-S104	Call
0.143	0.103	O-B105	Call	O-V105	Call	O-S105	Call
0.174	0.103	O-B106	Call	O-V106	Call	O-S106	Call
0.206	0.103	O-B107	Call	O-V107	Call	O-S107	Call
0.237	0.103	O-B108	Call	O-V108	Call	O-S108	Call
0.299	0.103	O-B109	Call	O-V109	Call	O-S109	Call
0.362	0.103	O-B110	Call	O-V110	Call	O-S110	Call
0.424	0.103	O-B111	Call	O-V111	Call	O-S111	Call
0.487	0.103	O-B112	Call	O-V112	Call	O-S112	Call
0.549	0.103	O-B113	Call	O-V113	Call	O-S113	Call
0.612	0.103	O-B114	Call	O-V114	Call	O-S114	Call
0.674	0.103	O-B115	Call	O-V115	Call	O-S115	Call
0.737	0.103	O-B116	Call	O-V116	Call	O-S116	Call
0.799	0.103	O-B117	Call	O-V117	Call	O-S117	Call
0.862	0.103	O-B118	Call	O-V118	Call	O-S118	Call
0.924	0.103	O-B119	Call	O-V119	Call	O-S119	Call
0.987	0.103	O-B120	Call	O-V120	Call	O-S120	Call
1.049	0.103	O-B121	Call	O-V121	Call	O-S121	Call
1.112	0.103	O-B122	Call	O-V122	Call	O-S122	Call
1.174	0.103	O-B123	Call	O-V123	Call	O-S123	Call
1.237	0.103	O-B124	Call	O-V124	Call	O-S124	Call
1.299	0.103	O-B125	Call	O-V125	Call	O-S125	Call
1.362	0.103	O-B126	Call	O-V126	Call	O-S126	Call
1.424	0.103	O-B127	Call	O-V127	Call	O-S127	Call
1.487	0.103	O-B128	Call	O-V128	Call	O-S128	Call
1.549	0.103	O-B129	Call	O-V129	Call	O-S129	Call
1.612	0.103	O-B130	Call	O-V130	Call	O-S130	Call
1.674	0.103	O-B131	Call	O-V131	Call	O-S131	Call
1.799	0.103	O-B133	Call	O-V133	Call	O-S133	Call
1.925	0.103	O-B135	Call	O-V135	Call	O-S135	Call
2.050	0.103	O-B137	Call	O-V137	Call	O-S137	Call
2.112	0.103	O-B138	Call	O-V138	Call	O-S138	Call
2.175	0.103	O-B139	Call	O-V139	Call	O-S139	Call
2.237	0.103	O-B140	Call	O-V140	Call	O-S140	Call
2.300	0.103	O-B141	Call	O-V141	Call	O-S141	Call
2.362	0.103	O-B142	Call	O-V142	Call	O-S142	Call
2.425	0.103	O-B143	Call	O-V143	Call	O-S143	Call
2.487	0.103	O-B144	Call	O-V144	Call	O-S144	Call
2.550	0.103	O-B145	Call	O-V145	Call	O-S145	Call
2.612	0.103	O-B146	Call	O-V146	Call	O-S146	Call
2.675	0.103	O-B147	Call	O-V147	Call	O-S147	Call
2.800	0.103	O-B149	Call	O-V149	Call	O-S149	Call
2.987	0.103	O-B151	Call	O-V151	Call	O-S151	Call
3.237	0.103	O-B152	Call	O-V152	Call	O-S152	Call
3.487	0.103	O-B153	Call	O-V153	Call	O-S153	Call
3.737	0.103	O-B154	Call	O-V154	Call	O-S154	Call
3.987	0.103	O-B155	Call	O-V155	Call	O-S155	Call
4.237	0.103	O-B156	Call	O-V156	Call	O-S156	Call
4.487	0.103	O-B157	Call	O-V157	Call	O-S157	Call
4.737	0.103	O-B158	Call	O-V158	Call	O-S158	Call
4.987	0.103	O-B159	Call	O-V159	Call	O-S159	Call
5.237	0.103	O-B160	Call	O-V160	Call	O-S160	Call
5.487	0.103	O-B161	Call	O-V161	Call	O-S161	Call
5.737	0.103	O-B162	Call	O-V162	Call	O-S162	Call
5.987	0.103	O-B163	Call	O-V163	Call	O-S163	Call

O-Rings (Elastomeric Gaskets)



- Standard Diameters: range from fractions of an inch to over 2 feet
- Materials consist of:
 - Viton® (fluorocarbon), Durometer = 75;
 - Buna-N (nitrile), Durometer = 70; or
 - Silicone rubber, Durometer = 70
- For common sizes typically used in KF, ISO, and ASA components, please see listings in those sections or visit our web site.

