Fitting Identification

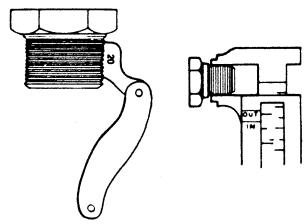
Fitting Thread Size Comparison Chart

The male connections have (Male unified thread class 2 fit) UN-2A specification threads and the female connections have (Female unified thread class 2 fit) UN-2B specification threads. The exceptions are male and female pipe threads.

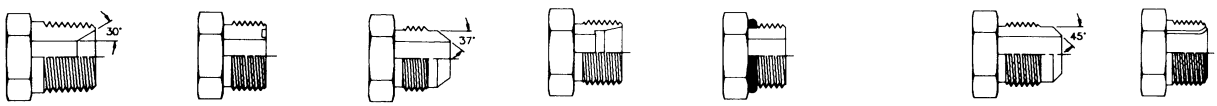
Tube Fittings

There are four basic types of tube fittings: Flare, Flareless, Straight Thread O-Ring, and Flat Face O-Ring Seal (FOR-SEAL™). Tube fittings seal in two ways. Flare and Flareless fittings use metal to metal contact joints. Straight Thread O-Ring and Flat Face O-Ring fittings use a rubber o-ring. Where extreme vibration is present, use Flareless, Straight Thread or Flat FaceO-Ring Seal fittings.

SIZING: For accuracy, it is recommended the male thread be measured. Measure the outside diameter. For our example use 7/16" Next measure the threads per inch – use 20. Our fitting size measures 7/16-20. Refer to the thread chart on this page for appropriate tube size and illustration.



See page 384 for Thread Measuring Kits.



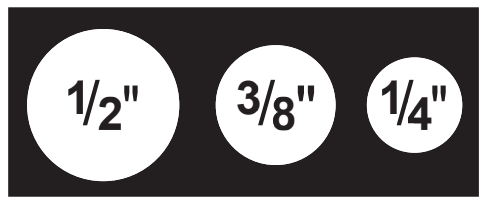
SIZE	PIPE	FOR-SEAL®	37° FLARE FLARE-TWIN®	ERMETO® 7000 SERIES	STRAIGHT THREAD O-RING SAE	45° FLARE	INVERTED FLARE
1/8	1/8-27	—	5/16-24	5/16-24	5/16-24	5/16-24	5/16-28
3/16	—	—	3/8-24	3/8-24	3/8-24	3/8-24	3/8-24
1/4	1/4-18	9/16-18	7/16-20	7/16-20	7/16-20	7/16-20	7/16-24
5/16	—	—	1/2-20	1/2-20	1/2-20	1/2-20	1/2-20
3/8	3/8-18	11/16-16	9/16-18	9/16-18	9/16-18	5/8-18	5/8-18
7/16	—	—	—	—	—	11/16-16	11/16-18
1/2	1/2-14	13/16-16	3/4-16	3/4-16	3/4-16	3/4-16	3/4-18
5/8	—	1-14	7/8-14	7/8-14	7/8-14	7/8-14	7/8-18
3/4	3/4-14	1-3/16–12	1-1/16–12	1-1/16–12	1-1/16–12	1-1/16–14	1-1/16–16
7/8	—	—	1-3/16–12	1-3/16–12	1-3/16–12	—	1-3/16–16
1	1–11-1/2	1-7/16–12	1-5/16–12	1-5/16–12	1-5/16–12	—	1-5/16–16
1 1/4	1-1/4–11-1/2	1-11/16–12	1-5/8–12	1-5/8–12	1-5/8–12	—	—
1 1/2	1-1/2–11-1/2	2-12	1-7/8–12	1-7/8–12	1-7/8–12	—	—
2	2–11-1/2	—	2-1/2–12	2-1/2–12	2-1/2–12	—	—
2 1/2	2-1/2–8	—	3-12	—	—	—	—
3	3-8	—	3-1/2–12	—	—	—	—

Pipe Fittings

The American Society of Automotive Engineers in cooperation with industry set up a standard for improvement in pipe threads. This improvement is known as the Dryseal Pipe Thread. All Weatherhead pipe threads are American Standard Taper Dryseal Pipe Threads (NPTF). The metal to metal seal is formed by contact at the thread crest and root.

Nominal pipe sizes do not agree with either the I.D., O.D., or thread sizes. To determine pipe size (up to 1-1/4") measure the diameter of the threads and subtract 1/4" For example, subtract 1/4" from a 1" pipe to obtain the nominal pipe size of 3/4".

Pipe sizes can also be given in 'dash numbers.' A dash number is always the numerator of an inch over 16th. For instance, if the pipe O.D. measures 1/2" that would be converted to 16ths (8/16), but be written as -8.



