

Flexible “Floppy Guard” Interlocked Metal Hose – HT1100

Highly-flexible interlocked metal armor hose provides maximum protection for hydraulic hoses in the most severe applications.

Construction – A single metal strip is loosely interlock-wound to create an extremely flexible interlocked metal hose.

Available in galvanized steel and stainless steel.

Applications – Armor shielding for hoses where maximum flexibility and protection from abrasion and damage are important.



Maximum Service Temperature:

Galvanized Steel: Up to 750°F

Stainless Steel: Up to 1800°F

SPECIFICATIONS (Lengths and Weights are based on extended hose and are approximate)

HTG1100 – Galvanized – .010" – .012" strip thickness

Part Number	ID (in)	Std. Length Colis (ft)	Weight (lbs/coil)
HTG1100-018X25	3/16	25	2.00
HTG1100-025X25	1/4	25	2.50
HTG1100-031X25	5/16	25	3.00
HTG1100-037X25	3/8	25	3.50
HTG1100-050X25	1/2	25	4.00
HTG1100-062X25	5/8	25	4.50
HTG1100-075X25	3/4	25	5.00
HTG1100-087X25	7/8	25	5.75
HTG1100-100X25	1	25	7.00
HTG1100-112X25	1 1/8	25	8.00
HTG1100-125X25	1 1/4	25	9.00
HTG1100-137X25	1 3/8	25	10.50
HTG1100-150X25	1 1/2	25	12.00
HTG1100-162X25	1 5/8	25	13.00
HTG1100-175X25	1 3/4	25	14.50
HTG1100-187X25	1 7/8	25	15.50
HTG1100-200X25	2	25	16.50
HTG1100-225X25	2 1/4	25	19.00

HTS1100 – Stainless Steel – .010" – .012" strip thickness

Part Number	ID (in)	Std. Length Colis (ft)	Weight (lbs/coil)
HTS1100-018X25	3/16	25	2.00
HTS1100-025X25	1/4	25	2.50
HTS1100-031X25	5/16	25	3.00
HTS1100-037X25	3/8	25	3.50
HTS1100-050X25	1/2	25	4.00
HTS1100-062X25	5/8	25	4.50
HTS1100-075X25	3/4	25	5.00
HTS1100-087X25	7/8	25	5.75
HTS1100-100X25	1	25	7.00
HTS1100-112X25	1 1/8	25	8.00
HTS1100-125X25	1 1/4	25	9.00
HTS1100-137X25	1 3/8	25	10.50
HTS1100-150X25	1 1/2	25	12.00
HTS1100-162X25	1 5/8	25	13.00
HTS1100-175X25	1 3/4	25	14.50
HTS1100-187X25	1 7/8	25	15.50
HTS1100-200X25	2	25	16.50
HTS1100-225X25	2 1/4	25	19.00

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Safety Guide and Basic Factors for Selecting, Installing & Maintaining Hose and Hose Assemblies

Hydraulic hose (and hose assemblies) has a limited life dependent on service conditions to which it is applied. Subjecting hose (and hose assemblies) to conditions more severe than the recommended limits significantly reduce service life. Exposure to combinations of recommended limits (i.e., continuous use at maximum rated working pressure, maximum recommended operating temperature and minimum bend radius) will also reduce service life.

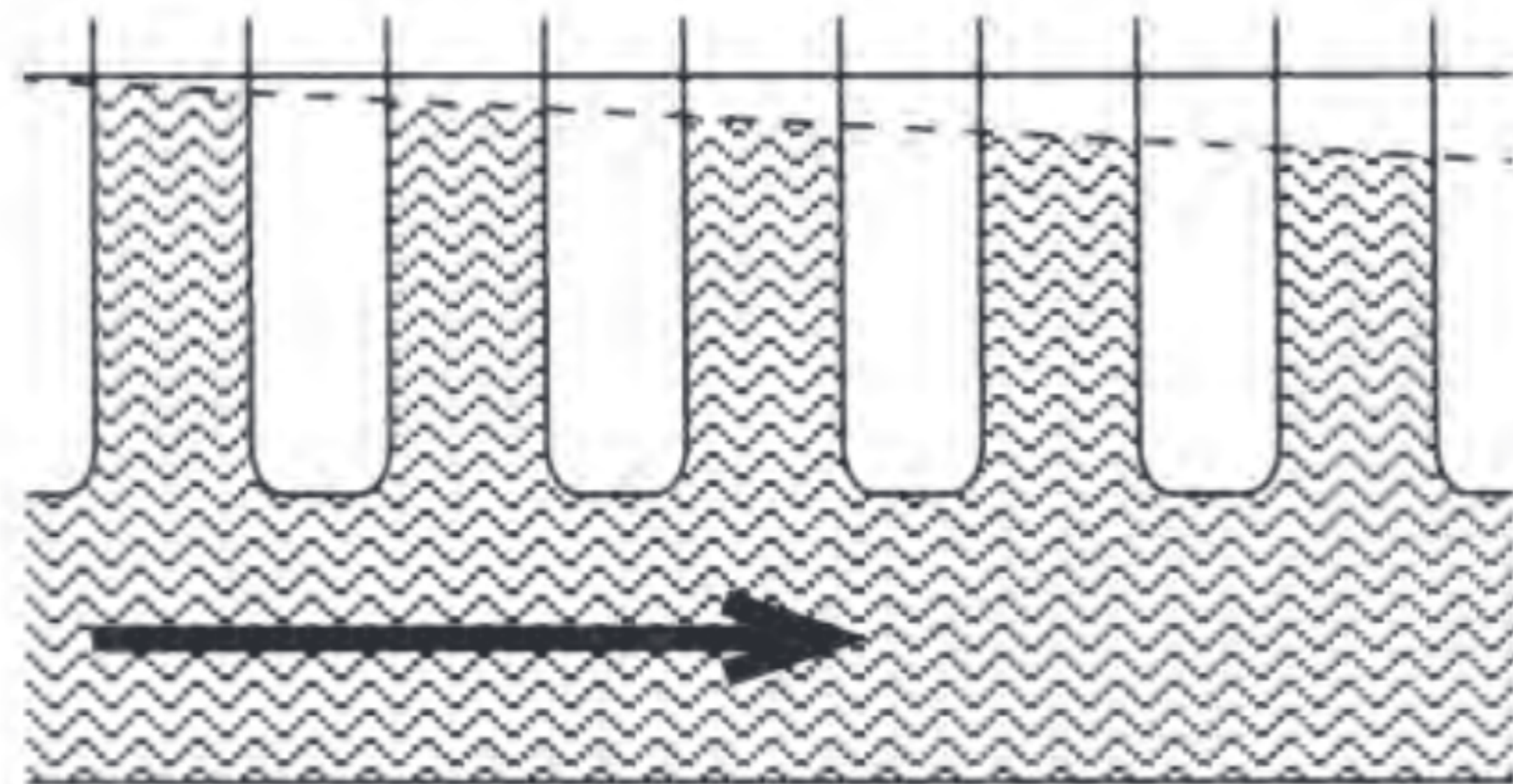
WARNING: FAILURE TO FOLLOW PROPER SELECTION, INSTALLATION AND MAINTENANCE PROCEDURES MAY RESULT IN PREMATURE FAILURES, BODILY INJURY, AND DAMAGE TO PROPERTY.

1. SELECTION – The following is a list of factors which must be considered before the selection of a hose can be made:

1.1 Line size:

In order to achieve maximum efficiency in a hydraulic system, it is necessary to keep pressure losses (resistance to the volumetric flow) to a minimum when a fluid is conveyed by the different types of flow lines.

When a fluid flows through a flow line, heat is generated by friction. Thus part of the energy is lost as heat energy, which results in a pressure loss.



These pressure losses depend upon:

- Flow velocity (for a given volumetric flow, the fluid flow velocity increases with a decrease in the cross sectional area of a flow line and vice versa) · length of the flow line
- The viscosity of the fluid flowing
- The density of the fluid flowing
- The type of flow (laminar or turbulent)

Types of flow – The type of flow changes from laminar to turbulent at a certain flow velocity. This velocity is given by the Reynold's Number Re .

For cylindrical flow lines the following formula applies:

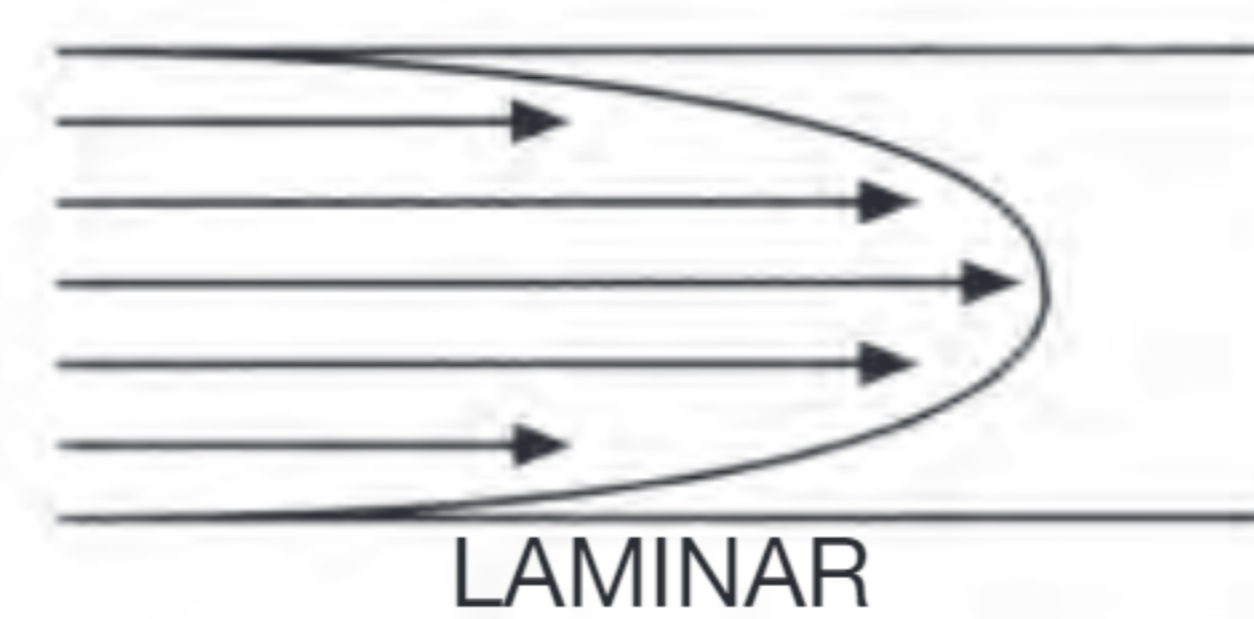
$$Re = \frac{vxd}{\nu}$$

where v = velocity (m/s)
 d = flow line internal dia. (m)
 ν = kinematic viscosity (m²/s)

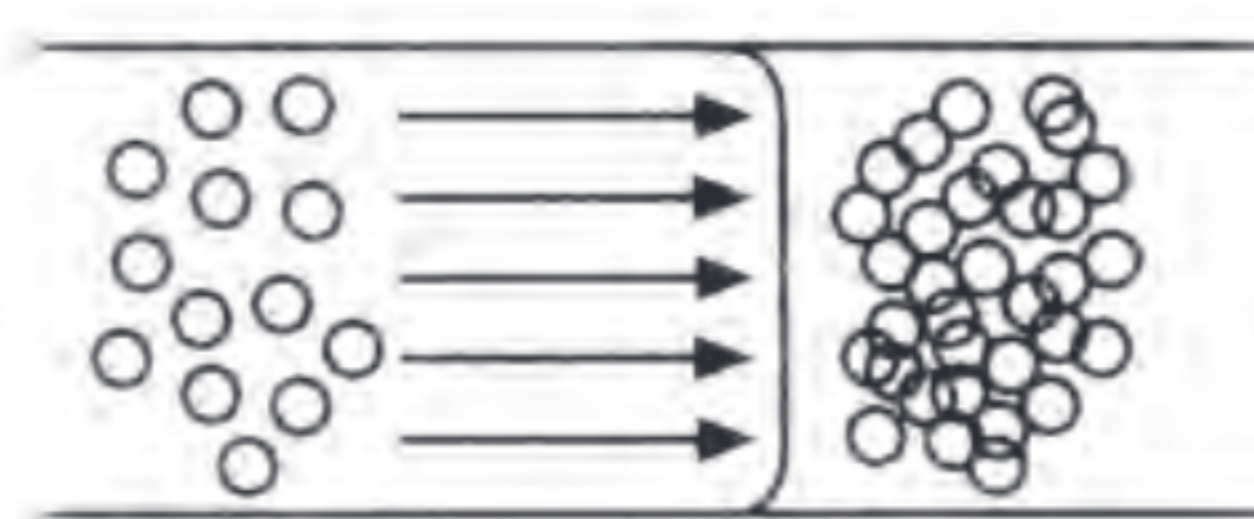
As soon as the value for Re exceeds 2300, the laminar flow changes to turbulent flow.

Laminar flow – In laminar flow, the individual fluid particles move up to certain speeds in uniform layers alongside each other. They scarcely disturb or influence each other.

Turbulent flow – If the value for Re exceeds 2300, flow becomes whirling and turbulent. The individual particles no longer move in one direction in an orderly fashion, but influence and hinder each other.



LAMINAR



TURBULENT

Certain fluid flow velocities have proved to be most suitable for hydraulic flow lines.

Recommended flow velocities:

Suction lines: 0.5	1.2 m/s	1.6	4 feet/s
Return lines: 2.....	3 m/s	6.5	10 feet/s
Pressure lines: 4.....	7.5 m/s	13.....	25 feet/s

It is therefore important to calculate correctly the required flow line sizes. Undersized pressure lines result in high fluid velocity causing an excessive pressure drop, and heat build up, which impair overall system performance. Undersized suction lines can cause cavitation at the hydraulic pump inlet, affecting performance, shortening pump life, and creating excessive noise levels.

The flow capacity nomogram on page 14 is an aid to determine the correct hose internal diameter size, desired flow rate and recommended velocity. By the use of any two known factors, the third can be determined.

1.2 Pressure:

After determining the system pressure for a hydraulic system, hose selection must be made so that the recommended maximum operating pressure specified by a given hose, is equal or greater than the system pressure. Dynamic pressure is common for all hydraulic systems.

Pressure surges which exceed the maximum working pressure (pressure relief valve setting) affect the service life of system components, including a hose assembly and therefore need to be taken into consideration. Hoses used for suction lines must be selected to ensure the hose will withstand the negative pressure of the system.

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1.3 Temperature:

Care must be taken to ensure that the operating temperature of the fluid being conveyed and ambient temperatures, do not exceed the limitations of the hose. Special care must be taken when routing near hot manifolds or molten metal.

1.4 Fluid Compatibility:

Hose selection must assure compatibility of the hose tube, cover, reinforcement, and fittings with the fluid used. Additional caution must be observed in hose selection for gaseous applications. Some fire resistant fluids require the same hose as petroleum oil. Some use a special hose, while a few fluids will not work with any hose at all.

1.5 Permeation:

Permeation (that is, seepage through the hose) will occur from inside the hose to outside when hose is used with gases, liquid and gas fuels, and refrigerants (including but not limited to such materials such as helium, fuel oil, natural gas, or freon). This permeation may result in high concentrations of vapors which are potentially flammable, explosive, or toxic, and in loss of fluid.

Even though the fluid compatibility is acceptable, you must take into account the fact that permeation will occur and could be hazardous. Permeation of moisture from outside the hose to inside the hose will also occur. If this moisture permeation would have detrimental effects (particularly but not limited to refrigeration and air conditioning systems), incorporation of sufficient drying capacity in the system or other appropriate system safeguards should be selected and used.

1.6 Routing:

Attention must be given to optimum routing to minimize inherent problems. Restrain, protect or guide hose with the use of clamps if necessary to minimize risk or damage due to excessive flexing, whipping or contact with other moving parts or corrosives. Determine hose lengths and configurations that will result in proper routing and protection from abrasion, snagging or kinking and provide leak resistant connections.

1.7 Environment:

Care must be taken to ensure that the hose and fittings are either compatible with or protected from the environment to which they are exposed. Environmental conditions including but not limited to ultraviolet light, heat, ozone, moisture, water, salt water, chemicals, and air pollutants can cause degradation and premature failure and, therefore, must be considered.

1.8 Mechanical Loads:

External forces can significantly reduce hose life. Mechanical loads which must be considered include excessive flexing, twist, kinking, tensile or side loads, bend radius, and vibration. Use of swivel type fittings or adaptors may be required to ensure no twist is put into the hose. Unusual applications may require special testing prior to hose selection.

1.9 Abrasion:

While a hose is designed with a reasonable level of abrasion resistance, care must be taken to protect the hose from excessive abrasion which can result in erosion, snagging, and

cutting of the hose cover. Exposure of the reinforcement will significantly accelerate hose failure.

1.10 Proper End Fitting:

Care must be taken to ensure proper compatibility exists between the hose and coupling selected based on the manufacturer's recommendations substantiated by testing to industry standards such as

SAE J517
DIN 20024, JIS B 8360.

1.11 Length:

When establishing proper hose length, motion absorption, hose length changes due to pressure, as well as hose and machine tolerances must be considered.

1.12 Specifications and Standards:

When selecting hose and fittings, government, industry, and manufacturer's specifications and recommendations must be reviewed as applicable.

1.13 Hose Cleanliness:

Hose components may vary in cleanliness levels. Care must be taken to ensure that the assemblies selected have an adequate level of cleanliness for the application.

1.14 Welding and Brazing:

Heating of plated parts, including hose fittings and adaptors, above 232°C (450°F) such as during welding, brazing, or soldering may emit deadly gases.

1.15 Electrical Conductivity:

Certain applications require that a hose be non-conductive to prevent electrical current flow. Other applications require the hose to be sufficiently conductive to drain off static electricity.

Extreme care must be exercised when selecting hose and fittings for these or any other applications in which electrical conductivity or non-conductivity is a factor.

For applications that require hose to be electrically non-conductive, including but not limited to applications near high voltage electric lines, only special non-conductive hose can be used.

The manufacturer of the equipment in which the non-conductive hose is to be used must be consulted to be certain that the hose and fittings that are selected are proper for the application.

Do not use any ALFAGOMMA hose or fitting for any application requiring non-conductive hose, including but not limited to applications near high voltage electric lines, unless the application is expressly approved in the ALFAGOMMA technical publication for the product, the hose is both orange in color and marked "non-conductive," and the manufacturer of the equipment on which the hose is to be used specifically approves the particular ALFAGOMMA hose and fitting for such use.

ALFAGOMMA does not supply any hose or fittings for conveying paint in airless paint spraying or similar applications and therefore should not be used. A special hose and fitting assembly is required for this application, to avoid static electricity buildup which could cause a spark that may result in an explosion and/or fire.

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The electrical conductivity or non-conductivity of hose and fittings is dependant upon many factors and may be susceptible to change. These factors include but are not limited to the various materials used to make the hose and the fittings, manufacturing methods (including moisture control), how the fittings contact the hose, age and amount of deterioration of damage or others changes, moisture content of the hose at a particular time, and other factors.

2. INSTALLATION – After the selection of the correct hose, the following factors must be considered prior to hose and fitting assembly and installation:

2.1 Pre-Installation Inspection:

Prior to installation, a careful examination of the hose must be performed. All components must be checked for correct style, size, and length. The hose must be examined for cleanliness, obstructions, blisters, cover looseness, or any other visible defects.

2.2 Hose and Fitting Assembly:

Do not assemble an ALFAGOMMA fitting on an ALFAGOMMA hose that is not specified by ALFAGOMMA for that hose. Do not assemble ALFAGOMMA fittings on another manufacturer's hose or an ALFAGOMMA hose on another manufacturer's fitting unless ALFAGOMMA approves the assembly in writing, and the user verifies the assembly and the application through analysis and testing. The ALFAGOMMA published hose assembly instructions must be followed for assembling the fittings on the hose.

2.3 Related Accessories:

Crimp or swage ALFAGOMMA hose or fittings only with ALFAGOMMA approved swage or crimp machines and in accordance with the ALFAGOMMA published hose assembly instructions.

2.4 Parts:

Do not use any ALFAGOMMA hose fitting part (including but not limited to sockets, or inserts) except with the correct ALFAGOMMA mating parts, in accordance with ALFAGOMMA published hose assembly instructions, unless authorized in writing by ALFAGOMMA.

2.5 Reusable/Permanent:

Do not reuse any reusable hose coupling that has blown or pulled off a hose. Do not reuse an ALFAGOMMA permanent (that is, crimped or swaged) hose fitting or any part thereof.

2.6 Minimum Bend Radius:

Installation of a hose at less than the minimum listed bend radius may significantly reduce the hose life. Particular attention must be given to avoid sharp bending at the hose/fitting juncture.

2.7 Twist Angle and Orientation:

Hose installations must be such that relative motion of machine components does not produce twisting.

2.8 Hose Restraints:

In many applications, it may be necessary to restrain, protect, or guide the hose to protect it from damage by unnecessary flexing, pressure surges, and contact with other mechanical components. Care must be taken to ensure such restraints do not introduce additional stress or wear points.

2.9 Proper Connection of Parts:

Proper physical installation of the hose requires a correctly installed port connection while ensuring that no twist or torque is transferred to the hose.

2.10 External Damage:

Proper installation is not complete without ensuring that tensile loads, side loads, kinking, flattening, potential abrasion, thread damage, or damage to sealing surfaces are corrected or eliminated.

2.11 System Checkout:

After completing the installation all air entrapment must be eliminated and the system pressurized to the maximum system pressure and checked for proper function without any leaks. Personnel must stay out of potential hazardous areas while testing.

3. HOSE AND FITTING MAINTENANCE INSTRUCTIONS

Even with proper selection and installation, hose life may be significantly reduced without a continuing maintenance program. Frequency should be determined by the severity of the application and risk potential. A maintenance program must be established and followed to include the following as a minimum:

3.1 Visual Inspection Hose/Fitting:

Any of the following conditions require immediate shutdown and replacement of the hose assembly:

- Fitting slippage on hose.
- Damaged, cut, or abraded cover (any reinforcement exposed).
- Hard, stiff, heat cracked, or charred hose.
- Cracked, damaged, or badly corroded fittings.
- Leaks at fitting or in hose.
- Kinked, crushed, flattened, or twisted hose.
- Blistered, soft, degraded, or loose cover.

3.2 Other Visual Inspection:

The following items must be tightened, repaired or replaced as required:

- Leaking port conditions.
- Remove excess dirt build-up.
- Clamp, guards, shields.
- System fluid level, fluid type, and any air entrapment.

3.3 Functional Test:

Operate the system at maximum operating pressure and check for possible malfunctions and freedom from leaks. Personnel must stay out of potential hazardous areas while testing.

3.4 Replacement Intervals:

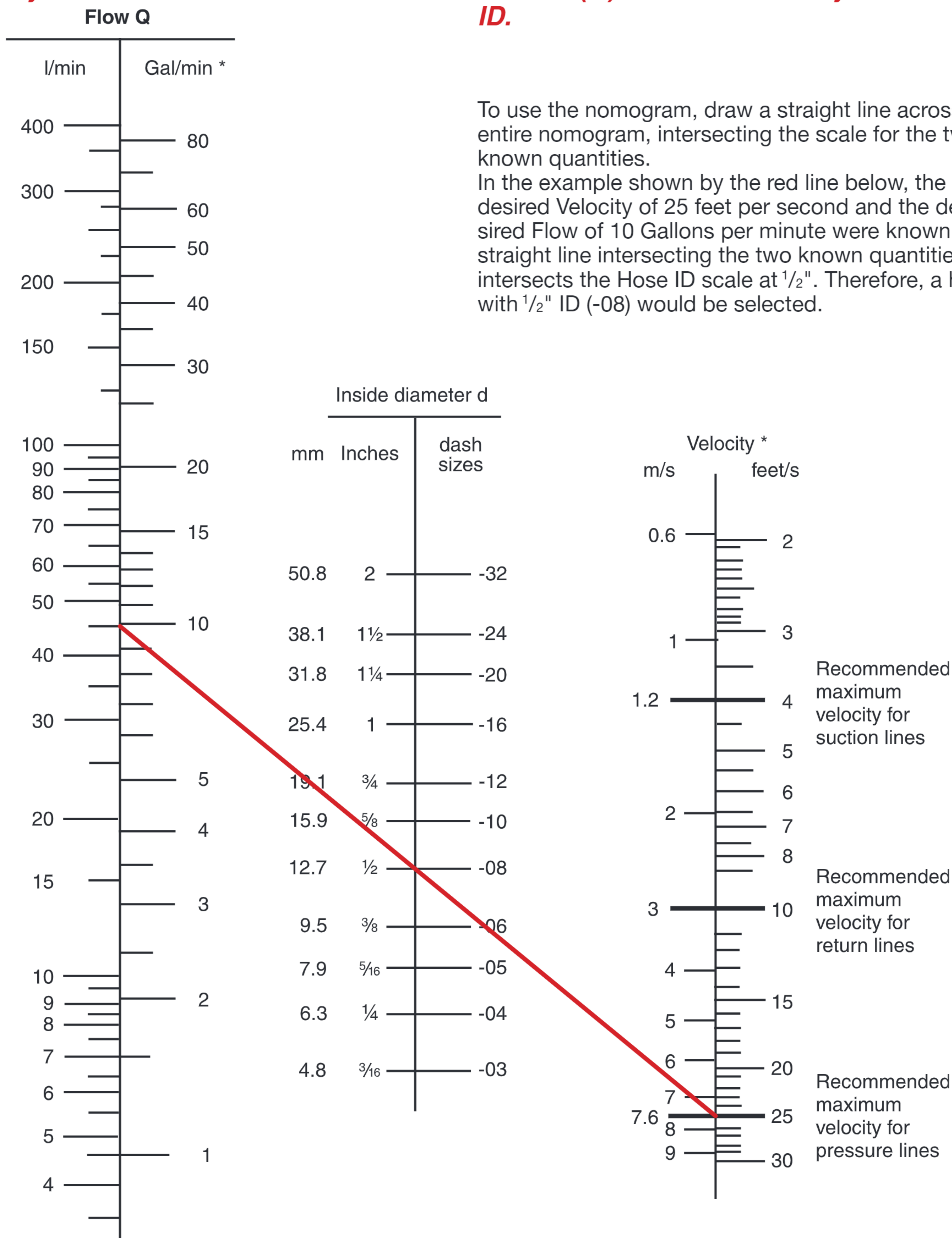
Specific replacement intervals must be considered based on previous service life, government or industry recommendations, or when failures could result in unacceptable downtime, damage, or injury risk.

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Hydraulic Hose Sizing Nomogram

Use the nomogram below to determine Hose ID Size based on Flow (Q) and Velocity.

Conversely, it can be used to determine Velocity, based on Flow (Q) and Hose ID, or Flow (Q) based on Velocity and Hose ID.



To use the nomogram, draw a straight line across the entire nomogram, intersecting the scale for the two known quantities.

In the example shown by the red line below, the desired Velocity of 25 feet per second and the desired Flow of 10 Gallons per minute were known. The straight line intersecting the two known quantities intersects the Hose ID scale at 1/2". Therefore, a hose with 1/2" ID (-08) would be selected.

* Gallons shown are Imperial (British) Gallons. To convert to US Liquid Gallons, multiply by 1.2009.
 Other Conversions: Gal/min (Brit) x 4.546 = l/min
 feet/s x 0.3048 = m/s

* Recommended Velocities shown are based on hydraulic fluids with maximum viscosity of 315 SSU at 100°F (38°C) working at room temperatures within the range 65°F (18°C) and 155°F (68°C).

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Pressure Drop US Chart



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Hose Pressure Drop*

The chart below shows pressure drop in **PSI** for 10 feet of hose (smooth bore) without fittings. Fluid specification: Specific gravity = .85; Viscosity = $\nu = 20$ centistokes (C.S.), (20 C.S. = 97 S.S.U.); ref MIL – H 5606, +70°F (+21°C).

Flow: US gallons per minute (gpm)

Hose pressure drop in PSI per 10 feet of hose length

Hose Size	-03	-04	-05	-06	-08	-10	-12	-16	-20	-24	-32	-40	-48
Hose I.D. (in.)	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	1-1/4	1-1/2	2	2-1/2	3
DN	5	6	8	10	12	16	20	25	32	40	50	63	80
US gallons per minute	.25	10	3.1										
	.50	19	6	2.7									
	1	40	12	5.5	2.4								
	2	95	24	10	4.8								
	3	185	46	17	7	2.2							
	4		78	29	12	3	1.2						
	5		120	44	18	4.5	1.6	0.7					
	8			95	39	10	3.6	1.4					
	10				59	15	5.7	2	0.6				
	12				80	20	7.2	2.6	0.8				
	15					30	10	4.2	1.2	0.4			
	18					40	15	6.3	1.5	0.6			
	20					49	19	8	2	0.7	0.3		
	25					72	26	11	3	1	0.4		
	30						34	14	3.6	1.3	0.5	0.1	
	35						47	19	5	1.7	0.7	0.2	
	40							25	6.5	2.2	0.9	0.2	
	50							36	9	3.3	1.3	0.4	0.2
	60							50	12	4.4	1.8	0.5	0.2
	70								17	6	2.4	0.7	0.3
80								21	7.1	3	0.8	0.3	0.1
90								27	9	3.8	1	0.5	0.1
100								33	12	4.7	1.3	0.6	0.2
150								60	22	8.5	2.2	1	0.3
200									36	15	3.9	1.7	0.6
250									54	22	5.3	2.5	0.8
300										29	7.5	4	1.1
400										51	14	6.5	2.2
500											20	10	3
800												18	5
1000													10

* Pressure drop values listed are typical of many petroleum based hydraulic oils at approximately +100°F (+38°C). Differences in fluids, fluid temperature and viscosity can increase or decrease actual pressure drop compared to the values listed.