Section Size 0.103" (Continued)

Dimensions (in.)		Buna-N		Fluorocarbon		Silicone	
I.D.	Section	Part No.	Price	Part No.	Price	Part No.	Price
6.237	0.103	O-B164	Call	O-V164	Call	O-S164	Call
6.487	0.103	O-B165	Call	O-V165	Call	O-S165	Call
6.737	0.103	O-B166	Call	O-V166	Call	O-S166	Call
6.987	0.103	O-B167	Call	O-V167	Call	O-S167	Call
7.237	0.103	O-B168	Call	O-V168	Call	O-S168	Call
7.487	0.103	O-B169	Call	O-V169	Call	O-S169	Call
7.737	0.103	O-B170	Call	O-V170	Call	O-S170	Call
7.987	0.103	O-B171	Call	O-V171	Call	O-S171	Call
8.237	0.103	O-B172	Call	O-V172	Call	O-S172	Call
8.487	0.103	O-B173	Call	O-V173	Call	O-S173	Call
8.737	0.103	O-B174	Call	O-V174	Call	O-S174	Call
8.987	0.103	O-B175	Call	O-V175	Call	O-S175	Call
9.237	0.103	O-B176	Call	O-V176	Call	O-S176	Call
9.487	0.103	O-B177	Call	O-V177	Call	O-S177	Call
9.737	0.103	O-B178	Call	O-V178	Call	O-S178	Call

Section Size 0.139"

Dimensions (in.)		Buna-N		Fluorocarbon		Silicone	
I.D.	Section	Part No.	Price	Part No.	Price	Part No.	Price
0.171	0.139	O-B201	Call	O-V201	Call	O-S201	Call
0.234	0.139	O-B202	Call	O-V202	Call	O-S202	Call
0.296	0.139	O-B203	Call	O-V203	Call	O-S203	Call
0.359	0.139	O-B204	Call	O-V204	Call	O-S204	Call
0.421	0.139	O-B205	Call	O-V205	Call	O-S205	Call
0.484	0.139	O-B206	Call	O-V206	Call	O-S206	Call
0.546	0.139	O-B207	Call	O-V207	Call	O-S207	Call
0.609	0.139	O-B208	Call	O-V208	Call	O-S208	Call
0.671	0.139	O-B209	Call	O-V209	Call	O-S209	Call
0.734	0.139	O-B210	Call	O-V210	Call	O-S210	Call
0.796	0.139	O-B211	Call	O-V211	Call	O-S211	Call
0.859	0.139	O-B212	Call	O-V212	Call	O-S212	Call
0.921	0.139	O-B213	Call	O-V213	Call	O-S213	Call
0.984	0.139	O-B214	Call	O-V214	Call	O-S214	Call
1.046	0.139	O-B215	Call	O-V215	Call	O-S215	Call
1.109	0.139	O-B216	Call	O-V216	Call	O-S216	Call
1.171	0.139	O-B217	Call	O-V217	Call	O-S217	Call
1.234	0.139	O-B218	Call	O-V218	Call	O-S218	Call
1.296	0.139	O-B219	Call	O-V219	Call	O-S219	Call
1.359	0.139	O-B220	Call	O-V220	Call	O-S220	Call
1.421	0.139	O-B221	Call	O-V221	Call	O-S221	Call
1.484	0.139	O-B222	Call	O-V222	Call	O-S222	Call
1.609	0.139	O-B223	Call	O-V223	Call	O-S223	Call



Section Size 0.139" (Continued)

