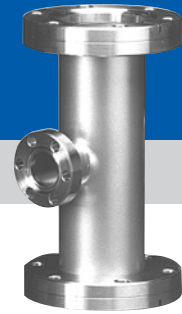


Flanges & Fittings

Section Two



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Flanges & Fittings

Flanges & Fittings General Information

Nor-Cal Products manufactures a complete selection of 304 or 316 stainless steel vacuum line hardware and maintains a large inventory of flanges, fittings, gaskets, clamps, bolts, O-rings and other hardware components for prompt deliveries and to meet those unexpected demands to complete your project.

Choose from more than 2,500 flanges, fittings, weld fittings, adapters, and aluminum to stainless steel transitions. Flange types include NW (ISO-KF), ISO, CF (Conflat), ASA and Wire Seal as well as EVAC chain clamps and aluminum seals for converting NW and ISO flanges from high vacuum to UHV.

Most standard vacuum components can be customized to meet your specific needs.



Flanges, Fittings, Adapters & Hardware

Nor-Cal Products flanges are made from 304 stainless steel material, which is specially processed to reduce impurities, grain size and microscopic leak paths. They are available in all commonly used high and ultra-high vacuum flange types, including ASA, NW (ISO-KF), ISO, CF and wire seal flanges. We also offer EVAC chain clamps and metal seals to convert a high vacuum NW flange to ultra-high vacuum.

Fittings are available with or without flanges. Weld fittings (without flanges) are typically sold to mechanical contractors for use during the fit up phase of new fab construction.

Nor-Cal Products provides a broad range of adapter fittings in order to connect two dissimilar types of components. They are made from 304 stainless steel and are TIG welded, cleaned and leak checked for vacuum service.

Flexible Hose & Couplings

Nor-Cal Products is your source for a comprehensive range of tubing, flexible vacuum connections, hose, and couplings, along with PVC hose. Flexible hose and couplings can dampen vibration issues and offer an expansion joint between pieces of equipment, and compensate for unusual geometries. Flexible vacuum connections are typically made by using edge welded bellows, hydroformed flexible couplings, flexible hose or PVC hose.

Nor-Cal Products offers flexible couplings and flexible hose as standards. PVC hose offers a low-cost alternative to stainless steel flexible hose. Edge-welded bellows provide the greatest stroke and flexibility but are more susceptible to damage. They are also more expensive. Edge welded bellows assemblies can be provided in a variety of materials as specials.

Aluminum to Stainless Steel Transitions

Aluminum/stainless steel transitions are used with standard CF flanges for UHV sealing and have the ability to provide value-added, custom designed vacuum-line assemblies in a variety of configurations and sizes.

Thermal Control

Nor-Cal Products carries a full line of heater jackets, controllers, insulators and accessories to fit any of our valves or vacuum line components. Heating vacuum lines reduces the build-up of semiconductor process by-products in valves and other exhaust line components while reducing particle generation and system downtime. Uniform line heating will minimize condensation and particle build-up in gas delivery and pump lines.

Stainless Steel Tubing

Nor-Cal Products consumption of stainless steel tubing for its own products makes it possible to offer 304 and 316L stainless steel tubing in lengths up to 20 feet.

304 stainless steel tubing standard finishes are white pickled (Number 1 unpolished), bright annealed or polished OD and ID, depending on the size. 316L stainless steel tubing is offered with a bright annealed finish only. Bright annealed and polished tubing has been pickled and passivated. Polished tube can be described as No. 4 polished. The surface meets ASTM A270, and has received a 150 grit polish on the OD and 180 grit on the ID. Special cleaning, materials and surface finishes are available for an additional charge.



SPECIFICATIONS

Tube OD sizes: 3/8 to 2 inches (9.53 to 50.8mm)

Materials

Flange: 304 or 316L stainless steel
O-rings: FKM, Buna & silicone

Fittings

Tube finishes: Beadblast standard
(Tumbled & electropolish available)

Fasteners: Wing nut, bulkhead & chain clamps

Vacuum range

Elastomer seal: $\geq 1 \times 10^{-8}$ mbar -High vacuum
Metal seal: $\geq 1 \times 10^{-11}$ mbar -UHV

Temperature range

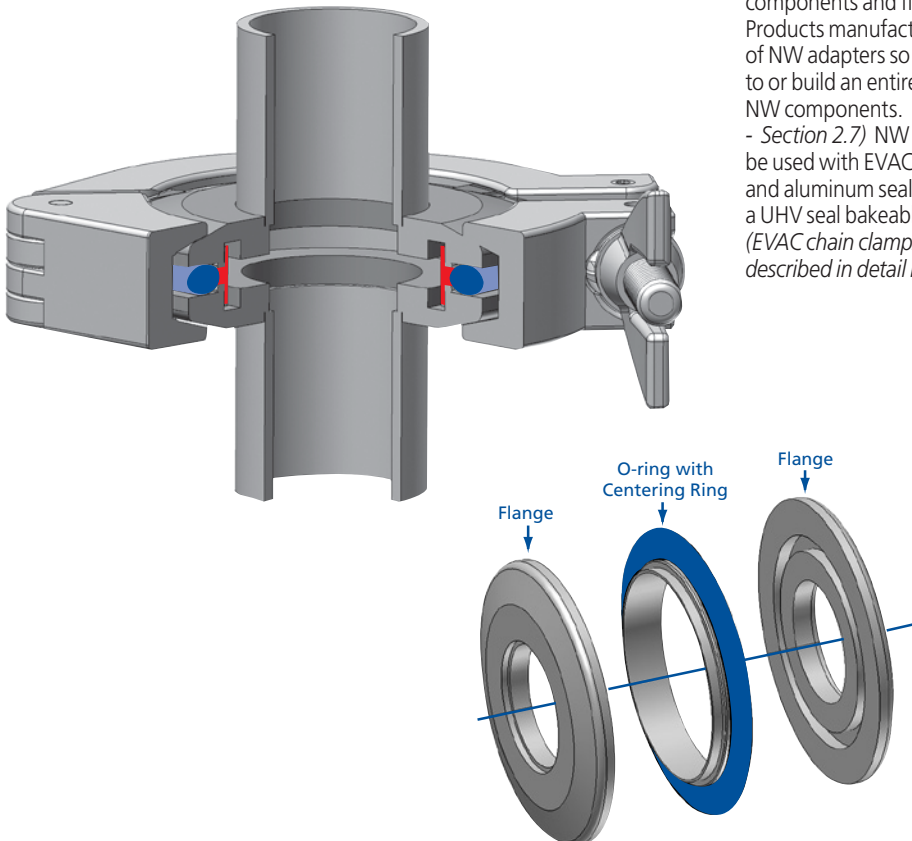
FKM: -20°C to 200°C
Silicone: -50° to 230°C
Buna: -30°C to 110°C
Metal seal: -270°C to 150°C

Nor-Cal Products NW flanges are designed to ISO 2861 specifications for standard USA tube sizes from 3/8 to 2 inches (9.53 to 50.8mm) OD. They are compatible with other manufacturers' ISO-KF style flanges. NW flanges utilize an aluminum clamp with a single wing nut fastener or a lock-over-center clamp allowing

frequent disassembly without tools. The vacuum seal is effected by the application of uniform pressure from the clamp on the 15° surface of the 304 stainless steel flanges. The mating flange surfaces compress a FKM O-ring held in place by a centering ring. The resultant seal can be used in vacuum applications of up

to 10^{-8} mbar and baked to 200°C, however sustained baking above 150°C may result in deterioration of O-rings. Additionally, NW flanges allow components to be rotated before assembly for ease of component alignment.

NW flanges are available on virtually all Nor-Cal Products components and fittings. Nor-Cal Products manufactures a full line of NW adapters so you can add to or build an entire system with NW components. (See adapters - Section 2.7) NW flanges can also be used with EVAC chain clamps and aluminum seals to obtain a UHV seal bakeable to 150°C. (EVAC chain clamps and seals are described in detail in Section 2.7.)



Trapped Centering Rings



Nor-Cal Products trapped centering rings for NW flanges feature easy assembly with exact centering and are appropriate for vacuum or pressure by externally supporting the sealing ring. Trapped O-rings are intended for use where pressures range from rough vacuum to above atmosphere. Applications include vacuum pump exhaust lines and abatement tools.

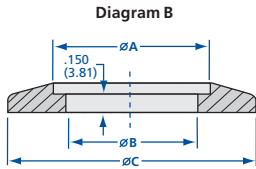
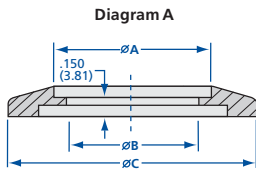
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Flanges & Fittings

NW Bored Blank Flanges & Blank Off Caps

NW Bored Blank Flanges (NWB)



MODEL NUMBER	DIAGRAM	TUBE OD	A	B	C
NW-10B-038	A	$\frac{3}{8}$ (9.53)	0.38 (9.65)	0.326 (8.28)	1.18 (29.97)
NW-10B-050	A	$\frac{1}{2}$ (12.70)	0.51 (12.95)	0.451 (11.46)	1.18 (29.97)
NW-16B-038	A	$\frac{3}{8}$ (9.53)	0.38 (9.65)	0.326 (8.28)	1.18 (29.97)
NW-16B-050	A	$\frac{1}{2}$ (12.70)	0.51 (12.95)	0.451 (11.46)	1.18 (29.97)
NW-16B-075	B	$\frac{3}{4}$ (19.05)	0.76 (19.30)	0.68 (17.27)	1.18 (29.97)
NW-25B-038	A	$\frac{3}{8}$ (9.53)	0.38 (9.65)	0.326 (8.28)	1.575 (40.01)
NW-25B-050	A	$\frac{1}{2}$ (12.70)	0.51 (12.95)	0.451 (11.46)	1.575 (40.01)
NW-25B-075	A	$\frac{3}{4}$ (19.05)	0.76 (19.30)	0.715 (18.16)	1.575 (40.01)
NW-25B-100	A	1 (25.40)	1.01 (25.65)	0.938 (23.83)	1.575 (40.01)
NW-40B-038	A	$\frac{3}{8}$ (9.53)	0.38 (9.65)	.326 (8.28)	2.16 (54.86)
NW-40B-050	A	$\frac{1}{2}$ (12.70)	0.51 (12.95)	0.451 (11.46)	2.16 (54.86)
NW-40B-075	A	$\frac{3}{4}$ (19.05)	0.76 (19.30)	0.715 (18.16)	2.16 (54.86)
NW-40B-100	A	1 (25.40)	1.01 (25.65)	0.938 (23.83)	2.16 (54.86)
NW-40B-150	A	$1\frac{1}{2}$ (38.10)	1.51 (38.35)	1.438 (36.53)	2.16 (54.86)
NW-50B-038	A	$\frac{3}{8}$ (9.53)	0.38 (9.65)	.326 (8.28)	2.95 (74.93)
NW-50B-050	A	$\frac{1}{2}$ (12.70)	0.51 (12.95)	0.451 (11.46)	2.95 (74.93)
NW-50B-075	A	$\frac{3}{4}$ (19.05)	0.76 (19.30)	0.715 (18.16)	2.95 (74.93)
NW-50B-100	A	1 (25.40)	1.01 (25.65)	0.938 (23.83)	2.95 (74.93)
NW-50B-150	A	$1\frac{1}{2}$ (38.10)	1.51 (38.35)	1.438 (36.53)	2.95 (74.93)
NW-50B-200	A	2 (50.80)	2.01 (51.05)	1.938 (49.23)	2.95 (74.93)

NW 316L Stainless Steel Bored Blank Flanges (NWB)

MODEL NUMBER	DIAGRAM	TUBE OD	A	B	C
NW-25B-100-316L	A	1 (25.40)	1.01 (25.65)	0.938 (23.83)	1.575 (40.01)
NW-40B-150-316L	A	$1\frac{1}{2}$ (38.10)	1.51 (38.35)	1.438 (36.53)	2.16 (54.86)
NW-50B-200-316L	A	2 (50.80)	2.01 (51.05)	1.938 (49.23)	2.95 (74.93)

SPECIFICATIONS

Tube OD sizes: $\frac{3}{8}$ to 2 inches (9.53 to 50.8mm)

Materials

Flange: 304 or 316L stainless steel
O-rings: FKM, Buna & silicone

Fasteners

Wing nut, bulkhead & chain clamps

Vacuum range

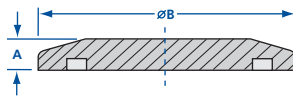
Elastomer seal: $\geq 1 \times 10^{-9}$ mbar - High vacuum
Metal seal: $\geq 1 \times 10^{-11}$ mbar - UHV

Temperature range

FKM: -20°C to 200°C
Silicone: -50° to 230°C
Buna: -30°C to 110°C
Metal seal: -270°C to 150°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

See Section 2.7 for EVAC metal seals



Blank Off Caps

MODEL NUMBER	A	B
NW-10B	0.200 (5.08)	1.18 (29.97)
NW-16B	0.200 (5.08)	1.18 (29.97)
NW-25B	0.200 (5.08)	1.575 (40.01)
NW-40B	0.200 (5.08)	2.16 (54.86)
NW-50B	0.200 (5.08)	2.95 (74.93)

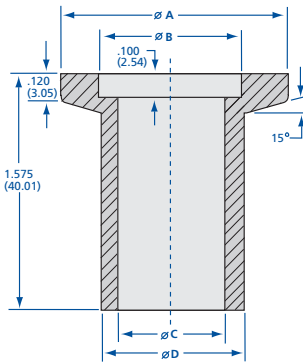
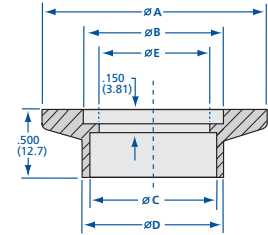
316L Blank Off Caps

MODEL NUMBER	A	B
NW-16B-316L	0.200 (5.08)	1.18 (29.97)
NW-25B-316L	0.200 (5.08)	1.575 (40.01)
NW-40B-316L	0.200 (5.08)	2.16 (54.86)
NW-50B-316L	0.200 (5.08)	2.95 (74.93)



NW Socket Weld Flanges

MODEL NUMBER	TUBE OD	A	B	C	D	E
NW-10-SW	1/2 (12.70)	1.18 (29.97)	0.48 (12.19)	0.51 (12.95)	0.61 (15.49)	-
NW-16-SW	3/4 (19.05)	1.18 (29.97)	0.68 (17.27)	0.76 (19.30)	0.798 (20.27)	-
NW-25-SW	1 (25.40)	1.575 (40.01)	1.031 (26.19)	1.01 (25.65)	1.14 (28.96)	0.938 (23.83)
NW-40-SW	1 1/2 (38.10)	2.16 (54.86)	1.62 (41.15)	1.51 (38.35)	1.64 (41.66)	1.438 (36.53)
NW-50-SW	2 (50.80)	2.95 (74.93)	2.06 (52.32)	2.01 (51.05)	2.14 (54.36)	1.938 (49.23)



NW Long Weld Neck Flanges

MODEL NUMBER	A	B	C	D
NW-10FL	1.18 (29.97)	0.48 (12.19)	0.38 (9.65)	1/2 (12.70)
NW-16FL	1.18 (29.97)	0.68 (17.27)	0.625 (15.88)	3/4 (19.05)
NW-25FL	1.575 (40.01)	1.031 (26.19)	0.87 (22.10)	1 (25.40)
NW-40FL	2.16 (54.86)	1.62 (41.15)	1.37 (34.80)	1 1/2 (38.10)
NW-50FL	2.95 (74.93)	2.06 (52.32)	1.87 (47.50)	2 (50.80)

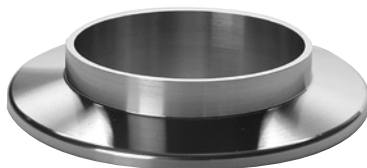
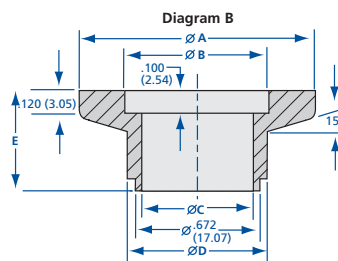
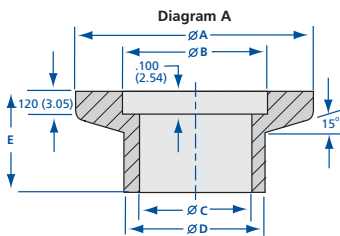
NW 316L Stainless Steel Long Weld Neck Flanges

MODEL NUMBER	A	B	C	D
NW-25FL-316L	1.575 (40.01)	1.031 (26.19)	0.87 (22.10)	1 (25.40)
NW-40FL-316L	2.16 (54.86)	1.62 (41.15)	1.37 (34.80)	1 1/2 (38.10)
NW-50FL-316L	2.95 (74.93)	2.06 (52.32)	1.87 (47.50)	2 (50.80)



NW Short Weld Neck Flanges

MODEL NUMBER	DIAGRAM	TUBE OD	A	B	C	D	E
NW-10F	A	1/2 (12.70)	1.18 (29.97)	0.48 (12.19)	0.38 (9.65)	1/2 (12.70)	0.5 (12.70)
NW-16F	B	3/4 (19.05)	1.18 (29.97)	0.68 (17.27)	0.625 (15.88)	3/4 (19.05)	0.56 (14.22)
NW-16FB	A	3/4 (19.05)	1.18 (29.97)	0.68 (17.27)	0.625 (15.88)	3/4 (19.05)	0.5 (12.70)
NW-25F	A	1 (25.40)	1.575 (40.01)	1.031 (26.19)	0.87 (22.10)	1 (25.40)	0.5 (12.70)
NW-40F	A	1 1/2 (38.10)	2.16 (54.86)	1.62 (41.15)	1.37 (34.80)	1 1/2 (38.10)	0.75 (19.05)
NW-50F	A	2 (50.80)	2.95 (74.93)	2.06 (52.32)	1.87 (47.50)	2 (50.80)	0.75 (19.05)



SPECIFICATIONS

Tube OD sizes: 3/8 to 2 inches (9.53 to 50.8mm)

Materials

Flange: 304 or 316L stainless steel
O-rings: FKM, Buna & silicone

Fasteners

Wing nut, bulkhead & chain clamps

Vacuum range

Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum
Metal seal: $\geq 1 \times 10^{-11}$ mbar - UHV

Temperature range

FKM: -20°C to 200°C
Silicone: -50° to 230°C
Buna: -30°C to 110°C
Metal seal: -270°C to 150°C

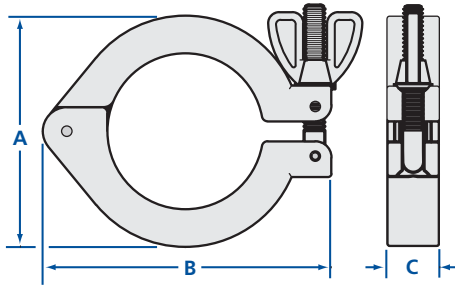
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

See Section 2.7 for EVAC metal seals

Flanges & Fittings

NW Assembly Hardware

Nor-Cal Products Wing Nut NW Clamps feature special centering ribs and evenly distributed clamping force to assure uniform O-ring compression and reduce the probability of failure under loads. Additional hinge knuckles and tighter manufacturing tolerances result in precise alignment and reduced side play. Clamp opening is limited to facilitate one-handed installation in hard-to-reach spaces. All NW clamps are designed and manufactured to meet Pneurop specifications for ISO-KF 10 through 50 flanges, so you can be confident of universal compatibility. We also provide chain clamps and metal seals for ISO-KF components to transform them from high vacuum to ultra-high vacuum connections.

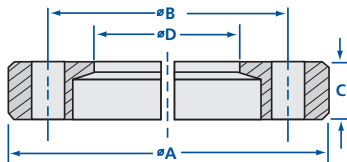
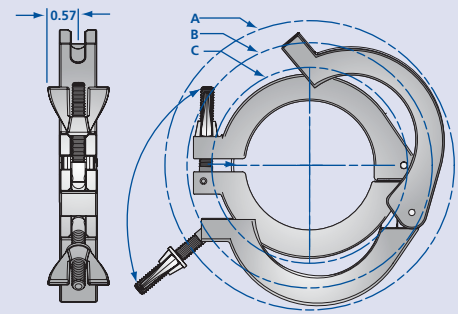


NW Wing Nut Clamps

MODEL NUMBER	A	B	C
NW-10-CP	1.69 (42.93)	2.392 (60.76)	0.625 (15.88)
NW-16-CP	1.69 (42.93)	2.392 (60.76)	0.625 (15.88)
NW-25-CP	2.14 (54.36)	2.796 (71.02)	0.625 (15.88)
NW-40-CP	2.75 (69.85)	3.437 (87.30)	0.625 (15.88)
NW-50-CP	3.50 (88.90)	4.245 (107.82)	0.710 (18.03)

NW Clamp Clearance Details

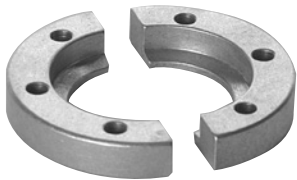
CLAMP	FLANGE	MIN. DIA. TO INSTALL A	MAX. DIA. CLOSED B	MIN. DIA. CLOSED C
NW-10-CP	NW-10B	2.86 (72.64)	2.65 (67.31)	1.75 (44.45)
NW-16-CP	NW-16B	2.86 (72.64)	2.65 (67.31)	1.75 (44.45)
NW-25-CP	NW-25B	3.32 (84.33)	3.00 (76.20)	2.24 (56.90)
NW-40-CP	NW-40B	4.00 (101.60)	3.72 (94.49)	2.90 (73.66)
NW-50-CP	NW-50B	5.45 (138.43)	4.62 (117.35)	3.69 (93.73)



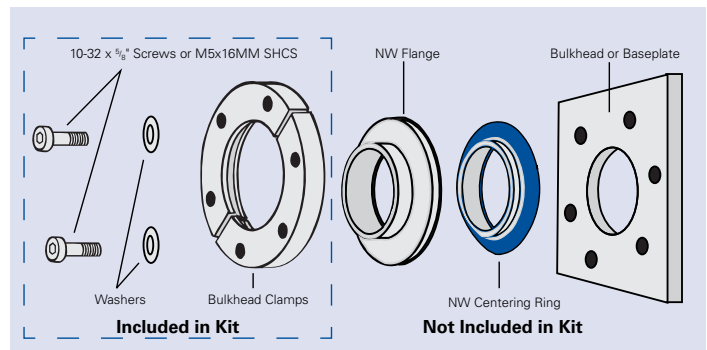
NW Bulkhead Clamp Kits

MODEL NUMBER	A	B	C	NUMBER OF SCREWS	THROUGH HOLE D
NW-16-BCP	2.00 (50.80)	1.50 (38.10)	0.361 (9.17)	6	0.90 (22.86)
NW-25-BCP	2.37 (60.20)	1.89 (48.01)	.0387 (9.83)	6	1.26 (32.00)
NW-40-BCP	2.94 (74.68)	2.44 (61.98)	0.366 (9.30)	6	1.84 (46.74)
NW-50-BCP	3.75 (95.25)	3.25 (82.55)	0.404 (10.26)	8	2.35 (59.69)

Add "-M5" for metric bolts



Bulkhead clamps provide a simple means of fastening an NW flange to a baseplate. Each aluminum clamp is sold with stainless steel socket head cap screws and washers for attachment. Leave 0.075 inch (2mm) minimum between the bottom of the tapped hole and the inside of the chamber wall.



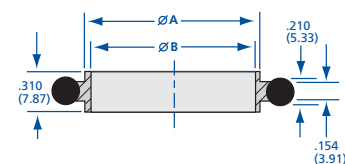
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Nor-Cal Products offers aluminum and stainless steel centering rings for NW and ISO flanges. Buna, silicone and FKM O-rings are available for NW, while Buna and FKM are stocked for ISO centering rings. Aluminum ISO centering rings are provided with an aluminum spacer ring. Stainless steel ISO centering rings are also provided with aluminum spacer rings as an option.

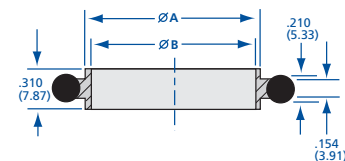
NW Aluminum Centering Rings with O-ring

MODEL NUMBER	O-RING MATERIAL	A	B
NW-10-CR-AV	FKM	0.478 (12.14)	0.456 (11.58)
NW-10-CR-AB	Buna	0.478 (12.14)	0.456 (11.58)
NW-16-CR-AV	FKM	0.669 (16.99)	0.625 (15.88)
NW-16-CR-AB	Buna	0.669 (16.99)	0.625 (15.88)
NW-25-CR-AV	FKM	1.024 (26.01)	0.984 (24.99)
NW-25-CR-AB	Buna	1.024 (26.01)	0.984 (24.99)
NW-40-CR-AV	FKM	1.614 (41.00)	1.57 (39.88)
NW-40-CR-AB	Buna	1.614 (41.00)	1.57 (39.88)
NW-50-CR-AV	FKM	2.047 (51.99)	1.967 (49.96)
NW-50-CR-AB	Buna	2.047 (51.99)	1.967 (49.96)



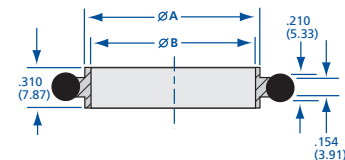
NW Stainless Steel Centering Rings with O-ring

MODEL NUMBER	O-RING MATERIAL	A	B
NW-10-CR-SV	FKM	0.478 (12.14)	0.456 (11.58)
NW-10-CR-SS	Silicone	0.478 (12.14)	0.456 (11.58)
NW-10-CR-SB	Buna	0.478 (12.14)	0.456 (11.58)
NW-16-CR-SV	FKM	0.669 (16.99)	0.625 (15.88)
NW-16-CR-SS	Silicone	0.669 (16.99)	0.625 (15.88)
NW-16-CR-SB	Buna	0.669 (16.99)	0.625 (15.88)
NW-25-CR-SV	FKM	1.024 (26.01)	0.984 (24.99)
NW-25-CR-SS	Silicone	1.024 (26.01)	0.984 (24.99)
NW-25-CR-SB	Buna	1.024 (26.01)	0.984 (24.99)
NW-40-CR-SV	FKM	1.614 (41.00)	1.570 (39.88)
NW-40-CR-SS	Silicone	1.614 (41.00)	1.570 (39.88)
NW-40-CR-SB	Buna	1.614 (41.00)	1.570 (39.88)
NW-50-CR-SV	FKM	2.047 (51.99)	1.967 (49.96)
NW-50-CR-SS	Silicone	2.047 (51.99)	1.967 (49.96)
NW-50-CR-SB	Buna	2.047 (51.99)	1.967 (49.96)



NW 316L Stainless Steel Centering Rings with O-ring

MODEL NUMBER	O-RING MATERIAL	A	B
NW-25-CR-SV-316L	FKM	1.024 (26.01)	0.984 (24.99)
NW-40-CR-SV-316L	FKM	1.614 (41.00)	1.570 (39.88)
NW-50-CR-SV-316L	FKM	2.047 (51.99)	1.967 (49.96)

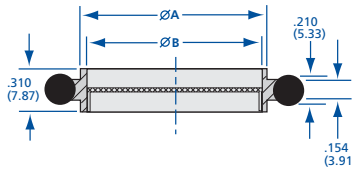
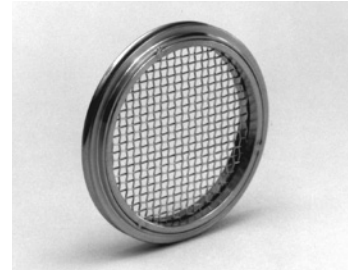


All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



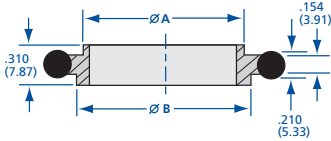
Flanges & Fittings

NW Centering Rings & Replacement O-rings



NW Screened Stainless Steel Centering Rings with O-ring

MODEL NUMBER	O-RING MATERIAL	A	B	MESH
NW-25-CR-SV-74	FKM	1.024 (26.01)	0.984 (24.99)	74
NW-40-CR-SV-74	FKM	1.614 (41.00)	1.570 (39.88)	74
NW-50-CR-SV-74	FKM	2.047 (51.99)	1.967 (49.96)	74



NW Reducer Stainless Steel Centering Rings with O-ring

MODEL NUMBER	O-RING MATERIAL	A	B
NW-10/16-CR	FKM	0.48 (12.19)	0.67 (17.02)
NW-20/25-CR	FKM	0.87 (22.10)	1.02 (25.91)
NW-32/40-CR	FKM	1.34 (34.04)	1.61 (40.89)

Buna and Silicone O-rings available. Call for pricing.

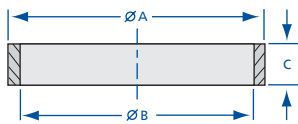


For dimensions refer to the centering ring/O-ring assembly drawing on the previous page and the overpressure ring diagram this page.

NW Stainless Steel Centering Rings with O-ring and Over Pressure Ring Kits

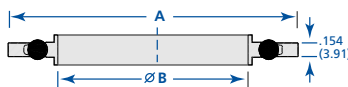
MODEL NUMBER	O-RING MATERIAL	DESCRIPTION
NW-10-CR-SV-PR	FKM	Contains model numbers NW-10-PR and NW-10-CR-SV
NW-16-CR-SV-PR	FKM	Contains model numbers NW-16-PR and NW-16-CR-SV
NW-25-CR-SV-PR	FKM	Contains model numbers NW-25-PR and NW-25-CR-SV
NW-40-CR-SV-PR	FKM	Contains model numbers NW-40-PR and NW-40-CR-SV
NW-50-CR-SV-PR	FKM	Contains model numbers NW-50-PR and NW-50-CR-SV

Buna and Silicone O-rings available. Call for pricing.



NW Stainless Steel Over Pressure Rings

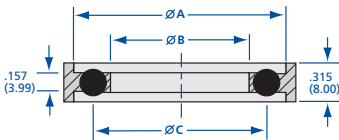
MODEL NUMBER	A	B	C
NW-10-PR	1.25 (31.75)	1.186 (30.12)	0.346 (8.79)
NW-16-PR	1.25 (31.75)	1.186 (30.12)	0.346 (8.79)
NW-25-PR	1.66 (42.16)	1.583 (40.21)	0.346 (8.79)
NW-40-PR	2.25 (57.15)	2.169 (55.09)	0.346 (8.79)
NW-50-PR	2.75 (69.85)	2.620 (66.55)	0.145 (3.68)



NW Stainless Steel Captured Centering Rings with O-ring

MODEL NUMBER	O-RING MATERIAL	A	B
NW-16-CRC-SV	FKM	1.25 (31.75)	0.625 (15.88)
NW-25-CRC-SV	FKM	1.66 (42.16)	0.984 (24.99)
NW-40-CRC-SV	FKM	2.25 (57.15)	1.570 (39.88)
NW-50-CRC-SV	FKM	2.75 (69.85)	1.967 (49.96)

Buna and Silicone O-rings available. Call for pricing.



NW trapped centering rings are composed of an aluminum outer ring, FKM O-ring, and stainless steel centering ring

NW Stainless Steel Trapped Centering Rings with O-ring

MODEL NUMBER	O-RING MATERIAL	A	B	C
NW-10/16-CRT-SV	FKM	1.18 (29.97)	0.63 (16.00)	0.91 (23.11)
NW-25-CRT-SV	FKM	1.58 (40.13)	0.95 (24.13)	1.3 (33.02)
NW-40-CRT-SV	FKM	2.17 (55.12)	1.58 (40.13)	1.89 (48.01)
NW-50-CRT-SV	FKM	2.95 (74.93)	1.97 (50.04)	2.32 (58.93)

Buna and Silicone O-rings available. Call for pricing.

FKM O-Rings

MODEL NUMBER	FLANGE TYPE
NW-10-OR-V	NW-10
NW-16-OR-V	NW-16
NW-25-OR-V	NW-25
NW-40-OR-V	NW-40
NW-50-OR-V	NW-50

Silicone O-Rings

MODEL NUMBER	FLANGE TYPE
NW-10-OR-S	NW-10
NW-16-OR-S	NW-16
NW-25-OR-S	NW-25
NW-40-OR-S	NW-40
NW-50-OR-S	NW-50

Buna O-Rings

MODEL NUMBER	FLANGE TYPE
NW-10-OR-B	NW-10
NW-16-OR-B	NW-16
NW-25-OR-B	NW-25
NW-40-OR-B	NW-40
NW-50-OR-B	NW-50

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



SPECIFICATIONS

Tube OD sizes: 1/2 to 2 inches (12.7 to 50.8mm)

Materials

Flange: 304 stainless steel
(316L available upon request)
O-rings: FKM, Buna & silicone

Fittings

Tube finishes: Beadblast standard
(Tumbled & electropolish available)

Fasteners

Wing nut, bulkhead & chain clamps

Vacuum range

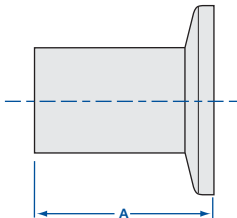
Elastomer seal: $\geq 1 \times 10^{-8}$ mbar -High vacuum
Metal seal: $\geq 1 \times 10^{-11}$ mbar - UHV

Temperature range

FKM: -20°C to 200°C
Silicone: -50° to 230°C
Buna: -30°C to 110°C
Metal seal: -270°C to 150°C

See Section 2.7 for EVAC metal seals

Nor-Cal Products manufactures a complete line of NW vacuum fittings. The tube portions are fabricated from 304 stainless steel. 316L stainless steel can be supplied on request. Nor-Cal Products makes its own elbows, and all tees and crosses are made with the pulled-port technique. This allows smooth, crevice-free butt welds to provide the maximum in cleanliness for UHV applications. Bakeout range is up to 200°C. Nor-Cal Products fittings are also available with CF, ISO and ASA flanges. Standard finish is bead blasted. Electropolished finish can also be provided as an option. Call for pricing.



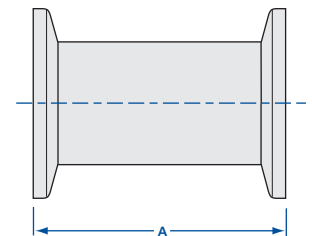
NW Half Nipples

MODEL NUMBER	TUBE OD	A
1N-NW-10	1/2 (12.70)	1.25 (31.75)
1N-NW-16B	3/4 (19.05)	1.15 (29.21)
1N-NW-25B	1 (25.40)	2.03 (51.56)
1N-NW-40B	1 1/2 (38.10)	2.40 (60.96)
1N-NW-50B	2 (50.80)	3.15 (80.01)



NW Full Nipples

MODEL NUMBER	TUBE OD	A
2N-NW-10	1/2 (12.70)	2.50 (63.50)
2N-NW-16B	3/4 (19.05)	2.30 (58.42)
2N-NW-25B	1 (25.40)	4.06 (103.12)
2N-NW-40B	1 1/2 (38.10)	4.80 (121.92)
2N-NW-50B	2 (50.80)	6.30 (160.02)

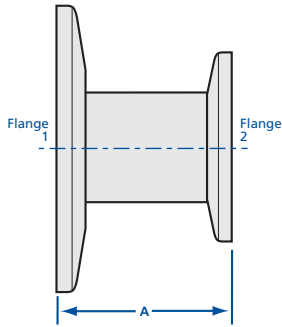


All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Flanges & Fittings

NW Fittings



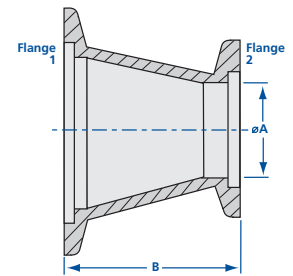
NW Reducer Nipples

MODEL NUMBER	FLANGE 1	FLANGE 2	TUBE OD	A
2NR-NW-16-10	NW-16	NW-10	1/2 (12.70)	1.40 (35.56)
2NR-NW-25-10	NW-25	NW-10	1/2 (12.70)	1.40 (35.56)
2NR-NW-25-16	NW-25	NW-16	3/4 (19.05)	1.30 (33.02)
2NR-NW-40-10	NW-40	NW-10	1/2 (12.70)	1.40 (35.56)
2NR-NW-40-16	NW-40	NW-16	3/4 (19.05)	1.30 (33.02)
2NR-NW-40-25	NW-40	NW-25	1 (25.40)	2.18 (55.37)
2NR-NW-50-10	NW-50	NW-10	1/2 (12.70)	1.40 (35.56)
2NR-NW-50-16	NW-50	NW-16	3/4 (19.05)	1.30 (33.02)
2NR-NW-50-25	NW-50	NW-25	1 (25.40)	2.18 (55.37)
2NR-NW-50-40	NW-50	NW-40	1 1/2 (38.10)	2.55 (64.77)



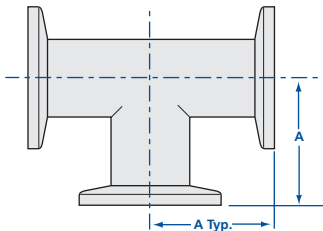
NW Conical Reducer Nipples

MODEL NUMBER	FLANGE 1	FLANGE 2	A	B
2NRC-NW-25-16	NW-25	NW-16	0.62 (15.75)	1.57 (39.88)
2NRC-NW-40-16	NW-40	NW-16	0.62 (15.75)	1.57 (39.88)
2NRC-NW-50-16	NW-50	NW-16	0.62 (15.75)	1.57 (39.88)
2NRC-NW-40-25	NW-40	NW-25	0.87 (22.10)	1.57 (39.88)
2NRC-NW-50-25	NW-50	NW-25	0.87 (22.10)	1.57 (39.88)
2NRC-NW-50-40	NW-50	NW-40	1.38 (35.05)	1.57 (39.88)



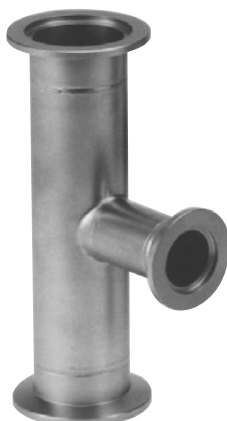
NW 316L Conical Reducer Nipples

MODEL NUMBER	FLANGE 1	FLANGE 2	A	B
2NRC-NW-40-25-316L	NW-40	NW-25	0.87 (22.10)	1.57 (39.88)
2NRC-NW-50-40-316L	NW-50	NW-40	0.87 (22.10)	1.57 (39.88)



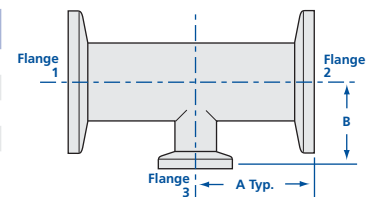
NW Tees

MODEL NUMBER	TUBE OD	A
3T-NW-10	1/2 (12.7)	1.25 (31.75)
3T-NW-16B	3/4 (19.05)	1.15 (29.21)
3T-NW-25B	1 (25.4)	2.03 (51.56)
3T-NW-40B	1 1/2 (38.1)	2.40 (60.96)
3T-NW-40H	1 1/2 (38.1)	2.56 (65.02)
3T-NW-50B	2 (50.8)	3.15 (80.01)
3T-NW-50H	2 (50.8)	2.76 (70.10)



NW Reducer Tees

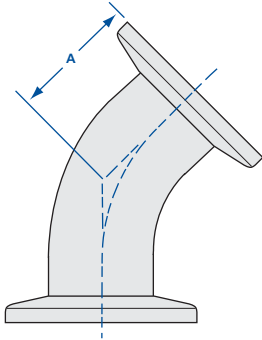
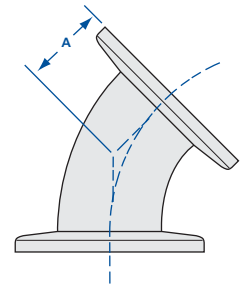
MODEL NUMBER	TUBE 1 & 2 ARM OD	TUBE 3 LEG OD	A	B
3TR-NW-25-16B	1 (25.40)	3/4 (19.05)	2.03 (51.56)	1.27 (32.26)
3TR-NW-40-16B	1 1/2 (38.10)	3/4 (19.05)	2.40 (60.96)	1.53 (38.86)
3TR-NW-40-25B	1 1/2 (38.10)	1 (25.40)	2.40 (60.96)	2.28 (57.91)
3TR-NW-50-16B	2 (50.80)	3/4 (19.05)	3.15 (80.01)	1.78 (45.21)
3TR-NW-50-40B	2 (50.80)	1 1/2 (38.10)	3.15 (80.01)	2.65 (67.31)





NW 45° Radius Elbows

MODEL NUMBER	TUBE OD	A
2K-NW-25	1 (25.40)	0.77 (19.56)
2K-NW-40	1½ (38.10)	1.08 (27.43)
2K-NW-50	2 (50.80)	1.39 (35.31)



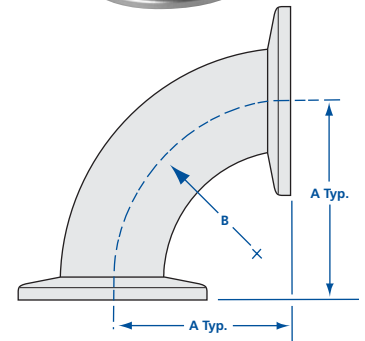
NW 45° Radius Elbows with Tangents

MODEL NUMBER	TUBE OD	A
2KL-NW-16	¾ (19.05)	0.91 (23.11)
2KL-NW-25	1 (25.40)	1.12 (28.45)
2KL-NW-40	1½ (38.10)	1.68 (42.67)
2KL-NW-50	2 (50.80)	1.99 (50.55)



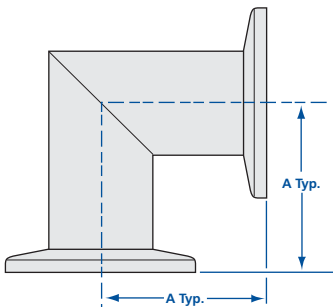
NW 90° Radius Elbows

MODEL NUMBER	TUBE OD	A	B
2E-NW-10	½ (12.70)	1.25 (31.75)	0.75 (19.05)
2E-NW-16B	¾ (19.05)	1.15 (29.21)	1.00 (25.40)
2E-NW-25B	1 (25.40)	1.65 (41.91)	1.50 (38.10)
2E-NW-40B	1½ (38.10)	2.40 (60.96)	2.25 (57.15)
2E-NW-40H	1½ (38.10)	2.56 (65.02)	2.25 (57.15)
2E-NW-40HL	1½ (38.10)	5.12 (130.05)	2.25 (57.15)
2E-NW-50B	2 (50.80)	3.15 (80.01)	3.00 (76.20)
2E-NW-50HL	2 (50.80)	5.51 (139.95)	3.00 (76.20)



NW 90° Mitered Elbows

MODEL NUMBER	TUBE OD	A
2E-NW-16MB	¾ (19.05)	1.15 (29.21)
2E-NW-25MB	1 (25.40)	2.03 (51.56)
2E-NW-40MB	1½ (38.10)	2.40 (60.96)
2E-NW-40MH	1½ (38.10)	2.56 (65.02)
2E-NW-50MB	2 (50.80)	3.15 (80.01)
2E-NW-50MH	2 (50.80)	2.76 (70.10)

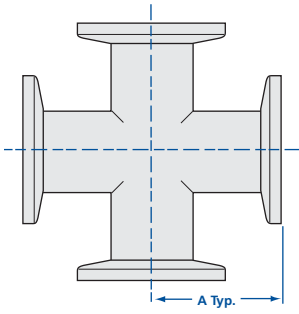


All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Flanges & Fittings

NW Fittings



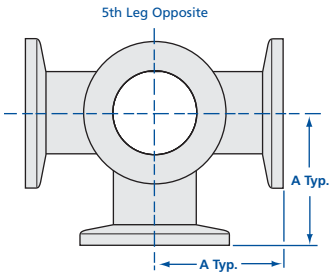
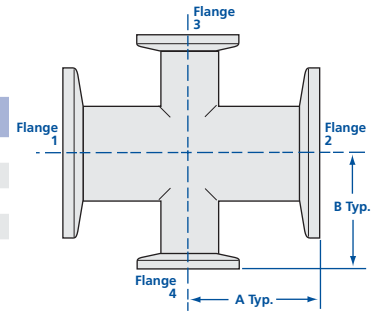
NW 4-Way Crosses

MODEL NUMBER	TUBE OD	A
4C-NW-10	1/2 (12.70)	1.25 (31.75)
4C-NW-16B	3/4 (19.05)	1.15 (29.21)
4C-NW-25B	1 (25.40)	2.03 (51.56)
4C-NW-40B	1 1/2 (38.10)	2.40 (60.96)
4C-NW-40H	1 1/2 (38.10)	2.56 (65.02)
4C-NW-50B	2 (50.80)	3.15 (80.01)
4C-NW-50H	2 (50.80)	2.76 (70.10)



NW Reducer Crosses

MODEL NUMBER	TUBE 1 & 2 OD	TUBE 3 & 4 OD	A	B
4CR-NW-25-16B	1 (25.40)	3/4 (19.05)	2.03 (51.56)	1.27 (32.26)
4CR-NW-40-16B	1 1/2 (38.10)	3/4 (19.05)	2.40 (60.96)	1.53 (38.86)
4CR-NW-40-25B	1 1/2 (38.10)	1 (25.40)	2.40 (60.96)	2.28 (57.91)
4CR-NW-50-16B	2 (50.80)	3/4 (19.05)	3.15 (80.01)	1.78 (45.21)
4CR-NW-50-40B	2 (50.80)	1 1/2 (38.10)	3.15 (80.01)	2.65 (67.31)



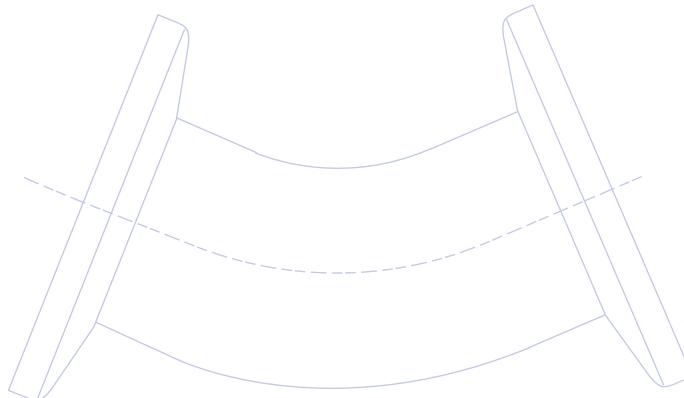
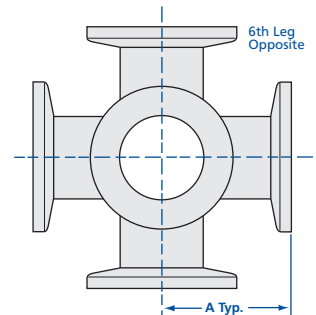
NW 5-Way Crosses

MODEL NUMBER	TUBE OD	A
5C-NW-16	3/4 (19.05)	1.50 (38.10)
5C-NW-25B	1 (25.40)	2.03 (51.56)
5C-NW-40B	1 1/2 (38.10)	2.40 (60.96)
5C-NW-50B	2 (50.80)	3.15 (80.01)



NW 6-Way Crosses

MODEL NUMBER	TUBE OD	A
6C-NW-16	3/4 (19.05)	1.50 (38.10)
6C-NW-25B	1 (25.40)	2.03 (51.56)
6C-NW-40B	1 1/2 (38.10)	2.40 (60.96)
6C-NW-50B	2 (50.80)	3.15 (80.01)



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



SPECIFICATIONS

General: Optional fastener or nonrotatable flanges with clearance bolt holes

Nominal OD sizes: ISO-63 to ISO-500

Tube OD sizes: 2 1/2 to 20 inches (63.5-508mm)

Materials

Flange: 304 or 316L stainless steel

O-rings: FKM, Buna

Bolts: 18-8 stainless steel

Vacuum range

Elastomer seal: $\geq 1 \times 10^{-8}$ mbar -High vacuum

Metal seal: $\geq 1 \times 10^{-11}$ mbar - UHV

Temperature range

FKM: -20°C to 200°C

Buna: -30°C to 110°C

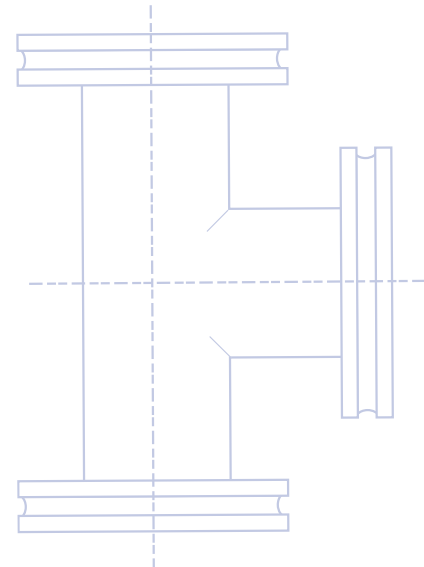
Metal seal: -270°C to 150°C

Nor-Cal Products ISO flanges and hardware are manufactured to the International Standards Organization specification so they can be mated to other manufacturers' ISO flanges. ISO flanges are made from Argon Oxygen Decarburization (AOD) 304 stainless steel material that is certified to meet ASTM-240 and has less than 0.01% sulfur in order to

prevent sulfur stringers. Grain size is 3 to 6 per ASTM E-112. Maximum inclusion size is 2.5 per ASTM E-45. Normally our standard material is in the low carbon range for 304 stainless steel. For increased corrosion resistance, some sizes are available from stock in 316L stainless steel.

Optional fastener and nonrotatable ISO flanges are available from stock

for 2 1/2 to 20 inch (63.5-508mm) tube sizes. Both use a FKM O-ring, held in place by a centering ring, to effect a seal with a vacuum range of 10^{-8} mbar. ISO components can be baked to 204°C. ISO flanges can also be used with standard clamps and aluminum seals to obtain a UHV seal bakeable to 150°C. Seals are described in detail in Catalog Section 2.7.

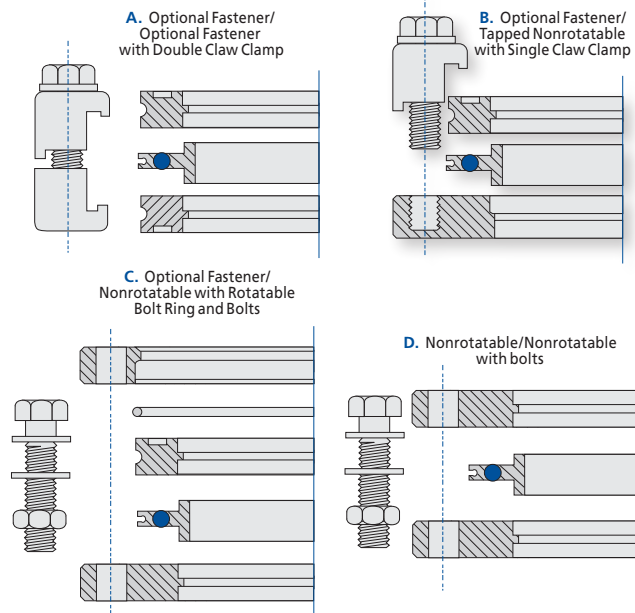


ISO Flange Assembly Instructions

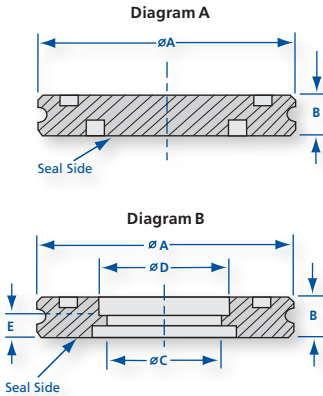
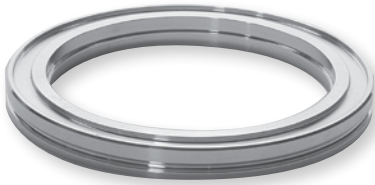
Optional fastener flanges are joined around the periphery with clamps. Double claw clamps are used when a pair of OF flanges are joined (See diagram A.), or single claw clamps are used to join an OF flange to a tapped nonrotatable on a pump or gate valve. (See diagram B.)

This fastening method allows the OF flange to be rotated for ease of component alignment.

Additionally, a rotatable bolt ring can be used to fasten an OF flange to a nonrotatable flange using bolts. (See diagram C.) A retainer ring prevents the OF flange from slipping through the bolt ring. Nonrotatable ISO flanges are assembled with bolts. (See diagram D.) They do not allow rotation of bolt holes on mating flanges to align components.



