

Coupling Identification

There are five coupling systems generally used for hydraulic connections today. They are identified geographically or by country as:

- North American**
- British**
- French**
- German**
- Japanese**

This section lists the origin and coupling style found in each country. Brief descriptions and dimensional data follows each coupling style.

North American Thread Types

Iron Pipe Thread Abbreviations

N National

S Straight Thread

F Fuels

P Pipe

T Tapered Thread

M Mechanical Joint

NPTF

National Pipe Tapered thread for Fuel is a dryseal thread. It is used for both male and female ends.

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.

NPSF

National Pipe Straight thread for Fuels 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

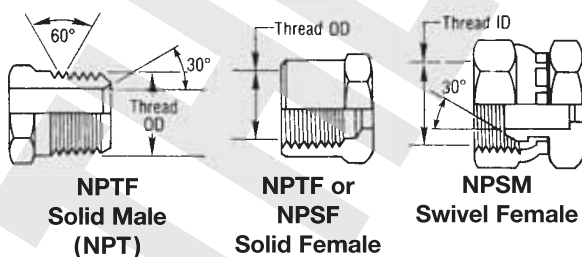
National Pipe Straight thread for Mechanical joint is used on the female swivel nut of iron pipe swivel adapters. The leak-resistant joint is not made by the sealing fit of threads, but by a tapered seat in the coupling end.

PMT / PNT

National Pipe Thread (NPT)

DASH	SIZE	THREAD	NPT	
			MALE (OD-MM)	FEMALE (ID-MM)
02	1/8"	1/8 - 27	10.32	9.12
04	1/4"	1/4 - 18	13.89	11.90
06	3/8"	3/8 - 18	17.06	15.08
08	1/2"	1/2 - 14	21.43	19.05
12	3/4"	3/4 - 14	26.98	24.20
16	1"	1 - 11.1/2	33.33	30.56
20	1-1/4"	1-1/4 - 11.1/2	42.46	38.89
24	1-1/2"	1-1/2 - 11.1/2	48.41	45.24
32	2"	2 - 11.1/2	60.32	57.15

NPT Pipe Thread



*JIC (37° Flare)

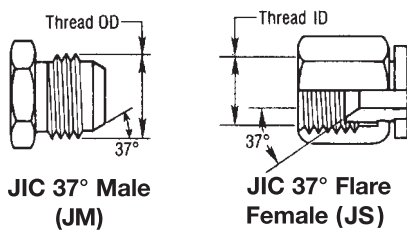
The Society of Automotive Engineers (SAE) specifies a 37° angle flare or seat be used with high pressure hydraulic tubing. These are commonly called JIC couplings.

The JIC 37° flare male will mate with a JIC female only.* The JIC male has straight threads and a 37° flare seat. The JIC female has straight threads and a 37° flare seat. The seal is made on the 37° flare seat.

Some sizes have the same threads as the SAE 45° flare. Carefully measure the seat angle to differentiate.

***Note:** Some C5, C5E and Lock-On couplings may have dual machined seats (both 37° and 45° seats).

JIC 37° Flare



JM / JS JIC (37° Flare)

DASH	SIZE	THREAD	JM	JS
			MALE (OD-MM)	FEMALE (ID-MM)
02	1/8"	5/16 - 24	7.93	6.74
03	3/16"	3/8 - 24	9.52	8.33
04	1/4"	7/16 - 20	11.11	9.92
05	5/16"	1/2 - 20	12.70	11.50
06	3/8"	9/16 - 18	14.28	12.70
08	1/2"	3/4 - 16	19.05	17.46
10	5/8"	7/8 - 14	22.22	20.63
12	3/4"	1-1/16 - 12	26.78	24.60
14	7/8"	1-3/16 - 12	30.16	28.17
16	1"	1-5/16 - 12	33.33	31.35
20	1-1/4"	1-5/8 - 12	41.27	39.29
24	1-1/2"	1-7/8 - 12	47.62	45.64
32	2"	2-1/2 - 12	63.50	61.51

*SAE (45° Flare)

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 — such as for fuel lines and refrigerant lines.

