TECHNICAL INFORMATION

WORKING PRESSURE

The tables on the following pages list the recommended working pressure for a variety of hydraulic fittings made in accordance with certain industry standards. Many factors such as impulse, vibration, mechanical shock, and improper assembly may affect the integrity of the fitting connection.

Midland Industries recommends sufficient testing be conducted to ensure that performance levels will be safe and satisfactory, especially if installed in systems operating at elevated pressures or in severe conditions. Working pressure ratings are capable of a 4 to 1 minimum burst. All steel fittings meet or exceed the minimum SAE pressure ratings. Always consider application and maximum pressure requirements when selecting fittings.

METHODS FOR INSTALLING FITTINGS

There are three methods for installing a fitting:

- Torque wrench
- Flats From Wrench Resistance
- Turns From Finger Tight

For Flare and NPSM Fittings, Midland recommends the flats from wrench resistence method be used whenever possible.

The differences in material, plating, and surface finish impacts the coefficient of friction when installing or connecting fittings. To minimize these variances, Midland recommends that fitting connections are lubricated when installed. Connections that are lubricated provide a more accurate installation torque, which results in fewer leaks.

USING A TORQUE WRENCH

The torque values given in the tables on the following pages are for reference purposes only based on industry standard practice and for low carbon steel mating with steel/iron components. Actual torque values may need to be adjusted due to variances described above.

SAE recommends always making a wet (lubricated) installation or connection to reduce friction on moving parts, O-rings, and variances in material and plating. The torque values in these tables are based off SAE values using a .17 coefficient of friction as per SAE J2593. Many hydraulic leaks are a result of over-torque, which causes excessive deformation of material or exceeds the yield strength of the material, which may reduce the load or clamping force between seal contacts.

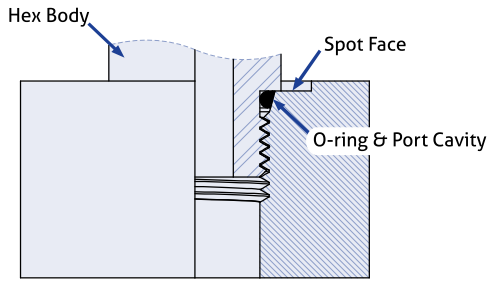
If more than one value or range is given, use the lower value first and increase only if required. Over-torquing can damage a fitting or mating component.

SAE O-Ring Boss Port Specifications

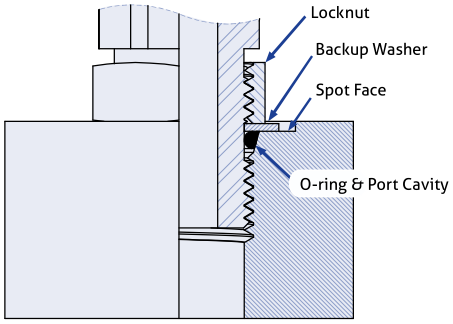
O-ring Boss ports (ORB) provide a seal by trapping the fitting's O-ring inside a port cavity. When a fitting is installed into the port, the O-ring is trapped between the fitting body hex or washer and port cavity.

Straight fittings include a hex, and sometimes an additional cylindrical shoulder below the hex and above the threads, to trap the O-ring in the port cavity.

Elbow and Tee fittings require a backup washer and a locknut above the O-ring on the threaded stud to permit a 360° orientation of the fitting around the port.



Straight SAE ORB



Adustable SAE ORB

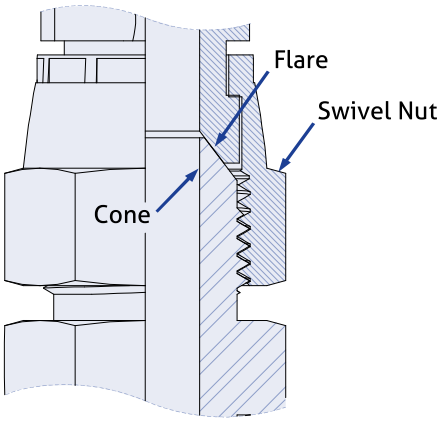
The following table lists the specifications for SAE O-Ring Boss Ports.