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Hose Pressure Drop*

Pressure drop in **KPa** (Kilo Pascal) for a 10 meter length of hose (smooth bore) without fittings. Fluid specification: specific gravity = 0.85; Viscosity = 20 centistokes (C.S.); ref MIL – H 5606 at +21°C (+70°F). Flow: Litres per minute (L/min)

Hose pressure drop in KPa per 10 meters of hose length

Hose size	-03	-04	-05	-06	-08	-10	-12	-16	-20	-24	-32	-40	-48
DN real	4.8	6.4	8.0	9.5	12.7	15.9	19.0	25.4	31.8	38.1	50.8	63.5	76.2
DN	5	6	8	10	12	16	20	25	32	40	50	63	80
Liters per minute	1	242	75										
	2	466	146	66									
	4	996	293	133	59								
	8	2433	613	250	117								
	10	3540	880	335	144	45							
	15		1776	660	273	69	27						
	20		3080	1129	462	116	41	18					
	30			2159	887	228	82	32					
	40				1496	379	141	50	14				
	50					555	192	75	22				
	60					756	263	111	30	10			
	70					970	373	154	37	13			
	80					1250	475	200	49	17	7		
	90					1531	560	237	66	21	9		
	100						653	274	73	24	10	3	
	125						964	393	103	36	15	4	
	150							567	147	50	19	5	
	175							735	186	60	27	7	3
	200							920	228	83	33	9	4
	250								347	124	50	13	6
300								475	162	68	17	8	3
400								832	303	118	32	14	5
500								1159	425	164	43	19	6
600									562	222	57	26	8
700									733	301	78	35	11
800									924	383	98	43	14
900									1144	468	118	53	16
1000										553	140	68	20

* Pressure drop values listed are typical of many petroleum based hydraulic oils at approximately +100°F (+38°C). Differences in fluids, fluid temperature and viscosity can increase or decrease actual pressure drop compared to the values listed.

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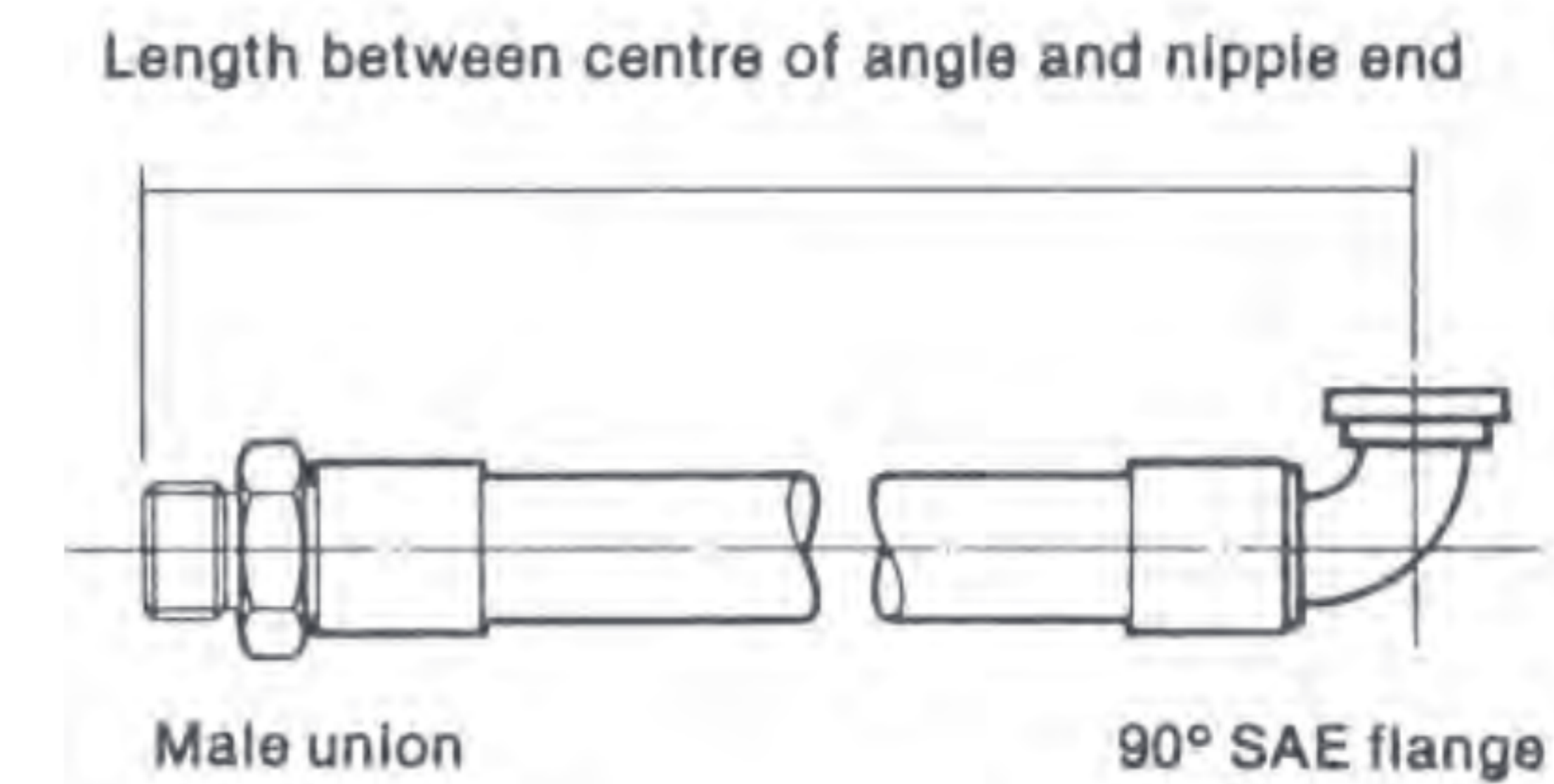
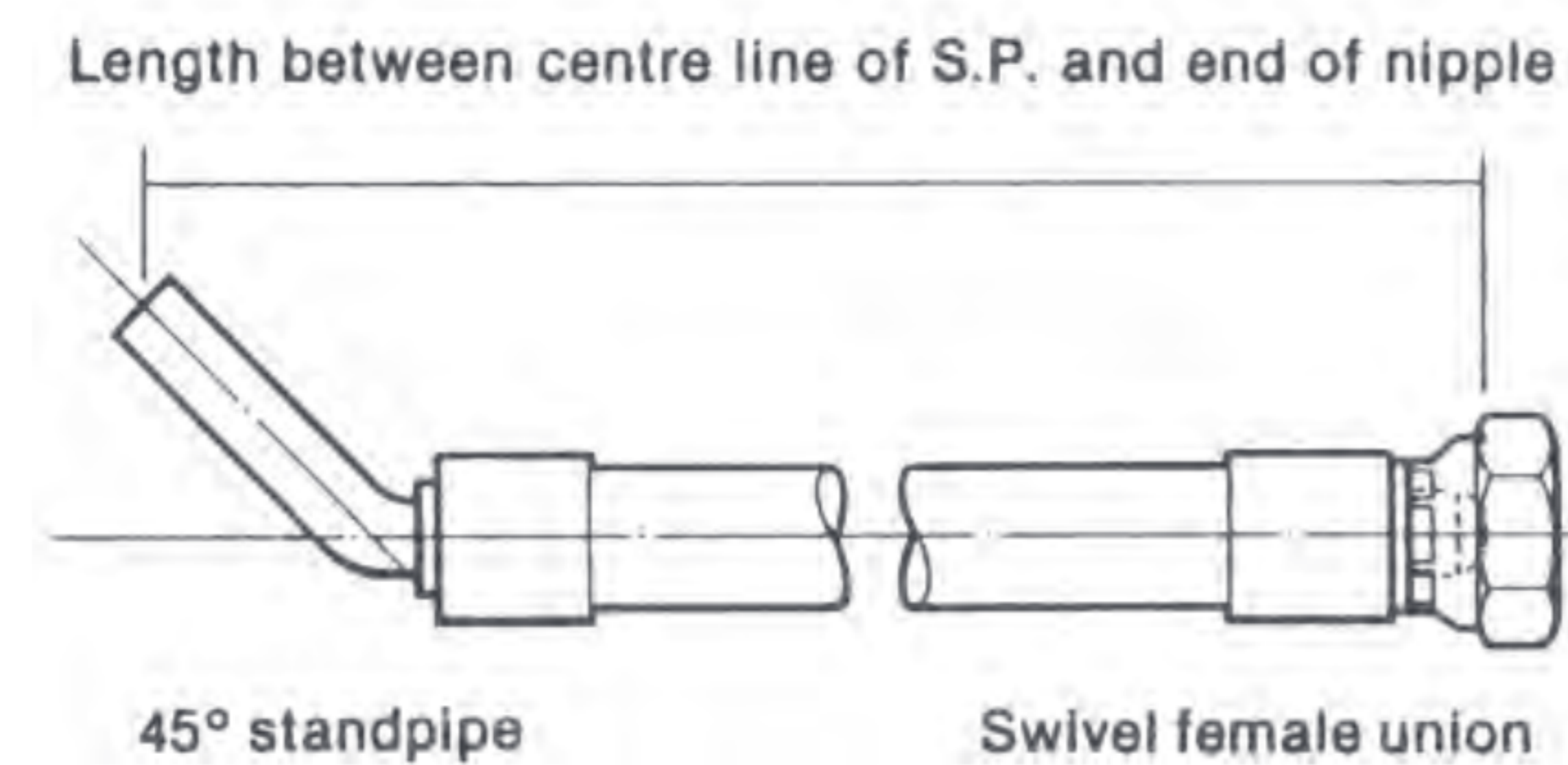
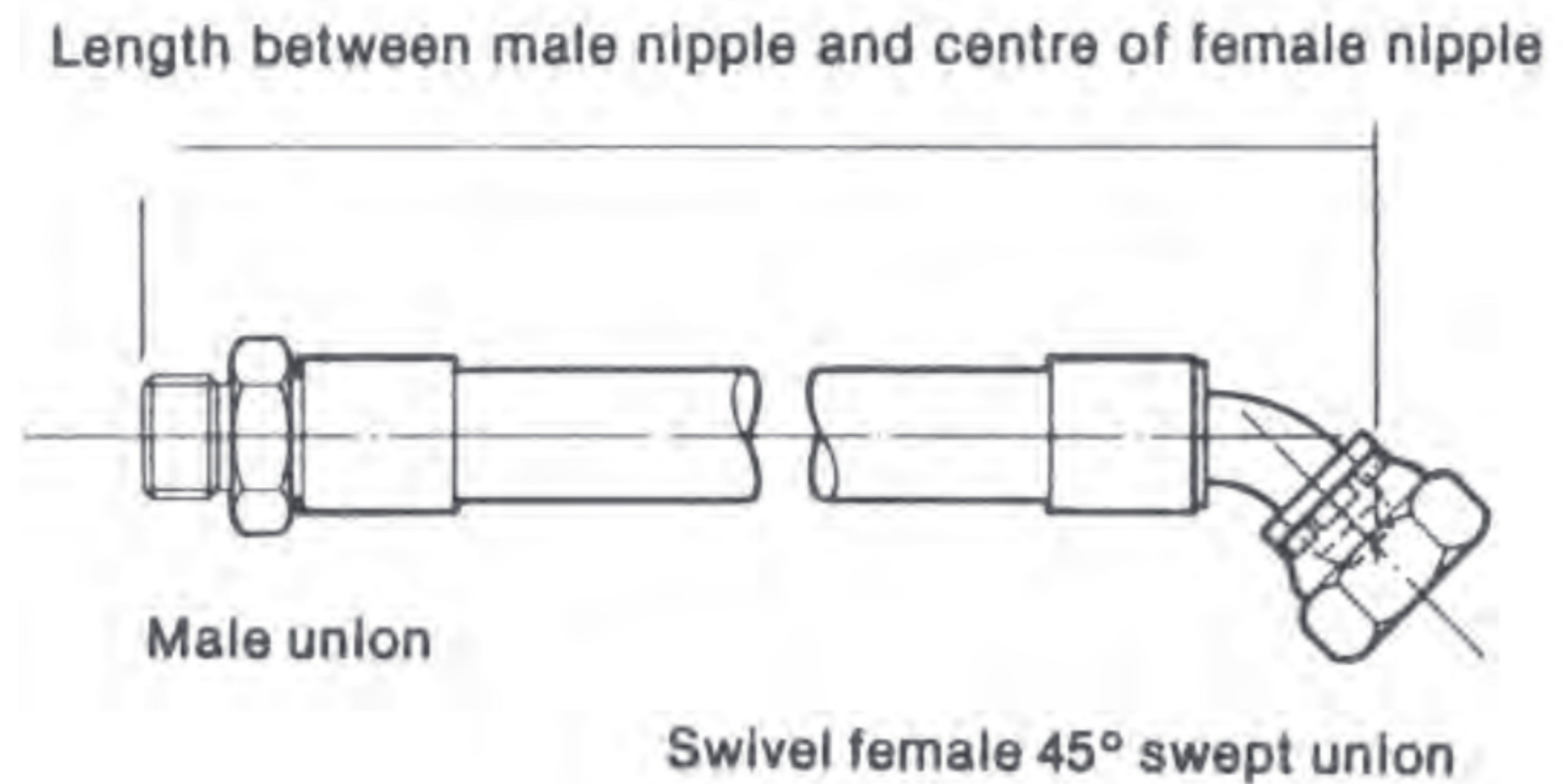
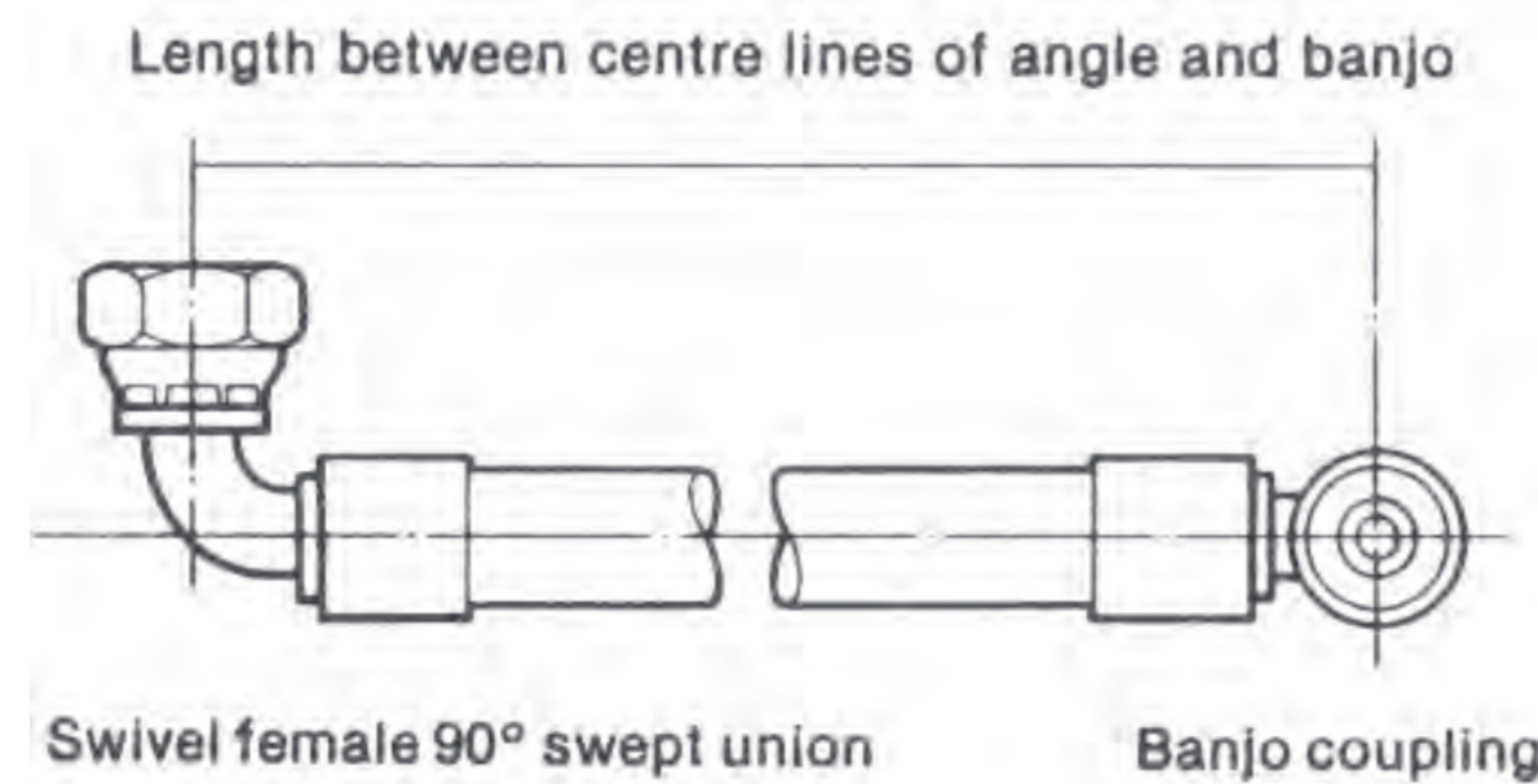
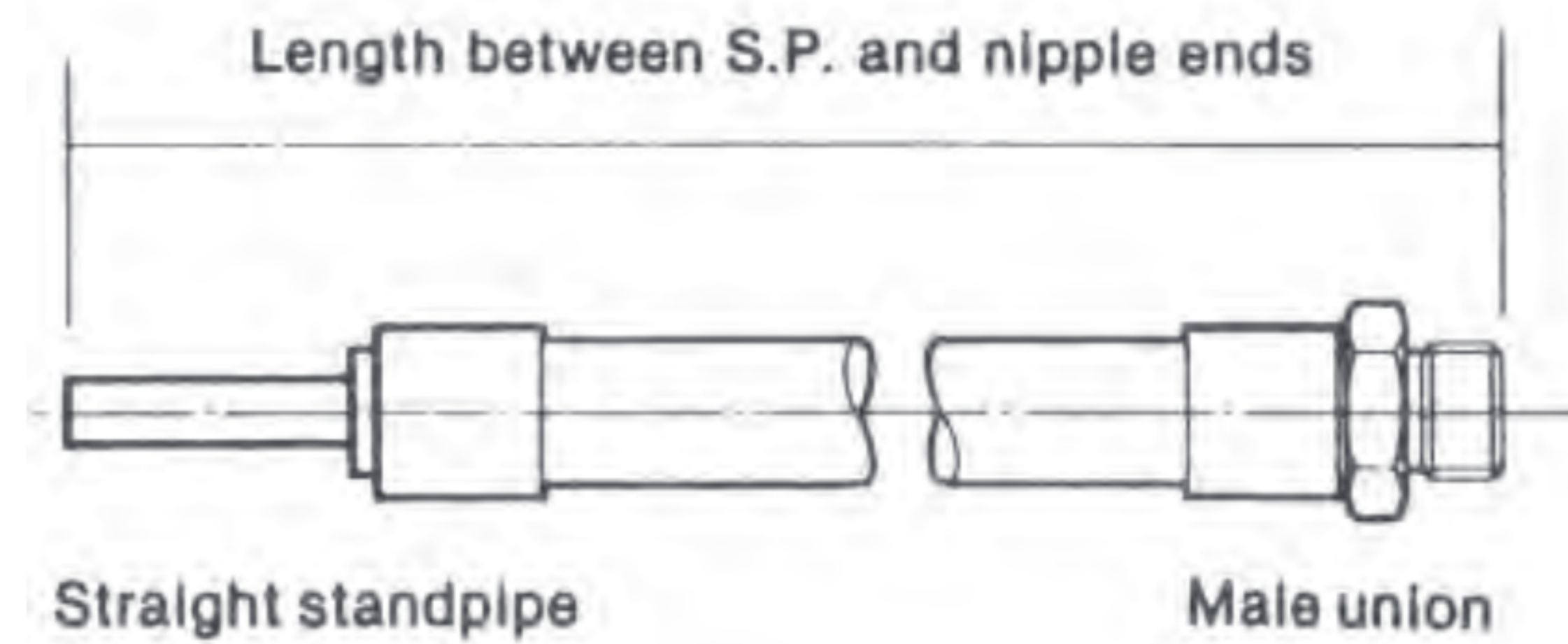
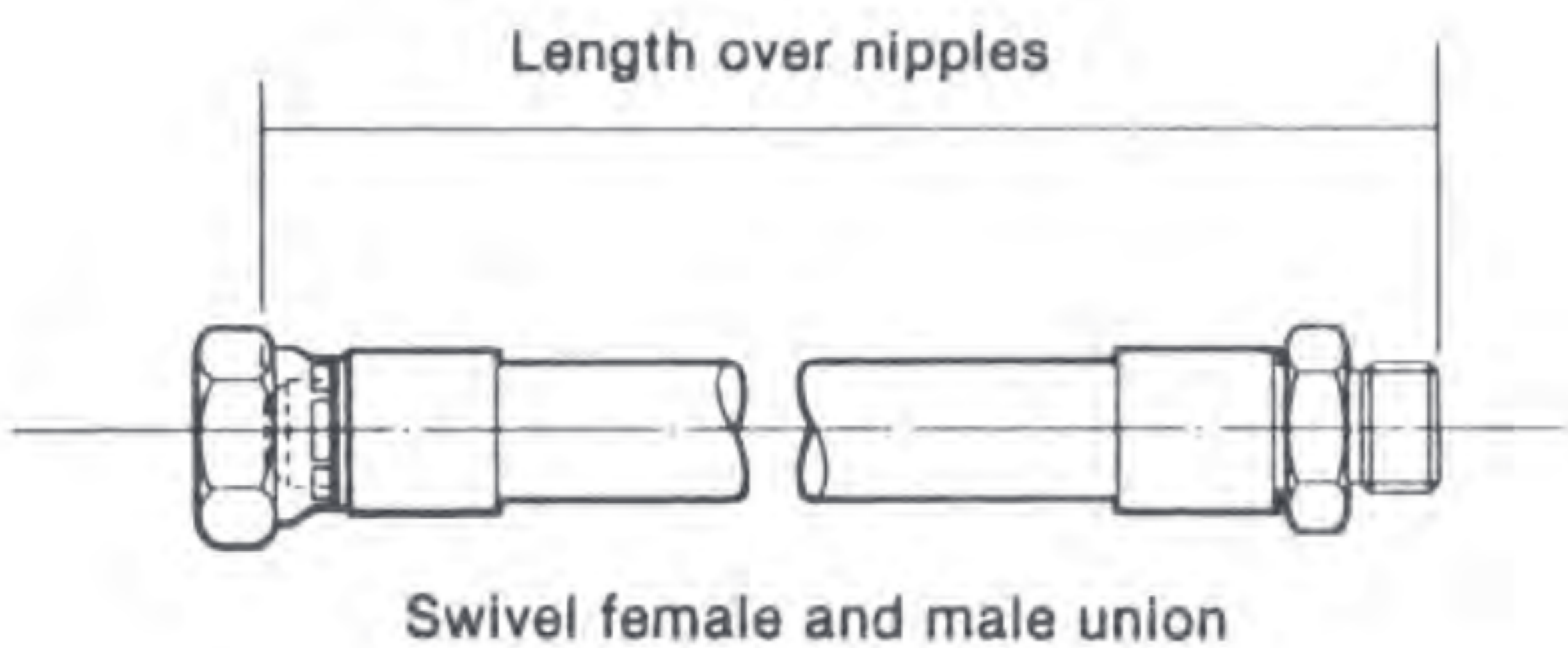
How to Determine Correct Assembly Length



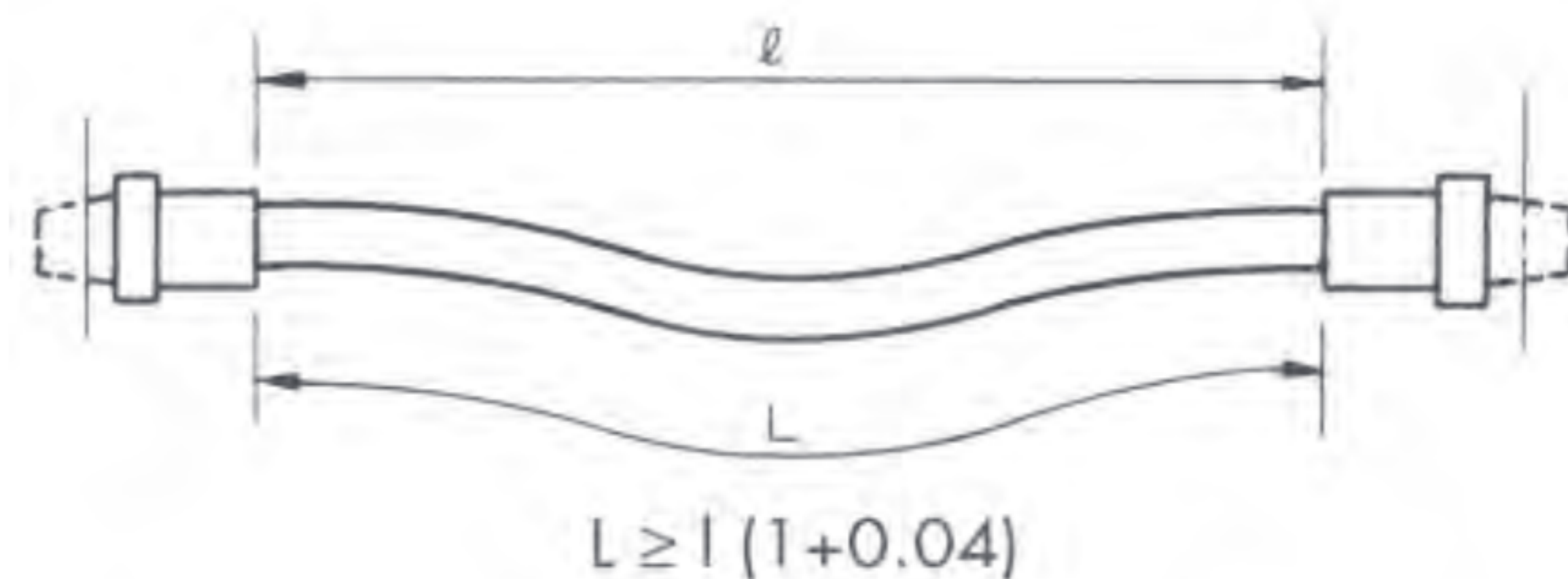
For most assemblies, the correct assembly length may be determined by direct measurement of the equipment or a drawing. Minimum bend radii as shown in the hose specification tables should be observed.

Assemblies are measured to the end of the seal.

To determine the length of hose needed in making assemblies with permanent or reusable couplings, subtract Dimension "C" (Cut off factor) for each coupling from the required overall assembly length. Dimension "C" may be found in the coupling specification tables.



Remember that hydraulic hose under pressure will elongate up to 2% of its length or contract up to 4% depending on pressure, type and size. Sufficient allowance should be made to permit such changes in length.



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Occasionally an assembly will be required similar to the sketches to the right. The following equations are helpful in determining the correct length:

FOR 180° TURN APPLICATIONS

$$\#1 L = 2A + \pi R$$

$$\#2 L = 2A + \pi R + T$$

L = Overall length of the hydraulic hose assembly, in mm or inches.

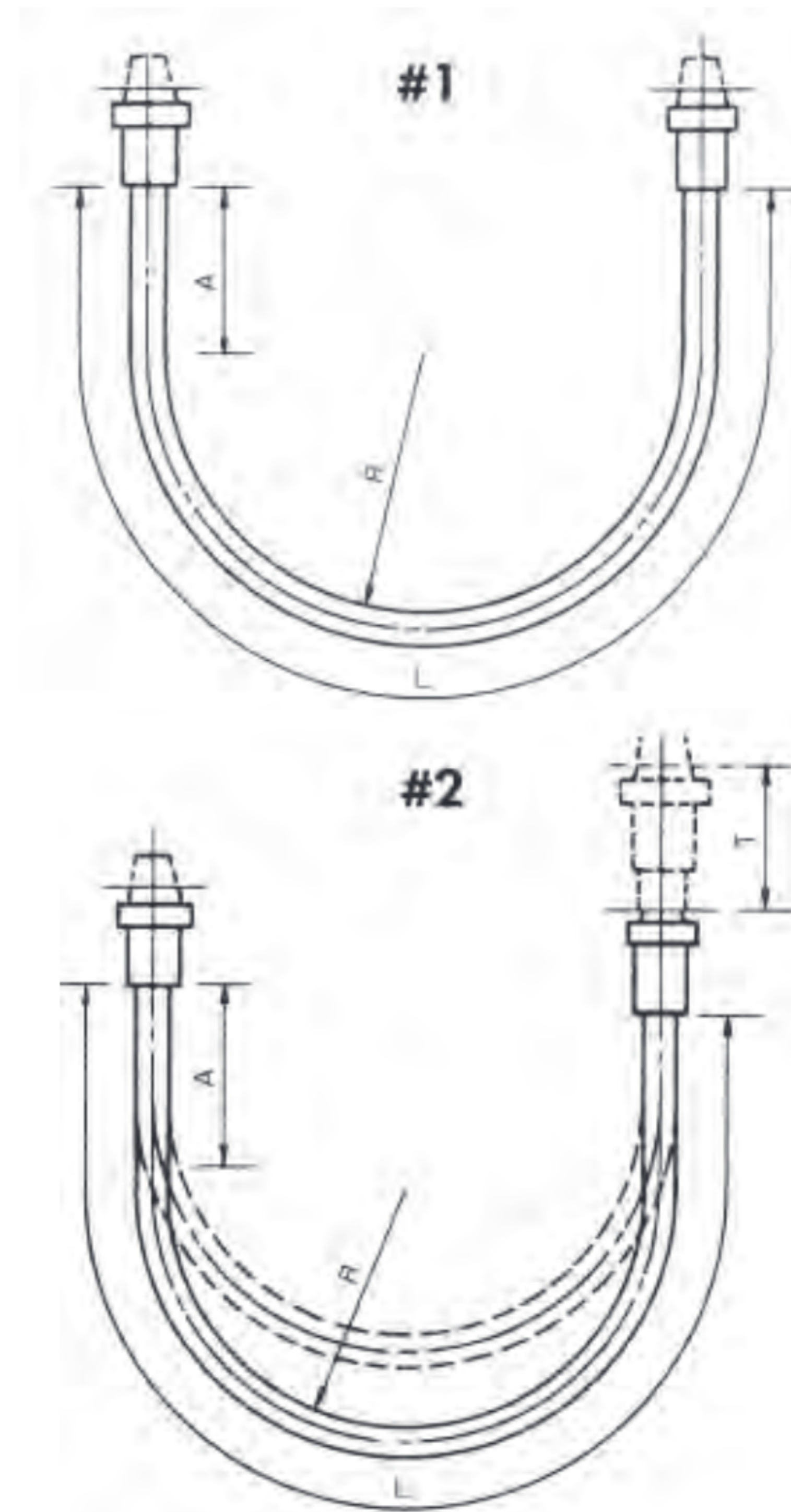
A = Allowance for a minimum straight section of hydraulic hose at each end of the assembly, measure from the outer end of each coupling, in mm or inches. These two straight sections are necessary to prevent excessive stress concentrations directly back of the couplings. See table below.