Fitting Identification

Identifying metric, or non-USA, threaded connections is similar to identifying the connections that have been commonly used in the United States. The following text covers how to identify the different styles of metric connections offered by Eaton.

BSPP & BSPT Thread Chart

BSP Thread Size	1/8-28	1/4-19	3/8-19	1/2-14	5/8-14	3/4-14	1-11	1-1/4–11	1-1/2–11	2-11
Male Thread Diameter	9.72 (.375)	13.16 (.518)	16.66 (.656)	20.96 (.825)	22.91 (.902)	26.44 (1.041)	33.25 (1.309)	41.91 (1.650)	47.80 (1.882)	59.51 (2.347)
Female Thread Diameter	8.73 (.343)	11.66 (.459)	15.37 (.605)	18.90 (.744)	20.85 (.821)	24.38 (.960)	30.61 (1.205)	39.24 (1.545)	45.24 (1.781)	55.94 (2.242)
Pitch	.91 (.036)	1.34 (.053)	1.34 (.053)	1.81 (.071)	1.81 (.071)	1.81 (.071)	2.31 (.091)	2.31 (.091)	2.31 (.091)	2.31 (.091)

Figure 4a. Dimension Note: MM(IN)

Threads

The thread forms and their corresponding specifications listed below are used on all of the metric styles of connections which will be discussed later. These cover the basic forms of the threads but not the style of connection.

THREAD TYPE	SPECIFICATIONS
British Parallel Pipe Threads	BS 2779, ISO/R 228
British Taper Pipe Threads	BS 21, ISO/R 7
Metric Parallel Threads	DIN 3852, ISO/R 6149
Metric Taper Threads	DIN 3852

Note: **BS** British Standards Institution

ISO International Standards Organization

DIN Deutsche Industrie Norme

To identify metric connections, you will need instruments that can accurately measure thread inside and outside diameters, thread pitch and fitting seat angles. The TA-1002 Thread Measuring Guide and Tool Kit is a basic kit that will help you in identifying most of the connections you will be encountering on imported equipment.

Parallel Threads ('G')

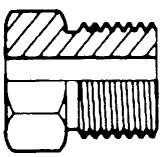


Figure 1.

apered Threads ('R')

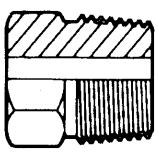


Figure 2.

Parallel and Tapered Threads

The first step in identifying thread forms is to determine if the thread is parallel or tapered. Parallel threads are not used for sealing fluids. Sealing is achieved by an elastomeric o-ring, metal seal, machined ring into the hex itself or a seat machined into the end of the fitting. This style is similar to straight thread o-ring port connections where the threads are used for retention of the sealing method against a machine port. Parallel threads can be determined by laying a straight edge along the threads. If the threads are parallel to the center line of the fitting, then the fitting has parallel threads. See Figure 1.

Tapered threads seat by the interference caused by the male and female threads. These threads create a pressure-tight joint by metal deformation when they are tightened. Sealants on the threads are commonly used in this style of connection. Laying a straight edge on the threads, compare this line with the center line of the fitting. If this line tapers slightly away from the center line, then the threads are tapered. See Figure 2.

British Pipe Threads

There are two forms of British Standard Pipe Threads that are used in the world today. They are BSPP (British Standard Pipe Parallel) and BSPT (British Standard Pipe Tapered). The BSPT male thread mates with the female BSPT thread similar to an NPTF connection. The 30° BSPP male adapters connect to a female BSPP thread with a 30° cone. This style is comparable to an NPSM swivel style. These threads are almost identical to the NPTF Pipe Thread except for the flank angle. This angle is 55° versus 60° on the NPTF. See Figure 3. Because of this difference, the two forms are NOT interchangeable.

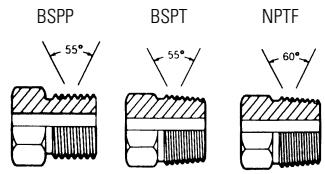


Figure 3.

Fitting Identification

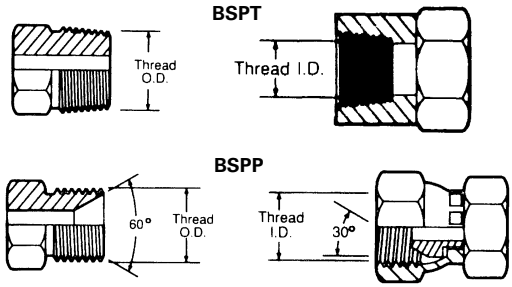


Figure 4.