Dimensions (in.)		Buna-N		Fluorocarbon		Silicone	
I.D.	Section	Part No.	Price	Part No.	Price	Part No.	Price
1.734	0.139	O-B224	Call	O-V224	Call	O-S224	Call
1.859	0.139	O-B225	Call	O-V225	Call	O-S225	Call
1.984	0.139	O-B226	Call	O-V226	Call	O-S226	Call
2.109	0.139	O-B227	Call	O-V227	Call	O-S227	Call
2.234	0.139	O-B228	Call	O-V228	Call	O-S228	Call
2.359	0.139	O-B229	Call	O-V229	Call	O-S229	Call
2.484	0.139	O-B230	Call	O-V230	Call	O-S230	Call
2.609	0.139	O-B231	Call	O-V231	Call	O-S231	Call
2.734	0.139	O-B232	Call	O-V232	Call	O-S232	Call
2.859	0.139	O-B233	Call	O-V233	Call	O-S233	Call
2.984	0.139	O-B234	Call	O-V234	Call	O-S234	Call
3.109	0.139	O-B235	Call	O-V235	Call	O-S235	Call
3.234	0.139	O-B236	Call	O-V236	Call	O-S236	Call
3.359	0.139	O-B237	Call	O-V237	Call	O-S237	Call
3.484	0.139	O-B238	Call	O-V238	Call	O-S238	Call
3.609	0.139	O-B239	Call	O-V239	Call	O-S239	Call
3.734	0.139	O-B240	Call	O-V240	Call	O-S240	Call
3.859	0.139	O-B241	Call	O-V241	Call	O-S241	Call
3.984	0.139	O-B242	Call	O-V242	Call	O-S242	Call
4.109	0.139	O-B243	Call	O-V243	Call	O-S243	Call
4.234	0.139	O-B244	Call	O-V244	Call	O-S244	Call
4.359	0.139	O-B245	Call	O-V245	Call	O-S245	Call
4.484	0.139	O-B246	Call	O-V246	Call	O-S246	Call
4.609	0.139	O-B247	Call	O-V247	Call	O-S247	Call
4.734	0.139	O-B248	Call	O-V248	Call	O-S248	Call
4.859	0.139	O-B249	Call	O-V249	Call	O-S249	Call
4.984	0.139	O-B250	Call	O-V250	Call	O-S250	Call
5.109	0.139	O-B251	Call	O-V251	Call	O-S251	Call
5.234	0.139	O-B252	Call	O-V252	Call	O-S252	Call
5.359	0.139	O-B253	Call	O-V253	Call	O-S253	Call
5.484	0.139	O-B254	Call	O-V254	Call	O-S254	Call
5.609	0.139	O-B255	Call	O-V255	Call	O-S255	Call
5.734	0.139	O-B256	Call	O-V256	Call	O-S256	Call
5.859	0.139	O-B257	Call	O-V257	Call	O-S257	Call
5.984	0.139	O-B258	Call	O-V258	Call	O-S258	Call
6.234	0.139	O-B259	Call	O-V259	Call	O-S259	Call
6.484	0.139	O-B260	Call	O-V260	Call	O-S260	Call
6.734	0.139	O-B261	Call	O-V261	Call	O-S261	Call
6.984	0.139	O-B262	Call	O-V262	Call	O-S262	Call
7.234	0.139	O-B263	Call	O-V263	Call	O-S263	Call
7.484	0.139	O-B264	Call	O-V264	Call	O-S264	Call
7.734	0.139	O-B265	Call	O-V265	Call	O-S265	Call
7.984	0.139	O-B266	Call	O-V266	Call	O-S266	Call
8.234	0.139	O-B267	Call	O-V267	Call	O-S267	Call
8.484	0.139	O-B268	Call	O-V268	Call	O-S268	Call
8.734	0.139	O-B269	Call	O-V269	Call	O-S269	Call
8.984	0.139	O-B270	Call	O-V270	Call	O-S270	Call
9.234	0.139	O-B271	Call	O-V271	Call	O-S271	Call
9.484	0.139	O-B272	Call	O-V272	Call	O-S272	Call
9.734	0.139	O-B273	Call	O-V273	Call	O-S273	Call
9.984	0.139	O-B274	Call	O-V274	Call	O-S274	Call
10.484	0.139	O-B275	Call	O-V275	Call	O-S275	Call
10.984	0.139	O-B276	Call	O-V276	Call	O-S276	Call
11.484	0.139	O-B277	Call	O-V277	Call	O-S277	Call
11.984	0.139	O-B278	Call	O-V278	Call	O-S278	Call
12.984	0.139	O-B279	Call	O-V279	Call	O-S279	Call
13.984	0.139	O-B280	Call	O-V280	Call	O-S280	Call
14.984	0.139	O-B281	Call	O-V281	Call	O-S281	Call
15.955	0.139	O-B282	Call	O-V282	Call	O-S282	Call
16.955	0.139	O-B283	Call	O-V283	Call	O-S283	Call
17.955	0.139	O-B284	Call	O-V284	Call	O-S284	Call