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

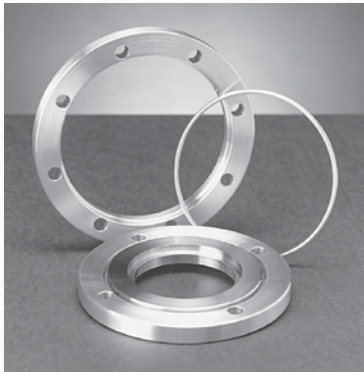


ISO Optional Fastener Flanges

MODEL NUMBER	DIAGRAM	NOMINAL ID	A	B	C	D	E
ISO-63-000-OF	A	-	3.74 (95.00)	0.47 (11.94)	-	-	-
ISO-63-250-OF	B	2 1/2 (63.50)	3.74 (95.00)	0.47 (11.94)	2.438 (61.93)	2.510 (63.75)	0.25 (6.35)
ISO-80-000-OF	A	-	4.331 (110.01)	0.47 (11.94)	-	-	-
ISO-80-300-OF	B	3 (76.20)	4.331 (110.01)	0.47 (11.94)	2.938 (74.63)	3.010 (76.45)	0.25 (6.35)
ISO-100-000-OF	A	-	5.118 (130.00)	0.47 (11.94)	-	-	-
ISO-100-400-OF	B	4 (101.60)	5.118 (130.00)	0.47 (11.94)	3.910 (99.31)	4.010 (101.85)	0.25 (6.35)
ISO-160-000-OF	A	-	7.087 (180.00)	0.47 (11.94)	-	-	-
ISO-160-600-OF	B	6 (152.40)	7.087 (180.01)	0.47 (11.94)	5.875 (149.23)	6.020 (152.91)	0.375 (9.53)
ISO-200-000-OF	A	-	9.449 (240.00)	0.47 (11.94)	-	-	-
ISO-200-800-OF	B	8 (203.20)	9.449 (240.00)	0.47 (11.94)	7.875 (200.03)	8.020 (203.71)	0.375 (9.53)
ISO-250-000-OF	A	-	11.417 (289.99)	0.47 (11.94)	-	-	-
ISO-250-1000-OF	B	10 (254.00)	11.417 (289.99)	0.47 (11.94)	9.875 (250.83)	10.020 (254.51)	0.375 (9.53)
ISO-320-000-OF	A	-	14.567 (370.00)	0.67 (17.02)	-	-	-
ISO-320-1200-OF	B	12 (304.80)	14.567 (370.00)	0.67 (17.02)	11.760 (298.70)	12.020 (305.31)	0.375 (9.53)
ISO-320-1275-OF	B	12 (304.80)	14.567 (370.00)	0.67 (17.02)	12.420 (315.47)	12.770 (324.36)	0.375 (9.53)
ISO-400-000-OF	A	-	17.716 (449.99)	0.67 (17.02)	-	-	-
ISO-400-1600-OF	B	16 (406.40)	17.716 (449.99)	0.67 (17.02)	15.624 (396.85)	16.020 (406.91)	0.375 (9.53)
ISO-500-000-OF	A	-	21.653 (549.99)	0.67 (17.02)	-	-	-
ISO-500-2000-OF	B	20 (508.00)	21.653 (549.99)	0.67 (17.02)	19.624 (498.45)	20.02 (508.51)	0.375 (9.53)

ISO 316L Optional Fastener Flanges

MODEL NUMBER	DIAGRAM	NOMINAL ID	A	B	C	D	E
ISO-63-250-OF-316L	B	2 1/2 (63.05)	3.740 (95.00)	0.47 (11.94)	2.438 (61.93)	2.510 (63.75)	0.25 (6.35)
ISO-80-300-OF-316L	B	3 (76.20)	4.331 (110.01)	0.47 (11.94)	2.938 (74.63)	3.010 (76.45)	0.25 (6.35)
ISO-100-400-OF-316L	B	4 (101.60)	5.118 (130.00)	0.47 (11.94)	3.910 (99.31)	4.010 (101.85)	0.25 (6.35)



ISO Rotatable Bolt Ring and Retainer Ring

MODEL NUMBER	FLANGE SIZE	A	B	C
ISO-63-BR	ISO-63	4.331 (110.01)	5.118 (130.00)	0.472 (11.99)
ISO-80-BR	ISO-80	4.921 (124.99)	5.709 (145.01)	0.472 (11.99)
ISO-100-BR	ISO-100	5.709 (145.01)	6.496 (165.00)	0.472 (11.99)
ISO-160-BR	ISO-160	7.874 (200.00)	8.858 (224.99)	0.630 (16.00)
ISO-200-BR	ISO-200	10.236 (259.99)	11.220 (284.99)	0.630 (16.00)
ISO-250-BR	ISO-250	12.205 (310.01)	13.189 (335.00)	0.630 (16.00)
ISO-320-BR	ISO-320	15.551 (395.00)	16.732 (424.99)	0.787 (19.99)
ISO-400-BR	ISO-400	18.898 (480.01)	20.079 (510.01)	0.787 (19.99)
ISO-500-BR	ISO-500	22.835 (580.01)	24.016 (610.01)	0.787 (19.99)

SPECIFICATIONS

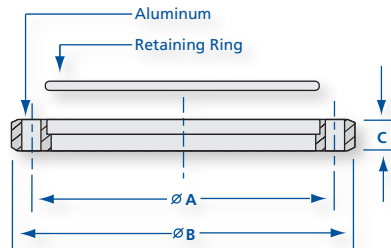
- General:** Optional fastener or nonrotatable flanges with clearance bolt holes
- Nominal OD sizes:** ISO-63 to ISO-500
- Tube OD sizes:** 2 1/2 to 20 inches (63.5-508mm)
- Materials**
 - Flange: 304 or 316L stainless steel
 - O-rings: FKM, Buna
 - Bolts: 18-8 stainless steel
- Vacuum range**
 - Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum
 - Metal seal: $\geq 1 \times 10^{-11}$ mbar - UHV
- Temperature range**
 - FKM: -20°C to 200°C
 - Silicone: -50° to 230°C
 - Buna: -30°C to 110°C
 - Metal seal: -270°C to 150°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

See Section 2.7 for EVAC metal seals

Replacement Retainer Ring

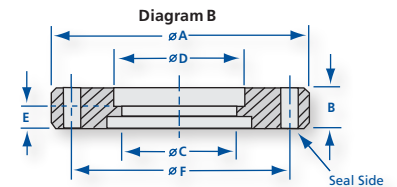
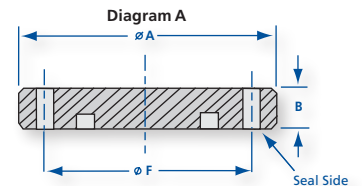
MODEL NUMBER
ISO-63-RR
ISO-80-RR
ISO-100-RR
ISO-160-RR
ISO-200-RR
ISO-250-RR
ISO-320-RR
ISO-400-RR
ISO-500-RR





ISO Nonrotatable Flanges

MODEL NUMBER	DIAGRAM	NOMINAL ID	A	B	C	D	E	F	BOLT HOLES	BOLT DIAMETER
ISO-63-000N	A	-	5.118 (130.00)	0.472 (11.99)	-	-	-	4.331 (110.01)	4	0.359 (9.12)
ISO-63-250N	B	2 1/2 (63.50)	5.118 (130.00)	0.472 (11.99)	2.438 (61.93)	2.510 (63.75)	0.250 (6.35)	4.331 (110.01)	4	0.359 (9.12)
ISO-80-000N	A	-	5.709 (145.01)	0.472 (11.99)	-	-	-	4.921 (124.99)	8	0.359 (9.12)
ISO-80-300N	B	3 1/2 (88.90)	5.709 (145.01)	0.472 (11.99)	2.938 (74.63)	3.010 (76.45)	0.250 (6.35)	4.921 (124.99)	8	0.359 (9.12)
ISO-100-000N	A	-	6.496 (165.00)	0.472 (11.99)	-	-	-	5.709 (145.01)	8	0.359 (9.12)
ISO-100-400N	B	4 (101.06)	6.496 (165.00)	0.472 (11.99)	3.910 (99.32)	4.010 (101.85)	0.250 (6.35)	5.709 (145.01)	8	0.359 (9.12)
ISO-160-000N	A	-	8.858 (224.99)	0.630 (16.00)	-	-	-	7.874 (200.00)	8	0.438 (11.13)
ISO-160-600N	B	6 (152.40)	8.858 (224.99)	0.630 (16.00)	5.875 (149.23)	6.020 (152.91)	0.375 (9.53)	7.874 (200.00)	8	0.438 (11.13)
ISO-200-000N	A	-	11.220 (284.99)	0.630 (16.00)	-	-	-	10.236 (259.99)	12	0.438 (11.13)
ISO-200-800N	B	8 (203.20)	11.220 (284.99)	0.630 (16.00)	7.875 (200.03)	8.020 (203.71)	0.375 (9.53)	10.236 (259.99)	12	0.438 (11.13)
ISO-250-000N	A	-	13.189 (335.00)	0.630 (16.00)	-	-	-	12.205 (310.01)	12	0.438 (11.13)
ISO-250-1000N	B	10 (254.00)	13.189 (335.00)	0.630 (16.00)	9.875 (250.83)	10.020 (254.51)	0.375 (9.53)	12.205 (310.01)	12	0.438 (11.13)
ISO-320-000N	A	-	16.732 (424.99)	0.787 (19.99)	-	-	-	15.551 (395.00)	12	0.551 (14.00)
ISO-320-1200N	B	12 (304.80)	16.732 (424.99)	0.787 (19.99)	11.760 (298.70)	12.020 (305.31)	0.375 (9.53)	15.551 (395.00)	12	0.551 (14.00)
ISO-320-1275N	B	12 (304.80)	16.732 (424.99)	0.787 (19.99)	12.420 (315.47)	12.770 (324.36)	0.375 (9.53)	15.551 (395.00)	12	0.551 (14.00)
ISO-400-000N	A	-	20.079 (510.01)	0.787 (19.99)	-	-	-	18.898 (480.01)	16	0.551 (14.00)
ISO-400-1600N	B	16 (406.80)	20.079 (510.01)	0.787 (19.99)	15.642 (397.31)	16.020 (406.91)	0.375 (9.53)	18.898 (480.01)	16	0.551 (14.00)
ISO-500-000N	A	-	24.016 (610.01)	0.787 (19.99)	-	-	-	22.835 (580.01)	16	0.551 (14.00)
ISO-500-2000N	B	20 (508.00)	24.016 (610.01)	0.787 (19.99)	19.642 (498.91)	20.020 (508.51)	0.375 (9.53)	22.835 (580.01)	16	0.551 (14.00)



SPECIFICATIONS

General: Optional fastener or nonrotatable flanges seal with clearance bolt holes

Nominal OD sizes: ISO-63 to ISO-500

Tube OD sizes: 2 1/2 to 20 inches (63.5-508mm)

Materials

Flange: 304 or 316L stainless steel

O-rings: FKM, Buna

Bolts: 18-8 stainless steel

Vacuum range

Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

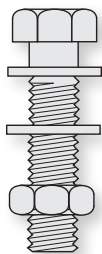
Metal seal: $\geq 1 \times 10^{-11}$ mbar - UHV

Temperature range

FKM: -20°C to 200°C

Buna: -30°C to 110°C

Metal seal: -270°C to 150°C



ISO Bolt Kits-Metric

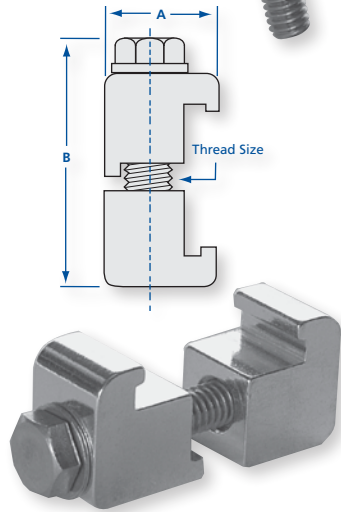
MODEL NUMBER	DESCRIPTION
B-ISO-63	(4) SS bolts, nuts & washers, M8 x 40mm
B-ISO-80	(8) SS bolts, nuts & washers, M8 x 40mm
B-ISO-100	(8) SS bolts, nuts & washers, M8 x 40mm
B-ISO-160	(8) SS bolts, nuts & washers, M10 x 50mm
B-ISO-200	(12) SS bolts, nuts & washers, M10 x 50mm
B-ISO-250	(12) SS bolts, nuts & washers, M10 x 50mm
B-ISO-320	(12) SS bolts, nuts & washers, M12 x 60mm
B-ISO-400	(16) SS bolts, nuts & washers, M12 x 60mm
B-ISO-500	(16) SS bolts, nuts & washers, M12 x 60mm

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

See Section 2.7 for EVAC metal seals

Flanges & Fittings

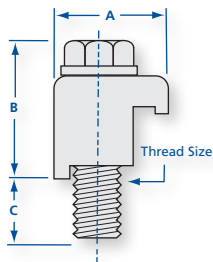
ISO Clamps



ISO Double Claw Aluminum Clamps

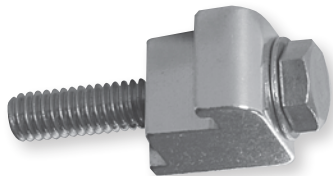
MODEL NUMBER	FLANGE SIZE	A	B	THREAD SIZE	CLAMPS REQUIRED
ISO-63-DCP	ISO-63	0.94 (23.88)	1.96 (49.78)	5/16-18	4
ISO-80-DCP	ISO-80	0.94 (23.88)	1.96 (49.78)	5/16-18	8
ISO-100-DCP	ISO-100	0.94 (23.88)	1.96 (49.78)	5/16-18	8
ISO-160-DCP	ISO-160	1.10 (27.94)	1.96 (49.78)	5/16-18	8
ISO-200-DCP	ISO-200	1.10 (27.94)	1.96 (49.78)	5/16-18	12
ISO-250-DCP	ISO-250	1.10 (27.94)	1.96 (49.78)	5/16-18	12
ISO-320-DCP	ISO-320	1.34 (34.04)	2.50 (63.50)	7/16-14	12
ISO-400-DCP	ISO-400	1.34 (34.04)	2.50 (63.50)	7/16-14	16
ISO-500-DCP	ISO-500	1.34 (34.04)	2.50 (63.50)	7/16-14	16

Metric Double Claw Clamps also available in most sizes. Call for information



ISO Single Claw Aluminum Clamps

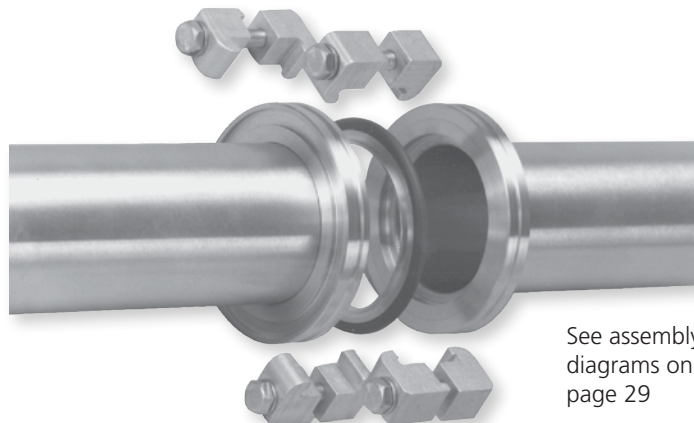
MODEL NUMBER	FLANGE SIZE	A	B	C	THREAD SIZE	CLAMPS REQUIRED
ISO-63-SCP	ISO-63	0.94 (23.88)	1.18 (29.97)	0.52 (13.21)	5/16-18	4
ISO-80-SCP	ISO-80	0.94 (23.88)	1.18 (29.97)	0.52 (13.21)	5/16-18	8
ISO-100-SCP	ISO-100	0.94 (23.88)	1.18 (29.97)	0.52 (13.21)	5/16-18	8
ISO-160-SCP	ISO-160	1.10 (27.94)	1.18 (29.97)	0.52 (13.21)	5/16-18	8
ISO-200-SCP	ISO-200	1.10 (27.94)	1.18 (29.97)	0.52 (13.21)	5/16-18	12
ISO-250-SCP	ISO-250	1.10 (27.94)	1.18 (29.97)	0.52 (13.21)	5/16-18	12
ISO-320-SCP	ISO-320	1.34 (34.04)	1.46 (37.08)	0.88 (22.35)	7/16-14	12
ISO-400-SCP	ISO-400	1.34 (34.04)	1.46 (37.08)	0.88 (22.35)	7/16-14	16
ISO-500-SCP	ISO-500	1.34 (34.04)	1.46 (37.08)	0.88 (22.35)	7/16-14	16



ISO Single Claw Aluminum Clamps – Metric

MODEL NUMBER	FLANGE SIZE	A	B	C	METRIC THREAD SIZE	CLAMPS REQUIRED
ISO-63-SCP-M	ISO-63	0.94 (23.88)	1.20 (30.48)	0.40 (10.16)	M8 x 1.25	4
ISO-80-SCP-M	ISO-80	0.94 (23.88)	1.20 (30.48)	0.40 (10.16)	M8 x 1.25	8
ISO-100-SCP-M	ISO-100	0.94 (23.88)	1.20 (30.48)	0.40 (10.16)	M8 x 1.25	8
ISO-160-SCP-M	ISO-160	1.10 (27.94)	1.20 (30.48)	0.40 (10.16)	M10 x 1.50	8
ISO-200-SCP-M	ISO-200	1.10 (27.94)	1.20 (30.48)	0.40 (10.16)	M10 x 1.50	12
ISO-250-SCP-M	ISO-250	1.10 (27.94)	1.20 (30.48)	0.40 (10.16)	M10 x 1.50	12
ISO-320-SCP-M	ISO-320	1.34 (34.04)	1.48 (37.59)	0.79 (20.07)	M12 x 1.75	12
ISO-400-SCP-M	ISO-400	1.34 (34.04)	1.48 (37.59)	0.79 (20.07)	M12 x 1.75	16
ISO-500-SCP-M	ISO-500	1.34 (34.04)	1.48 (37.59)	0.79 (20.07)	M12 x 1.75	16

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



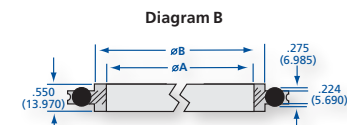
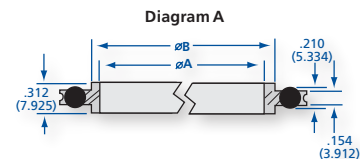
See assembly diagrams on page 29



ISO Aluminum Centering Rings with O-ring and Aluminum Spacer Ring

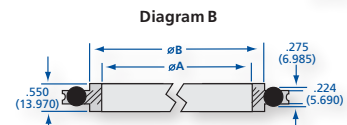
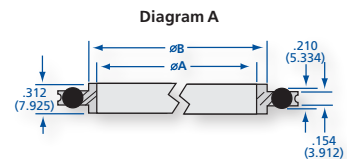
MODEL NUMBER	DIAGRAM	O-RING MATERIAL	A	B
ISO-63-CR-AV*	A	FKM	2.63 (66.80)	2.74 (69.60)
ISO-63-CR-AB*	A	Buna	2.63 (66.80)	2.74 (69.60)
ISO-80-CR-AV	A	FKM	3.14 (79.76)	3.25 (82.55)
ISO-80-CR-AB	A	Buna	3.14 (79.76)	3.25 (82.55)
ISO-100-CR-AV	A	FKM	3.89 (98.81)	4.00 (101.60)
ISO-100-CR-AB	A	Buna	3.89 (98.81)	4.00 (101.60)
ISO-160-CR-AV	A	FKM	5.90 (149.86)	6.01 (152.65)
ISO-160-CR-AB	A	Buna	5.90 (149.86)	6.01 (152.65)
ISO-200-CR-AV	A	FKM	8.26 (209.80)	8.37 (212.60)
ISO-200-CR-AB	A	Buna	8.26 (209.80)	8.37 (212.60)
ISO-250-CR-AV	A	FKM	10.14 (257.56)	10.25 (260.35)
ISO-250-CR-AB	A	Buna	10.14 (257.56)	10.25 (260.35)
ISO-320-CR-AV	B	FKM	12.32 (312.93)	12.51 (317.75)
ISO-320-CR-AB	B	Buna	12.32 (312.93)	12.51 (317.75)
ISO-400-CR-AV	B	FKM	15.55 (394.97)	15.75 (400.05)
ISO-400-CR-AB	B	Buna	15.55 (394.97)	15.75 (400.05)
ISO-500-CR-AV	B	FKM	19.53 (496.06)	19.72 (500.89)
ISO-500-CR-AB	B	Buna	19.53 (496.06)	19.72 (500.89)

*Machined centering ring.



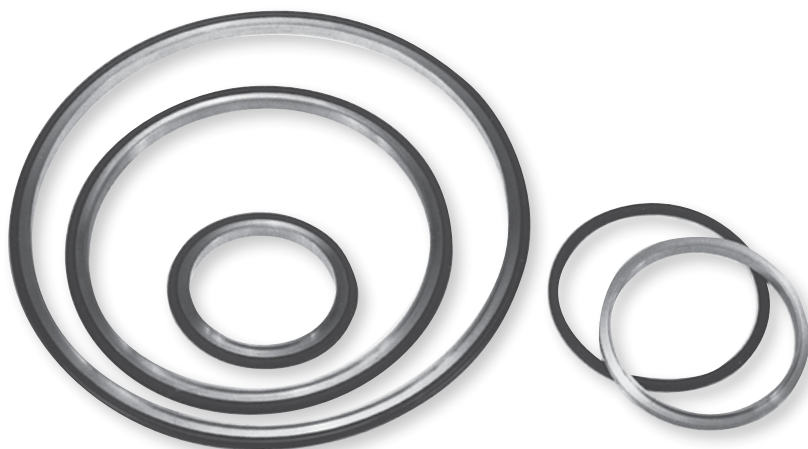
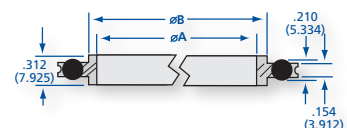
ISO Stainless Steel Centering Rings with O-ring and Aluminum Spacer Ring

MODEL NUMBER	DIAGRAM	O-RING MATERIAL	A	B
ISO-63-CR-SV	A	FKM	2.63 (66.80)	2.74 (69.60)
ISO-80-CR-SV	A	FKM	3.14 (79.76)	3.25 (82.55)
ISO-100-CR-SV	A	FKM	3.89 (98.81)	4.00 (101.60)
ISO-160-CR-SV	A	FKM	5.90 (149.86)	6.01 (152.65)
ISO-200-CR-SV	A	FKM	8.26 (209.80)	8.37 (212.60)
ISO-250-CR-SV	A	FKM	10.14 (257.56)	10.25 (260.35)
ISO-320-CR-SV	B	FKM	12.36 (313.94)	12.52 (318.01)
ISO-400-CR-SV	B	FKM	15.55 (394.97)	15.75 (400.05)



ISO 316L Stainless Steel Centering Rings with O-ring and Aluminum Spacer Ring

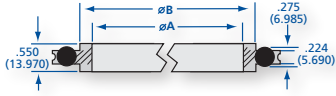
MODEL NUMBER	O-RING MATERIAL	A	B
ISO-63-CR-SV-316L	FKM	2.63 (66.80)	2.74 (69.60)
ISO-80-CR-SV-316L	FKM	3.14 (79.76)	3.25 (82.55)
ISO-100-CR-SV-316L	FKM	3.89 (98.81)	4.00 (101.60)



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Flanges & Fittings

ISO Centering Rings

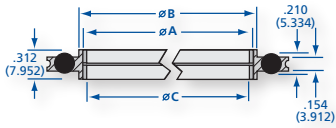


ISO Stainless Steel Centering Rings with O-ring

MODEL NUMBER	O-RING MATERIAL	A	B
ISO-63-CR	FKM	2.63 (66.80)	2.74 (69.60)
ISO-80-CR	FKM	3.14 (79.76)	3.25 (82.55)
ISO-100-CR	FKM	3.89 (98.81)	4.00 (101.60)
ISO-160-CR	FKM	5.90 (149.86)	6.01 (152.65)
ISO-200-CR	FKM	8.26 (209.80)	8.37 (212.60)
ISO-250-CR	FKM	10.14 (257.56)	10.25 (260.35)
ISO-320-CR	FKM	12.32 (312.93)	12.52 (318.01)
ISO-400-CR	FKM	15.55 (394.97)	15.74 (399.80)

See below for replacement O-rings.

ISO Screened Stainless Steel Centering Rings with O-ring and Aluminum Spacer Ring



MODEL NUMBER	O-RING MATERIAL	A	B	C	MESH (sq./in.)
ISO-63-CR-SV-16	FKM	2.63 (66.80)	2.74 (69.60)	2.38 (60.45)	16
ISO-80-CR-SV-16	FKM	3.14 (79.76)	3.25 (82.55)	2.87 (72.90)	16
ISO-100-CR-SV-16	FKM	3.89 (98.81)	4.00 (101.60)	3.50 (88.90)	16
ISO-160-CR-SV-16	FKM	5.90 (149.86)	6.01 (152.65)	5.50 (139.70)	16

Includes O-ring. See below for replacement O-rings.



FKM O-Rings

MODEL NUMBER	FLANGE TYPE
ISO-63-OR-V	ISO-63
ISO-80-OR-V	ISO-80
ISO-100-OR-V	ISO-100
ISO-160-OR-V	ISO-160
ISO-200-OR-V	ISO-200
ISO-250-OR-V	ISO-250
ISO-320-OR-V	ISO-320
ISO-400-OR-V	ISO-400
ISO-500-OR-V	ISO-500

Buna O-Rings

MODEL NUMBER	FLANGE TYPE
ISO-63-OR-B	ISO-63
ISO-80-OR-B	ISO-80
ISO-100-OR-B	ISO-100
ISO-160-OR-B	ISO-160
ISO-200-OR-B	ISO-200
ISO-250-OR-B	ISO-250
ISO-320-OR-B	ISO-320
ISO-400-OR-B	ISO-400
ISO-500-OR-B	ISO-500

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Nor-Cal Products manufactures a complete line of ISO vacuum fittings with optional fastener or nonrotatable flanges. The fitting tube portions are fabricated from 304 stainless steel. For increased resistance to corrosion in downstream semiconductor processes, some ISO flanges and fittings are available in 316L stainless steel. Elbows, tees and crosses are fabricated in-house using a pulled-port technique for smooth, crevice-free butt welds to provide the maximum in cleanliness for UHV applications.

Fittings are shown with optional fastener (OF) flanges only. To order a fitting with nonrotatable flanges substitute “-N” for “-OF” in the model number. Fittings are also available with CF (Conflat style), NW (ISO-KF compatible) and ASA flanges. Standard finish is bead blasted. Electropolished finish also available. Call for pricing.



SPECIFICATIONS

General: Optional fastener or nonrotatable flanges with clearance bolt holes

Nominal OD sizes: ISO-63 to ISO-500

Tube OD sizes: 2 1/2 to 20 inches (63.5-508mm)

Tube finish: Beadblast, tumbled, or electropolish

Materials

Flange: 304 or 316L stainless steel

O-rings: FKM, Buna

Bolts: 18-8 stainless steel

Vacuum range

Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Metal seal: $\geq 1 \times 10^{-11}$ mbar - UHV

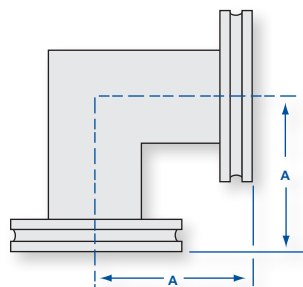
Temperature range

FKM: -20°C to 200°C

Buna: -30°C to 110°C

Metal seal: -270°C to 150°C

See Section 2.7 for EVAC metal seals



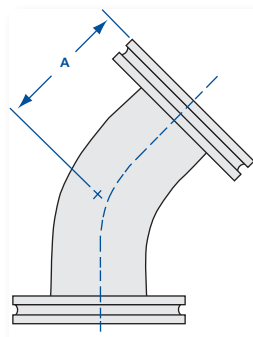
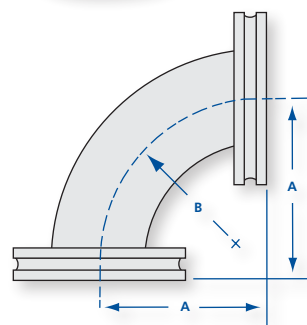
ISO 90° Mitered Elbows

MODEL NUMBER	TUBE OD	A
2E-ISO-63-OF-M	2 1/2 (63.50)	3.25 (82.55)
2E-ISO-80-OF-M	3 (76.20)	3.50 (88.90)
2E-ISO-100-OF-M	4 (101.60)	4.13 (104.90)
2E-ISO-160-OF-M	6 (152.40)	5.38 (136.65)
2E-ISO-200-OF-M	8 (203.20)	7.38 (187.45)
2E-ISO-250-OF-M	10 (254.00)	9.88 (250.95)



ISO 90° Radius Elbows

MODEL NUMBER	TUBE OD	A	B
2E-ISO-63-OF	2 1/2 (63.50)	4.00 (101.60)	3.75 (95.25)
2E-ISO-80-OF	3 (76.20)	4.75 (120.65)	4.50 (114.30)
2E-ISO-100-OF	4 (101.60)	6.25 (158.75)	6.00 (152.40)
2E-ISO-160-OF	6 (152.40)	9.38 (238.25)	9.00 (228.60)
2E-ISO-200-OF	8 (203.20)	12.38 (314.45)	12.00 (304.80)
2E-ISO-250-OF	10 (254.00)	15.38 (390.65)	15.00 (381.00)



ISO 45° Elbows with Tangents

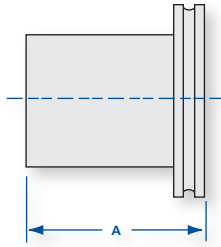
MODEL NUMBER	TUBE OD	A
2KL-ISO-63-OF	2 1/2 (63.50)	3.25 (82.55)
2KL-ISO-80-OF	3 (76.20)	3.93 (99.82)
2KL-ISO-100-OF	4 (101.60)	5.03 (127.76)



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Flanges & Fittings

ISO Fittings



ISO Half Nipples

MODEL NUMBER	TUBE OD	A
1N-ISO-63-OF	2½ (63.50)	3.25 (82.55)
1N-ISO-63-OF-V	2½ (63.50)	4.00 (101.60)
1N-ISO-63-OF-H	2½ (63.50)	3.94 (100.08)
1N-ISO-80-OF	3 (76.20)	3.50 (88.90)
1N-ISO-80-OF-H	3 (76.20)	3.94 (100.08)
1N-ISO-100-OF	4 (101.60)	4.13 (104.90)
1N-ISO-100-OF-V	4 (101.60)	5.12 (130.05)
1N-ISO-100-OF-H	4 (101.60)	3.94 (100.08)
1N-ISO-160-OF	6 (152.40)	5.38 (136.65)
1N-ISO-160-OF-V	6 (152.40)	6.44 (163.58)
1N-ISO-160-OF-H	6 (152.40)	3.94 (100.08)
1N-ISO-200-OF	8 (203.20)	7.38 (187.45)
1N-ISO-250-OF	10 (254.00)	9.88 (250.95)
1N-ISO-320-OF	12 (304.80)	9.88 (250.95)
1N-ISO-400-OF	16 (406.40)	9.88 (250.95)
1N-ISO-500-OF	20 (508.00)	9.88 (250.95)



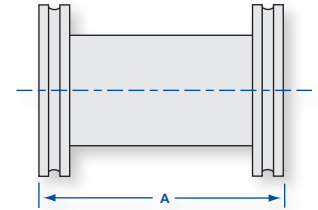
ISO 316L Half Nipples

MODEL NUMBER	TUBE OD	A
1N-ISO-63-OF-316L	2½ (63.50)	3.25 (82.55)
1N-ISO-80-OF-316L	3 (76.20)	3.50 (88.90)
1N-ISO-100-OF-316L	4 (101.60)	4.13 (104.90)



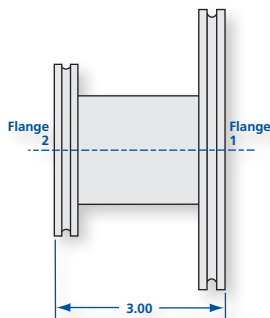
ISO Full Nipples

MODEL NUMBER	TUBE OD	A
2N-ISO-63-OF	2½ (63.50)	6.50 (165.10)
2N-ISO-80-OF	3 (76.20)	7.00 (177.80)
2N-ISO-100-OF	4 (101.60)	8.26 (209.80)
2N-ISO-160-OF	6 (152.40)	10.76 (273.30)
2N-ISO-200-OF	8 (203.20)	14.76 (374.90)
2N-ISO-250-OF	10 (254.00)	19.76 (501.90)
2N-ISO-320-OF	12 (304.80)	19.76 (501.90)
2N-ISO-400-OF	16 (406.40)	19.76 (501.90)
2N-ISO-500-OF	20 (508.00)	19.76 (501.90)



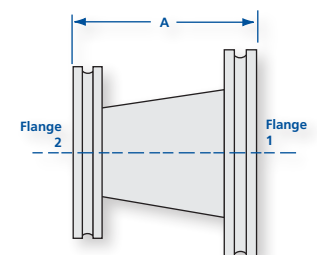
ISO Reducer Nipples

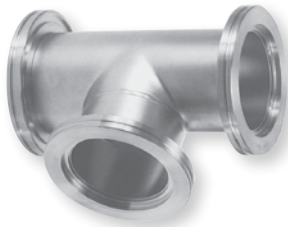
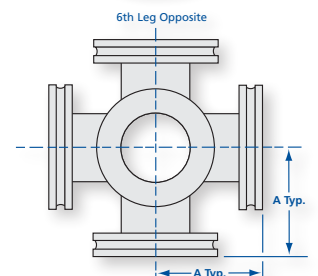
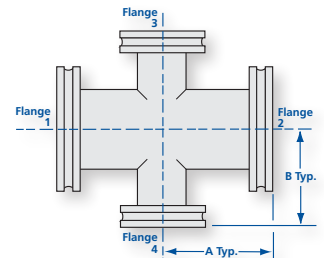
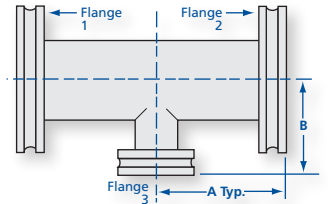
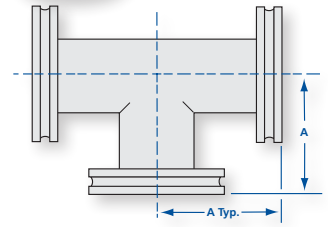
MODEL NUMBER	FLANGE 1	FLANGE 2	TUBE OD
2NR-ISO-80-63-OF	ISO-80	ISO-63	2½ (63.50)
2NR-ISO-100-63-OF	ISO-100	ISO-63	2½ (63.50)
2NR-ISO-100-80-OF	ISO-100	ISO-80	3 (76.20)
2NR-ISO-160-63-OF	ISO-160	ISO-63	2½ (63.50)
2NR-ISO-160-80-OF	ISO-160	ISO-80	3 (76.20)
2NR-ISO-160-100-OF	ISO-160	ISO-100	4 (101.60)
2NR-ISO-200-63-OF	ISO-200	ISO-63	2½ (63.50)
2NR-ISO-200-80-OF	ISO-200	ISO-80	3 (76.20)
2NR-ISO-200-100-OF	ISO-200	ISO-100	4 (101.60)
2NR-ISO-200-160-OF	ISO-200	ISO-160	6 (152.40)
2NR-ISO-250-63-OF	ISO-250	ISO-63	2½ (63.50)
2NR-ISO-250-80-OF	ISO-250	ISO-80	3 (76.20)
2NR-ISO-250-100-OF	ISO-250	ISO-100	4 (101.60)
2NR-ISO-250-160-OF	ISO-250	ISO-160	6 (152.40)
2NR-ISO-250-200-OF	ISO-250	ISO-200	8 (203.20)



ISO Conical Reducer Nipples

MODEL NUMBER	FLANGE 1 TYPE	TUBE OD	FLANGE 2 TYPE	TUBE OD	A
2NRC-ISO-80-63-OF	ISO-80	3 (76.2)	ISO-63	2½ (63.50)	4.12 (104.65)
2NRC-ISO-100-63-OF	ISO-100	4 (101.6)	ISO-63	2½ (63.50)	4.12 (104.65)
2NRC-ISO-100-80-OF	ISO-100	4 (101.6)	ISO-80	3 (76.20)	4.12 (104.65)



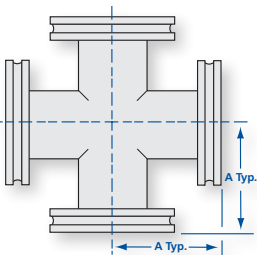


ISO Tees

MODEL NUMBER	TUBE OD	A
3T-ISO-63-OF	2 1/2 (63.50)	3.25 (82.55)
3T-ISO-80-OF	3 (76.20)	3.50 (88.90)
3T-ISO-100-OF	4 (101.60)	4.13 (104.90)
3T-ISO-160-OF	6 (152.40)	5.38 (136.65)
3T-ISO-200-OF	8 (203.20)	7.38 (187.45)
3T-ISO-250-OF	10 (254.00)	9.88 (250.95)

ISO Reducer Tees

MODEL NUMBER	FLANGE 1 & 2		FLANGE 3		A	B
	TYPE	ARM OD	TYPE	LEG OD		
3TR-ISO-80-63-OF	ISO-80	3 (76.2)	ISO-63	2 1/2 (63.50)	3.50 (88.90)	3.50 (88.90)
3TR-ISO-100-63-OF	ISO-100	4 (101.6)	ISO-63	2 1/2 (63.50)	4.13 (104.90)	4.00 (101.60)
3TR-ISO-100-80-OF	ISO-100	4 (101.6)	ISO-80	3 (76.20)	4.13 (104.90)	4.00 (101.60)
3TR-ISO-160-63-OF	ISO-160	6 (152.4)	ISO-63	2 1/2 (63.50)	5.38 (136.65)	5.00 (127.00)
3TR-ISO-160-80-OF	ISO-160	6 (152.4)	ISO-80	3 (76.20)	5.38 (136.65)	5.00 (127.00)
3TR-ISO-160-100-OF	ISO-160	6 (152.4)	ISO-100	4 (101.60)	5.38 (136.65)	5.13 (130.30)
3TR-ISO-200-63-OF	ISO-200	8 (203.2)	ISO-63	2 1/2 (63.50)	7.38 (187.45)	6.00 (152.40)
3TR-ISO-200-80-OF	ISO-200	8 (203.2)	ISO-80	3 (76.20)	7.38 (187.45)	6.00 (152.40)
3TR-ISO-200-100-OF	ISO-200	8 (203.2)	ISO-100	4 (101.60)	7.38 (187.45)	6.13 (155.70)
3TR-ISO-200-160-OF	ISO-200	8 (203.2)	ISO-160	6 (152.40)	7.38 (187.45)	6.38 (162.05)

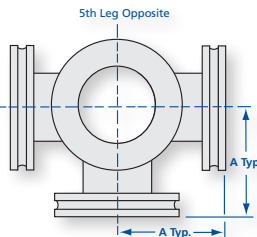


ISO 4-Way Crosses

MODEL NUMBER	TUBE OD	A
4C-ISO-63-OF	2 1/2 (63.50)	3.25 (82.55)
4C-ISO-80-OF	3 (76.20)	3.50 (88.90)
4C-ISO-100-OF	4 (101.60)	4.13 (104.90)
4C-ISO-160-OF	6 (152.40)	5.38 (136.65)
4C-ISO-200-OF	8 (203.20)	7.38 (187.45)
4C-ISO-250-OF	10 (254.00)	9.88 (250.95)

ISO 4-Way Reducer Crosses

MODEL NUMBER	FLANGES 1 & 2		FLANGES 3 & 4		A	B
	TYPE	ARM OD	TYPE	LEG OD		
4CR-ISO-80-63-OF	ISO-80	3	ISO-63	2 1/2 (63.50)	3.50 (88.90)	3.50 (88.90)
4CR-ISO-100-63-OF	ISO-100	4	ISO-63	2 1/2 (63.50)	4.13 (104.90)	4.00 (101.60)
4CR-ISO-100-80-OF	ISO-100	4	ISO-80	3 (76.20)	4.13 (104.90)	4.00 (101.60)
4CR-ISO-160-63-OF	ISO-160	6	ISO-63	2 1/2 (63.50)	5.38 (136.65)	5.00 (127.00)
4CR-ISO-160-80-OF	ISO-160	6	ISO-80	3 (76.20)	5.38 (136.65)	5.00 (127.00)
4CR-ISO-160-100-OF	ISO-160	6	ISO-100	4 (101.60)	5.38 (136.65)	5.13 (130.30)
4CR-ISO-200-160-OF	ISO-200	8	ISO-160	6 (152.40)	7.38 (187.45)	6.38 (162.05)



ISO 5-Way Crosses

MODEL NUMBER	TUBE OD	A
5C-ISO-63-OF	2 1/2 (63.50)	3.25 (82.55)
5C-ISO-80-OF	3 (76.20)	3.50 (88.90)
5C-ISO-100-OF	4 (101.60)	4.13 (104.90)
5C-ISO-160-OF	6 (152.40)	5.38 (136.65)
5C-ISO-200-OF	8 (203.20)	7.38 (187.45)
5C-ISO-250-OF	10 (254.00)	9.88 (250.95)



ISO 6-Way Crosses

MODEL NUMBER	TUBE OD	A
6C-ISO-63-OF	2 1/2 (63.50)	3.25 (82.55)
6C-ISO-80-OF	3 (76.20)	3.50 (88.90)
6C-ISO-100-OF	4 (101.60)	4.13 (104.90)
6C-ISO-160-OF	6 (152.40)	5.38 (136.65)
6C-ISO-200-OF	8 (203.20)	7.38 (187.45)
6C-ISO-250-OF	10 (254.00)	9.88 (250.95)



Flanges & Fittings

ASA Flange General Information

SPECIFICATIONS

General: Rotatable or nonrotatable flanges

Nominal OD sizes: 5 to 16 inches
(125-400mm)

Tube OD sizes: 2 to 12 inches (50-320mm)

Materials

Flange: 304 stainless steel

O-rings: FKM

Bolts: 18-8 stainless steel

Vacuum range: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range: -20° to 204°C
Sustained: -20°C to 150°C



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Nor-Cal Products ASA flanges are manufactured from specially treated 304 stainless steel. These flanges mate with standard 150 lb. ASA flanges or 150 ANSI flanges. They are available from stock for standard tube sizes from 2 to 12 inches (50.8 to 304.8mm). Larger sizes are available upon request.

ASA TO ANSI CONVERSION CHART

ASA	ANSI
5.0	1.5
6.0	2.0
7.5	3.0
9.0	4.0
11.0	6.0
13.5	8.0
16.0	10.0

Nuts and bolts are used to apply pressure between the mating flanges and a seal is effected when a FKM

O-ring is compressed. ASA flanges can be baked to 204°C and have a vacuum range of up to 10⁻⁸ mbar. Besides being sold separately, they are available as standards on nipples, adapters, tees, crosses, elbows and valves.

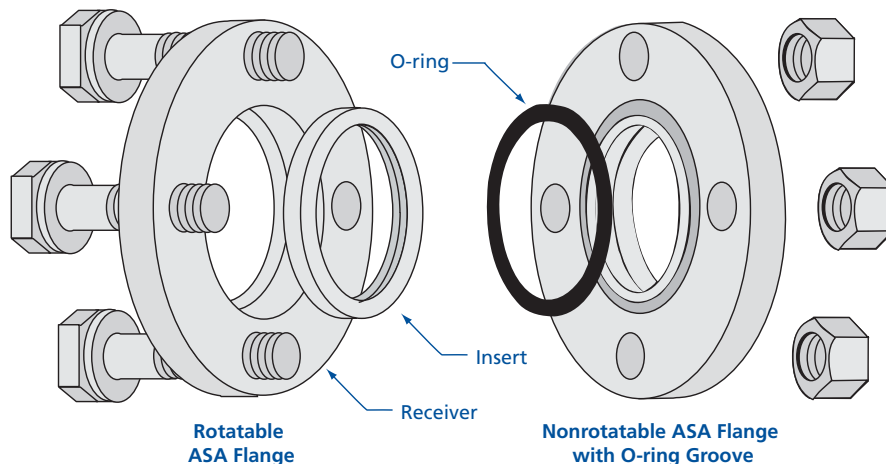
Rotatable Flange Option

When components of several systems are used interchangeably, use of rotatable flanges is recommended. Assembly is facilitated by rotation of mating flanges, to align bolt holes. Nonrotatable ASA flanges, unlike rotatable, contain both sealing surface and bolt holes in one unit rather than two. This makes the nonrotatable flange less expensive, and therefore the preferred choice when mating component orientation is not a

concern. All fittings are priced with nonrotatable flanges. For fittings with rotatable flanges, add the difference between a nonrotatable and rotatable flange of the desired size. Multiply by the number of rotatable flanges required. Be sure to specify the flange numbers which are rotatable.

O-Ring Groove Option

One of each pair of mating ASA flanges requires an O-ring groove. When ordering flanges with grooves indicate this by adding “-G” to the flange model number. An example would be a rotatable ASA-11 flange bored out for six inch (152.4mm) OD tubing with a groove. The model number would be ASA-11-600R-G. The same rule applies when ordering a fitting or adapter flange with only one ASA flange. An example would be adapter flange model number ASA-6-338-200Z-G. When a fitting has more than one ASA flange, such as a four-way cross, indicate which flanges are desired with grooves by using the flange numbers on the drawing. If, for example, you desired a cross with ASA-9 flanges and a six inch (160mm) tube OD with grooved flanges on the left and bottom ports, the model number would be 4C-ASA-9-600-G1-G3. Add the appropriate amount for each O-ring groove to the price of the fitting.

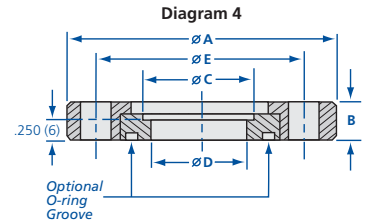
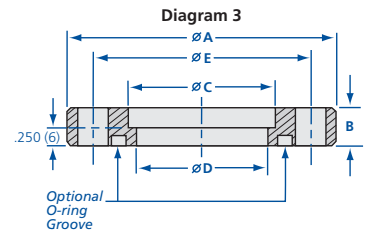
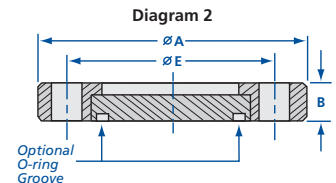
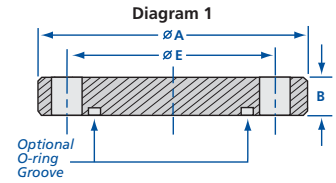




ASA Flanges - 5 to 9 Inch (125-225mm) OD

One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.

MODEL NUMBER	TYPE	DIAGRAM	A	B	C	D	E	BOLT HOLES NO.	BOLT HOLES SIZE
ASA-5-000N	Blank	1	5.00 (127.00)	0.500 (12.70)	-	-	3.880 (98.55)	4	0.625 (15.8)
ASA-5-200N	Bored	3	5.00 (127.00)	0.500 (12.70)	2.01 (51.05)	1.938 (49.23)	3.880 (98.55)	4	0.625 (15.8)
ASA-5-250N	Bored	3	5.00 (127.00)	0.500 (12.70)	2.51 (63.75)	2.438 (61.93)	3.880 (98.55)	4	0.625 (15.8)
ASA-5-000R	Blank	2	5.00 (127.00)	0.500 (12.70)	-	-	3.880 (98.55)	4	0.625 (15.8)
ASA-5-200R	Bored	4	5.00 (127.00)	0.500 (12.70)	2.01 (51.05)	1.938 (49.23)	3.880 (98.55)	4	0.625 (15.8)
ASA-5-250R	Bored	4	5.00 (127.00)	0.500 (12.70)	2.51 (63.75)	2.438 (61.93)	3.880 (98.55)	4	0.625 (15.8)
ASA-6-000N	Blank	1	6.00 (152.40)	0.500 (12.70)	-	-	4.750 (120.65)	4	0.750 (19.05)
ASA-6-300N	Bored	3	6.00 (152.40)	0.500 (12.70)	3.01 (76.45)	2.938 (74.63)	4.750 (120.65)	4	0.750 (19.05)
ASA-6-350N	Bored	3	6.00 (152.40)	0.500 (12.70)	3.51 (89.15)	3.438 (87.33)	4.750 (120.65)	4	0.750 (19.05)
ASA-6-000R	Blank	2	6.00 (152.40)	0.612 (15.54)	-	-	4.750 (120.65)	4	0.750 (19.05)
ASA-6-300R	Bored	4	6.00 (152.40)	0.612 (15.54)	3.01 (76.45)	2.938 (74.63)	4.750 (120.65)	4	0.750 (19.05)
ASA-6-350R	Bored	4	6.00 (152.40)	0.612 (15.54)	3.51 (89.15)	3.438 (87.33)	4.750 (120.65)	4	0.750 (19.05)
ASA-7.5-000N	Blank	1	7.50 (190.50)	0.500 (12.70)	-	-	6.000 (152.40)	4	0.750 (19.05)
ASA-7.5-400N	Bored	3	7.50 (190.50)	0.500 (12.70)	4.01 (101.85)	3.910 (99.31)	6.000 (152.40)	4	0.750 (19.05)
ASA-7.5-000R	Blank	2	7.50 (190.50)	0.612 (15.54)	-	-	6.000 (152.40)	4	0.750 (19.05)
ASA-7.5-400R	Bored	4	7.50 (190.50)	0.612 (15.54)	4.01 (101.85)	3.910 (99.31)	6.000 (152.40)	4	0.750 (19.05)
ASA-9-000N	Blank	1	9.00 (228.60)	0.500 (12.70)	-	-	7.500 (190.50)	8	0.750 (19.05)
ASA-9-400N	Bored	3	9.00 (228.60)	0.500 (12.70)	4.01 (101.85)	3.910 (99.31)	7.500 (190.50)	8	0.750 (19.05)
ASA-9-600N	Bored	3	9.00 (228.60)	0.500 (12.70)	6.02 (152.91)	5.875 (149.23)	7.500 (190.50)	8	0.750 (19.05)
ASA-9-000R	Blank	2	9.00 (228.60)	0.612 (15.54)	-	-	7.500 (190.50)	8	0.750 (19.05)
ASA-9-400R	Bored	4	9.00 (228.60)	0.612 (15.54)	4.01 (101.85)	3.910 (99.31)	7.500 (190.50)	8	0.750 (19.05)
ASA-9-600R	Bored	4	9.00 (228.60)	0.612 (15.54)	6.02 (152.91)	5.875 (149.23)	7.500 (190.50)	8	0.750 (19.05)



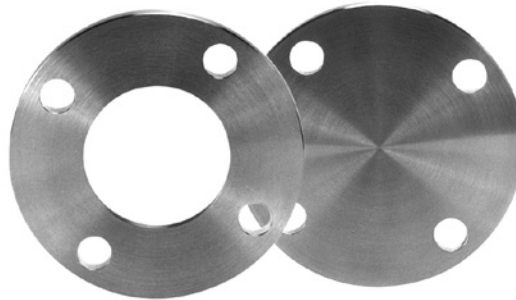
Model Number Definitions

N = Nonrotatable R = Rotatable

O-ring Groove Option

Indicate grooved flanges by adding “-G” to the end of the main part number. Add the appropriate cost for each grooved flange.

Example: ASA-9-000R-G



ASA Flange Hardware

MODEL NUMBER	FLANGE SIZE	DESCRIPTION
BA-5	ASA-5	(4) SS bolts (9/16-12 x 1.5) nuts and washers
OR-2-231	ASA-5	(1) FKM O-ring
BA-6	ASA-6	(4) SS bolts (5/8-11 x 1.5) nuts and washers
OR-2-238	ASA-6	(1) FKM O-ring
BA-7.5	ASA-7.5	(4) SS bolts (5/8-11 x 1.5) nuts and washers
OR-2-243	ASA-7.5	(1) FKM O-ring
BA-9	ASA-9	(8) SS bolts (5/8-11 x 1.5) nuts and washers
OR-2-259	ASA-9	(1) FKM O-ring

ASA Hardware for Mating to Gate Valves

MODEL NUMBER	FLANGE SIZE	DESCRIPTION
BA-6GV	ASA-6	(4) SS bolts (3/8-16x1.0) & reducer bushings (3/8 x 3/4)
BA-7.5GV	ASA-7.5	(4) SS bolts (3/8-16x1.0) & reducer bushings (3/8 x 3/4)
BA-9GV	ASA-9	(8) SS bolts (3/8-16x1.0) & reducer bushings (3/8 x 3/4)

SPECIFICATIONS

General: Rotatable and nonrotatable

Materials

Flanges: 304 stainless steel
Gaskets: FKM
Bolts: 18-8 stainless steel

Torque: 21.5 Nm

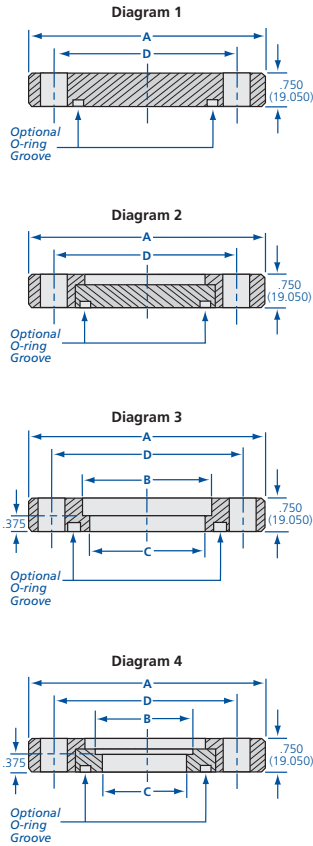
Vacuum range: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range: -20° to 204°C
Sustained: -20°C to 150°C



Flanges & Fittings

ASA Flanges & Hardware



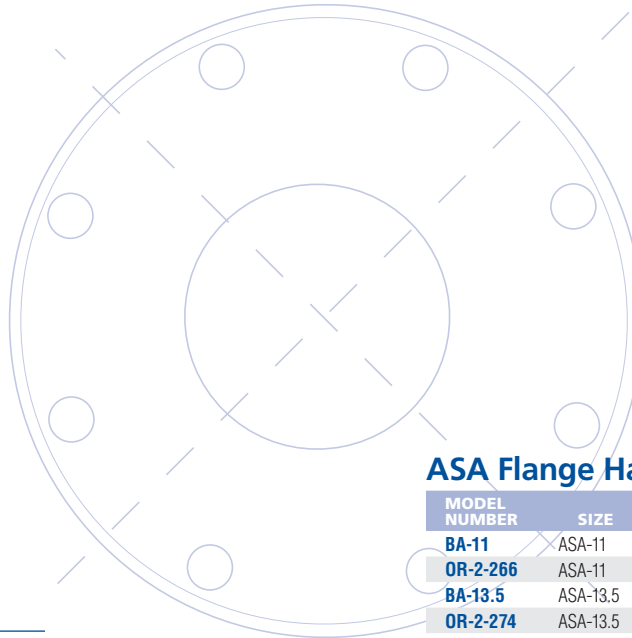
ASA Flanges - 11 to 16 Inch (285-400mm) OD

One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.

MODEL NUMBER	TYPE	DIAGRAM	A	B	C	D	BOLT HOLES	
							NO.	SIZE
ASA-11-000N	Blank	1	11.00 (279.40)	-	-	9.500 (251.3)	8	0.812 (20.62)
ASA-11-600N	Bored	3	11.00 (279.40)	6.02 (152.91)	5.875 (149.225)	9.500 (251.3)	8	0.812 (20.62)
ASA-11-800N	Bored	3	11.00 (279.40)	8.02 (203.71)	7.875 (200.025)	9.500 (251.3)	8	0.812 (20.62)
ASA-11-000R	Blank	2	11.00 (279.40)	-	-	9.500 (251.3)	8	0.812 (20.62)
ASA-11-600R	Bored	4	11.00 (279.40)	6.02 (152.91)	5.875 (149.225)	9.500 (251.3)	8	0.812 (20.62)
ASA-11-800R	Bored	4	11.00 (279.40)	8.02 (203.71)	7.875 (200.025)	9.500 (251.3)	8	0.812 (20.62)
ASA-13.5-000N	Blank	1	13.50 (343.90)	-	-	11.750 (298.45)	8	0.812 (20.62)
ASA-13.5-800N	Bored	3	13.50 (343.90)	8.02 (203.71)	7.875 (200.025)	11.750 (298.45)	8	0.812 (20.62)
ASA-13.5-1000N	Bored	3	13.50 (343.90)	10.03 (254.76)	9.875 (250.825)	11.750 (298.45)	8	0.812 (20.62)
ASA-13.5-000R	Blank	2	13.50 (343.90)	-	-	11.750 (298.45)	8	0.812 (20.62)
ASA-13.5-800R	Bored	4	13.50 (343.90)	8.02 (203.71)	7.875 (200.025)	11.750 (298.45)	8	0.812 (20.62)
ASA-13.5-1000R	Bored	4	13.50 (343.90)	10.03 (254.76)	9.875 (250.825)	11.750 (298.45)	8	0.812 (20.62)
ASA-16-000N	Blank	1	16.00 (406.40)	-	-	14.250 (361.95)	12	0.812 (20.62)
ASA-16-1000N	Bored	3	16.00 (406.40)	10.03 (254.76)	9.875 (250.825)	14.250 (361.95)	12	0.812 (20.62)
ASA-16-1200N	Bored	3	16.00 (406.40)	12.03 (305.56)	11.875 (301.625)	14.250 (361.95)	12	0.812 (20.62)
ASA-16-000R	Blank	2	16.00 (406.40)	-	-	14.250 (361.95)	12	0.812 (20.62)
ASA-16-1000R	Bored	4	16.00 (406.40)	10.03 (254.76)	9.875 (250.825)	14.250 (361.95)	12	0.812 (20.62)
ASA-16-1200R	Bored	4	16.00 (406.40)	12.03 (305.56)	11.875 (301.625)	14.250 (361.95)	12	0.812 (20.62)

Model Number Definitions

N = Nonrotatable R = Rotatable



O-ring Groove Option

Indicate grooved flanges by adding "-G" to the end of the main part number. Add the appropriate cost for each grooved flange.