SAE O-Ring Boss Specifications								
Dash Size	Tube Size	Thread	SAE-ORB to JIC and Pipe Fittings*			SAE-ORB to ORFS Fittings**		
			Torque	Working Pressure		Torque	Working Pressure	
			Adjustable & Non- Adjustable	Adjustable	Non-Adjustable	Adjustable & Non- Adjustable	Adjustable	Non- Adjustable
			(ft-lbs) +25% -0%	*(psi)*	*(psi)*	*(ft-lbs) +25% -0%*	*(psi)*	*(psi)*
02	*1/8*	*5/16-24*	*6*	*4500*	*4500*	-	-	-
03	*3/16*	*3/8-24*	*7*	*4500*	*4500*	*7*	*5800*	*9100*
04	*1/4*	*7/16-20*	*13*	*4500*	*4500*	*15*	*5800*	*9100*
05	*5/16*	*1/2-20*	*18*	*4500*	*4500*	*18*	*5800*	*9100*
06	*3/8*	*9/16-18*	*22*	*3600*	*4500*	*26*	*5800*	*9100*
08	*1/2*	*3/4-16*	*37*	*3600*	*4500*	*52*	*5800*	*9100*
10	*5/8*	*7/8-14*	*44*	*2900*	*3600*	*74*	*5800*	*9100*
12	*3/4*	*1-1/16-12*	*70*	*2900*	*3600*	*125*	*5800*	*5800*
14	*7/8*	*1-3/16-12*	*92*	*2300*	*2900*	*158*	*5800*	*5800*
16	*1*	*1-5/16-12*	*111*	*2300*	*2900*	*199*	*4500*	*5800*
20	*1 1/4*	*1-5/8-12*	*147*	*1800*	*2300*	*210*	*3600*	*3600*
24	*1 1/2*	*1-7/8-12*	*155*	*1800*	*2300*	*273*	*2900*	*3600*
32	*2*	*2-1/2-12*	*221*	*1450*	*1800*	-	-	-
* = Light duty studs included on JIC, NPTF and NPSM fittings per SAE J1926/3 & J514 ** = Heavy duty studs included on ORFS fittings per SAE J1926/2 & J1453								
Note: Torque values are for wet torque and are allowed up to 25% the listed value according to SAE J2593.								

JIC Adapter Specifications

Male flared fittings include a conical nose with external threads for clamping.

A flared fitting or tube assembly is tightened against the cone with a swivel nut. By forcing the flare against the cone during the torquing process, the nose cone is slightly deformed and meshes to create a metal to metal seal between the flare and the cone.



The following table lists the specifications for JIC adapters.

JIC Specifications							
Dash Size	Tube Size	Thread	Working Pressure		Torque		
			Male	Female Swivel Nut	JIC Rigid	JIC Swivel	Bulkhead Locknut
			(psi)	(psi)	(FFWR)	(FFWR)	(ft-lbs) +25% -0%
02	1/8	5/16-24	5000	5000	1/4 - 1/2	2	4
03	3/16	3/8-24	5000	5000	1/4 - 1/2	2	6
04	1/4	7/16-20	5000	4500	1/4 - 1/2	2	10
05	5/16	1/2-20	5000	4000	1/4 - 1/2	2	13
06	3/8	9/16-18	5000	4000	1/4 - 1/2	2	16
08	1/2	3/4-16	4500	4000	1/4 - 1/2	2	27
10	5/8	7/8-14	3500	3000	1/4 - 1/2	1 1/2	32
12	3/4	1-1/16-12	3500	3000	1/4 - 1/2	1 1/2	52
14	7/8	1-3/16-12	3000	2500	1/4 - 1/2	1 1/2	66
16	1	1-5/16-12	3000	2500	1/4 - 1/2	1 1/2	85
20	1 1/4	1-5/8-12	2500	2000	1/4 - 1/2	1	111
24	1 1/2	1-7/8-12	2000	1500	1/4 - 1/2	1	114
32	2	2-1/2-12	1500	1125	1/4 - 1/2	1	162
Values are per SAE J514							

It has been my observation that most people get ahead during the time that others waste. -*Henry Ford*

Pipe & Pipe Swivel Adapter Specifications

NPSM fittings include an inverted 60° cone inside an internally threaded swivel union nut. Male NPTF fittings that have a 30° internal chamfer that make a 60° inverted cone, will mate with NPSM swivel unions.