Section Size 0.210"

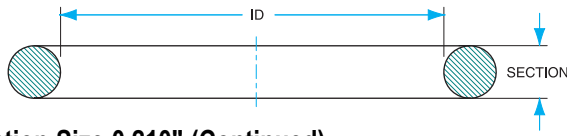
Dimensions (in.)		Buna-N		Fluorocarbon		Silicone	
I.D.	Section	Part No.	Price	Part No.	Price	Part No.	Price
0.412	0.210	O-B309	Call	O-V309	Call	O-S309	Call
0.475	0.210	O-B310	Call	O-V310	Call	O-S310	Call
0.537	0.210	O-B311	Call	O-V311	Call	O-S311	Call
0.600	0.210	O-B312	Call	O-V312	Call	O-S312	Call
0.662	0.210	O-B313	Call	O-V313	Call	O-S313	Call
0.725	0.210	O-B314	Call	O-V314	Call	O-S314	Call
0.787	0.210	O-B315	Call	O-V315	Call	O-S315	Call
0.850	0.210	O-B316	Call	O-V316	Call	O-S316	Call
0.912	0.210	O-B317	Call	O-V317	Call	O-S317	Call
0.975	0.210	O-B318	Call	O-V318	Call	O-S318	Call
1.037	0.210	O-B319	Call	O-V319	Call	O-S319	Call
1.100	0.210	O-B320	Call	O-V320	Call	O-S320	Call
1.162	0.210	O-B321	Call	O-V321	Call	O-S321	Call
1.225	0.210	O-B322	Call	O-V322	Call	O-S322	Call
1.287	0.210	O-B323	Call	O-V323	Call	O-S323	Call
1.350	0.210	O-B324	Call	O-V324	Call	O-S324	Call
1.475	0.210	O-B325	Call	O-V325	Call	O-S325	Call
1.600	0.210	O-B326	Call	O-V326	Call	O-S326	Call
1.725	0.210	O-B327	Call	O-V327	Call	O-S327	Call
1.850	0.210	O-B328	Call	O-V328	Call	O-S328	Call
1.975	0.210	O-B329	Call	O-V329	Call	O-S329	Call
2.100	0.210	O-B330	Call	O-V330	Call	O-S330	Call
2.225	0.210	O-B331	Call	O-V331	Call	O-S331	Call
2.350	0.210	O-B332	Call	O-V332	Call	O-S332	Call
2.475	0.210	O-B333	Call	O-V333	Call	O-S333	Call
2.600	0.210	O-B334	Call	O-V334	Call	O-S334	Call
2.725	0.210	O-B335	Call	O-V335	Call	O-S335	Call
2.850	0.210	O-B336	Call	O-V336	Call	O-S336	Call
2.975	0.210	O-B337	Call	O-V337	Call	O-S337	Call
3.100	0.210	O-B338	Call	O-V338	Call	O-S338	Call
3.225	0.210	O-B339	Call	O-V339	Call	O-S339	Call
3.350	0.210	O-B340	Call	O-V340	Call	O-S340	Call
3.475	0.210	O-B341	Call	O-V341	Call	O-S341	Call
3.600	0.210	O-B342	Call	O-V342	Call	O-S342	Call
3.725	0.210	O-B343	Call	O-V343	Call	O-S343	Call
3.850	0.210	O-B344	Call	O-V344	Call	O-S344	Call
3.975	0.210	O-B345	Call	O-V345	Call	O-S345	Call
4.100	0.210	O-B346	Call	O-V346	Call	O-S346	Call
4.225	0.210	O-B347	Call	O-V347	Call	O-S347	Call
4.350	0.210	O-B348	Call	O-V348	Call	O-S348	Call
4.475	0.210	O-B349	Call	O-V349	Call	O-S349	Call
4.600	0.210	O-B350	Call	O-V350	Call	O-S350	Call
4.725	0.210	O-B351	Call	O-V351	Call	O-S351	Call
4.850	0.210	O-B352	Call	O-V352	Call	O-S352	Call
4.975	0.210	O-B353	Call	O-V353	Call	O-S353	Call
5.100	0.210	O-B354	Call	O-V354	Call	O-S354	Call
5.225	0.210	O-B355	Call	O-V355	Call	O-S355	Call
5.350	0.210	O-B356	Call	O-V356	Call	O-S356	Call
5.475	0.210	O-B357	Call	O-V357	Call	O-S357	Call
5.600	0.210	O-B358	Call	O-V358	Call	O-S358	Call
5.725	0.210	O-B359	Call	O-V359	Call	O-S359	Call
5.850	0.210	O-B360	Call	O-V360	Call	O-S360	Call
5.975	0.210	O-B361	Call	O-V361	Call	O-S361	Call
6.225	0.210	O-B362	Call	O-V362	Call	O-S362	Call
6.475	0.210	O-B363	Call	O-V363	Call	O-S363	Call
6.725	0.210	O-B364	Call	O-V364	Call	O-S364	Call
6.975	0.210	O-B365	Call	O-V365	Call	O-S365	Call
7.225	0.210	O-B366	Call	O-V366	Call	O-S366	Call
7.475	0.210	O-B367	Call	O-V367	Call	O-S367	Call
7.725	0.210	O-B368	Call	O-V368	Call	O-S368	Call
7.975	0.210	O-B369	Call	O-V369	Call	O-S369	Call