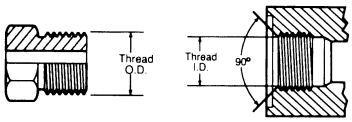
Identifying BSP threads starts with determining if it is a parallel or tapered thread. Next, referencing Figure 4 and 4a, measure the lead thread diameter. Compare this measurement to the listed dimensions to determine size. If instruments are not available to measure this, you can compare it end-to-end with a known NPTF thread to approximately arrive at the nominal BSP size. Finally, measure the pitch and compare it to the chart on Figure 4 to complete the identification. These dimensions will be the same for both BSPP and BSPT.

Metric Threads

Metric threads are similar to inch-sized threads except for the sizing which is based on standard metric units. Identifying metric threads starts with determining if it is a parallel or tapered thread. Next, measure the thread diameter. Compare this measurement to the dimensions listed in Figure 5 to determine size. Finally, measure the pitch and compare to chart. These dimensions will be common for both parallel and tapered threads.

DIN 3901/3902L, 3901/3902S

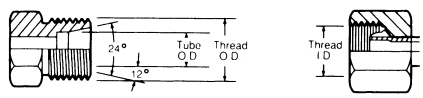
The most popular metric flareless, or bite-type, fitting style is the 24° Metric Tube Seat. This style incorporates a tapered seat in the fitting body with a bite-type sleeve, or ferrule, for the connection. When the nut is tightened, the tapered seat forces the sleeve into the tube creating a positive seal. This style of connection is available in both a Light and Heavy series and is designed for medium and high pressure applications respectively. The two series have different parallel thread sizes in relationship to the nominal tube outside diameter, but share a common sleeve. This style can be identified by the combination of the 24° internal seat and a male metric parallel thread. The series can be determined by measuring the seat counterbore, which is the approximate tube outside diameter, and comparing it to the thread size. Compare these di-mensions to those shown in Figure 6 to determine the series. The nominal sleeve size is taken directly from the tube outside diameter dimension.



METRIC THREAD SIZE	MALE THREAD DIAMETER		FEMALE THREAD DIAMETER		PITCH	
	MM	IN	MM	IN	MM	IN
M10 x 1.0	10.0	.394	8.5	.335	1.0	.039
M12 x 1.5	12.0	.472	10.5	.413	1.5	.059
M14 x 1.5	14.0	.551	12.5	.492	1.5	.059
M16 x 1.5	16.0	.630	15.5	.610	1.5	.059
M18 x 1.5	18.0	.709	16.5	.650	1.5	.059
M20 x 1.5	20.0	.787	18.5	.728	1.5	.059
M22 x 1.5	22.0	.866	20.5	.807	1.5	.059
M24 x 1.5	24.0	.945	22.5	.886	1.5	.059
M26 x 1.5	26.0	1.024	24.5	.964	1.5	.059
M27 x 2.0	27.0	1.063	25.5	1.004	2.0	.079
M30 x 2.0	30.0	1.181	28.5	1.122	2.0	.079
M33 x 2.0	33.0	1.299	31.5	1.240	2.0	.079
M36 x 2.0	36.0	1.417	34.5	1.358	2.0	.079
M42 x 2.0	42.0	1.653	40.5	1.594	2.0	.079

Figure 5.

See page 384 for Thread Measuring Kits.



TUBE O.D.		NOM. O.D.	SERIES–THREAD	
MM	IN	(MM)	LIGHT - l.Rh.	HEAVY - s.Rh.
8	.315	8	M14 x 1.5	M16 x 1.5
10	.394	10	M16 x 1.5	M18 x 1.5
12	.472	12	M18 x 1.5	M20 x 1.5
14	.551	14	—	M22 x 1.5
15	.591	15	M22 x 1.5	—
16	.630	16	—	M24 x 1.5
18	.709	18	M26 x 1.5	—
20	.787	20	—	M30 x 2.0
22	.866	22	M30 x 2.0	—
25	.984	25	—	M36 x 2.0
28	1.102	28	M36 x 2.0	—
30	1.181	30	—	M42 x 2.0

Figure 6.

Fitting Identification

Metric Flareless Connections

Metric 60° Tube Seat DIN 7631

This series combines an internal 60° seat with parallel metric Light series threads. Mating with female metric swivel fittings with a globe seal made to DIN 3863L, this connection provides a metal to metal seal when tightened. This style can be identified by the internal 60° seat on the male metric threaded portion. Reference Figure 7 for thread information.

Japanese 30° Flare

The Japanese 30° flare style is similar to the 37° JIC flare connection except for two things. The seat angle is 30° and threads are metric straight threads. This fitting is often referred to as a 'Komatsu' style connection. To identify this style, first verify the seat angle is 30°. Next establish the metric thread size by measuring the thread outside diameter. Compare this dimension to those shown in Figure 9. The threads in this series will conform to Japanese Industrial Standard (JIS) B 0207.