R = Bending radius of the hose, in mm or inches. See hose specifications tables.

T = Amount of travel, in mm or inches.

Often right angle adapters provide a convenient means of avoiding a bend radius that is too small.

Hose ID	in.	1/4	5/16	3/8	1/2	5/8	3/4	1	1 1/4	1 1/2	2
	mm	6.4	7.9	9.5	12.7	15.9	19	25	31.8	38.1	50.8
Min. "A"	in.	5	5	5	6	6	7	8	9	10	11
	mm	127	127	127	152	152	178	203	229	254	279



Length Tolerance for Hydraulic Hose Assemblies and Specified Hose Lengths

Length

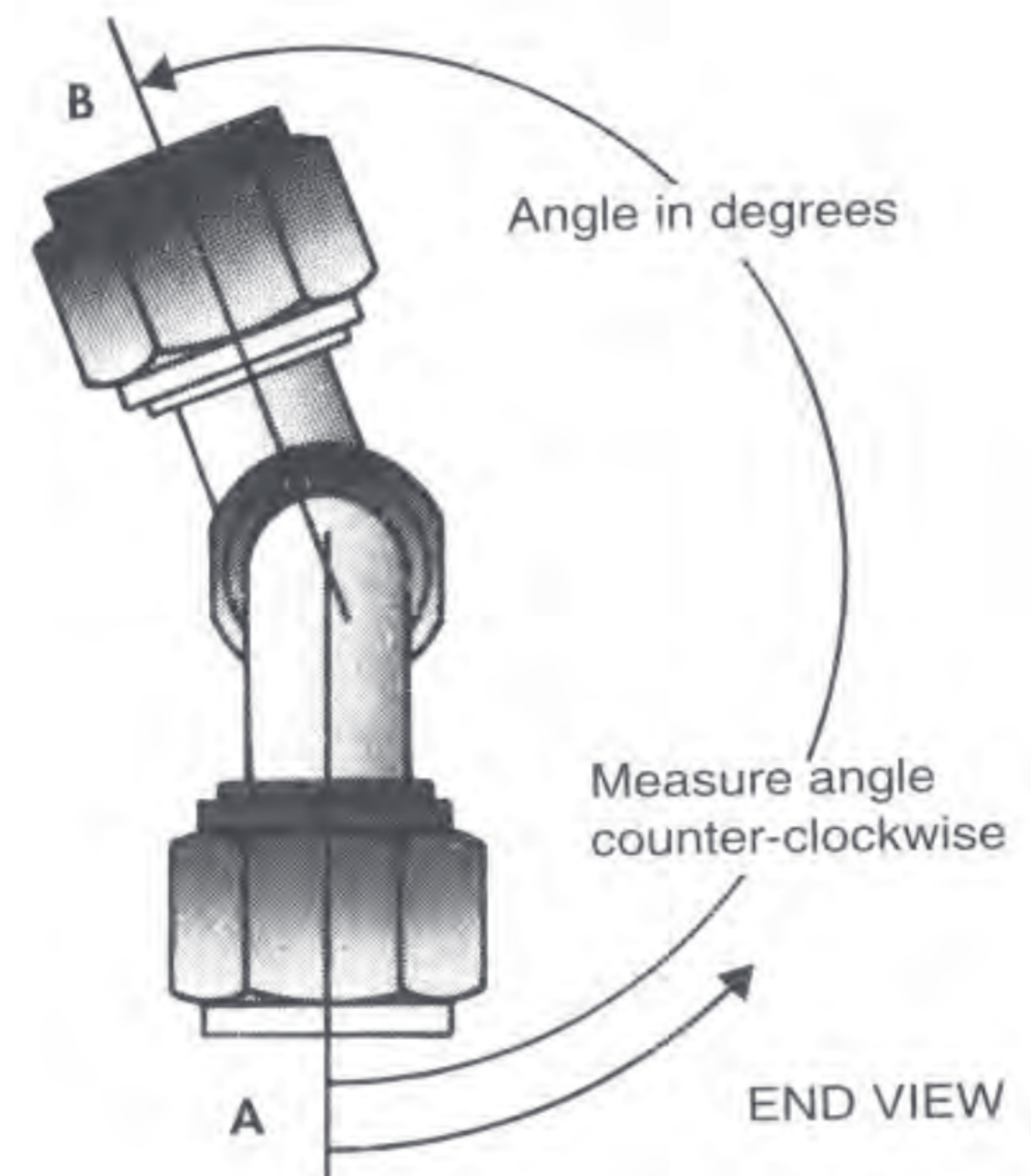
- For lengths from 0 up to and including 12" (305 mm)
- For lengths > 12" (305 mm) < 18" (457 mm)
- For lengths > 18" (457 mm) < 36" (914 mm)
- For lengths > 36" (914 mm) < 48" (1219 mm)
- For lengths > 48" (1219 mm) < 72" (1830 mm)
- For lengths > 72" (1830 mm)

Elbow angle and angle of Orientation.

Tolerance

- ± 1/8" ± 3 mm
- ± 3/16" ± 5 mm
- ± 1/4" ± 6 mm
- ± 3/8" ± 10 mm
- ± 1/2" ± 13 mm
- ± 1%

Tolerance ± 3



Angle Couplings

A – To measure angle of offset of a hose assembly, point one end of coupling "A" (the nearest) to a vertical position downward. The angle can then be measured from the centerline of this vertical coupling "B" (the far coupling). See illustration at right.

Relationships can then be expressed from 0° to 360°. If angle is not given, elbows are positioned at 0°.

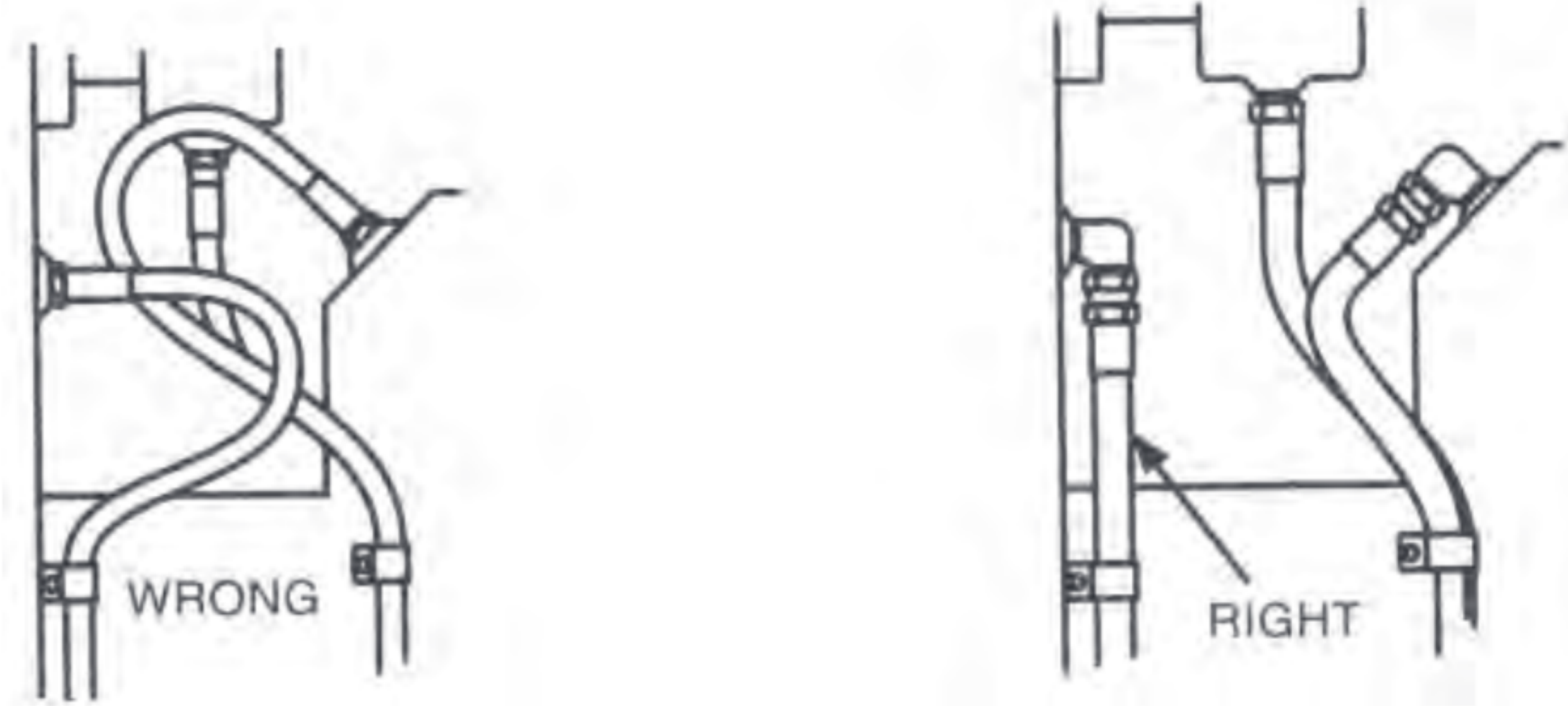
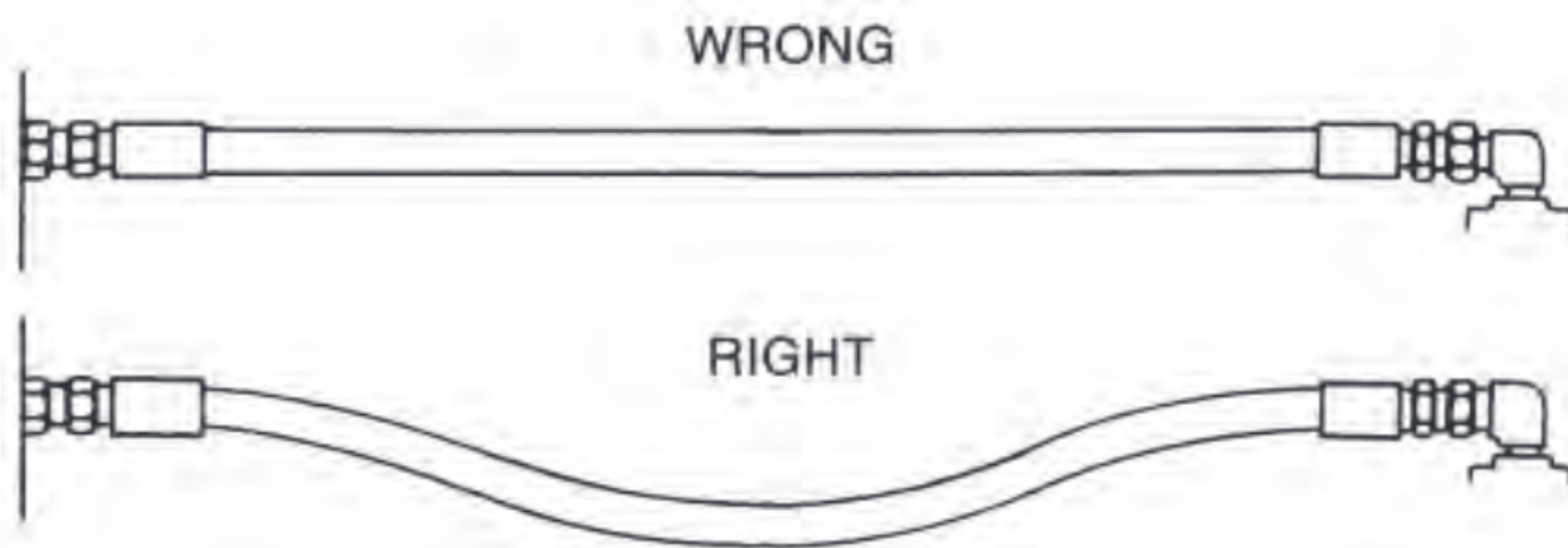
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Correct Assembly & Installation

Satisfactory performance and appearance depend upon proper hose installation. Excessive length destroys the trim appearance of an installation and adds unnecessarily to the cost of the equipment. Hose assemblies of insufficient length to permit

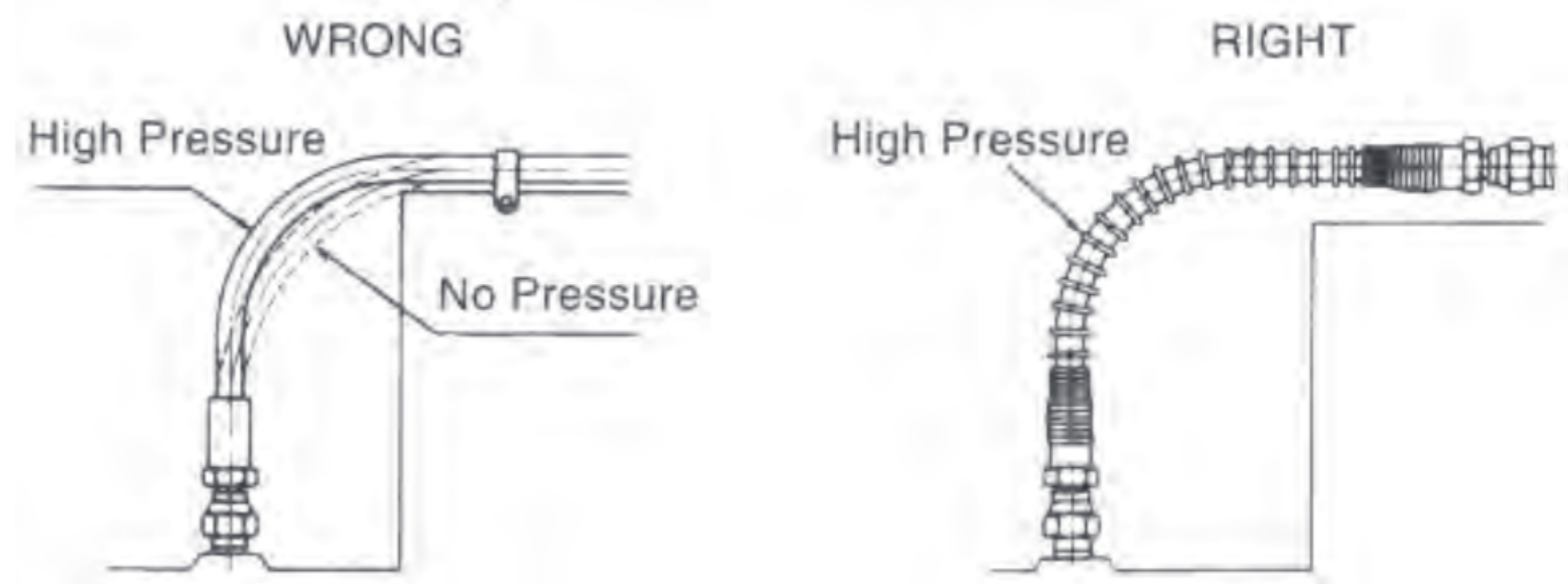
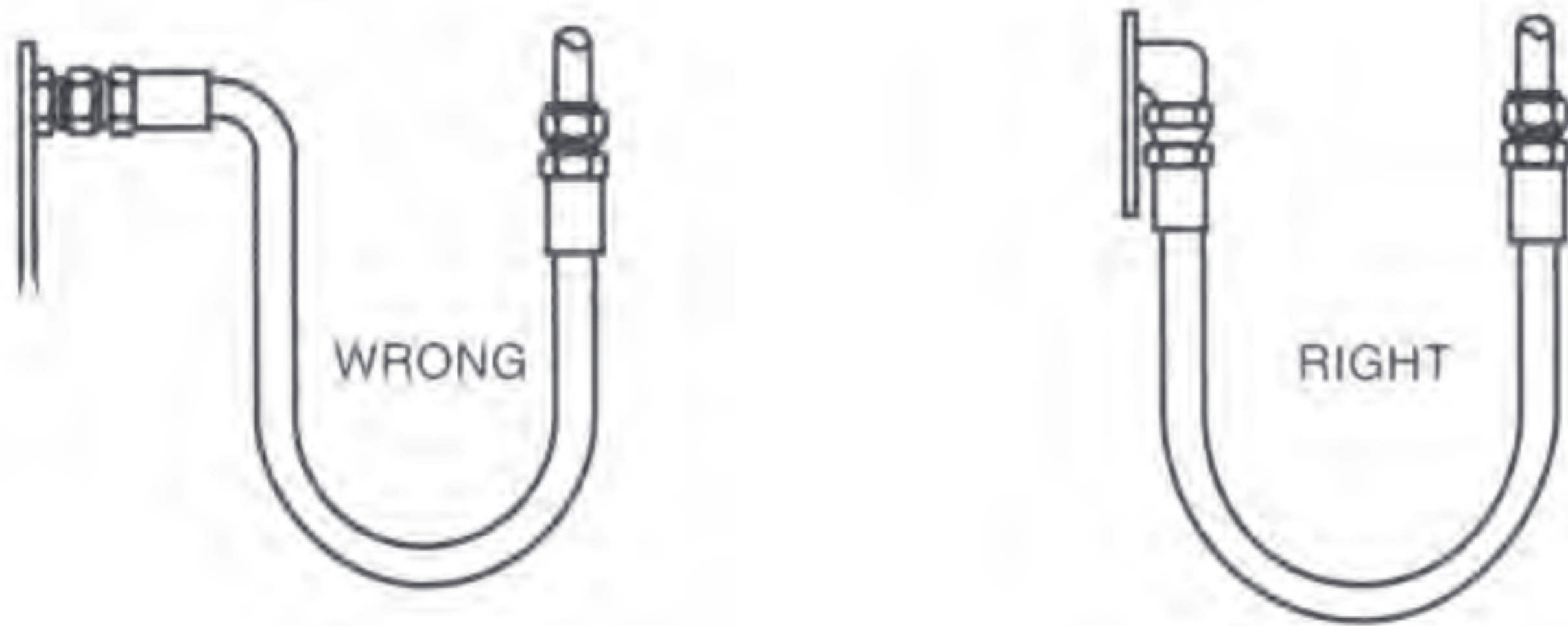
adequate flexing, expansion or contraction will cause poor power transmission and shorten the life of the hose.

The diagrams below offer suggestions for proper hose installations to obtain the maximum in performance and economy.



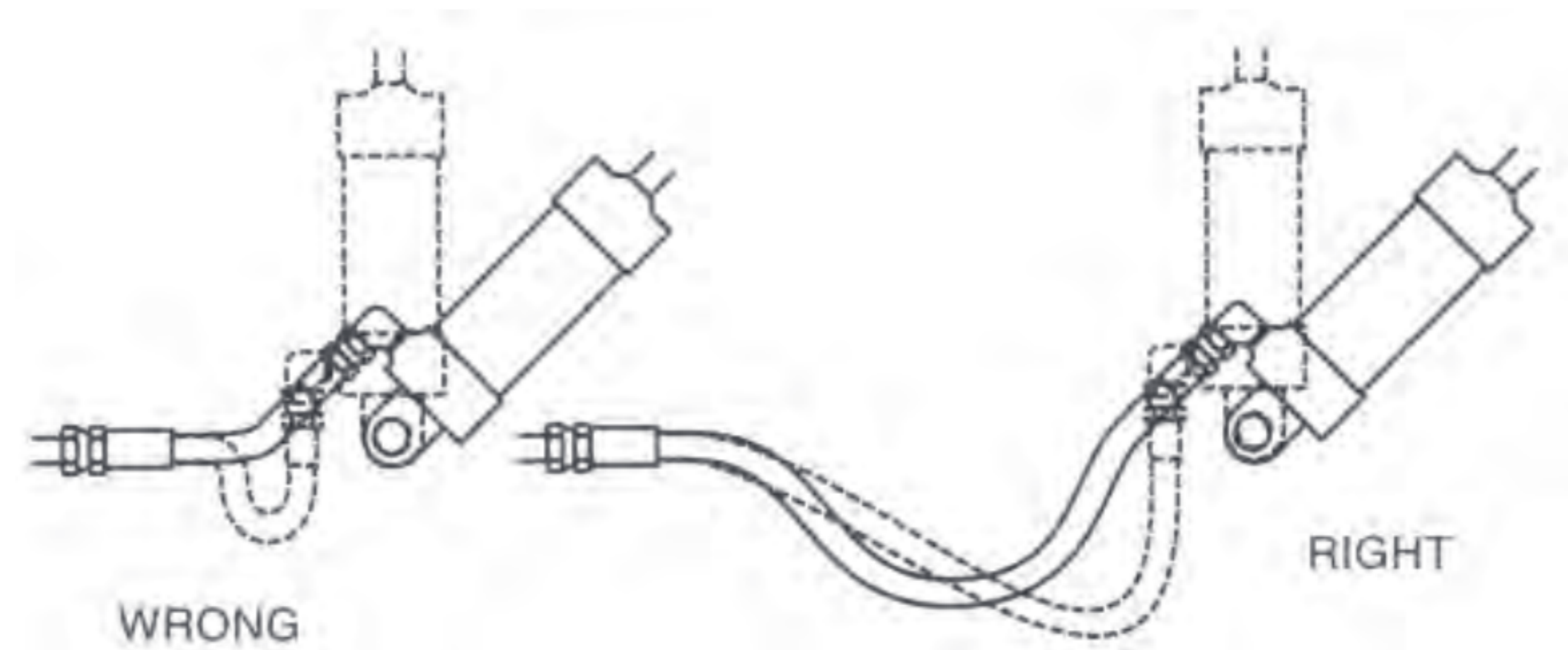
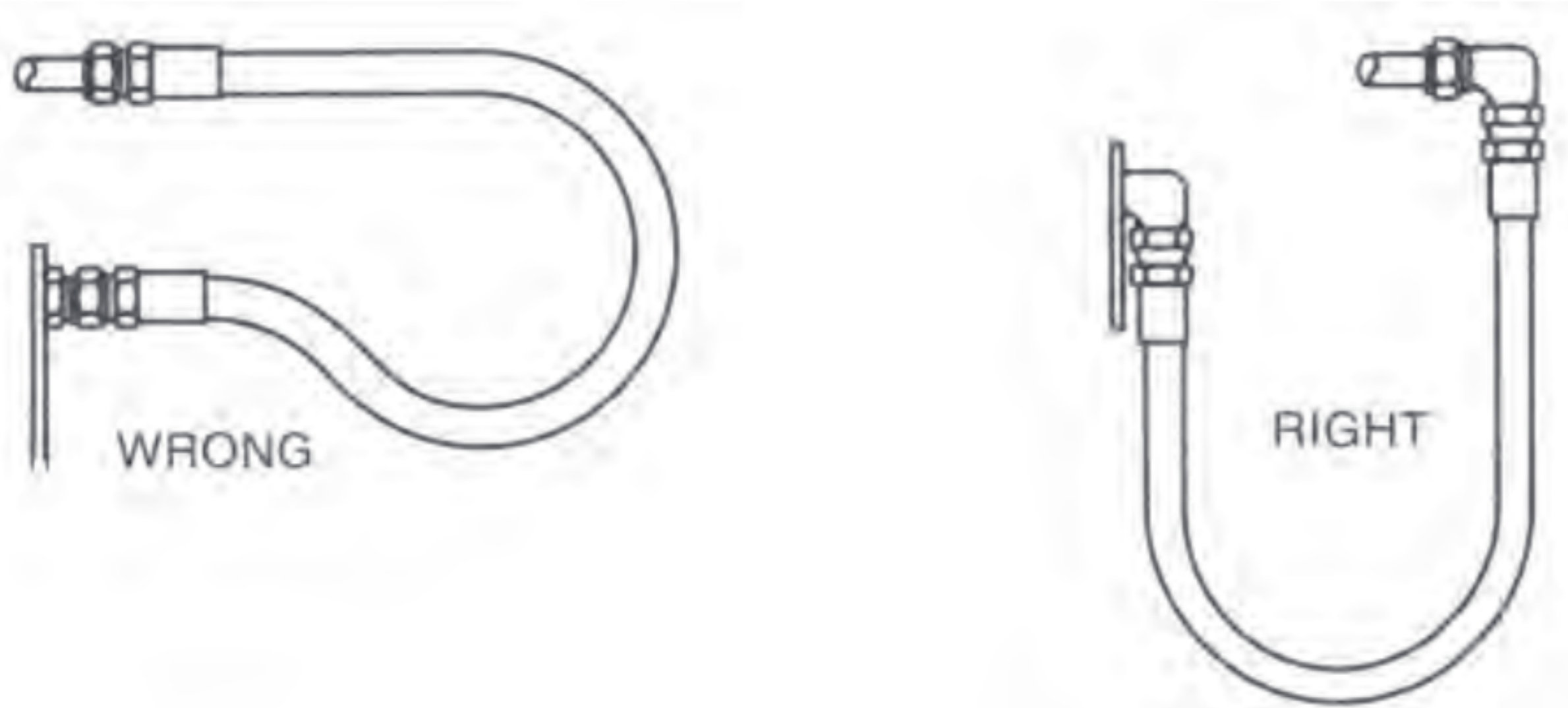
Since hose may change in length from +2% to -4% under the surge of high pressure, provide sufficient slack for expansion and contraction.

Obtain direct routing of hose through use of 45° and 90° adapters and fittings. Improve appearance by avoiding excessive hose length.



Avoid a sharp twist or bend in the hose by using the proper angle adaptors.

Due to changes in the length when a hose is pressurized, do not clamp at bends so curves absorb changes and protect the hose with a spring guard. Do not clamp high and low pressure lines together and protect the hose with a spring guard.



Where the radius falls below the required minimum, an angle adapter should be used as shown above to avoid a sharp bend in the hose.

Adequate hose length is most important to distribute movement on flexing applications and to avoid abrasion.