**1
Flanges, Fittings, & Components**

NOTE: The material most commonly used is fluorocarbon, due to its low porosity to most gases and its tolerance to high temperatures over short periods. Refer to the Technical Notes in this section on Elastomeric Gaskets for more information on o-ring selection.

O-Rings

O-Rings (Elastomeric Gaskets)



Section Size 0.210" (Continued)

Dimensions (in.)		Buna-N		Fluorocarbon		Silicone	
I.D.	Section	Part No.	Price	Part No.	Price	Part No.	Price
8.225	0.210	O-B370	Call	O-V370	Call	O-S370	Call
8.475	0.210	O-B371	Call	O-V371	Call	O-S371	Call
8.725	0.210	O-B372	Call	O-V372	Call	O-S372	Call
8.975	0.210	O-B373	Call	O-V373	Call	O-S373	Call
9.225	0.210	O-B374	Call	O-V374	Call	O-S374	Call
9.475	0.210	O-B375	Call	O-V375	Call	O-S375	Call
9.725	0.210	O-B376	Call	O-V376	Call	O-S376	Call
9.975	0.210	O-B377	Call	O-V377	Call	O-S377	Call
10.475	0.210	O-B378	Call	O-V378	Call	O-S378	Call
10.975	0.210	O-B379	Call	O-V379	Call	O-S379	Call
11.475	0.210	O-B380	Call	O-V380	Call	O-S380	Call
11.975	0.210	O-B381	Call	O-V381	Call	O-S381	Call
12.975	0.210	O-B382	Call	O-V382	Call	O-S382	Call
13.975	0.210	O-B383	Call	O-V383	Call	O-S383	Call
14.975	0.210	O-B384	Call	O-V384	Call	O-S384	Call
15.955	0.210	O-B385	Call	O-V385	Call	O-S385	Call
16.955	0.210	O-B386	Call	O-V386	Call	O-S386	Call
17.955	0.210	O-B387	Call	O-V387	Call	O-S387	Call
18.955	0.210	O-B388	Call	O-V388	Call	O-S388	Call
19.955	0.210	O-B389	Call	O-V389	Call	O-S389	Call
20.955	0.210	O-B390	Call	O-V390	Call	O-S390	Call
21.955	0.210	O-B391	Call	O-V391	Call	O-S391	Call
22.940	0.210	O-B392	Call	O-V392	Call	O-S392	Call
23.940	0.210	O-B393	Call	O-V393	Call	O-S393	Call
24.940	0.210	O-B394	Call	O-V394	Call	O-S394	Call
25.940	0.210	O-B395	Call	O-V395	Call	O-S395	Call



- Standard Diameters: range from fractions of an inch to over 2 feet
- Materials consist of:
 - Viton® (fluorocarbon), Durometer = 75;
 - Buna-N (nitrile), Durometer = 70; or
 - Silicone rubber, Durometer = 70
- For common sizes typically used in KF, ISO, and ASA components, please see listings in those sections or visit our web site.

NOTE: The material most commonly used is fluorocarbon, due to its low porosity to most gases and its tolerance to high temperatures over short periods. Refer to the Technical Notes in this section on Elastomeric Gaskets for more information on o-ring selection.