Example: ASA-9-000R-G

SPECIFICATIONS

General: Rotatable and nonrotatable

Material

Flanges: 304 stainless steel
Gaskets: FKM
Bolts: 18-8 stainless steel

Torque: 21.5 Nm

Vacuum range: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range: -20° to 204°C
Operating: -20°C to 150°C

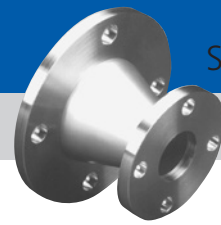
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

ASA Flange Hardware

MODEL NUMBER	SIZE	DESCRIPTION
BA-11	ASA-11	(8) SS bolts (3/4-10 x 2.25) nuts and washers
OR-2-266	ASA-11	(1) FKM O-ring
BA-13.5	ASA-13.5	(8) SS bolts (3/4-10 x 2.25) nuts and washers
OR-2-274	ASA-13.5	(1) FKM O-ring
BA-16	ASA-16	(12) SS bolts (3/4-10 x 2.25) nuts and washers
OR-2-278	ASA-16	(1) FKM O-ring

ASA Hardware for Mating to Gate Valves

MODEL NUMBER	SIZE	DESCRIPTION
BA-11GV	ASA-11	(8) SS bolts (3/8-16 x 1.0)
BA-16GV	ASA-16	(12) SS bolts (3/8-16 x 1.0)



Nor-Cal Products manufactures a complete line of flanged vacuum component fittings. The tube portions are fabricated from 304 stainless steel. On request, 316 stainless steel can be supplied. Nor-Cal Products makes its own elbows, and all tees and crosses are made with the pulled-port technique. This allows smooth, crevice-free butt welds to provide the maximum in cleanliness for UHV applications. Bake-out range is up to 200°C. Nor-Cal Products fittings are also available with CF (Conflat style), NW and ISO flanges.

SPECIFICATIONS

General: Rotatable and nonrotatable

Materials

Flanges: 304 stainless steel
Gaskets: FKM
Bolts: 18-8 stainless steel

Torque: 21.5 Nm

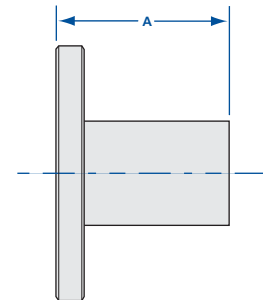
Vacuum range: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range: -20° to 204°C
Sustained: -20°C to 150°C

ASA Half Nipples

One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.

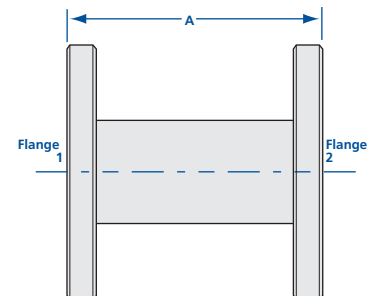
MODEL NUMBER	FLANGE OD	TUBE OD	A
1N-ASA-5-200	5.00 (127.00)	2 (50.80)	3.25 (82.55)
1N-ASA-5-250	5.00 (127.00)	2½ (63.50)	3.25 (82.55)
1N-ASA-5-250V	5.00 (127.00)	2½ (63.50)	4.00 (101.60)
1N-ASA-6-300	6.00 (152.40)	3 (76.20)	3.50 (88.90)
1N-ASA-7.5-400	7.50 (190.50)	4 (101.60)	4.13 (104.90)
1N-ASA-7.5-400V	7.50 (190.50)	4 (101.60)	5.12 (130.05)
1N-ASA-9-400	9.00 (228.60)	4 (101.60)	4.13 (104.90)
1N-ASA-9-400V	9.00 (228.60)	4 (101.60)	5.12 (130.05)
1N-ASA-9-600	9.00 (228.60)	6 (152.40)	2.25 (57.15)
1N-ASA-9-600V	9.00 (228.60)	6 (152.40)	6.31 (160.27)
1N-ASA-11-600	11.00 (279.40)	6 (152.40)	5.38 (136.65)
1N-ASA-11-600V	11.00 (279.40)	6 (152.40)	6.44 (163.58)
1N-ASA-11-800	11.00 (279.40)	8 (203.20)	7.38 (187.45)
1N-ASA-13.5-800	13.50 (342.90)	8 (203.20)	7.75 (196.85)
1N-ASA-13.5-1000	13.50 (342.90)	10 (254.00)	9.88 (250.95)
1N-ASA-16-1000	16.00 (406.40)	10 (254.00)	9.88 (250.95)
1N-ASA-16-1200	16.00 (406.40)	12 (304.80)	9.88 (250.95)



ASA Full Nipples

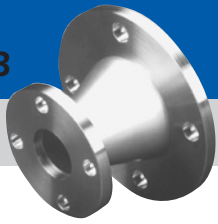
One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.

MODEL NUMBER	FLANGE OD	TUBE OD	A
2N-ASA-5-200N	5.00 (127.00)	2 (50.80)	6.50 (165.10)
2N-ASA-5-250N	5.00 (127.00)	2½ (63.50)	6.50 (165.10)
2N-ASA-5-250NV	5.00 (127.00)	2½ (63.50)	8.00 (203.20)
2N-ASA-6-300N	6.00 (152.40)	3 (76.20)	7.00 (177.80)
2N-ASA-7.5-400N	7.50 (190.50)	4 (101.60)	8.26 (209.80)
2N-ASA-7.5-400NV	7.50 (190.50)	4 (101.60)	10.24 (260.10)
2N-ASA-9-400N	9.00 (228.60)	4 (101.60)	8.26 (209.80)
2N-ASA-9-400NV	9.00 (228.60)	4 (101.60)	10.24 (260.10)
2N-ASA-9-600N	9.00 (228.60)	6 (152.40)	10.50 (266.70)
2N-ASA-9-600NV	9.00 (228.60)	6 (152.40)	12.62 (320.55)
2N-ASA-11-600N	11.00 (279.40)	6 (152.40)	10.76 (273.30)
2N-ASA-11-600NV	11.00 (279.40)	6 (152.40)	12.88 (327.15)
2N-ASA-11-800N	11.00 (279.40)	8 (203.20)	14.76 (374.90)
2N-ASA-13.5-800N	13.50 (342.90)	8 (203.20)	15.50 (393.70)
2N-ASA-13.5-1000N	13.50 (342.90)	10 (254.00)	19.76 (501.90)
2N-ASA-16-1000N	16.00 (406.40)	10 (254.00)	19.76 (501.90)
2N-ASA-16-1200N	16.00 (406.40)	12 (304.80)	19.76 (501.90)



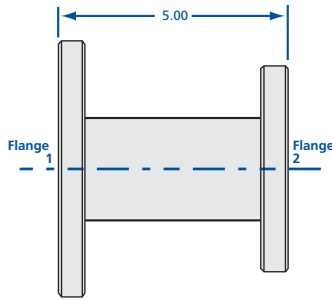
O-ring Groove Option

Indicate grooved flanges by adding “-G + Flange number from drawing” to the end of main part number. Add the appropriate cost for each grooved flange. **Example: 4C-ASA-9-600-G1-G3**

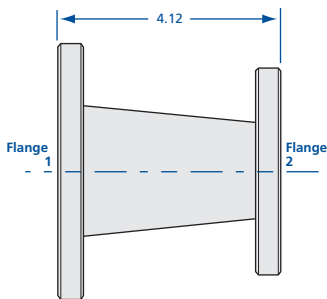


ASA Reducer Nipples

One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.



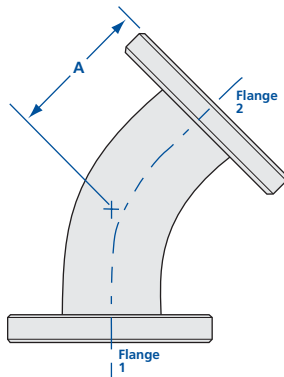
MODEL NUMBER	FLANGE 1	FLANGE 2	TUBE OD
2NR-ASA-9-5-N	ASA-9	ASA-5	2 (50.80)
2NR-ASA-9-6-N	ASA-9	ASA-6	3 (76.20)
2NR-ASA-9-7.5-N	ASA-9	ASA-7.5	4 (101.60)
2NR-ASA-11-5-N	ASA-11	ASA-5	2 (50.80)
2NR-ASA-11-6-N	ASA-11	ASA-6	3 (76.20)
2NR-ASA-11-7.5-N	ASA-11	ASA-7.5	4 (101.60)
2NR-ASA-11-9-N	ASA-11	ASA-9	6 (152.40)
2NR-ASA-13.5-5-N	ASA-13.5	ASA-5	2 (50.80)
2NR-ASA-13.5-6-N	ASA-13.5	ASA-6	3 (76.20)
2NR-ASA-13.5-7.5-N	ASA-13.5	ASA-7.5	4 (101.60)
2NR-ASA-13.5-9-N	ASA-13.5	ASA-9	6 (152.40)
2NR-ASA-13.5-11-N	ASA-13.5	ASA-11	8 (203.20)
2NR-ASA-16-5-N	ASA-16	ASA-5	2 (50.80)
2NR-ASA-16-6-N	ASA-16	ASA-6	3 (76.20)
2NR-ASA-16-7.5-N	ASA-16	ASA-7.5	4 (101.60)
2NR-ASA-16-9-N	ASA-16	ASA-9	6 (152.40)
2NR-ASA-16-11-N	ASA-16	ASA-11	8 (203.20)
2NR-ASA-16-13.5-N	ASA-16	ASA-13.5	10 (254.00)



Conical Reducer Nipples

One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.

MODEL NUMBER	FLANGE 1 SIZE	FLANGE 1 TUBE OD	FLANGE 2 SIZE	FLANGE 2 TUBE OD
2NRC-ASA-6-5-N	ASA-6	3 (76.20)	ASA-5	2 (50.80)
2NRC-ASA-7.5-5-N	ASA-7.5	4 (101.60)	ASA-5	2 (50.80)
2NRC-ASA-7.5-6-N	ASA-7.5	4 (101.60)	ASA-6	3 (76.20)



ASA 45° Radius Elbows with Tangents

One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.

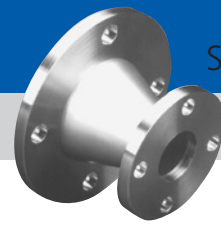
MODEL NUMBER	FLANGE OD	TUBE OD	A
2KL-ASA-5-N	5.00 (127.00)	2 (50.80)	2.09 (53.09)
2KL-ASA-6-N	6.00 (152.40)	3 (76.20)	3.93 (99.82)
2KL-ASA-7.5-N	7.50 (190.50)	4 (101.60)	5.02 (127.51)
2KL-ASA-9-N	9.00 (228.60)	4 (101.60)	5.02 (127.51)

O-ring Groove Option

Indicate grooved flanges by adding "**-G** + Flange number from drawing" to the end of main part number. Add the appropriate cost for each grooved flange.

Example: 4C-ASA-9-600-G1-G3

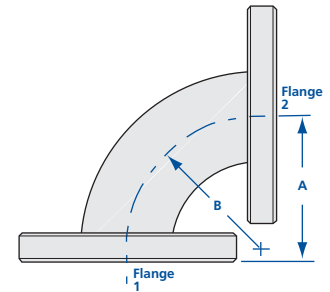
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



ASA 90° Radius Elbows

One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.

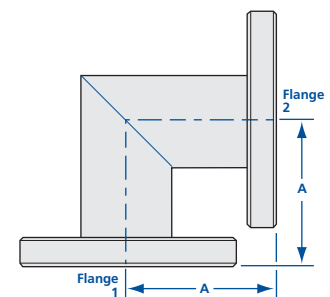
MODEL NUMBER	FLANGE OD	TUBE OD	A	B
2E-ASA-5-N	5.00 (127.0)	2 (50.80)	3.25 (82.55)	3 (76.20)
2E-ASA-6-N	6.00 (152.4)	3 (76.20)	4.75 (120.65)	4 1/2 (114.30)
2E-ASA-9-N	9.00 (228.6)	4 (101.60)	6.25 (158.75)	6 (152.40)
2E-ASA-11-N	11.00 (279.4)	6 (152.40)	9.38 (238.25)	9 (228.60)
2E-ASA-13.5-N	13.50 (342.9)	8 (203.20)	12.38 (314.45)	12 (304.80)
2E-ASA-16-N	16.00 (406.4)	10 (254.00)	15.38 (390.65)	15 (381.00)



ASA 90° Mitered Elbows

One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.

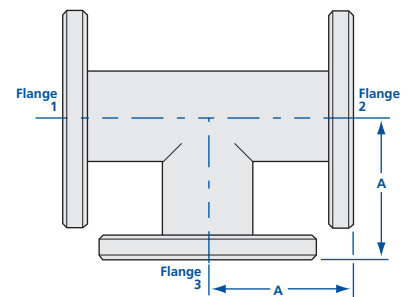
MODEL NUMBER	FLANGE OD	TUBE OD	A
2E-ASA-5-200NM	5.00 (127.00)	2 (50.80)	3.25 (82.55)
2E-ASA-5-250NM	5.00 (127.00)	2 1/2 (63.50)	3.25 (82.55)
2E-ASA-5-250NMV	5.00 (127.00)	2 1/2 (63.50)	4.00 (101.60)
2E-ASA-7.5-400NMV	7.50 (190.50)	4 (101.60)	5.12 (130.05)
2E-ASA-9-400NMV	9.00 (228.60)	4 (101.60)	5.12 (130.05)
2E-ASA-9-600NM	9.00 (228.60)	6 (152.40)	5.25 (133.35)
2E-ASA-9-600NMV	9.00 (228.60)	6 (152.40)	6.31 (160.27)
2E-ASA-11-600NMV	11.00 (279.40)	6 (152.40)	6.44 (163.58)
2E-ASA-11-800NM	11.00 (279.40)	8 (203.20)	7.38 (187.45)
2E-ASA-13.5-800NM	13.50 (342.90)	8 (203.20)	7.75 (196.85)
2E-ASA-13.5-1000NM	13.50 (342.90)	10 (254.00)	9.88 (250.95)
2E-ASA-16-1000NM	16.00 (406.40)	10 (254.00)	9.88 (250.95)



ASA Tees

One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.

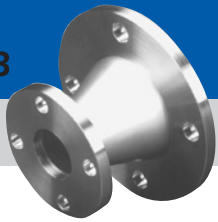
MODEL NUMBER	FLANGE OD	TUBE OD	A
3T-ASA-5-200N	5.00 (127.00)	2 (50.80)	3.25 (82.55)
3T-ASA-5-250N	5.00 (127.00)	2 1/2 (63.50)	3.25 (82.55)
3T-ASA-5-250NV	5.00 (127.00)	2 1/2 (63.50)	4.00 (101.60)
3T-ASA-7.5-400NV	7.50 (190.50)	4 (101.60)	5.12 (130.05)
3T-ASA-9-400NV	9.00 (228.60)	4 (101.60)	5.12 (130.05)
3T-ASA-9-600N	9.00 (228.60)	6 (152.40)	5.25 (133.35)
3T-ASA-9-600NV	9.00 (228.60)	6 (152.40)	6.31 (160.27)
3T-ASA-11-600NV	11.00 (279.40)	6 (152.40)	6.44 (163.58)
3T-ASA-11-800N	11.00 (279.40)	8 (203.20)	7.38 (187.45)
3T-ASA-13.5-800N	13.50 (342.90)	8 (203.20)	7.75 (196.85)
3T-ASA-13.5-1000N	13.50 (342.90)	10 (254.00)	9.88 (250.95)
3T-ASA-16-1000N	16.00 (406.40)	10 (254.00)	9.88 (250.95)



O-ring Groove Option

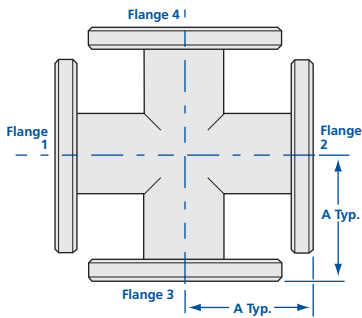
Indicate grooved flanges by adding
 "-G +Flange number from drawing"
 to the end of main part number. Add
 the appropriate cost for
 each grooved flange.

Example: 4C-ASA-9-600-G1-G3



ASA 4-Way Crosses

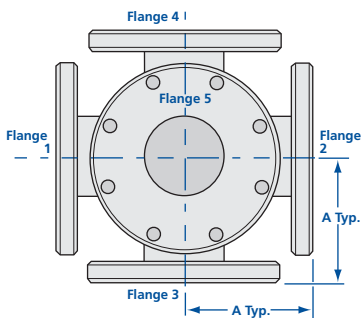
One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.



MODEL NUMBER	FLANGE OD	TUBE OD	A
4C-ASA-5-200N	5.00 (127.00)	2 (50.80)	3.25 (82.55)
4C-ASA-5-250N	5.00 (127.00)	2 1/2 (63.50)	3.25 (82.55)
4C-ASA-5-250NV	5.00 (127.00)	2 1/2 (63.50)	4.00 (101.60)
4C-ASA-7.5-400NV	7.50 (190.50)	4 (101.60)	5.12 (130.05)
4C-ASA-9-400NV	9.00 (228.60)	4 (101.60)	5.12 (130.05)
4C-ASA-9-600N	9.00 (228.60)	6 (152.40)	5.25 (133.35)
4C-ASA-9-600NV	9.00 (228.60)	6 (152.40)	6.31 (160.27)
4C-ASA-11-600NV	11.00 (279.40)	6 (152.40)	6.44 (163.58)
4C-ASA-11-800N	11.00 (279.40)	8 (203.20)	7.38 (187.45)
4C-ASA-13.5-800N	13.50 (342.90)	8 (203.20)	7.75 (196.85)
4C-ASA-13.5-1000N	13.50 (342.90)	10 (254.00)	9.88 (250.95)
4C-ASA-16-1000N	16.00 (406.40)	10 (254.00)	9.88 (250.95)

ASA 5-Way Crosses

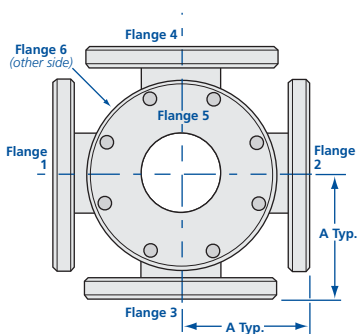
One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.



MODEL NUMBER	FLANGE OD	TUBE OD	A
5C-ASA-5-200N	5.00 (127.00)	2 (50.80)	3.25 (82.55)
5C-ASA-5-250N	5.00 (127.00)	2 1/2 (63.50)	3.25 (82.55)
5C-ASA-5-250NV	5.00 (127.00)	2 1/2 (63.50)	4.00 (101.60)
5C-ASA-7.5-400NV	7.50 (190.50)	4 (101.60)	5.12 (130.05)
5C-ASA-9-400NV	9.00 (228.60)	4 (101.60)	5.12 (130.05)
5C-ASA-9-600N	9.00 (228.60)	6 (152.40)	5.25 (133.35)
5C-ASA-9-600NV	9.00 (228.60)	6 (152.40)	6.31 (160.27)
5C-ASA-11-600NV	11.00 (279.40)	6 (152.40)	6.44 (163.58)
5C-ASA-11-800N	11.00 (279.40)	8 (203.20)	7.38 (187.45)
5C-ASA-13.5-800N	13.50 (342.90)	8 (203.20)	7.75 (196.85)
5C-ASA-13.5-1000N	13.50 (342.90)	10 (254.00)	9.88 (250.95)
5C-ASA-16-1000N	16.00 (406.40)	10 (254.00)	9.88 (250.95)

ASA 6-Way Crosses

One of each pair of mating ASA flanges requires an O-ring groove. To specify grooved flanges refer to the instructions below.



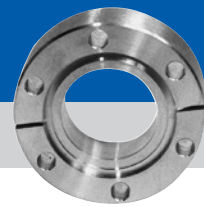
MODEL NUMBER	FLANGE OD	TUBE OD	A
6C-ASA-5-200N	5.00 (127.00)	2 (50.80)	3.25 (82.55)
6C-ASA-5-250N	5.00 (127.00)	2 1/2 (63.50)	3.25 (82.55)
6C-ASA-5-250NV	5.00 (127.00)	2 1/2 (63.50)	4.00 (101.60)
6C-ASA-7.5-400NV	7.50 (190.50)	4 (101.60)	5.12 (130.05)
6C-ASA-9-400NV	9.00 (228.60)	4 (101.60)	5.12 (130.05)
6C-ASA-9-600N	9.00 (228.60)	6 (152.40)	5.25 (133.35)
6C-ASA-9-600NV	9.00 (228.60)	6 (152.40)	6.31 (160.27)
6C-ASA-11-600NV	11.00 (279.40)	6 (152.40)	6.44 (163.58)
6C-ASA-11-800N	11.00 (279.40)	8 (203.20)	7.38 (187.45)
6C-ASA-13.5-800N	13.50 (342.90)	8 (203.20)	7.75 (196.85)
6C-ASA-13.5-1000N	13.50 (342.90)	10 (254.00)	9.88 (250.95)
6C-ASA-16-1000N	16.00 (406.40)	10 (254.00)	9.88 (250.95)

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

O-ring Groove Option

Indicate grooved flanges by adding "-G + Flange number from drawing" to the end of main part number. Add the appropriate cost for each grooved flange.

Example: 4C-ASA-9-600-G1-G3



SPECIFICATIONS

General: Rotatable or nonrotatable with tapped or clearance bolt holes

Nominal OD sizes: 1 1/3 to 16 1/2 inches (34-419mm)

Tube OD sizes: 1/4 to 14 inches (6-350mm)

Materials

Flange: 304 stainless steel (316L available on request)

Gaskets: FKM, copper or silver plated
Bolts: 18-8 stainless steel or silver plated

Vacuum range

Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV

Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

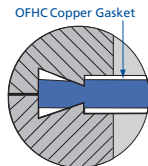
Temperature range

Metal seal: -200°C to 450°C

Elastomer seal: -20°C to 150°C

Nor-Cal Products Conflat (CF) flanges are compatible with other Conflat style flanges and are available in sizes from 1 1/3 to 16 1/2 inch (33.96-419.1mm) OD for 1/4 to 14 inch (6.35-355.6mm) tube diameters. Normally our standard material is in the low carbon range for 304. Flanges are made from 304 that has been specially treated to remove impurities inherent in 300 series steels. Special UHV flanges 4 1/2 inches (114.3mm) OD and smaller can be made from 304 electroslag remelt (ESR) bar stock. ESR is a refining process that produces stainless steel with higher purity, fewer inclusions and more uniform grain structure to eliminate microscopic leak paths. Our standard flange material is certified to meet ASTM A-240 and has less than 0.01% sulfur to prevent sulfur stringers. Grain size is 3 to 6 per ASTM E-112. Maximum

inclusion size is 2.5 per ASTM E-45. As specials, 304L and 316L material can be supplied in roll-forged rings. Machining is consistent with good UHV practice. Machine coolant is sulfur free to reduce outgassing. State-of-the-art CNC machine centers are used to produce flanges with consistent high quality. Flanges are machine washed in approved aqueous detergent after machining. Chem-cleaning and clean room packaging are available. CF flanges utilize an OFHC copper gasket to produce a vacuum tight seal up to 10^{-13} mbar, even when baked repeatedly to 450°C. When the copper gasket is compressed between the knife edges of CF flanges, its material flows laterally to fill surface imperfections.



Nor-Cal Products offers CF flanges in rotatable as well as nonrotatable versions. (Refer to diagram on page 46.) When components of several systems are used interchangeably, the use of rotatable flanges is recommended. Assembly is facilitated by rotating the receiver portion of the flange to align its bolt holes with those of the mating flange. The insert is welded to the tube or component and contains the knife edge portion of the CF flange. Nonrotatable CF flanges, unlike rotatable, contain both sealing surface and bolt holes in one unit. This makes the nonrotatable flange less expensive, and therefore the preferred choice when mating component orientation is not a concern. All fittings are priced with a rotatable flange opposing a nonrotatable. For fittings with all nonrotatable flanges subtract the difference in price between a rotatable and nonrotatable flange of the desired size multiplied by the number of additional nonrotatable flanges.



Metric Flanges and Hardware

Nor-Cal Products now stocks bored metric tapped CF flanges in 2 3/4, 4 1/2, 6, 8 and 10 inch (69.85, 114.3, 152.5, 203.2 and 254mm) ODs. Other sizes are available upon request. Fasteners for metric flanges are stocked for each flange size.



Silver plated Gaskets and Bolts

We are now offering silver plated copper gaskets and bolt kits in a variety of sizes. Silver plated copper gaskets are recommended when the use of pure copper is unacceptable. Silver plated bolt kits offer an alternative to using anti-seize thread lubricant.



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Flanges & Fittings

CF Flange Assembly Instructions

SPECIFICATIONS

General: Rotatable or nonrotatable flanges with tapped or clearance bolt holes

Nominal OD sizes: 1¹/₃ to 16¹/₂ inches (34-419mm)

Tube sizes: 1/4 to 14 inches (6.35-355.6mm)

Materials

Flange: 304 stainless steel

(316L available on request)

Gaskets: FKM, copper or silver plated

Bolts: 18-8 stainless steel or silver plated

Vacuum range

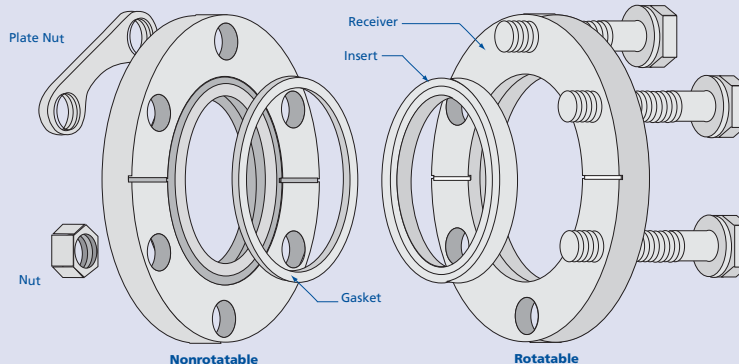
Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV

Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature Range

Metal seal: -200°C to 450°C

Elastomer seal: -20°C to 150°C



Fastening Hardware

CF flanges are available with tapped or untapped holes. Tapped flanges are available in UNC/UNF or metric threads. Tapped flanges have through holes, so bolts may protrude slightly from the back of the flange when fastened to an untapped flange. Untapped CF flanges can be fastened to each other with stainless steel bolts and hex nuts or plate nuts. Plate nuts center themselves over two adjacent holes and can be held in place with one finger while the bolts are tightened. They are available for most flange sizes from 1¹/₃ to 10 inch (33.96-254mm) ODs. As an alternative to hex head bolts, 12-point bolts are available for CF flanges from 2³/₄ to 10 inch (33.96 to 354mm) ODs. Silver plated bolts eliminate the need for anti-seize compound in clean room environments.

Assembly Instructions for Nor-Cal CF (Conflat) Flanges

1. Apply a small amount of high temperature anti-seize compound to the bolt threads.
2. Check that both flange surfaces are clean and sealing edges are free from nicks and scratches.
3. Using clean, lint free gloves, unpack gasket.
4. Place gasket in the knife edge counterbore of nonrotatable flange.
5. Align the mating hole pattern and leak test grooves.
6. Install the proper bolts and tighten hand tight. Check to see that the flange faces are parallel.
7. Tighten the bolts 1/4 to 1/2 turns using a star pattern until the flange faces are metal to metal.
8. Torque the fasteners to the listed value using the same pattern.

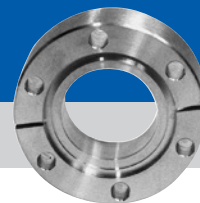
Torque Specifications*

NOMINAL OD	BOLT SIZE	TORQUE IN NM
1 ¹ / ₃ (34)	8-32 (M4)	3.2
2 ¹ / ₈ (54)	1/4-28 (M6)	12.4
2 ³ / ₄ (70)	1/4-28 (M6)	12.4
3 ³ / ₈ (86)	5/16-24 (M8)	21.5
4 ¹ / ₂ (114)	5/16-24 (M8)	21.5
4 ⁵ / ₈ (117)	5/16-24 (M8)	21.5
6 (152)	5/16-24 (M8)	21.5
6 ³ / ₄ (171)	5/16-24 (M8)	21.5
8 (203)	5/16-24 (M8)	21.5
10 (254)	5/16-24 (M8)	21.5
12 (305)	5/16-24 (M8)	21.5
13 ¹ / ₄ (337)	3/8-24 (M8)	39.0
14 (356)	3/8-24 (M8)	39.0
14 ¹ / ₂ (368)	3/8-24 (M8)	39.0
16 ¹ / ₂ (419)	3/8-24 (M8)	39.0

* Specifications for Nor-Cal supplied fasteners only

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

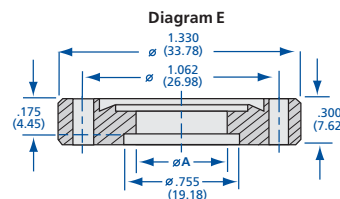
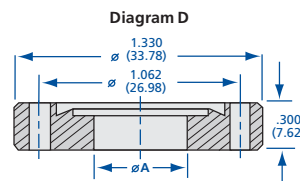
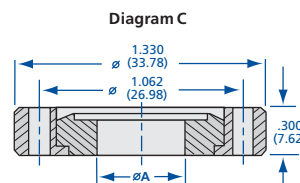
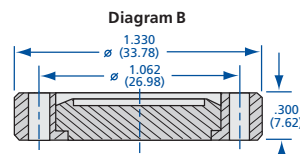
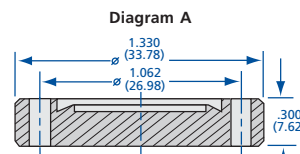




CF mini flanges are manufactured to the same high standard as our other CF flanges for 1/4, 3/8, 1/2, and 3/4 inch (6.35, 9.53, 12.7 and 19.05mm) OD tube sizes. Nor-Cal Products offers special purpose, double-sided and zero-length reducer mini flanges along with fittings, viewports and feedthroughs in this size, so we can supply all the components necessary to build a complete table-top, small laboratory or gas handling system from stock.

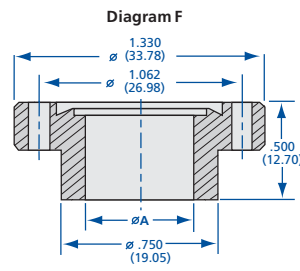
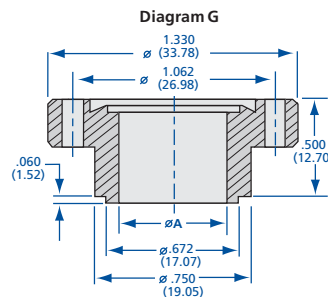
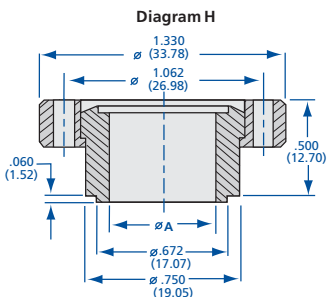
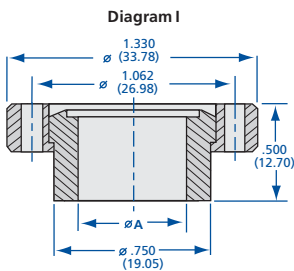
CF Mini Flanges

MODEL NUMBER	TYPE	DIAGRAM	A	BOLT HOLES	DIAMETER OR THREAD
133-000N	Blank	A	-	6	.172
133-000NK	Blank weld neck with weld prep	G	-	6	.172
133-025N	Bored	D	.255 (6.48)	6	.172
133-038N	Bored	D	.0380 (9.65)	6	.172
133-050N	Bored	D	0.505 (12.83)	6	.172
133-075N	Counterbored for tube OD	E	0.625 (15.88)	6	.172
133-075NK	Bored weld neck with weld prep	G	0.625 (15.88)	6	.172
133-075NBK	Bored weld neck without weld prep	F	0.625 (15.88)	6	.172
133-000NT	Blank	A	-	6	8-32
133-000NKT	Blank weld neck with weld prep	G	-	6	8-32
133-025NT	Bored	D	.255 (6.48)	6	8-32
133-038NT	Bored	D	.0380 (9.65)	6	8-32
133-050NT	Bored	D	0.505 (12.83)	6	8-32
133-075NT	Counterbored for tube OD	E	0.625 (15.88)	6	8-32
133-075NKT	Bored weld neck with weld prep	G	0.625 (15.88)	6	8-32
133-075NBKT	Bored weld neck without weld prep	F	0.625 (15.88)	6	8-32
133-000R	Blank	B	-	6	.172
133-000RK	Blank weld neck with weld prep	H	-	6	.172
133-025R	Bored	C	.255 (6.48)	6	.172
133-038R	Bored	C	.0380 (9.65)	6	.172
133-050R	Bored	C	0.505 (12.83)	6	.172
133-075R	Bored	C	0.625 (15.88)	6	.172
133-075RK	Bored weld neck with weld prep	H	0.625 (15.88)	6	.172
133-075RBK	Bored weld neck without weld prep	I	0.625 (15.88)	6	.172
133-000RT	Blank	B	-	6	8-32
133-000RKT	Blank weld neck with weld prep	H	-	6	8-32
133-025RT	Bored	C	.255 (6.48)	6	8-32
133-038RT	Bored	C	.0380 (9.65)	6	8-32
133-050RT	Bored	C	0.505 (12.83)	6	8-32
133-075RT	Bored	C	0.625 (15.88)	6	8-32
133-075RKT	Bored weld neck with weld prep	H	0.625 (15.88)	6	8-32
133-075RBKT	Bored weld neck without weld prep	I	0.625 (15.88)	6	8-32



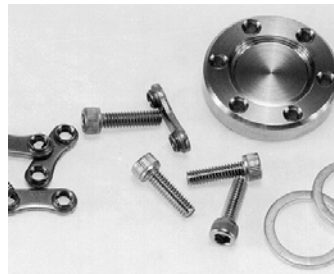
Model Number Definitions

N = Nonrotatable, clearance bolt holes **NT** = Nonrotatable, tapped bolt holes **R** = Rotatable, clearance bolt holes
RT = Rotatable, tapped bolt holes **K** = Weld neck with weld prep **BK** = Weld neck without weld prep **Add -M4** = Metric Thread



CF Mini Flange Hardware

MODEL NUMBER	DESCRIPTION
G-133	(10) OFHC copper gaskets
G-133-SP	(10) Silver plated copper gaskets
G-133V	(5) FKM gaskets
B-133	(25) SS 8-32 x .75 inch bolts, nuts & washers
B-133T	(25) SS 8-32 x .56 inch bolts & washers
B-133-SP	(25) Silver plated SS 8-32 x .75 inch bolts, nuts & washers
B-133T-SP	(25) Silver plated SS 8-32 x .56 inch bolts & washers
NP-075	(24) 8-32 plate nuts. See page 63.
KNP-075	(12) Plate nuts and (24) 8-32 x .75 inch bolts



SPECIFICATIONS

General: Rotatable and nonrotatable with tapped or clearance bolt holes

Materials

Flanges: 304 stainless steel
 (316L available upon request)
 Gaskets: Copper, FKM or silver plated
 Bolts: 18-8 stainless steel or silver plated

Torque: 3.2 Nm

Vacuum range

Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
 Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

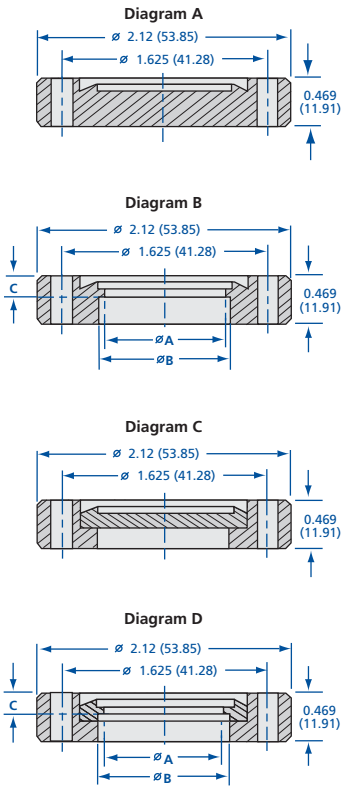
Temperature Range

Metal seal: -200°C to 450°C
 Elastomer seal: -20°C to 150°C



Flanges & Fittings

CF Flanges and Hardware



CF Flanges - 2 1/8 Inch (54mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	ID A	B	C	BOLT HOLES	DIAMETER OR THREAD
212-000N	Blank	A	-	-	-	4	.265
212-025N	Bored	B	0.255 (6.48)	-	-	4	.265
212-050N	Bored	B	0.505 (12.83)	-	-	4	.265
212-075N	Bored	B	0.688 (17.48)	0.760 (19.30)	0.167 (4.24)	4	.265
212-100N	Bored	B	0.938 (23.83)	1.010 (25.65)	0.167 (4.24)	4	.265
212-000NT	Blank	A	-	-	-	4	1/4-28
212-025NT	Bored	B	0.255 (6.48)	-	-	4	1/4-28
212-050NT	Bored	B	0.505 (12.83)	-	-	4	1/4-28
212-075NT	Bored	B	0.688 (17.48)	0.760 (19.30)	0.167 (4.24)	4	1/4-28
212-100NT	Bored	B	0.938 (23.83)	1.010 (25.65)	0.167 (4.24)	4	1/4-28
212-000R	Blank	C	-	-	-	4	.265
212-025R	Bored	D	0.255 (6.48)	-	-	4	.265
212-050R	Bored	D	0.505 (12.83)	-	-	4	.265
212-075R	Bored	D	0.688 (17.48)	0.760 (19.30)	0.167 (4.24)	4	.265
212-100R	Bored	D	0.938 (23.83)	1.010 (25.65)	0.167 (4.24)	4	.265
212-000RT	Blank	C	-	-	-	4	1/4-28
212-025RT	Bored	D	0.255 (6.48)	-	-	4	1/4-28
212-050RT	Bored	D	0.505 (12.83)	-	-	4	1/4-28
212-075RT	Bored	D	0.688 (17.48)	0.760 (19.30)	0.167 (4.24)	4	1/4-28
212-100RT	Bored	D	0.938 (23.83)	1.010 (25.65)	0.167 (4.24)	4	1/4-28

Model Number Definitions

N = Nonrotatable, clearance bolt holes **NT** = Nonrotatable, tapped bolt holes **R** = Rotatable, clearance bolt holes
RT = Rotatable, tapped bolt holes **Add -M6** = Metric tapped bolt holes

CF Flange Hardware - 2 1/8 (54mm) Inch Nominal OD



MODEL NUMBER	DESCRIPTION
G-212	(10) OFHC copper gaskets
G-212V	(5) FKM gaskets
B-212	(25) SS 1/4-28 x 1 1/4 inch bolts, nuts & washers
B-212T	(25) SS 1/4-28 x 7/8 inch bolts & washers
B-212-12	(25) SS 12-pt. 1/4-28 x 1 1/4 inch bolts, nuts & washers
B-212T-12	(25) SS 12-pt. 1/4-28 x 7/8 inch bolts & washers

SPECIFICATIONS

General: Rotatable and nonrotatable with tapped or clearance bolt holes

Materials

Flanges: 304 stainless steel
 (316L available upon request)
 Gaskets: Copper, FKM
 Bolts: 18-8 stainless steel

Torque: 12.4 Nm

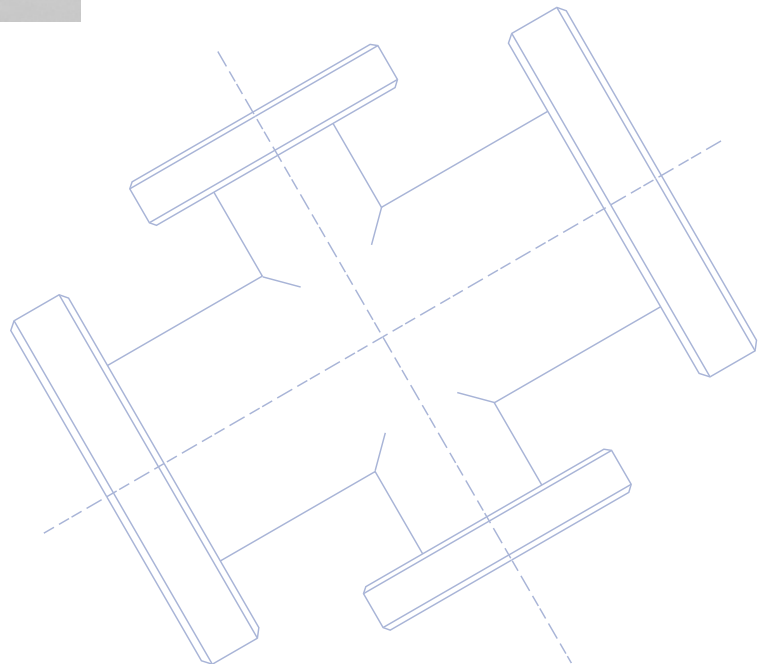
Vacuum range

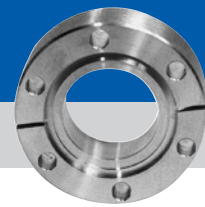
Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
 Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range

Metal seal: -200°C to 450°C
 Elastomer seal: -20°C to 150°C

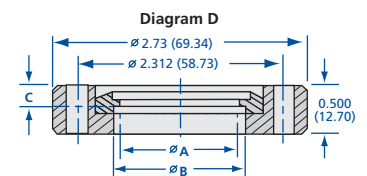
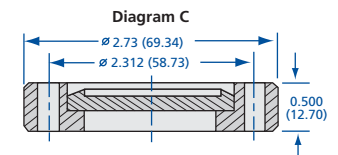
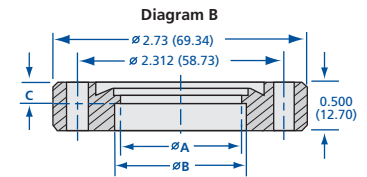
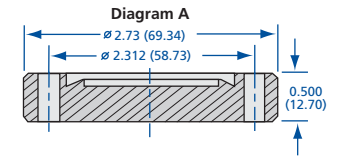
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.





CF Flanges - 2 3/4 Inch (70mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	ID A	B	C	BOLT HOLES	DIAMETER OR THREAD
275-000N	Blank	A	-	-	-	6	.265
275-025N	Bored	B	0.255 (6.48)	-	-	6	.265
275-050N	Bored	B	0.505 (12.83)	-	-	6	.265
275-075N	Bored	B	0.688 (17.48)	0.760 (19.30)	0.209 (5.31)	6	.265
275-100N	Bored	B	0.938 (23.83)	1.010 (25.65)	0.209 (5.31)	6	.265
275-125N	Bored	B	1.188 (30.18)	1.260 (32.00)	0.209 (5.31)	6	.265
275-150N	Bored	B	1.438 (36.53)	1.510 (38.35)	0.209 (5.31)	6	.265
275-162N	Bored	B	1.560 (39.62)	1.635 (41.53)	0.209 (5.31)	6	.265
275-175N	Bored	B	1.620 (41.15)	1.760 (44.70)	0.209 (5.31)	6	.265
275-000NT	Blank	A	-	-	-	6	1/4-28
275-025NT	Bored	B	0.255 (6.48)	-	-	6	1/4-28
275-050NT	Bored	B	0.505 (12.83)	-	-	6	1/4-28
275-075NT	Bored	B	0.688 (17.48)	0.760 (19.30)	0.209 (5.31)	6	1/4-28
275-100NT	Bored	B	0.938 (23.83)	1.010 (25.65)	0.209 (5.31)	6	1/4-28
275-125NT	Bored	B	1.188 (30.18)	1.260 (32.00)	0.209 (5.31)	6	1/4-28
275-150NT	Bored	B	1.438 (36.53)	1.510 (38.35)	0.209 (5.31)	6	1/4-28
275-162NT	Bored	B	1.560 (39.62)	1.635 (41.53)	0.209 (5.31)	6	1/4-28
275-175NT	Bored	B	1.620 (41.15)	1.760 (44.70)	0.209 (5.31)	6	1/4-28
275-000R	Blank	C	-	-	-	6	.265
275-025R	Bored	D	0.255 (6.48)	-	-	6	.265
275-050R	Bored	D	0.505 (12.83)	-	-	6	.265
275-075R	Bored	D	0.688 (30.18)	0.760 (19.30)	0.209 (5.31)	6	.265
275-100R	Bored	D	0.938 (23.83)	1.010 (25.65)	0.209 (5.31)	6	.265
275-125R	Bored	D	1.188 (30.18)	1.260 (32.00)	0.209 (5.31)	6	.265
275-150R	Bored	D	1.438 (36.53)	1.510 (38.35)	0.209 (5.31)	6	.265
275-000RT	Blank	C	-	-	-	6	1/4-28
275-025RT	Bored	D	0.255 (6.48)	-	-	6	1/4-28
275-050RT	Bored	D	0.505 (12.83)	-	-	6	1/4-28
275-075RT	Bored	D	0.688 (30.18)	0.760 (19.30)	0.209 (5.31)	6	1/4-28
275-100RT	Bored	D	0.938 (23.83)	1.010 (25.65)	0.209 (5.31)	6	1/4-28
275-125RT	Bored	D	1.188 (30.18)	1.260 (32.00)	0.209 (5.31)	6	1/4-28
275-150RT	Bored	D	1.438 (36.53)	1.510 (38.35)	0.209 (5.31)	6	1/4-28



Model Number Definitions

N = Nonrotatable, clearance bolt holes **NT** = Nonrotatable, tapped bolt holes **R** = Rotatable, clearance bolt holes
RT = Rotatable, tapped bolt holes **Add-M6** = Metric tapped bolt holes

CF Flange Hardware - 2 3/4 (70mm) Inch Nominal OD

MODEL NUMBER	DESCRIPTION
G-275	(10) OFHC copper gaskets
G-275V	(5) FKM gaskets
G-275-SP	(10) Silver plated copper gaskets
B-275	(25) SS 1/4-28 x 1 1/4 inch bolts, nuts & washers
B-275T	(25) SS 1/4-28 x 1 inch bolts & washers
B-275-12	(25) SS 12-pt. 1/4-28 x 1 1/4 inch bolts, nuts & washers
B-275-12-SP	(25) Silver plated SS 12-pt. 1/4-28 x 1 1/4 inch bolts, nuts & washers
B-275T-12	(25) SS 12-pt. 1/4-28 x 1 inch bolts & washers
B-275T-12-SP	(25) Silver plated SS 12-pt. 1/4-28 x 7/8 inch bolts & washers
B-275T-M	(25) SS (metric) M6 x 1.00 x 25mm bolts & washers
NP-150	(24) 1/4-28 plate nuts. See page 66
KNP-150	(12) Plate nuts, (24) 1/4-28 x 1 1/4 inch bolts & washers
KNP-150-12	(12) Plate nuts, (24) 12-pt. 1/4-28 x 1 1/4 inch bolts & washers



SPECIFICATIONS

General: Rotatable and nonrotatable with tapped or clearance holes

Materials

Flanges: 304 stainless steel
 (316L available upon request)
 Gaskets: Copper, FKM or silver plated
 Bolts: 18-8 stainless steel or silver plated

Torque: 12.4 Nm

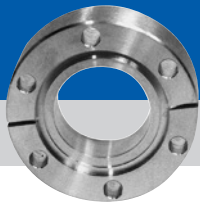
Vacuum range

Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
 Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature Range

Metal seal: -200°C to 450°C
 Elastomer seal: -20°C to 150°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Flanges & Fittings

CF Flanges and Hardware

CF Flanges - 3³/₈ Inch (86mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	F	BOLT HOLES	DIAMETER OR THREAD
338-000N	Blank	A	3.36 (85.34)	-	-	-	2.850 (72.39)	0.687 (17.45)	8	.332
338-150N	Bored	B	3.36 (85.34)	1.438 (36.53)	1.510 (38.35)	0.225 (5.72)	2.850 (72.39)	0.687 (17.45)	8	.332
338-200N	Bored	B	3.36 (85.34)	1.938 (49.23)	2.010 (51.05)	0.225 (5.72)	2.850 (72.39)	0.687 (17.45)	8	.332
338-000NT	Blank	A	3.36 (85.34)	-	-	-	2.850 (72.39)	0.687 (17.45)	8	5/16-24
338-150NT	Bored	B	3.36 (85.34)	1.438 (36.53)	1.510 (38.35)	0.225 (5.72)	2.850 (72.39)	0.687 (17.45)	8	5/16-24
338-200NT	Bored	B	3.36 (85.34)	1.938 (49.23)	2.010 (51.05)	0.225 (5.72)	2.850 (72.39)	0.687 (17.45)	8	5/16-24
338-000R	Blank	C	3.36 (85.34)	-	-	-	2.850 (72.39)	0.687 (17.45)	8	.332
338-150R	Bored	D	3.36 (85.34)	1.438 (36.53)	1.510 (38.35)	0.225 (5.72)	2.850 (72.39)	0.687 (17.45)	8	.332
338-200R	Bored	D	3.36 (85.34)	1.938 (49.23)	2.010 (51.05)	0.225 (5.72)	2.850 (72.39)	0.687 (17.45)	8	.332
338-000RT	Blank	C	3.36 (85.34)	-	-	-	2.850 (72.39)	0.687 (17.45)	8	5/16-24
338-150RT	Bored	D	3.36 (85.34)	1.438 (36.53)	1.510 (38.35)	0.225 (5.72)	2.850 (72.39)	0.687 (17.45)	8	5/16-24
338-200RT	Bored	D	3.36 (85.34)	1.938 (49.23)	2.010 (51.05)	0.225 (5.72)	2.850 (72.39)	0.687 (17.45)	8	5/16-24

CF Flanges - 4¹/₂ Inch (114mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	F	BOLT HOLES	DIAMETER OR THREAD
450-000N	Blank	A	4.47 (113.54)	-	-	-	3.628 (92.15)	0.687 (17.45)	8	.332
450-150N	Bored	B	4.47 (113.54)	1.438 (36.53)	1.510 (38.35)	0.375 (9.53)	3.628 (92.15)	0.687 (17.45)	8	.332
450-200N	Bored	B	4.47 (113.54)	1.938 (49.23)	2.010 (51.05)	0.375 (9.53)	3.628 (92.15)	0.687 (17.45)	8	.332
450-250N	Bored	B	4.47 (113.54)	2.438 (61.93)	2.510 (63.75)	0.375 (9.53)	3.628 (92.15)	0.687 (17.45)	8	.332
450-000NT	Blank	A	4.47 (113.54)	-	-	-	3.628 (92.15)	0.687 (17.45)	8	5/16-24
450-150NT	Bored	B	4.47 (113.54)	1.438 (36.53)	1.510 (38.35)	0.375 (9.53)	3.628 (92.15)	0.687 (17.45)	8	5/16-24
450-200NT	Bored	B	4.47 (113.54)	1.938 (49.23)	2.010 (51.05)	0.375 (9.53)	3.628 (92.15)	0.687 (17.45)	8	5/16-24
450-250NT	Bored	B	4.47 (113.54)	2.438 (61.93)	2.510 (63.75)	0.375 (9.53)	3.628 (92.15)	0.687 (17.45)	8	5/16-24
450-000R	Blank	C	4.47 (113.54)	-	-	-	3.628 (92.15)	0.750 (19.05)	8	.332
450-150R	Bored	D	4.47 (113.54)	1.438 (36.53)	1.510 (38.35)	0.375 (9.53)	3.628 (92.15)	0.750 (19.05)	8	.332
450-200R	Bored	D	4.47 (113.54)	1.938 (49.23)	2.010 (51.05)	0.375 (9.53)	3.628 (92.15)	0.750 (19.05)	8	.332
450-250R	Bored	D	4.47 (113.54)	2.438 (61.93)	2.510 (63.75)	0.375 (9.53)	3.628 (92.15)	0.750 (19.05)	8	.332
450-000RT	Blank	C	4.47 (113.54)	-	-	-	3.628 (92.15)	0.750 (19.05)	8	5/16-24
450-150RT	Bored	D	4.47 (113.54)	1.438 (36.53)	1.510 (38.35)	0.375 (9.53)	3.628 (92.15)	0.750 (19.05)	8	5/16-24
450-200RT	Bored	D	4.47 (113.54)	1.938 (49.23)	2.010 (51.05)	0.375 (9.53)	3.628 (92.15)	0.750 (19.05)	8	5/16-24
450-250RT	Bored	D	4.47 (113.54)	2.438 (61.93)	2.510 (63.75)	0.375 (9.53)	3.628 (92.15)	0.750 (19.05)	8	5/16-24

Model Number Definitions

N = Nonrotatable, clearance bolt holes
 NT = Nonrotatable, tapped bolt holes
 R = Rotatable, clearance bolt holes
 RT = Rotatable, tapped bolt holes
 Add -M8 = Metric tapped bolt holes

CF Flange Hardware - 3³/₈ Inch (86mm) Nominal OD

MODEL NUMBER	DESCRIPTION
G-338	(10) OFHC copper gaskets
G-338-SP	(10) Silver plated copper gaskets
G-338V	(1) FKM gasket
B-338	(25) SS 5/16-24 x 1 3/4 inch bolts, nuts & washers
B-338T	(25) SS 5/16-24 x 1 1/4 inch bolts & washers
B-338-12	(25) SS 12-pt. 5/16-24 x 1 3/4 inch bolts, nuts & washers
B-338T-12	(25) SS 12-pt. 5/16-24 x 1 1/4 inch bolts & washers
B-338-12-SP	(25) Silver plated SS 12-pt. 5/16-24 x 1 3/4 inch bolts, nuts & washers
B-338T-12-SP	(25) Silver plated SS 12-pt. 5/16-24 x 1 1/4 inch bolts, washers
NP-200	(24) 5/16-24 plate nuts. See page 66
KNP-200	(16) Plate nuts, (32) 5/16-24 x 1 3/4 inch bolts & washers
KNP-200-12	(16) Plate nuts, (32) 12-pt. 5/16-24 x 1 3/4 inch bolts & washers

CF Flange Hardware - 4¹/₂ Inch (114mm) Nominal OD

MODEL NUMBER	DESCRIPTION
G-450	(10) OFHC copper gaskets
G-450-SP	(10) Silver plated copper gaskets
G-450V	(1) FKM gasket
B-450	(25) SS 5/16-24 x 2 inch bolts, nuts & washers
B-450T	(25) SS 5/16-24 x 1 1/4 inch bolts & washers
B-450-12	(25) SS 12-pt. 5/16-24 x 2 inch bolts, nuts & washers
B-450T-12	(25) SS 12-pt. 5/16-24 x 1 1/4 inch bolts & washers
B-450-12-SP	(25) Silver plated SS 12-pt. 5/16-24 x 2 inch bolts, nuts & washers
B-450T-12-SP	(25) Silver plated SS 12-pt. 5/16-24 x 1 1/4 inch bolts & washers
B-450-M	(25) SS (metric) M8 x 1.25 x 35mm bolts & washers
NP-250	(24) 5/16-24 plate nuts. See page 66
KNP-250	(16) Plate nuts, (32) 5/16-24 x 2 inch bolts & washers
KNP-250-12	(16) Plate nuts, (32) 12-pt. 5/16-24 x 2 inch bolts & washers

SPECIFICATIONS

General: Rotatable and nonrotatable with tapped or clearance bolt holes

Materials

Flanges: 304 stainless steel
 (316L available upon request)
 Gaskets: Copper, FKM or silver plated
 Bolts: 18-8 stainless steel or silver plated

Torque: 21.5 Nm

Vacuum range

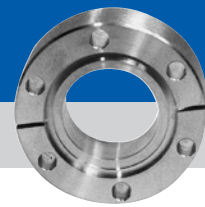
Metal seal: $\geq 1 \times 10^{-13}$ mbar-UHV
 Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range

Metal seal: -200°C to 450°C
 Elastomer seal: -20°C to 150°C

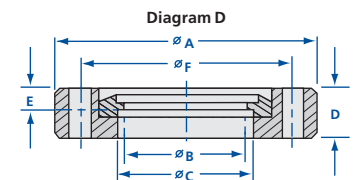
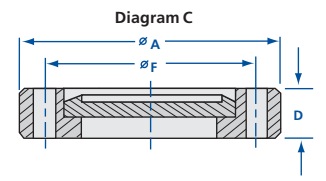
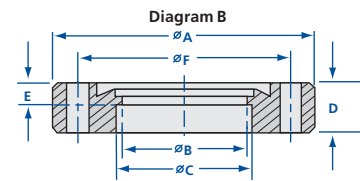
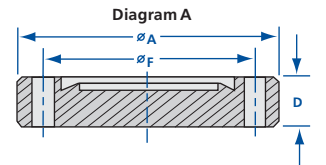
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.