NOTE: THE MATING MALE THREADS MUST INCLUDE AN INSIDE CHAMFER ON THE END OF THE FITTING THAT MATES WITH THE INVERTED CONE. THREADS ARE FOR CLAMPING FORCE ONLY AND THE SEALING OCCURS ON A SMALL RADIAL SECTION BETWEEN THE MALE FITTING INTERNAL CHAMFER AND THE SWIVEL UNION INVERTED CONE.

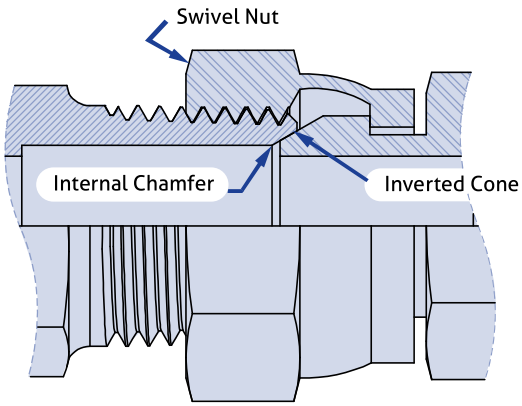


Figure 7 : NPTF & NPSM Union

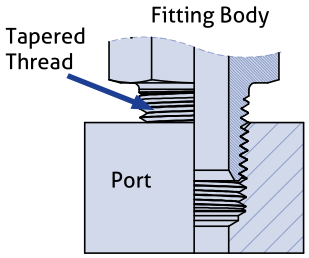


Figure 8: NPT & NPTF Assembly

NPT and NPTF pipe threads seal by wedging the tapered threads through deformation into each other. Both of these threads require thread sealants to complete a seal.

The following table lists the specifications for NPT, NPTF, and NPSM Pipe adapters.

NPT, NPTF, and NPSM Pipe Specifications						
Dash Size	Thread Size	Major OD* (inch)	Working Pressure		Torque	
			NPT, NPTF Male and Female	NPSM Female Swivel Nut	NPT, NPTF	NPSM Swivel Union
			(psi)	*(psi)*	*(TFFT)*	*(FFWR)*
02	*1/8-27*	*.405*	*5000*	*5000*	*2-3*	*2*
04	*1/4-18*	*.540*	*4000*	*5000*	*2-3*	*2*
06	*3/8-18*	*.675*	*3000*	*4000*	*2-3*	*2*
08	*1/2-14*	*.84*	*3000*	*3500*	*2-3*	*2*
12	*3/4-14*	*1.050*	*2500*	*2250*	*2-3*	*2*
16	*1-11 1/2*	*1.315*	*2000*	*2000*	*1 1/2 - 2 1/2*	*1 1/2*
20	*1 1/4-11 1/2*	*1.660*	*1150*	*1625*	*1 1/2 - 2 1/2*	*1 1/2*
24	*1 1/2-11 1/2*	*1.900*	*1000*	*1250*	*1 1/2 - 2 1/2*	*1 1/2*
32	*2-11 1/2*	*2.375*	*1000*	*1125*	*1 1/2 - 2 1/2*	*1 1/2*
Values are per SAE J514 & J2593						

Table 3: NPT, NPTF, and NPSM Pipe Specifications

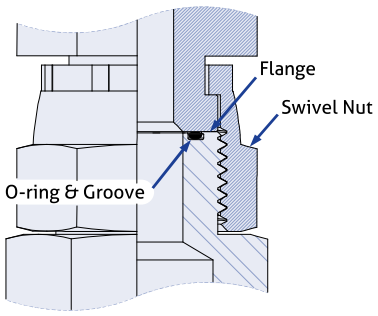
Folks who never do any more than they are paid for, never get paid for any more than they do.