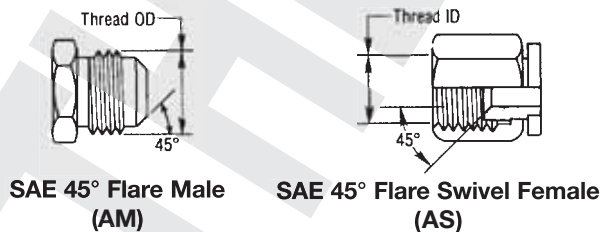
The SAE 45° flare male will mate with an SAE 45° flare female only or a dual seat JIC/SAE 45°.*

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.

Some sizes have the same threads as the SAE 37° flare.

Carefully measure the seat angle to differentiate.

SAE 45° Flare



AM / AS SAE (45° Flare)

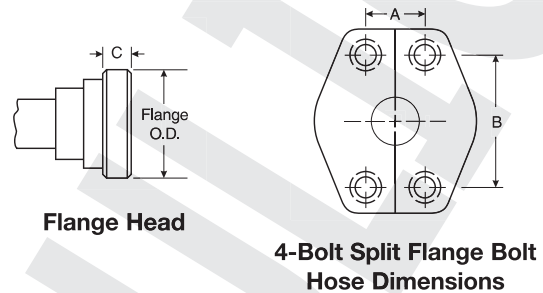
DASH	SIZE	THREAD	AM	AS
			MALE (OD-MM)	FEMALE (ID-MM)
02	1/8"	5/16 - 24	7.93	6.74
03	3/16"	3/8 - 24	9.52	8.33
04	1/4"	7/16 - 20	11.11	9.92
05	5/16"	1/2 - 20	12.70	11.50
06	3/8"	5/8 - 18	15.87	14.28
07	7/16"	11/16 - 16	17.46	15.87
08	1/2"	3/4 - 16	19.05	17.46
10	5/8"	7/8 - 14	22.22	20.63
12	3/4"	1-1/16 - 14	26.98	25.00

O-Ring Flange – SAE J518

The SAE Code 61 and Code 62 4-Bolt Split Flange is used worldwide, usually as a connection on pumps and motors. There are three exceptions.

1. The -10 size, which is common outside of North America, is not an SAE standard size (generally found on Komatsu equipment).
2. Caterpillar flanges, which are the same flange O.D. as SAE Code 62, have a thicker flange head ("C" dimension in Table).
3. Poclain flanges, which are completely different from SAE flanges.

SAE Code 61 and Code 62



SA / SAH / SAC

O-Ring Flange - SAE J518

DASH	SIZE	CODE 61 (SA)				CODE 62 (SAH)				CATERPILLAR (SAC)			
		Flange (OD-MM)	C (MM)	A (MM)	B (MM)	Flange (OD-MM)	C (MM)	A (MM)	B (MM)	Flange (OD-MM)	C (MM)	A (MM)	B (MM)
08	1/2"	30.18	6.73	17.47	38.10	31.75	7.75	18.23	40.49				
10	5/8"	34.16	6.73										
12	3/4"	38.10	6.73	22.22	47.63	41.28	8.76	23.79	50.80	41.28	14.22	23.82	50.80
16	1"	44.45	8.00	26.18	52.37	47.63	9.53	27.76	57.15	47.63	14.22	27.78	57.15
20	1-1/4"	50.80	8.00	30.17	58.72	53.98	10.29	31.75	66.68	53.98	14.22	31.75	66.67
24	1-1/2"	60.33	8.00	35.71	69.85	63.50	12.57	36.50	79.38	63.50	14.22	36.52	79.37
32	2"	71.42	9.53	42.87	77.77	79.38	12.57	44.45	96.82	79.38	14.22	44.45	96.82
40	2-1/2"	84.12	9.53	50.80	88.90								
48	3"	101.60	9.53	61.92	106.37								
56	3-1/2"	114.30	11.22	69.85	120.65								
64	4"	127.00	11.22	77.77	130.17								
80	5"	152.40	11.22	92.07	152.40								