Section Size 0.275"

Dimensions (in.)		Buna-N		Fluorocarbon		Silicone	
I.D.	Section	Part No.	Price	Part No.	Price	Part No.	Price
4.600	0.275	O-B426	Call	O-V426	Call	O-S426	Call
4.725	0.275	O-B427	Call	O-V427	Call	O-S427	Call
4.850	0.275	O-B427	Call	O-V428	Call	O-S428	Call
4.975	0.275	O-B429	Call	O-V429	Call	O-S429	Call
5.100	0.275	O-B430	Call	O-V430	Call	O-S430	Call
5.225	0.275	O-B431	Call	O-V431	Call	O-S431	Call
5.350	0.275	O-B432	Call	O-V432	Call	O-S432	Call
5.475	0.275	O-B433	Call	O-V433	Call	O-S433	Call
5.600	0.275	O-B434	Call	O-V434	Call	O-S434	Call
5.725	0.275	O-B435	Call	O-V435	Call	O-S435	Call
5.850	0.275	O-B436	Call	O-V436	Call	O-S436	Call
5.975	0.275	O-B437	Call	O-V437	Call	O-S437	Call
6.225	0.275	O-B438	Call	O-V438	Call	O-S438	Call
6.475	0.275	O-B439	Call	O-V439	Call	O-S439	Call
6.725	0.275	O-B440	Call	O-V440	Call	O-S440	Call
6.975	0.275	O-B441	Call	O-V441	Call	O-S441	Call
7.225	0.275	O-B442	Call	O-V442	Call	O-S442	Call
7.475	0.275	O-B443	Call	O-V443	Call	O-S443	Call
7.725	0.275	O-B444	Call	O-V444	Call	O-S444	Call
7.975	0.275	O-B445	Call	O-V445	Call	O-S445	Call
8.475	0.275	O-B446	Call	O-V446	Call	O-S446	Call
8.975	0.275	O-B447	Call	O-V447	Call	O-S447	Call
9.475	0.275	O-B448	Call	O-V448	Call	O-S448	Call
9.975	0.275	O-B449	Call	O-V449	Call	O-S449	Call
10.475	0.275	O-B450	Call	O-V450	Call	O-S450	Call

Section Size 0.275" (Continued)

Dimensions (in.)		Buna-N		Fluorocarbon		Silicone	
I.D.	Section	Part No.	Price	Part No.	Price	Part No.	Price
10.975	0.275	O-B451	Call	O-V451	Call	O-S451	Call
11.475	0.275	O-B452	Call	O-V452	Call	O-S452	Call
11.975	0.275	O-B453	Call	O-V453	Call	O-S453	Call
12.475	0.275	O-B454	Call	O-V454	Call	O-S454	Call
12.975	0.275	O-B455	Call	O-V455	Call	O-S455	Call
13.475	0.275	O-B456	Call	O-V456	Call	O-S456	Call
13.975	0.275	O-B457	Call	O-V457	Call	O-S457	Call
14.475	0.275	O-B458	Call	O-V458	Call	O-S458	Call
14.975	0.275	O-B459	Call	O-V459	Call	O-S459	Call
15.475	0.275	O-B460	Call	O-V460	Call	O-S460	Call
15.955	0.275	O-B461	Call	O-V461	Call	O-S461	Call
16.455	0.275	O-B462	Call	O-V462	Call	O-S462	Call
16.955	0.275	O-B463	Call	O-V463	Call	O-S463	Call
17.455	0.275	O-B464	Call	O-V464	Call	O-S464	Call
17.955	0.275	O-B465	Call	O-V465	Call	O-S465	Call
18.455	0.275	O-B466	Call	O-V466	Call	O-S466	Call
18.955	0.275	O-B467	Call	O-V467	Call	O-S467	Call
19.455	0.275	O-B468	Call	O-V468	Call	O-S468	Call
19.955	0.275	O-B469	Call	O-V469	Call	O-S469	Call
20.955	0.275	O-B470	Call	O-V470	Call	O-S470	Call
21.955	0.275	O-B471	Call	O-V471	Call	O-S471	Call
22.940	0.275	O-B472	Call	O-V472	Call	O-S472	Call
23.940	0.275	O-B473	Call	O-V473	Call	O-S473	Call
24.940	0.275	O-B474	Call	O-V474	Call	O-S474	Call
25.940	0.275	O-B475	Call	O-V475	Call	O-S475	Call