-Elebert Hubbard

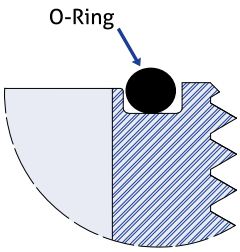
O-ring Face Seal Adapter Specifications

O-ring face seal fittings include a precision groove in the face of the male fitting. Sealing occurs when an O-ring is trapped in the groove by a smooth flat flange that is clamped against the face with a nut or nut and sleeve. The flat flange may be formed or brazed onto the end of a tube, or is machined on a fitting.

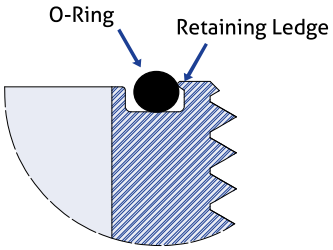
There are two SAE groove types:
- Type A: The original style A O-ring has no retaining ledge.
- Type B: The Type B groove has a retaining ledge (half dovetail) that improves O-ring retention. The Type B style is more commonly found and is a design improvement over the Type A.



ORFS Fitting Assembly



Detail View of Cross Section of Groove Type A



View of Groove Type B

The following table lists the specifications for O-ring Face Seal adapters.

ORFS Specifications								
Dash Size	Tube Size	Thread Size	Working Pressure		Torque			
			Male	Female Swivel Nut	Male & Female	Bulkhead Locknut	Tube Nuts	Swivel Nuts
			(psi)	*(psi)*	*(ft-lbs) +25% -0%*	*(ft-lbs) +25% -0%*		
04	*1/4*	*9/16-18*	*6000*	*6000*	*18*	*16*	*1/4-1/2*	*1/2-3/4*
06	*3/8*	*11/16-16*	*6000*	*6000*	*29*	*22*	*1/4-1/2*	*1/2-3/4*
08	*1/2*	*13/16-16*	*6000*	*6000*	*41*	*29*	*1/4-1/2*	*1/2-3/4*
10	*5/8*	*1-14*	*6000*	*6000*	*44*	*44*	*1/4-1/2*	*1/2-3/4*
12	*3/4*	*1-3/16-12*	*6000*	*6000*	*66*	*66*	*1/4-1/2*	*1/3-1/2*
16	*1*	*1-7/16-12*	*6000*	*5000*	*92*	*92*	*1/4-1/2*	*1/3-1/2*
20	*1 1/4*	*1-11/16-12*	*4000*	*4000*	*125*	*111*	*1/4-1/2*	*1/3-1/2*
24	*1 1/2*	*2-12*	*4000*	*3000*	*147*	*125*	*1/4-1/2*	*1/3-1/2*
Note: Values are per SAE J2593 & J1453								
Torque values are for wet installation of steel components. Reduce torque values for softer material components.								

Table 4 : ORFS Specifications

BSPT, BSPP and Metric Adapter Specifications

BSPT and Metric tapered threads install and work in the same manner as NPT and NPTF.

Male BSPP fittings include an inverted 60° cone inside an internally threaded swivel union nut. Male BSPP fittings that have a 30° internal chamfer that make a 60° inverted cone, will mate with Female BSPP swivel unions.

NOTE: THE MATING MALE THREADS MUST INCLUDE AN INSIDE CHAMFER ON THE END OF THE FITTING THAT MATES WITH THE INVERTED CONE. THREADS ARE FOR CLAMPING FORCE ONLY AND THE SEALING OCCURS ON A SMALL RADIAL SECTION BETWEEN THE MALE FITTING INTERNAL CHAMFER AND THE SWIVEL UNION INVERTED CONE.

DIN swivel unions have a 24° inverted cone and may be installed into DIN bite-ring compression fittings. To provide enhanced performance, an O-ring is sometimes included in the cone of some DIN swivel unions.

British Standard Pipe Parallel (BSPP) and Metric Parallel threaded ports do not include a port cavity like the O-ring Boss or ISO 6149 port. Instead, an O-ring sits on top of the spot face or external surface and is surrounded by a metal retaining ring or other retaining component to trap the O-ring between the fitting hex, body, and spot face.

Elbow and Tee fittings have a locknut, backup washer, O-ring and retaining washer to permit 360° orientation around the axis of the port.