CF Flanges - 4 5/8 Inch (117mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	F	BOLT HOLES	DIAMETER OR THREAD
462-000N	Blank	A	4.61 (117.09)	-	-	0.812 (20.62)	-	4.030 (102.36)	10	.332
462-300N	Bored	B	4.61 (117.09)	2.938 (74.63)	3.010 (76.45)	0.812 (20.62)	0.281 (7.14)	4.030 (102.36)	10	.332
462-000NT	Blank	A	4.61 (117.09)	-	-	0.812 (20.62)	-	4.030 (102.36)	10	5/16-24
462-300NT	Bored	B	4.61 (117.09)	2.938 (74.63)	3.010 (76.45)	0.812 (20.62)	0.281 (7.14)	4.030 (102.36)	10	5/16-24
462-000R	Blank	C	4.61 (117.09)	-	-	0.812 (20.62)	-	4.030 (102.36)	10	.332
462-300R	Bored	D	4.61 (117.09)	2.938 (74.63)	3.010 (76.45)	0.812 (20.62)	0.281 (7.14)	4.030 (102.36)	10	.332
462-000RT	Blank	C	4.61 (117.09)	-	-	0.812 (20.62)	-	4.030 (102.36)	10	5/16-24
462-300RT	Bored	D	4.61 (117.09)	2.938 (74.63)	3.010 (76.45)	0.812 (20.62)	0.281 (7.14)	4.030 (102.36)	10	5/16-24



CF Flanges - 6 Inch (152mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	F	BOLT HOLES	DIAMETER OR THREAD
600-000N	Blank	A	5.97 (151.64)	-	-	0.781 (19.84)	-	5.128 (130.25)	16	.332
600-400N	Bored	B	5.97 (151.64)	3.910 (99.31)	4.010 (101.85)	0.781 (19.84)	0.438 (11.13)	5.128 (130.25)	16	.332
600-000NT	Blank	A	5.97 (151.64)	-	-	0.781 (19.84)	-	5.128 (130.25)	16	5/16-24
600-400NT	Bored	B	5.97 (151.64)	3.910 (99.31)	4.010 (101.85)	0.781 (19.84)	0.438 (11.13)	5.128 (130.25)	16	5/16-24
600-000R	Blank	C	5.97 (151.64)	-	-	0.844 (21.44)	-	5.128 (130.25)	16	.332
600-400R	Bored	D	5.97 (151.64)	3.910 (99.31)	4.010 (101.85)	0.844 (21.44)	0.438 (11.13)	5.128 (130.25)	16	.332
600-000RT	Blank	C	5.97 (151.64)	-	-	0.844 (21.44)	-	5.128 (130.25)	16	5/16-24
600-400RT	Bored	D	5.97 (151.64)	3.910 (99.31)	4.010 (101.85)	0.844 (21.44)	0.438 (11.13)	5.128 (130.25)	16	5/16-24

Model Number Definitions

N = Nonrotatable, clearance bolt holes **NT** = Nonrotatable, tapped bolt holes **R** = Rotatable, clearance bolt holes
RT = Rotatable, tapped bolt holes **Add-M8** = Metric tapped bolt holes

CF Flange Hardware - 4 5/8 Inch (117mm) Nominal OD

MODEL NUMBER	DESCRIPTION
G-462	(10) OFHC copper gaskets
G-462V	(1) FKM gasket
B-462	(25) SS 5/16-24 x 2 1/4 inch bolts, nuts & washers
B-462T	(25) SS 5/16-24 x 1 1/4 inch bolts & washers
B-462-12	(25) SS 12-pt. 5/16-24 x 2 1/4 inch bolts, nuts & washers
B-462T-12	(25) SS 12-pt. 5/16-24 x 1 1/4 inch bolts & washers
NP-300	(24) 5/16-24 plate nuts. See page 66
KNP-300	(20) Plate nuts, (40) 5/16-24 x 2 1/4 inch bolts & washers
KNP-300-12	(20) Plate nuts, (40) 12-pt. 5/16-24 x 2 1/4 inch bolts & washers



SPECIFICATIONS

General: Rotatable and nonrotatable with tapped or clearance bolt holes

Materials

Flanges: 304 stainless steel
(316L available upon request)
Gaskets: Copper, FKM and silver plated
Bolts: 18-8 stainless steel and silver plated

Torque: 21.5 Nm

Vacuum range

Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature Range

Metal seal: -200°C to 450°C
Elastomer seal: -20°C to 150°C

CF Flange Hardware - 6 Inch (152mm) Nominal OD

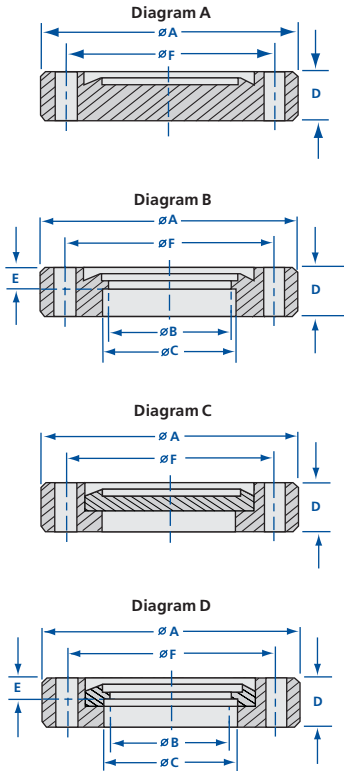
MODEL NUMBER	DESCRIPTION
G-600	(10) OFHC copper gaskets
G-600V	(1) FKM gasket
G-600-SP	(10) Silver plated copper gaskets
B-600	(25) SS 5/16-24 x 2 1/4 inch bolts, nuts & washers
B-600T	(25) SS 5/16-24 x 1 1/4 inch bolts & washers
B-600-12	(25) SS 12-pt. 5/16-24 x 2 1/4 inch bolts, nuts & washers
B-600T-12	(25) SS 12-pt. 5/16-24 x 1 1/4 inch bolts & washers
B-600-12-SP	(25) Silver plated SS 12-pt. 5/16-24 x 2 1/4 inch bolts, nuts & washers
B-600T-12-SP	(25) Silver plated SS 12-pt. 5/16-24 x 1 1/4 inch bolts & washers
B-600T-M	(25) SS (metric) M8 x 1 1/4 x 35mm bolts & washers
NP-400	(24) 5/16-24 plate nuts. See page 66
KNP-400	(16) Plate nuts (32) 5/16-24 x 2 1/4 inch bolts & washers
KNP-400-12	(16) Plate nuts (32) 12-pt. 5/16-24 x 2 1/4 inch bolts & washers





Flanges & Fittings

CF Flanges and Hardware



CF Flanges - 6³/₄ Inch (171mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	F	BOLT HOLES	DIAMETER OR THREAD
675-000N	Blank	A	6.73 (170.94)	-	-	0.844 (21.44)	-	5.969 (151.61)	18	.332
675-500N	Bored	B	6.73 (170.94)	4.875 (123.83)	5.010 (127.25)	0.844 (21.44)	0.460 (11.68)	5.969 (151.61)	18	.332
675-000NT	Blank	A	6.73 (170.94)	-	-	0.844 (21.44)	-	5.969 (151.61)	18	5/16-24
675-500NT	Bored	B	6.73 (170.94)	4.875 (123.83)	5.010 (127.25)	0.844 (21.44)	0.460 (11.68)	5.969 (151.61)	18	5/16-24
675-000R	Blank	C	6.73 (170.94)	-	-	0.844 (21.44)	-	5.969 (151.61)	18	.332
675-500R	Bored	D	6.73 (170.94)	4.875 (123.83)	5.010 (127.25)	0.844 (21.44)	0.460 (11.68)	5.969 (151.61)	18	.332
675-000RT	Blank	C	6.73 (170.94)	-	-	0.844 (21.44)	-	5.969 (151.61)	18	5/16-24
675-500RT	Bored	D	6.73 (170.94)	4.875 (123.83)	5.010 (127.25)	0.844 (21.44)	0.460 (11.68)	5.969 (151.61)	18	5/16-24

CF Flanges - 8 Inch (203mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	F	BOLT HOLES	DIAMETER OR THREAD
800-000N	Blank	A	7.97 (202.44)	-	-	0.937 (22.71)	-	7.128 (181.05)	20	.332
800-600N	Bored	B	7.97 (202.44)	5.875 (149.23)	6.020 (152.91)	0.937 (22.71)	0.500 (12.7)	7.128 (181.05)	20	.332
800-000NT	Blank	A	7.97 (202.44)	-	-	0.937 (22.71)	-	7.128 (181.05)	20	5/16-24
800-600NT	Bored	B	7.97 (202.44)	5.875 (149.23)	6.020 (152.91)	0.937 (22.71)	0.500 (12.7)	7.128 (181.05)	20	5/16-24
800-000R	Blank	C	7.97 (202.44)	-	-	0.937 (22.71)	-	7.128 (181.05)	20	.332
800-600R	Bored	D	7.97 (202.44)	5.875 (149.23)	6.020 (152.91)	0.937 (22.71)	0.500 (12.7)	7.128 (181.05)	20	.332
800-000RT	Blank	C	7.97 (202.44)	-	-	0.937 (22.71)	-	7.128 (181.05)	20	5/16-24
800-600RT	Bored	D	7.97 (202.44)	5.875 (149.23)	6.020 (152.91)	0.937 (22.71)	0.500 (12.7)	7.128 (181.05)	20	5/16-24

Model Number Definitions

N = Nonrotatable, clearance bolt holes **NT** = Nonrotatable, tapped bolt holes **R** = Rotatable, clearance bolt holes
RT = Rotatable, tapped bolt holes **Add-M8** = Metric tapped bolt holes

SPECIFICATIONS

General: Rotatable and nonrotatable with tapped or clearance bolt holes

Material
 Flanges: 304 stainless steel
 (316L available upon request)
 Gaskets: Copper, FKM or silver plated
 Bolts: 18-8 stainless steel or silver plated

Torque: 21.5 Nm

Vacuum range
 Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
 Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range
 Metal seal: -200°C to 450°C
 Elastomer seal: -20°C to 150°C



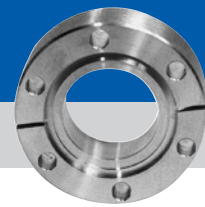
CF Flange Hardware - 6³/₄ Inch (171mm) Nominal OD

MODEL NUMBER	DESCRIPTION
G-675	(10) OFHC copper gaskets
G-675V	(1) FKM gasket
B-675	(25) SS 5/16-24 x 2 1/4 inch bolts, nuts & washers
B-675T	(25) SS 5/16-24 x 1 1/2 inch bolts & washers
B-675-12	(25) SS 12-pt. 5/16-24 x 2 1/4 inch bolts, nuts & washers
B-675T-12	(25) SS 12-pt. 5/16-24 x 1 3/4 inch bolts & washers

CF Flange Hardware - 8 Inch (203mm) Nominal OD

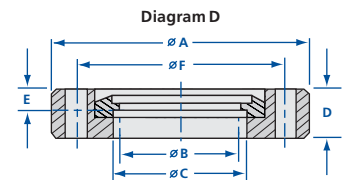
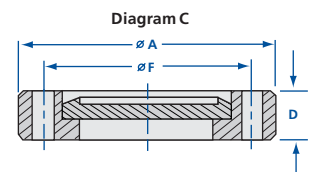
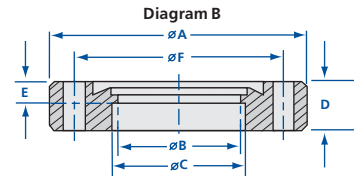
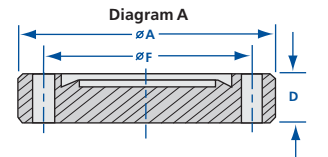
MODEL NUMBER	DESCRIPTION
G-800	(10) OFHC copper gaskets
G-800V	(1) FKM gasket
G-800-SP	(10) Silver plated copper gaskets
B-800	(25) SS 5/16-24 x 2 1/4 inch bolts, nuts & washers
B-800T	(25) SS 5/16-24 x 1 3/4 inch bolts & washers
B-800-12	(25) SS 12-pt. 5/16-24 x 2 1/4 inch bolts, nuts & washers
B-800T-12	(25) SS 12-pt. 5/16-24 x 1 3/4 inch bolts & washers
B-800-12-SP	(25) Silver plated SS 12-pt. 5/16-24 x 2 1/4 inch bolts, nuts & washers
B-800T-12-SP	(25) Silver plated SS 12-pt. 5/16-24 x 1 3/4 inch bolts & washers
B-800T-M	(25) SS (metric) M8 x 1 1/4 x 45mm bolts & washers
NP-600	(24) 5/16-24 plate nuts. See page 66
KNP-600	(20) Plate nuts, (40) 5/16-24 x 2 1/4 inch bolts & washers
KNP-600-12	(20) Plate nuts, (40) 5/16-24 x 2 1/4 inch 12-pt. bolts & washers

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



CF Flanges - 10 Inch (254mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	F	BOLT HOLES	DIAMETER OR THREAD
1000-000N	Blank	A	9.97 (253.24)	-	-	0.968 (24.59)	-	9.128 (231.85)	24	.332
1000-800N	Bored	B	9.97 (253.24)	7.875 (200.03)	8.020 (203.71)	0.968 (24.59)	0.500 (12.70)	9.128 (231.85)	24	.332
1000-000NT	Blank	A	9.97 (253.24)	-	-	0.968 (24.59)	-	9.128 (231.85)	24	5/16-24
1000-800NT	Bored	B	9.97 (253.24)	7.875 (200.03)	8.020 (203.71)	0.968 (24.59)	0.500 (12.70)	9.128 (231.85)	24	5/16-24
1000-000R	Blank	C	9.97 (253.24)	-	-	0.968 (24.59)	-	9.128 (231.85)	24	.332
1000-800R	Bored	D	9.97 (253.24)	7.875 (200.03)	8.020 (203.71)	0.968 (24.59)	0.500 (12.70)	9.128 (231.85)	24	.332
1000-000RT	Blank	C	9.97 (253.24)	-	-	0.968 (24.59)	-	9.128 (231.85)	24	5/16-24
1000-800RT	Bored	D	9.97 (253.24)	7.875 (200.03)	8.020 (203.71)	0.968 (24.59)	0.500 (12.70)	9.128 (231.85)	24	5/16-24



CF Flanges - 12 Inch (305mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	F	BOLT HOLES	DIAMETER OR THREAD
1200-000N	Blank	A	12.00 (304.80)	-	-	1.125 (28.58)	-	11.181 (284)	32	.332
1200-1000N	Bored	B	12.00 (304.80)	9.875 (250.83)	10.020 (254.51)	1.125 (28.58)	0.500 (12.70)	11.181 (284)	32	.332
1200-000NT	Blank	A	12.00 (304.80)	-	-	1.125 (28.58)	-	11.181 (284)	32	5/16-24
1200-1000NT	Bored	B	12.00 (304.80)	9.875 (250.83)	10.020 (254.51)	1.125 (28.58)	0.500 (12.70)	11.181 (284)	32	5/16-24
1200-000R	Blank	C	12.00 (304.80)	-	-	1.125 (28.58)	-	11.181 (284)	32	.332
1200-1000R	Bored	D	12.00 (304.80)	9.875 (250.83)	10.020 (254.51)	1.125 (28.58)	0.500 (12.70)	11.181 (284)	32	.332
1200-000RT	Blank	C	12.00 (304.80)	-	-	1.125 (28.58)	-	11.181 (284)	32	5/16-24
1200-1000RT	Bored	D	12.00 (304.80)	9.875 (250.83)	10.020 (254.51)	1.125 (28.58)	0.500 (12.70)	11.181 (284)	32	5/16-24

Model Number Definitions

N = Nonrotatable, clearance bolt holes **NT** = Nonrotatable, tapped bolt holes **R** = Rotatable, clearance bolt holes
RT = Rotatable, tapped bolt holes **Add -M8** = Metric tapped bolt holes

CF Flange Hardware - 10 Inch (254mm) Nominal OD

MODEL NUMBER	DESCRIPTION
G-1000	(10) OFHC copper gaskets
G-1000V	(1) FKM gasket
G-1000-SP	(10) Silver plated copper gaskets
B-1000	(25) SS 5/16-24 x 2 1/2 inch bolts, nuts & washers
B-1000T	(25) SS 5/16-24 x 1 3/4 inch bolts & washers
B-1000-12	(25) SS 12-pt. 5/16-24 x 2 1/2 inch bolts, nuts & washers
B-1000T-12	(25) SS 12-pt. 5/16-24 x 1 3/4 inch bolts & washers
B-1000-12-SP	(25) Silver plated SS 12-pt. 5/16-24 x 2 1/2 inch bolts, nuts & washers
B-1000T-12-SP	(25) Silver plated SS 12-pt. 5/16-24 x 1 3/4 inch bolts & washers
B-1000T-M	(25) SS (metric) M8 x 1 1/4 x 45mm bolts & washers
NP-800	(24) 5/16-24 plate nuts. See page 66
KNP-800	(24) Plate nuts, (48) 5/16-24 x 2 1/4 inch bolts & washers
KNP-800-12	(24) Plate nuts, (48) 12-pt. 5/16-24 x 2 1/4 inch bolts & washers



SPECIFICATIONS

General: Rotatable and nonrotatable with tapped or clearance bolt holes

Material

Flanges: 304 stainless steel
 (316L available upon request)
 Gaskets: Copper, FKM or silver plated
 Bolts: 18-8 stainless steel or silver plated

Torque: 21.5 Nm

Vacuum range

Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
 Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

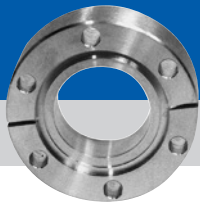
Temperature Range

Metal seal: -200°C to 450°C
 Elastomer seal: -20°C to 150°C

CF Flange Hardware - 12 Inch (305mm) Nominal OD

MODEL NUMBER	DESCRIPTION
G-1200	(1) OFHC copper gasket
B-1200	(32) SS 5/16-24 x 3 inch bolts, nuts & washers
B-1200T	(32) SS 5/16-24 x 1 3/4 inch bolts & washers





Flanges & Fittings

CF Flanges and Hardware

Diagram A

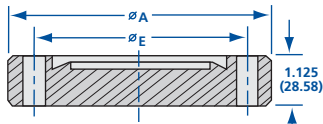


Diagram B

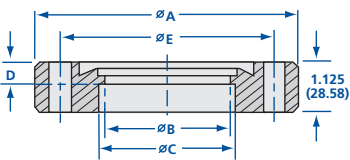


Diagram C

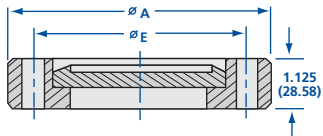
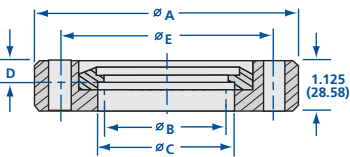


Diagram D



CF Flanges - 13 1/4 Inch (337mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	BOLT HOLES	DIAMETER OR THREAD
1325-000N	Blank	A	13.25 (336.55)	-	-	-	12.055 (306.20)	30	.390
1325-1000N	Bored	B	13.25 (336.55)	9.875 (250.83)	10.020 (254.51)	0.500 (12.70)	12.055 (306.20)	30	.390
1325-000NT	Blank	A	13.25 (336.55)	-	-	-	12.055 (306.20)	30	3/8-24
1325-1000NT	Bored	B	13.25 (336.55)	9.875 (250.83)	10.020 (254.51)	0.500 (12.70)	12.055 (306.20)	30	3/8-24
1325-000R	Blank	C	13.25 (336.55)	-	-	-	12.055 (306.20)	30	.390
1325-1000R	Bored	D	13.25 (336.55)	9.875 (250.83)	10.020 (254.51)	0.500 (12.70)	12.055 (306.20)	30	.390
1325-000RT	Blank	C	13.25 (336.55)	-	-	-	12.055 (306.20)	30	3/8-24
1325-1000RT	Bored	D	13.25 (336.55)	9.875 (250.83)	10.020 (254.51)	0.500 (12.70)	12.055 (306.20)	30	3/8-24

CF Flanges - 14 Inch (356mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	BOLT HOLES	DIAMETER OR THREAD
1400-000N	Blank	A	14.00 (355.60)	-	-	-	12.810 (325.37)	30	.390
1400-1200N	Bored	B	14.00 (355.60)	11.875 (301.63)	12.030 (305.56)	0.500 (12.70)	12.810 (325.37)	30	.390
1400-000NT	Blank	A	14.00 (355.60)	-	-	-	12.810 (325.37)	30	3/8-24
1400-1200NT	Bored	B	14.00 (355.60)	11.875 (301.63)	12.030 (305.56)	0.500 (12.70)	12.810 (325.37)	30	3/8-24
1400-000R	Blank	C	14.00 (355.60)	-	-	-	12.810 (325.37)	30	.390
1400-1200R	Bored	D	14.00 (355.60)	11.875 (301.63)	12.030 (305.56)	0.500 (12.70)	12.810 (325.37)	30	.390
1400-000RT	Blank	C	14.00 (355.60)	-	-	-	12.810 (325.37)	30	3/8-24
1400-1200RT	Bored	D	14.00 (355.60)	11.875 (301.63)	12.030 (305.56)	0.500 (12.70)	12.810 (325.37)	30	3/8-24

Model Number Definitions

N = Nonrotatable, clearance bolt holes NT = Nonrotatable, tapped bolt holes R = Rotatable, clearance bolt holes
RT = Rotatable, tapped bolt holes Add-M8 = Metric tapped bolt holes

CF Flange Hardware-13 1/4 Inch (337mm) Nominal OD

MODEL NUMBER	DESCRIPTION
G-1325	(1) OFHC copper gasket
G-1325V	(1) FKM gasket
B-1325	(30) SS 3/8-24 x 3 inch bolts, nuts & washers
B-1325T	(30) SS 3/8-24 x 2 inch bolts & washers

CF Flange Hardware - 14 Inch (356mm) Nominal OD

MODEL NUMBER	DESCRIPTION
G-1400	(1) OFHC copper gasket
G-1400V	(1) FKM gasket
B-1400	(30) SS 3/8-24 x 3 inch bolts, nuts & washers
B-1400T	(30) SS 3/8-24 x 2 inch bolts & washers



SPECIFICATIONS

General: Rotatable and nonrotatable with tapped or clearance bolt holes

Material
Flanges: 304 stainless steel
(316L available upon request)
Gaskets: Copper, FKM
Bolts: 18-8 stainless steel

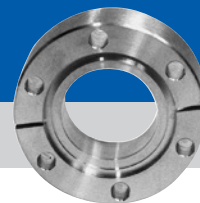
Torque: 39.0 Nm

Vacuum range
Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range
Metal seal: -200°C to 450°C
Elastomer seal: -20°C to 150°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.





CF Flanges - 14½ Inch (368mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	BOLT HOLES	DIAMETER OR THREAD
1450-000N	Blank	A	14.50 (368.30)	Blank	-	-	13.310 (338.07)	32	0.390
1450-1200N	Bored	B	14.50 (368.30)	11.875 (301.63)	12.020 (305.31)	0.500 (12.70)	13.310 (338.07)	32	0.390
1450-000NT	Blank	A	14.50 (368.30)	Blank	-	-	13.310 (338.07)	32	¾-24
1450-1200NT	Bored	B	14.50 (368.30)	11.875 (301.63)	12.020 (305.31)	0.500 (12.70)	13.310 (338.07)	32	¾-24
1450-000R	Blank	C	14.50 (368.30)	Blank	-	-	13.310 (338.07)	32	0.390
1450-1200R	Bored	D	14.50 (368.30)	11.875 (301.63)	12.020 (305.31)	0.500 (12.70)	13.310 (338.07)	32	0.390
1450-000RT	Blank	C	14.50 (368.30)	Blank	-	-	13.310 (338.07)	32	¾-24
1450-1200RT	Bored	D	14.50 (368.30)	11.875 (301.63)	12.020 (305.31)	0.500 (12.70)	13.310 (338.07)	32	¾-24

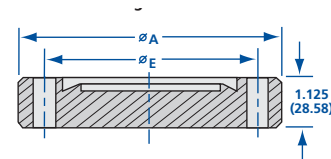


Diagram B

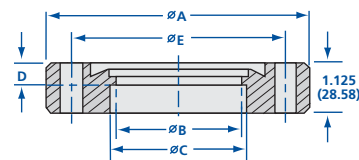


Diagram C

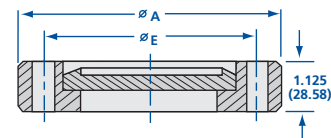
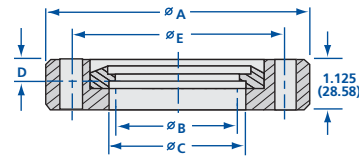


Diagram D



CF Flanges - 16½ Inch (419mm) Nominal OD

MODEL NUMBER	TYPE	DIAGRAM	OD A	ID B	C	D	E	BOLT HOLES	DIAMETER OR THREAD
1650-000N	Blank	A	16.50 (419.10)	Blank	-	-	15.310 (388.87)	36	0.390
1650-1400N	Bored	B	16.50 (419.10)	13.750 (349.25)	14.020 (356.11)	0.500 (12.70)	15.310 (388.87)	36	0.390
1650-000NT	Blank	A	16.50 (419.10)	Blank	-	-	15.310 (388.87)	36	¾-24
1650-1400NT	Bored	B	16.50 (419.10)	13.750 (349.25)	14.020 (356.11)	0.500 (12.70)	15.310 (388.87)	36	¾-24
1650-000R	Blank	C	16.50 (419.10)	Blank	-	-	15.310 (388.87)	36	0.390
1650-1400R	Bored	D	16.50 (419.10)	13.750 (349.25)	14.020 (356.11)	0.500 (12.70)	15.310 (388.87)	36	0.390
1650-000RT	Blank	C	16.50 (419.10)	Blank	-	-	15.310 (388.87)	36	¾-24
1650-1400RT	Bored	D	16.50 (419.10)	13.750 (349.25)	14.020 (356.11)	0.500 (12.70)	15.310 (388.87)	36	¾-24

Model Number Definitions

N = Nonrotatable, clearance bolt holes **NT** = Nonrotatable, tapped bolt holes **R** = Rotatable, clearance bolt holes
RT = Rotatable, tapped bolt holes **Add-M8** = Metric tapped bolt holes

CF Flange Hardware - 14½ Inch (368mm) Nominal OD

MODEL NUMBER	DESCRIPTION
G-1450	(1) OFHC copper gasket
B-1450	(32) SS ¾-24 x 3 inch bolts, nuts & washers
B-1450T	(32) SS ¾-24 x 2 inch bolts & washers



CF Flange Hardware - 16½ Inch (419mm) Nominal OD

MODEL NUMBER	DESCRIPTION
G-1650	(1) OFHC copper gasket
G-1650V	(1) FKM gasket
B-1650	(36) SS ¾-24 x 3 inch bolts, nuts & washers
B-1650T	(36) SS ¾-24 x 2 inch bolts & washers

SPECIFICATIONS

General: Rotatable and nonrotatable with tapped or clearance bolt holes

Material

Flanges: 304 stainless steel
 (316L available upon request)
 Gaskets: Copper, FKM
 Bolts: 18-8 stainless steel

Torque: 39 Nm.

Vacuum range

Metal seal: ≥1 x 10⁻¹³ mbar - UHV
 Elastomer seal: ≥1 x 10⁻⁸ mbar - High vacuum

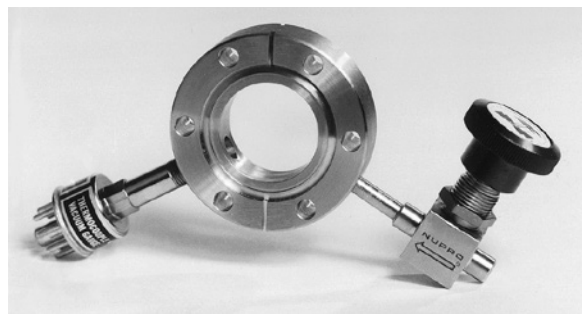
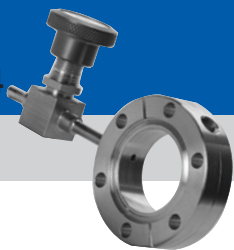
Temperature range

Metal seal: -200°C to 450°C
 Elastomer seal: -20°C to 150°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Flanges & Fittings

CF Special Purpose Flanges



SPECIFICATIONS

General: Nonrotatable with clearance bolt holes

Material
 Flanges: 304 stainless steel (316L available on request)
 Gaskets: Copper, FKM
 Bolts: 18-8 stainless steel

Torque: See page 46

Vacuum range
 Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
 Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range
 Metal seal: -200°C to 450°C
 Elastomer seal: -20°C to 150°C

Nor-Cal Products' special purpose CF flanges are used as roughing accessories, accommodating thermocouple gauge tubes, up-to-air valves and/or NPT threaded fittings. Double-sided flanges are provided with one or more radially tapped holes. Blank flanges are provided with a single concentric $1/8$ NPT tapped hole.

Hardware for special purpose flanges is located on the appropriate flange size pages.

CF Double-Sided Special Purpose Flanges

MODEL NUMBER	FLANGE OD	FEATURE	DIAGRAM	A	B
133-D1	1.33 (33.78)	(1) $1/16$ inch (1.59) NPT hole	A	0.25 (6.35)	0.50 (12.70)
275-D1	2.75 (69.85)	(1) $1/8$ inch (3.18) NPT hole	A	0.38 (9.65)	0.75 (19.05)
133-D2	1.33 (33.78)	(2) $1/16$ inch (1.59) NPT holes	B	0.25 (6.35)	0.50 (12.70)
275-D2	2.75 (69.85)	(2) $1/8$ inch (3.18) NPT holes	B	0.38 (9.65)	0.75 (19.05)
133-DT	1.33 (33.78)	Thermocouple gauge tube	C	0.25 (6.35)	0.50 (12.70)
275-DT	2.75 (69.85)	Thermocouple gauge tube	C	0.38 (9.65)	0.75 (19.05)
133-DV	1.33 (33.78)	Up-to-air valve	D	0.25 (6.35)	0.50 (12.70)
275-DV	2.75 (69.85)	Up-to-air valve	D	0.38 (9.65)	0.75 (19.05)
133-DV-1/4 MVCR	1.33 (33.78)	Up-to-air valve & $1/4$ inch (6.35) Cajon male VCR fitting on valve	D	0.25 (6.35)	0.50 (12.70)
275-DV-1/4 MVCR	2.75 (69.85)	Up-to-air valve & $1/4$ inch (6.35) Cajon male VCR fitting on valve	D	0.38 (9.65)	0.75 (19.05)
133-DV-1/4 FVCR	1.33 (33.78)	Up-to-air valve & $1/4$ inch (6.35) Cajon female VCR fitting on valve	D	0.25 (6.35)	0.50 (12.70)
275-DV-1/4 FVCR	2.75 (69.85)	Up-to-air valve & $1/4$ inch (6.35) Cajon female VCR fitting on valve	D	0.38 (9.65)	0.75 (19.05)
133-DV-1/4 SWAG	1.33 (33.78)	Up-to-air valve & $1/4$ inch (6.35) Swagelok fitting on valve	D	0.25 (6.35)	0.50 (12.70)
275-DV-1/4 SWAG	2.75 (69.85)	Up-to-air valve & $1/4$ inch (6.35) Swagelok fitting on valve	D	0.38 (9.65)	0.75 (19.05)
133-D1V	1.33 (33.78)	(1) $1/16$ inch (1.59) NPT hole & up-to-air valve	F	0.25 (6.35)	0.50 (12.70)
275-D1V	2.75 (69.85)	(1) $1/8$ inch (3.18) NPT hole & up-to-air valve	F	0.38 (9.65)	0.75 (19.05)
133-DTV	1.33 (33.78)	Thermocouple gauge tube & up-to-air valve	E	0.25 (6.35)	0.50 (12.70)
275-DTV	2.75 (69.85)	Thermocouple gauge tube & up-to-air valve	E	0.38 (9.65)	0.75 (19.05)
133-DTV-1/4 MVCR	1.33 (33.78)	Thermocouple gauge tube & up-to-air valve with $1/4$ inch (6.35) Cajon male VCR fitting on valve	E	0.25 (6.35)	0.50 (12.70)
275-DTV-1/4 MVCR	2.75 (69.85)	Thermocouple gauge tube & up-to-air valve with $1/4$ inch (6.35) Cajon male VCR fitting on valve	E	0.38 (9.65)	0.75 (19.05)
133-DTV-1/4 FVCR	1.33 (33.78)	Thermocouple gauge tube & up-to-air valve with $1/4$ inch (6.35) Cajon female VCR fitting on valve	E	0.25 (6.35)	0.50 (12.70)
275-DTV-1/4 FVCR	2.75 (69.85)	Thermocouple gauge tube & up-to-air valve with $1/4$ inch (6.35) Cajon female VCR fitting on valve	E	0.38 (9.65)	0.75 (19.05)
133-DTV-1/4 SWAG	1.33 (33.78)	Thermocouple gauge tube & up-to-air valve with $1/4$ inch (6.35) Swagelok fitting on valve	E	0.25 (6.35)	0.50 (12.70)
275-DTV-1/4 SWAG	2.75 (69.85)	Thermocouple gauge tube & up-to-air valve with $1/4$ inch (6.35) Swagelok fitting on valve	E	0.38 (9.65)	0.75 (19.05)
275-DS-MINI	2.75 (69.85)	(1) 1.33 inch (33.78) OD side port	G	0.38 (9.65)	0.75 (19.05)

Diagram A

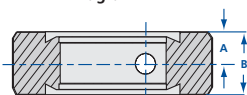


Diagram B

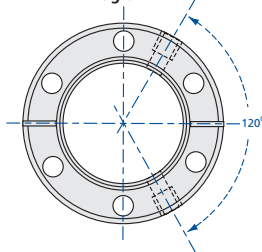


Diagram C

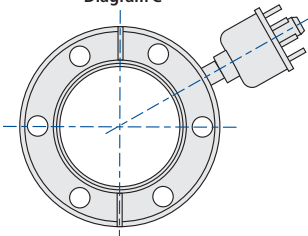


Diagram D

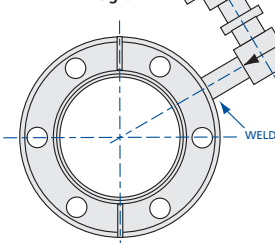


Diagram F

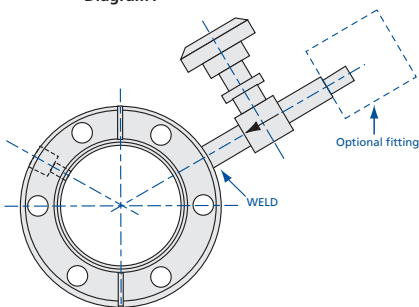


Diagram E

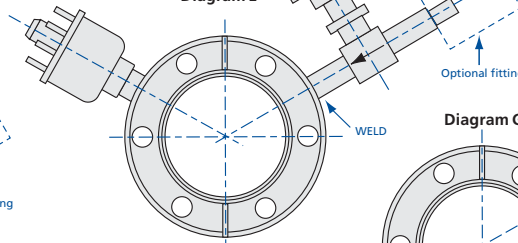
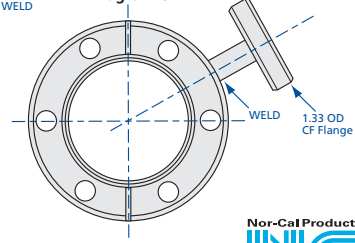
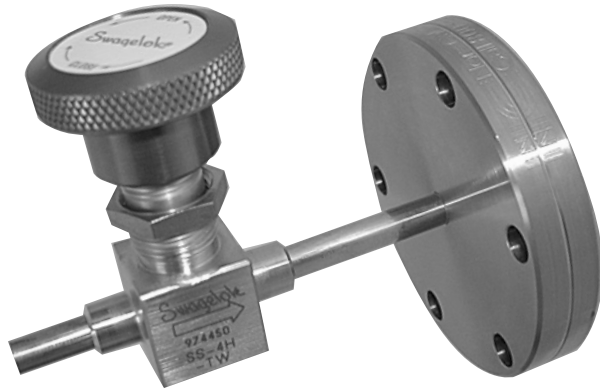
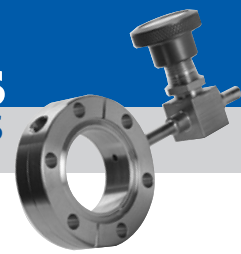


Diagram G



Flanges & Fittings

CF Special Purpose Flanges



CF Straight-Through Special Purpose Flanges

MODEL NUMBER	FLANGE OD	FEATURE	DIAGRAM
133-ST	1.33 (33.78)	(1) 1/8 inch (3.18) NPT hole	A
275-ST	2.75 (69.85)	(1) 1/8 inch (3.18) NPT hole	A
133-STT	1.33 (33.78)	Thermocouple gauge tube	B
275-STT	2.75 (69.85)	Thermocouple gauge tube	B
133-STV	1.33 (33.78)	Up-to-air valve	C
275-STV	2.75 (69.85)	Up-to-air valve	C
133-STV-1/4 MVCR	1.33 (33.78)	Up-to-air valve and 1/4 inch (6.35) Cajon male VCR fitting on valve	C
275-STV-1/4 MVCR	2.75 (69.85)	Up-to-air valve and 1/4 inch (6.35) Cajon male VCR fitting on valve	C
133-STV-1/4 FVCR	1.33 (33.78)	Up-to-air valve and 1/4 inch (6.35) Cajon female VCR fitting on valve	C
275-STV-1/4 FVCR	2.75 (69.85)	Up-to-air valve and 1/4 inch (6.35) Cajon female VCR fitting on valve	C
133-STV-1/4 SWAG	1.33 (33.78)	Up-to-air valve and 1/4 inch (6.35) Swagelok fitting on valve	C
275-STV-1/4 SWAG	2.75 (69.85)	Up-to-air valve and 1/4 inch (6.35) Swagelok fitting on valve	C

SPECIFICATIONS

General: Nonrotatable with clearance bolt holes

Material

Flanges: 304 stainless steel
(316L available upon request)
Gaskets: Copper, FKM
Bolts: 18-8 stainless steel

Torque: See page 46

Vacuum range

Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature Range

Metal seal: -200°C to 450°C
Elastomer seal: -20°C to 150°C

Diagram A

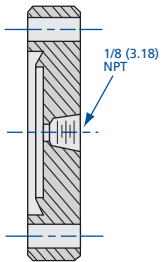


Diagram B

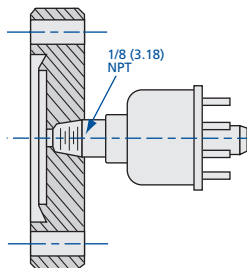
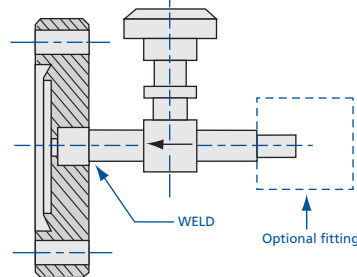
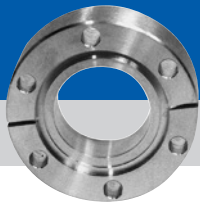


Diagram C



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Flanges & Fittings

CF Double-Sided Flanges

Nor-Cal Products' double-sided flanges are identical to standard CF flanges except the same gasket-sealing detail is machined into both faces of the flange. These flanges can be inserted between like-sized flanges as spacers, orifice plates, or when radially drilled, as custom penetrations into vacuum systems.

CF Double-Sided Flanges

MODEL NUMBER	NOMINAL OD	MADE FROM	A	B
133-000D	1½ (34)	133-000N	-	0.300 (7.62)
133-025D	1½ (34)	133-000N	0.255 (6.48)	0.300 (7.62)
133-038D	1½ (34)	133-000N	0.380 (9.65)	0.300 (7.62)
133-050D	1½ (34)	133-000N	0.505 (12.83)	0.300 (7.62)
133-075D	1½ (34)	133-000N	0.630 (16.00)	0.300 (7.62)
133-000DS	1½ (34)	133-000NS	-	0.500 (12.7)
133-075DS	1½ (34)	133-000NS	0.630 (16.00)	0.500 (12.7)
212-000D	2½ (54)	212-000N	-	0.470 (11.94)
212-100D	2½ (54)	212-000N	1.010 (25.65)	0.470 (11.94)
275-000D	2½ (54)	275-000N	-	0.500 (12.7)
275-025D	2¾ (70)	275-000N	0.255 (6.48)	0.500 (12.7)
275-050D	2¾ (70)	275-000N	0.505 (12.83)	0.500 (12.7)
275-075D	2¾ (70)	275-000N	0.760 (19.30)	0.500 (12.7)
275-100D	2¾ (70)	275-000N	1.010 (25.65)	0.500 (12.7)
275-125D	2¾ (70)	275-000N	1.260 (32.00)	0.500 (12.7)
275-150D	2¾ (70)	275-000N	1.510 (38.35)	0.500 (12.7)
275-000DS	2¾ (70)	275-000NS	-	0.750 (19.05)
275-150DS	2¾ (70)	275-000NS	1.510 (38.35)	0.750 (19.05)
338-000D	3⅝ (86)	338-000N	-	0.687 (17.45)
338-150D	3⅝ (86)	338-000N	1.510 (38.35)	0.687 (17.45)
338-200D	3⅝ (86)	338-000N	2.010 (51.05)	0.687 (17.45)
450-000D	4½ (114)	450-000N	-	0.687 (17.45)
450-150D	4½ (114)	450-000N	1.510 (38.35)	0.687 (17.45)
450-200D	4½ (114)	450-000N	2.010 (51.05)	0.687 (17.45)
450-250D	4½ (114)	450-000N	2.510 (63.75)	0.687 (17.45)
462-000D	4⅝ (117)	462-000N	-	0.812 (20.62)
462-300D	4⅝ (117)	462-000N	3.010 (76.45)	0.812 (20.62)
600-000D	6 (152)	600-000N	-	0.781 (19.84)
600-400D	6 (152)	600-000N	4.010 (101.85)	0.781 (19.84)
675-000D	6¾ (171)	675-000N	-	0.844 (21.44)
675-500D	6¾ (171)	675-000N	5.010 (127.25)	0.844 (21.44)
800-000D	8 (203)	800-000N	-	0.875 (22.23)
800-600D	8 (203)	800-000N	6.020 (152.91)	0.875 (22.23)
1000-000D	10 (254)	1000-000N	-	0.968 (24.59)
1000-800D	10 (254)	1000-000N	8.020 (203.71)	0.968 (24.59)
1325-000D	13¼ (337)	1325-000N	-	1.125 (28.58)
1325-1000D	13¼ (337)	1325-000N	10.020 (254.51)	1.125 (28.58)
1400-000D	14 (356)	1400-000N	-	1.125 (28.58)
1400-1200D	14 (356)	1400-000N	12.020 (305.31)	1.125 (28.58)

DS = Thicker than standard flange D = Double-sided flange, nonrotatable

CF Double-Sided Flange Hardware

MODEL NUMBER	NOMINAL OD	DESCRIPTION
G-133	1½ (34)	(10) OFHC copper gaskets
G-133V	1½ (34)	(5) FKM gaskets
B-133D	1½ (34)	(5) SS 8-32 x 1¼ inch bolts, nuts and washers
G-212	2½ (54)	(10) OFHC copper gaskets
G-212V	2½ (54)	(5) FKM gaskets
B-212D	2½ (54)	(25) SS ¼-28 x 1¾ inch bolts, nuts and washers
G-275	2¾ (70)	(10) OFHC copper gaskets
G-275V	2¾ (70)	(5) FKM gaskets
B-275DS	2¾ (70)	(25) SS ¼-28 x 2 inch bolts, nuts and washers
B-275D	2¾ (70)	(25) SS ¼-28 x 1¾ inch bolts, nuts and washers
KNP-150D	2¾ (70)	(6) Plate nuts, ¼-28 x 2 inch (12) bolts and washers
G-338	3⅝ (86)	(10) OFHC copper gaskets
G-338V	3⅝ (86)	(1) FKM gaskets
B-338D	3⅝ (86)	(25) SS ⅝-16-24 x 2½ inch bolts, nuts and washers
G-450	4½ (114)	(10) OFHC copper gaskets
G-450V	4½ (114)	(1) FKM gaskets
B-450D	4½ (114)	(25) SS ⅝-16-24 x 3¾ inch bolts, nuts and washers
G-462	4⅝ (117)	(10) OFHC copper gaskets
G-462V	4⅝ (117)	(1) FKM gaskets
B-462D	4⅝ (117)	(25) SS ⅝-16-24 x 3 inch bolts, nuts and washers
G-600	6 (152)	(10) OFHC copper gaskets
G-600V	6 (152)	(1) FKM gaskets
B-600D	6 (152)	(25) SS ⅝-16-24 x 3 inch bolts, nuts and washers
G-675	6¾ (171)	(10) OFHC copper gaskets
G-675V	6¾ (171)	(1) FKM gaskets
B-675D	6¾ (171)	(25) SS ⅝-16-24 x 3 inch bolts, nuts and washers
G-800	8 (203)	(10) OFHC copper gaskets
G-800V	8 (203)	(1) FKM gaskets
B-800D	8 (203)	(25) SS ⅝-16-24 x 3 inch bolts, nuts & washers
G-1000	10 (254)	(10) OFHC copper gaskets
G-1000V	10 (254)	(1) FKM gaskets
B-1000D	10 (254)	(25) SS ⅝-16-24 x 3½ inch bolts, nuts and washers
G-1325	13¼ (337)	(1) OFHC copper gaskets
G-1325V	13¼ (337)	(1) FKM gaskets

SPECIFICATIONS

General: Nonrotatable with clearance bolt holes

Material

Flanges: 304 stainless steel
(316L available upon request)
Gaskets: Copper, FKM
Bolts: 18-8 stainless steel

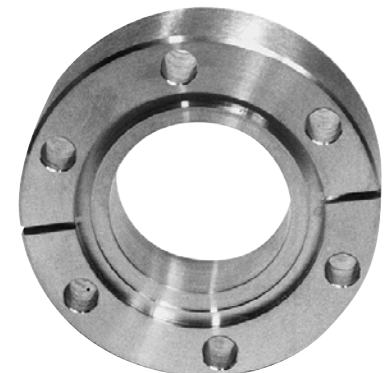
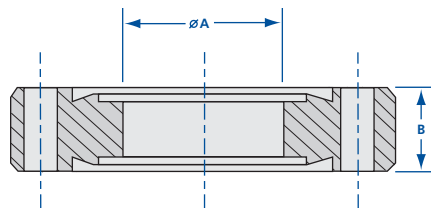
Torque: See page 46

Vacuum range

Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

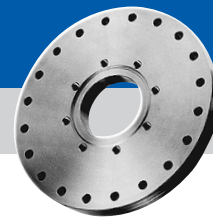
Temperature range

Metal seal: -200°C to 450°C
Elastomer seal: -20°C to 150°C



Flanges & Fittings

CF Zero Length Reducer Flanges



Nor-Cal Products' zero length reducer flanges are a convenient and inexpensive way to reduce a large flange for smaller vacuum plumbing and/or component connection. To list all possible reducer combinations would require excessive space, therefore only the most commonly used reducers are listed. If your requirement is not listed, please inquire.

CF Zero Length Reducer Flanges

MODEL NUMBER	SMALL FLANGE DETAIL	LARGE FLANGE DETAIL	A	B
212-133-075Z	133-000NT	212-000NT	0.625 (15.88)	0.470 (11.94)
275-133-075Z	133-000NT	275-000N	0.625 (15.88)	0.500 (12.70)
275-212-100Z	212-000NT	275-000NT	1.000 (25.40)	0.500 (12.70)
338-133-075Z	133-000NT	338-000N	0.625 (15.88)	0.687 (17.45)
338-212-100Z	212-000NT	338-000NT	1.000 (25.40)	0.687 (17.45)
338-275-150Z	275-000NT	338-000NT	1.500 (38.10)	0.687 (17.45)
450-133-075Z	133-000NT	450-000N	0.625 (15.88)	0.687 (17.45)
450-212-100Z	212-000NT	450-000N	1.000 (25.40)	0.687 (17.45)
450-275-150Z	275-000NT	450-000N	1.500 (38.10)	0.687 (17.45)
450-338-200Z	338-000NT	450-000NT	2.000 (50.80)	0.687 (17.45)
462-133-075Z	133-000NT	462-000N	0.625 (15.88)	0.812 (20.62)
462-212-100Z	212-000NT	462-000N	1.000 (25.40)	0.812 (20.62)
462-275-150Z	275-000NT	462-000N	1.500 (38.10)	0.812 (20.62)
462-338-200Z	338-000NT	462-000N	2.000 (50.80)	0.812 (20.62)
600-133-075Z	133-000NT	600-000N	0.625 (15.88)	0.781 (19.84)
600-212-100Z	212-000NT	600-000N	1.000 (25.40)	0.781 (19.84)
600-275-150Z	275-000NT	600-000N	1.500 (38.10)	0.781 (19.84)
600-338-200Z	338-000NT	600-000N	2.000 (50.80)	0.781 (19.84)
600-450-250Z	450-000NT	600-000N	2.500 (63.50)	0.781 (19.84)
600-462-300Z	462-000NT	600-000NT	3.000 (76.20)	0.781 (19.84)
675-133-075Z	133-000NT	675-000N	0.625 (15.88)	0.844 (21.44)
675-212-100Z	212-000NT	675-000N	1.000 (25.40)	0.844 (21.44)
675-275-150Z	275-000NT	675-000N	1.500 (38.10)	0.844 (21.44)
675-338-200Z	338-000NT	675-000N	2.000 (50.80)	0.844 (21.44)
675-450-250Z	450-000NT	675-000N	2.500 (63.50)	0.844 (21.44)
675-462-300Z	462-000NT	675-000N	3.000 (76.20)	0.844 (21.44)
675-600-400Z	600-000NT	675-000NT	4.000 (101.60)	0.844 (21.44)
800-133-075Z	133-000NT	800-000N	0.625 (15.88)	0.875 (22.23)
800-212-100Z	212-000NT	800-000N	1.000 (25.40)	0.875 (22.23)
800-275-150Z	275-000NT	800-000N	1.500 (38.10)	0.875 (22.23)
800-338-200Z	338-000NT	800-000N	2.000 (50.80)	0.875 (22.23)
800-450-250Z	450-000NT	800-000N	2.500 (63.50)	0.875 (22.23)
800-462-300Z	462-000NT	800-000N	3.000 (76.20)	0.875 (22.23)
800-600-400Z	600-000NT	800-000N	4.000 (101.60)	0.875 (22.23)
800-675-500Z	675-000NT	800-000NT	5.000 (127.00)	0.875 (22.23)
1000-133-075Z	133-000NT	1000-000N	0.625 (15.88)	0.968 (24.59)
1000-212-100Z	212-000NT	1000-000N	1.000 (25.40)	0.968 (24.59)
1000-275-150Z	275-000NT	1000-000N	1.500 (38.10)	0.968 (24.59)
1000-338-200Z	338-000NT	1000-000N	2.000 (50.80)	0.968 (24.59)
1000-450-250Z	450-000NT	1000-000N	2.500 (63.50)	0.968 (24.59)
1000-462-300Z	462-000NT	1000-000N	3.000 (76.20)	0.968 (24.59)
1000-600-400Z	600-000NT	1000-000N	4.000 (101.60)	0.968 (24.59)
1000-675-500Z	675-000NT	1000-000N	5.000 (127.00)	0.968 (24.59)
1000-800-600Z	800-000NT	1000-000N	6.000 (152.40)	0.968 (24.59)
1325-133-075Z	133-000NT	1325-000N	0.625 (15.88)	1.125 (28.58)
1325-212-100Z	212-000NT	1325-000N	1.000 (25.40)	1.125 (28.58)
1325-275-150Z	275-100NT	1325-000N	1.500 (38.10)	1.125 (28.58)
1325-338-200Z	338-000NT	1325-000N	2.000 (50.80)	1.125 (28.58)
1325-450-250Z	450-000NT	1325-000N	2.500 (63.50)	1.125 (28.58)
1325-462-300Z	462-000NT	1325-000N	3.000 (76.20)	1.125 (28.58)
1325-600-400Z	600-000NT	1325-000N	4.000 (101.60)	1.125 (28.58)
1325-675-500Z	675-000NT	1325-000N	5.000 (127.00)	1.125 (28.58)
1325-800-600Z	800-000NT	1325-000N	6.000 (152.40)	1.125 (28.58)
1325-1000-800Z	1000-000NT	1325-000N	8.000 (203.20)	1.125 (28.58)

SPECIFICATIONS

General: Nonrotatable with tapped or clearance bolt holes

Material

- Flanges: 304 stainless steel (316L available upon request)
- Gaskets: Copper, FKM or silver plated
- Bolts: 18-8 stainless steel or silver plated

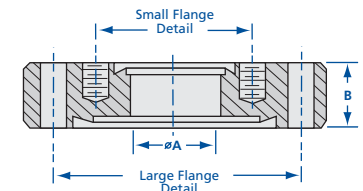
Torque: See page 46

Vacuum range

- Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
- Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range

- Metal seal: -200°C to 450°C
- Elastomer seal: -20°C to 150°C



For gasket and hardware options please refer to appropriate flange page

Flange Detail Definitions

N = Nonrotatable, clearance bolt holes NT = Nonrotatable, tapped bolt holes

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



SPECIFICATIONS

General: Rotatable or nonrotatable with clearance bolt holes

Materials

Tube/Flanges: 304 stainless steel
(316L available on request)

Gaskets: FKM, copper or silver plated

Bolts: 18-8 stainless steel or silver plated

Torque: Refer to specific flange specs

Vacuum range

Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV

Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range

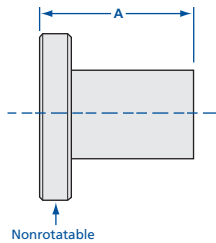
Metal seal: -200°C to 450°C

Elastomer: -20°C to 150°C



Nor-Cal Products manufactures a complete line of vacuum fittings with CF flanges. The tube portions are fabricated from 304 stainless steel. On request 316L stainless steel can be supplied. Nor-Cal Products makes its own elbows, and all tees and crosses are made with the pulled port technique. This allows smooth, crevice-free butt welds to provide the maximum in cleanliness for UHV applications. Bakeout range is up to 450°C. Standard finish is bead blasted. Electropolish can also be provided as an option. Call for pricing.