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HOSES

ONE-PIECE B SERIES

ONE-PIECE D SERIES

ONE-PIECE F & P SERIES

TWO-PIECE FERRULES (A & PFR SERIES)

TWO-PIECE INSERTS (A SERIES)

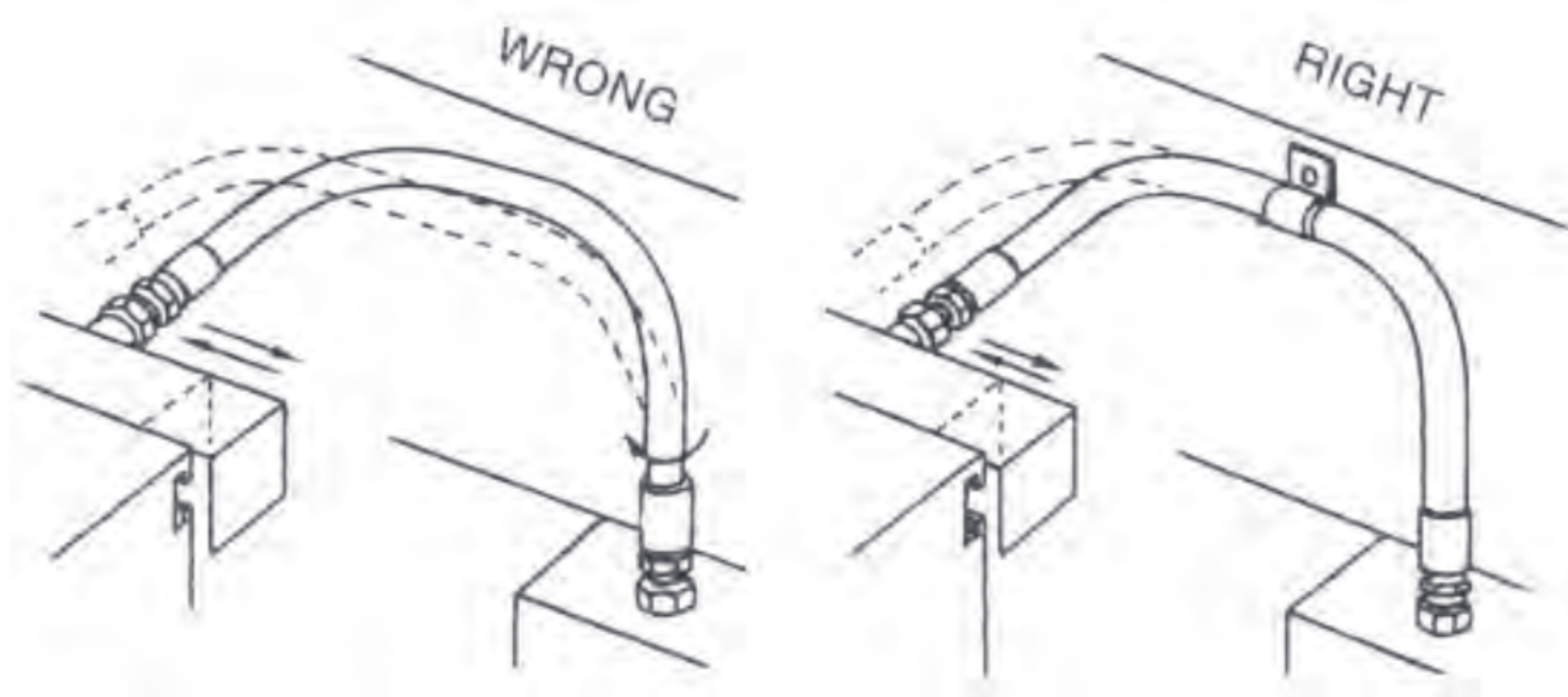
TWO-PIECE INTERLOCK FERRULES & INSERTS (X & Z SERIES)

QUICK RELEASE

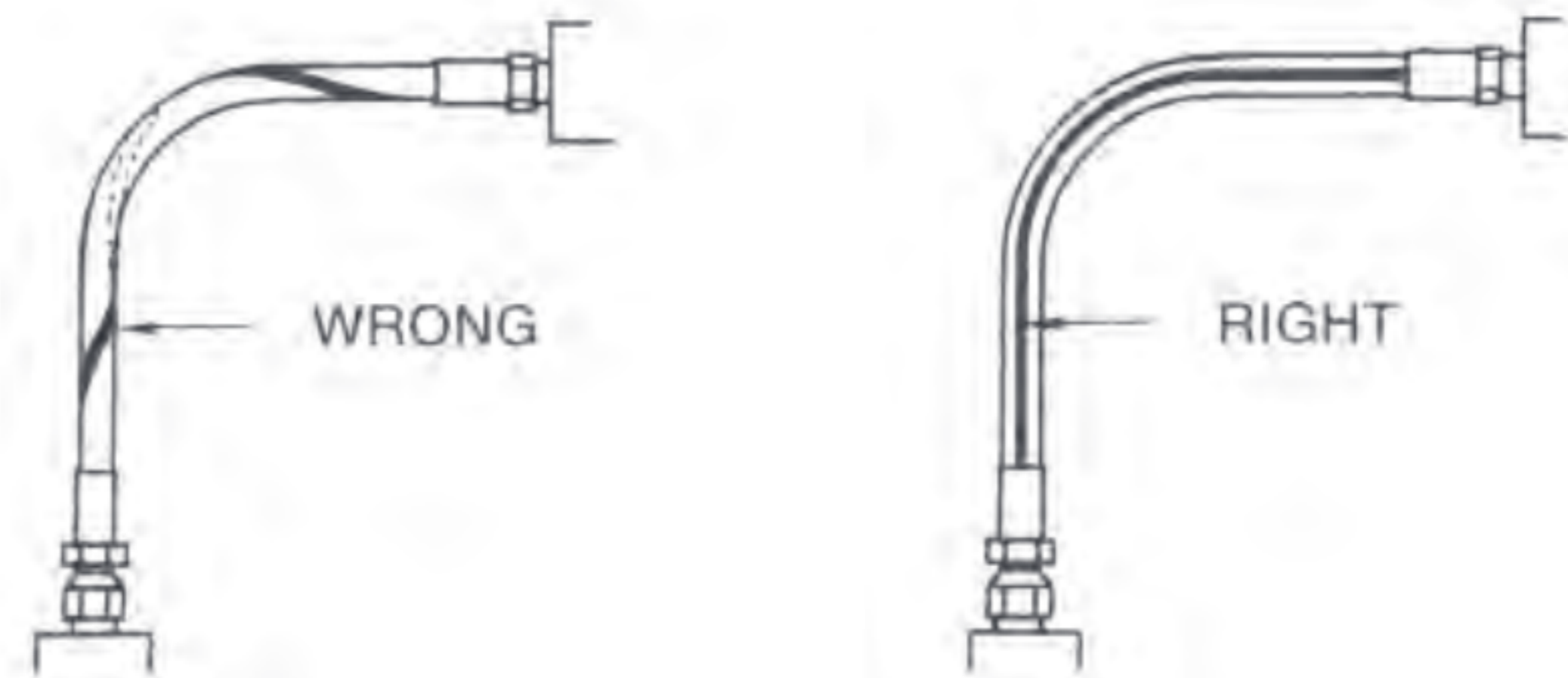
ASSEMBLY EQUIPMENT

TECHNICAL INFORMATION

Correct Assembly & Installation

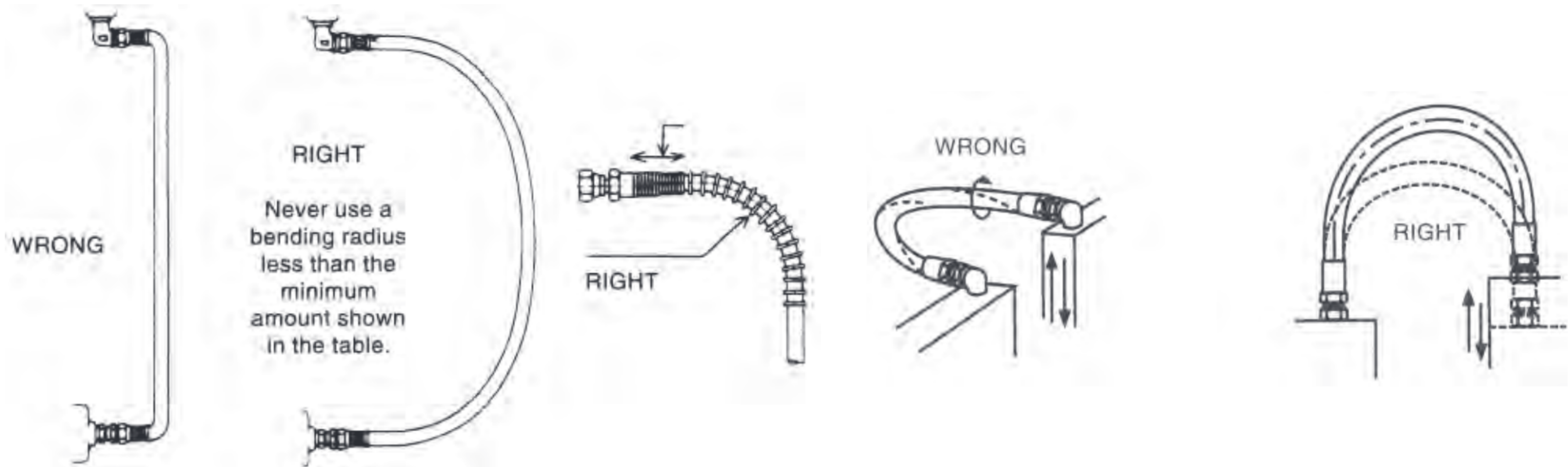


To avoid twisting in hose lines bent in two planes, clamp hose at change of plane, as shown.



Hose should not be twisted.

Hose is weakened when installed in a twisted position. Also pressure in twisted hose tends to loosen fitting connections. Design so that machine motion produces bending rather than twisting.



To prevent twisting and distortion, hose should be bent in the same plane as the motion of the boss to which the hose is connected.

Never use a bending radius less than the minimum shown in the hose specification tables. Avoid sharp bends in hoses to reduce collapsing of lines and restriction of flow by using a proper spring guard. Exceeding minimum bend radius will greatly reduce hose assembly life.

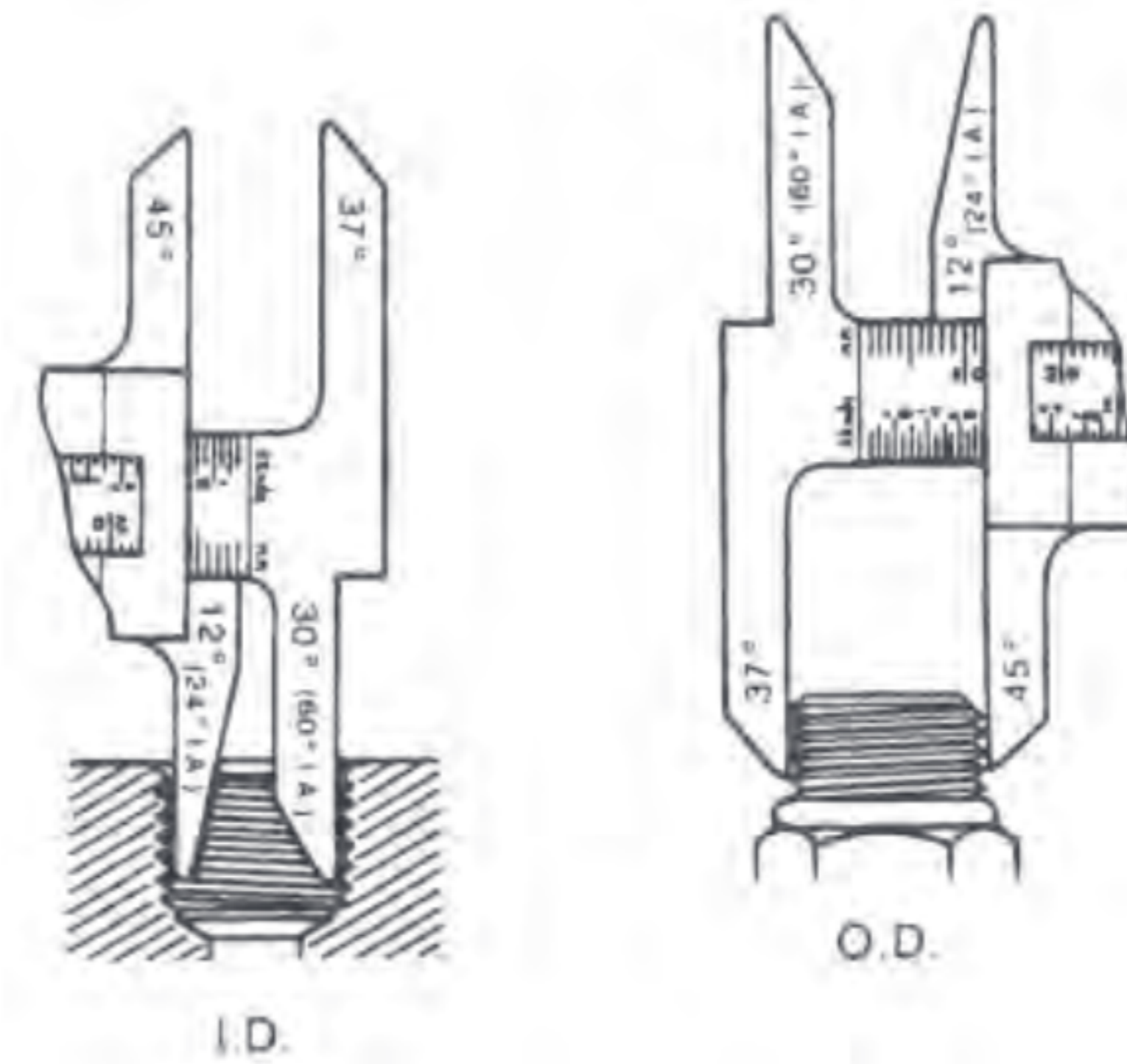
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HOSES
ONE-PIECE B SERIES
ONE-PIECE D SERIES
ONE-PIECE F & P SERIES
TWO-PIECE FERRULES (A & PFR SERIES)
TWO-PIECE INSERTS (A SERIES)
TWO-PIECE INTERLOCK FERRULES & INSERTS (X & Z SERIES)
QUICK RELEASE
ASSEMBLY EQUIPMENT

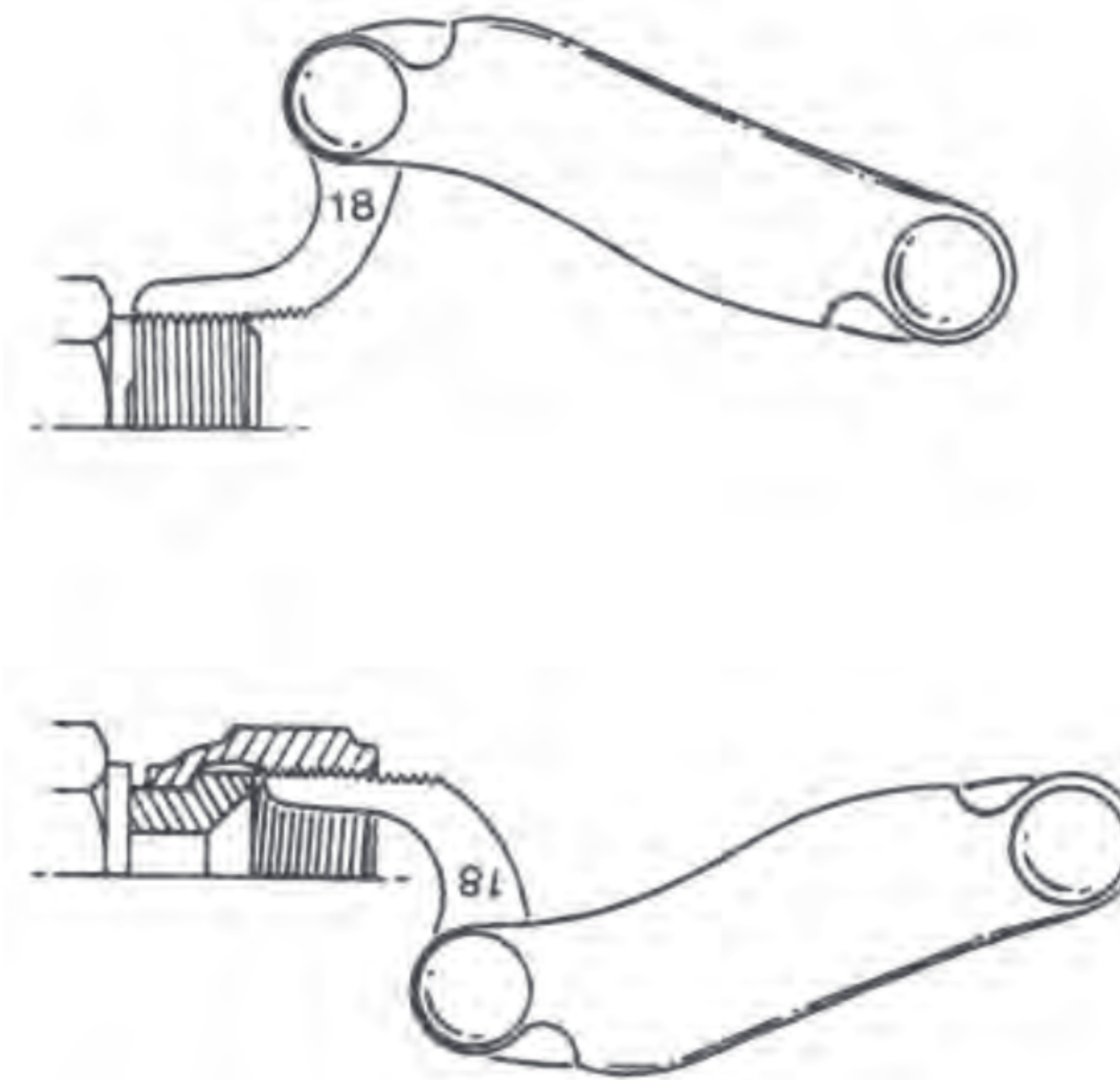
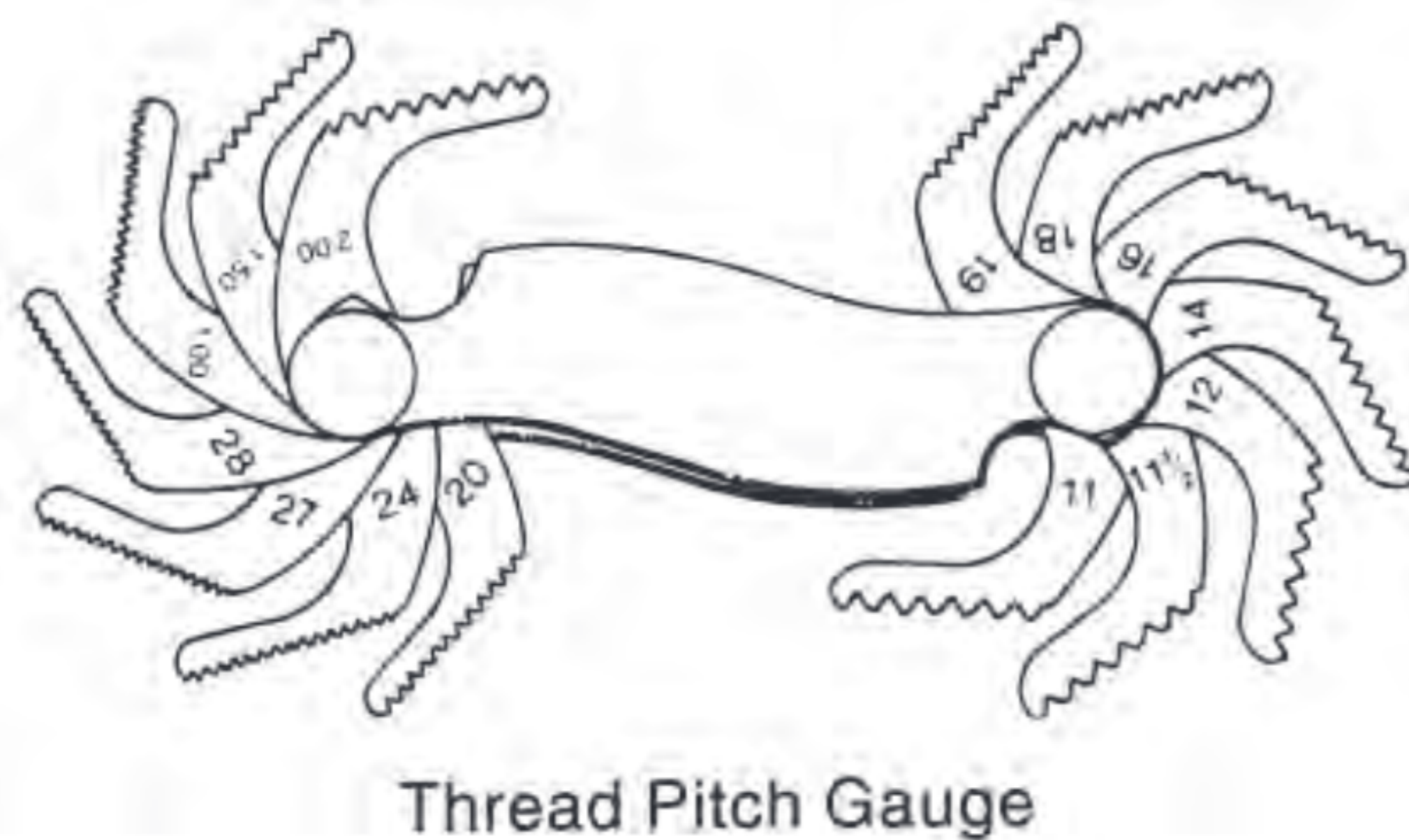
Measuring Threads and Seat Angles

Measuring Threads

With the calliper, measure the thread diameter at the largest point. (O.D. of male threads – I.D. of female threads). See illustration at right.

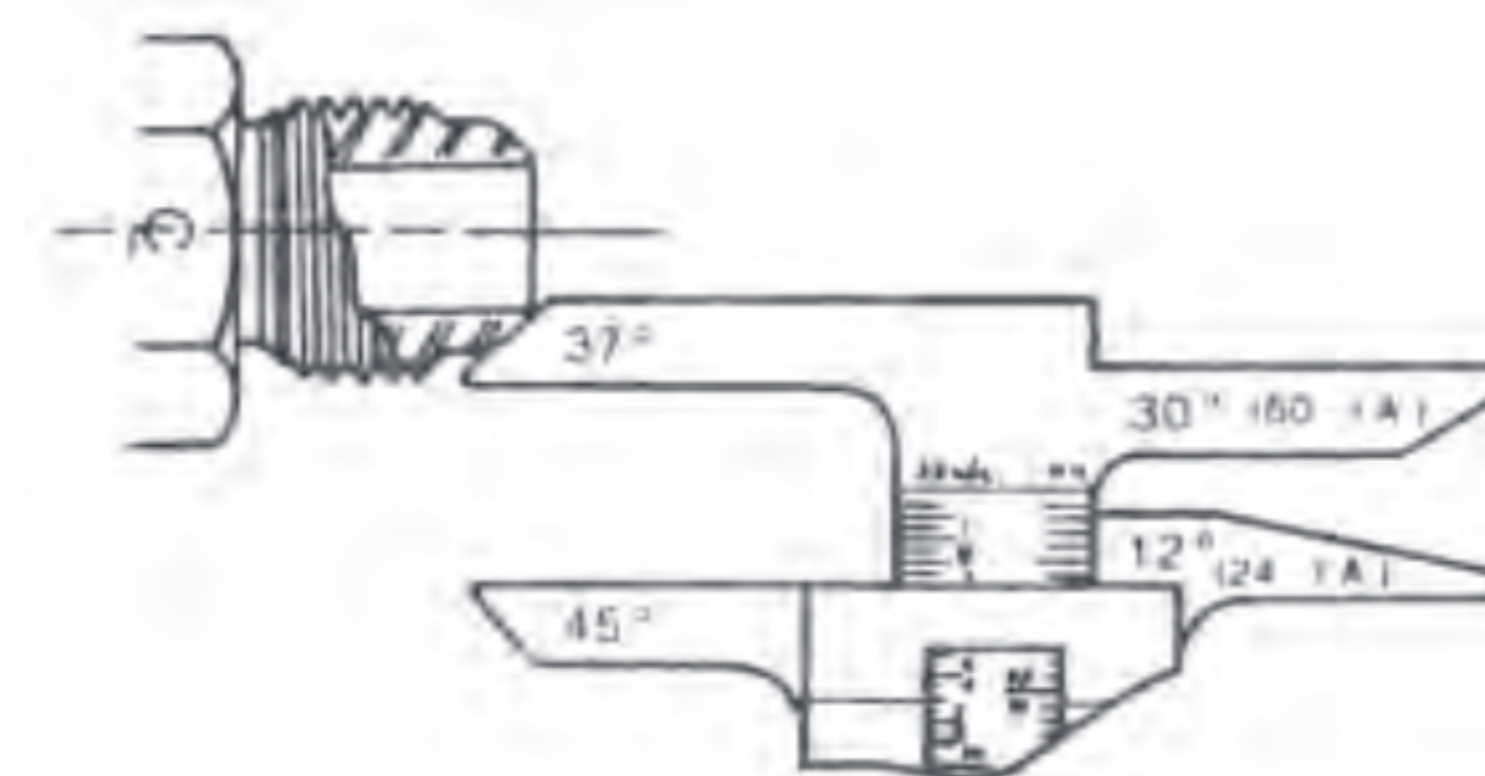


Use a thread pitch gauge (see illustration below) to determine the number of threads per inch or the distance between threads in metric connections. Place the gauge on the threads (see illustrations at right) until the fit is snug. Match the measurement to the chart.



Measuring Seat Angles

When the centerline of the seat gauge extends parallel to the projected longitudinal axis of the coupling, then the angles of the gauge and seat match. See illustration at right.

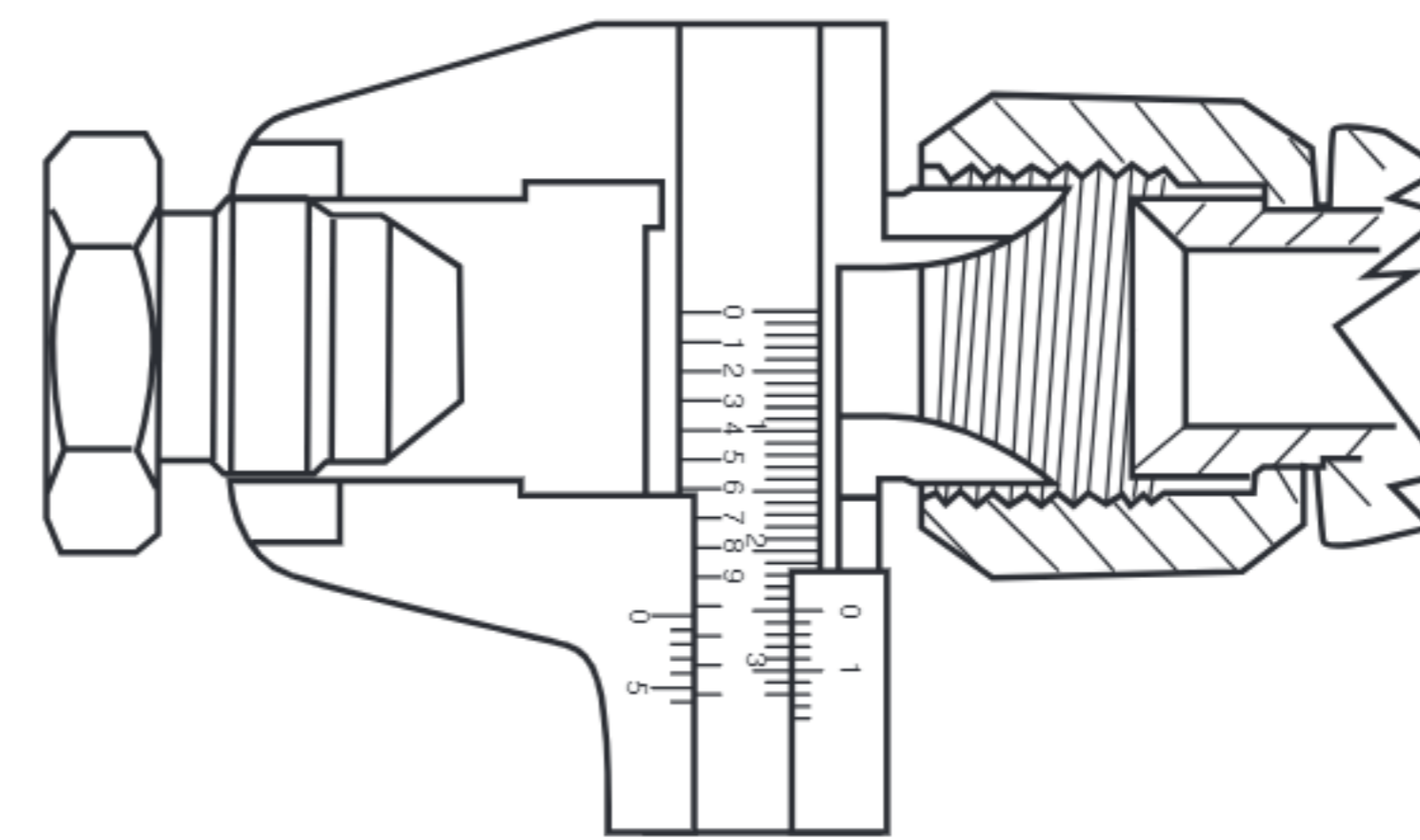


Compare the measurements taken to the couplings shown in the coupling specification tables that appear in this catalog.

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HOW TO DETERMINE THE THREAD TYPE USING CALLIPERS

By measuring with a caliper the outside diameter of the thread of a male or the inside diameter of the thread of a female you will get a measure in mm. By finding this value in mm on the below table, you'll be able to find the relevant thread type.



Male OD	mm	Female ID	Male OD	mm	Female ID
	8,7	G1/8" BSP		27,9	1 3/16" – 12 JIC
1/8" – 27 NPTF	9,5			28,0	M 30 x 2
G1/8" BSP	9,6			28,5	30 x 1,5 DKF
M 10 x 1	9,8		M 30 x 2	29,8	
	9,9	7/16" – 20 JIC	30 x 1,5 CEF	29,9	
	10,5	M 12 x 1,5	1 3/16" – 12 JIC	30,1	
7/16" – 20 JIC	11,0			30,7	G1" BSP
	11,4	1/2" – 20 SAE		31,2	1 5/16" – 12 JIC
	11,6	G1/4" BSP	1" – 11 1/2 NPTF	31,4	
M 12 x 1,5	11,9			31,5	M 33 x 1,5
1/4" – 18 NPTF	12,5		G1" BSP	33,1	
	12,5	M 14 x 1,5	1 5/16" – 12 JIC	33,2	
1/2" – 20 SAE	12,6			34,0	M 36 x 2
	12,9	9/16" – 18 JIC		34,5	36 x 1,5 DKF
G1/4" BSP	13,0		M 36 x 2	35,8	
M 14 x 1,5	13,9		36 x 1,5 CEF	35,9	
9/16" – 18 JIC	14,2			36,5	M 36 x 1,5
	14,5	M 16 x 1,5	M 38 x 1,5	37,9	
	15,1	G3/8" BSP		38,8	1 5/8" – 12 JIC
M 16 x 1,5	15,8			39,4	G1 1/4" BSP
3/8" – 18 NPTF	15,9			39,8	M 42 x 2
	16,5	M 18 x 1,5	1 1/4" – 11 1/2 NPTF	40,2	
G3/8" BSP	16,6			40,5	M 42 x 1,5
	17,5	3/4" – 16 JIC	1 5/8" – 12 JIC	41,1	
M 18 x 1,5	17,9		1 1/4" – 11 BSP	41,7	
	18,4	20 x 1,5 DKF	M 42 x 2	41,8	
3/4" – 16 JIC	18,8			42,4	M 45 x 2
	18,8	G1/2" BSP		43,3	45 x 1,5 DKF
1/2" – 14 NPT	19,8		M 45 x 2	44,8	
20 x 1,5 CEF	19,9		45 x 1,5 CEF	44,9	
	20,4	7/8" – 14 SAE		45,1	1 7/8" – 12 JIC
	20,5	M 22 x 1,5		45,2	G1 1/2" BSP
G1/2" BSP	20,8		1 1/2" – 11 1/2 NPTF	46,3	
	20,9	G5/8" BSP	1 7/8" – 12 JIC	47,5	
M 22 x 1,5	21,9		G1 1/2" BSP	47,7	
7/8" – 14 SAE	22,1			49,6	M 52 x 2
	22,5	24 x 1,5 DKF		50,3	52 x 1,5 DKF
G5/8" BSP	22,8		M 52 x 2	51,8	
24 x 1,5 CEF	23,9		52 x 1,5 CEF	51,9	
	24,5	G3/4" BSP		57,4	G2" BSP
	24,8	1 1/16" – 12 JIC	2" – 11 1/2 NPTF	58,3	
3/4" – 14 NPTF	25,1		G2" BSP	59,4	
	25,5	M 26 x 1,5		61,1	2 1/2" – 12 JIC
M 26 x 1,5	25,9			62,5	M 65 x 2
G3/4" BSP	26,3		2 1/2" – 12 JIC	63,3	
1 1/16" – 12 JIC	26,8				

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Fitting Identification

Dash Numbers

Most fluid piping system sizes are measured by dash numbers. These are universally used abbreviations for the size of a component expressed as the numerator of the fraction with the denominator always being 16. For example, a -04 port is 4/16 or 1/4 inch. Dash numbers are usually nominal (in name only) and are abbreviations that make the ordering of components easier.