The following table lists the specifications for **BSPP & BSPT Adapters**

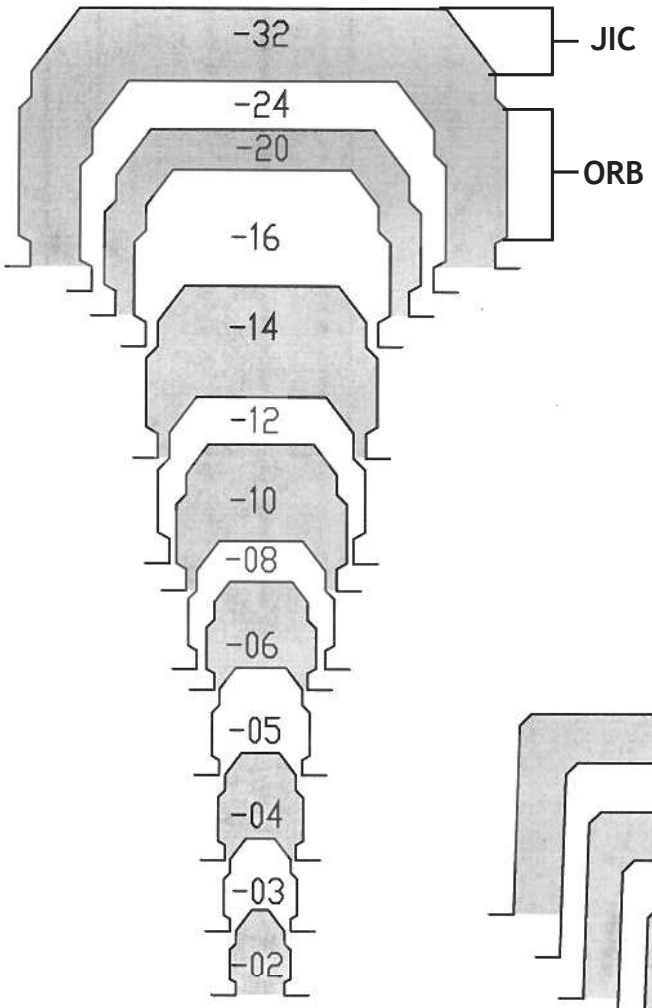
BSPP & BSPT Specifications				
Dash Size	BSPT & BSPP		Torque	
	THREAD SIZE	MAJOR OD*	BSPP Swivel Union	BSPT
		(inch)		
02	1/8-28	0.383	2	2-3
04	1/4-19	0.518	2	2-3
06	3/8-19	0.656	2	2-3
08	1/2-14	0.825	2	2-3
10	5/8-14	0.929	2	2-3
12	3/4-14	1.041	2	2-3
16	1-11	1.309	1 1/2	1 1/2 - 2 1/2
20	1 1/4-11	1.650	1 1/2	1 1/2 - 2 1/2
24	1 1/2-11	1.882	1 1/2	1 1/2 - 2 1/2
32	2-11	2.347	1 1/2	1 1/2 - 2 1/2

The following table lists the specifications for **Metric Adapters**

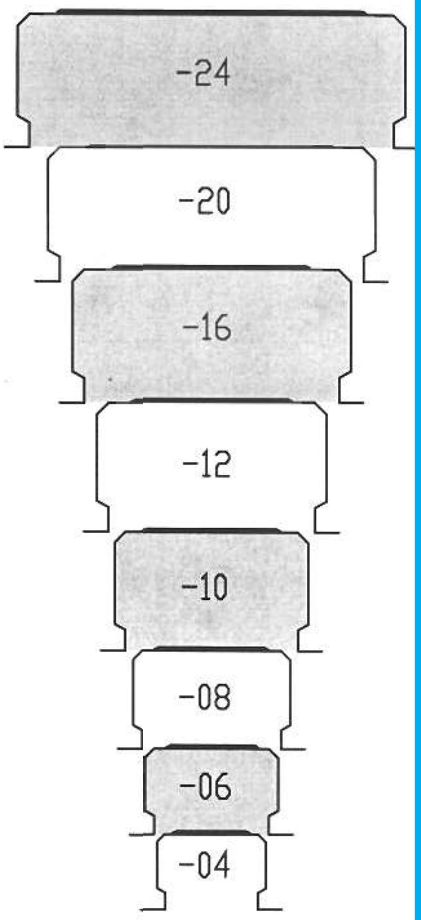
Metric DIN 3852-1 Threads	
Dash Size	THREAD SIZE
	(mm)
08	8 x 1.0
10	10 x 1.0
12	12 x 1.5
14	14 x 1.5
16	16 x 1.5
18	18 x 1.5
20	20 x 1.5
22	22 x 1.5
24	24 x 1.5
26	26 x 1.5
27	27 x 2.0
30	30 x 2.0
33	33 x 2.0
39	39 x 2.0
42	42 x 2.0
48	48 x 2.0
60	60 X 2.0
Values are from DIN 3852-1	