Japanese 30° Flare (JIS)

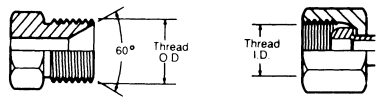
Similar to BSPP and a 30° seat. The seal is made when contact is made between the male and female flares, with the threads retaining the connection. The JIS 30° flare is similar to the 37° flare connection. To determine the difference between the JIS 30° flare and the JIC 37° flare, carefully measure the seat angle. The threads in this series conform to Japanese Industrial Standard (JIS) B 0202.

Metric Split Flange Fittings

Metric split flanges are found in applications where high pressure and high vibration conditions exist. A flange clamp is used to secure the split flange head and o-ring against a machined port to provide an elastomeric and metal-to-metal seal. They are used in applications up to 3000 PSI. The physical dimensions are similar to the SAE Code 61 standard pressure series which makes the two styles fully interchangeable. To identify, referencing Figure 10, simply measure the flange head diameter to arrive at the nominal flange size.

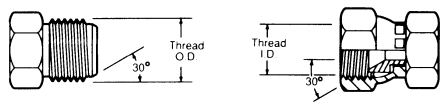
Note: To prevent leakage when replacing this type of fitting with standard Code 61 hose end, make sure to use the existing flange halves and hardware with a new SAE-style o-ring. Also note that in this series there is a 5/8 nominal size which is a non-standard SAE size and require a special o-ring. Failure to reuse flange halves and hardware will result in an improper connection which could cause the hose assembly to fail.

⚠ Proper selection of hose and hose ends is critical for proper operation and safe use of the hose and hose ends. See page 3 of this catalog for important safety information.



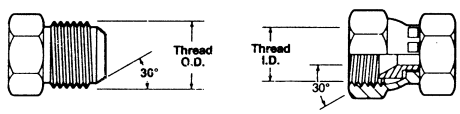
METRIC THREAD SIZE	MALE THREAD DIAMETER		FEMALE THREAD DIAMETER		PITCH	
	MM	IN	MM	IN	MM	IN
M12 x 1.5	12.0	.472	10.5	.413	1.5	.059
M14 x 1.5	14.0	.551	12.5	.492	1.5	.059
M16 x 1.5	16.0	.630	15.5	.610	1.5	.059
M18 x 1.5	18.0	.709	16.5	.650	1.5	.059
M22 x 1.5	22.0	.866	20.5	.807	1.5	.059
M26 x 1.5	26.0	1.024	24.5	.964	1.5	.059

Figure 7.



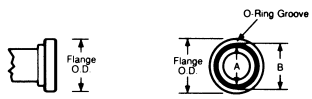
METRIC TUBE SIZE	THREAD SIZE	MALE THREAD DIAMETER		FEMALE THREAD DIAMETER		PITCH	
MM	MM	MM	IN	MM	IN	MM	IN
6	M14x1.5	14	.551	12.5	.492	1.5	.059
9	M18x1.5	18	.709	16.5	.650	1.5	.059
12	M22x1.5	22	.866	20.5	.807	1.5	.059
16	M24x1.5	24	.945	22.5	.886	1.5	.059
19	M30x2.0	30	1.181	28.5	1.122	1.5	.059
25	M33x2.0	33	1.299	31.5	1.240	1.5	.059
32	M42x2.0	42	1.653	40.5	1.594	1.5	.059

Figure 8.



INCH SIZE	THREAD SIZE	MALE THREAD O.D.		FEMALE THREAD I.D.	
		IN	MM	IN	MM
1/4	1/4-19	17/32	13.7	1/2	12.4
3/8	3/8-19	11/16	17.2	5/8	16.0
1/2	1/2-14	27/32	21.5	25/32	19.8
3/4	3/4-14	1-1/16	26.9	1	25.4
1	1-11	1-11/32	34.0	1-1/4	31.8
1-1/4	1-1/2-11	1-29/32	48.5	1-27/32	46.2
2	2-11	2-3/8	60.4	2-5/16	58.2

Figure 9.



NOMINAL FLANGE SIZE		FLANGE HEAD O.D.		O-RING GROOVE DIA "A"		DIA. "B"	
MM	IN	MM	IN	MM	IN	MM	IN
12.7	1/2	30	1.19	18.5	.73	25.0	.98
15.9	5/8	34	1.34	20.1	.79	28.0	1.10
19.0	3/4	38	1.50	21.5	.85	31.0	1.22
25.4	1	44	1.75	28.5	1.12	38.0	1.50
31.8	1-1/4	51	2.00	34.5	1.36	44.0	1.73
38.1	1-1/2	60	2.38	44.4	1.75	54.0	2.12
50.8	2	71	2.81	56.5	2.22	65.0	2.56

Figure 10.