CF Half Nipples



MODEL NUMBER	FLANGE OD	TUBE OD	A
1N-075	1.33 (33.78)	3/4 (19.05)	1.50 (38.10)
1N-100	2.12 (53.85)	1 (25.40)	2.05 (52.07)
1N-150	2.75 (69.85)	1 1/2 (38.10)	2.46 (62.48)
1N-200	3.38 (85.85)	2 (50.80)	3.22 (81.79)
1N-250	4.50 (114.30)	2 1/2 (63.50)	3.38 (85.85)
1N-250V	4.50 (114.30)	2 1/2 (63.50)	4.12 (104.65)
1N-300	4.62 (117.35)	3 (76.20)	3.53 (89.66)
1N-400	6.00 (152.40)	4 (101.60)	4.32 (109.73)
1N-400V	6.00 (152.40)	4 (101.60)	5.31 (134.87)
1N-600	8.00 (203.20)	6 (152.40)	5.50 (139.70)
1N-600V	8.00 (203.20)	6 (152.40)	6.56 (166.62)
1N-800	10.00 (254.00)	8 (203.20)	7.50 (190.50)
1N-1000	13.25 (336.55)	10 (254.00)	10.00 (254.00)
1N-1200	14.00 (355.60)	12 (304.80)	10.00 (254.00)



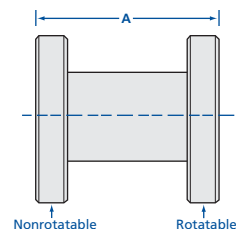
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



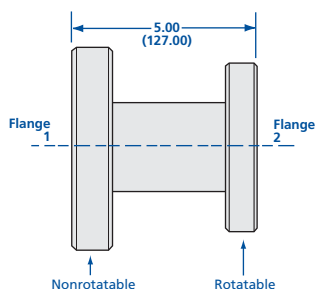
CF Full Nipples



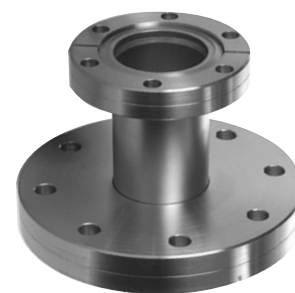
MODEL NUMBER	FLANGE OD	TUBE OD	A
2N-075	1.33 (33.78)	3/4 (19.05)	3.00 (76.20)
2N-100	2.12 (53.85)	1 (25.40)	4.10 (104.14)
2N-150	2.75 (69.85)	1 1/2 (38.10)	4.92 (124.97)
2N-200	3.38 (85.85)	2 (50.80)	6.44 (163.58)
2N-250	4.50 (114.30)	2 1/2 (63.50)	6.76 (171.70)
2N-250V	4.50 (114.30)	2 1/2 (63.50)	8.24 (209.3)
2N-300	4.62 (117.35)	3 (76.20)	7.06 (179.32)
2N-400	6.00 (152.40)	4 (101.60)	8.64 (219.46)
2N-400V	6.00 (152.40)	4 (101.60)	10.62 (269.75)
2N-600	8.00 (203.20)	6 (152.40)	11.00 (279.40)
2N-600V	8.00 (203.20)	6 (152.40)	13.12 (333.25)
2N-800	10.00 (254.00)	8 (203.20)	15.00 (381.00)
2N-1000	13.25 (336.55)	10 (254.00)	20.00 (508.00)
2N-1200	14.00 (355.60)	12 (304.80)	20.00 (508.00)



CF Reducer Nipples



MODEL NUMBER	FLANGE 1 OD	FLANGE 2 OD	TUBE OD
2NR-600-275	6.00 (152.40)	2 3/4 (69.85)	1.50 (38.10)
2NR-800-275	8.00 (203.20)	2 3/4 (69.85)	1.50 (38.10)
2NR-800-450	8.00 (203.20)	4 1/2 (114.30)	2.50 (63.50)
2NR-800-600	8.00 (203.20)	6 (152.40)	4.00 (101.60)
2NR-1000-275	10.00 (254.00)	2 3/4 (69.85)	1.50 (38.10)
2NR-1000-450	10.00 (254.00)	4 1/2 (114.30)	2.50 (63.50)
2NR-1000-600	10.00 (254.00)	6 (152.40)	4.00 (101.60)
2NR-1000-800	10.00 (254.00)	8 (203.20)	6.00 (152.40)
2NR-1325-1000	13.25 (336.55)	10 (254.00)	8.00 (203.20)
2NR-1400-1200	14.00 (355.60)	12 (304.80)	10.00 (254.00)

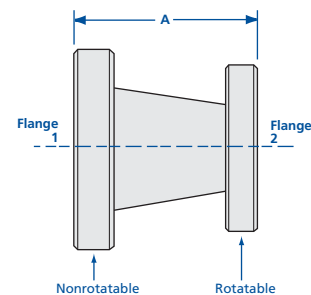


Note: Reducer nipples with other CF flanges and different lengths are available upon request.

CF Conical Reducer Nipples



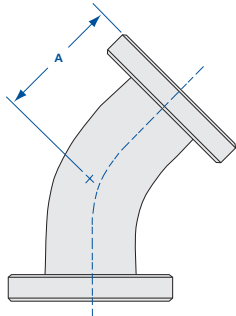
MODEL NUMBER	FLANGE 1 OD	FLANGE 1 TUBE OD	FLANGE 2 OD	FLANGE 2 TUBE OD	A
2NRC-212-133	2.12 (53.85)	1 (25.40)	1.33 (33.78)	3/4 (19.05)	2.04 (51.82)
2NRC-275-133	2.75 (69.85)	1 1/2 (38.10)	1.33 (33.78)	3/4 (19.05)	3.08 (78.23)
2NRC-275-212	2.75 (69.85)	1 1/2 (38.10)	2.12 (53.85)	1 (25.40)	2.75 (69.85)
2NRC-338-212	3.38 (85.85)	2 (50.80)	2.12 (53.85)	1 (25.40)	2.77 (70.36)
2NRC-338-275	3.38 (85.85)	2 (50.80)	2.75 (69.85)	1 1/2 (38.10)	2.81 (71.37)
2NRC-450-275	4.50 (114.3)	2 1/2 (63.50)	2.75 (69.85)	1 1/2 (38.10)	2.96 (75.18)
2NRC-450-338	4.50 (114.3)	2 1/2 (63.50)	3.38 (85.85)	2 (50.80)	2.98 (75.69)
2NRC-462-275	4.62 (117.35)	3 (76.20)	2.75 (69.85)	1 1/2 (38.10)	4.12 (104.65)
2NRC-462-338	4.62 (117.35)	3 (76.20)	3.38 (85.85)	2 (50.80)	4.13 (104.90)
2NRC-462-450	4.62 (117.35)	3 (76.20)	4.50 (114.30)	2 1/2 (63.50)	4.28 (108.71)
2NRC-600-338	6.00 (152.40)	4 (101.60)	3.38 (85.85)	2 (50.80)	4.29 (108.97)
2NRC-600-450	6.00 (152.40)	4 (101.60)	4.50 (114.30)	2 1/2 (63.50)	4.44 (112.78)
2NRC-600-462	6.00 (152.40)	4 (101.60)	4.62 (117.35)	3 (76.20)	4.34 (110.24)



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Flanges & Fittings

CF Fittings



Both Flanges Rotatable

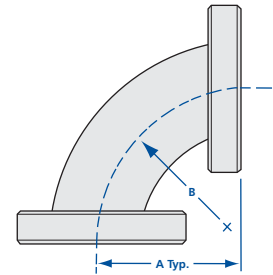
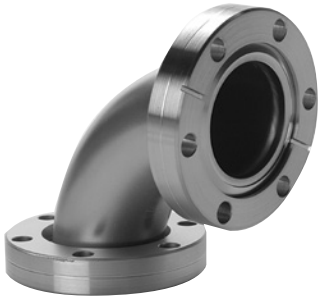
CF 45° Radius Elbow with Tangents

MODEL NUMBER	FLANGE OD	TUBE OD	A
2KL-075	1.33 (33.78)	3/4 (19.05)	0.94 (23.88)
2KL-100	2.12 (53.85)	1 (25.40)	1.14 (28.96)
2KL-150	2.75 (69.85)	1 1/2 (38.10)	1.74 (44.20)
2KL-200	3.38 (85.85)	2 (50.80)	2.07 (52.58)
2KL-250	4.50 (114.30)	2 1/2 (63.50)	3.37 (85.60)
2KL-300	4.62 (117.35)	3 (76.20)	3.96 (100.58)
2KL-400	6.00 (152.40)	4 (101.60)	5.22 (132.59)



CF 90° Radius Elbows

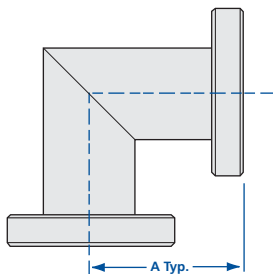
MODEL NUMBER	FLANGE OD	TUBE OD	A	B
2E-075	1.33 (33.78)	3/4 (19.05)	1.50 (38.10)	1.00 (25.40)
2E-100	2.12 (53.85)	1 (25.40)	1.67 (42.42)	1.50 (38.10)
2E-150	2.75 (69.85)	1 1/2 (38.10)	2.46 (62.48)	2.25 (57.15)
2E-200	3.38 (85.85)	2 (50.80)	3.22 (81.79)	3.00 (76.20)
2E-250	4.50 (114.30)	2 1/2 (63.50)	4.12 (104.65)	3.75 (95.25)
2E-300	4.62 (117.35)	3 (76.20)	4.78 (121.41)	4.50 (114.30)
2E-400	6.00 (152.40)	4 (101.60)	6.44 (163.58)	6.00 (152.40)
2E-600	8.00 (203.20)	6 (152.40)	9.50 (241.30)	9.00 (228.60)
2E-800	10.00 (254.00)	8 (203.20)	12.50 (317.50)	12.00 (304.80)
2E-1000	13.25 (336.55)	10 (254.00)	15.50 (393.70)	15.00 (381.00)



Both Flanges Rotatable

CF 90° Mitered Elbows

MODEL NUMBER	FLANGE OD	TUBE OD	A
2E-075M	1.33 (33.78)	3/4 (19.05)	1.50 (38.10)
2E-100M	2.12 (53.85)	1 (25.40)	2.05 (52.07)
2E-150M	2.75 (69.85)	1 1/2 (38.10)	2.46 (62.48)
2E-200M	3.38 (85.85)	2 (50.80)	3.22 (81.79)
2E-250M	4.50 (114.30)	2 1/2 (63.50)	3.38 (85.85)
2E-250MV	4.50 (114.30)	2 1/2 (63.50)	4.12 (104.65)
2E-300M	4.62 (117.35)	3 (76.20)	3.53 (89.66)
2E-400M	6.00 (152.40)	4 (101.60)	4.32 (109.73)
2E-400MV	6.00 (152.40)	4 (101.60)	5.31 (134.87)
2E-500M	6.75 (171.45)	5 (127.00)	4.71 (119.63)
2E-600M	8.00 (203.20)	6 (152.40)	5.50 (139.70)
2E-600MV	8.00 (203.20)	6 (152.40)	6.56 (166.62)
2E-800M	10.00 (254.00)	8 (203.20)	7.50 (190.50)
2E-1000M	13.25 (336.55)	10 (254.00)	10.00 (254.00)



Both Flanges Rotatable



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



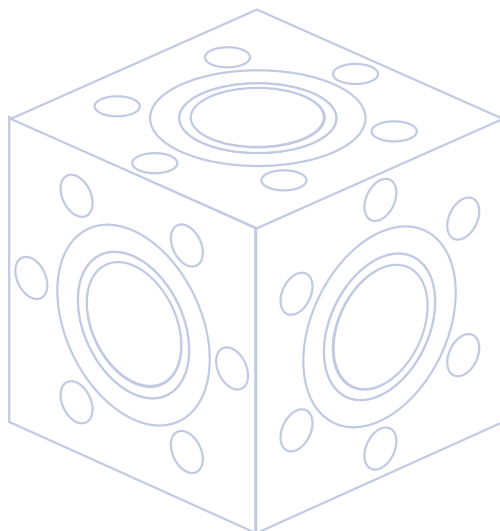
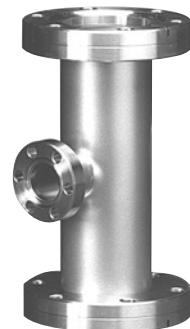
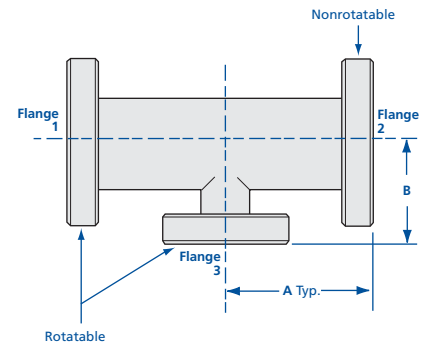
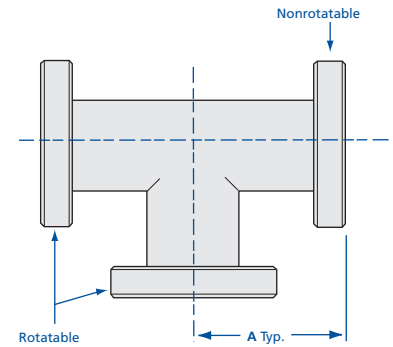
CF Tees

MODEL NUMBER	FLANGE OD	TUBE OD	A
3T-075	1.33 (33.78)	3/4 (19.05)	1.50 (38.10)
3T-100	2.12 (53.85)	1 (25.40)	2.05 (52.07)
3T-150	2.75 (69.85)	1 1/2 (38.10)	2.46 (62.48)
3T-200	3.38 (85.85)	2 (50.80)	3.22 (81.79)
3T-250	4.50 (114.30)	2 1/2 (63.50)	3.38 (85.85)
3T-250V	4.50 (114.30)	2 1/2 (63.50)	4.12 (104.65)
3T-300	4.62 (117.35)	3 (76.20)	3.53 (89.66)
3T-400	6.00 (152.40)	4 (101.60)	4.32 (109.73)
3T-400V	6.00 (152.40)	4 (101.60)	5.31 (134.87)
3T-500	6.75 (171.45)	5 (127.00)	4.71 (119.63)
3T-600	8.00 (203.20)	6 (152.40)	5.50 (139.70)
3T-600V	8.00 (203.20)	6 (152.40)	6.56 (166.62)
3T-800	10.00 (254.00)	8 (203.20)	7.50 (190.50)
3T-1000	13.25 (336.55)	10 (254.00)	10.00 (254.00)

Note: Reducer tees in other tube sizes are available upon request.

CF Reducer Tees

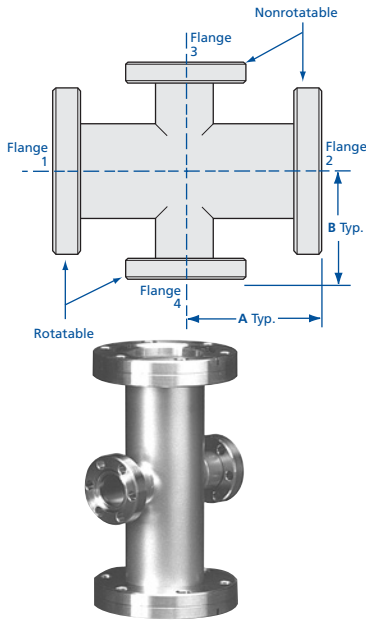
MODEL NUMBER	FLANGE 1 & 2 FLANGE OD	FLANGE 1 & 2 TUBE OD	FLANGE 3 FLANGE OD	FLANGE 3 TUBE OD	A	B
3TR-150-075	2.75 (69.85)	1 1/2 (38.10)	1.33 (33.78)	3/4 (19.05)	2.46 (62.48)	1.87 (47.50)
3TR-150-100	2.75 (69.85)	1 1/2 (38.10)	2.12 (53.85)	1 (25.40)	2.46 (62.48)	2.29 (58.17)
3TR-200-075	3.38 (85.85)	2 (50.80)	1.33 (33.78)	3/4 (19.05)	3.22 (81.79)	2.13 (54.10)
3TR-200-150	3.38 (85.85)	2 (50.80)	2.75 (69.85)	1 1/2 (38.10)	3.22 (81.79)	2.71 (68.83)
3TR-250-150	4.50 (114.30)	2 1/2 (63.50)	2.75 (69.85)	1 1/2 (38.10)	3.38 (85.85)	2.96 (75.18)
3TR-250-200	4.50 (114.30)	2 1/2 (63.50)	3.38 (85.85)	2 (50.80)	3.38 (85.85)	3.48 (88.39)
3TR-300-200	4.62 (117.35)	3 (76.20)	3.38 (85.85)	2 (50.80)	3.53 (89.66)	3.73 (94.74)
3TR-300-250	4.62 (117.35)	3 (76.20)	4.50 (114.30)	2 1/2 (63.50)	3.53 (89.66)	3.63 (92.20)
3TR-400-150	6.00 (152.40)	4 (101.60)	2.75 (69.85)	1 1/2 (38.10)	4.32 (109.73)	3.71 (94.23)
3TR-400-200	6.00 (152.40)	4 (101.60)	3.38 (85.85)	2 (50.80)	4.32 (109.73)	4.23 (107.44)
3TR-400-250	6.00 (152.40)	4 (101.60)	4.50 (114.30)	2 1/2 (63.50)	4.32 (109.73)	4.13 (104.90)
3TR-400-300	6.00 (152.40)	4 (101.60)	4.62 (117.35)	3 (76.20)	4.32 (109.73)	4.03 (102.36)
3TR-500-400	6.75 (171.45)	5 (127.00)	6.00 (152.40)	4 (101.60)	4.71 (119.63)	4.82 (122.43)
3TR-600-150	8.00 (203.20)	6 (152.40)	2.75 (69.85)	1 1/2 (38.10)	5.50 (139.70)	4.71 (119.63)
3TR-600-200	8.00 (203.20)	6 (152.40)	3.38 (85.85)	2 (50.80)	5.50 (139.70)	5.23 (132.84)
3TR-600-250	8.00 (203.20)	6 (152.40)	4.50 (114.30)	2 1/2 (63.50)	5.50 (139.70)	5.13 (130.30)
3TR-600-400	8.00 (203.20)	6 (152.40)	6.00 (152.40)	4 (101.60)	5.50 (139.70)	5.32 (135.13)
3TR-800-600	10.00 (254.00)	8 (203.20)	8.00 (203.20)	6 (152.40)	7.50 (190.50)	6.50 (165.10)



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Flanges & Fittings

CF Fittings



CF Reducer Crosses

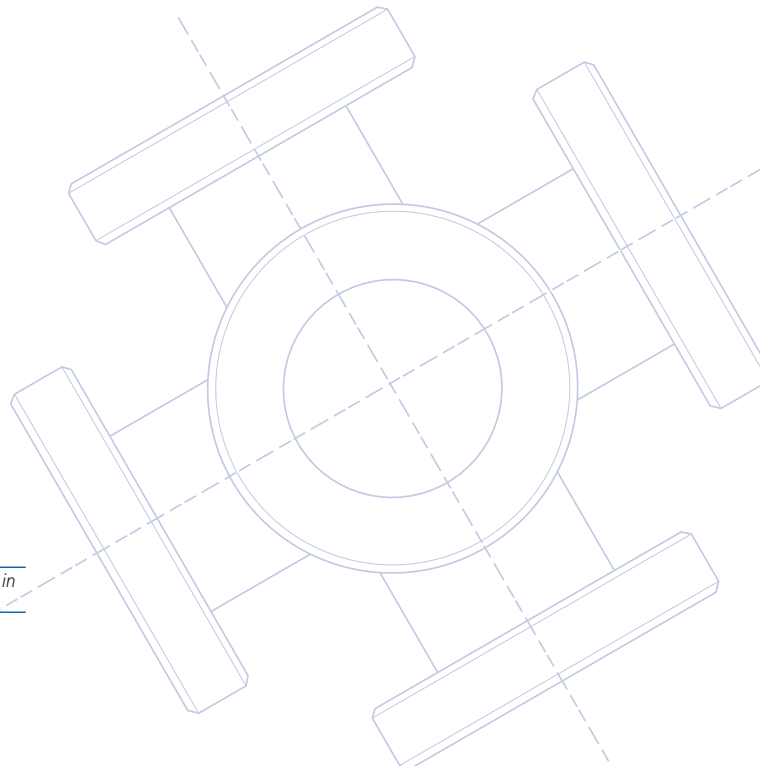
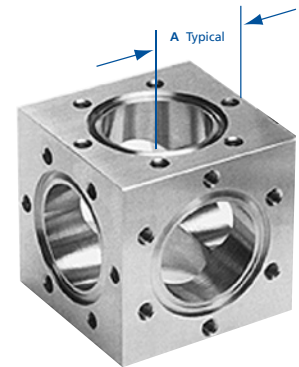
MODEL NUMBER	FLANGE 1 & 2 FLANGE OD	FLANGE 1 & 2 TUBE OD	FLANGE 3 & 4 FLANGE OD	FLANGE 3 & 4 TUBE OD	A	B
4CR-150-075	2.75 (69.85)	1½ (38.10)	1.33 (33.78)	¾ (19.05)	2.46 (62.48)	1.87 (47.50)
4CR-150-100	2.75 (69.85)	1½ (38.10)	2.12 (53.85)	1 (25.40)	2.46 (62.48)	2.29 (58.17)
4CR-200-075	3.38 (85.85)	2 (50.80)	1.33 (33.78)	¾ (19.05)	3.22 (81.79)	2.13 (54.10)
4CR-200-150	3.38 (85.85)	2 (50.80)	2.75 (69.85)	1½ (38.10)	3.22 (81.79)	2.71 (68.83)
4CR-250-150	4.50 (114.30)	2½ (63.50)	2.75 (69.85)	1½ (38.10)	3.38 (85.85)	2.96 (75.18)
4CR-250-200	4.50 (114.30)	2½ (63.50)	3.38 (85.85)	2 (50.80)	3.38 (85.85)	3.48 (88.39)
4CR-300-200	4.62 (117.35)	3 (76.20)	3.38 (85.85)	2 (50.80)	3.53 (89.66)	3.73 (94.74)
4CR-300-250	4.62 (117.35)	3 (76.20)	4.50 (114.30)	2½ (63.50)	3.53 (89.66)	3.63 (92.2)
4CR-400-150	6.00 (152.40)	4 (101.60)	2.75 (69.85)	1½ (38.10)	4.32 (109.73)	3.71 (94.23)
4CR-400-200	6.00 (152.40)	4 (101.60)	3.38 (85.85)	2 (50.80)	4.32 (109.73)	4.23 (107.44)
4CR-400-250	6.00 (152.40)	4 (101.60)	4.50 (114.30)	2½ (63.50)	4.32 (109.73)	4.13 (104.90)
4CR-400-300	6.00 (152.40)	4 (101.60)	4.62 (117.35)	3 (76.20)	4.32 (109.73)	4.03 (102.36)
4CR-500-400	6.75 (171.45)	5 (127.00)	6.00 (152.40)	4 (101.60)	4.71 (119.63)	4.82 (122.43)
4CR-600-150	8.00 (203.20)	6 (152.40)	2.75 (69.85)	1½ (38.10)	5.50 (139.70)	4.71 (119.63)
4CR-600-200	8.00 (203.20)	6 (152.40)	3.38 (85.85)	2 (50.80)	5.50 (139.70)	5.23 (132.84)
4CR-600-250	8.00 (203.20)	6 (152.40)	4.50 (114.30)	2½ (63.50)	5.50 (139.70)	5.13 (130.30)
4CR-600-400	8.00 (203.20)	6 (152.40)	6.00 (152.40)	4 (101.60)	5.50 (139.70)	5.32 (135.13)
4CR-800-600	10.00 (254.00)	6 (152.40)	8.00 (203.20)	6 (152.40)	7.50 (190.50)	6.50 (165.10)

Note: Other reducer combinations can be supplied upon request.

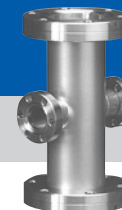
CF 6-Way Cube Crosses

MODEL NUMBER	NOMINAL FLANGE SIZE	A
6C-075-CU	1.33 (33.78)	0.67 (17.02)
6C-150-CU	2.75 (69.85)	1.37 (34.80)
6C-250-CU	4.50 (114.30)	2.24 (56.90)
6C-400-CU	6 (152.40)	2.98 (75.69)
6C-600-CU	8.00 (203.20)	3.98 (101.09)

Note: Cube crosses are available in other sizes upon request



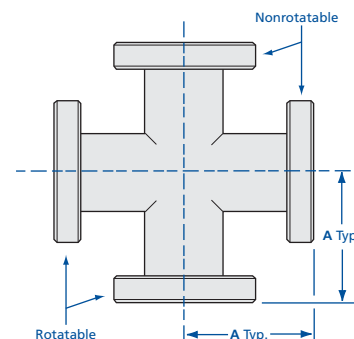
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



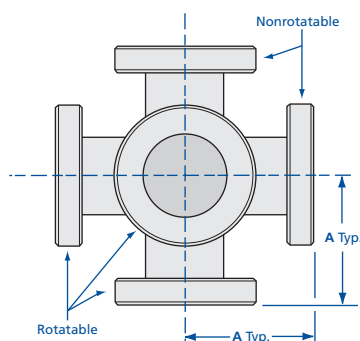
CF 4-Way Crosses



MODEL NUMBER	FLANGE OD	TUBE OD	A
4C-075	1.33 (33.78)	3/4 (19.05)	1.50 (38.10)
4C-100	2.12 (53.85)	1 (25.40)	2.05 (52.07)
4C-150	2.75 (69.85)	1 1/2 (38.10)	2.46 (62.48)
4C-200	3.38 (85.85)	2 (50.80)	3.22 (81.79)
4C-250	4.50 (114.30)	2 1/2 (63.50)	3.38 (85.85)
4C-250V	4.50 (114.30)	2 1/2 (63.50)	4.12 (104.65)
4C-300	4.62 (117.35)	3 (76.20)	3.53 (89.66)
4C-400	6.00 (152.40)	4 (101.60)	4.32 (109.73)
4C-400V	6.00 (152.40)	4 (101.60)	5.31 (134.87)
4C-500	6.75 (171.45)	5 (127.00)	4.71 (119.63)
4C-600	8.00 (203.20)	6 (152.40)	5.50 (139.70)
4C-600V	8.00 (203.20)	6 (152.40)	6.56 (166.62)
4C-800	10.00 (254.00)	8 (203.20)	7.50 (190.50)
4C-1000	13.25 (336.55)	10 (254.00)	10.00 (254.00)



CF 5-Way Crosses



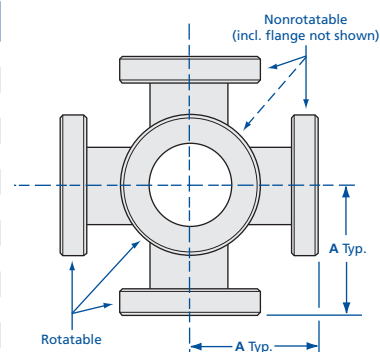
MODEL NUMBER	FLANGE OD	TUBE OD	A
5C-075	1.33 (33.78)	3/4 (19.05)	1.50 (38.10)
5C-100	2.12 (53.85)	1 (25.40)	2.05 (52.07)
5C-150	2.75 (69.85)	1 1/2 (38.10)	2.46 (62.48)
5C-200	3.38 (85.85)	2 (50.80)	3.22 (81.79)
5C-250	4.50 (114.30)	2 1/2 (63.50)	3.38 (85.85)
5C-250V	4.50 (114.30)	2 1/2 (63.50)	4.12 (104.65)
5C-300	4.62 (117.35)	3 (76.20)	3.53 (89.66)
5C-400	6.00 (152.40)	4 (101.60)	4.32 (109.73)
5C-400V	6.00 (152.40)	4 (101.60)	5.31 (134.87)
5C-500	6.75 (171.45)	5 (127.00)	4.71 (119.63)
5C-600	8.00 (203.20)	6 (152.40)	5.50 (139.70)
5C-600V	8.00 (203.20)	6 (152.40)	6.56 (166.62)
5C-800	10.00 (254.00)	8 (203.20)	7.50 (190.50)
5C-1000	13.25 (336.55)	10 (254.00)	10.00 (254.00)



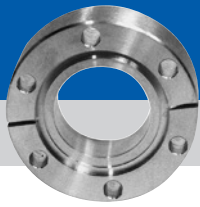
CF 6-Way Crosses



MODEL NUMBER	FLANGE OD	TUBE OD	A
6C-075	1.33 (33.78)	3/4 (19.05)	1.50 (38.10)
6C-100	2.12 (53.85)	1 (25.40)	2.05 (52.07)
6C-150	2.75 (69.85)	1 1/2 (38.10)	2.46 (62.48)
6C-200	3.38 (85.85)	2 (50.80)	3.22 (81.79)
6C-250	4.50 (114.30)	2 1/2 (63.50)	3.38 (85.85)
6C-250V	4.50 (114.30)	2 1/2 (63.50)	4.12 (104.65)
6C-300	4.62 (117.35)	3 (76.20)	3.53 (89.66)
6C-400	6.00 (152.40)	4 (101.60)	4.32 (109.73)
6C-400V	6.00 (152.40)	4 (101.60)	5.31 (134.87)
6C-500	6.75 (171.45)	5 (127.00)	4.71 (119.63)
6C-600	8.00 (203.20)	6 (152.40)	5.50 (139.70)
6C-600V	8.00 (203.20)	6 (152.40)	6.56 (166.62)
6C-800	10.00 (254.00)	8 (203.20)	7.50 (190.50)
6C-1000	13.25 (336.55)	10 (254.00)	10.00 (254.00)



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Flanges & Fittings

Plate Nuts

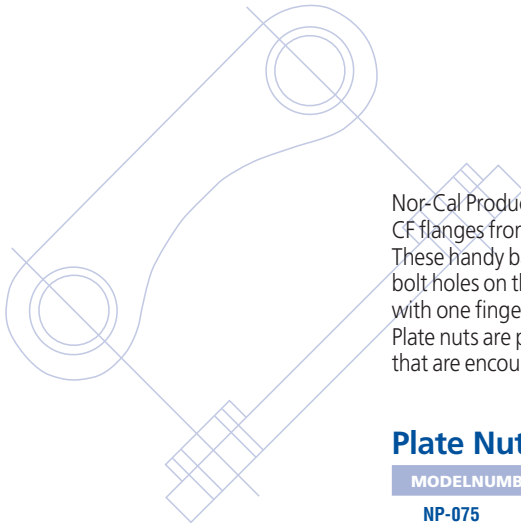


Plate Nut for
1¹/₃ (33.78) and 2³/₄ (69.85) Flanges

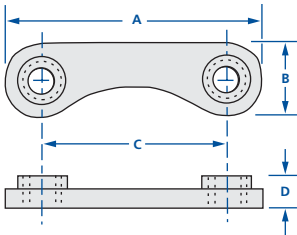
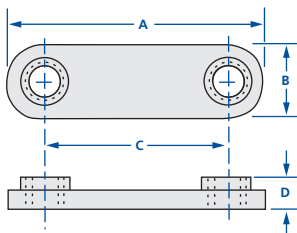


Plate Nut for
Flanges larger than 2³/₄ (69.85)



Nor-Cal Products manufactures plate nuts for most sizes of CF flanges from 1¹/₃ to 10 inches (33.96 to 254mm) OD. These handy backing nuts center themselves over two adjacent bolt holes on the back side of a flange and can be held in place with one finger while bolts are tightened with a single wrench. Plate nuts are perfect for those hard to reach (and see) spaces that are encountered during system assembly and service.



Plate Nuts

MODEL NUMBER	FLANGE OD	THREAD SIZE	A	B	C	D
NP-075	1 ¹ / ₃ (40)	8-32	0.80 (20.32)	0.3 (7.62)	0.53 (13.46)	0.15 (3.81)
NP-150	2 ³ / ₄ (70)	1/4-28	1.59 (40.39)	0.5 (12.70)	1.15 (29.21)	0.18 (4.57)
NP-150M	2 ³ / ₄ (70)	M6	1.59 (40.39)	0.5 (12.70)	1.15 (29.21)	0.18 (4.57)
NP-200	3 ³ / ₈ (86)	5/16-24	1.75 (44.45)	0.5 (12.70)	1.09 (27.69)	0.22 (5.59)
NP-250	4 ¹ / ₂ (114)	5/16-24	2.03 (51.56)	0.5 (12.70)	1.39 (35.31)	0.22 (5.59)
NP-250M	4 ¹ / ₂ (114)	M8	2.03 (51.56)	0.5 (12.70)	1.39 (35.31)	0.22 (5.59)
NP-300	4 ⁵ / ₈ (117)	5/16-24	1.75 (44.45)	0.5 (12.70)	1.25 (31.75)	0.22 (5.59)
NP-400	6 (152)	5/16-24	1.75 (44.45)	0.5 (12.70)	1.00 (25.40)	0.22 (5.59)
NP-400M	6 (152)	M8	1.75 (44.45)	0.5 (12.70)	1.00 (25.40)	0.22 (5.59)
NP-600	8 (200)	5/16-24	1.75 (44.45)	0.5 (12.70)	1.12 (28.45)	0.22 (5.59)
NP-600M	8 (200)	M8	1.75 (44.45)	0.5 (12.70)	1.12 (28.45)	0.22 (5.59)
NP-800	10 (254)	5/16-24	1.75 (44.45)	0.5 (12.70)	1.19 (30.23)	0.22 (5.59)

All plate nuts – 24 per package

Plate Nut Assembly Kits with Hex Head Bolts

MODEL NUMBER	FLANGE OD	DESCRIPTION
KNP-075	1 ¹ / ₃ (34)	(12) Plate nuts (24) SS 8-32 x 3/4 inch bolts and washers
KNP-150	2 ³ / ₄ (70)	(12) Plate nuts (24) SS 1/4-28 x 1 1/4 inch bolts and washers
KNP-200	3 ³ / ₈ (86)	(16) Plate nuts (32) SS 5/16-24 x 1 3/4 inch bolts and washers
KNP-250	4 ¹ / ₂ (114)	(16) Plate nuts (32) SS 5/16-24 x 2 inch bolts and washers
KNP-300	4 ⁵ / ₈ (117)	(20) Plate nuts (40) SS 5/16-24 x 2 1/4 inch bolts and washers
KNP-400	6 (152)	(16) Plate nuts (32) SS 5/16-24 x 2 1/4 inch bolts and washers
KNP-600	8 (200)	(16) Plate nuts (32) SS 5/16-24 x 2 1/4 inch bolts and washers
KNP-800	10 (254)	(24) Plate nuts (48) SS 5/16-24 x 2 1/2 inch bolts and washers

Plate Nut Assembly Kits with 12-pt. Bolts

MODEL NUMBER	FLANGE OD	DESCRIPTION
KNP-150-12	2 ³ / ₄ (70)	(12) Plate nuts (24) SS 12-pt. 1/4-28 x 1 1/4 inch bolts and washers
KNP-200-12	3 ³ / ₈ (86)	(16) Plate nuts (32) SS 12-pt. 5/16-24 x 1 3/4 inch bolts and washers
KNP-250-12	4 ¹ / ₂ (114)	(16) Plate nuts (32) SS 12-pt. 5/16-24 x 2 inch bolts and washers
KNP-300-12	4 ⁵ / ₈ (117)	(20) Plate nuts (40) SS 12-pt. 5/16-24 x 2 1/4 inch bolts and washers
KNP-400-12	6 (152)	(16) Plate nuts (32) SS 12-pt. 5/16-24 x 2 1/4 inch bolts and washers
KNP-600-12	8 (200)	(20) Plate nuts (49) SS 12-pt. 5/16-24 x 2 1/4 inch bolts and washers
KNP-800-12	10 (254)	(24) Plate nuts (48) SS 12-pt. 5/16-24 x 2 1/2 inch bolts and washers

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Flanges & Fittings

Aluminum to Stainless Steel Transitions

Nor-Cal Products' Aluminum to Stainless Steel Transitions provide a reliable UHV seal for aluminum vacuum systems. An explosion-bonded composite of aluminum, stainless steel and two other UHV materials make these transitions leak-tight at UHV pressures. Transitions are welded to a stainless steel CF flange as a complete unit ready to weld to your aluminum chamber or beamline, or the transition can be purchased separately for welding to your own CF flange. The explosion bonds have been tested for tensile, shear and thermal stress. Testing included thermal quenching from 773°K to 77°K. This process has shown vacuum integrity to better than 5×10^{-10} standard cc per second with wall thickness as thin as 0.025 inch (6.35mm). Each unit is thermally cycled to 300°C. Helium leak testing is done before and after thermal cycling.



Applications

- Accelerators
- Synchrotrons
- Semiconductor processing

Aluminum to Stainless Steel Transitions

MODEL NUMBER	DESCRIPTION	A	B	C	D	E
ALST-075-CF	Nonrotatable CF	1.33 (33.78)	0.50 (12.70)	0.750 (19.05)	2.20 (55.88)	1.00 (25.40)
ALST-075	Transition only	-	0.50 (12.70)	0.750 (19.05)	-	1.00 (25.40)
ALST-150-CF	Nonrotatable CF	2.73 (69.34)	1.25 (31.75)	1.500 (38.10)	1.91 (48.51)	1.75 (44.45)
ALST-150	Transition only	-	1.25 (31.75)	1.500 (38.10)	-	1.75 (44.45)
ALST-250-CF	Nonrotatable CF	4.47 (113.54)	2.25 (57.15)	2.500 (63.50)	2.08 (52.83)	2.75 (69.85)
ALST-250	Transition only	-	2.25 (57.15)	2.500 (63.50)	-	2.75 (69.85)
ALST-400-CF	Nonrotatable CF	5.97 (151.64)	3.75 (95.25)	4.000 (101.60)	2.14 (54.36)	4.25 (107.95)
ALST-400	Transition only	-	3.75 (95.25)	4.000 (101.60)	-	4.25 (107.95)
ALST-600-CF	Nonrotatable CF	7.97 (202.44)	5.75 (146.05)	6.000 (152.40)	2.20 (55.88)	6.25 (158.75)
ALST-600	Transition only	-	5.75 (146.05)	6.000 (152.40)	-	6.25 (158.75)
ALST-800-CF	Nonrotatable CF	9.97 (253.24)	7.75 (196.85)	8.000 (203.20)	2.20 (55.88)	8.25 (209.55)
ALST-800	Transition only	-	7.75 (196.85)	8.000 (203.20)	-	8.25 (209.55)

SPECIFICATIONS

General: Nonrotatable with clearance bolt holes

Material

Flanges: 304 stainless steel
(316L available upon request)
Gaskets: Copper, FKM or silver plated
Bolts: 18-8 stainless steel or silver plated

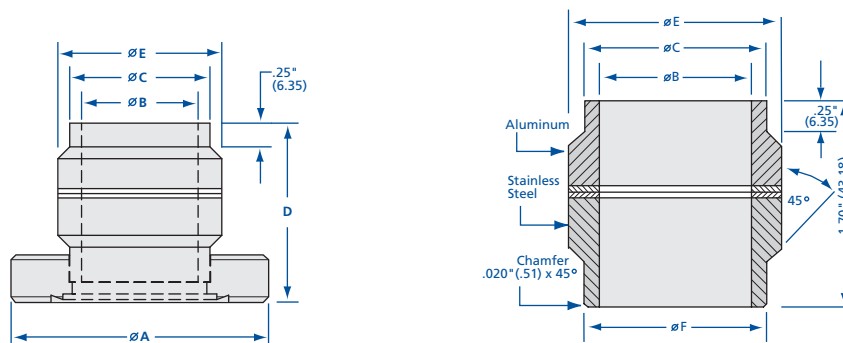
Torque: 21.5 Nm.

Vacuum range

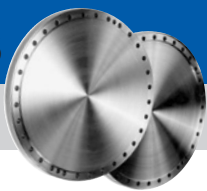
Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV
Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range

Metal seal: -200°C to 450°C
Elastomer seal: -20°C to 150°C



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Flanges & Fittings

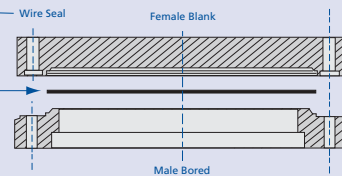
Wire Seal Flanges

SPECIFICATIONS

General: Nonrotatable flanges with clearance bolt holes
Nominal OD sizes: 12 ³ / ₈ to 27 ¹ / ₈ inches (314 to 689mm)
Tube OD sizes: 10 to 24 inches (254 to 609.6mm)
Materials
Flange: 304 stainless steel (316L available on request)
Gaskets: Copper
Bolts: 18-8 stainless steel
Vacuum range: ≥1 x 10 ⁻¹³ mbar - UHV
Temperature range: -200° to 450°C

Wire Seal Flange Assembly Instructions

- Apply a small amount of high temperature anti-seize compound to the bolt threads.
- Check that both flange surfaces are clean and sealing edges are free from nicks and scratches.
- Using clean, lint free gloves, unpack gasket.
- Place seal over the sealing area on the male flange.
- Align the mating flange hole pattern and leak test grooves.
- Install the proper bolts and tighten hand tight. Check to see that the flange faces are parallel.
- Tighten the bolts 1/4 to 1/2 turns using a circular clockwise pattern until the flange faces are metal to metal.
- Torque the fasteners until leak tight using the same pattern. Never exceed maximum torque.

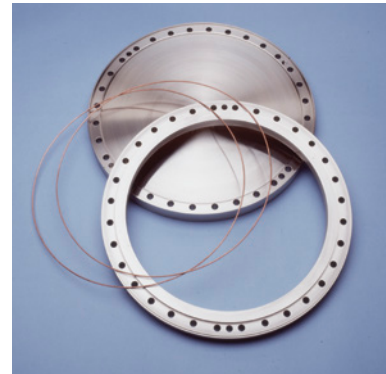


Torque Specifications

NOMINAL OD	BOLT SIZE	MAX. TORQUE Nm
12 (305)	3/8 - 24	29.4
14 (356)	3/8 - 24	29.4
17 (432)	1/2 - 20	61.1
19 (483)	1/2 - 20	61.1
22 (559)	5/8 - 18	140.6
27 (686)	5/8 - 18	140.6

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Nor-Cal Products' wire seal flanges are designed for use on bell jars, custom vacuum chambers and related systems. Standard sizes range from 12 to 27 inch (305 to 686mm) nominal OD for tube sizes from 10 to 24 inch OD (254 to 609.6mm). A male and female flange compress a 0.080 inch (20.32mm) diameter OFHC copper wire to effect a seal. Gasket flow is confined by the geometry of the flange surfaces to the area of the seal. Minor nicks and scratches within this contact area are filled with crushed copper wire providing a seal that is leak tight at 10⁻¹³ mbar after repeated bake out to 450°C. Solid blanks are standard. Dished head blanks are offered as a lower cost alternative.

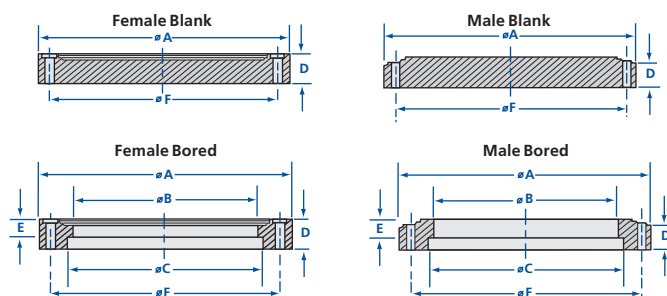


Wire Seal Flanges

MODEL NUMBER	OD A	B	C	D	E	F	BOLT HOLES
WS-12-000M	12.375 (314.33)	-	-	1.13 (28.70)	-	11.343 (288.11)	24
WS-12-1000M	12.375 (314.33)	9.750 (247.65)	10.020 (254.51)	1.13 (28.70)	0.630 (16.00)	11.343 (288.11)	24
WS-12-000F	12.375 (314.33)	-	-	1.13 (28.70)	-	11.343 (288.11)	24
WS-12-1000F	12.375 (314.33)	9.750 (247.65)	10.020 (254.51)	1.13 (28.70)	0.630 (16.00)	11.343 (288.11)	24
WS-14-000M	14.625 (371.48)	-	-	1.13 (28.70)	-	13.593 (345.26)	32
WS-14-1200M	14.625 (371.48)	11.750 (298.45)	12.020 (305.31)	1.13 (28.70)	0.630 (16.00)	13.593 (345.26)	32
WS-14-000F	14.625 (371.48)	-	-	1.13 (28.70)	-	13.593 (345.26)	32
WS-14-1200F	14.625 (371.48)	11.750 (298.45)	12.020 (305.31)	1.13 (28.70)	0.630 (16.00)	13.593 (345.26)	32
WS-17-000M	17.250 (438.15)	-	-	1.13 (28.70)	-	15.718 (399.24)	36
WS-17-1400M	17.250 (438.15)	13.750 (349.25)	14.020 (356.11)	1.13 (28.70)	0.630 (16.00)	15.718 (399.24)	36
WS-17-000F	17.250 (438.15)	-	-	1.13 (28.70)	-	15.718 (399.24)	36
WS-17-1400F	17.250 (438.15)	13.750 (349.25)	14.020 (356.11)	1.13 (28.70)	0.630 (16.00)	15.718 (399.24)	36
WS-19-000M	19.562 (496.87)	-	-	1.31 (33.27)	-	17.875 (454.03)	36
WS-19-1600M	19.562 (496.87)	15.750 (400.05)	16.020 (406.91)	1.31 (33.27)	0.630 (16.00)	17.875 (454.03)	36
WS-19-000F	19.562 (496.87)	-	-	1.31 (33.27)	-	17.875 (454.03)	36
WS-19-1600F	19.562 (496.87)	15.750 (400.05)	16.020 (406.91)	1.31 (33.27)	0.630 (16.00)	17.875 (454.03)	36
WS-22-000M	22.125 (561.98)	-	-	1.50 (38.10)	-	20.187 (512.75)	36
WS-22-1800M	22.125 (561.98)	17.750 (450.85)	18.020 (457.71)	1.50 (38.10)	1.000 (25.40)	20.187 (512.75)	36
WS-22-000F	22.125 (561.98)	-	-	1.50 (38.10)	-	20.187 (512.75)	36
WS-22-1800F	22.125 (561.98)	17.750 (450.85)	18.020 (457.71)	1.50 (38.10)	1.000 (25.40)	20.187 (512.75)	36
WS-27-000M	27.125 (688.98)	-	-	1.75 (44.45)	-	25.843 (656.41)	40
WS-27-2400M	27.125 (688.98)	23.625 (600.08)	24.020 (610.11)	1.75 (44.45)	1.125 (28.58)	25.843 (656.41)	40
WS-27-000F	27.125 (688.98)	-	-	1.75 (44.45)	-	25.843 (656.41)	40
WS-27-2400F	27.125 (688.98)	23.625 (600.08)	24.020 (610.11)	1.75 (44.45)	1.125 (28.58)	25.843 (656.41)	40

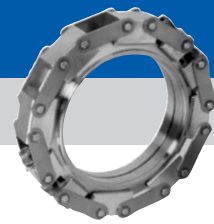
Model Number Definitions

M = Male flange F = Female flange



Wire Seal Flange Gaskets and Bolt Sets

MODEL NUMBER	FLANGE OD	DESCRIPTION	QUANTITY
WG-12	12.375 (314.33)	Copper gasket	1
WB-12	12.375 (314.33)	SS 3/8-24 x 2 1/2 bolts and nuts	24
WG-14	14.625 (371.48)	Copper gasket	1
WB-14	14.625 (371.48)	SS 3/8-24 x 2 1/2 bolts and nuts	32
WG-17	17.250 (438.15)	Copper gasket	1
WB-17	17.250 (438.15)	SS 1/2-20 x 2 3/4 bolts and nuts	36
WG-19	19.562 (496.87)	Copper gasket	1
WB-19	19.562 (496.87)	SS 1/2-20 x 3 bolts and nuts	36
WG-22	22.125 (561.98)	Copper gasket	1
WB-22	22.125 (561.98)	SS 5/8-18 x 3 1/2 bolts and nuts	36
WG-27	27.125 (688.98)	Copper gasket	1
WB-27	27.125 (688.98)	SS 5/8-18 x 4 bolts and nuts	40



SPECIFICATIONS

Tube OD sizes:
 $\frac{3}{4}$ to 4 inches (19.05 to 101.6mm)

Materials
 Flange: 304 stainless steel
 Seal: Aluminum

Vacuum range: $\geq 1 \times 10^{-11}$ mbar - UHV
Temperature range: -270°C to 150°C



EVAC Aluminum Metal Seals

Aluminum seals locate on the centering ring groove (inner centering) or outside edge of the flange (outer centering) depending on the size. (Inner and outer centering versions are available for all NW flange sizes.) Aluminum knife-edges are compressed by the flange sealing surfaces when the chain clamp or ISO claw clamp is tightened. The resultant seal has a helium leak rate of less than 1×10^{-11} standard mbar l/sec and can be baked repeatedly to 150°C. The aluminum alloy is soft enough to make a good seal with reasonable force but will not flow at moderate temperatures. Aluminum Seals will even work with aluminum flanges.

EVAC Large NW Flanges

Nor-Cal Products offers blank and bored NW-63, NW-80 and NW-100 flanges that are compatible with other manufacturers' large QF/KF flanges made to the ISO 2961 specification. They can be used with chain clamps to form elastomer or aluminum metal seals. Elastomer seals are formed with standard ISO centering ring/O-ring assemblies and elastomer chain clamps. UHV connections are formed with aluminum metal seals and chain clamps. NW flanges are made from 304 stainless steel for 2.5 to 4.0 inch (63.5 to 101.6mm) OD tube sizes. Flanges for tube sizes up to 28 inches (711.2mm) OD, metric tube sizes can be supplied.



EVAC CeFiX® Flanges, Seals, Chain Clamps & Fittings

Nor-Cal Products now offers CeFiX® connections in sizes NW16 up to NW250. Call for more information. The CeFiX® system enables reaching XHV leakproof connections within seconds.

The main difference between the CF and CeFiX® systems is found in the compression of the metal gasket. The CF knife edge makes a circular imprint into the gasket causing one time usability.

The CeFiX® system creates a completely particle-free -pressing mechanism that allows seals to be reused. A further advantage of the wide overlapping area with a wide cross section is its extensive thermocycling capability with a sheer range of -271 to +450°C (*usually breaking the fragile CF knife edge after one cycle*).

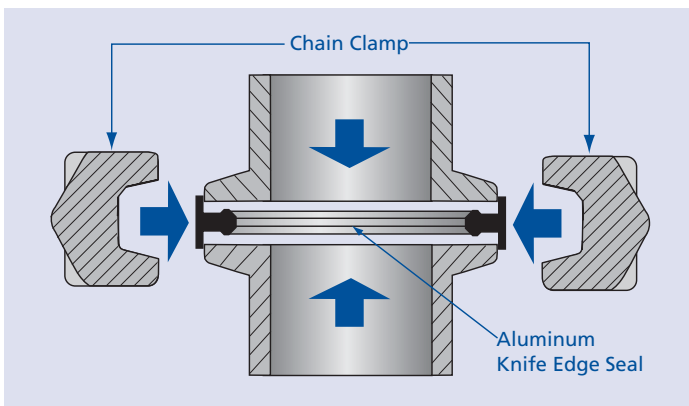
This technology requires only 50% of the CF compression force at the seal surface in order to achieve gas-tight intermetallic diffusion bonds.

Applications & Benefits:

- UHV applications up to 10^{-11} mbar
- Pressurized applications up to 300 bar
- Cryo applications down to -270°C
- Oven applications up to 300°C (copper seals)
- CeFiX® system registered by EVAC
- Flange seals reusable up to 10 times (provided no scratches)
- 316L stainless steel for nuclear and military applications

Nor-Cal Products stocks a complete line of EVAC chain clamps and aluminum metal seals for converting elastomer seal NW (KF) and ISO flanges to UHV metal seals. They provide a number of benefits over elastomer seals: reduced outgassing, no permeation, no hydrocarbons, resistance to radiation and short half-life. Aluminum seals are used in high-energy physics, other UHV applications and cryogenic applications. Aluminum seals are reliable in high vibration or temperature cycling environments. Chain clamps and NW flanges are the standard vacuum flange for many Japanese semiconductor equipment manufacturers. The advantages over using the standard ISO flange are the time and space savings during assembly and the flexibility to form high vacuum or UHV seals.