There are a few coupling systems used for hydraulic connections. They are identified as:

American, British, French, German, Japanese

This section lists the origin and coupling style. Descriptions and dimensional data follow each coupling style.

American Thread Types

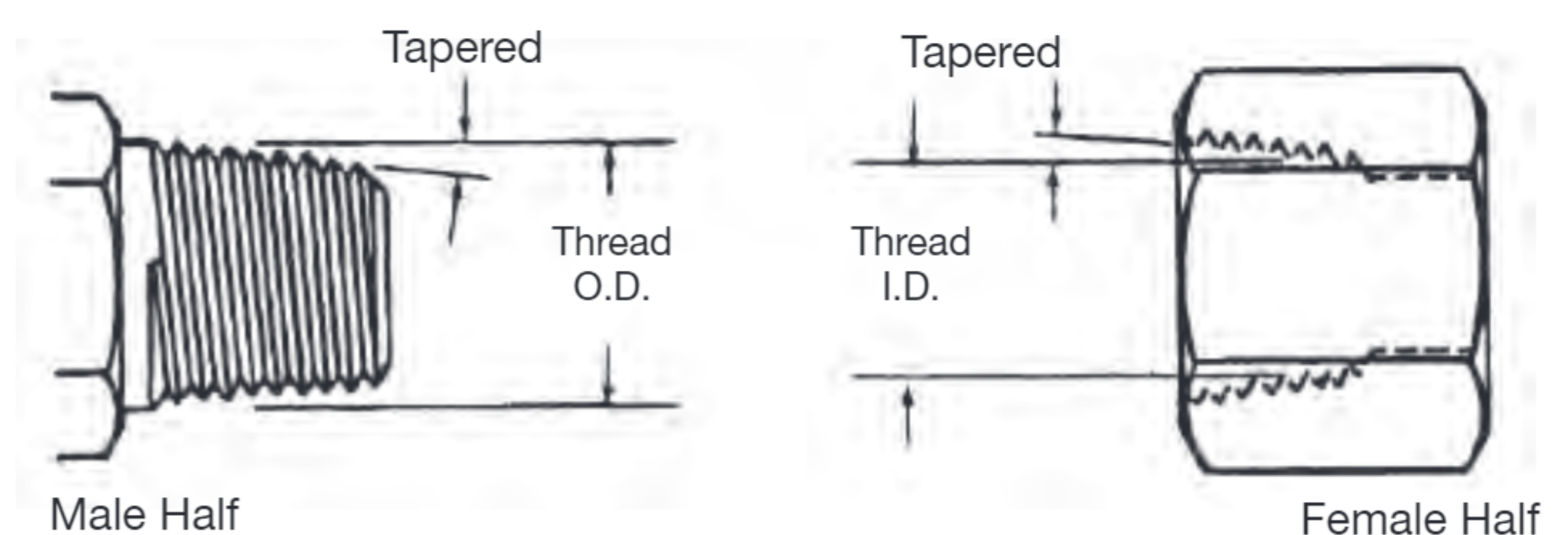
NPTF – (National Pipe Tapered Fuel)

This is a dryseal thread, the National pipe tapered thread for fuels. This is used for both male and female ends. This connection is still widely used in fluid power systems, even though it is not recommended by the National Fluid Power Associations (N.F.P.A.) for use in hydraulic applications.

The NPTF male will mate with the NPTF, NPSF, or NPSM female.

The NPTF male has tapered threads and a 30° inverted seat. The NPTF female has tapered threads and no seat. The seal takes place by deformation of the threads. The NPSM female has straight threads and a 30° inverted seat. The seal takes place on the 30° seat.

The NPTF connector is similar to, but not interchangeable with, the BSPT connector. The thread pitch is different in most sizes. Also, the thread angle is 60° instead of the 55° angle found on BSPT threads.



Thread Identification Table

National Pipe Straight Mechanical (NPSM) National Pipe Tapered for Fuels (NPTF)

Dash Size	Inch Size (in.)	Thread Size (in - TPI)	Female Thread ID		Male Thread OD	
			(mm)	(in.)	(mm)	(in.)
-02	1/8	1/8 - 27	8.7	0.34	10.3	0.41
-04	1/4	1/4 - 18	11.9	0.47	14.3	0.56
-06	3/8	3/8 - 18	15.1	0.59	17.5	0.69
-08	1/2	1/2 - 14	18.3	0.72	21.4	0.84
-12	3/4	3/4 - 14	23.8	0.94	27.0	1.06
-16	1	1 - 11 1/2	30.2	1.19	33.3	1.31
-20	1 1/4	1 1/4 - 11 1/2	38.9	1.53	42.9	1.69
-24	1 1/2	1 1/2 - 11 1/2	44.5	1.75	48.4	1.91
-32	2	2 - 11 1/2	57.2	2.25	60.3	2.38

NPSF – (National Pipe Straight Thread for Fuels)

The National pipe straight thread for fuels. This is sometimes used for female ends and properly mates with the NPTF male end. However, the SAE recommends the NPTF thread in preference to the NPSF for female ends.

NPSM – (National Pipe Straight Mechanical)

National pipe straight thread for mechanical joint. This is used on the female swivel nut of iron pipe swivel adapters. The leak-resistant joint is not made by the sealing fit of threads, but by a tapered seat in the coupling end. This connection is sometimes used in fluid power systems.

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HOSES
ONE-PIECE B SERIES
ONE-PIECE D SERIES
ONE-PIECE F & P SERIES
TWO-PIECE FERRULES (A & PFR SERIES)
TWO-PIECE INSERTS (A SERIES)
TWO-PIECE INTERLOCK FERRULES & INSERTS (X & Z SERIES)
QUICK RELEASE
ASSEMBLY EQUIPMENT
TECHNICAL INFORMATION

American

SAE J514 Straight Thread O-Ring Boss (ORB)

This port connection is recommended by the N.F.P.A. for optional leakage control in medium and high pressure hydraulic systems. The O-ring boss male will mate with an O-ring boss female only.

The female is generally found on ports.

Thread Identification Table

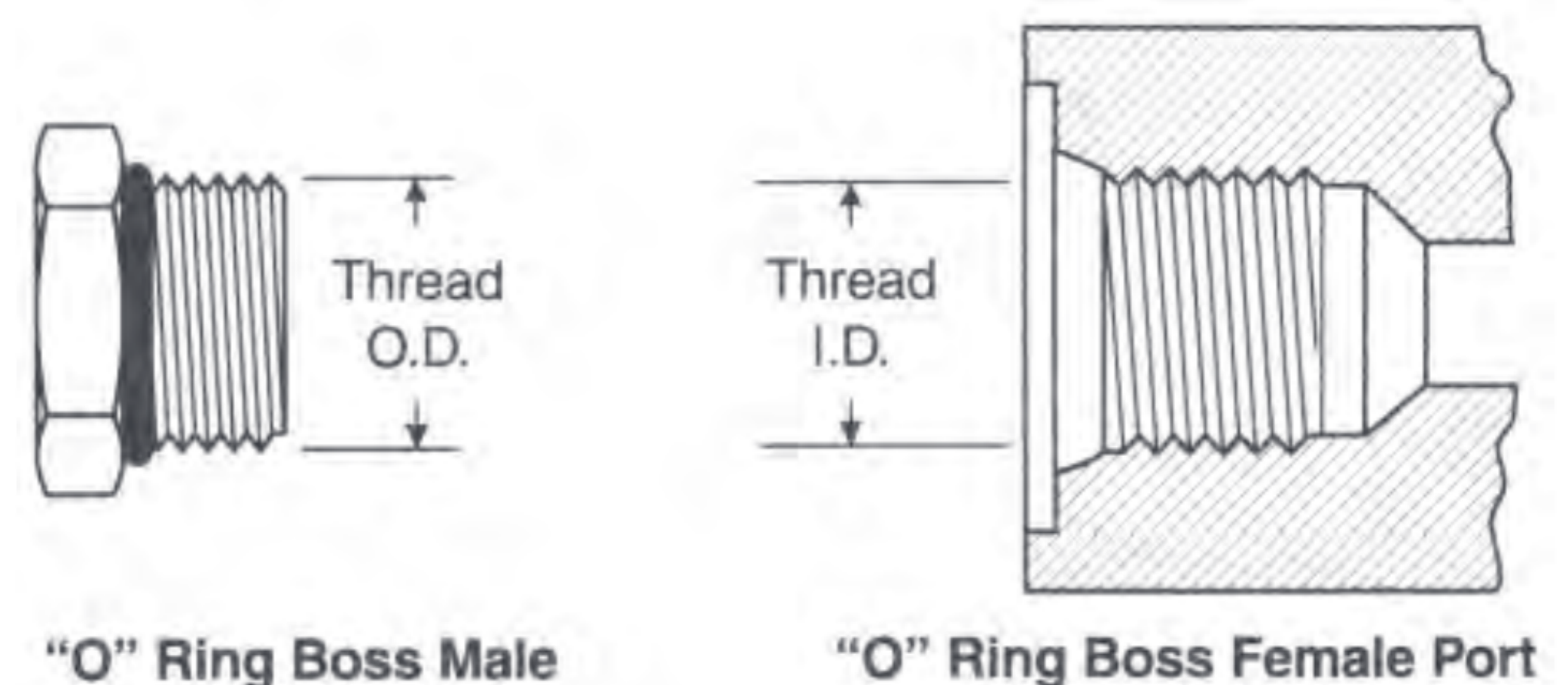
SAE J514 Straight Thread O-Ring Boss

Dash Size	Inch Size (in.)	Thread Size (in - TPI)	Female Thread ID		Male Thread OD	
			(mm)	(in.)	(mm)	(in.)
-02	1/8	5/16 - 24	6.9	0.27	7.8	0.31
-03	3/16	3/8 - 24	8.5	0.34	9.4	0.37
-04	1/4	7/16 - 20	9.9	0.39	11.2	0.44
-05	5/16	1/2 - 20	11.5	0.45	12.6	0.49
-06	3/8	9/16 - 18	12.9	0.51	14.1	0.56
-08	1/2	3/4 - 16	17.5	0.69	18.9	0.74
-10	5/8	7/8 - 14	20.5	0.81	22.1	0.87
-12	3/4	1 1/16 - 12	24.9	0.98	26.9	1.06
-14	7/8	1 3/16 - 12	28.1	1.11	30.0	1.18
-16	1	1 5/16 - 12	31.3	1.23	33.1	1.31
-20	1 1/4	1 5/8 - 12	39.2	1.54	41.1	1.62
-24	1 1/2	1 7/8 - 12	45.6	1.79	47.4	1.87
-32	2	2 1/2 - 12	61.4	2.42	63.3	2.49

The male has straight threads and an O-ring. The female has straight threads and a sealing face. The seal is made at the O-ring on the male and sealing face on the female.

The threads hold the connection mechanically.

SAE Straight Thread O-Ring Boss



SAE J514 37° (JIC)

The Society of Automotive Engineers (SAE) specifies a 37° angle flare or seat be used with high pressure hydraulic tubing. These are commonly called JIC couplings.

The JIC 37°Flare male will only mate with a JIC female.

The JIC male has straight threads and a 37°Flare seat.

Thread Identification Table

SAE J514 37°Flare (JIC)

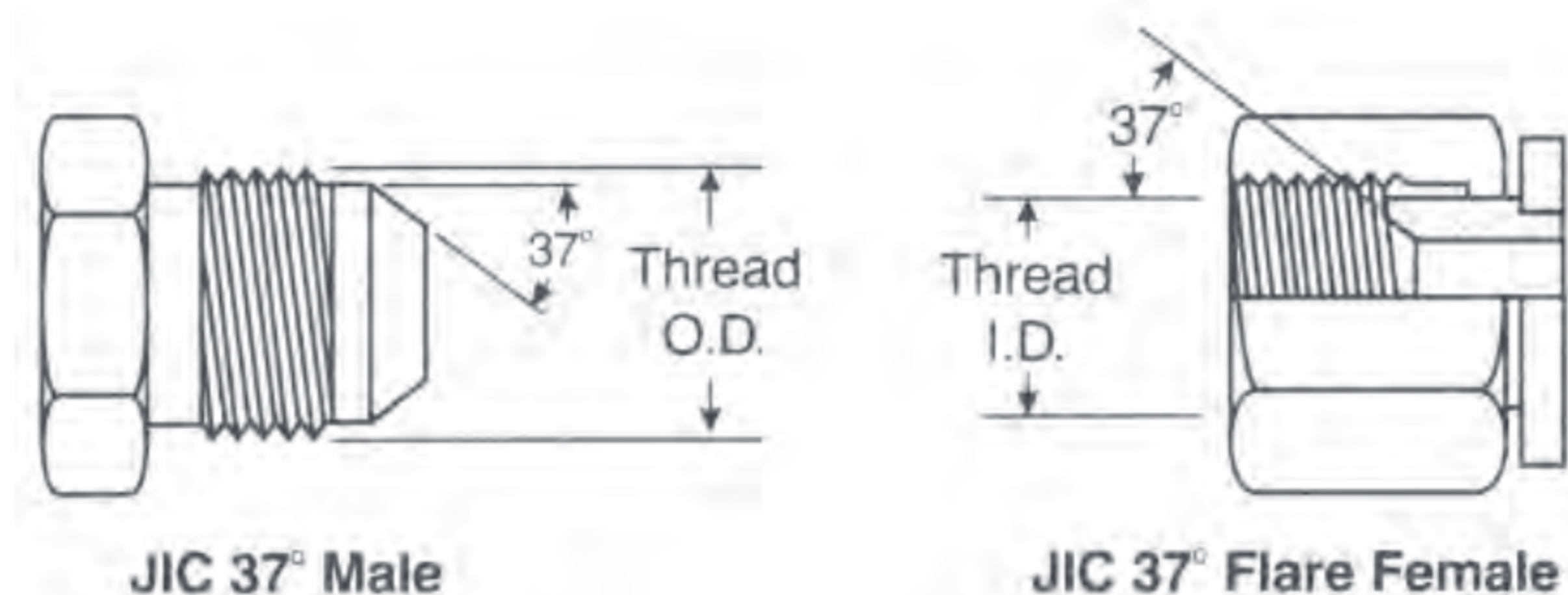
Dash Size	Inch Size (in.)	Thread Size (in - TPI)	Female Thread ID		Male Thread OD	
			(mm)	(in.)	(mm)	(in.)
-02	1/8	5/16 - 24	6.9	0.27	7.8	0.31
-03	3/16	3/8 - 24	8.5	0.34	9.4	0.37
-04	1/4	7/16 - 20	9.9	0.39	11.2	0.44
-05	5/16	1/2 - 20	11.5	0.45	12.6	0.49
-06	3/8	9/16 - 18	12.9	0.51	14.1	0.56
-08	1/2	3/4 - 16	17.5	0.69	18.9	0.74
-10	5/8	7/8 - 14	20.5	0.81	22.1	0.87
-12	3/4	1 1/16 - 12	24.9	0.98	26.9	1.06
-14	7/8	1 3/16 - 12	28.1	1.11	30.0	1.18
-16	1	1 5/16 - 12	31.3	1.23	33.1	1.31
-20	1 1/4	1 5/8 - 12	39.2	1.54	41.1	1.62
-24	1 1/2	1 7/8 - 12	45.6	1.79	47.4	1.87
-32	2	2 1/2 - 12	61.4	2.42	63.3	2.49

The JIC female has straight threads and a 37°Flare seat.

The seal is made on the 37°Flare seat by establishing a line contact between the male flare and the female cone seat. The threads hold the connection mechanically.

CAUTION: In the -02, -03, -04, -05, -08 and -10 sizes, the threads of the SAE 45°Flare and the SAE 37°Flare are the same. However, the sealing surface angles are not the same. Carefully measure the seat angle to differentiate.

37°Flare (JIC)



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Fitting Identification - American



HOSES
ONE-PIECE B SERIES
ONE-PIECE D SERIES
ONE-PIECE F & P SERIES
TWO-PIECE FERRULES (A & PFR SERIES)
TWO-PIECE INSERTS (A SERIES)
TWO-PIECE INTERLOCK FERRULES & INSERTS (X & Z SERIES)
QUICK RELEASE
ASSEMBLY EQUIPMENT
TECHNICAL INFORMATION

American (Continued)

SAE J512 45°

A term usually applied to fittings having a 45° angle flare or seat. Soft copper tubing is generally used in such applications as it is easily flared to the 45° angle. These are for low pressure applications – commonly used in refrigeration, automotive and truck piping systems. The SAE 45°Flare male will mate with an SAE 45°Flare female only

The SAE male has straight threads and a 45°Flare seat.

The SAE female has straight threads and a 45°Flare seat.

The seal is made on the 45°Flare seat.

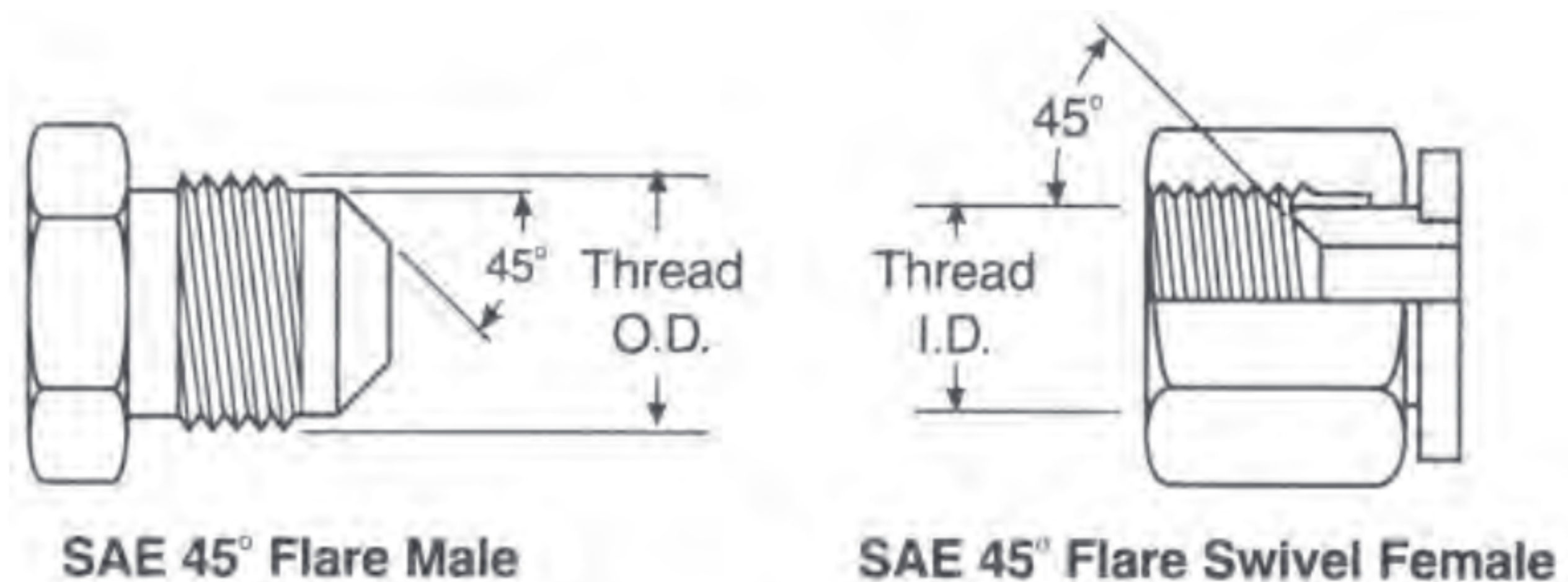
The threads hold the connection mechanically.

CAUTION: In the -02, -03, -04, -05, -08 and -10 sizes, the threads of the SAE 45°Flare and the SAE 37°Flare are the same. However, the sealing surface angles are not the same. Carefully measure the seat angle to differentiate.

Thread Identification Table SAE J512 45°

Dash Size	Inch Size (in.)	Thread Size (in - TPI)	Female Thread ID		Male Thread OD	
			(mm)	(in.)	(mm)	(in.)
-02	1/8	5/16 - 24	6.9	0.27	7.9	0.31
-03	3/16	3/8 - 24	8.6	0.34	9.6	0.38
-04	1/4	7/16 - 20	9.9	0.39	11.2	0.44
-05	5/16	1/2 - 20	11.4	0.45	12.7	0.50
-06	3/8	5/8 - 18	14.2	0.56	15.7	0.62
-07	7/16	11/16 - 16	15.7	0.62	17.3	0.68
-08	1/2	3/4 - 16	17.0	0.68	19.0	0.75
-10	5/8	7/8 - 14	20.3	0.80	22.3	0.88
-12	3/4	1 1/16 - 14	25.1	0.99	26.9	1.06
-14	7/8	1 1/4 - 12	29.5	1.16	31.7	1.25
-16	1	1 3/8 - 12	32.5	1.28	35.0	1.38

SAE 45°Flare



SAE J1453 O-Ring Face Seal (ORFS)

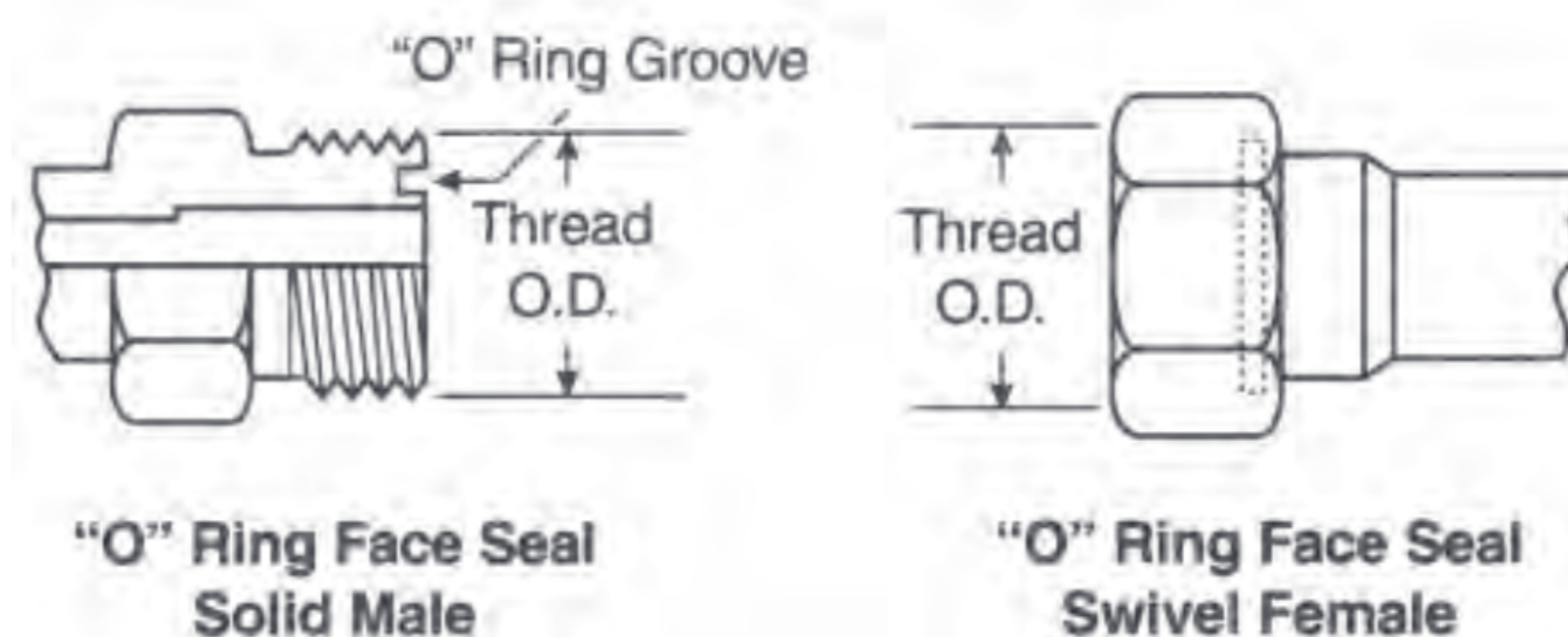
A seal is made when the O-ring in the male contacts the flat face on the female. Couplings are intended for hydraulic systems where elastomeric seals are acceptable to overcome leakage and leak resistance is crucial. This connection offers the very best leakage control available today.

The male connector has a straight thread and a machined flat face. The female has a straight thread and a machined flat face. The seal takes place by compressing the O-ring onto the flat face of the female, similar to the split flange type fitting. The threads hold the connection mechanically.

Thread Identification Table SAE J1453 O-Ring Face Seal (ORFS)

Dash Size	Inch Size (in.)	Thread Size (in - TPI)	Female Thread ID		Male Thread OD	
			(mm)	(in.)	(mm)	(in.)
-04	1/4	9/16 - 18	12.9	0.51	14.1	0.56
-06	3/8	11/16 - 16	15.9	0.63	17.3	0.68
-08	1/2	13/16 - 16	19.1	0.75	20.5	0.81
-10	5/8	1 - 14	23.6	0.93	23.2	0.99
-12	3/4	1 3/16 - 12	28.1	1.11	30.0	1.18
-16	1	1 7/16 - 12	34.4	1.36	36.3	1.43
-20	1 1/4	1 11/16 - 12	40.8	1.61	42.7	1.68
-24	1 1/2	2 - 12	48.7	1.92	50.6	1.99

O-Ring Face Seal (ORFS)



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American (Continued)

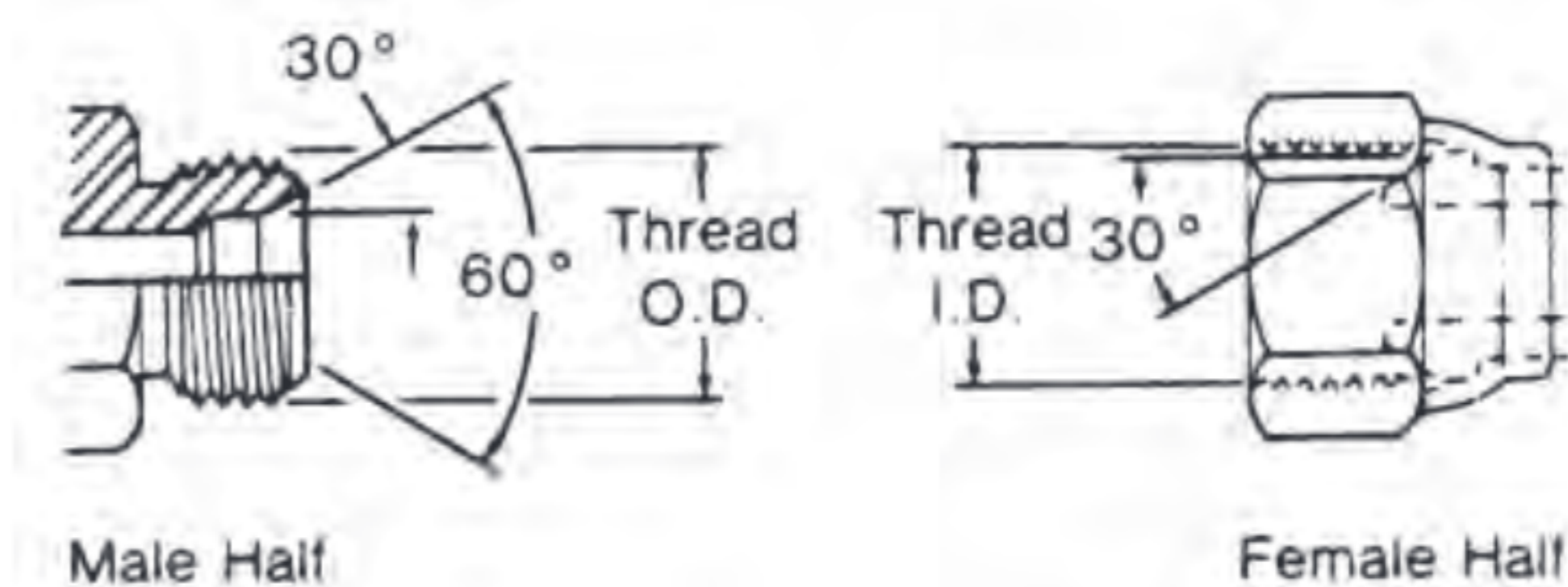
SAE J512 Inverted Flare

This connection is frequently used in automotive systems. The male connector can either be a 45° Flare in the tube fitting form or a 42° seat in the machined adapter form.

The female has a straight thread with a 42° inverted flare. The seal takes place on the flared surface. The threads hold the connection mechanically.