PROFILE SIZE CHART

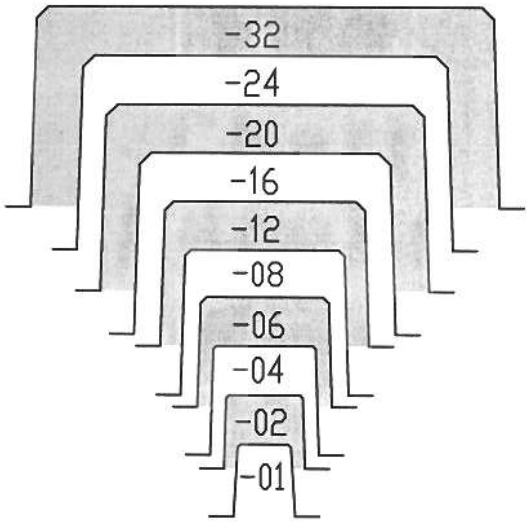
MALE JIC/ MALE O-RING BOSS

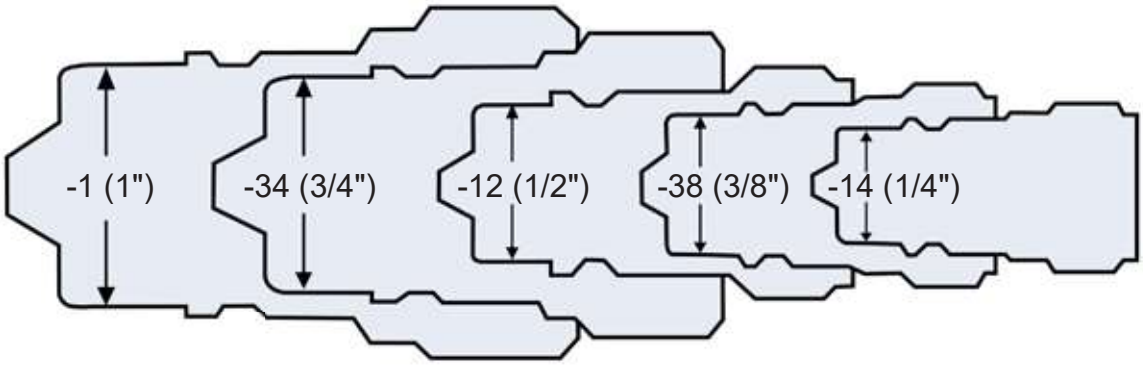


O-RING FACE SEAL

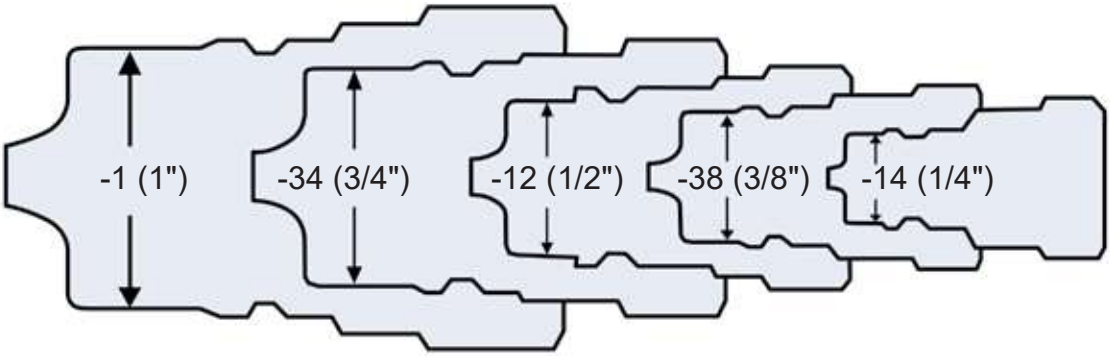


MALE PIPE