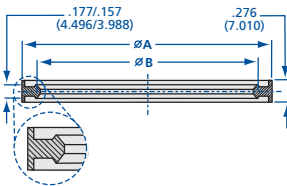
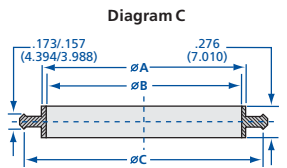
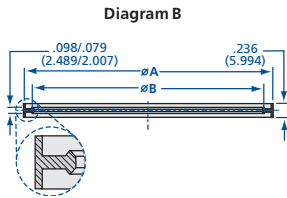
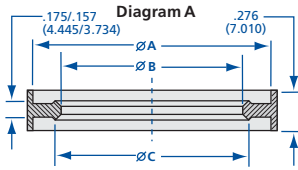
To install a metal seal on an existing NW flange, simply remove the standard clamp, centering ring and O-ring assembly. Replace them with an aluminum knife edge seal and chain clamp. (See diagram). Standard ISO claw clamps can be used with aluminum seals to convert ISO flanges from high vacuum to UHV. Nor-Cal Products large NW flanges are available in 63, 80 and 100 NW sizes from stock. Chain clamps are used to form either elastomer or metal seals with large NW flanges.





Flanges & Fittings

EVAC Metal Seals



EVAC Aluminum Metal Seals with Outer Centering Ring for NW-16 to NW-250 Tapered Flanges

MODEL NUMBER	DIAGRAM	FLANGE	A	B	C
34.142.116-AZ	A	NW-10/16	1.18 (29.97)	0.79 (20.00)	0.91 (23.11)
34.142.125-AZ	A	NW-20/25	1.58 (40.13)	1.26 (32.00)	1.30 (33.02)
34.142.140-AZ	A	NW-32/40	2.16 (54.86)	1.77 (40.13)	1.89 (48.01)
34.142.150-AZ	A	NW-50	2.95 (75.00)	2.56 (65.00)	2.68 (68.00)
34.142.163-AZ	A	NW-63	3.43 (87.00)	3.03 (77.00)	3.14 (80.00)

EVAC Aluminum Metal Seals with Inner Centering Ring for NW-16 to NW-250 Tapered Flanges

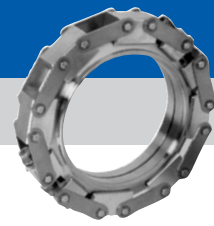
MODEL NUMBER	DIAGRAM	FLANGE	A	B	C
34.142.116-IZ	C	NW-16	0.67 (17.00)	0.60 (15.00)	0.83 (21.00)
34.142.125-IZ	C	NW-25	1.02 (26.00)	0.94 (24.00)	1.18 (30.00)
34.142.140-IZ	C	NW-40	1.61 (41.00)	1.54 (39.00)	1.85 (47.00)
34.142.150-IZ	C	NW-50	2.04 (52.00)	1.97 (50.00)	2.32 (59.00)
34.142.163-IZ	C	NW-63	2.76 (70.00)	2.68 (68.00)	3.03 (77.00)
34.342.108	C	NW-80	3.27 (83.00)	4.49 (114.00)	3.54 (90.00)
34.342.110	C	NW-100	4.02 (102.00)	5.28 (134.00)	4.29 (109.00)
34.342.116	C	NW-160	6.02 (153.00)	7.48 (190.00)	6.30 (160.00)
34.342.120	C	NW-200	8.39 (213.00)	9.92 (252.00)	8.66 (220.00)
34.342.125	C	NW-250	10.28 (261.00)	11.85 (301.00)	10.55 (268.00)

EVAC Aluminum Metal Seals with Outer Centering Ring for ISO-63 to ISO-250 Flanges

MODEL NUMBER	FLANGE	A	B	TORQUE	NUMBER CLAMPS*
34.341.106	ISO-63	3.74 (95.00)	3.47 (88.14)	11.3 Nm	4
34.341.108	ISO-80	4.33 (109.98)	4.06 (103.12)	11.3 Nm	6
34.341.110	ISO-100	5.12 (130.05)	4.84 (122.94)	11.3 Nm	8

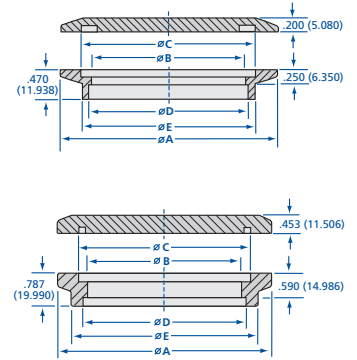
*Use with Nor-Cal Products ISO double or single claw clamps.

All dimensions are in inches and (mm) unless otherwise noted



EVAC NW-63 to NW-250 Tapered Flanges

MODEL NUMBER	DESCRIPTION	A	B	C	D	E
32.120.563	Blank	3.43 (87.12)	-	2.76 (70.10)	-	-
32.220.308	Blank	4.49 (114.05)	-	3.27 (83.06)	-	-
32.220.310	Blank	5.28 (134.11)	-	4.02 (102.11)	-	-
32.217.306	Bored for 2 1/2 inch (63mm) tube OD	3.43 (87.12)	2.44 (61.98)	2.76 (70.10)	2.51 (63.75)	2.71 (68.83)
32.217.308	Bored for 3 inch (75mm) tube OD	4.49 (114.05)	2.87 (72.90)	3.27 (83.06)	3.01 (76.45)	3.82 (97.03)
32.217.310	Bored for 4 inch (100mm) tube OD	5.28 (134.11)	3.87 (98.30)	4.02 (102.11)	4.01 (101.85)	4.61 (117.09)

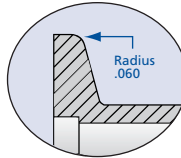




Flanges & Fittings

EVAC Chain Clamps

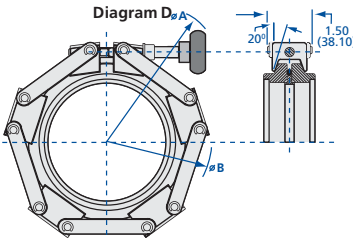
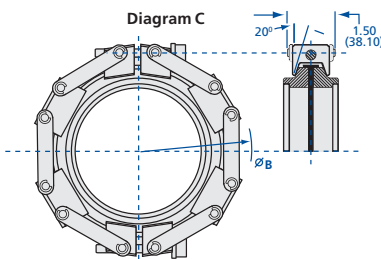
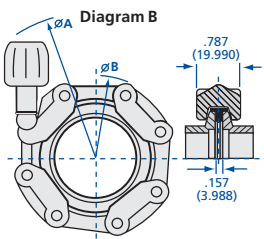
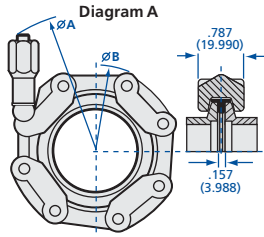
Nor-Cal Products stocks chain clamps for NW flanges in two styles: one with PTFE coated aluminum links and an uncoated version. The less expensive uncoated version is the preferred choice for sealing standard NW flanges with aluminum metal seals. The uncoated chain clamps can be used with NW flanges that have a radius of approximately .060 of an inch (1.5mm) on the outer edge of the non-sealing side.



Most manufacturers' NW flanges have this feature. If the flanges to be sealed have a sharp edge, the PTFE coated chain clamps are required to ensure adequate sealing force for aluminum metal seals. Both versions use a single, hex head nut for closure. Stainless steel chain clamps and low cost composite chain clamps are available for elastomer NW connections. Chain clamps for NW-63 flanges are similar to the NW-16 to 50 sizes. The style to use with NW-63 elastomer seals has a single knob for tightening. The clamp used for sealing aluminum

metal seals has a single hex head nut. Both have uncoated aluminum links, although PTFE coated aluminum versions are available.

Chain clamps for 80 to 100mm flanges are stocked in two styles: one with a single knob for elastomer seals and another with two allen head bolts for aluminum metal seals. Although chain clamps are bakeable to 150°C, the knobs should not be baked above 60°C. Chain clamps for tube sizes up to 28 inch (711mm) OD can be supplied on request.



EVAC Chain Clamps for NW-16 to NW-63 Flanges – Aluminum Links

MODEL NUMBER	FLANGE SIZE	NO. OF LINKS	DIAGRAM	APPLICATION	A	B	MAX. TEMP.	TORQUE ELASTOMER / METAL
30.151.516	10/16	3	A	Metal or Elastomer Seals	4.53 (115.06)	2.36 (59.94)	150°C	1.017 Nm / 2.486 Nm
30.151.525	20/25	3	A	Metal or Elastomer Seals	4.92 (124.97)	2.76 (70.10)	150°C	1.469 Nm / 2.938 Nm
30.151.540	32/40	4	A	Metal or Elastomer Seals	5.32 (135.13)	3.35 (85.09)	150°C	2.034 Nm / 4.406 Nm
30.151.550	50	5	A	Metal or Elastomer Seals	5.98 (151.89)	4.13 (104.90)	150°C	2.486 Nm / 4.971 Nm
30.151.563	63	6	A	Metal or Elastomer Seals	6.30 (160.02)	4.72 (119.89)	150°C	2.486 Nm / 4.971 Nm

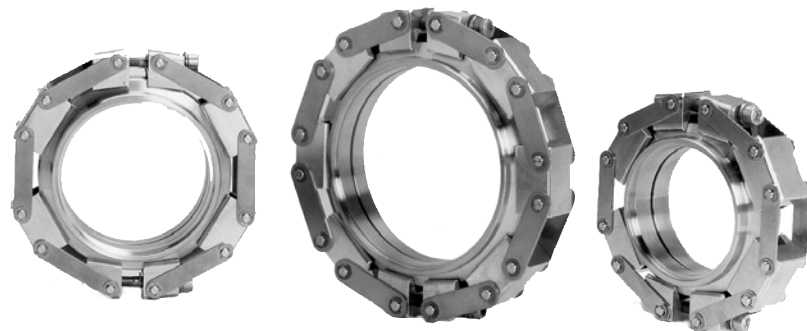
EVAC Chain Clamps for NW-16 to NW-63 Flanges - PTFE Coated Links*

MODEL NUMBER	FLANGE SIZE	NO. OF LINKS	DIAGRAM	APPLICATION	A	B	MAX. TEMP.	TORQUE ELASTOMER / METAL
30.159.516	10/16	3	A	No radius, metal/elastomer	4.53 (115.06)	2.36 (59.94)	150°C	1.017 Nm / 2.486 Nm
30.159.525	20/25	3	A	No radius, metal/elastomer	4.92 (124.97)	2.76 (70.10)	150°C	1.469 Nm / 2.938 Nm
30.159.540	32/40	4	A	No radius, metal/elastomer	5.32 (135.13)	3.35 (85.09)	150°C	2.034 Nm / 4.406 Nm
30.159.550	50	5	A	No radius, metal/elastomer	5.98 (151.89)	4.13 (104.90)	150°C	2.486 Nm / 4.971 Nm
30.159.563	63	6	A	No radius, metal/elastomer	6.30 (160.02)	4.72 (119.89)	150°C	2.486 Nm / 4.971 Nm

*Not radiation resistant

EVAC Chain Clamps for NW-63 to NW-250 Flanges

MODEL NUMBER	FLANGE SIZE	DIAGRAM	APPLICATION	A	B	MAX. TEMP.	TORQUE ELASTOMER/METAL
30.111.563	63	B	Elastomer seals only	6.69 (169.93)	4.72 (119.89)	150°C	2.500Nm
30.211.508	80	D	Elastomer seals only	9.61 (244.09)	6.06 (153.92)	150°C	3.500 Nm
30.211.510	100	D	Elastomer seals only	10.08 (256.03)	6.77 (171.98)	150°C	4.000 Nm



All dimensions are in inches and (mm) unless otherwise noted



Adapter Fittings

Nor-Cal Products provides a broad range of adapter fittings in order to connect two dissimilar types of components. They are made from 304 or 316L stainless steel and are TIG welded, cleaned and leak checked for vacuum service. Tube finishes are normally bead blasted. However, tumbled or electropolished finish can be provided upon request. Flanges and nipples used to adapt different sizes of the same flange type are called reducers. They are listed in the flanges and fittings section for the particular flange type. For example, CF zero length reducer flanges are listed in the CF section of Flanges and Fittings.

SPECIFICATIONS

Materials: 304 or 316L stainless steel

Vacuum range

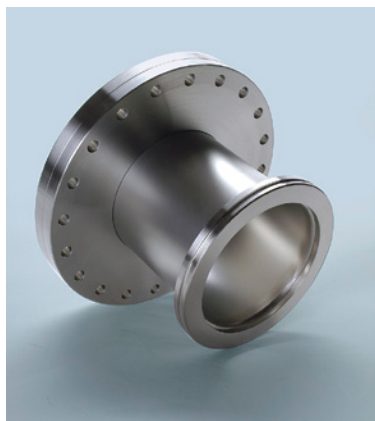
Metal seal: $\geq 1 \times 10^{-13}$ mbar - UHV

Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range

Metal seal: -200°C to 450°C

Elastomer seal: -20°C to 150°C

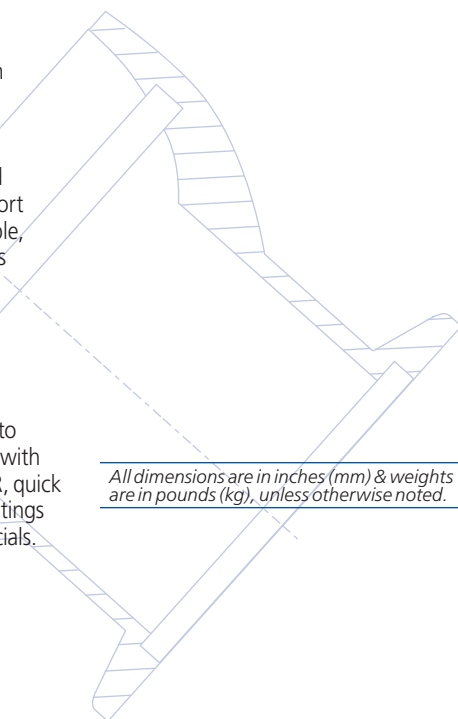


Flange-to-Flange Adapters

Flange-to-flange adapter fittings are used as a transition between two dissimilar flange types. We offer adapter fittings with flange combinations for CF (Conflat), NW (ISO-KF), ISO and ASA (ANSI) components as standards. We frequently provide other flange combinations as specials. These include wire seal, JIS, MESC, and other flanges. Flange-to-flange adapter nipples usually have a short length of straight tubing between the two flanges. Where possible, we offer conical adapters as an option to reduce conductance loss at the opening of the larger flange. Nor-Cal Products also offers adapter tees and crosses with ISO and NW flanges. ASA to CF adapter flanges are also found in this section.

Flange-to-Fitting Adapters

Flange-to-fitting adapters are commonly used on chamber ports to connect flanges to special fittings. Nor-Cal Products offers these with CF, NW, ISO and ASA flanges for Swagelok, male and female VCR, quick disconnect, male and female NPT, ball socket and Welch pump fittings as standards. Other combinations can be supplied quickly as specials.



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

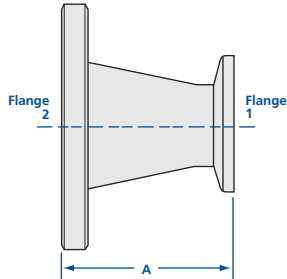
Adapter Fittings

Flange-to-Flange



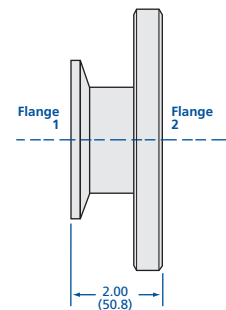
NW to CF Conical Adapter Nipples

MODEL NUMBER	TYPE	FLANGE 1 NOM. TUBE OD	TYPE	FLANGE 2 NOM. TUBE OD	A
ANC-NW-16-212	NW-16	3/4 (19.05)	2.12 CF	1 (25.40)	1.69 (42.93)
ANC-NW-16-275	NW-16	3/4 (19.05)	2.75 CF	1 1/2 (38.10)	2.73 (69.34)
ANC-NW-25-133	NW-25	1 (25.40)	1.33 CF	3/4 (19.05)	2.03 (51.56)
ANC-NW-25-275	NW-25	1 (25.40)	2.75 CF	1 1/2 (38.10)	2.73 (69.34)
ANC-NW-25-338	NW-25	1 (25.40)	3.38 CF	2 (50.80)	2.75 (69.85)
ANC-NW-40-133	NW-40	1 1/2 (38.10)	1.33 CF	3/4 (19.05)	3.03 (76.96)
ANC-NW-40-212	NW-40	1 1/2 (38.10)	2.12 CF	1 (25.40)	2.69 (68.33)
ANC-NW-40-338	NW-40	1 1/2 (38.10)	3.38 CF	2 (50.80)	2.75 (69.85)
ANC-NW-40-450	NW-40	1 1/2 (38.10)	4.50 CF	2 1/2 (63.50)	2.90 (73.66)
ANC-NW-40-462	NW-40	1 1/2 (38.10)	4.62 CF	3 (76.20)	4.06 (103.12)
ANC-NW-50-212	NW-50	2 (50.80)	2.12 CF	1 (25.40)	2.69 (68.33)
ANC-NW-50-275	NW-50	2 (50.80)	2.75 CF	1 1/2 (38.10)	2.73 (69.34)
ANC-NW-50-450	NW-50	2 (50.80)	4.50 CF	2 1/2 (63.50)	2.90 (73.66)
ANC-NW-50-462	NW-50	2 (50.80)	4.62 CF	3 (76.50)	4.06 (103.12)
ANC-NW-50-600	NW-50	2 (50.80)	6.00 CF	4 (101.60)	4.21 (106.93)



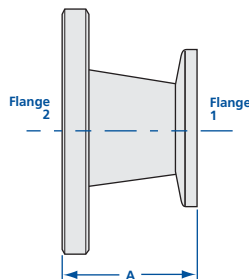
NW to CF Adapter Nipples

MODEL NUMBER	FLANGE 1 TYPE	FLANGE 2 TYPE	NOM. TUBE OD
AN-NW-10-133	NW-10	1.33 CF	1/2 (12.70)
AN-NW-16-133	NW-16	1.33 CF	3/4 (19.05)
AN-NW-25-212	NW-25	2.12 CF	1 (25.40)
AN-NW-40-275	NW-40	2.75 CF	1 1/2 (38.10)
AN-NW-50-133	NW-50	1.33 CF	3/4 (19.05)
AN-NW-50-338	NW-50	3.38 CF	2 (50.80)



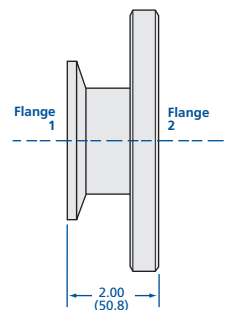
NW to ASA Conical Adapter Nipples

MODEL NUMBER	TYPE	FLANGE 1 NOM. TUBE OD	FLANGE 2 TYPE NOM. TUBE OD	A
ANC-NW-25-ASA-5	NW-25	1 (25.40)	ASA-5 2 (50.80)	2.78 (70.61)
ANC-NW-40-ASA-5	NW-40	1 1/2 (38.10)	ASA-5 2 1/2 (63.50)	2.78 (70.61)
ANC-NW-40-ASA-6	NW-40	1 1/2 (38.10)	ASA-6 3 (76.20)	4.03 (102.36)
ANC-NW-50-ASA-5	NW-50	2 (50.80)	ASA-5 2 1/2 (63.50)	2.78 (70.61)
ANC-NW-50-ASA-6	NW-50	2 (50.80)	ASA-6 3 (76.20)	4.03 (102.36)
ANC-NW-50-ASA-7.5	NW-50	2 (50.80)	ASA-7.5 4 (101.60)	4.03 (102.36)



NW to ASA Adapter Nipples

MODEL NUMBER	FLANGE 1 TYPE	FLANGE 2 TYPE	NOM. TUBE OD
AN-NW-16-ASA-5	NW-16	ASA-5	3/4 (19.05)
AN-NW-16-ASA-6	NW-16	ASA-6	3/4 (19.05)
AN-NW-16-ASA-7.5	NW-16	ASA-7.5	3/4 (19.05)
AN-NW-16-ASA-9	NW-16	ASA-9	3/4 (19.05)
AN-NW-16-ASA-11	NW-16	ASA-11	3/4 (19.05)
AN-NW-25-ASA-6	NW-25	ASA-6	1 (25.40)
AN-NW-25-ASA-7.5	NW-25	ASA-7.5	1 (25.40)
AN-NW-25-ASA-9	NW-25	ASA-9	1 (25.40)
AN-NW-25-ASA-11	NW-25	ASA-11	1 (25.40)
AN-NW-40-ASA-7.5	NW-40	ASA-7.5	1 1/2 (38.10)
AN-NW-40-ASA-9	NW-40	ASA-9	1 1/2 (38.10)
AN-NW-40-ASA-11	NW-40	ASA-11	1 1/2 (38.10)
AN-NW-50-ASA-9	NW-50	ASA-9	2 (50.80)
AN-NW-50-ASA-11	NW-50	ASA-11	2 (50.80)



SPECIFICATIONS

Materials: 304 stainless steel
(316L available upon request)

Vacuum range: $\geq 1 \times 10^{-8}$ mbar - High vacuum

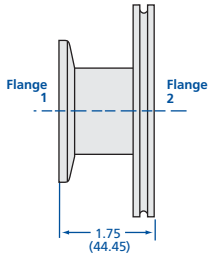
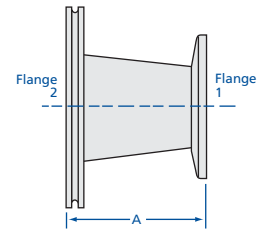
Temperature range: -20°C to 150°C

Note: Add suffix "G" to model number if O-Ring Groove is required on ASA flange.
Call for ASA groove prices.



NW to ISO Conical Adapter Nipples

MODEL NUMBER	FLANGE 1 TYPE	FLANGE 1 NOM. TUBE OD	FLANGE 2 TYPE	FLANGE 2 NOM. TUBE OD	A
ANC-NW-40-ISO-63	NW-40	1½ (38.10)	ISO-63	2½ (63.50)	2.78 (70.61)
ANC-NW-40-ISO-80	NW-40	1½ (38.10)	ISO-80	3 (76.20)	4.03 (102.36)
ANC-NW-50-ISO-63	NW-50	2 (50.80)	ISO-63	2½ (63.50)	2.78 (70.61)
ANC-NW-50-ISO-80	NW-50	2 (50.80)	ISO-80	3 (76.20)	4.03 (102.36)
ANC-NW-50-ISO-100	NW-50	2 (50.80)	ISO-100	4 (101.60)	4.03 (102.36)



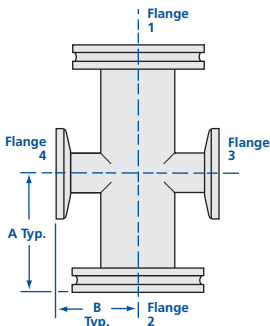
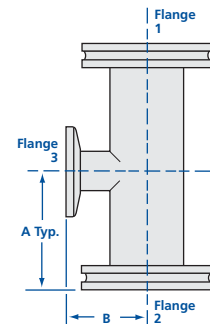
NW to ISO Adapter Nipples

MODEL NUMBER	FLANGE 1 TYPE	FLANGE 2 TYPE	NOM. TUBE OD
AN-NW-16-ISO-63-OF	NW-16	ISO-63	¾ (19.05)
AN-NW-25-ISO-63-OF	NW-25	ISO-63	1 (25.40)
AN-NW-25-ISO-80-OF	NW-25	ISO-80	1 (25.40)
AN-NW-25-ISO-100-OF	NW-25	ISO-100	1 (25.40)
AN-NW-40-ISO-100-OF	NW-40	ISO-100	1½ (38.10)
AN-NW-50-ISO-160-OF	NW-50	ISO-160	2 (50.80)



NW to ISO Adapter Tees

MODEL NUMBER	FLANGE 1 TYPE	FLANGE 1 NOM. TUBE OD	FLANGE 2 TYPE	FLANGE 2 NOM. TUBE OD	A	B
3TA-NW-40-ISO-63-OF	ISO-63	2½ (63.50)	NW-40	1½ (38.10)	3.25 (82.55)	2.90 (73.66)
3TA-NW-40-ISO-80-OF	ISO-80	3 (76.20)	NW-40	1½ (38.10)	3.50 (88.90)	3.15 (80.01)
3TA-NW-40-ISO-100-OF	ISO-100	4 (101.60)	NW-40	1½ (38.10)	4.13 (104.90)	3.65 (92.71)
3TA-NW-40-ISO-160-OF	ISO-160	6 (152.40)	NW-40	1½ (38.10)	5.38 (136.65)	4.65 (118.11)
3TA-NW-50-ISO-63-OF	ISO-63	2½ (63.50)	NW-50	2 (50.80)	3.25 (82.55)	3.40 (86.36)
3TA-NW-50-ISO-80-OF	ISO-80	3 (76.20)	NW-50	2 (50.80)	3.50 (88.90)	3.65 (92.71)
3TA-NW-50-ISO-100-OF	ISO-100	4 (101.60)	NW-50	2 (50.80)	4.13 (104.90)	4.15 (105.41)
3TA-NW-50-ISO-160-OF	ISO-160	6 (152.40)	NW-50	2 (50.80)	5.38 (136.65)	5.15 (130.81)



NW to ISO Adapter Crosses

MODEL NUMBER	FLANGE 1 TYPE	FLANGE 1 NOM. TUBE OD	FLANGE 2 TYPE	FLANGE 2 NOM. TUBE OD	A	B
4CA-NW-40-ISO-63-OF	ISO-63	2½ (63.50)	NW-40	1½ (38.10)	3.25 (82.55)	2.90 (73.66)
4CA-NW-40-ISO-80-OF	ISO-80	3 (76.20)	NW-40	1½ (38.10)	3.50 (88.90)	3.15 (80.01)
4CA-NW-40-ISO-100-OF	ISO-100	4 (101.60)	NW-40	1½ (38.10)	4.13 (104.90)	3.65 (92.71)
4CA-NW-40-ISO-160-OF	ISO-160	6 (152.40)	NW-40	1½ (38.10)	5.38 (136.65)	4.65 (118.11)
4CA-NW-50-ISO-63-OF	ISO-63	2½ (63.50)	NW-50	2 (50.80)	3.25 (82.55)	3.40 (86.36)
4CA-NW-50-ISO-80-OF	ISO-80	3 (76.20)	NW-50	2 (50.80)	3.50 (88.90)	3.65 (92.71)
4CA-NW-50-ISO-100-OF	ISO-100	4 (101.60)	NW-50	2 (50.80)	4.13 (104.90)	4.15 (105.41)
4CA-NW-50-ISO-160-OF	ISO-160	6 (152.40)	NW-50	2 (50.80)	5.38 (136.65)	5.15 (130.81)



SPECIFICATIONS

Materials: 304 stainless steel
(316L available upon request)

Vacuum range: ≥1 x 10⁻⁸ mbar - High vacuum

Temperature range: -20°C to 150°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

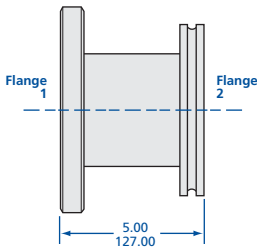
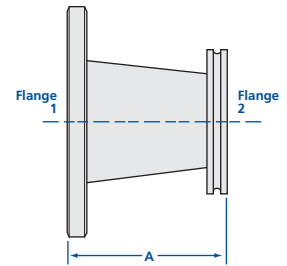
Adapter Fittings

Flange-to-Flange



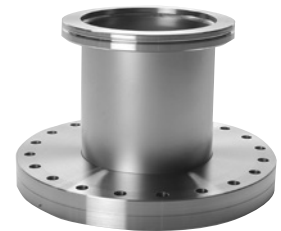
CF to ISO Conical Adapter Nipples

MODEL NUMBER	FLANGE 1		FLANGE 2		A
	TYPE	NOM. TUBE OD	TYPE	NOM. TUBE OD	
ANC-275-ISO-63-OF	2.75 CF	1½ (40)	ISO-63-OF	2½ (63)	2.83 (71.88)
ANC-275-ISO-80-OF	2.75 CF	1½ (40)	ISO-80-OF	3 (75)	4.08 (103.63)
ANC-338-ISO-63-OF	3.38 CF	2 (50)	ISO-63-OF	2½ (63)	2.85 (72.39)
ANC-338-ISO-80-OF	3.38 CF	2 (50)	ISO-80-OF	3 (75)	4.10 (104.14)
ANC-338-ISO-100-OF	3.38 CF	2 (50)	ISO-100-OF	4 (100)	4.10 (104.14)
ANC-450-ISO-80-OF	4.50 CF	2½ (63)	ISO-80-OF	3 (75)	4.25 (107.95)
ANC-450-ISO-100-OF	4.50 CF	2½ (63)	ISO-100-OF	4 (100)	4.25 (107.95)
ANC-462-ISO-63-OF	4.62 CF	3 (75)	ISO-63-OF	2½ (63)	4.16 (105.66)
ANC-462-ISO-100-OF	4.62 CF	3 (75)	ISO-100-OF	4 (100)	4.16 (105.66)
ANC-600-ISO-63-OF	6.00 CF	4 (100)	ISO-63-OF	2½ (63)	4.31 (109.47)
ANC-600-ISO-80-OF	6.00 CF	4 (100)	ISO-80-OF	3 (75)	4.31 (109.47)



CF to ISO Adapter Nipples

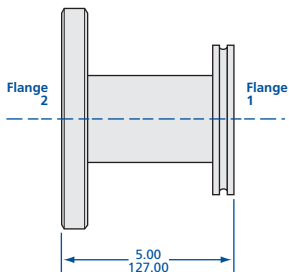
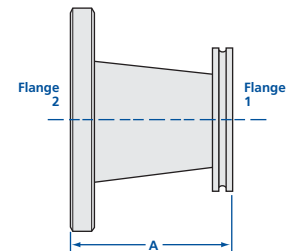
MODEL NUMBER	FLANGE 1 TYPE	FLANGE 2 TYPE	NOM. TUBE OD
AN-450-ISO-63-OF	4.50 CF	ISO-63-OF	2½ (63.50)
AN-462-ISO-80-OF	4.62 CF	ISO-80-OF	3 (76.20)
AN-600-ISO-100-OF	6.00 CF	ISO-100-OF	4 (101.60)
AN-800-ISO-160-OF	8.00 CF	ISO-160-OF	6 (152.40)
AN-1000-ISO-200-OF	10.00 CF	ISO-200-OF	8 (203.20)



ISO to ASA Conical Adapter Nipples

MODEL NUMBER	FLANGE 1 TYPE	NOM. TUBE OD	FLANGE 2 TYPE	NOM. TUBE OD	A
ANC-ISO-63-OF-ASA-5	ISO-63	2½ (63.50)	ASA-5	2 (50.80)	2.88 (73.15)
ANC-ISO-63-OF-ASA-6	ISO-63	2½ (63.50)	ASA-6	3 (76.20)	4.13 (104.90)
ANC-ISO-63-OF-ASA-7.5	ISO-63	2½ (63.50)	ASA-7.5	4 (101.60)	4.13 (104.90)
ANC-ISO-80-OF-ASA-5	ISO-80	3 (76.20)	ASA-5	2 (50.80)	4.13 (104.90)
ANC-ISO-80-OF-ASA-7.5	ISO-80	3 (76.20)	ASA-7.5	4 (101.60)	4.13 (104.90)
ANC-ISO-100-OF-ASA-5	ISO-100	4 (101.60)	ASA-5	2 (50.80)	4.13 (104.90)
ANC-ISO-100-OF-ASA-6	ISO-100	4 (101.60)	ASA-6	3 (76.20)	4.13 (104.90)

Note: Add suffix "-G" to model number if O-ring groove is required on ASA flange.
Call for groove prices.



ISO to ASA Adapter Nipples

MODEL NUMBER	FLANGE 1 TYPE	FLANGE 2 TYPE	NOM. TUBE OD
AN-ISO-63-OF-ASA-11	ISO-63	ASA-11	2½ (63.50)
AN-ISO-80-OF-ASA-6	ISO-80	ASA-6	3 (76.20)
AN-ISO-80-OF-ASA-11	ISO-80	ASA-11	3 (76.20)
AN-ISO-100-OF-ASA-7.5	ISO-100	ASA-7.5	4 (101.60)
AN-ISO-100-OF-ASA-9	ISO-100	ASA-9	4 (101.60)
AN-ISO-100-OF-ASA-11	ISO-100	ASA-11	4 (101.60)
AN-ISO-160-OF-ASA-9	ISO-160	ASA-9	6 (152.40)
AN-ISO-160-OF-ASA-11	ISO-160	ASA-11	6 (152.40)
AN-ISO-200-OF-ASA-11	ISO-200	ASA-11	8 (203.20)
AN-ISO-200-OF-ASA-13.5	ISO-200	ASA-13.5	8 (203.20)

Note: Add suffix "-G" to model number if O-ring groove is required on ASA flange.
Call for groove prices.



SPECIFICATIONS

Materials: 304 or stainless steel
(316L available upon request)

Vacuum range: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range: -20°C to 150°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Adapter Fittings

Flange-to-Flange

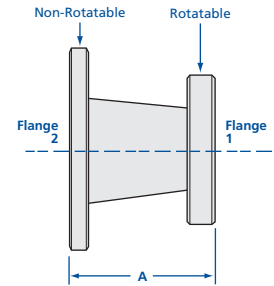


CF to ASA Conical Adapter Nipples

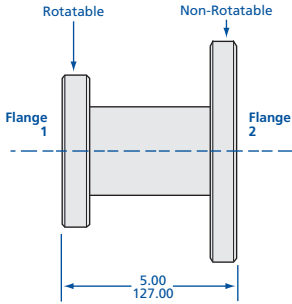


MODEL NUMBER	TYPE	FLANGE 1 NOM. TUBE OD	TYPE	FLANGE 2 NOM. TUBE OD	A
ANC-212-ASA-5	2.12 CF	1 (25.40)	ASA-5	2 (50.80)	2.79 (70.87)
ANC-275-ASA-5	2.75 CF	1½ (38.10)	ASA-5	2 (50.80)	2.83 (71.88)
ANC-275-ASA-6	2.75 CF	1½ (38.10)	ASA-6	3 (76.20)	4.08 (103.63)
ANC-338-ASA-5	3.38 CF	2 (50.80)	ASA-5	2½ (63.50)	2.85 (72.38)
ANC-338-ASA-6	3.38 CF	2 (50.80)	ASA-6	3 (76.20)	4.10 (104.14)
ANC-338-ASA-7.5	3.38 CF	2 (50.80)	ASA-7.5	4 (101.60)	4.10 (104.14)
ANC-450-ASA-5	4.50 CF	2 (50.80)	ASA-5	2 (50.80)	3.00 (76.20)
ANC-450-ASA-6	4.50 CF	2½ (63.50)	ASA-6	3 (76.20)	4.25 (107.95)
ANC-450-ASA-7.5	4.50 CF	2½ (63.50)	ASA-7.5	4 (101.60)	4.25 (107.95)
ANC-462-ASA-5	4.62 CF	3 (76.20)	ASA-5	2 (50.80)	4.16 (105.66)
ANC-462-ASA-7.5	4.62 CF	3 (76.20)	ASA-7.5	4 (101.60)	4.16 (105.66)
ANC-600-ASA-5	6.00 CF	4 (101.60)	ASA-5	2 (50.80)	4.31 (109.47)
ANC-600-ASA-6	6.00 CF	4 (101.60)	ASA-6	3 (76.20)	4.31 (109.47)

Note: Add suffix "-G" to model number if O-ring groove is required on ASA flange. Call for groove prices.



CF to ASA Adapter Nipples



MODEL NUMBER	FLANGE 1 TYPE	FLANGE 2 TYPE	NOMINAL TUBE OD
AN-133-ASA-5	1.33 CF	ASA-5	¾ (19.05)
AN-133-ASA-6	1.33 CF	ASA-6	¾ (19.05)
AN-212-ASA-6	2.12 CF	ASA-6	1 (25.40)
AN-462-ASA-6	4.62 CF	ASA-6	3 (76.20)
AN-133-ASA-7.5	1.33 CF	ASA-7.5	¾ (19.05)
AN-212-ASA-7.5	2.12 CF	ASA-7.5	1 (25.40)
AN-275-ASA-7.5	2.75 CF	ASA-7.5	1½ (38.10)
AN-133-ASA-9	1.33 CF	ASA-9	¾ (19.05)
AN-212-ASA-9	2.12 CF	ASA-9	1 (25.40)
AN-275-ASA-9	2.75 CF	ASA-9	1½ (38.10)
AN-338-ASA-9	3.38 CF	ASA-9	2 (50.80)
AN-450-ASA-9	4.50 CF	ASA-9	2½ (63.50)
AN-462-ASA-9	4.62 CF	ASA-9	3 (76.20)
AN-600-ASA-9	6.00 CF	ASA-9	4 (101.60)
AN-133-ASA-11	1.33 CF	ASA-11	¾ (19.05)
AN-212-ASA-11	2.12 CF	ASA-11	1 (25.40)
AN-275-ASA-11	2.75 CF	ASA-11	1½ (38.10)
AN-338-ASA-11	3.38 CF	ASA-11	2 (50.80)
AN-450-ASA-11	4.50 CF	ASA-11	2½ (63.50)
AN-462-ASA-11	4.62 CF	ASA-11	3 (76.20)
AN-600-ASA-11	6.00 CF	ASA-11	4 (101.60)
AN-800-ASA-11	8.00 CF	ASA-11	6 (152.40)
AN-133-ASA-13.5	1.33 CF	ASA-13.5	¾ (19.05)
AN-212-ASA-13.5	2.12 CF	ASA-13.5	1 (25.40)
AN-275-ASA-13.5	2.75 CF	ASA-13.5	1½ (38.10)
AN-338-ASA-13.5	3.38 CF	ASA-13.5	2 (50.80)
AN-450-ASA-13.5	4.50 CF	ASA-13.5	2½ (63.50)
AN-462-ASA-13.5	4.62 CF	ASA-13.5	3 (76.20)
AN-600-ASA-13.5	6.00 CF	ASA-13.5	4 (101.60)
AN-800-ASA-13.5	8.00 CF	ASA-13.5	6 (152.40)
AN-1000-ASA-13.5	10.00 CF	ASA-13.5	8 (203.20)
AN-133-ASA-16	1.33 CF	ASA-16	¾ (19.05)
AN-212-ASA-16	2.12 CF	ASA-16	1 (25.40)
AN-275-ASA-16	2.75 CF	ASA-16	1½ (38.01)
AN-338-ASA-16	3.38 CF	ASA-16	2 (50.80)
AN-450-ASA-16	4.50 CF	ASA-16	2½ (63.50)
AN-462-ASA-16	4.62 CF	ASA-16	3 (76.20)
AN-600-ASA-16	6.00 CF	ASA-16	4 (101.60)
AN-800-ASA-16	8.00 CF	ASA-16	6 (152.40)
AN-1000-ASA-16	10.00 CF	ASA-16	8 (203.20)
AN-1325-ASA-16	13.25 CF	ASA-16	10 (254.00)

Note: Add suffix "-G" to model number if O-ring groove is required on ASA flange. Call for groove prices.



SPECIFICATIONS

Materials: 304 or stainless steel
(316L available upon request)

Vacuum range: ≥ 1 x 10⁻⁸ mbar - High vacuum

Temperature range: -20°C to 150°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Adapter Fittings

Adapter Flange and Flange-to-Fitting

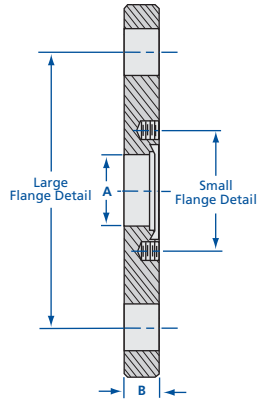


SPECIFICATIONS

Materials: 304 stainless steel

Vacuum range: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature range: -20°C to 150°C



CF to ASA Adapter Flanges

MODEL NUMBER	SMALL FLANGE	LARGE FLANGE	A	B
ASA-5-133-075Z	133-000NT	ASA-5-000N	0.63 (16.00)	0.50 (12.70)
ASA-5-212-100Z	212-000NT	ASA-5-000N	1.00 (25.40)	0.50 (12.70)
ASA-5-275-150Z	275-000NT	ASA-5-000N	1.50 (38.10)	0.50 (12.70)
ASA-6-133-075Z	133-000NT	ASA-6-000N	0.63 (16.00)	0.50 (12.70)
ASA-6-212-100Z	212-000NT	ASA-6-000N	1.00 (25.40)	0.50 (12.70)
ASA-6-275-150Z	275-000NT	ASA-6-000N	1.50 (38.10)	0.50 (12.70)
ASA-6-338-200Z	338-000NT	ASA-6-000N	2.00 (50.80)	0.75 (19.05)
ASA-7.5-133-075Z	133-000NT	ASA-7.5-000N	0.63 (16.00)	0.50 (12.70)
ASA-7.5-212-100Z	212-000NT	ASA-7.5-000N	1.00 (25.40)	0.50 (12.70)
ASA-7.5-275-150Z	275-000NT	ASA-7.5-000N	1.50 (38.10)	0.50 (12.70)
ASA-7.5-338-200Z	338-000NT	ASA-7.5-000N	2.00 (50.80)	0.75 (19.05)
ASA-7.5-450-250Z	450-000NT	ASA-7.5-000N	2.50 (63.50)	0.75 (19.05)
ASA-9-133-075Z	133-000NT	ASA-9-000N	0.63 (16.00)	0.75 (19.05)
ASA-9-212-100Z	212-000NT	ASA-9-000N	1.00 (25.40)	0.75 (19.05)
ASA-9-275-150Z	275-000NT	ASA-9-000N	1.50 (38.10)	0.75 (19.05)
ASA-9-338-200Z	338-000NT	ASA-9-000N	2.00 (50.80)	0.75 (19.05)
ASA-9-450-250Z	450-000NT	ASA-9-000N	2.50 (63.50)	0.75 (19.05)
ASA-9-462-300Z	462-000NT	ASA-9-000N	3.00 (76.20)	0.75 (19.05)
ASA-9-600-400Z	600-000NT	ASA-9-000N	4.00 (101.60)	0.75 (19.05)
ASA-11-133-075Z	133-000NT	ASA-11-000N	0.63 (16.00)	0.75 (19.05)
ASA-11-212-100Z	212-000NT	ASA-11-000N	1.00 (25.40)	0.75 (19.05)
ASA-11-275-150Z	275-000NT	ASA-11-000N	1.50 (38.10)	0.75 (19.05)
ASA-11-338-200Z	338-000NT	ASA-11-000N	2.00 (50.80)	0.75 (19.05)
ASA-11-450-250Z	450-000NT	ASA-11-000N	2.50 (63.50)	0.75 (19.05)
ASA-11-462-300Z	462-000NT	ASA-11-000N	3.00 (76.20)	0.75 (19.05)
ASA-11-600-400Z	600-000NT	ASA-11-000N	4.00 (101.60)	0.75 (19.05)
ASA-11-800-600Z	800-000NT	ASA-11-000N	6.00 (152.40)	0.75 (19.05)



SPECIFICATIONS

Materials: 304 stainless steel

Vacuum range: $\geq 1 \times 10^{-8}$ mbar - High vacuum

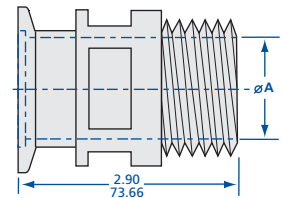
Temperature range: -20°C to 150°C



NW Welch Pump Adapters

MODEL NUMBER	USE WITH WELCH PUMP MODEL NUMBER	THREAD	TUBE ID A
AN-NW-16-1400	1399, 1400, 1410	3/8-18 NPSM x 1.00	0.450 (11.43)
AN-NW-16-1405	1405	3/4-20 NPSM x 1.00	0.562 (14.28)
AN-NW-25-1405	1405	3/4-20 NPSM x 1.00	0.562 (14.28)
AN-NW-25-1402	1380, 1402, 1403, 8806, 8811, 8816, 8821	1-20 NPSM x 1.00	0.750 (19.05)
AN-NW-40-1402	1380, 1402, 1403, 8806, 8811, 8816, 8821	1-20 NPSM x 1.00	0.750 (19.05)
AN-NW-40-1376	1373, 1376, 8831	1 1/2-12 NPSM x 1.00	1.125 (28.58)
AN-NW-40-1397	1374, 1397	1 3/4-20 NPSM x 1.00	1.375 (34.93)
AN-NW-50-1397	1374, 1397	1 3/4-20 NPSM x 1.00	1.375 (34.93)

Note: Includes aluminum gasket



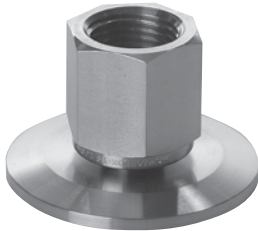
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Adapter Fittings

Flange-to-Fitting



NW Female Pipe Adapters



MODEL NUMBER	NPT	A
NW-10-1/8 FPT	1/8 (3.18)	0.92 (23.37)
NW-16-1/8 FPT	1/8 (3.18)	0.92 (23.37)
NW-25-1/8 FPT	1/8 (3.18)	0.92 (23.37)
NW-40-1/8 FPT	1/8 (3.18)	0.92 (23.37)
NW-50-1/8 FPT	1/8 (3.18)	0.92 (23.37)
NW-10-1/4 FPT	1/4 (6.35)	1.07 (27.18)
NW-16-1/4 FPT	1/4 (6.35)	1.07 (27.18)
NW-25-1/4 FPT	1/4 (6.35)	1.07 (27.18)
NW-40-1/4 FPT	1/4 (6.35)	1.07 (27.18)
NW-50-1/4 FPT	1/4 (6.35)	1.07 (27.18)
NW-16-1/2 FPT	1/2 (12.70)	1.44 (36.58)
NW-25-1/2 FPT	1/2 (12.70)	1.39 (35.31)
NW-40-1/2 FPT	1/2 (12.70)	1.39 (35.31)
NW-50-1/2 FPT	1/2 (12.70)	1.39 (35.31)
NW-25-3/4 FPT	3/4 (19.05)	1.45 (36.83)
NW-40-3/4 FPT	3/4 (19.05)	1.45 (36.83)
NW-50-3/4 FPT	3/4 (19.05)	1.45 (36.83)
NW-25-1 FPT	1 (25.40)	1.57 (39.88)
NW-40-1 FPT	1 (25.40)	1.57 (39.88)
NW-50-1 FPT	1 (25.40)	1.57 (39.88)

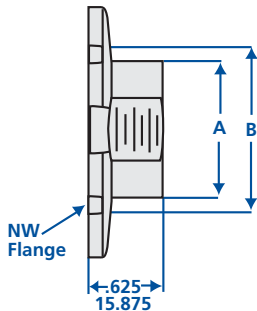
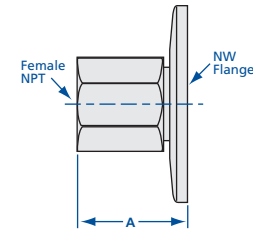
SPECIFICATIONS

Materials

Flanges: 304 stainless steel
NPT Fittings: 316L stainless steel

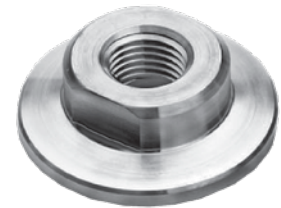
Vacuum range: $\geq 1 \times 10^{-6}$ mbar - High vacuum

Temperature range: -20°C to 150°C

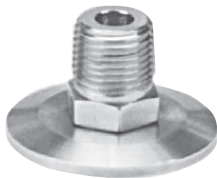


Machined NW Female Pipe Adapters

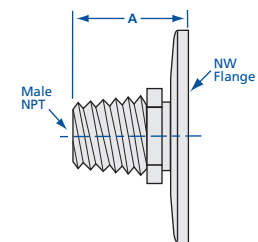
MODEL NUMBER	NPT	A FLAT	B OD
NW-16-1/8-FPTM	1/8 (3.18)	.625 (15.88)	0.75 (19.05)
NW-16-1/4-FPTM	1/4 (6.35)	.625 (15.88)	0.75 (19.05)
NW-25-1/8-FPTM	1/8 (3.18)	.875 (22.23)	1.00 (25.40)
NW-25-1/4-FPTM	1/4 (6.35)	.875 (22.23)	1.00 (25.40)
NW-40-1/8-FPTM	1/8 (3.18)	1.25 (31.75)	1.50 (38.10)
NW-40-1/4-FPTM	1/4 (6.35)	1.25 (31.75)	1.50 (38.10)



NW Male Pipe Adapters



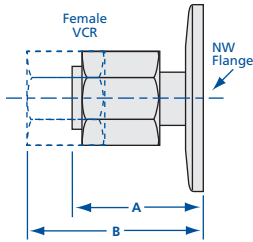
MODEL NUMBER	NPT	A
NW-10-1/8 MPT	1/8 (3.18)	0.89 (22.61)
NW-16-1/8 MPT	1/8 (3.18)	0.89 (22.61)
NW-25-1/8 MPT	1/8 (3.18)	0.89 (22.61)
NW-40-1/8 MPT	1/8 (3.18)	0.89 (22.61)
NW-50-1/8 MPT	1/8 (3.18)	0.89 (22.61)
NW-10-1/4 MPT	1/4 (6.35)	1.10 (27.94)
NW-16-1/4 MPT	1/4 (6.35)	1.10 (27.94)
NW-25-1/4 MPT	1/4 (6.35)	1.10 (27.94)
NW-40-1/4 MPT	1/4 (6.35)	1.10 (27.94)
NW-50-1/4 MPT	1/4 (6.35)	1.10 (27.94)
NW-16-1/2 MPT	1/2 (12.70)	1.35 (34.29)
NW-25-1/2 MPT	1/2 (12.70)	1.35 (34.29)
NW-40-1/2 MPT	1/2 (12.70)	1.35 (34.29)
NW-50-1/2 MPT	1/2 (12.70)	1.35 (34.29)
NW-25-3/4 MPT	3/4 (19.05)	1.35 (34.29)
NW-40-3/4 MPT	3/4 (19.05)	1.35 (34.29)
NW-50-3/4 MPT	3/4 (19.05)	1.35 (34.29)
NW-25-1 MPT	1 (25.40)	1.64 (41.66)
NW-40-1 MPT	1 (25.40)	1.64 (41.66)
NW-50-1 MPT	1 (25.40)	1.64 (41.66)



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Adapter Fittings

Flange-to-Fitting



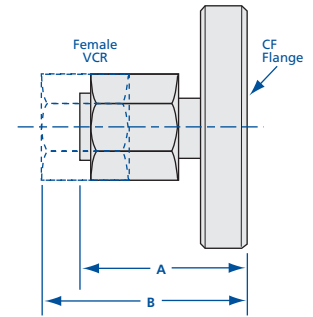
NW Female VCR Adapters

MODEL NUMBER	FLANGE TYPE	VCR SIZE	A	B
NW-10-1/4 FVCR	NW-10	1/4 (6.35)	1.46 (37.08)	1.96 (49.78)
NW-16-1/4 FVCR	NW-16	1/4 (6.35)	1.46 (37.08)	1.96 (49.78)
NW-25-1/4 FVCR	NW-25	1/4 (6.35)	1.46 (37.08)	1.96 (49.78)
NW-40-1/4 FVCR	NW-40	1/4 (6.35)	1.46 (37.08)	1.96 (49.78)
NW-50-1/4 FVCR	NW-50	1/4 (6.35)	1.46 (37.08)	1.96 (49.78)
NW-16-3/8 FVCR	NW-16	3/8 (9.53)	1.65 (41.91)	2.20 (55.88)
NW-25-3/8 FVCR	NW-25	3/8 (9.53)	1.65 (41.91)	2.20 (55.88)
NW-40-3/8 FVCR	NW-40	3/8 (9.53)	1.65 (41.91)	2.20 (55.88)
NW-50-3/8 FVCR	NW-50	3/8 (9.53)	1.65 (41.91)	2.20 (55.88)
NW-16-1/2 FVCR	NW-16	1/2 (12.70)	1.65 (41.91)	2.20 (55.88)
NW-25-1/2 FVCR	NW-25	1/2 (12.70)	1.65 (41.91)	2.20 (55.88)
NW-40-1/2 FVCR	NW-40	1/2 (12.70)	1.65 (41.91)	2.20 (55.88)
NW-50-1/2 FVCR	NW-50	1/2 (12.70)	1.65 (41.91)	2.20 (55.88)



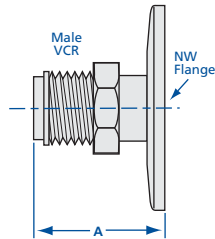
CF Female VCR Adapters

MODEL NUMBER	FLANGE TYPE	VCR SIZE	A	B
133-1/4 FVCR	1.33 CF	1/4 (6.35)	1.36 (34.54)	1.88 (47.75)
133-3/8 FVCR	1.33 CF	3/8 (9.53)	1.55 (39.37)	2.13 (54.10)
275-1/4 FVCR	2.75 CF	1/4 (6.35)	1.36 (34.54)	1.88 (47.75)
275-3/8 FVCR	2.75 CF	3/8 (9.53)	1.55 (39.37)	2.13 (54.10)



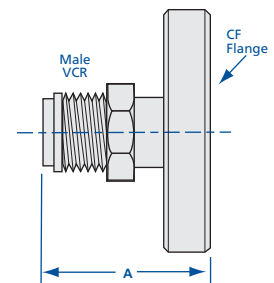
NW Male VCR Adapters

MODEL NUMBER	FLANGE TYPE	VCR SIZE	A
NW-10-1/4 MVCR	NW-10	1/4 (6.35)	1.46 (37.08)
NW-16-1/4 MVCR	NW-16	1/4 (6.35)	1.46 (37.08)
NW-25-1/4 MVCR	NW-25	1/4 (6.35)	1.46 (37.08)
NW-40-1/4 MVCR	NW-40	1/4 (6.35)	1.46 (37.08)
NW-50-1/4 MVCR	NW-50	1/4 (6.35)	1.46 (37.08)
NW-16-3/8 MVCR	NW-16	3/8 (9.53)	1.65 (41.91)
NW-25-3/8 MVCR	NW-25	3/8 (9.53)	1.65 (41.91)
NW-40-3/8 MVCR	NW-40	3/8 (9.53)	1.65 (41.91)
NW-50-3/8 MVCR	NW-50	3/8 (9.53)	1.65 (41.91)
NW-16-1/2 MVCR	NW-16	1/2 (12.70)	1.65 (41.91)
NW-25-1/2 MVCR	NW-25	1/2 (12.70)	1.65 (41.91)
NW-40-1/2 MVCR	NW-40	1/2 (12.70)	1.65 (41.91)
NW-50-1/2 MVCR	NW-50	1/2 (12.70)	1.65 (41.91)