Thread Identification Table SAE J512 Inverted Flare

Dash Size	Inch Size (in.)	Thread Size (in - TPI)	Female Thread ID		Male Thread OD	
			(mm)	(in.)	(mm)	(in.)
-02	1/8	5/16 - 28	6.9	0.27	7.9	0.31
-03	3/16	3/8 - 24	8.6	0.34	9.6	0.38
-04	1/4	7/16 - 24	9.9	0.39	11.2	0.44
-05	5/16	1/2 - 20	11.4	0.45	12.7	0.50
-06	3/8	5/8 - 18	14.2	0.56	15.7	0.62
-07	7/16	11/16 - 18	15.7	0.62	17.3	0.68
-08	1/2	3/4 - 18	17.0	0.68	19.0	0.76
-10	5/8	7/8 - 18	20.3	0.80	22.3	0.88
-12	3/4	1 1/16 - 16	25.1	0.99	26.9	1.06



SAE J1467 Clip Fastener (Press-Lok Connector)

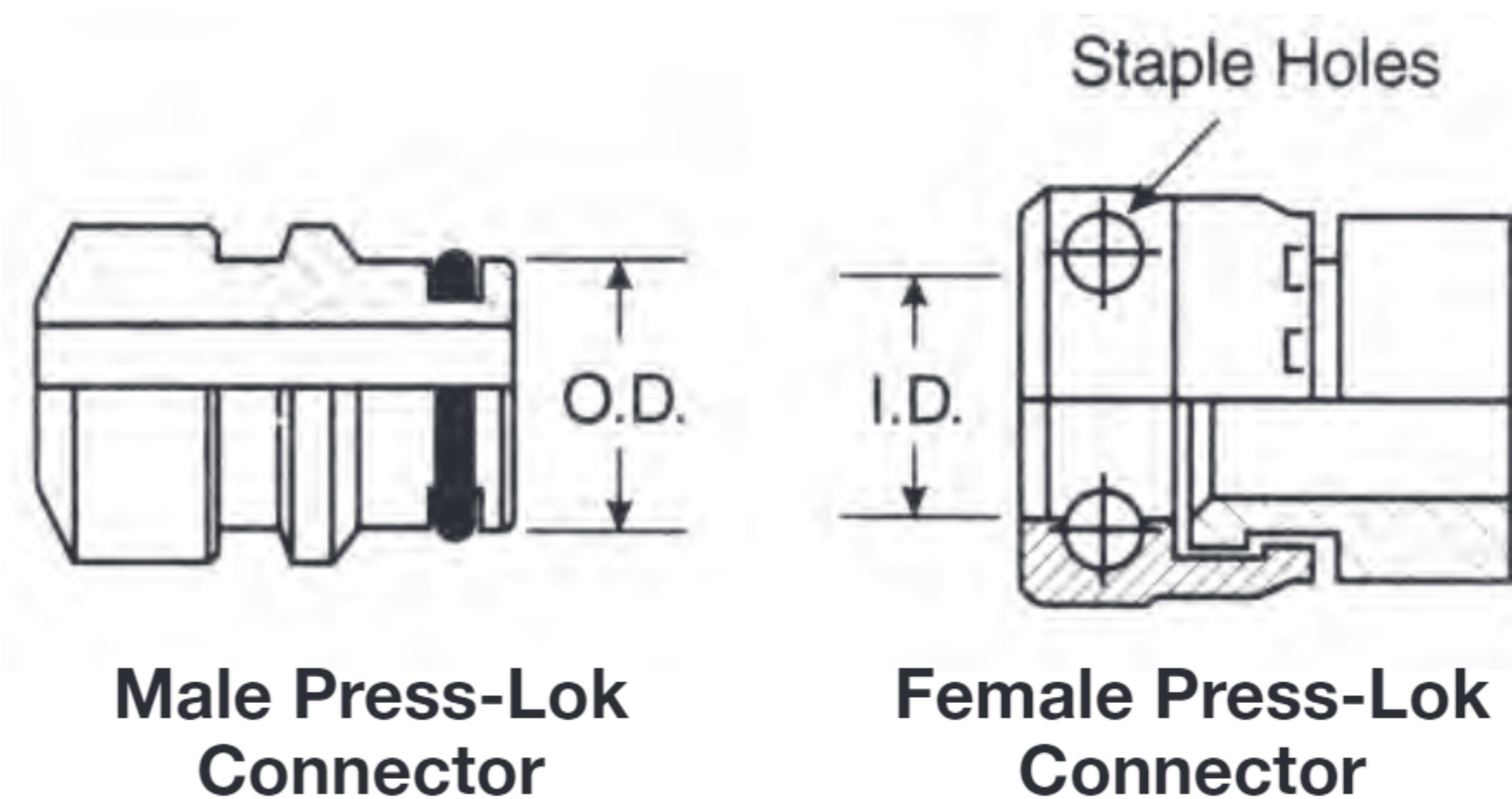
This is a radial O-ring seal connection commonly used for hydraulic applications in underground mines. The male contains an exterior O-ring and backup ring, plus, a groove to accept the "staple." The female has a smooth bore with two holes for the staple.

A "U" shaped staple or retaining clip is inserted through the two holes, passing through the groove in the male to lock the connection together. The seal takes place by contact between the O-ring in the male and the smooth bore of the female.

Connector Identification Table SAE J1467 Clip Fastener

Dash Size	Inch Size	Male OD		Female ID	
		(in.)	(mm)	(in.)	(mm)
-04	1/4	19/32	14.9	19/32	15.1
-06	3/8	25/32	19.9	51/64	20.1
-08	1/2	15/16	23.9	61/64	24.1
-12	3/4	1 9/64	28.9	1 9/64	29.1
-16	1	1 17/32	38.9	1 35/64	39.1
-20	1 1/4	1 13/16	45.9	1 13/16	46.1
-24	1 1/2	2 5/32	54.9	2 11/64	55.2
-32	2	2 33/64	63.9	2 17/32	64.2

Press-Lok Connectors



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HOSES
ONE-PIECE B SERIES
ONE-PIECE D SERIES
ONE-PIECE F & P SERIES
TWO-PIECE FERRULES (A & PFR SERIES)
TWO-PIECE INSERTS (A SERIES)
TWO-PIECE INTERLOCK FERRULES & INSERTS (X & Z SERIES)
QUICK RELEASE
ASSEMBLY EQUIPMENT

American (Continued)

SAE J518/DIN20066/ISO-DIS 6162/JIS B8363 O-ring Flanges

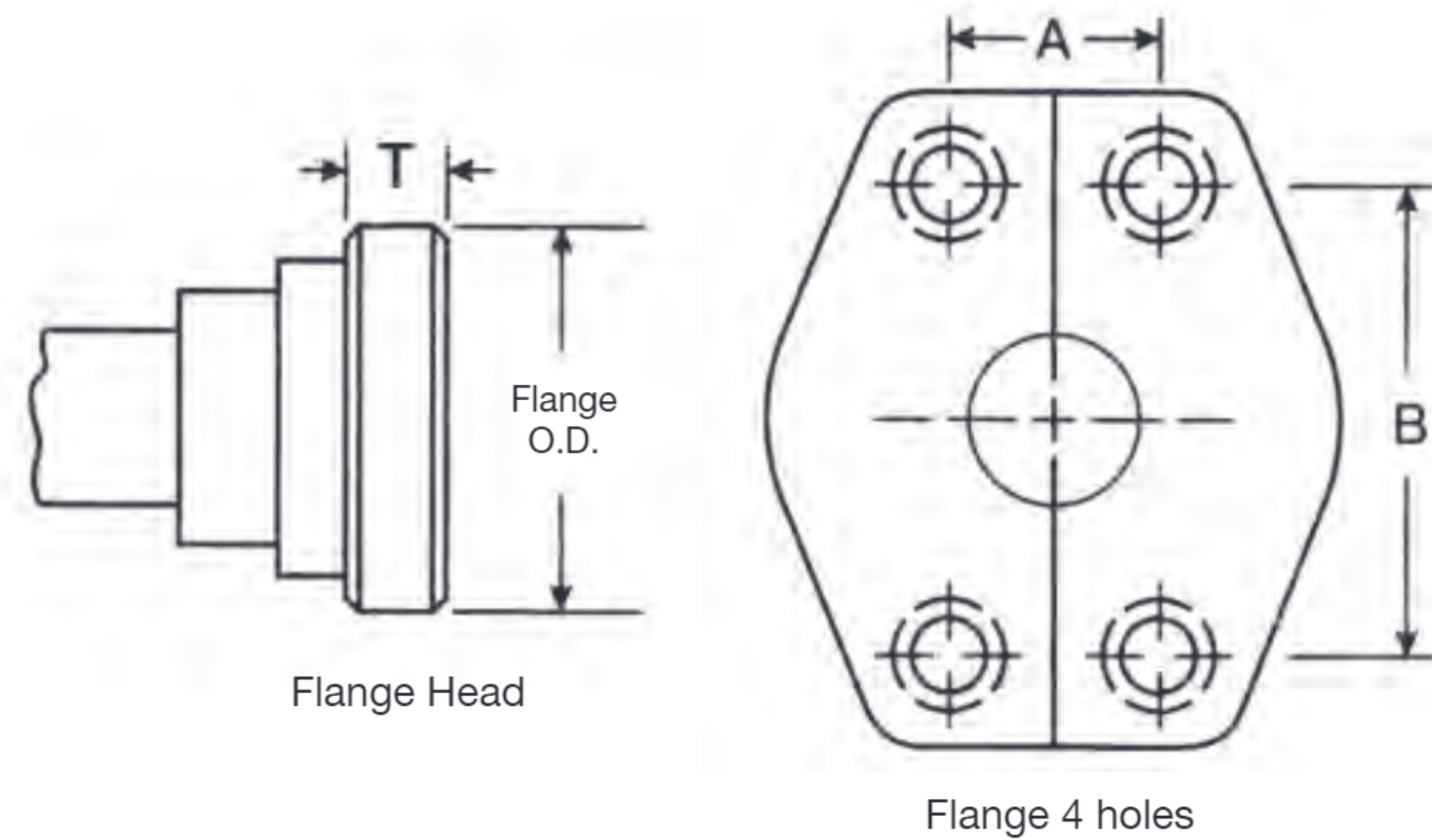
This connection is commonly used in fluid power systems. There are two pressure ratings. Code 61 Form R, PN 35/350 bar, Type I, is referred to as the “standard” series and Code 62 Form S, PN 415 bar, Type II, is the “heavy duty” “6000 psi” series. The design concept for both series is the same, but the bolt hole spacing and flanged head diameters are larger for the higher pressure, Code 62 connection.

The female (port) is an unthreaded hole with four bolt holes in a rectangular pattern around the port.

The male consists of a flanged head, grooved for an O-ring, and either a captive flange or split flange halves with bolt holes to match the port. The seal take place on the O-ring, which is compressed between the flange head and the flat surface surrounding the port. The threaded bolts hold the connection together.

SAE J518, DIN 20066, ISO/ DIS 6162 and JIS B 8363 are interchangeable, except for bolt sizes.

SAE Code 61 and Code 62 flange 4 holes



Flange Head Guide

Flange Dash Size	Code 61				Code 62				SUPERCAT			
	Flange Size		Flange Thickness		Flange Size		Flange Thickness		Flange Size		Flange Thickness	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
-08	1.19	30.2	.265	6.7	1.25	31.8	.305	7.7				
-10*	1.34	34.0	.265	6.7								
-12	1.50	38.1	.265	6.7	1.63	41.3	.345	8.7	1.63	41.3	.56	14.2
-16	1.75	44.5	.315	8.0	1.88	47.6	.375	9.5	1.88	47.6	.56	14.2
-20	2.00	50.8	.315	8.0	2.13	54.0	.405	10.3	2.13	54.0	.56	14.2
-24	2.38	60.3	.315	8.0	2.50	63.5	.495	12.6	2.50	63.5	.56	14.2
-32	2.81	71.4	.375	9.5	3.13	79.4	.495	12.6	3.13	79.4	.56	14.2
-40	3.31	84.1	.375	9.5								

* -10 is a non-SAE size flange.

Note: All Code 61 flange head hose couplings meet or exceed SAE J518 Code 61 requirements for hydraulic split flange connections. The Code 61 flange head design can withstand a maximum operating pressure of 3000 to 5000 psi, depending on size.

How to Measure

Four Bolt Flange – First measure the port hole diameter using the calliper. Next, measure the longest bolt hole spacing from centre-to-centre (Dimension “A”) or measure the flanged head diameter. OD

There are three exceptions:

1. The size -10, which is common outside of North America is not an SAE Standard size.
2. Caterpillar flanges, which are the same flange OD as SAE Code 62, have a thicker flange head.
3. Poclain flanges, which are completely different from SAE flanges.

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TECHNICAL INFORMATION

British Connections

British Standard Pipe Parallel

Popular couplings British Standard Pipe (BSP) threads, also known as Whitworth threads.

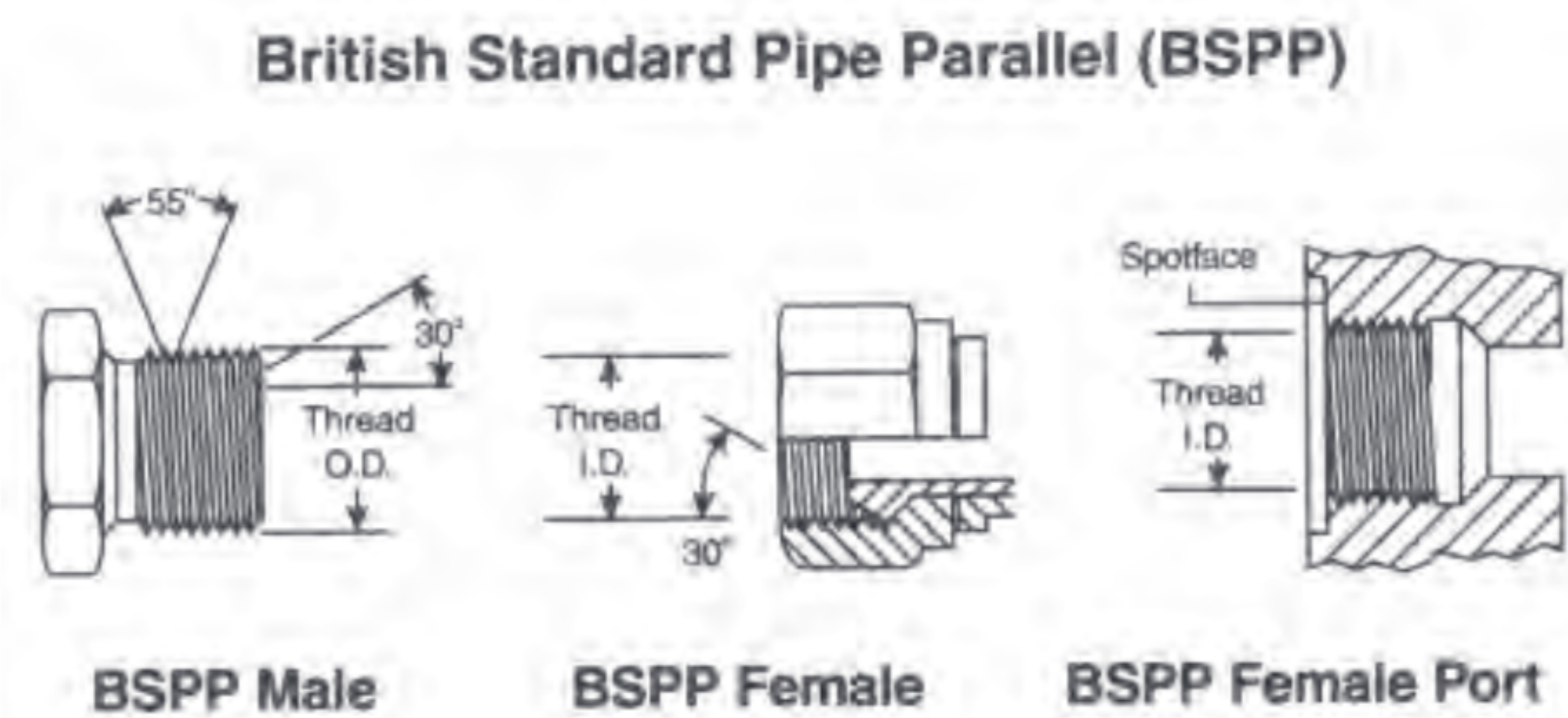
The BSPP (parallel) male will mate with a BSPP (parallel) female or a female port.

The BSPP male has straight threads and a 30° seat.

The BSPP female has straight threads and a 30° seat.

The female port has straight threads and a spotface. The seal on the port is made with an O-Ring or soft metal washer on the male.

The BSPP (parallel) connector is similar to, but not interchangeable with, the NPSM connector. The thread pitch is different in most sizes, and the thread angle is 55° instead of the 60° angle found on NPSM threads. The female swivel BSPP has a tapered nose which seals on the cone seat of the male.

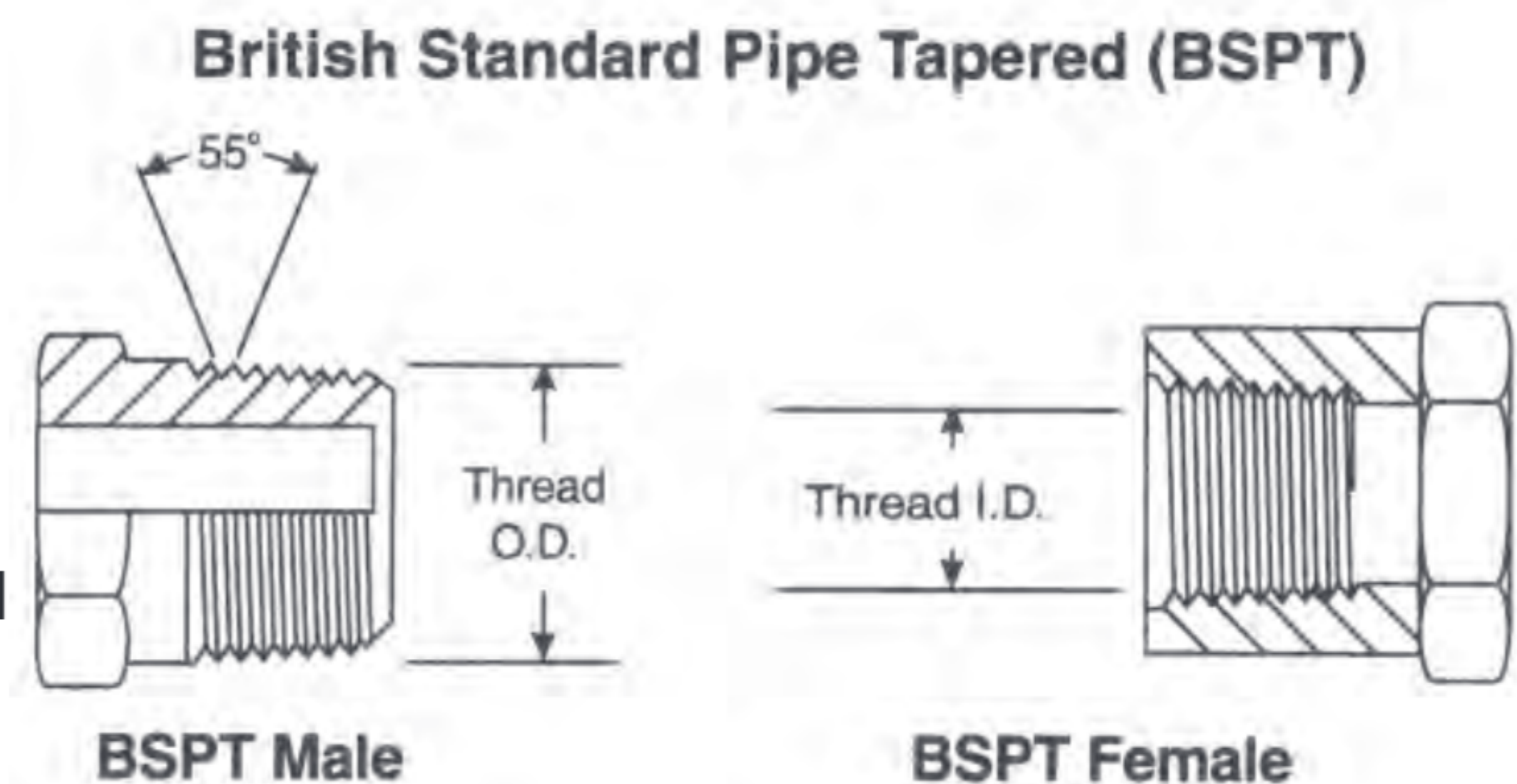


British Standard Pipe Tapered

The BSPT (tapered) male will mate with a BSPT (tapered) female, or a BSPP (parallel) female.

The BSPT male has tapered threads. When mating with either the BSPT (tapered) female or the BSPP (parallel) female port, the seal is made on the threads accomplished by thread distortion. A thread sealant is recommended.

The BSPT connector is similar to, but not interchangeable with, the NPTF connector. The thread pitch is different in most cases, and the thread angle is 55° instead of the 60° angle found on NPTF threads.



Thread Identification Table

British Standard Pipe Parallel & Tapered (BSPP & BSPT)

Dash Size	Inch Size (in.)	Thread Size (in - TPI)	Female Thread ID		Male Thread OD	
			(mm)	(in.)	(mm)	(in.)
-02	1/8	1/8 - 28	8.71	0.34	9.5	0.38
-04	1/4	1/4 - 19	11.1	0.44	13.5	0.53
-06	3/8	3/8 - 19	15.1	0.59	16.7	0.66
-08	1/2	1/2 - 14	18/3	0.72	20.6	0.81
-10	5/8	5/8 - 14	20.6	0.81	23.0	0.91
-12	3/4	3/4 - 14	23.8	0.94	26.2	1.03
-16	1	1 - 11	30.2	1.19	33.3	1.31
-20	1 1/4	1 1/4 - 11	38.9	1.53	42.1	1.66
-24	1 1/2	1 1/2 - 11	45.2	1.78	47.6	1.88
-32	2	2 - 11	56.4	2.22	59.5	2.34

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Fitting Identification - French



HOSES
ONE-PIECE B SERIES
ONE-PIECE D SERIES
ONE-PIECE F & P SERIES
TWO-PIECE FERRULES (A & PFR SERIES)
TWO-PIECE INSERTS (A SERIES)
TWO-PIECE INTERLOCK FERRULES & INSERTS (X & Z SERIES)
QUICK RELEASE
ASSEMBLY EQUIPMENT

French Connections

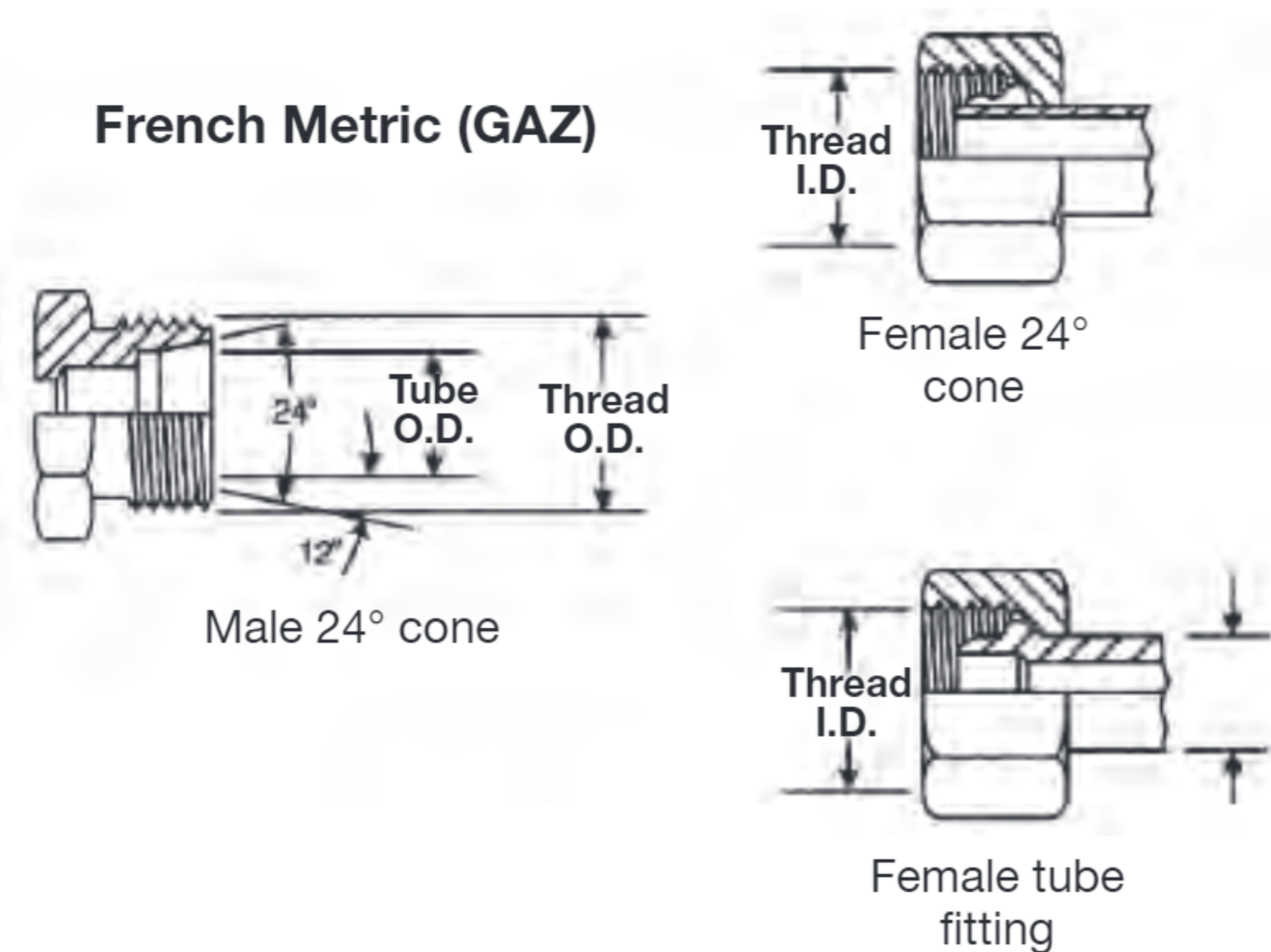
French GAZ have a 24° seat and metric threads. These are similar to German DIN couplings, but the threads are different in some sizes, the French use fine threads in all sizes. French flanges are different than SAE, they have a lip that protrudes from the flange face. These are Poclairn style flanges.

Millimetric and GAZ 24°

This connection consists of a common male and two different females.

The French Metric (GAZ) male will mate with the female 24° Cone or the female tube fitting.

The male has a 24° seat and straight metric threads. The female has a 24° seat or a tubing sleeve and straight metric threads. The Millimetric Series is used with whole number metric O.D. tubing and the GAZ Series is used with fractional number metric O.D. pipe size tubing.



GAZ Poclairn 24° Flange

The Poclairn (French GAZ) 24° high pressure flange is usually found on Poclairn equipment.

The male flange will mate with a female flange or port. The seal is made on the 24° seat.

Thread Identification Table French Metric Millimetric

Metric Thread (Dia. X Pitch)	Female Thread ID		Male Thread OD		Tube OD	
	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)
M12 X 1.0	11.0	0.43	12.0	0.47	6	0.24
M14 X 1.5	12.5	0.49	14.0	0.55	8	0.31
M16 X 1.5	14.5	0.57	16.0	0.63	10	0.39
M18 X 1.5	16.5	0.65	18.0	0.71	12	0.47
M20 X 1.5	18.5	0.73	20.0	0.79	14	0.55
M22 X 1.5	20.5	0.81	22.0	0.87	15	0.59
M24 X 1.5	22.5	0.89	24.0	0.94	16	0.63
M27 X 1.5	25.5	1.00	27.0	1.06	18	0.71
M30 X 1.5	28.5	1.12	30.0	1.18	22	0.87
M33 X 1.5	31.5	1.24	33.0	1.30	25	0.98
M36 X 1.5	34.5	1.36	36.0	1.42	28	1.10
M39 X 1.5	37.5	1.48	39.0	1.54	30	1.18
M42 X 1.5	40.5	1.59	42.0	1.65	32	1.26
M45 X 1.5	43.5	1.71	45.0	1.77	35	1.38
M48 X 1.5	46.5	1.83	48.0	1.89	38	1.50
M52 X 1.5	50.5	1.99	52.0	2.05	40	1.57
M54 X 2.0	51.9	2.04	54.0	2.13	45	1.77

Thread Identification Table French Metric GAZ 24° Cone

Dash Size (Dash)	Inch Size (Dia. X Pitch)	Female Thread ID		Male Thread OD		Tube OD 60° Cone	
		(mm)	(in.)	(mm)	(in.)	(mm)	(in.)
-6	M20 X 1.5	18.5	0.73	20.0	0.78	13.25	0.52
-8	M24 X 1.5	22.5	0.89	24.0	0.94	16.75	0.66
-10	M30 X 1.5	28.5	1.12	30.0	1.18	21.25	0.83
-12	M36 X 1.5	34.5	1.36	36.0	1.41	26.75	1.05
-16	M45 X 1.5	43.5	1.71	45.0	1.77	33.50	1.32
-20	M52 X 1.5	50.5	1.99	52.0	2.04	42.25	1.66

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German DIN Connections

A coupling referred to as metric, usually means a DIN coupling. Flanges are standard Code 61 or Code 62.

DIN 2353 24° Cone

The DIN 24° Cone male will mate with any of the three females shown below.

The male has a 24° seat, straight metric threads, and a recessed counterbore which matches the tube O.D. used with it. The mating female may be a 24° Cone with O'Ring, (DKO type) a metric tube fitting or a universal 24° or 60° Cone.

There is a light and heavy series DIN coupling. Proper identification is made by measuring both the thread size and the tube O.D. (The heavy series has a smaller tube O.D. than the light, but has a thicker wall section).

Thread Identification Table DIN 24° Cone

Metric Thread (Dia. X Pitch)	Female Thread ID		Male Thread OD		Tube OD			
	(mm)	(in.)	(mm)	(in.)	Light Series		Heavy Series	
M12 X 1.5	10.5	0.41	12	0.47	6	0.24		
M14 X 1.5	12.5	0.49	14	0.55	8	0.31	6	0.24
M16 X 1.5	14.5	0.57	16	0.63	10	0.39	8	0.31
M18 X 1.5	16.5	0.65	18	0.71	12	0.47	10	0.39
M20 X 1.5	18.5	0.73	20	0.79			12	0.47
M22 X 1.5	20.5	0.81	22	0.87	15	0.59	14	0.55
M24 X 1.5	22.5	0.89	24	0.94			16	0.63
M26 X 1.5	24.5	0.96	26	1.02	18	0.71		
M30 X 2.0	27.9	1.10	30	1.18	22	0.87	20	0.79
M36 X 2.0	33.9	1.33	36	1.42	28	1.10	25	0.98
M42 X 2.0	39.9	1.57	42	1.65			30	1.18
M45 X 2.0	42.9	1.69	45	1.77	35	1.38		
M52 X 2.0	49.9	1.96	52	2.05	42	1.65	38	1.50

DIN 3863 60° Cone

This connection is frequently used in hydraulic systems. The DIN 60° Cone male will mate with the female universal 24° or 60° Cone only.