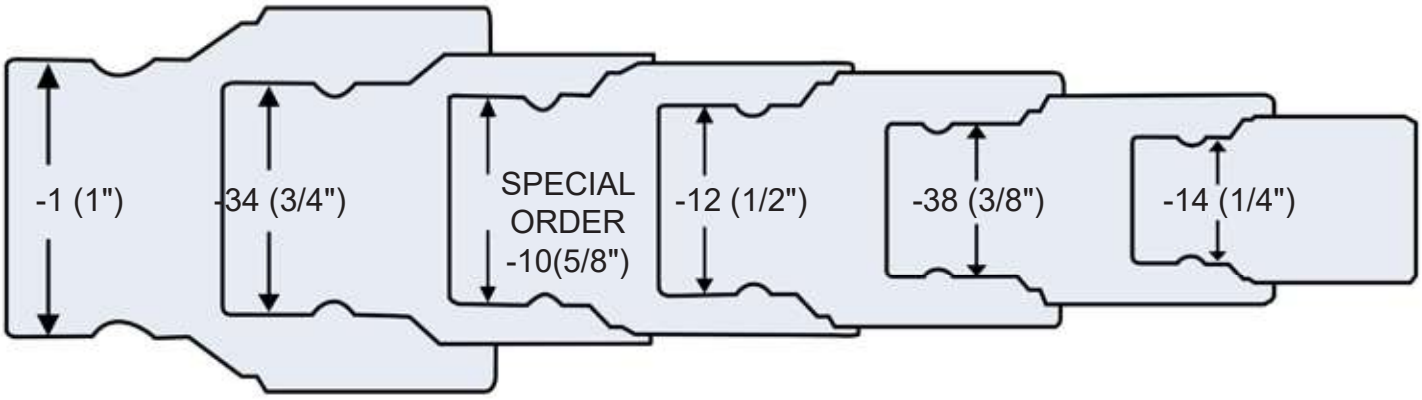




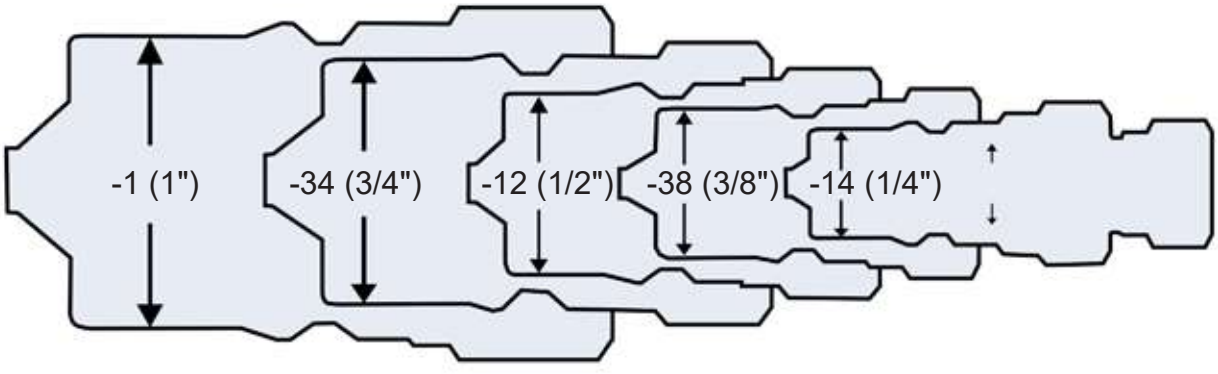
AG INTERCHANGE - NV SERIES



ISO 7241 - 1 - ISO A - ANV SERIES



ISO 16028 - FF SERIES



ISO 7241 - 1 ISO B - HNV SERIES