CF Male VCR Adapters

MODEL NUMBER	FLANGE TYPE	VCR SIZE	A
133-1/4 MVCR	1.33 CF	1/4 (6.35)	1.46 (37.08)
133-3/8 MVCR	1.33 CF	3/8 (9.53)	1.65 (41.91)
275-1/4 MVCR	2.75 CF	1/4 (6.35)	1.46 (37.08)
275-3/8 MVCR	2.75 CF	3/8 (9.53)	1.65 (41.91)



SPECIFICATIONS

Materials

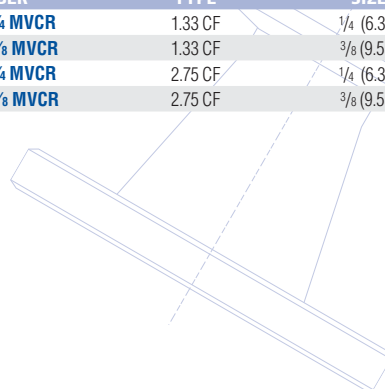
Flanges: 304 stainless steel
VCR Fittings: 316L stainless steel

Vacuum range:

NW Flange: $\geq 1 \times 10^{-8}$ mbar - High vacuum
CF Flange: $\geq 1 \times 10^{-10}$ mbar - UHV

Temperature range: -20°C to 200°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Adapter Fittings

Flange-to-Fitting



NW Quick Disconnect Adapters

MODEL NUMBER	FLANGE TYPE	ID A	ID B	C
NW-10-1/4 QD	NW-10	1/4 (6.35)	0.187 (4.75)	1.48 (37.59)
NW-16-1/4 QD	NW-16	1/4 (6.35)	0.187 (4.75)	1.48 (37.59)
NW-25-1/4 QD	NW-25	1/4 (6.35)	0.187 (4.75)	1.48 (37.59)
NW-40-1/4 QD	NW-40	1/4 (6.35)	0.187 (4.75)	1.48 (37.59)
NW-10-3/8 QD	NW-10	3/8 (9.53)	0.281 (7.14)	1.62 (41.15)
NW-16-3/8 QD	NW-16	3/8 (9.53)	0.281 (7.14)	1.62 (41.15)
NW-25-3/8 QD	NW-25	3/8 (9.53)	0.281 (7.14)	1.62 (41.15)
NW-40-3/8 QD	NW-40	3/8 (9.53)	0.281 (7.14)	1.62 (41.15)
NW-16-1/2 QD	NW-16	1/2 (12.70)	0.406 (10.31)	1.79 (45.47)
NW-25-1/2 QD	NW-25	1/2 (12.70)	0.406 (10.31)	1.79 (45.47)
NW-40-1/2 QD	NW-40	1/2 (12.70)	0.406 (10.31)	1.79 (45.47)
NW-50-1/2 QD	NW-50	1/2 (12.70)	0.406 (10.31)	1.79 (45.47)
NW-25-3/4 QD	NW-25	3/4 (19.05)	0.625 (15.88)	1.93 (49.02)
NW-40-3/4 QD	NW-40	3/4 (19.05)	0.625 (15.88)	1.93 (49.02)
NW-50-3/4 QD	NW-50	3/4 (19.05)	0.625 (15.88)	1.93 (49.02)
NW-40-1 QD	NW-40	1 (25.40)	0.875 (22.23)	1.95 (49.53)
NW-50-1 QD	NW-50	1 (25.40)	0.875 (22.23)	1.95 (49.53)

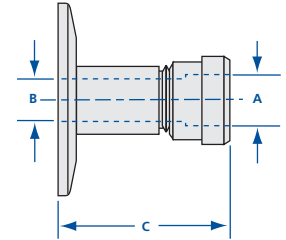
Note: On request, NW Quick Disconnects can be provided bored through for the tube OD. Add "-BT" suffix to the part number and call for price. Example: NW-10-1/4 QD-BT

SPECIFICATIONS

Materials
 Flanges: 304 stainless steel
 QD Fittings: 316L stainless steel

Vacuum range: $\geq 1 \times 10^{-8}$ mbar - High vacuum

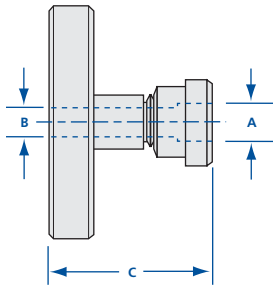
Temperature range: -20°C to 150°C



CF Quick Disconnect Adapters

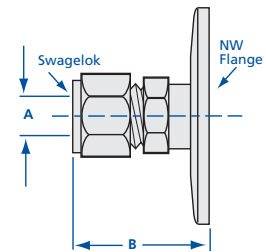
MODEL NUMBER	FLANGE OD	ID A	ID B	C
133-1/4 QD	1.33 CF	1/4 (6.35)	3/16 (4.76)	1.39 (35.31)
133-3/8 QD	1.33 CF	3/8 (9.53)	9/32 (7.14)	1.53 (38.86)
133-1/2 QD	1.33 CF	1/2 (12.70)	13/32 (10.32)	1.70 (43.18)
275-1/4 QD	2.75 CF	1/4 (6.35)	3/16 (4.76)	1.39 (35.31)
275-3/8 QD	2.75 CF	3/8 (9.53)	9/32 (7.14)	1.53 (38.86)
275-1/2 QD	2.75 CF	1/2 (12.70)	13/32 (10.32)	1.70 (43.18)
275-3/4 QD	2.75 CF	3/4 (19.05)	5/8 (15.88)	1.99 (50.55)
275-1 QD	2.75 CF	1 (25.40)	7/8 (22.23)	2.01 (51.05)

Note: On request, CF Quick Disconnects can be provided bored through for the tube OD. Add "-BT" suffix to the part number and call for price. Example: 133-1/4 QD-BT



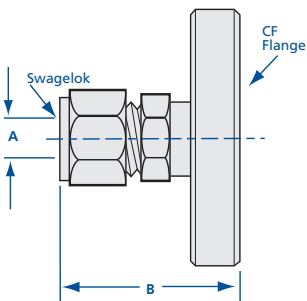
NW Swagelok Adapters

MODEL NUMBER	FLANGE TYPE	ID A	ID B
NW-10-1/4 SWAG	NW-10	1/4 (6.35)	1.47 (37.34)
NW-16-1/4 SWAG	NW-16	1/4 (6.35)	1.47 (37.34)
NW-25-1/4 SWAG	NW-25	1/4 (6.35)	1.47 (37.34)
NW-40-1/4 SWAG	NW-40	1/4 (6.35)	1.47 (37.34)
NW-50-1/4 SWAG	NW-50	1/4 (6.35)	1.47 (37.34)
NW-10-3/8 SWAG	NW-10	3/8 (9.53)	1.63 (41.40)
NW-16-3/8 SWAG	NW-16	3/8 (9.53)	1.63 (41.40)
NW-25-3/8 SWAG	NW-25	3/8 (9.53)	1.63 (41.40)
NW-40-3/8 SWAG	NW-40	3/8 (9.53)	1.63 (41.40)
NW-50-3/8 SWAG	NW-50	3/8 (9.53)	1.63 (41.40)



CF Swagelok Adapters

MODEL NUMBER	FLANGE TYPE	ID A	ID B
133-1/4 SWAG	1.33 CF	1/4 (6.35)	1.37 (34.80)
133-3/8 SWAG	1.33 CF	3/8 (9.53)	1.58 (40.13)
275-1/4 SWAG	2.75 CF	1/4 (6.35)	1.37 (34.80)
275-3/8 SWAG	2.75 CF	3/8 (9.53)	1.54 (39.12)



SPECIFICATIONS

Materials
 Flanges: 304 stainless steel
 Swagelok Fittings: 316L stainless steel

Vacuum range: $\geq 1 \times 10^{-6}$ mbar - High vacuum

Temperature range
 NW Flange: -20°C to 200°C
 CF Flange: -200°C to 450°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



SPECIFICATIONS

Nominal ID sizes

Bellows: 3/4 to 4 inch (19.05-101.6mm)
 PVC Hose: 1/2 to 2 inch (12.7-50.8mm)
 Flex Couplings: 3/8 to 12 inch
 (9.53-304.8mm)

Flange Types: NW, ISO, CF, ASA

Materials

Bellows: 316L or 321 stainless steel
 PVC Hose: Wire reinforced polyvinyl chloride
 Flanges: 304 stainless steel
 (316L available on request)

Vacuum Range

Metal seal: $\geq 1 \times 10^{-10}$ mbar - UHV
 Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum
 PVC Hose: $\geq 1 \times 10^{-2}$ Rough vacuum

Temperature Range

Metal seal: -200°C to 450°C
 Elastomer seal: -20°C to 150°C
 PVC Hose: -4°C to 65°C

Options: Protective braided sleeving

Flexible Vacuum Connections

Flexible vacuum connections are typically made by using edge welded bellows, hydroformed flexible couplings and hose or PVC hose. Edge welded bellows provide the greatest stroke and flexibility, but are the most susceptible to damage. Edge welded bellows are also more expensive than the other flexible connections.

Nor-Cal Products offers flexible couplings and flexible hose as standards. Edge welded bellows assemblies can be provided in a variety of materials as specials. PVC hose offers a low cost alternative to stainless steel flexible hose.

Flexible Hose

Flexible stainless steel hose is available in 3/4 to 4 inch (19.05-101.6mm) diameters in standard lengths of 12, 18, 24 and 36 inches (304.8, 457.2, 609.6 and 914.4mm) with NW, ISO, CF and ASA flanges. Hose with NW and ISO flanges are also available in 10, 20 and 40 inch (metric equivalent) lengths.

CF and ASA flanged hose has one rotatable and one nonrotatable flange for ease of bolt hole alignment. ASA flanged hose may require an O-ring groove on one flange for proper installation. Be sure to specify.

NW to CF adapter hose provides a flexible transition between components with NW and CF flanges. NW hose is available in medium wall "FH-" (0.010 Inch (.254mm) wall thickness), heavy wall "TH-" (0.017 Inches (.432mm)),



and thin wall "LH-" (0.006 Inches (.152mm)). Thin wall hose is the perfect choice for applications requiring increased flexibility. Protective braiding is offered as a standard for NW and CF medium wall tubing "FHB-" in diameters up to and including 4 inches (101.6mm).

Flexible Couplings

Pressurizing the inside of thin wall stainless steel tubing inside a mold forms convolutions in flexible couplings and hose. Generally speaking, when comparing flexible couplings to hose, couplings are thinner walled, and have more convolutions per inch, resulting in greater flexibility and stroke, and are used for alignment or vibration isolation rather than as roughing lines. Being thinner, flexible couplings are more susceptible to mechanical damage than hose.

Nor-Cal Products flexible couplings have more convolutions than comparable products, resulting in greater flexibility and lower

spring rates. Maximum compression for flexible couplings is typically 20% of the convolution (flexible) length. Extension is typically 10%. Couplings are available in 321 or 316L stainless steel in various lengths with NW, ISO, CF and ASA flanges.

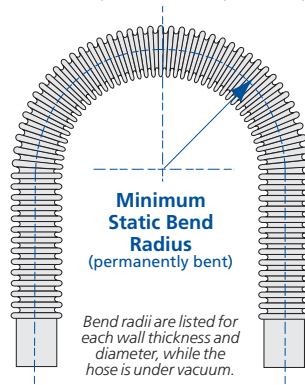
PVC Hose

Plasticized PVC hose can be used as a low cost rough vacuum line. An embedded spiral wire prevents the wall from collapsing under vacuum. Unlike edge welded bellows, flexible couplings and hose, which are UHV compatible, PVC hose should be used for rough vacuum due to the higher outgassing rate. Although it can be bent relatively easily, it cannot be compressed or extended.

Order by the foot with or without NW flanges. Each length includes two hose clamps for installation.

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

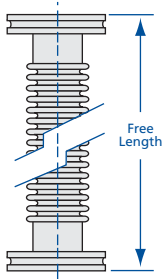
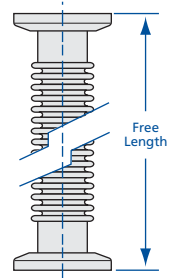
Spring rates are called out in pounds/inch





NW Flexible Couplings

MODEL NUMBER	FLANGE TYPE	BELLOWS ID	WALL THICKNESS	FREE LENGTH	SPRING RATE	COMPRESSED LENGTH
2FC-NW-10-1	NW-10	3/8 (9.525)	0.006 (.15)	3.20 (81.28)	35	3.0 (76.20)
2FC-NW-10-2	NW-10	3/8 (9.525)	0.006 (.15)	4.20 (106.68)	28	3.8 (96.52)
2FC-NW-10-3	NW-10	3/8 (9.525)	0.006 (.15)	5.20 (132.08)	22	4.6 (116.84)
2FC-NW-16-1	NW-16	1/2 (12.70)	0.006 (.15)	3.20 (81.28)	61	3.0 (76.20)
2FC-NW-16-2	NW-16	1/2 (12.70)	0.006 (.15)	4.20 (106.68)	49	3.8 (96.52)
2FC-NW-16-3	NW-16	1/2 (12.70)	0.006 (.15)	5.20 (132.08)	38	4.6 (116.84)
2FC-NW-25-1	NW-25	3/4 (19.05)	0.006 (.15)	3.20 (81.28)	45	3.0 (76.20)
2FC-NW-25-2	NW-25	3/4 (19.05)	0.006 (.15)	4.20 (106.68)	36	3.8 (96.52)
2FC-NW-25-3	NW-25	3/4 (19.05)	0.006 (.15)	5.20 (132.08)	28	4.6 (116.84)
2FC-NW-40-1	NW-40	1 1/2 (38.10)	0.006 (.15)	3.20 (81.28)	85	3.0 (76.20)
2FC-NW-40-2	NW-40	1 1/2 (38.10)	0.006 (.15)	4.20 (106.68)	69	3.8 (96.52)
2FC-NW-40-3	NW-40	1 1/2 (38.10)	0.006 (.15)	5.20 (132.08)	53	4.6 (116.84)
2FC-NW-40-6	NW-40	1 1/2 (38.10)	0.006 (.15)	8.20 (208.28)	28	7.0 (177.80)
2FC-NW-50-1	NW-50	1 3/4 (44.45)	0.006 (.15)	3.20 (81.28)	62	3.0 (76.20)
2FC-NW-50-2	NW-50	1 3/4 (44.45)	0.006 (.15)	4.20 (106.68)	50	3.8 (96.52)
2FC-NW-50-3	NW-50	1 3/4 (44.45)	0.006 (.15)	5.20 (132.08)	38	4.6 (116.84)



ISO Flexible Couplings

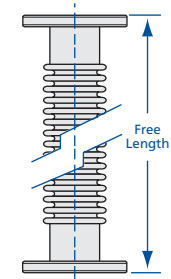
MODEL NUMBER	FLANGE TYPE	BELLOWS ID	WALL THICKNESS	FREE LENGTH	SPRING RATE	COMPRESSED LENGTH
2FC-ISO-250-4	ISO-63	2 1/2 (63.50)	0.008 (.20)	7.00 (177.80)	80	6.20 (157.48)
2FC-ISO-300-4	ISO-80	3 (76.20)	0.008 (.20)	7.00 (177.80)	78	6.20 (157.48)
2FC-ISO-400-4	ISO-100	4 (101.60)	0.010 (.25)	7.00 (177.80)	75	6.20 (157.48)
2FC-ISO-600-4	ISO-160	6 (152.40)	0.010 (.25)	7.00 (177.80)	130	6.20 (157.48)
2FC-ISO-800-4	ISO-200	8 (203.20)	0.010 (.25)	7.00 (177.80)	83	6.20 (157.48)
2FC-ISO-1000-10	ISO-250	10 (254.00)	0.012 (.30)	13.50 (342.90)	87	11.40 (289.56)



ASA Flexible Couplings

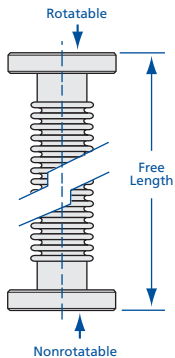
MODEL NUMBER	FLANGE TYPE	BELLOWS ID	WALL THICKNESS	FREE LENGTH	SPRING RATE	COMPRESSED LENGTH
2FC-ASA-5-200N-3	ASA 5	2 (50.80)	0.006 (.15)	6.00 (152.40)	56	5.4 (137.16)
2FC-ASA-5-250N-4	ASA 5	2 1/2 (63.50)	0.008 (.20)	7.00 (177.80)	80	6.20 (157.48)
2FC-ASA-6-300N-4	ASA 6	3 (76.20)	0.008 (.20)	7.00 (177.80)	78	6.20 (157.48)
2FC-ASA-7.5-400N-4	ASA 7.5	4 (101.60)	0.008 (.20)	7.00 (177.80)	75	6.20 (157.48)
2FC-ASA-9-400N-4	ASA 9	4 (101.60)	0.008 (.20)	7.00 (177.80)	75	6.20 (157.48)
2FC-ASA-9-600N-4	ASA 9	6 (152.40)	0.010 (.25)	7.00 (177.80)	130	6.20 (157.48)
2FC-ASA-11-600N-4	ASA 11	6 (152.40)	0.010 (.25)	7.00 (177.80)	130	6.20 (157.48)
2FC-ASA-11-800N-4	ASA 11	8 (203.20)	0.010 (.25)	7.00 (177.80)	83	6.20 (157.48)
2FC-ASA-13.5-800N-4	ASA 13.5	8 (203.20)	0.010 (.25)	7.00 (177.80)	83	6.20 (157.48)
2FC-ASA-13.5-1000N-10	ASA 13.5	10 (254.00)	0.012 (.30)	14.00 (355.60)	87	12.0 (304.80)
2FC-ASA-16-1000N-10	ASA 16	10 (254.00)	0.012 (.30)	14.00 (355.60)	87	12.0 (304.80)
2FC-ASA-16-1200N-11.8	ASA 16	12 (304.8)	0.012 (.30)	15.87 (403.10)	92	13.8 (350.52)

Note: Call for ASA O-ring groove pricing



CF Flexible Couplings

MODEL NUMBER	FLANGE TYPE	BELLOWS ID	WALL THICKNESS	FREE LENGTH	SPRING RATE	COMPRESSED LENGTH
2FC-075-1	1.33 CF	1/2 (12.70)	0.006 (.15)	3.20 (81.28)	61	3.0 (76.20)
2FC-075-2	1.33 CF	1/2 (12.70)	0.006 (.15)	4.20 (106.68)	49	3.8 (96.52)
2FC-075-3	1.33 CF	1/2 (12.70)	0.006 (.15)	5.20 (132.08)	38	4.6 (116.84)
2FC-100-1	2.12 CF	3/4 (19.05)	0.006 (.15)	3.20 (81.28)	45	3.0 (76.20)
2FC-100-2	2.12 CF	3/4 (19.05)	0.006 (.15)	4.20 (106.68)	36	3.8 (96.52)
2FC-100-3	2.12 CF	3/4 (19.05)	0.006 (.15)	5.20 (132.08)	28	4.6 (116.84)
2FC-150-1	2.75 CF	1 1/2 (38.10)	0.006 (.15)	3.20 (81.28)	85	3.0 (76.20)
2FC-150-2	2.75 CF	1 1/2 (38.10)	0.006 (.15)	4.20 (106.68)	69	3.8 (96.52)
2FC-150-3	2.75 CF	1 1/2 (38.10)	0.006 (.15)	5.20 (132.08)	53	4.6 (116.84)
2FC-150-6	2.75 CF	1 1/2 (38.10)	0.006 (.15)	8.20 (208.28)	28	7.0 (177.80)
2FC-200-3	3.38 CF	2 (50.80)	0.006 (.15)	6.00 (152.40)	56	5.4 (137.16)
2FC-250-4	4.50 CF	2 1/2 (63.50)	0.008 (.20)	7.00 (177.80)	80	6.2 (157.48)
2FC-300-4	4.62 CF	3 (76.20)	0.008 (.20)	7.00 (177.80)	78	6.2 (157.48)
2FC-400-4	6.00 CF	4 (101.60)	0.008 (.20)	7.00 (177.80)	75	6.2 (157.48)
2FC-500-4	6.75 CF	5 (127.00)	0.008 (.20)	7.00 (177.80)	73	6.2 (157.48)
2FC-600-4	8.00 CF	6 (152.40)	0.010 (.25)	7.00 (177.80)	130	6.2 (157.48)
2FC-800-4	10.00 CF	8 (203.20)	0.010 (.25)	7.00 (177.80)	83	6.2 (157.48)



SPECIFICATIONS

Nominal ID sizes: 3/8 to 12 inches (9.53-304.8mm)

Materials

Bellows: 316L or 321 stainless steel
Flanges: 304 stainless steel (316L available on request)

Vacuum Range

Metal seal: $\geq 1 \times 10^{-10}$ mbar - UHV
Elastomer seal: $\geq 1 \times 10^{-6}$ mbar - High vacuum

Temperature Range

Metal seal: -200°C to 450°C
Elastomer seal: -20°C to 150°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

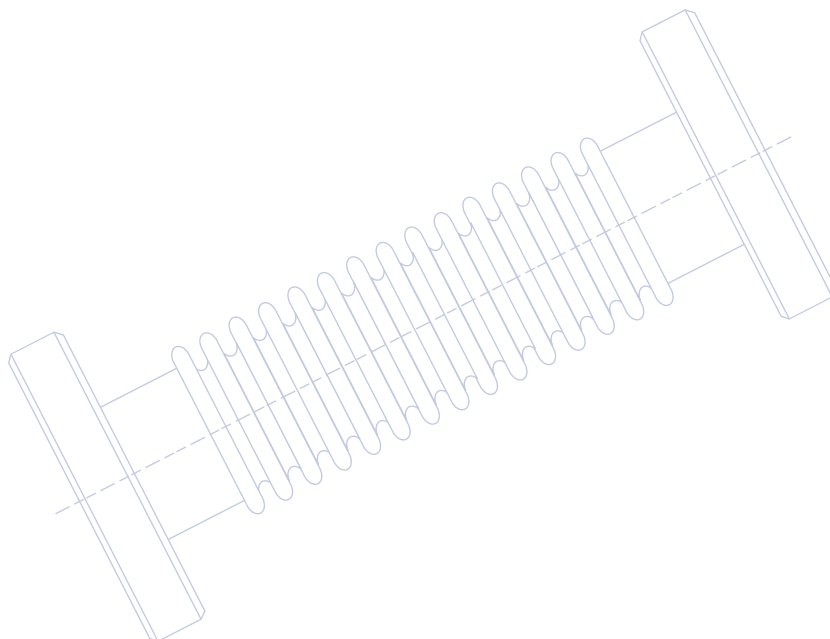
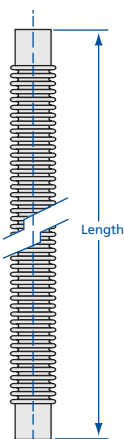
Flexible Hose & Couplings

Flexible Stainless Steel Hose



Flexible Stainless Steel Hose without Flanges

MODEL NUMBER	NOMINAL ID	HOSE OD	OVERALL LENGTH	WALL THICKNESS	STATIC BEND RADIUS
FH-075-12	3/4 (19.05)	1.11 (28.19)	12 (304.80)	0.008 (.20)	1.26 (32.00)
FH-075-18	3/4 (19.05)	1.11 (28.19)	18 (457.20)	0.008 (.20)	1.26 (32.00)
FH-075-24	3/4 (19.05)	1.11 (28.19)	24 (609.60)	0.008 (.20)	1.26 (32.00)
FH-075-36	3/4 (19.05)	1.11 (28.19)	36 (914.40)	0.008 (.20)	1.26 (32.00)
FH-100-12	1 (25.40)	1.37 (34.80)	12 (304.80)	0.008 (.20)	1.46 (37.08)
FH-100-18	1 (25.40)	1.37 (34.80)	18 (457.20)	0.008 (.20)	1.46 (37.08)
FH-100-24	1 (25.40)	1.37 (34.80)	24 (609.60)	0.008 (.20)	1.46 (37.08)
FH-100-36	1 (25.40)	1.37 (34.80)	36 (914.40)	0.008 (.20)	1.46 (37.08)
FH-150-12	1 1/2 (38.10)	2.06 (52.32)	12 (304.80)	0.010 (.25)	2.16 (54.86)
FH-150-18	1 1/2 (38.10)	2.06 (52.32)	18 (457.20)	0.010 (.25)	2.16 (54.86)
FH-150-24	1 1/2 (38.10)	2.06 (52.32)	24 (609.60)	0.010 (.25)	2.16 (54.86)
FH-150-36	1 1/2 (38.10)	2.06 (52.32)	36 (914.40)	0.010 (.25)	2.16 (54.86)
FH-200-12	2 (50.80)	2.55 (64.77)	12 (304.80)	0.012 (.30)	3.50 (88.90)
FH-200-18	2 (50.80)	2.55 (64.77)	18 (457.20)	0.012 (.30)	3.50 (88.90)
FH-200-24	2 (50.80)	2.55 (64.77)	24 (609.60)	0.012 (.30)	3.50 (88.90)
FH-200-36	2 (50.80)	2.55 (64.77)	36 (914.40)	0.012 (.30)	3.50 (88.90)
FH-250-12	2 1/2 (63.50)	3.34 (84.84)	12 (304.80)	0.016 (.41)	4.25 (107.95)
FH-250-18	2 1/2 (63.50)	3.34 (84.84)	18 (457.20)	0.016 (.41)	4.25 (107.95)
FH-250-24	2 1/2 (63.50)	3.34 (84.84)	24 (609.60)	0.016 (.41)	4.25 (107.95)
FH-250-36	2 1/2 (63.50)	3.34 (84.84)	36 (914.40)	0.016 (.41)	4.25 (107.95)
FH-300-12	3 (76.20)	3.99 (101.35)	12 (304.80)	0.016 (.41)	6.00 (152.40)
FH-300-18	3 (76.20)	3.99 (101.35)	18 (457.20)	0.016 (.41)	6.00 (152.40)
FH-300-24	3 (76.20)	3.99 (101.35)	24 (609.60)	0.016 (.41)	6.00 (152.40)
FH-300-36	3 (76.20)	3.99 (101.35)	36 (914.40)	0.016 (.41)	6.00 (152.40)
FH-400-12	4 (101.60)	4.83 (122.68)	12 (304.80)	0.016 (.41)	8.60 (218.44)
FH-400-18	4 (101.60)	4.83 (122.68)	18 (457.20)	0.016 (.41)	8.60 (218.44)
FH-400-24	4 (101.60)	4.83 (122.68)	24 (609.60)	0.016 (.41)	8.60 (218.44)
FH-400-36	4 (101.60)	4.83 (122.68)	36 (914.40)	0.016 (.41)	8.60 (218.44)



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Flexible Hose & Couplings

Flexible Stainless Steel Hose



NW Flexible Stainless Steel Hose – Thin Wall

MODEL NUMBER	FLANGE TYPE	NOMINAL ID	HOSE OD	OVERALL LENGTH	WALL THICKNESS	STATIC BEND RADIUS
LH-075-10-2NW	NW-16	3/4 (19.05)	1.02 (25.91)	10 (254.00)	0.006 (.15)	3.0 (76.20)
LH-075-12-2NW	NW-16	3/4 (19.05)	1.02 (25.91)	12 (304.80)	0.006 (.15)	3.0 (76.20)
LH-075-18-2NW	NW-16	3/4 (19.05)	1.02 (25.91)	18 (457.20)	0.006 (.15)	3.0 (76.20)
LH-075-24-2NW	NW-16	3/4 (19.05)	1.02 (25.91)	24 (609.60)	0.006 (.15)	3.0 (76.20)
LH-075-36-2NW	NW-16	3/4 (19.05)	1.02 (25.91)	36 (914.40)	0.006 (.15)	3.0 (76.20)
LH-100-10-2NW	NW-25	1 (25.40)	1.37 (34.80)	10 (254.00)	0.006 (.15)	4.0 (101.60)
LH-100-12-2NW	NW-25	1 (25.40)	1.37 (34.80)	12 (304.80)	0.006 (.15)	4.0 (101.60)
LH-100-18-2NW	NW-25	1 (25.40)	1.37 (34.80)	18 (457.20)	0.006 (.15)	4.0 (101.60)
LH-100-24-2NW	NW-25	1 (25.40)	1.37 (34.80)	24 (609.60)	0.006 (.15)	4.0 (101.60)
LH-100-36-2NW	NW-25	1 (25.40)	1.37 (34.80)	36 (914.40)	0.006 (.15)	4.0 (101.60)
LH-150-10-2NW	NW-40	1 1/2 (38.10)	1.91 (48.51)	10 (254.00)	0.006 (.15)	6.0 (152.40)
LH-150-12-2NW	NW-40	1 1/2 (38.10)	1.91 (48.51)	12 (304.80)	0.006 (.15)	6.0 (152.40)
LH-150-18-2NW	NW-40	1 1/2 (38.10)	1.91 (48.51)	18 (457.20)	0.006 (.15)	6.0 (152.40)
LH-150-24-2NW	NW-40	1 1/2 (38.10)	1.91 (48.51)	24 (609.60)	0.006 (.15)	6.0 (152.40)
LH-150-36-2NW	NW-40	1 1/2 (38.10)	1.91 (48.51)	36 (914.40)	0.006 (.15)	6.0 (152.40)
LH-200-10-2NW	NW-50	2 (50.80)	2.45 (62.23)	10 (254.00)	0.006 (.15)	7.5 (190.50)
LH-200-12-2NW	NW-50	2 (50.80)	2.45 (62.23)	12 (304.80)	0.006 (.15)	7.5 (190.50)
LH-200-18-2NW	NW-50	2 (50.80)	2.45 (62.23)	18 (457.20)	0.006 (.15)	7.5 (190.50)
LH-200-24-2NW	NW-50	2 (50.80)	2.45 (62.23)	24 (609.60)	0.006 (.15)	7.5 (190.50)
LH-200-36-2NW	NW-50	2 (50.80)	2.45 (62.23)	36 (914.40)	0.006 (.15)	7.5 (190.50)

SPECIFICATIONS

Nominal ID sizes: 3/4 to 2 inch (19.05 -50.8mm)

Materials

Hose: 321 stainless steel
 Tube ends: 304 stainless steel
 Flanges: 304 stainless steel
 (316L available on request)

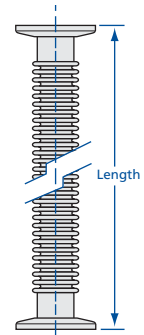
Vacuum Range

Metal seal: $\geq 1 \times 10^{-10}$ mbar - UHV
 Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature Range

Metal seal: -200°C to 450°C
 Elastomer seal: -20°C to 150°C

Options: Protective braided sleeving



NW Flexible Stainless Steel Hose – Medium Wall

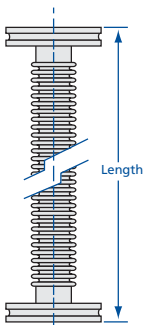
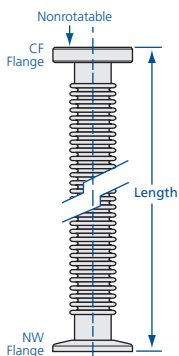
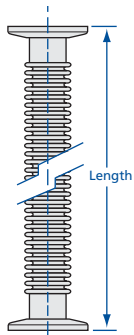
MODEL NUMBER	FLANGE TYPE	NOMINAL ID	HOSE OD	OVERALL LENGTH	WALL THICKNESS	STATIC BEND RADIUS
FH-075-10-2NW	NW-16	3/4 (19.05)	1.11 (28.19)	10 (254.00)	0.008 (.20)	1.26 (32.00)
FH-075-12-2NW	NW-16	3/4 (19.05)	1.11 (28.19)	12 (304.80)	0.008 (.20)	1.26 (32.00)
FH-075-18-2NW	NW-16	3/4 (19.05)	1.11 (28.19)	18 (457.20)	0.008 (.20)	1.26 (32.00)
FH-075-20-2NW	NW-16	3/4 (19.05)	1.11 (28.19)	20 (508.00)	0.008 (.20)	1.26 (32.00)
FH-075-24-2NW	NW-16	3/4 (19.05)	1.11 (28.19)	24 (609.60)	0.008 (.20)	1.26 (32.00)
FH-075-36-2NW	NW-16	3/4 (19.05)	1.11 (28.19)	36 (914.40)	0.008 (.20)	1.26 (32.00)
FH-075-40-2NW	NW-16	3/4 (19.05)	1.11 (28.19)	40 (1016.00)	0.008 (.20)	1.26 (32.00)
FH-100-10-2NW	NW-25	1 (25.40)	1.37 (34.80)	10 (254.00)	0.008 (.20)	1.46 (37.08)
FH-100-12-2NW	NW-25	1 (25.40)	1.37 (34.80)	12 (304.80)	0.008 (.20)	1.46 (37.08)
FH-100-18-2NW	NW-25	1 (25.40)	1.37 (34.80)	18 (457.20)	0.008 (.20)	1.46 (37.08)
FH-100-20-2NW	NW-25	1 (25.40)	1.37 (34.80)	20 (508.00)	0.008 (.20)	1.46 (37.08)
FH-100-24-2NW	NW-25	1 (25.40)	1.37 (34.80)	24 (609.60)	0.008 (.20)	1.46 (37.08)
FH-100-36-2NW	NW-25	1 (25.40)	1.37 (34.80)	36 (914.40)	0.008 (.20)	1.46 (37.08)
FH-100-40-2NW	NW-25	1 (25.40)	1.37 (34.80)	40 (1016.00)	0.008 (.20)	1.46 (37.08)
FH-150-10-2NW	NW-40	1 1/2 (38.10)	2.06 (52.32)	10 (254.00)	0.010 (.25)	2.16 (54.86)
FH-150-12-2NW	NW-40	1 1/2 (38.10)	2.06 (52.32)	12 (304.80)	0.010 (.25)	2.16 (54.86)
FH-150-18-2NW	NW-40	1 1/2 (38.10)	2.06 (52.32)	18 (457.20)	0.010 (.25)	2.16 (54.86)
FH-150-20-2NW	NW-40	1 1/2 (38.10)	2.06 (52.32)	20 (508.00)	0.010 (.25)	2.16 (54.86)
FH-150-24-2NW	NW-40	1 1/2 (38.10)	2.06 (52.32)	24 (609.60)	0.010 (.25)	2.16 (54.86)
FH-150-36-2NW	NW-40	1 1/2 (38.10)	2.06 (52.32)	36 (914.40)	0.010 (.25)	2.16 (54.86)
FH-150-40-2NW	NW-40	1 1/2 (38.10)	2.06 (52.32)	40 (1016.00)	0.010 (.25)	2.16 (54.86)
FH-200-10-2NW	NW-50	2 (50.80)	2.55 (64.77)	10 (254.00)	0.012 (.30)	3.50 (88.90)
FH-200-12-2NW	NW-50	2 (50.80)	2.55 (64.77)	12 (304.80)	0.012 (.30)	3.50 (88.90)
FH-200-18-2NW	NW-50	2 (50.80)	2.55 (64.77)	18 (457.20)	0.012 (.30)	3.50 (88.90)
FH-200-20-2NW	NW-50	2 (50.80)	2.55 (64.77)	20 (508.00)	0.012 (.30)	3.50 (88.90)
FH-200-24-2NW	NW-50	2 (50.80)	2.55 (64.77)	24 (609.60)	0.012 (.30)	3.50 (88.90)
FH-200-36-2NW	NW-50	2 (50.80)	2.55 (64.77)	36 (914.40)	0.012 (.30)	3.50 (88.90)
FH-200-40-2NW	NW-50	2 (50.80)	2.55 (64.77)	40 (1016.00)	0.012 (.30)	3.50 (88.90)

Larger hose IDs and other flange configurations available upon request.

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Flexible Hose & Couplings

Flexible Stainless Steel Hose



NW Flexible Stainless Steel Hose – Thick Wall

MODEL NUMBER	FLANGE TYPE	NOMINAL ID	HOSE OD	OVERALL LENGTH	WALL THICKNESS	STATIC BEND RADIUS
TH-075-10-2NW	NW-16	3/4 (19.05)	1.10 (27.94)	10 (254.00)	0.017 (.43)	2.13 (54.10)
TH-075-20-2NW	NW-16	3/4 (19.05)	1.10 (27.94)	20 (508.00)	0.017 (.43)	2.13 (54.10)
TH-075-40-2NW	NW-16	3/4 (19.05)	1.10 (27.94)	40 (1016.00)	0.017 (.43)	2.13 (54.10)
TH-100-10-2NW	NW-25	1 (25.40)	1.50 (38.10)	10 (254.00)	0.017 (.43)	2.88 (73.15)
TH-100-20-2NW	NW-25	1 (25.40)	1.50 (38.10)	20 (508.00)	0.017 (.43)	2.88 (73.15)
TH-100-40-2NW	NW-25	1 (25.40)	1.50 (38.10)	40 (1016.00)	0.017 (.43)	2.88 (73.15)
TH-150-10-2NW	NW-40	1 1/2 (38.10)	2.10 (53.34)	10 (254.00)	0.020 (.51)	3.50 (88.90)
TH-150-20-2NW	NW-40	1 1/2 (38.10)	2.10 (53.34)	20 (508.00)	0.020 (.51)	3.50 (88.90)
TH-150-40-2NW	NW-40	1 1/2 (38.10)	2.10 (53.34)	40 (1016.00)	0.020 (.51)	3.50 (88.90)
TH-200-10-2NW	NW-50	2 (50.80)	2.63 (66.80)	10 (254.00)	0.020 (.51)	5.25 (133.35)
TH-200-20-2NW	NW-50	2 (50.80)	2.63 (66.80)	20 (508.00)	0.020 (.51)	5.25 (133.35)
TH-200-40-2NW	NW-50	2 (50.80)	2.63 (66.80)	40 (1016.00)	0.020 (.51)	5.25 (133.35)

NW/CF Flexible Stainless Steel Adapter Hose – Medium Wall

MODEL NUMBER	FLANGE 1 TYPE	FLANGE 2 TYPE	NOMINAL ID	HOSE OD	OVERALL LENGTH	WALL THICKNESS	STATIC BEND RADIUS
FH-075-12-NW-CF	NW-16	CF-1.33	3/4 (19.05)	1.11 (28.19)	12 (304.80)	0.008 (.20)	1.26 (32.00)
FH-075-18-NW-CF	NW-16	CF-1.33	3/4 (19.05)	1.11 (28.19)	18 (457.20)	0.008 (.20)	1.26 (32.00)
FH-075-24-NW-CF	NW-16	CF-1.33	3/4 (19.05)	1.11 (28.19)	24 (609.60)	0.008 (.20)	1.26 (32.00)
FH-075-36-NW-CF	NW-16	CF-1.33	3/4 (19.05)	1.11 (28.19)	36 (914.40)	0.008 (.20)	1.26 (32.00)
FH-150-12-NW-CF	NW-40	CF-2.75	1 1/2 (38.10)	2.06 (52.32)	12 (304.80)	0.010 (.25)	2.16 (54.86)
FH-150-18-NW-CF	NW-40	CF-2.75	1 1/2 (38.10)	2.06 (52.32)	18 (457.20)	0.010 (.25)	2.16 (54.86)
FH-150-24-NW-CF	NW-40	CF-2.75	1 1/2 (38.10)	2.06 (52.32)	24 (609.60)	0.010 (.25)	2.16 (54.86)
FH-150-36-NW-CF	NW-40	CF-2.75	1 1/2 (38.10)	2.06 (52.32)	36 (914.40)	0.010 (.25)	2.16 (54.86)

ISO Flexible Stainless Steel Hose – Medium Wall

MODEL NUMBER	FLANGE TYPE	NOMINAL ID	HOSE OD	OVERALL LENGTH	WALL THICKNESS	STATIC BEND RADIUS
FH-250-10-2ISO	ISO-63	2 1/2 (63.50)	3.34 (84.84)	10 (254.00)	0.016 (.41)	3.15 (80.01)
FH-250-12-2ISO	ISO-63	2 1/2 (63.50)	3.34 (84.84)	12 (304.80)	0.016 (.41)	3.15 (80.01)
FH-250-18-2ISO	ISO-63	2 1/2 (63.50)	3.34 (84.84)	18 (457.20)	0.016 (.41)	3.15 (80.01)
FH-250-20-2ISO	ISO-63	2 1/2 (63.50)	3.34 (84.84)	20 (508.00)	0.016 (.41)	3.15 (80.01)
FH-250-24-2ISO	ISO-63	2 1/2 (63.50)	3.34 (84.84)	24 (609.60)	0.016 (.41)	3.15 (80.01)
FH-250-36-2ISO	ISO-63	2 1/2 (63.50)	3.34 (84.84)	36 (914.40)	0.016 (.41)	3.15 (80.01)
FH-250-40-2ISO	ISO-63	3 (76.20)	3.99 (101.35)	40 (1016.00)	0.016 (.41)	3.15 (80.01)
FH-300-10-2ISO	ISO-80	3 (76.20)	3.99 (101.35)	10 (254.00)	0.016 (.41)	3.82 (97.03)
FH-300-12-2ISO	ISO-80	3 (76.20)	3.99 (101.35)	12 (304.80)	0.016 (.41)	3.82 (97.03)
FH-300-18-2ISO	ISO-80	3 (76.20)	3.99 (101.35)	18 (457.20)	0.016 (.41)	3.82 (97.03)
FH-300-20-2ISO	ISO-80	3 (76.20)	3.99 (101.35)	20 (508.00)	0.016 (.41)	3.82 (97.03)
FH-300-24-2ISO	ISO-80	3 (76.20)	3.99 (101.35)	24 (609.60)	0.016 (.41)	3.82 (97.03)
FH-300-36-2ISO	ISO-80	3 (76.20)	3.99 (101.35)	36 (914.40)	0.016 (.41)	3.82 (97.03)
FH-300-40-2ISO	ISO-80	4 (101.60)	4.83 (122.68)	40 (1016.00)	0.016 (.41)	3.82 (97.03)
FH-400-10-2ISO	ISO-100	4 (101.60)	4.83 (122.68)	10 (254.00)	0.016 (.41)	4.45 (113.03)
FH-400-12-2ISO	ISO-100	4 (101.60)	4.83 (122.68)	12 (304.80)	0.016 (.41)	4.45 (113.03)
FH-400-18-2ISO	ISO-100	4 (101.60)	4.83 (122.68)	18 (457.20)	0.016 (.41)	4.45 (113.03)
FH-400-20-2ISO	ISO-100	4 (101.60)	4.83 (122.68)	20 (508.00)	0.016 (.41)	4.45 (113.03)
FH-400-24-2ISO	ISO-100	4 (101.60)	4.83 (122.68)	24 (609.60)	0.016 (.41)	4.45 (113.03)
FH-400-36-2ISO	ISO-100	4 (101.60)	4.83 (122.68)	36 (914.40)	0.016 (.41)	4.45 (113.03)
FH-400-40-2ISO	ISO-100	4 (101.60)	4.83 (122.68)	40 (1016.00)	0.016 (.41)	4.45 (113.03)

SPECIFICATIONS

Nominal ID sizes: 3/4 to 4 inch
(19.05-101.6mm)

Materials

Hose: 321 stainless steel
Tube ends: 304 stainless steel
Flanges: 304 stainless steel
(316L available on request)

Vacuum Range

Metal seal: $\geq 1 \times 10^{-10}$ mbar - UHV
Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature Range

Metal seal: -200°C to 450°C
Elastomer seal: -20°C to 150°C

Options: Protective braided sleeving

ISO Flexible Stainless Steel Hose – Thick Wall

MODEL NUMBER	FLANGE TYPE	NOMINAL ID	HOSE OD	OVERALL LENGTH	WALL THICKNESS	STATIC BEND RADIUS
TH-250-20-2ISO	ISO-63	2 1/2 (63.50)	3.10 (78.74)	20 (508.00)	0.020 (.51)	8.00 (203.20)
TH-250-40-2ISO	ISO-63	2 1/2 (63.50)	3.10 (78.74)	40 (1016.00)	0.020 (.51)	8.00 (203.20)
TH-300-20-2ISO	ISO-80	3 (76.20)	3.92 (99.57)	20 (508.00)	0.020 (.51)	9.00 (228.60)
TH-300-40-2ISO	ISO-80	3 (76.20)	3.92 (99.57)	40 (1016.00)	0.020 (.51)	9.00 (228.60)
TH-400-20-2ISO	ISO-100	4 (101.60)	4.82 (122.43)	20 (508.00)	0.020 (.51)	13.00 (330.20)
TH-400-40-2ISO	ISO-100	4 (101.60)	4.82 (122.43)	40 (1016.00)	0.020 (.51)	13.00 (330.20)

Flexible Hose & Couplings

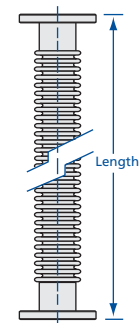
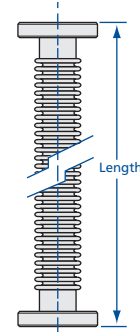
Flexible Stainless Steel Hose



CF Flexible Stainless Steel Hose

MODEL NUMBER	NOMINAL ID	HOSE OD	OVERALL LENGTH	FLANGE OD	WALL THICKNESS	STATIC BEND RADIUS
FH-075-12-2CF	¾ (19.05)	1.11 (28.19)	12 (304.80)	1.33 (33.78)	0.008 (.20)	1.26 (32.00)
FH-075-18-2CF	¾ (19.05)	1.11 (28.19)	18 (547.20)	1.33 (33.78)	0.008 (.20)	1.26 (32.00)
FH-075-24-2CF	¾ (19.05)	1.11 (28.19)	24 (609.60)	1.33 (33.78)	0.008 (.20)	1.26 (32.00)
FH-075-36-2CF	¾ (19.05)	1.11 (28.19)	36 (914.40)	1.33 (33.78)	0.008 (.20)	1.26 (32.00)
FH-100-12-2CF	1 (25.40)	1.37 (34.80)	12 (304.80)	2.12 (53.85)	0.008 (.20)	1.46 (37.08)
FH-100-18-2CF	1 (25.40)	1.37 (34.80)	18 (547.20)	2.12 (53.85)	0.008 (.20)	1.46 (37.08)
FH-100-24-2CF	1 (25.40)	1.37 (34.80)	24 (609.60)	2.12 (53.85)	0.008 (.20)	1.46 (37.08)
FH-100-36-2CF	1 (25.40)	1.37 (34.80)	36 (914.40)	2.12 (53.85)	0.008 (.20)	1.46 (37.08)
FH-150-12-2CF	1½ (38.10)	2.06 (52.32)	12 (304.80)	2.75 (69.85)	0.010 (.25)	2.16 (54.86)
FH-150-18-2CF	1½ (38.10)	2.06 (52.32)	18 (547.20)	2.75 (69.85)	0.010 (.25)	2.16 (54.86)
FH-150-24-2CF	1½ (38.10)	2.06 (52.32)	24 (609.60)	2.75 (69.85)	0.010 (.25)	2.16 (54.86)
FH-150-36-2CF	1½ (38.10)	2.06 (52.32)	36 (914.40)	2.75 (69.85)	0.010 (.25)	2.16 (54.86)
FH-200-12-2CF	2 (50.80)	2.55 (64.77)	12 (304.80)	3.38 (85.85)	0.012 (.30)	3.50 (88.90)
FH-200-18-2CF	2 (50.80)	2.55 (64.77)	18 (547.20)	3.38 (85.85)	0.012 (.30)	3.50 (88.90)
FH-200-24-2CF	2 (50.80)	2.55 (64.77)	24 (609.60)	3.38 (85.85)	0.012 (.30)	3.50 (88.90)
FH-200-36-2CF	2 (50.80)	2.55 (64.77)	36 (914.40)	3.38 (85.85)	0.012 (.30)	3.50 (88.90)
FH-250-12-2CF	2½ (63.50)	3.34 (84.84)	12 (304.80)	4.50 (114.30)	0.016 (.41)	4.25 (107.95)
FH-250-18-2CF	2½ (63.50)	3.34 (84.84)	18 (547.20)	4.50 (114.30)	0.016 (.41)	4.25 (107.95)
FH-250-24-2CF	2½ (63.50)	3.34 (84.84)	24 (609.60)	4.50 (114.30)	0.016 (.41)	4.25 (107.95)
FH-250-36-2CF	2½ (63.50)	3.34 (84.84)	36 (914.40)	4.50 (114.30)	0.016 (.41)	4.25 (107.95)
FH-300-12-2CF	3 (76.20)	3.99 (101.35)	12 (304.80)	4.62 (117.35)	0.016 (.41)	6.00 (152.40)
FH-300-18-2CF	3 (76.20)	3.99 (101.35)	18 (547.20)	4.62 (117.35)	0.016 (.41)	6.00 (152.40)
FH-300-24-2CF	3 (76.20)	3.99 (101.35)	24 (609.60)	4.62 (117.35)	0.016 (.41)	6.00 (152.40)
FH-300-36-2CF	3 (76.20)	3.99 (101.35)	36 (914.40)	4.62 (117.35)	0.016 (.41)	6.00 (152.40)
FH-400-12-2CF	4 (101.60)	4.83 (122.68)	12 (304.80)	6.00 (152.40)	0.016 (.41)	8.60 (218.44)
FH-400-18-2CF	4 (101.60)	4.83 (122.68)	18 (547.20)	6.00 (152.40)	0.016 (.41)	8.60 (218.44)
FH-400-24-2CF	4 (101.60)	4.83 (122.68)	24 (609.60)	6.00 (152.40)	0.016 (.41)	8.60 (218.44)
FH-400-36-2CF	4 (101.60)	4.83 (122.68)	36 (914.40)	6.00 (152.40)	0.016 (.41)	8.60 (218.44)

Note: See Braided Hose selection next page.