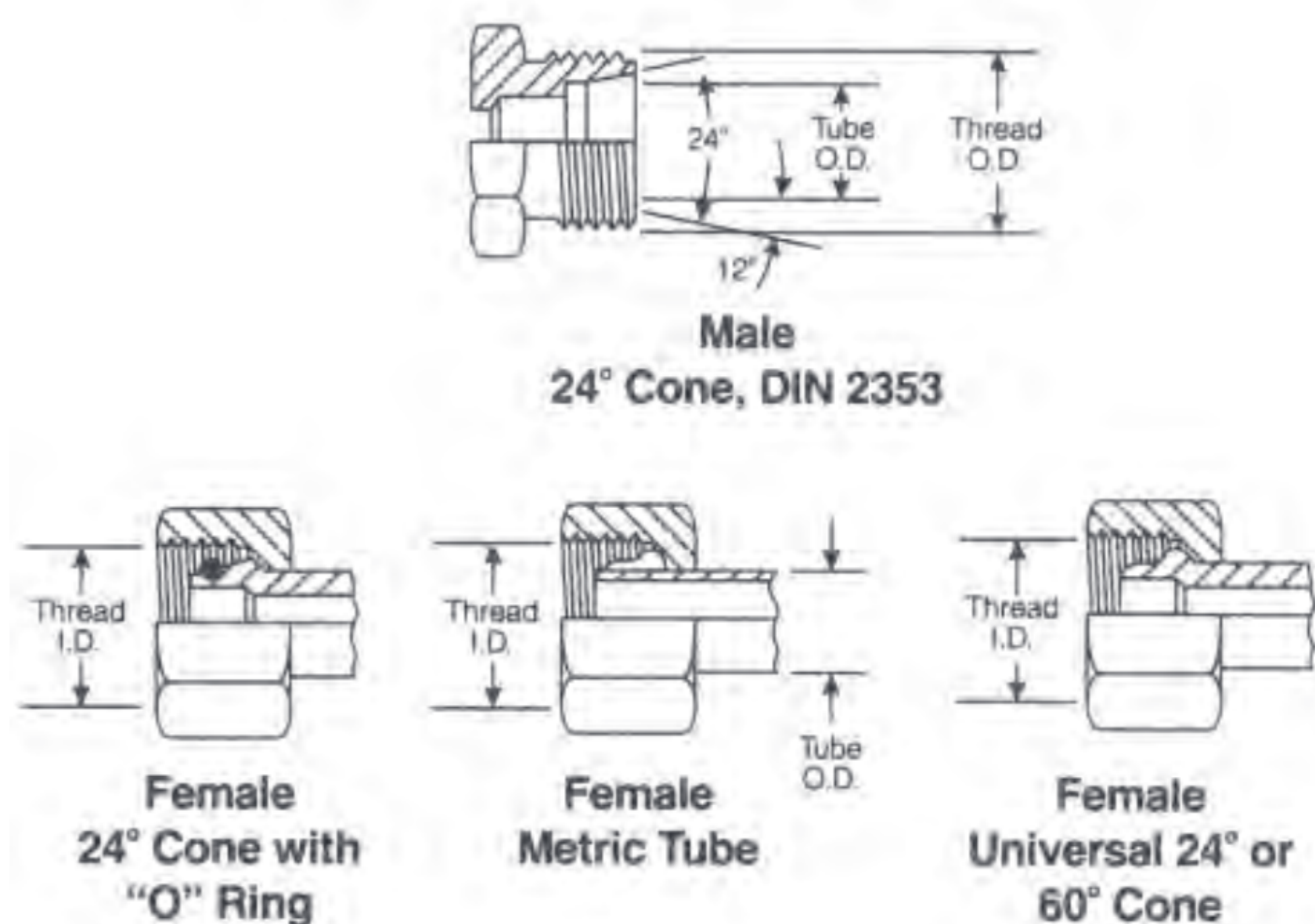
The male has a 60° seat and straight metric threads.

The female has a 24° and 60° universal seat and straight metric threads. The seal takes place by contact between the cone of the male and the nose of the flareless swivel. The threads hold the connection mechanically.

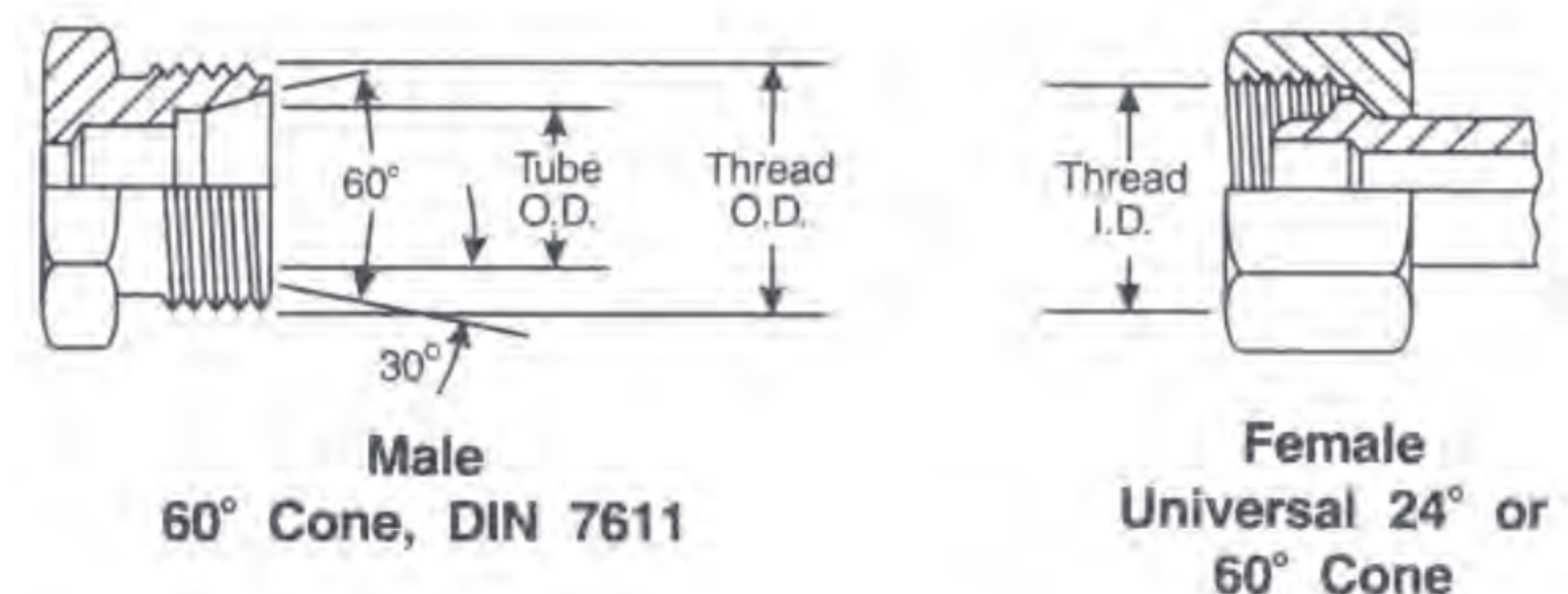
Thread Identification Table DIN 60° Cone

Metric Thread (Dia. X Pitch)	Female Thread ID		Male Thread OD		Tube OD	
	(mm)	(in.)	(mm)	(in.)	(mm)	(in.)
M12 X 1.5	10.5	0.41	12	0.47	6	0.24
M14 X 1.5	12.5	0.49	14	0.55	8	0.31
M16 X 1.5	14.5	0.57	16	0.63	10	0.39
M18 X 1.5	16.5	0.65	18	0.71	12	0.47
M22 X 1.5	20.5	0.81	22	0.87	15	0.59
M26 X 1.5	24.5	0.96	26	1.02	18	0.71
M30 X 1.5	28.5	1.12	30	1.18	22	0.87
M38 X 1.5	36.5	1.44	38	1.50	28	1.10
M45 X 1.5	43.5	1.71	45	1.77	35	1.38
M52 X 1.5	50.5	1.99	52	2.05	42	1.65

DIN 24° Male and Mating Females



DIN 60° Male and Mating Female



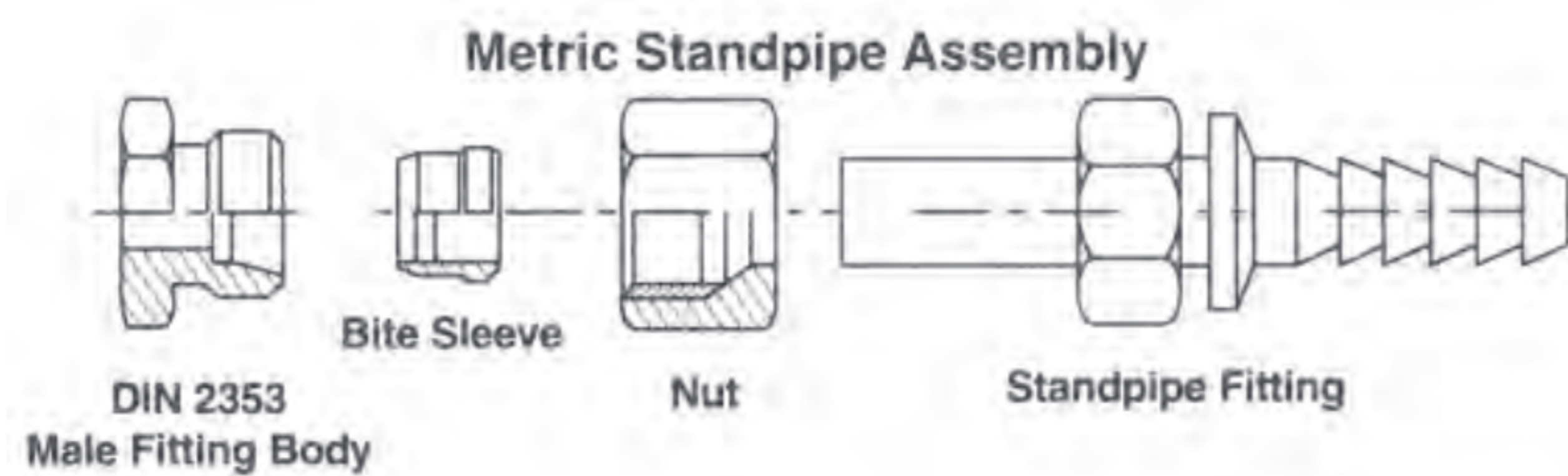
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HOSES

German DIN Connections (Continued)

Metric Standpipe

A metric standpipe is comprised of three components attached to a male fitting. The components are: a Standpipe, Bite Sleeve and Metric Nut. The nut is placed over the Standpipe, followed by the Bite Sleeve (see illustration below). For DIN light assemblies, a DIN light metric nut is used. For DIN heavy assemblies, a DIN heavy metric nut is used. The Bite Sleeve and Standpipe are selected on the basis of tube O.D.



Tube O.D. (mm)	Metric Nut Thread	
	Light	Heavy
6	M12 x 1.5	
8	M14 x 1.5	M16 x 1.5
10	M16 x 1.5	M18 x 1.5
12	M18 x 1.5	M20 x 1.5
15	M22 x 1.5	
16		M24 x 1.5
18	M26 x 1.5	
20		M30 x 2.0
22	M30 x 2.0	
25		M36 x 2.0
28	M36 x 2.0	
30		M42 x 2.0
35	M45 x 2.0	
38		M52 x 2.0
42	M52 x 2.0	

ONE-PIECE
B SERIES

ONE-PIECE
D SERIES

ONE-PIECE
F & P SERIES

TWO-PIECE FERRULES
(A & PFR SERIES)

TWO-PIECE INSERTS
(A SERIES)

TWO-PIECE INTERLOCK
FERRULES & INSERTS
(X & Z SERIES)

QUICK
RELEASE

ASSEMBLY
EQUIPMENT

TECHNICAL
INFORMATION

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Japanese Connections

Japanese equipment uses JIS (Japanese Industrial Standard) couplings with a 30° seat and British Standard Pipe Parallel threads. All flanges are code 61 or Code 62 (except -10).

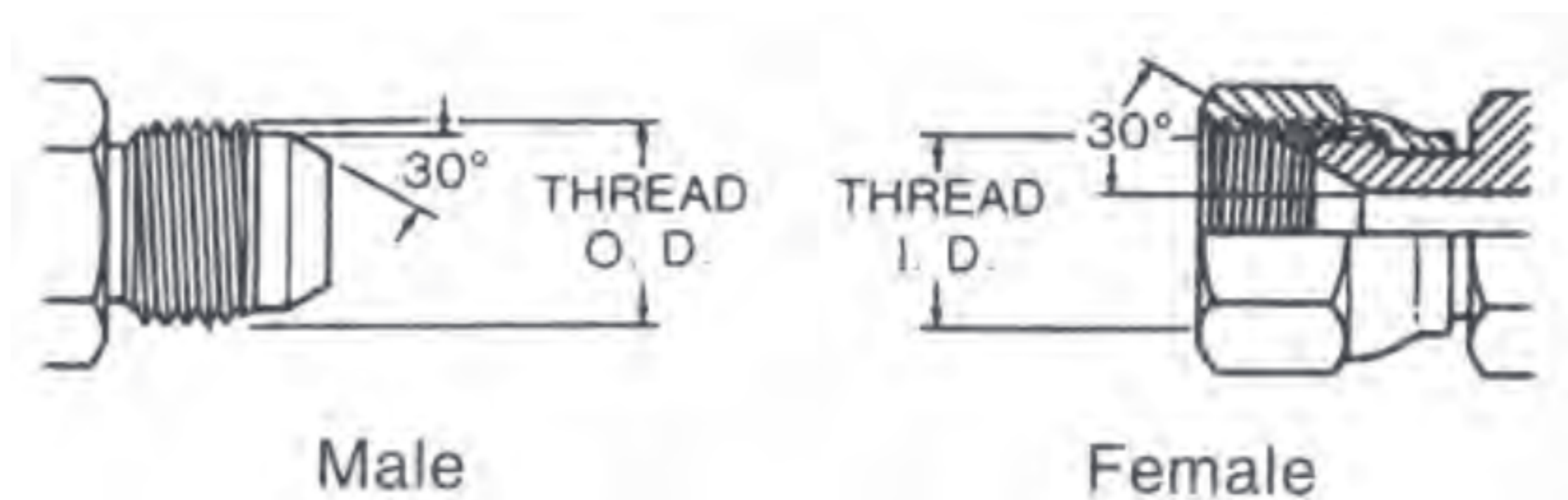
JIS 30° Flare Parallel Pipe Threads

JIS B 0202

These Japanese 30° Flare male coupling will mate with a Japanese 30° Flare female only.

The male and female have straight threads and a 30° seat. The seal is made on the 30° seat.

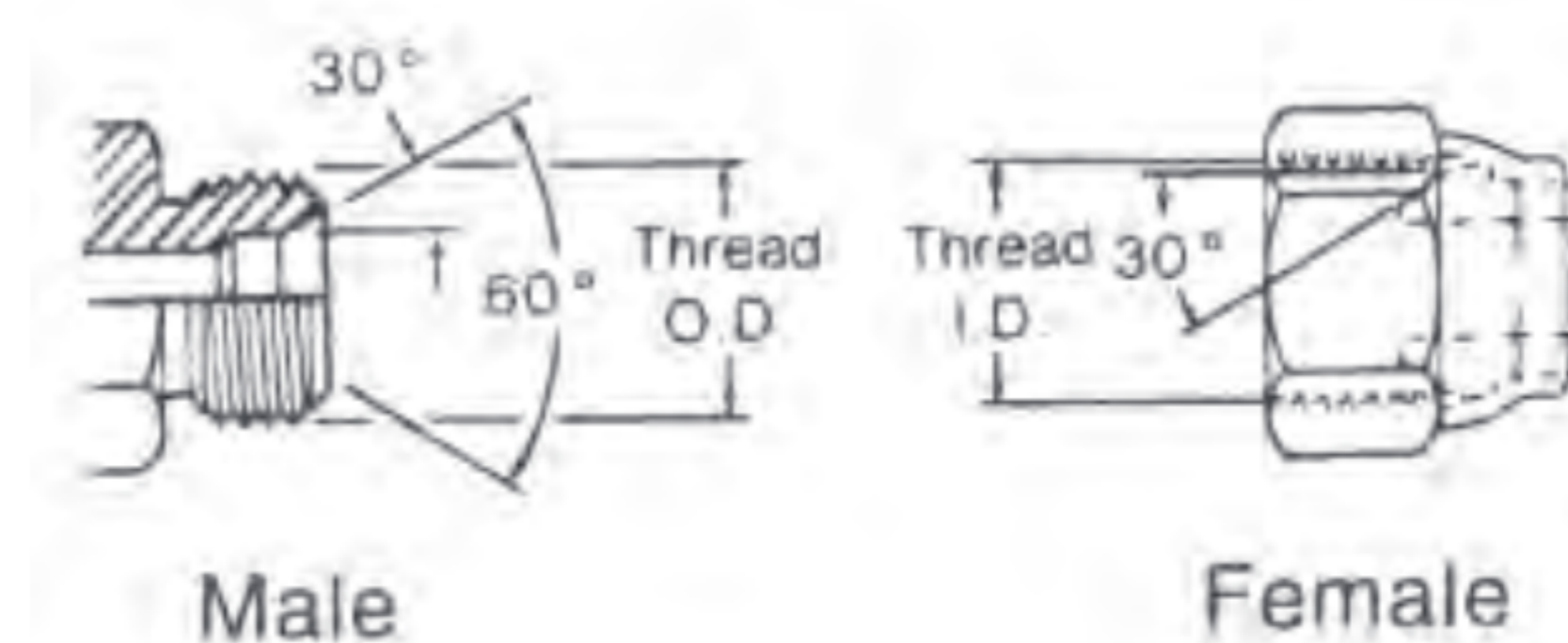
The threads on the Japanese 30° Flare connector conform to JIS B 020, the same as the BSPP threads. Both the British and Japanese connectors have a 30° seat, but they are not interchangeable, because the British seat is inverted.



JIS 30° Inverted Seat, Parallel Pipe Threads

JIS B 0202

The JIS parallel is similar to the BSPP connection. The JIS parallel thread and the BSPP connection are interchangeable.

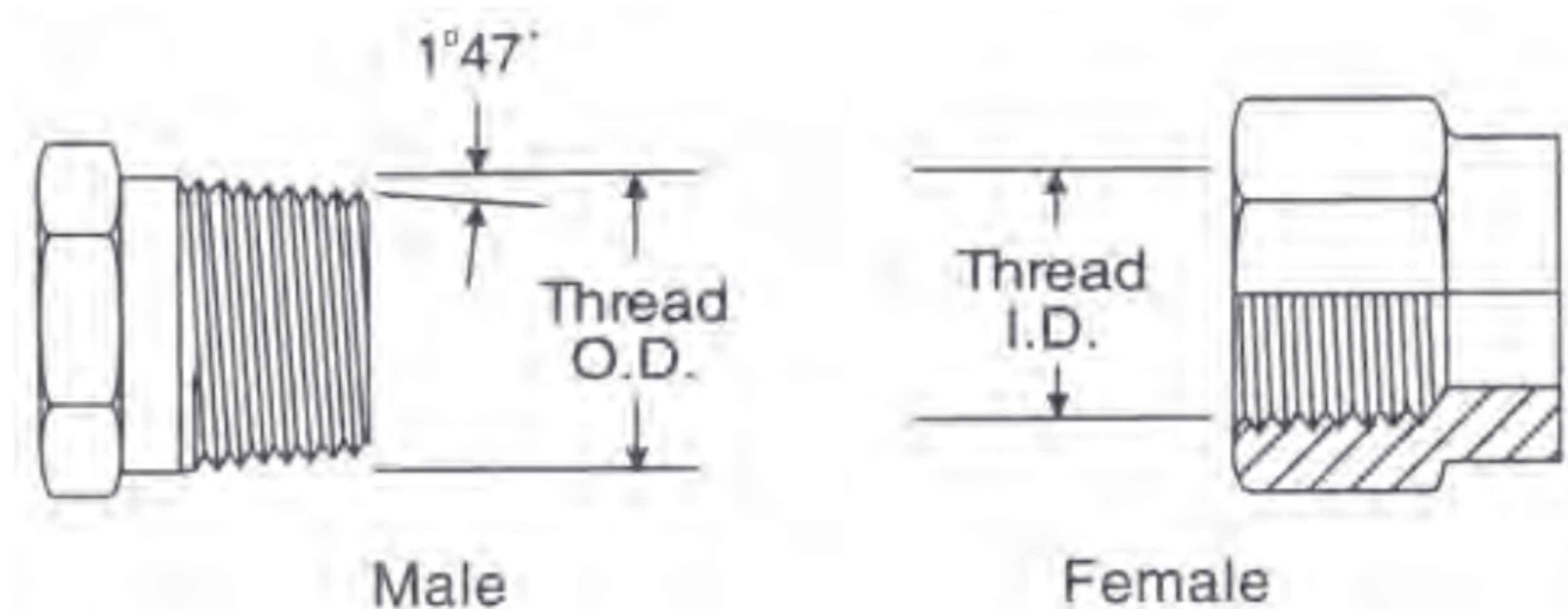


JIS Tapered Pipe Thread (PT)

JIS B 0203

The JIS tapered pipe thread connection is similar to the BSPT connection and fully interchangeable. The Japanese connection does not have a 30° Flare, and will not mate with the BSPP female. The threads conform to JIS B 0203, same as BSPT threads.

The seal on the JIS tapered pipe thread connection is made on the threads.



Thread Identification Table

JIS Tapered Pipe, 30° Flare Parallel Pipe, and 30° Male Inverted Seat

Dash Size	Inch Size (in.)	Thread Size (in - TPI)	Female Thread ID		Male Thread OD	
			(mm)	(in.)	(mm)	(in.)
-02	1/8	1/8 - 28	8.7	0.34	9.5	0.38
-04	1/4	1/4 - 19	11.9	0.47	13.5	0.53
-06	3/8	3/8 - 19	15.1	0.59	16.7	0.66
-08	1/2	1/2 - 14	19.1	0.75	20.6	0.81
-10	5/8	5/8 - 14	20.6	0.81	23.1	0.91
-12	3/4	3/4 - 14	23.8	0.94	26.2	1.03
-16	1	1 - 11	30.2	1.19	33.3	1.31
-20	1 1/4	1 1/4 - 11	38.9	1.53	42.1	1.66
-24	1 1/2	1 1/2 - 11	45.2	1.78	47.6	1.88
-32	2	2 - 11	56.4	2.22	59.5	2.34

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Fitting Identification - Japanese

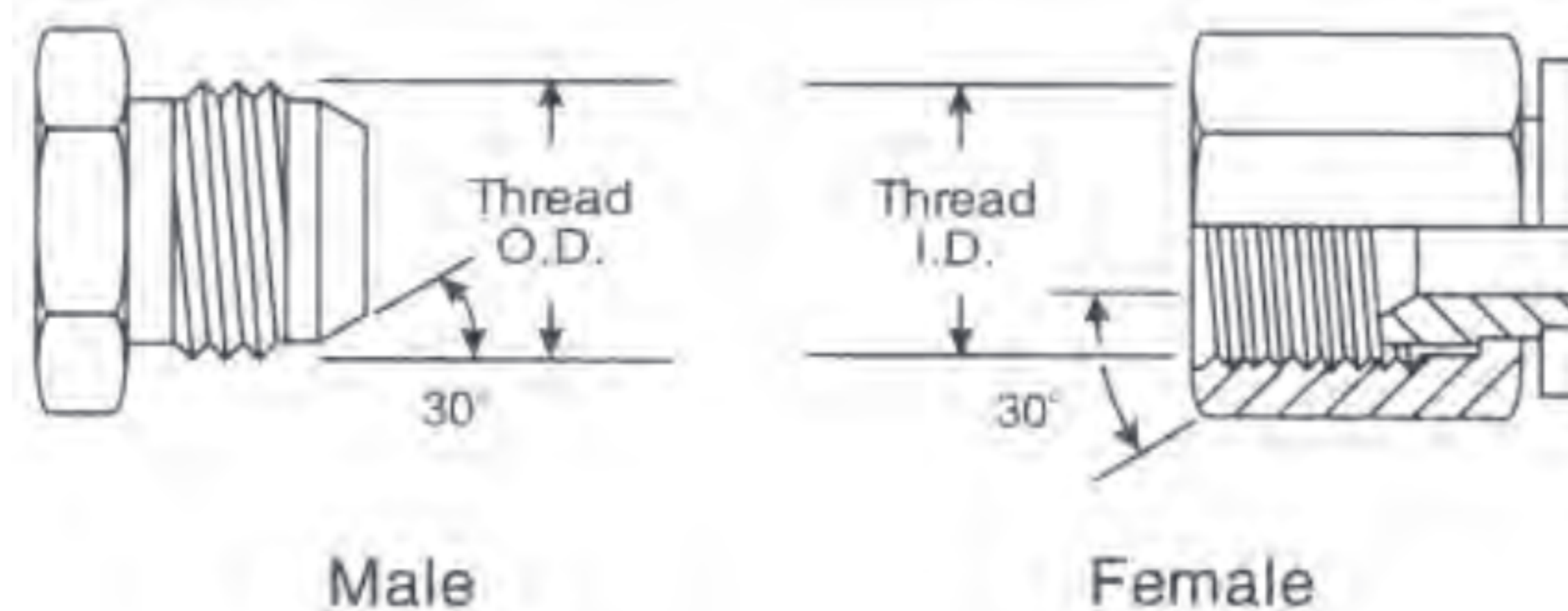
HOSES

Japanese Connections (Continued)

Komatsu Style 30° Flare Parallel Threads

The Komatsu style 30° Flare Parallel thread coupling is identical to the Japanese 30° Flare parallel except for the threads. The Komatsu uses Metric fine threads which conform to JIS B 0207.

The Komatsu connector seals on the 30° Flare.



Flange Dash Size	Nominal Size		Metric Thread Size	Male Thread O. D. (mm)	B Thread I.D. (mm)
	(in.)	(mm)			
-06	3/8	9.5	M18 x 1.5	18	16.4
-08	1/2	13	M22 x 1.5	22	20.4
-10	5/8	16	M24 x 1.5	24	22.4
-12	3/4	19	M30 x 1.5	30	28.4
-16	1	25	M33 x 1.5	33	31.4
-20	1 1/4	32	M36 x 1.5	36	34.4
-24	1 1/2	38	M42 x 1.5	42	40.4

ONE-PIECE B SERIES

ONE-PIECE D SERIES

ONE-PIECE F & P SERIES

TWO-PIECE FERRULES (A & PFR SERIES)

TWO-PIECE INSERTS (A SERIES)

TWO-PIECE INTERLOCK FERRULES & INSERTS (X & Z SERIES)

QUICK RELEASE

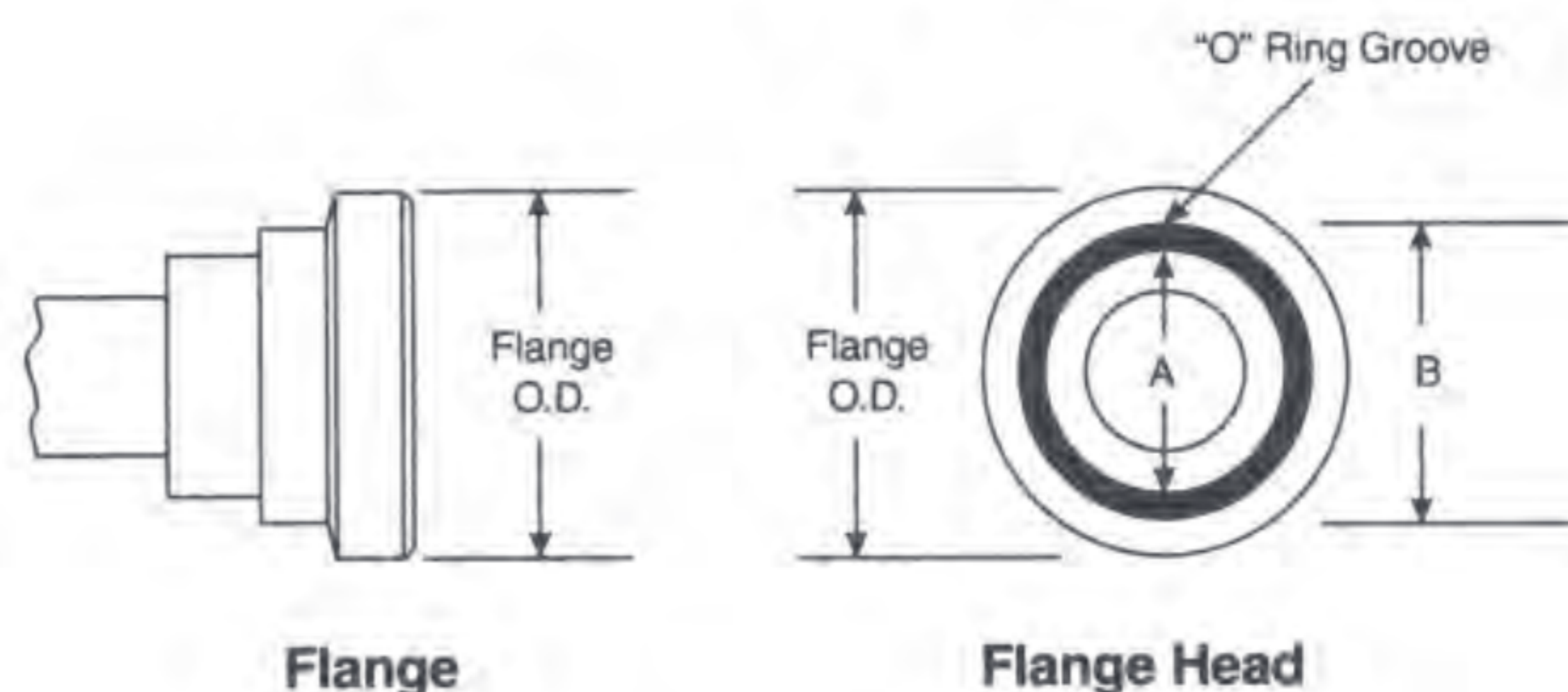
ASSEMBLY EQUIPMENT

TECHNICAL INFORMATION

Komatsu Flange Fitting

The Komatsu Flange fitting is nearly identical to and fully interchangeable with the SAE Code 61 flange fitting. In all sizes the O-ring dimensions are different. When replacing a Komatsu flange with an SAE style flange, an SAE style O-ring must be used.