ASA Flexible Stainless Steel Hose

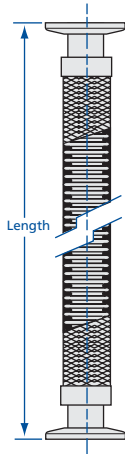
MODEL NUMBER	DESCRIPTION	NOMINAL ID	HOSE OD	OVERALL LENGTH	WALL THICKNESS	STATIC BEND RADIUS
FH-250-12-ASA	ASA-5 on one port	2½ (63.50)	3.34 (84.84)	12 (304.80)	0.016 (.41)	4.25 (107.95)
FH-250-12-2ASA	ASA-5 on both ports	2½ (63.50)	3.34 (84.84)	12 (304.80)	0.016 (.41)	4.25 (107.95)
FH-250-18-ASA	ASA-5 on one port	2½ (63.50)	3.34 (84.84)	18 (457.20)	0.016 (.41)	4.25 (107.95)
FH-250-18-2ASA	ASA-5 on both ports	2½ (63.50)	3.34 (84.84)	18 (457.20)	0.016 (.41)	4.25 (107.95)
FH-250-24-ASA	ASA-5 on one port	2½ (63.50)	3.34 (84.84)	24 (609.60)	0.016 (.41)	4.25 (107.95)
FH-250-24-2ASA	ASA-5 on both ports	2½ (63.50)	3.34 (84.84)	24 (609.60)	0.016 (.41)	4.25 (107.95)
FH-250-36-ASA	ASA-5 on one port	2½ (63.50)	3.34 (84.84)	36 (914.40)	0.016 (.41)	4.25 (107.95)
FH-250-36-2ASA	ASA-5 on both ports	2½ (63.50)	3.34 (84.84)	36 (914.40)	0.016 (.41)	4.25 (107.95)
FH-300-12-ASA	ASA-6 on one port	3 (76.20)	3.99 (101.35)	12 (304.80)	0.016 (.41)	6.00 (152.40)
FH-300-12-2ASA	ASA-6 on both ports	3 (76.20)	3.99 (101.35)	12 (304.80)	0.016 (.41)	6.00 (152.40)
FH-300-18-ASA	ASA-6 on one port	3 (76.20)	3.99 (101.35)	18 (457.20)	0.016 (.41)	6.00 (152.40)
FH-300-18-2ASA	ASA-6 on both ports	3 (76.20)	3.99 (101.35)	18 (457.20)	0.016 (.41)	6.00 (152.40)
FH-300-24-ASA	ASA-6 on one port	3 (76.20)	3.99 (101.35)	24 (609.60)	0.016 (.41)	6.00 (152.40)
FH-300-24-2ASA	ASA-6 on both ports	3 (76.20)	3.99 (101.35)	24 (609.60)	0.016 (.41)	6.00 (152.40)
FH-300-36-ASA	ASA-6 on one port	3 (76.20)	3.99 (101.35)	36 (914.40)	0.016 (.41)	6.00 (152.40)
FH-300-36-2ASA	ASA-6 on both ports	3 (76.20)	3.99 (101.35)	36 (914.40)	0.016 (.41)	6.00 (152.40)
FH-400-12-ASA	ASA-7.5 on one port	4 (101.60)	4.83 (122.68)	12 (304.80)	0.016 (.41)	8.60 (218.44)
FH-400-12-2ASA	ASA-7.5 on both ports	4 (101.60)	4.83 (122.68)	12 (304.80)	0.016 (.41)	8.60 (218.44)
FH-400-18-ASA	ASA-7.5 on one port	4 (101.60)	4.83 (122.68)	18 (457.20)	0.016 (.41)	8.60 (218.44)
FH-400-18-2ASA	ASA-7.5 on both ports	4 (101.60)	4.83 (122.68)	18 (457.20)	0.016 (.41)	8.60 (218.44)
FH-400-24-ASA	ASA-7.5 on one port	4 (101.60)	4.83 (122.68)	24 (609.60)	0.016 (.41)	8.60 (218.44)
FH-400-24-2ASA	ASA-7.5 on both ports	4 (101.60)	4.83 (122.68)	24 (609.60)	0.016 (.41)	8.60 (218.44)
FH-400-36-ASA	ASA-7.5 on one port	4 (101.60)	4.83 (122.68)	36 (914.40)	0.016 (.41)	8.60 (218.44)
FH-400-36-2ASA	ASA-7.5 on both ports	4 (101.60)	4.83 (122.68)	36 (914.40)	0.016 (.41)	8.60 (218.44)

Note: Call for O-ring groove pricing if required

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Flexible Hose & Couplings

Braided Stainless Steel Flexible Hose



NW Flexible Stainless Steel Braided Hose

MODEL NUMBER	FLANGE TYPE	NOMINAL ID	HOSE OD	OVERALL LENGTH	WALL THICKNESS	STATIC BEND RADIUS
FHB-075-12-2NW	NW-16	3/4 (19.05)	1 1/4 (31.75)	12 (304.80)	0.008 (.20)	2.09 (53.09)
FHB-075-18-2NW	NW-16	3/4 (19.05)	1 1/4 (31.75)	18 (457.20)	0.008 (.20)	2.09 (53.09)
FHB-075-20-2NW	NW-16	3/4 (19.05)	1 1/4 (31.75)	20 (508.00)	0.008 (.20)	2.09 (53.09)
FHB-075-24-2NW	NW-16	3/4 (19.05)	1 1/4 (31.75)	24 (609.60)	0.008 (.20)	2.09 (53.09)
FHB-075-36-2NW	NW-16	3/4 (19.05)	1 1/4 (31.75)	36 (914.40)	0.008 (.20)	2.09 (53.09)
FHB-075-40-2NW	NW-16	3/4 (19.05)	1 1/4 (31.75)	40 (1016.00)	0.008 (.20)	2.09 (53.09)
FHB-100-12-2NW	NW-25	1 (25.40)	1 5/8 (41.28)	12 (304.80)	0.008 (.20)	2.52 (64.01)
FHB-100-18-2NW	NW-25	1 (25.40)	1 5/8 (41.28)	18 (457.20)	0.008 (.20)	2.52 (64.01)
FHB-100-20-2NW	NW-25	1 (25.40)	1 5/8 (41.28)	20 (508.00)	0.008 (.20)	2.52 (64.01)
FHB-100-24-2NW	NW-25	1 (25.40)	1 5/8 (41.28)	24 (609.60)	0.008 (.20)	2.52 (64.01)
FHB-100-36-2NW	NW-25	1 (25.40)	1 5/8 (41.28)	36 (914.40)	0.008 (.20)	2.52 (64.01)
FHB-100-40-2NW	NW-25	1 (25.40)	1 5/8 (41.28)	40 (1016.00)	0.008 (.20)	2.52 (64.01)
FHB-150-12-2NW	NW-40	1 1/2 (38.10)	2 1/4 (57.15)	12 (304.80)	0.010 (.25)	3.86 (98.04)
FHB-150-18-2NW	NW-40	1 1/2 (38.10)	2 1/4 (57.15)	18 (457.20)	0.010 (.25)	3.86 (98.04)
FHB-150-20-2NW	NW-40	1 1/2 (38.10)	2 1/4 (57.15)	20 (508.00)	0.010 (.25)	3.86 (98.04)
FHB-150-24-2NW	NW-40	1 1/2 (38.10)	2 1/4 (57.15)	24 (609.60)	0.010 (.25)	3.86 (98.04)
FHB-150-36-2NW	NW-40	1 1/2 (38.10)	2 1/4 (57.15)	36 (914.40)	0.010 (.25)	3.86 (98.04)
FHB-150-40-2NW	NW-40	1 1/2 (38.10)	2 1/4 (57.15)	40 (1016.00)	0.010 (.25)	3.86 (98.04)
FHB-200-12-2NW	NW-50	2 (50.80)	2 3/4 (69.85)	12 (304.80)	0.012 (.30)	4.72 (119.89)
FHB-200-18-2NW	NW-50	2 (50.80)	2 3/4 (69.85)	18 (457.20)	0.012 (.30)	4.72 (119.89)
FHB-200-20-2NW	NW-50	2 (50.80)	2 3/4 (69.85)	20 (508.00)	0.012 (.30)	4.72 (119.89)
FHB-200-24-2NW	NW-50	2 (50.80)	2 3/4 (69.85)	24 (609.60)	0.012 (.30)	4.72 (119.89)
FHB-200-36-2NW	NW-50	2 (50.80)	2 3/4 (69.85)	36 (914.40)	0.012 (.30)	4.72 (119.89)
FHB-200-40-2NW	NW-50	2 (50.80)	2 3/4 (69.85)	40 (1016.00)	0.012 (.30)	4.72 (119.89)

CF Flexible Stainless Steel Braided Hose

MODEL NUMBER	NOMINAL ID	HOSE OD	OVERALL LENGTH	FLANGE OD	WALL THICKNESS	STATIC BEND RADIUS
FHB-075-12-2CF	3/4 (19.05)	1 1/4 (31.75)	12 (304.80)	1.33 (33.78)	0.008 (.20)	2.09 (53.09)
FHB-075-18-2CF	3/4 (19.05)	1 1/4 (31.75)	18 (457.20)	1.33 (33.78)	0.008 (.20)	2.09 (53.09)
FHB-075-24-2CF	3/4 (19.05)	1 1/4 (31.75)	24 (609.60)	1.33 (33.78)	0.008 (.20)	2.09 (53.09)
FHB-075-36-2CF	3/4 (19.05)	1 1/4 (31.75)	36 (914.40)	1.33 (33.78)	0.008 (.20)	2.09 (53.09)
FHB-100-12-2CF	1 (25.40)	1 5/8 (41.28)	12 (304.80)	2.12 (53.85)	0.008 (.20)	2.52 (64.01)
FHB-100-18-2CF	1 (25.40)	1 5/8 (41.28)	18 (457.20)	2.12 (53.85)	0.008 (.20)	2.52 (64.01)
FHB-100-24-2CF	1 (25.40)	1 5/8 (41.28)	24 (609.60)	2.12 (53.85)	0.008 (.20)	2.52 (64.01)
FHB-100-36-2CF	1 (25.40)	1 5/8 (41.28)	36 (914.40)	2.12 (53.85)	0.008 (.20)	2.52 (64.01)
FHB-150-12-2CF	1 1/2 (38.10)	2 1/4 (57.15)	12 (304.80)	2.75 (69.85)	0.010 (.25)	3.86 (98.04)
FHB-150-18-2CF	1 1/2 (38.10)	2 1/4 (57.15)	18 (457.20)	2.75 (69.85)	0.010 (.25)	3.86 (98.04)
FHB-150-24-2CF	1 1/2 (38.10)	2 1/4 (57.15)	24 (609.60)	2.75 (69.85)	0.010 (.25)	3.86 (98.04)
FHB-150-36-2CF	1 1/2 (38.10)	2 1/4 (57.15)	36 (914.40)	2.75 (69.85)	0.010 (.25)	3.86 (98.04)
FHB-200-12-2CF	2 (50.80)	2 3/4 (69.85)	12 (304.80)	3.38 (85.85)	0.012 (.30)	4.72 (119.89)
FHB-200-18-2CF	2 (50.80)	2 3/4 (69.85)	18 (457.20)	3.38 (85.85)	0.012 (.30)	4.72 (119.89)
FHB-200-24-2CF	2 (50.80)	2 3/4 (69.85)	24 (609.60)	3.38 (85.85)	0.012 (.30)	4.72 (119.89)
FHB-200-36-2CF	2 (50.80)	2 3/4 (69.85)	36 (914.40)	3.38 (85.85)	0.012 (.30)	4.72 (119.89)

SPECIFICATIONS

Nominal ID sizes: 3/4 to 2 inch
(19.05-50.8mm)

Materials

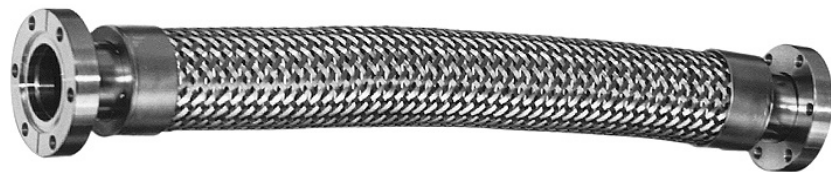
Bellows: 321 stainless steel
Tube ends: 304 stainless steel
Flanges: 304 stainless steel
(316L available on request)

Vacuum Range

Metal seal: $\geq 1 \times 10^{-10}$ mbar - UHV
Elastomer seal: $\geq 1 \times 10^{-8}$ mbar - High vacuum

Temperature Range

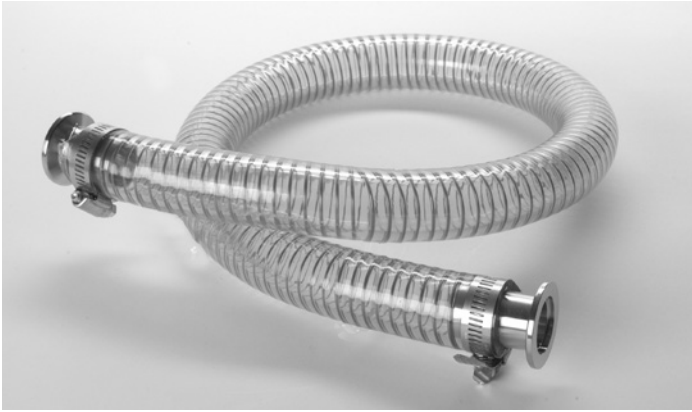
Metal seal: -200°C to 450°C
Elastomer seal: -20°C to 150°C



Larger hose IDs and other flange configurations available upon request.

Flexible Hose & Couplings

PVC Flexible Hose

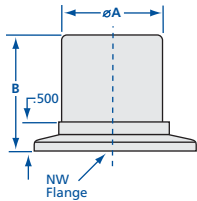
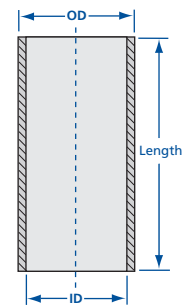


PVC Flexible Hose

Each length includes two hose clamps for installation.

MODEL NUMBER	NOMINAL ID	HOSE OD	STATIC BEND RADIUS
PVC-050	1/2 (12.70)	0.813 (20.65)	2.00 (50.80)
PVC-075	3/4 (19.05)	1.125 (28.58)	3.00 (76.20)
PVC-100	1 (25.40)	1.375 (34.93)	4.00 (101.60)
PVC-150	1 1/2 (38.10)	2.000 (50.80)	6.00 (152.40)
PVC-200	2 (50.80)	2.500 (63.50)	8.00 (203.20)

Note: To order specify length required in feet as follows: PVC-100-5.0 and PVC-200-10.0



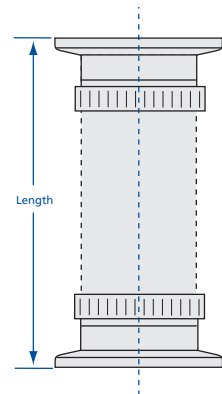
PVC Hose Nipples

MODEL NUMBER	FLANGE TYPE	NIPPLE MATERIAL	A	B
1HN-NW-10-050	NW-10	304 SS	0.50 (12.70)	1.26 (32.00)
1HN-NW-16-075	NW-16	304 SS	0.75 (19.05)	1.26 (32.00)
1HN-NW-25-100	NW-25	304 SS	1.00 (25.40)	1.50 (38.10)
1HN-NW-40-150	NW-40	304 SS	1.50 (38.10)	1.97 (50.04)
1HN-NW-50-200	NW-50	304 SS	2.00 (50.80)	2.17 (55.12)



PVC Hose with NW Flanges

MODEL NUMBER	FLANGE TYPE	NOMINAL ID	HOSE OD	OVERALL LENGTH	STATIC BEND RADIUS
PVC-050-12-2NW	NW-10	1/2 (12.70)	0.813 (20.65)	12 (304.80)	2.00 (50.80)
PVC-050-24-2NW	NW-10	1/2 (12.70)	0.813 (20.65)	24 (609.60)	2.00 (50.80)
PVC-050-36-2NW	NW-10	1/2 (12.70)	0.813 (20.65)	36 (914.40)	2.00 (50.80)
PVC-050-72-2NW	NW-10	1/2 (12.70)	0.813 (20.65)	72 (1828.80)	2.00 (50.80)
PVC-075-12-2NW	NW-16	3/4 (19.05)	1.125 (28.58)	12 (304.80)	3.00 (76.20)
PVC-075-24-2NW	NW-16	3/4 (19.05)	1.125 (28.58)	24 (609.60)	3.00 (76.20)
PVC-075-36-2NW	NW-16	3/4 (19.05)	1.125 (28.58)	36 (914.40)	3.00 (76.20)
PVC-075-72-2NW	NW-16	3/4 (19.05)	1.125 (28.58)	72 (1828.80)	3.00 (76.20)
PVC-100-12-2NW	NW-25	1 (25.40)	1.375 (34.93)	12 (304.80)	4.00 (101.60)
PVC-100-24-2NW	NW-25	1 (25.40)	1.375 (34.93)	24 (609.60)	4.00 (101.60)
PVC-100-36-2NW	NW-25	1 (25.40)	1.375 (34.93)	36 (914.40)	4.00 (101.60)
PVC-100-72-2NW	NW-25	1 (25.40)	1.375 (34.93)	72 (1828.80)	4.00 (101.60)
PVC-150-12-2NW	NW-40	1 1/2 (38.10)	2.000 (50.80)	12 (304.80)	6.00 (152.40)
PVC-150-24-2NW	NW-40	1 1/2 (38.10)	2.000 (50.80)	24 (609.60)	6.00 (152.40)
PVC-150-36-2NW	NW-40	1 1/2 (38.10)	2.000 (50.80)	36 (914.40)	6.00 (152.40)
PVC-150-72-2NW	NW-40	1 1/2 (38.10)	2.000 (50.80)	72 (1828.80)	6.00 (152.40)
PVC-200-12-2NW	NW-50	2 (50.80)	2.500 (63.50)	12 (304.80)	8.00 (203.20)
PVC-200-24-2NW	NW-50	2 (50.80)	2.500 (63.50)	24 (609.60)	8.00 (203.20)
PVC-200-36-2NW	NW-50	2 (50.80)	2.500 (63.50)	36 (914.40)	8.00 (203.20)
PVC-200-72-2NW	NW-50	2 (50.80)	2.500 (63.50)	72 (1828.80)	8.00 (203.20)



SPECIFICATIONS

Nominal ID sizes: 1/2 to 2 inch (12.7-50.8mm)

Materials

Hose: Wire reinforced polyvinyl chloride (PVC)
 Nipples: 304 stainless steel
 Flanges: 304 stainless steel
 (316L available on request)

Vacuum Range: ≥1 x 10⁻² Rough vacuum

Maximum Temperature: -4° to 65°C



SPECIFICATIONS

Tube OD sizes: 1/2 to 12 inches (12.7-304.8mm)

Materials: 304 or 316L stainless steel

Vacuum range: $\geq 1 \times 10^{-13}$ mbar

Temperature range: -200° to 450°C

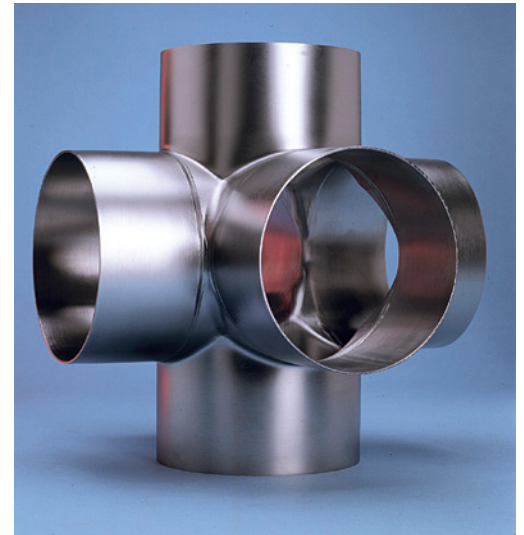
Nor-Cal Products has served industry and research for over 55 years as a premier source for manufactured stainless steel weld fittings.

We worked with Lawrence Livermore National Laboratory in the 1960's to develop their specification for vacuum piping, which has become the standard in the industry. Weld fittings are commonly used in vacuum roughing lines on semiconductor process equipment and for foreline and pump exhaust lines in semiconductor subfabs.

All tees and crosses are fabricated with the pulled-port technique and full penetration butt welds, providing crevice-free weld joints and the maximum in cleanliness for UHV applications.

Weld fittings are available from stock in 304 stainless steel. Some sizes are stocked in 316L stainless steel for additional corrosion resistance.

All weld fittings are available with various flange combinations. *Please refer to the appropriate flange fittings section in this catalog.*



Tube Finishes

The standard finish for all weld fittings is tumbled, although there are some fittings that are not available with the tumbled finish. These weld fittings are bead-blasted and are designated by a "-B" suffix on the part number. (See photo at right) All weld fittings can be electropolished on request. Call for pricing.

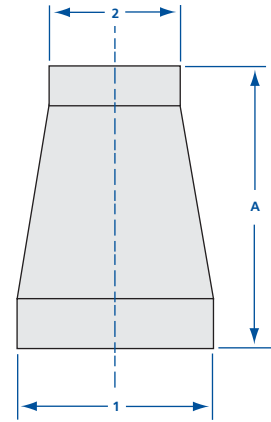
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



Conical reducers provide a compact means of adapting to a smaller diameter tube with minimal loss in conductance. They are available from stock in 304 stainless steel. Some sizes are stocked in 316L stainless steel for additional corrosion resistance. Conical adapter nipples are available with various flange combinations. See appropriate section.

Conical Reducers

MODEL NUMBER	TUBE OD 1	TUBE OD 2	A	WALL THICKNESS
B-31W-100-075	1 (25.40)	3/4 (19.05)	1.38 (35.05)	0.065 (1.65)
B-31W-150-075	1 1/2 (38.10)	3/4 (19.05)	2.38 (60.45)	0.065 (1.65)
B-31W-150-100	1 1/2 (38.10)	1 (25.40)	2.38 (60.45)	0.065 (1.65)
B-31W-200-100	2 (50.80)	1 (25.40)	2.38 (60.45)	0.065 (1.65)
B-31W-200-150	2 (50.80)	1 1/2 (38.10)	2.38 (60.45)	0.065 (1.65)
B-31W-250-150	2 1/2 (63.50)	1 1/2 (38.10)	2.38 (60.45)	0.065 (1.65)
B-31W-250-200	2 1/2 (63.50)	2 (50.80)	2.38 (60.45)	0.065 (1.65)
B-31W-300-150	3 (76.20)	1 1/2 (38.10)	3.62 (91.95)	0.065 (1.65)
B-31W-300-200	3 (76.20)	2 (50.80)	3.62 (91.95)	0.065 (1.65)
B-31W-300-250	3 (76.20)	2 1/2 (63.50)	3.62 (91.95)	0.065 (1.65)
B-31W-400-150	4 (101.60)	1 1/2 (38.10)	3.62 (91.95)	0.065 (1.65)
B-31W-400-200	4 (101.60)	2 (50.80)	3.62 (91.95)	0.065 (1.65)
B-31W-400-250	4 (101.60)	2 1/2 (63.50)	3.62 (91.95)	0.065 (1.65)
B-31W-400-300	4 (101.60)	3 (76.20)	3.62 (91.95)	0.065 (1.65)
B-31W-600-300-B	6 (152.40)	3 (76.20)	5.50 (139.70)	0.074 (1.88)
B-31W-600-400-B	6 (152.40)	4 (101.60)	5.50 (139.70)	0.074 (1.88)
B-31W-600-400-HW	6 (152.40)	4 (101.60)	5.50 (139.70)	0.083 (2.11)

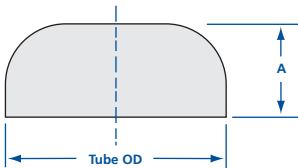


316L Conical Reducers

MODEL NUMBER	TUBE OD 1	TUBE OD 2	A	WALL THICKNESS
B-31W-200-100-316L	2 (50.80)	1 (25.40)	2.38 (60.45)	0.065 (1.65)
B-31W-200-150-316L	2 (50.80)	1 1/2 (38.10)	2.38 (60.45)	0.065 (1.65)
B-31W-300-200-316L	3 (76.20)	2 (50.80)	3.62 (91.95)	0.065 (1.65)
B-31W-400-150-316L-B	4 (101.60)	1 1/2 (38.10)	5.25 (133.35)	0.065 (1.65)
B-31W-400-200-316L	4 (101.60)	2 (50.80)	3.62 (91.95)	0.065 (1.65)

End Caps

MODEL NUMBER	TUBE OD	A	WALL THICKNESS
G-2W-050	1/2 (12.70)	0.32 (8.13)	0.050 (1.27)
G-2W-075	3/4 (19.05)	0.31 (7.87)	0.050 (1.27)
G-2W-100	1 (25.40)	0.43 (10.92)	0.060 (1.52)
G-2W-150	1 1/2 (38.10)	0.56 (14.22)	0.060 (1.52)
G-2W-200	2 (50.80)	0.75 (19.05)	0.060 (1.52)
G-2W-250	2 1/2 (63.50)	0.70 (17.78)	0.060 (1.52)
G-2W-300	3 (76.20)	0.67 (17.02)	0.074 (1.88)
G-2W-400	4 (101.60)	0.48 (12.19)	0.074 (1.88)
G-2W-450	4 1/2 (114.30)	0.51 (12.95)	0.060 (1.52)
G-2W-600	6 (152.40)	0.88 (22.35)	0.074 (1.88)
G-2W-800	8 (203.20)	0.83 (21.08)	0.074 (1.88)



End Cap Reducers

MODEL NUMBER	TUBE OD 1	TUBE OD 2	A
ECR-075-050	3/4 (19.05)	1/2 (12.70)	2.38 (60.45)
ECR-100-050	1 (25.40)	1/2 (12.70)	2.38 (60.45)
ECR-100-075	1 (25.40)	3/4 (19.05)	2.38 (60.45)
ECR-150-050	1 1/2 (38.10)	1/2 (12.70)	2.38 (60.45)
ECR-150-075	1 1/2 (38.10)	3/4 (19.05)	2.38 (60.45)
ECR-150-100	1 1/2 (38.10)	1 (25.40)	2.38 (60.45)
ECR-200-150	2 (50.80)	1 1/2 (38.10)	2.38 (60.45)
ECR-250-200	2 1/2 (63.50)	2 (50.80)	2.38 (60.45)
ECR-300-150	3 (76.20)	1 1/2 (38.10)	3.62 (91.95)
ECR-300-200	3 (76.20)	2 (50.80)	3.62 (91.95)
ECR-300-250	3 (76.20)	2 1/2 (63.50)	3.62 (91.95)
ECR-400-200-B	4 (101.60)	2 (50.80)	3.62 (91.95)
ECR-400-300-B	4 (101.60)	3 (76.20)	3.62 (91.95)
ECR-600-400-B	6 (152.40)	4 (101.60)	3.62 (91.95)
ECR-800-600-B	8 (203.20)	6 (152.40)	3.62 (91.95)

Other reducer combinations can be supplied upon request.

SPECIFICATIONS

Tube OD sizes: 1 to 6 inches (25.4-152.4mm)

Materials: 304 or 316L stainless steel

Vacuum range: $\geq 1 \times 10^{-13}$ mbar

Temperature range: -200° to 450°C

Weld Fittings

Elbows



SPECIFICATIONS

Tube OD sizes: 1/2 to 10 inches (12.7-254mm)

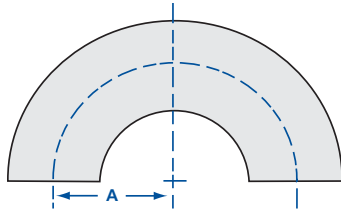
Materials: 304 or 316L stainless steel

Vacuum range: ≥1 x 10⁻¹³ mbar

Temperature range: -200° to 450°C

Nor-Cal Products offers 180° return bend radius elbows in sizes up to 2 inches (50.8mm) OD and 45° and 90° radius elbows in sizes up to 10 inches (254mm) OD. Radius elbows offer the highest conductance geometry in a tube bend. All elbows are available from stock in 304 stainless steel, and some sizes are stocked in 316L stainless steel for additional corrosion resistance.

We have added several 45° and 90° elbows with tangents to match other commonly available dimensions. Look for the HW suffix for elbows that match HPS weld fitting dimensions, for example. Elbows are also available with various flange combinations. See appropriate section.



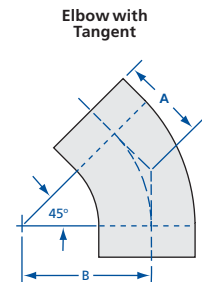
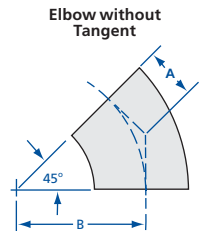
180° Return Bend Radius Elbows

MODEL NUMBER	TUBE OD	WALL THICKNESS	A
G-2WU-050	1/2 (12.70)	0.049 (1.24)	0.75 (19.05)
G-2WU-075	3/4 (19.05)	0.035 (0.89)	1.00 (25.40)
G-2WU-100	1 (25.40)	0.065 (1.65)	1.50 (38.10)
G-2WU-150	1 1/2 (38.10)	0.065 (1.65)	2.25 (57.15)
G-2WU-200	2 (50.80)	0.065 (1.65)	3.00 (76.20)



45° Radius Elbows

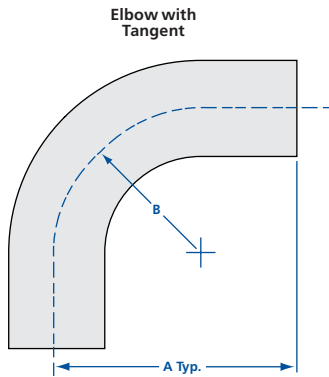
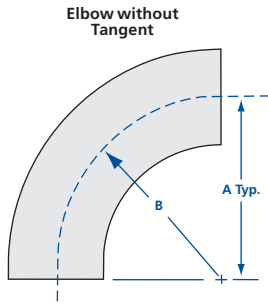
MODEL NUMBER	TUBE OD	WALL THICKNESS	A	B	316L TANGENT
G-2WK-050	1/2 (12.70)	0.049 (1.24)	0.31 (7.87)	0.75 (19.05)	
G-2WK-075	3/4 (19.05)	0.035 (0.89)	0.41 (10.41)	1.00 (25.40)	
G-2WK-075T	3/4 (19.05)	0.065 (1.65)	0.41 (10.41)	1.13 (28.70)	
G-2KL-075	3/4 (19.05)	0.035 (0.89)	0.76 (19.30)	1.00 (25.40)	✓
G-2WK-100	1 (25.40)	0.065 (1.65)	0.62 (15.75)	1.50 (38.10)	
G-2WK-100-316L	1 (25.40)	0.065 (1.65)	0.62 (15.75)	1.50 (38.10)	✓
G-2KL-100	1 (25.40)	0.065 (1.65)	0.97 (24.64)	1.50 (38.10)	✓
G-2KL-100HW	1 (25.40)	0.065 (1.65)	1.19 (30.23)	1.50 (38.10)	✓
G-2KL-100-316L	1 (25.40)	0.065 (1.65)	0.97 (24.64)	1.50 (38.10)	✓ ✓
G-2WK-150	1 1/2 (38.10)	0.065 (1.65)	0.93 (23.62)	2.25 (57.15)	
G-2WK-150-316L	1 1/2 (38.10)	0.065 (1.65)	0.93 (23.62)	2.25 (57.15)	✓
G-2KL-150	1 1/2 (38.10)	0.065 (1.65)	1.53 (35.86)	2.25 (57.15)	✓
G-2KL-150HW	1 1/2 (38.10)	0.065 (1.65)	1.63 (41.40)	2.25 (57.15)	✓
G-2KL-150-316L	1 1/2 (38.10)	0.065 (1.65)	1.53 (35.86)	2.25 (57.15)	✓ ✓
G-2WK-200	2 (50.80)	0.065 (1.65)	1.24 (31.50)	3.00 (76.20)	
G-2WK-200-316L	2 (50.80)	0.065 (1.65)	1.24 (31.50)	3.00 (76.20)	✓
G-2KL-200	2 (50.80)	0.065 (1.65)	1.84 (46.74)	3.00 (76.20)	✓
G-2KL-200HW	2 (50.80)	0.065 (1.65)	2.31 (58.67)	3.00 (76.20)	✓
G-2KL-200-316L	2 (50.80)	0.065 (1.65)	1.84 (46.74)	3.00 (76.20)	✓ ✓
G-2WK-250	2 1/2 (63.50)	0.065 (1.65)	1.55 (39.37)	3.75 (95.25)	
G-2WK-250-316L	2 1/2 (63.50)	0.065 (1.65)	1.55 (39.37)	3.75 (95.25)	✓
G-2KL-250	2 1/2 (63.50)	0.065 (1.65)	3.00 (76.20)	3.75 (95.25)	✓
G-2WK-300	3 (76.20)	0.065 (1.65)	1.86 (47.24)	4.50 (114.30)	
G-2WK-300-316L	3 (76.20)	0.065 (1.65)	1.86 (47.24)	4.50 (114.30)	✓
G-2KL-300	3 (76.20)	0.065 (1.65)	3.68 (93.47)	4.50 (114.30)	✓
G-2KL-300-316L	3 (76.20)	0.065 (1.65)	3.68 (93.47)	4.50 (114.30)	✓ ✓
G-2WK-400	4 (101.60)	0.083 (2.11)	2.49 (63.25)	6.00 (152.40)	
G-2WK-400-316L	4 (101.60)	0.083 (2.11)	2.49 (63.25)	6.00 (152.40)	✓
G-2KL-400	4 (101.60)	0.083 (2.11)	4.78 (121.41)	6.00 (152.40)	✓
G-2KL-400HW	4 (101.60)	0.083 (2.11)	4.81 (122.17)	6.00 (152.40)	✓
G-2KL-400-316L	4 (101.60)	0.083 (2.11)	4.78 (121.41)	6.00 (152.40)	✓ ✓
G-2WK-600-B	6 (152.40)	0.083 (2.11)	3.73 (94.74)	9.00 (228.60)	
G-2WK-800-B	8 (203.20)	¹⁰⁹ / _(2.77-3.40) - ¹³⁴	4.97 (126.24)	12.00 (304.80)	
G-2WK-1000-B	10 (254.00)	¹⁰⁹ / _(2.77-3.40) - ¹³⁴	6.21 (157.73)	15.00 (381.00)	



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.



90° Radius Elbows



MODEL NUMBER	TUBE OD	WALL THICKNESS	A	B	316L TANGENT
G-2WC-050	1/2 (12.70)	0.049 (1.24)	0.75 (19.05)	0.75 (19.05)	
G-2WC-075	3/4 (19.05)	0.035 (0.89)	1.00 (25.40)	1.00 (25.40)	
G-2WC-075H	3/4 (19.05)	0.035 (0.89)	1.42 (36.07)	1.00 (25.40)	✓
G-2WC-100	1 (25.40)	0.065 (1.65)	1.50 (38.10)	1.50 (38.10)	
G-2WC-100-316L	1 (25.40)	0.065 (1.65)	1.50 (38.10)	1.50 (38.10)	✓
G-2WC-100H	1 (25.40)	0.065 (1.65)	1.82 (46.23)	1.50 (38.10)	✓
G-2WC-100HW	1 (25.40)	0.065 (1.65)	2.06 (52.32)	1.50 (38.10)	✓
G-2WC-100H-316L	1 (25.40)	0.065 (1.65)	1.82 (46.23)	1.50 (38.10)	✓ ✓
G-2WC-150	1 1/2 (38.10)	0.065 (1.65)	2.25 (57.15)	2.25 (57.15)	
G-2WC-150-316L	1 1/2 (38.10)	0.065 (1.65)	2.25 (57.15)	2.25 (57.15)	✓
G-2WC-150H	1 1/2 (38.10)	0.065 (1.65)	2.41 (61.21)	2.25 (57.15)	✓
G-2WC-150HW	1 1/2 (38.10)	0.065 (1.65)	2.94 (74.68)	2.25 (57.15)	✓
G-2WC-150HL	1 1/2 (38.10)	0.065 (1.65)	4.97 (126.24)	2.25 (57.15)	✓
G-2WC-150H-316L	1 1/2 (38.10)	0.065 (1.65)	2.41 (61.21)	2.25 (57.15)	✓ ✓
G-2WC-200	2 (50.80)	0.065 (1.65)	3.00 (76.20)	3.00 (76.20)	
G-2WC-200-316L	2 (50.80)	0.065 (1.65)	3.00 (76.20)	3.00 (76.20)	✓
G-2WC-200H	2 (50.80)	0.065 (1.65)	4.06 (103.12)	3.00 (76.20)	✓
G-2WC-200HL	2 (50.80)	0.065 (1.65)	5.36 (136.14)	3.00 (76.20)	✓
G-2WC-200H-316L	2 (50.80)	0.065 (1.65)	4.06 (103.12)	3.00 (76.20)	✓ ✓
G-2WC-250	2 1/2 (63.50)	0.065 (1.65)	3.75 (95.25)	3.75 (95.25)	
G-2WC-250-316L	2 1/2 (63.50)	0.065 (1.65)	3.75 (95.25)	3.75 (95.25)	✓
G-2WC-250H	2 1/2 (63.50)	0.065 (1.65)	5.19 (131.83)	3.75 (95.25)	✓
G-2WC-300	3 (76.20)	0.065 (1.65)	4.50 (114.30)	4.50 (114.30)	
G-2WC-300-316L	3 (76.20)	0.065 (1.65)	4.50 (114.30)	4.50 (114.30)	✓
G-2WC-300H	3 (76.20)	0.065 (1.65)	6.31 (160.27)	4.50 (114.30)	✓
G-2WC-400	4 (101.60)	0.083 (2.11)	6.00 (152.40)	6.00 (152.40)	
G-2WC-400-316L	4 (101.60)	0.083 (2.11)	6.00 (152.40)	6.00 (152.40)	✓
G-2WC-400H	4 (101.60)	0.083 (2.11)	8.31 (211.07)	6.00 (152.40)	✓
G-2WC-600-B	6 (152.40)	0.109 (2.77)	9.00 (228.60)	9.00 (228.60)	
G-2WC-800-B	8 (203.20)	.109 - .134 (2.77-3.40)	12.00 (304.80)	12.00 (304.80)	
G-2WC-1000-B	10 (254.00)	.109 - .134 (2.77-3.40)	15.00 (381.00)	15.00 (381.00)	

SPECIFICATIONS

Tube OD sizes: 1/2 to 10 inches (12.7-254mm)

Materials: 304 stainless steel
(316L available upon request)

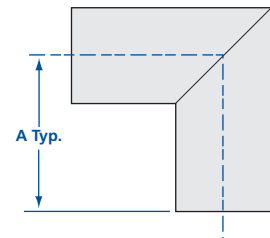
Vacuum range: ≥1 x 10⁻¹³ mbar

Temperature range: -200° to 450°C



90° Mitered Elbow

MODEL NUMBER	TUBE OD	WALL THICKNESS	A
E-075M	3/4 (19.05)	0.035 (0.89)	1.00 (25.40)
E-100M	1 (25.40)	0.065 (1.65)	1.88 (47.75)
E-150M	1 1/2 (38.10)	0.065 (1.65)	2.25 (57.15)
E-150MH	1 1/2 (38.10)	0.065 (1.65)	2.41 (61.21)
E-200M	2 (50.80)	0.065 (1.65)	3.00 (76.20)
E-200MH	2 (50.80)	0.065 (1.65)	2.61 (66.29)
E-250M	2 1/2 (63.50)	0.065 (1.65)	3.00 (76.20)
E-250MV	2 1/2 (63.50)	0.065 (1.65)	3.75 (95.25)
E-300M	3 (76.20)	0.065 (1.65)	3.25 (82.55)
E-400M	4 (101.60)	0.083 (2.11)	3.88 (98.55)
E-400MV-B	4 (101.60)	0.083 (2.11)	4.87 (123.70)
E-500M-B	5 (127.00)	0.083 (2.11)	4.25 (107.95)
E-600M-B	6 (152.40)	0.083 (2.11)	5.00 (127.00)
E-600MV-B	6 (152.40)	0.083 (2.11)	6.06 (153.92)
E-800M-B	8 (203.20)	0.120 (3.05)	7.00 (177.80)
E-1000M-B	10 (254.00)	0.120 (3.05)	9.50 (241.30)



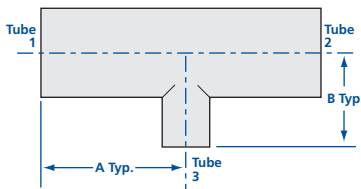
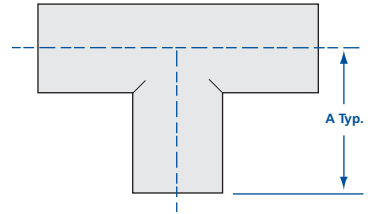


304 stainless steel tees and reducer tees are fabricated with the pulled-port technique and full penetration welds. This provides crevice-free weld joints and the maximum in cleanliness for UHV applications. Other sizes are available on request. We have added tees to match other commonly available dimensions. Look for the HW suffix for tees that match HPS weld fitting dimensions, for example. These fittings are also offered with various flange combinations. See appropriate flange section.



Tees

MODEL NUMBER	TUBE OD	WALL THICKNESS	A
G-7W-050	1/2 (12.70)	0.049 (1.24)	0.75 (19.05)
G-7W-075	3/4 (19.05)	0.035 (0.89)	1.00 (25.40)
G-7W-075HW	3/4 (19.05)	0.065 (1.65)	1.88 (47.75)
G-7W-075T	3/4 (19.05)	0.065 (1.65)	1.00 (25.40)
G-7W-100	1 (25.40)	0.065 (1.65)	1.88 (47.75)
G-7W-150	1 1/2 (38.10)	0.065 (1.65)	2.25 (57.15)
G-7W-150H	1 1/2 (38.10)	0.065 (1.65)	2.41 (61.21)
G-7W-200	2 (50.80)	0.065 (1.65)	3.00 (76.20)
G-7W-200H	2 (50.80)	0.065 (1.65)	2.61 (66.29)
G-7W-250	2 1/2 (63.50)	0.065 (1.65)	3.00 (76.20)
G-7W-250V	2 1/2 (63.50)	0.065 (1.65)	3.75 (95.25)
G-7W-300	3 (76.20)	0.065 (1.65)	3.25 (82.55)
G-7W-400	4 (101.60)	0.083 (2.11)	3.88 (98.55)
G-7W-400V	4 (101.60)	0.083 (2.11)	4.87 (123.70)
G-7W-500-B	5 (127.00)	0.083 (2.11)	4.25 (107.95)
G-7W-600-B	6 (152.40)	0.083 (2.11)	5.00 (127.00)
G-7W-600V-B	6 (152.40)	0.083 (2.11)	6.06 (153.92)
G-7W-800-B	8 (203.20)	0.120 (3.05)	7.00 (177.80)
G-7W-1000-B	10 (254.00)	0.120 (3.05)	9.50 (241.30)



Reducer Tees

MODEL NUMBER	TUBE 1 & 2 ARM OD	TUBE 3 LEG OD	A	B
G-7WR-100-050	1 (25.40)	1/2 (12.70)	1.88 (47.75)	1.00 (25.40)
G-7WR-100-075	1 (25.40)	3/4 (19.05)	1.88 (47.75)	1.12 (28.45)
G-7WR-150-050	1 1/2 (38.10)	1/2 (12.70)	2.25 (57.15)	1.25 (31.75)
G-7WR-150-075	1 1/2 (38.10)	3/4 (19.05)	2.25 (57.15)	1.38 (35.05)
G-7WR-150-100	1 1/2 (38.10)	1 (25.40)	2.25 (57.15)	2.13 (54.10)
G-7WR-200-050	2 (50.80)	1/2 (12.70)	3.00 (76.20)	1.50 (38.10)
G-7WR-200-075	2 (50.80)	3/4 (19.05)	3.00 (76.20)	1.63 (41.40)
G-7WR-200-100	2 (50.80)	1 (25.40)	3.00 (76.20)	2.38 (60.45)
G-7WR-200-150	2 (50.80)	1 1/2 (38.10)	3.00 (76.20)	2.50 (63.50)
G-7WR-250-150	2 1/2 (63.50)	1 1/2 (38.10)	3.00 (76.20)	2.75 (69.85)
G-7WR-250-200	2 1/2 (63.50)	2 (50.80)	3.00 (76.20)	3.25 (82.55)
G-7WR-300-150	3 (76.20)	1 1/2 (38.10)	3.25 (82.55)	3.00 (76.20)
G-7WR-300-200	3 (76.20)	2 (50.80)	3.25 (82.55)	3.50 (88.90)
G-7WR-300-250	3 (76.20)	2 1/2 (63.50)	3.25 (82.55)	3.25 (82.55)
G-7WR-400-150-B	4 (101.60)	1 1/2 (38.10)	3.88 (98.55)	3.50 (88.90)
G-7WR-400-200-B	4 (101.60)	2 (50.80)	3.88 (98.55)	4.00 (101.60)
G-7WR-400-250-B	4 (101.60)	2 1/2 (63.50)	3.88 (98.55)	3.75 (95.25)
G-7WR-400-300-B	4 (101.60)	3 (76.20)	3.88 (98.55)	3.75 (95.25)
G-7WR-500-400-B	5 (127.00)	4 (101.60)	4.25 (107.95)	4.38 (111.25)
G-7WR-600-150-B	6 (152.40)	1 1/2 (38.10)	5.00 (127.00)	4.50 (114.30)
G-7WR-600-200-B	6 (152.40)	2 (50.80)	5.00 (127.00)	5.00 (127.00)
G-7WR-600-250-B	6 (152.40)	2 1/2 (63.50)	5.00 (127.00)	4.75 (120.65)
G-7WR-600-400-B	6 (152.40)	4 (101.60)	5.00 (127.00)	4.88 (123.95)
G-7WR-600-500-B	6 (152.40)	5 (127.00)	5.00 (127.00)	4.75 (120.65)
G-7WR-800-600-B	8 (203.20)	6 (152.40)	7.00 (177.80)	6.00 (152.40)



SPECIFICATIONS

Tube OD sizes: 1/2 to 10 inches (12.7-254mm)

Materials: 304 or stainless steel
(316L available upon request)

Vacuum range: $\geq 1 \times 10^{-13}$ mbar

Temperature range: -200° to 450°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

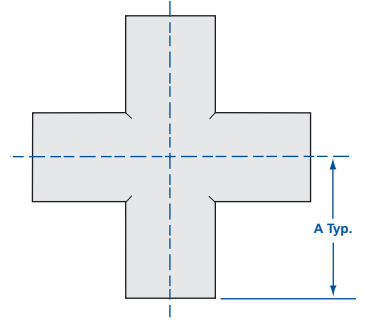


304 stainless steel crosses and reducer crosses are offered in a wide range of sizes as standard products. All crosses are fabricated with the pulled-port technique and full penetration butt welds. This provides crevice-free weld joints and the maximum in cleanliness for UHV applications. As always, other sizes are available on request. These fittings are offered with various flange combinations. See appropriate sections.

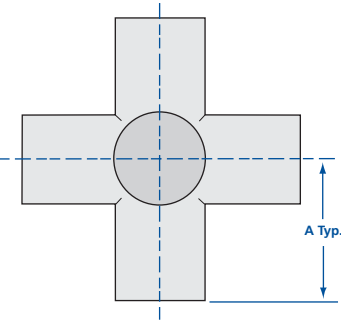
4-Way Crosses



MODEL NUMBER	TUBE OD	WALL THICKNESS	A
G-9W-050	1/2 (12.70)	0.049 (1.24)	0.75 (19.05)
G-9W-075	3/4 (19.05)	0.035 (.89)	1.00 (25.40)
G-9W-100	1 (25.40)	0.065 (1.65)	1.88 (47.75)
G-9W-150	1 1/2 (38.10)	0.065 (1.65)	2.25 (57.15)
G-9W-150H	1 1/2 (38.10)	0.065 (1.65)	2.41 (61.21)
G-9W-200	2 (50.80)	0.065 (1.65)	3.00 (76.20)
G-9W-200H	2 (50.80)	0.065 (1.65)	2.61 (66.29)
G-9W-250	2 1/2 (63.50)	0.065 (1.65)	3.00 (76.20)
G-9W-250V	2 1/2 (63.50)	0.065 (1.65)	3.75 (95.25)
G-9W-300	3 (76.20)	0.065 (1.65)	3.25 (82.55)
G-9W-400	4 (101.60)	0.083 (2.11)	3.88 (98.55)
G-9W-400V	4 (101.60)	0.083 (2.11)	4.87 (123.70)
G-9W-500-B	5 (127.00)	0.083 (2.11)	4.25 (107.95)
G-9W-600-B	6 (152.40)	0.083 (2.11)	5.00 (127.00)
G-9W-600V-B	6 (152.40)	0.083 (2.11)	6.06 (153.92)
G-9W-800-B	8 (203.20)	0.120 (3.05)	7.00 (177.80)
G-9W-1000-B	10 (254.00)	0.120 (3.05)	9.50 (241.30)



5-Way Crosses



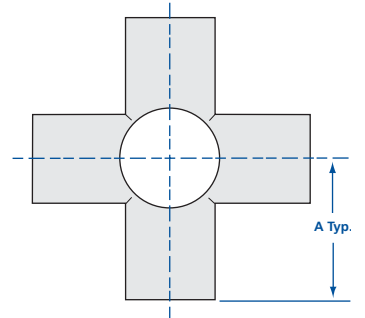
MODEL NUMBER	TUBE OD	WALL THICKNESS	A
G-10W-075	3/4 (19.05)	0.035 (0.89)	1.00 (25.40)
G-10W-100	1 (25.40)	0.065 (1.65)	1.88 (47.75)
G-10W-150	1 1/2 (38.10)	0.065 (1.65)	2.25 (57.15)
G-10W-200	2 (50.80)	0.065 (1.65)	3.00 (76.20)
G-10W-250	2 1/2 (63.50)	0.065 (1.65)	3.00 (76.20)
G-10W-250V	2 1/2 (63.50)	0.065 (1.65)	3.75 (95.25)
G-10W-300-B	3 (76.20)	0.065 (1.65)	3.25 (82.55)
G-10W-400-B	4 (101.60)	0.083 (2.11)	3.88 (98.55)
G-10W-400V-B	4 (101.60)	0.083 (2.11)	4.87 (123.70)
G-10W-500-B	5 (127.00)	0.083 (2.11)	4.25 (107.95)
G-10W-600-B	6 (152.40)	0.083 (2.11)	5.00 (127.00)
G-10W-600V-B	6 (152.40)	0.083 (2.11)	6.06 (153.92)
G-10W-800-B	8 (203.20)	0.120 (3.05)	7.00 (177.80)
G-10W-1000-B	10 (254.00)	0.120 (3.05)	9.50 (241.30)



6-Way Crosses



MODEL NUMBER	TUBE OD	WALL THICKNESS	A
G-11W-075	3/4 (19.05)	0.035 (0.89)	1.00 (25.40)
G-11W-100	1 (25.40)	0.065 (1.65)	1.88 (47.75)
G-11W-150	1 1/2 (38.10)	0.065 (1.65)	2.25 (57.15)
G-11W-200	2 (50.80)	0.065 (1.65)	3.00 (76.20)
G-11W-250	2 1/2 (63.50)	0.065 (1.65)	3.00 (76.20)
G-11W-250V	2 1/2 (63.50)	0.065 (1.65)	3.75 (95.25)
G-11W-300-B	3 (76.20)	0.065 (1.65)	3.25 (82.55)
G-11W-400-B	4 (101.60)	0.083 (2.11)	3.88 (98.55)
G-11W-400V-B	4 (101.60)	0.083 (2.11)	4.87 (123.70)
G-11W-500-B	5 (127.00)	0.083 (2.11)	4.25 (107.95)
G-11W-600-B	6 (152.40)	0.083 (2.11)	5.00 (127.00)
G-11W-600V-B	6 (152.40)	0.083 (2.11)	6.06 (153.92)
G-11W-800-B	8 (203.20)	0.120 (3.05)	7.00 (177.80)
G-11W-1000-B	10 (254.00)	0.120 (3.05)	9.50 (241.30)





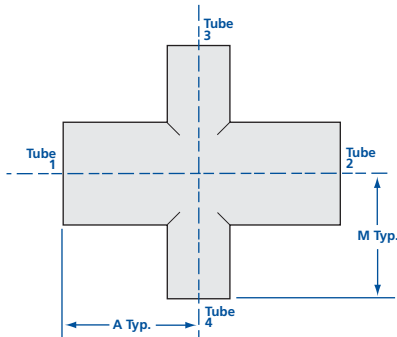
SPECIFICATIONS

Tube OD sizes: 3/4 to 12 inches
(19.05-304.8mm)

Materials: 304 or stainless steel
(316L available upon request)

Vacuum range: $\geq 1 \times 10^{-13}$ mbar

Temperature range: -200° to 450°C



Reducer Crosses

MODEL NUMBER	TUBE 1 & 2 ARM OD	TUBE 3 & 4 LEG OD	A	M
G-9WR-100-050	1 (25.40)	1/2 (12.70)	1.88 (47.75)	1.00 (25.40)
G-9WR-100-075	1 (25.40)	3/4 (19.05)	1.88 (47.75)	1.12 (28.45)
G-9WR-150-050	1 1/2 (38.10)	1/2 (12.70)	2.25 (57.15)	1.25 (31.75)
G-9WR-150-075	1 1/2 (38.10)	3/4 (19.05)	2.25 (57.15)	1.38 (35.05)
G-9WR-150-100	1 1/2 (38.10)	1 (25.40)	2.25 (57.15)	2.13 (54.10)
G-9WR-200-050	2 (50.80)	1/2 (12.70)	3.00 (76.20)	1.50 (38.10)
G-9WR-200-075	2 (50.80)	3/4 (19.05)	3.00 (76.20)	1.63 (41.40)
G-9WR-200-150	2 (50.80)	1 1/2 (38.10)	3.00 (76.20)	2.50 (63.50)
G-9WR-250-150	2 1/2 (63.50)	1 1/2 (38.10)	3.00 (76.20)	2.75 (69.85)
G-9WR-250-200	2 1/2 (63.50)	2 (50.80)	3.00 (76.20)	3.25 (82.55)
G-9WR-300-150	3 (76.20)	1 1/2 (38.10)	3.25 (82.55)	3.00 (76.20)
G-9WR-300-200	3 (76.20)	2 (50.80)	3.25 (82.55)	3.50 (88.90)
G-9WR-300-250	3 (76.20)	2 1/2 (63.50)	3.25 (82.55)	3.25 (82.55)
G-9WR-400-150-B	4 (101.60)	1 1/2 (38.10)	3.88 (98.55)	3.50 (88.90)
G-9WR-400-200-B	4 (101.60)	2 (50.80)	3.88 (98.55)	4.00 (101.60)
G-9WR-400-250-B	4 (101.60)	2 1/2 (63.50)	3.88 (98.55)	3.75 (95.25)
G-9WR-400-300-B	4 (101.60)	3 (76.20)	3.88 (98.55)	3.75 (95.25)
G-9WR-500-400-B	5 (127.00)	4 (101.60)	4.25 (107.95)	4.38 (111.25)
G-9WR-600-150-B	6 (152.40)	1 1/2 (38.10)	5.00 (127.00)	4.50 (114.30)
G-9WR-600-200-B	6 (152.40)	2 (50.80)	5.00 (127.00)	5.00 (127.00)
G-9WR-600-250-B	6 (152.40)	2 1/2 (63.50)	5.00 (127.00)	4.75 (120.65)
G-9WR-600-300-B	6 (152.40)	3 (76.20)	5.00 (127.00)	4.75 (120.65)
G-9WR-600-400-B	6 (152.40)	4 (101.60)	5.00 (127.00)	4.88 (123.95)
G-9WR-600-500-B	6 (152.40)	5 (127.00)	5.00 (127.00)	4.75 (120.65)
G-9WR-800-600-B	8 (203.20)	6 (152.40)	7.00 (177.80)	6.00 (152.40)

Other reducer combinations can be supplied upon request.



304 & 316L Stainless Steel Tubing

Nor-Cal Products consumption of stainless steel tubing for its own products makes it possible to offer 304 and 316L stainless steel tubing in lengths up to 20 feet. 304 stainless steel tubing standard finishes are white pickled (Number 1 unpolished), bright annealed or polished OD and ID, depending on the size. 316L stainless steel tubing is offered with a bright annealed finish only. Bright annealed and polished tubing has been pickled and passivated. Polished tube can be described as No. 4 polished. The surface meets ASTM A270, and has received a 150 grit polish on the OD and 180 grit on the ID. *Special cleaning, materials and surface finishes are available for an additional charge.*



SPECIFICATIONS

Tube OD sizes: 1/2 to 12 inches
(12.7-304.8mm)

Materials: 304 or 316L stainless steel

Finishes: Bright Annealed,
polished ID & OD & white pickled

Vacuum range: $\geq 1 \times 10^{-13}$ mbar

Temperature range: -200° to 450°C

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

MODEL NUMBER	SURFACE FINISH	TUBE OD	TUBE ID	WALL THICKNESS
SST-050	Bright annealed	1/2 (12.70)	0.402 (10.21)	0.049 (1.24)
SST-075	Bright annealed	3/4 (19.05)	0.680 (17.27)	0.035 (0.89)
SST-075-316L	Bright annealed	3/4 (19.05)	0.680 (17.27)	0.035 (0.89)
SST-100	Polished ID & OD	1 (25.40)	0.870 (22.10)	0.065 (1.65)
SST-100-316L	Bright annealed	1 (25.40)	0.870 (22.10)	0.065 (1.65)
SST-125	Bright annealed	1 1/4 (31.75)	1.120 (28.45)	0.065 (1.65)
SST-150	Polished ID & OD	1 1/2 (38.10)	1.370 (34.80)	0.065 (1.65)
SST-150-316L	Bright annealed	1 1/2 (38.10)	1.370 (34.80)	0.065 (1.65)
SST-162	Bright annealed	1 5/8 (41.28)	1.490 (37.85)	0.065 (1.65)
SST-175	Bright annealed	1 3/4 (44.45)	1.630 (41.40)	0.065 (1.65)
SST-200	Polished ID & OD	2 (50.80)	1.870 (47.50)	0.065 (1.65)
SST-200-316L	Bright annealed	2 (50.80)	1.870 (47.50)	0.065 (1.65)
SST-250	Polished ID & OD	2 1/2 (63.5)	2.370 (60.20)	0.065 (1.65)
SST-250-316L	Bright annealed	2 1/2 (63.5)	2.370 (60.20)	0.065 (1.65)
SST-300	Polished ID & OD	3 (76.20)	2.870 (72.90)	0.065 (1.65)
SST-300-316L	Bright annealed	3 (76.20)	2.870 (72.90)	0.065 (1.65)
SST-400	Polished ID & OD	4 (101.60)	3.834 (97.38)	0.083 (2.11)
SST-400-316L	Bright annealed	4 (101.60)	3.834 (97.38)	0.083 (2.11)
SST-500	White pickled	5 (127.00)	4.834 (122.78)	0.083 (2.11)
SST-600	White pickled	6 (152.40)	5.834 (148.18)	0.083 (2.11)
SST-800	White pickled	8 (203.20)	7.760 (197.10)	0.120 (3.05)
SST-1000	White pickled	10 (254.00)	9.760 (247.90)	0.120 (3.05)
SST-1200	White pickled	12 (304.80)	11.760 (298.70)	0.120 (3.05)

* Cutting fee applies, call for pricing. To order specify length required in feet as follows:
SST-400-20.0 (20" length of 4" OD tube) SST-150-316L-20.0 (20" length of 1.5" OD tube)