Komatsu Style Flange Fitting



Flange Dash Size	Nominal Size		Flange Size (in.)	A (in.)	B (in.)
	(in.)	(mm)			
-08	1/2	12.7	1.19	.73	.98
-10*	5/8	15.9	1.34	.73	1.10
-12	3/4	19.1	1.50	.85	1.22
-16	1	25.4	1.75	1.12	1.50
-20	1 1/4	31.8	2.00	1.36	1.73
-24	1 1/2	38.1	2.38	1.75	2.12
-32	2	50.8	2.81	2.22	2.56

* This is a non-SAE size flange

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Recommended Fitting and Adapter Installation Torque

Please note that the recommended values shown on this page change on a periodic basis. These are the known recommended values as set by the appropriate agency standards at the time of this catalog printing.

SAE J514 37° Flare (JIC)

Dash Size	Thread Size	lb. ft.		N. m	
		Min	Max	Min	Max
-04	7/16 - 20	11	12	15	16
-05	1/2 - 20	14	15	19	21
-06	9/16 - 18	18	20	24	28
-08	3/4 - 16	36	39	49	53
-10	7/8 - 14	57	63	77	85
-12	1 1/16 - 12	79	88	107	119
-14	1 3/16 - 12	94	103	127	140
-16	1 5/16 - 12	108	113	147	154
-20	1 5/8 - 12	127	133	172	181
-24	1 7/8 - 12	158	167	215	226
-32	2 1/2 - 12	245	258	332	350

BSPP

Dash Size	Thread Size	Torque lb. Ft.		Torque N m	
		With O-Ring	Without O-Ring	With O-Ring	Without O-Ring
-02	1/8-28	N/A	7	N/A	10
-04	1/4-19	15	15	20	20
-06	3/8-19	26	26	35	35
-08	1/2-14	37	44	50	60
-10	5/8-14	44	52	60	70
-12	3/4-14	63	85	85	115
-16	1-11	85	103	115	140
-20	1 1/4-11	140	155	190	210
-24	1 1/2-11	177	214	240	290
-32	2-11	221	295	300	400

SAE J1453 O-Ring Face Seal

Dash Size	Thread Size	lb. ft.		N. m	
		Min	Max	Min	Max
-04	9/16 - 18	10	12	14	16
-06	11/16 - 16	18	20	24	27
-08	13/16 - 16	32	35	43	47
-10	1 - 14	46	50	60	68
-12	1 3/16 - 12	65	70	90	95
-16	1 7/16 - 12	92	100	125	135
-20	1 11/16 - 12	125	140	170	190
-24	2 - 12	150	165	200	225

JIS (B8363)

Dash Size	Thread Size	lb. ft.	N.m
-04	1/4 - 19	19	25
-06	3/8 - 19	25	34
-08	1/2 - 14	49	64
-10	5/8 - 14	100	132
-12	3/4 - 14	100	132
-16	1 - 11	149	196
-20	1 1/4 - 11	171	225
-24	1 1/2 - 11	194	255
-32	2 - 11	240	316

SAE J518 Code 61 Flange Half Bolt

Dash Size	Thread Size	lb. ft.		N. m	
		Min	Max	Min	Max
-08	1/2	15	19	20	25
-12	3/4	21	29	28	40
-16	1	27	35	37	48
-20	1 1/4	35	46	48	62
-24	1 1/2	46	58	62	79
-32	2	54	66	73	90
-40	2 1/2	79	91	107	124
-48	3	137	149	186	203

Metric

Thread mm	lb. ft.	N. m
M12 x 1.5	15	15
M14 x 1.5	19	25
M16 x 1.5	33	45
M18 x 1.5	37	50
M20 x 1.5	52	70
M22 x 1.5	55	75
M24 x 1.5	74	100
M26 x 1.5	81	110
M30 x 2	96	160
M36 x 2	162	220
M42 x 2	170	230
M45 x 2	220	300
M52 x 2	367	500

SAE J518 Code 62 Flange Half Bolt

Dash Size	Thread Size	lb. ft.		N. m	
		Min	Max	Min	Max
-08	1/2	15	19	20	25
-12	3/4	25	33	34	45
-16	1	42	50	56	68
-20	1 1/4	62	75	85	102
-24	1 1/2	116	133	158	181
-32	2	199	216	271	294

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HOSES
ONE-PIECE B SERIES
ONE-PIECE D SERIES
ONE-PIECE F & P SERIES
TWO-PIECE FERRULES (A & PFR SERIES)
TWO-PIECE INSERTS (A SERIES)
TWO-PIECE INTERLOCK FERRULES & INSERTS (X & Z SERIES)
QUICK RELEASE
ASSEMBLY EQUIPMENT

JIC FFFT TORQUE METHOD

The FFFT (Flats From Finger Tight) method allows to assemble fittings and adapters at the correct torque value without a dynamometric wrench. The rotation applied according the value shown in Tab.1 ensures a good sealing, avoid unscrewing and over torque that can cause nut or cone crack.

Assembling instruction:

- hand tighten the joint
- make a longitudinal mark on one of the flats of hex and continue it on the body hex as shown in Fig.1
- tighten the joint further by the number of flat as shown in Tab.1

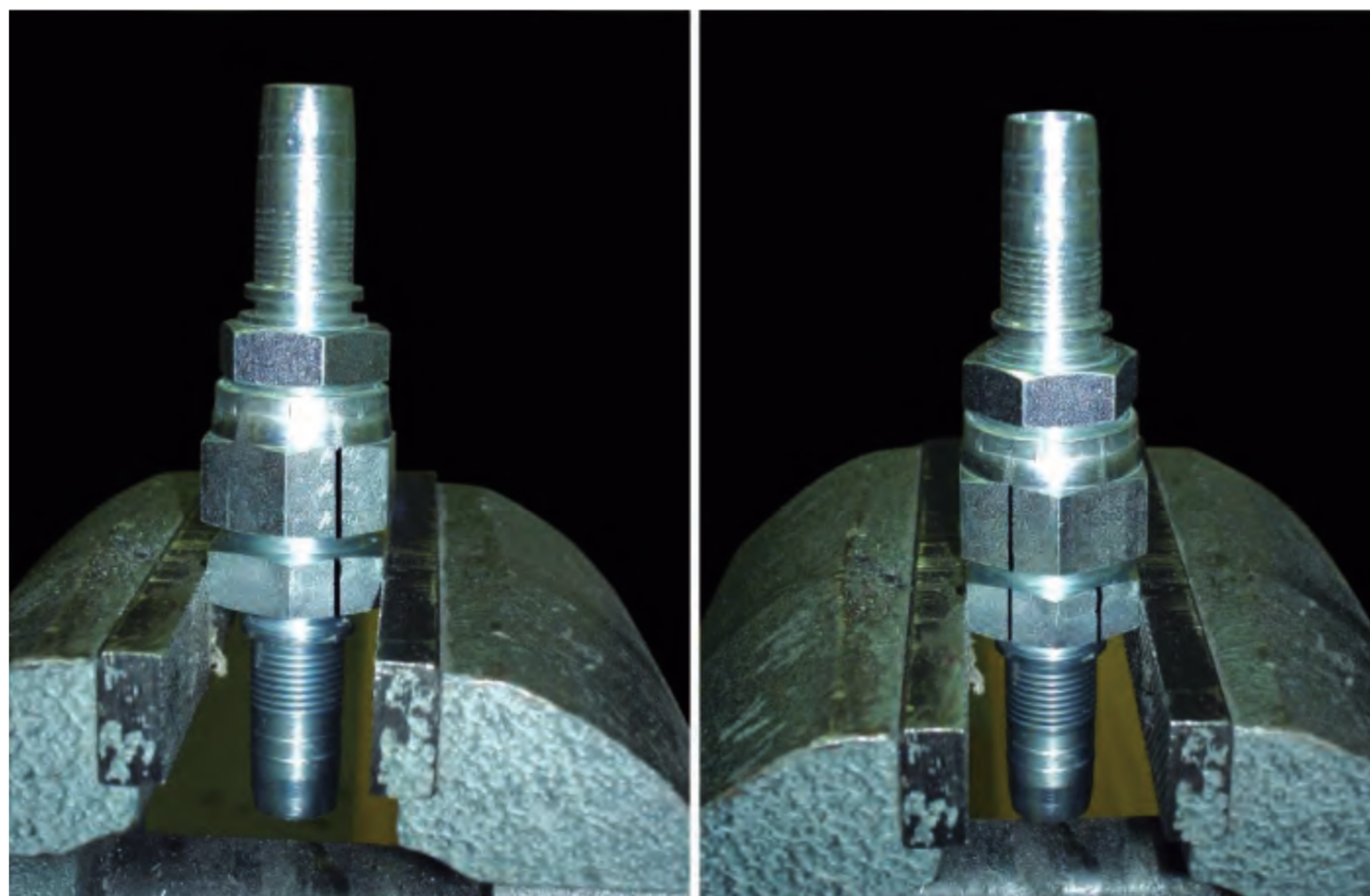


Fig.1

Assembling value - carbon steel material - SAE J514 JIC 37° flare						
Dash size	Thread	Lb*ft		N*m		FFFT 0/+0.25
		min	max	min	max	
-4	7/16-20	11	12	15	16	2
-5	1/2-20	14	15	19	21	2
-6	9/16-18	18	20	24	28	2
-8	3/4-16	36	39	49	53	1.5
-10	7/8-14	57	63	77	85	1.5
-12	1 1/16-12	79	88	107	119	1
-14	1 3/16-12	94	103	127	140	1
-16	1 5/16-12	108	113	147	154	1
-20	1 5/8-12	127	133	172	181	1
-24	1 7/8-12	158	167	215	226	1
-32	2 1/2-12	245	258	332	350	1

Tab.1

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TECHNICAL INFORMATION

Pressure Conversion Metric to PSI (1 kPa = 0.145 PSI)

Kilo Pascals (kPa)	Mega Pascals (MPa)	Bar (Bar)	Pounds per Square Inch (PSI)
100	0.1	1	14.5
200	0.2	2	29.0
300	0.3	3	43.5
400	0.4	4	58.0
500	0.5	5	72.5
600	0.6	6	87.0
700	0.7	7	101.5
800	0.8	8	116.0
900	0.9	9	130.5
1,000	1.0	10	145.0
2,000	2.0	20	290.1
3,000	3.0	30	435.1
4,000	4.0	40	580.2
5,000	5.0	50	725.2
6,000	6.0	60	870.2
7,000	7.0	70	1,015
8,000	8.0	80	1,160
9,000	9.0	90	1,305
10,000	10	100	1,450
20,000	20	200	2,901
30,000	30	300	4,351
40,000	40	400	5,802
50,000	50	500	7,252
60,000	60	600	8,702
70,000	70	700	10,153
80,000	80	800	11,603
90,000	90	900	13,053
100,000	100	1,000	14,504
200,000	200	2,000	29,008
300,000	300	3,000	43,511

Pressure Conversion PSI to Metric (1 PSI = 6.89 kPa)

Pounds per Square Inch (PSI)	Kilo Pascals (kPa)	Mega Pascals (MPa)	Bar (Bar)
10	68.9	0.07	0.7
20	137.9	0.14	1.4
30	206.8	0.21	2.1
40	275.8	0.28	2.8
50	344.7	0.34	3.4
60	413.7	0.41	4.1
70	482.6	0.48	4.8
80	551.6	0.55	5.5
90	620.5	0.62	6.2
100	689	0.7	6.9
200	1,379	1.4	13.8
300	2,068	2.1	20.7
400	2,758	2.8	27.6
500	3,447	3.4	34.5
600	4,137	4.1	41.4
700	4,826	4.8	48.3
800	5,516	5.5	55.2
900	6,205	6.2	62.1
1,000	6,895	6.9	68.9
2,000	13,790	13.8	147.9
3,000	20,684	20.7	206.8
4,000	27,579	27.6	275.8
5,000	34,474	34.5	344.7
6,000	41,369	41.4	413.7
7,000	48,263	48.3	482.6
8,000	55,158	55.2	551.6
9,000	62,053	62.1	620.5
10,000	68,948	68.9	689.0
20,000	137,895	147.9	1,379.0
30,000	206,843	206.8	2,068.0
40,000	275,790	275.8	2,758.0

Decimal and Millimeter Equivalents of Fractions

Inches		mm	Inches		mm	Inches		mm	Inches		mm
1/64	.0156	.397	17/64	.2656	6.747	33/64	.5156	13.097	49/64	.7656	19.447
1/32	.0312	.794	9/32	.2812	7.144	17/32	.5312	13.494	25/32	.7812	19.844
3/64	.0468	1.191	19/64	.2968	7.541	35/64	.5468	13.891	51/64	.7968	20.241
1/16	.0625	1.588	5/16	.3125	7.938	9/16	.5625	14.288	13/16	.8125	20.638
5/64	.0781	2.381	21/64	.3281	8.334	37/64	.5781	14.684	53/64	.8281	21.034
3/32	.0937	2.381	11/32	.3437	8.731	19/32	.5937	15.081	27/32	.8437	21.431
7/64	.1093	2.778	23/64	.3593	9.128	39/64	.6093	15.478	55/64	.8593	21.828
1/8	.1250	3.175	3/8	.3750	9.525	5/8	.6250	15.875	7/8	.8750	22.225
9/64	.1406	3.572	25/64	.3906	9.922	41/64	.6406	16.272	57/64	.8906	22.622
5/32	.1562	3.969	13/32	.4062	10.319	21/32	.6562	16.669	29/32	.9062	23.019
11/64	.1718	4.366	27/64	.4218	10.716	43/64	.6718	17.066	59/64	.9218	23.416
3/16	.1875	4.763	7/16	.4375	11.113	11/16	.6875	17.463	15/16	.9375	23.813
13/64	.2031	5.159	29/64	.4531	11.509	45/64	.7031	17.859	61/64	.9531	24.209
7/32	.2187	5.556	15/32	.4687	11.906	23/32	.7187	18.256	31/32	.9687	24.606
15/64	.2343	5.963	31/64	.4843	12.303	47/64	.7343	18.653	63/64	.9843	25.003
1/4	.2500	6.350	1/2	.5000	12.700	3/4	.7500	19.050	1	1.0000	25.400

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Temperature Conversions



Temperature Conversion Tables

-459 to 0			0 to 100						100 to 1,000					
°C	°C °F	°F	°C	°C °F	°F	°C	°C °F	°F	°C	°C °F	°F	°C	°C °F	°F
-273	-459.4		-17.8	0	32.0	10.0	50	122.0	38	100	212	260	500	932
-268	-450		-17.2	1	33.8	10.6	51	123.8	43	110	230	266	510	950
-262	-440		-16.7	2	35.6	11.1	52	125.6	49	120	248	271	520	968
-257	-430		-16.1	3	37.4	11.7	53	127.4	54	130	266	277	530	986
-251	-420		-15.6	4	39.2	12.2	54	129.2	60	140	284	282	540	1004
-246	-410		-15.0	5	41.0	12.8	55	131.0	66	150	302	288	550	1022
-240	-400		-14.4	6	42.8	13.3	56	132.8	71	160	320	293	560	1040
-234	-390		-13.9	7	44.6	13.9	57	134.6	77	170	338	299	570	1058
-229	-380		-13.3	8	46.4	14.4	58	136.4	82	180	356	304	580	1076
-223	-370		-12.8	9	48.2	15.0	59	138.2	88	190	374	310	590	1094
-218	-360		-12.2	10	50.0	15.6	60	140.0	93	200	392	316	600	1112
-212	-350		-11.7	11	51.8	16.1	61	141.8	99	210	410	321	610	1130
-207	-340		-11.1	12	53.6	16.7	62	143.6	100	212	413	327	620	1148
-201	-330		-10.6	13	55.4	17.2	63	145.4	104	220	428	332	630	1166
-196	-320		-10.0	14	57.2	17.8	64	147.2	110	230	446	338	640	1184
-190	-310		-9.4	15	59.0	18.3	65	149.0	116	240	464	343	650	1202
-184	-300		-8.9	16	60.8	18.9	66	150.8	121	250	482	349	660	1220
-179	-290		-8.3	17	62.6	19.4	67	152.6	127	260	500	354	670	1238
-173	-280		-7.8	18	64.6	20.0	68	154.4	132	270	518	360	680	1255
-169	-273	-459	-7.2	19	66.2	20.6	69	156.2	138	280	536	366	690	1274
-168	-270	-454	-6.7	20	68.0	21.1	70	158.0	143	290	554	371	700	1292
-162	-260	-436	-6.1	21	69.8	21.7	71	159.8	149	300	572	377	710	1310
-157	-250	-418	-5.6	22	71.6	22.2	72	161.6	154	310	590	382	720	1328
-151	-240	-400	-5.0	23	73.4	22.8	73	163.4	160	320	608	388	730	1346
-146	-230	-382	-4.4	24	75.2	23.3	74	165.2	166	330	626	393	740	1364
-140	-220	-364	-3.9	25	77.0	23.9	75	167.0	171	340	644	399	750	1382
-134	-210	-346	-3.3	26	78.8	24.4	76	168.8	177	350	662	404	760	1400
-129	-200	-328	-2.8	27	80.6	25.0	77	170.6	182	360	680	410	770	1418
-123	-190	-310	-2.2	28	82.4	25.6	78	172.4	188	370	698	416	780	1436
-118	-180	-292	-1.7	29	84.2	26.1	79	174.2	193	380	716	421	790	1454
-112	-170	-274	-1.1	30	86.0	26.7	80	176.0	199	390	734	427	800	1472
-107	-160	-256	-0.6	31	87.8	27.2	81	177.8	204	400	752	432	810	1490
-101	-150	-238	0	32	89.6	27.8	82	179.6	210	410	770	438	820	1508
-96	-140	-220	0.6	33	91.4	28.3	83	181.4	216	420	788	443	830	1526
-90	-130	-202	1.1	34	93.2	28.9	84	183.2	221	430	806	449	840	1544
-84	-120	-184	1.7	35	95.0	29.4	85	185.0	227	440	824	454	850	1562
-79	-110	-166	2.2	36	96.8	30.0	86	186.8	232	450	842	460	860	1580
-73	-100	-148	2.8	37	98.6	30.6	87	188.6	238	460	860	466	870	1598
-68	-90	-130	3.3	38	100.4	31.1	88	190.4	243	470	878	471	880	1616
-62	-80	-112	3.9	39	102.2	31.7	89	192.2	249	480	896	477	890	1634
-57	-70	-94	4.4	40	104.0	32.2	90	194.0	254	490	914	482	900	1652
-51	-60	-76	5.0	41	105.8	32.8	91	195.8				488	910	1670
-46	-50	-58	5.6	42	107.6	33.3	92	197.6				493	920	1688
-40	-40	-40	6.1	43	109.4	33.9	93	199.4				499	930	1706
-34	-30	-22	6.7	44	111.2	34.4	94	201.2				504	940	1724
-29	-20	-4	7.2	45	113.0	35.0	95	203.0				510	950	1742
-23	-10	14	7.8	46	114.8	35.6	96	204.8				516	960	1760
-17.8	0	32	8.3	47	116.6	36.1	97	206.6				521	970	1778
			8.9	48	118.4	36.7	98	208.4				527	980	1795
			9.4	49	120.2	37.2	99	210.2				532	990	1814
						37.8	100	212.0				538	1000	1832

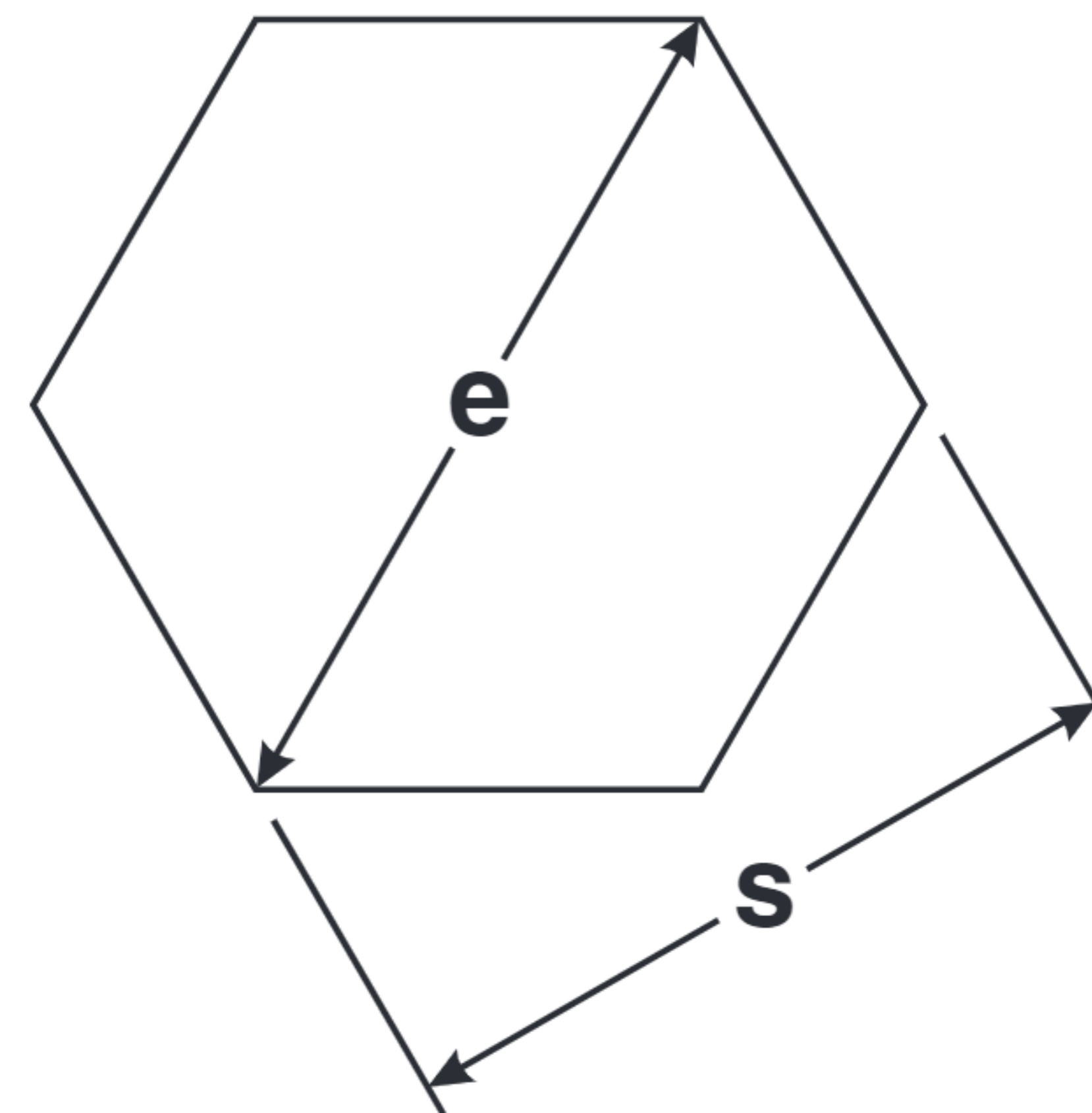
Look up the reading in the middle (shaded) column. To determine equivalent in Fahrenheit, look in right hand column; to determine equivalent in Centigrade, look in left hand column. Example: -20°F = -29°C (left).

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HOSES
ONE-PIECE B SERIES
ONE-PIECE D SERIES
ONE-PIECE F & P SERIES
TWO-PIECE FERRULES (A & PFR SERIES)
TWO-PIECE INSERTS (A SERIES)
TWO-PIECE INTERLOCK FERRULES & INSERTS (X & Z SERIES)
QUICK RELEASE
ASSEMBLY EQUIPMENT
TECHNICAL INFORMATION

Hexagon Across Corner Dimensions

The across corner dimensions are calculated using the factor 1.1547. Should the corners be rounded, the across corner dimensions will be smaller than shown in the table below.



Metric Hex Sizes		Inch Hex Sizes											
		Hexagons in inches and mm; Across corner dimensions in mm											
s	e	s			e	s			e	s			e
mm	mm	In	In	mm	mm	In	In	mm	mm	In	In	mm	mm
10	11.5	1/4	0.25	6.4	7.4	1 1/4	1.25	31.8	36.7	2 5/16	2.31	58.7	67.8
12	13.8	9/32	0.28	7.1	8.2	1 9/32	1.28	32.5	37.5	2 3/8	2.38	60.3	69.6
14	16.2	5/16	0.31	7.9	9.1	1 5/16	1.31	33.3	38.5	2 7/16	2.44	61.9	71.5
17	19.6	11/32	0.34	8.7	10.0	1 11/32	1.34	34.1	39.4	2 1/2	2.50	63.5	73.3
19	21.9	3/8	0.38	9.2	10.6	1 3/8	1.38	34.9	40.3	2 9/16	2.56	65.1	75.2
22	25.4	13/32	0.41	10.3	11.9	1 13/32	1.41	35.7	41.2	2 5/8	2.63	66.7	77.0
24	27.7	7/16	0.44	11.1	12.8	1 7/16	1.44	36.5	42.1	2 11/16	2.69	68.3	78.9
27	31.2	15/32	0.47	11.9	13.7	1 15/32	1.47	37.3	43.1	2 3/4	2.75	69.9	80.7
30	34.6	1/2	0.50	12.7	14.7	1 1/2	1.50	38.1	44.0	2 13/16	2.81	71.4	82.4
32	36.9	17/32	0.53	13.5	15.6	1 17/32	1.53	38.9	44.9	2 7/8	2.88	73.0	84.3
36	41.6	9/16	0.56	14.3	16.5	1 9/16	1.56	39.7	45.8	2 15/16	2.94	74.6	86.1
41	47.3	19/32	0.59	15.1	17.4	1 19/32	1.59	40.5	46.8	3	3.00	76.2	88.0
46	53.1	5/8	0.63	15.9	18.4	1 5/8	1.63	41.3	47.7	3 1/16	3.06	77.8	89.8
50	57.7	21/32	0.66	16.7	19.3	1 21/32	1.66	42.1	48.6	3 1/8	3.13	79.4	91.7
55	63.5	11/16	0.69	17.5	20.2	1 11/16	1.69	42.9	49.5	3 3/16	3.19	81.0	93.5
60	69.3	23/32	0.72	18.3	21.1	1 23/32	1.72	43.7	50.5	3 1/4	3.25	82.6	95.4
65	75.0	3/4	0.75	19.1	22.0	1 3/4	1.75	44.5	51.4	3 5/16	3.31	84.1	97.1
70	80.0	25/32	0.78	19.8	22.9	1 25/32	1.78	45.2	52.2	3 3/8	3.38	85.7	99.0
75	86.5	13/16	0.81	20.6	23.8	1 13/16	1.81	46.0	53.1	3 7/16	3.44	87.3	100.8
80	92.4	27/32	0.84	21.4	24.7	1 27/32	1.84	46.8	54.0	3 1/2	3.50	88.9	102.7
85	98.0	7/8	0.88	22.2	25.6	1 7/8	1.88	47.6	55.0	3 9/16	3.56	90.5	104.5
90	104	29/32	0.91	23.0	26.6	1 29/32	1.91	48.4	55.9	3 5/8	3.63	92.1	106.3
95	110	15/16	0.94	23.8	27.5	1 15/16	1.94	49.2	56.8	3 11/16	3.69	93.7	108.2
100	116	31/32	0.97	24.6	28.4	1 31/32	1.97	50.0	57.7	3 3/4	3.75	95.3	110.0
105	121	1	1.00	25.4	29.3	2	2.00	50.8	58.7	3 13/16	3.81	96.8	111.8
110	127	1 1/32	1.03	26.2	30.3	2 1/32	2.03	51.6	59.6	3 7/8	3.88	98.4	113.6
115	133	1 1/16	1.06	27.0	31.2	2 1/16	2.06	52.4	60.5	3 15/16	3.94	100.0	115.5
120	139	1 3/32	1.09	27.8	32.1	2 3/32	2.09	53.2	61.4	4	4.00	101.6	117.3
130	150	1 1/8	1.13	28.6	33.0	2 1/8	2.13	54.0	62.4	4 1/8	4.13	104.8	121.0
135	156	1 5/32	1.16	29.4	33.9	2 5/32	2.16	54.8	63.3	4 1/4	4.25	108.0	124.7
145	167	1 3/16	1.19	30.2	34.9	2 3/16	2.19	55.6	64.2	4 3/8	4.38	111.1	128.3
150	173	1 7/32	1.22	31.0	35.8	2 1/4	2.25	57.5	66.0	4 1/2	4.50	114.3	132.0

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Hose or tubing used in bent configurations will be subjected to increased abrasion. Hose clamps or couplings may loosen after initial installation, and all sections of hose and tubing – including connections, couplings, clamps, conductivity and bonding – should be inspected frequently, regularly and consistently, and should be replaced, adjusted or re-tightened to avoid leakage, prevent injuries or damage, and for general safety purposes.

Purchasers or users of the Products should frequently and consistently undertake inspections and protective measures with respect to the use and application of Products, which should include the examination of tube and cover, conditions of the hose or tubing, and the identification, repair or replacement of sections showing cracking, blistering, separations, internal and external abrasions, leaking or slipped couplings or connections and make proper proof tests.

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