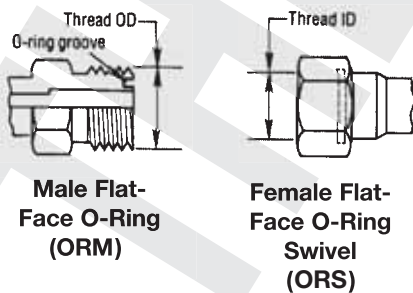
O-Ring Face Seal (ORFS) – SAE J1453

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.

The solid male O-ring face seal fitting will mate with a swivel female O-ring face seal SAE J1453 fitting only.

An O-ring rests in the O-ring groove in the male.

O-Ring Face Seal



ORM / ORS

O-RING FACE SEAL - SAE J1453

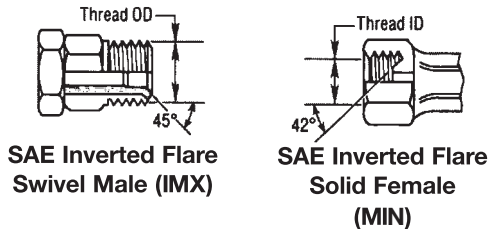
DASH	SIZE	THREAD	O-RING FACE SEAL - SAE J1453	
			ORM (MALE (OD-MM))	ORS (FEMALE (ID-MM))
04	1/4"	9/16 - 18	14.28	12.70
06	3/8"	11/16 - 16	17.46	15.87
08	1/2"	13/16 - 16	20.64	19.05
10	5/8"	1 - 16	25.40	23.81
12	3/4"	1-3/16 - 12	30.16	28.57
16	1"	1-7/16 - 12	36.51	34.13
20	1-1/4"	1-11/16 - 12	42.86	40.48
24	1-1/2"	2 - 12	50.80	48.41

SAE Inverted Flare

The SAE 45° inverted flare male will mate with an SAE 42° inverted flare female only.

The male has straight threads and a 45° inverted flare. The female has straight threads and a 42° inverted flare. The seal is made on the 45° flare seat on the male and the 42° flare seat on the female.

SAE Inverted Flare



SAE Inverted Flare Swivel Male (IMX)

SAE Inverted Flare Solid Female (MIN)

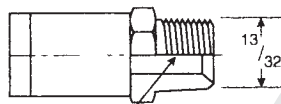
IMX

SAE 45 - INVERT FLARE

DASH	SIZE	THREAD	IMX	MIN
			MALE (OD-MM)	FEMALE (ID-MM)
02	1/8"	5/16 - 28	7.93	6.74
03	3/16"	3/8 - 24	9.52	8.33
04	1/4"	7/16 - 24	11.11	9.92
05	5/16"	1/2 - 20	12.70	11.50
06	3/8"	5/8 - 18	15.87	14.28
07	7/16"	11/16 - 18	17.46	15.87
08	1/2"	3/4 - 18	19.05	17.46
10	5/8"	7/8 - 18	22.22	20.63
12	3/4"	1-1/16 - 16	26.98	25.00

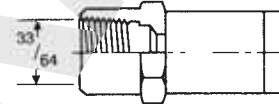
Grease Fittings

Special Male Grease Fitting



1/8-27 Pipe Thread

Special Female Grease Fitting



1/2-27 Tapered Thread

British

It is a common misconception that all foreign threads are metric. This is not always the case. There are two common thread forms: Metric and Whitworth (BSP). The country of origin and the proper nomenclature for each is listed below.

British Standard Pipe Parallel

Popular couplings have British Standard Pipe (BSP) threads, also known as Whitworth threads. These can be parallel threads (BSPP) with a 30° inverted flare or tapered threads (BSPT), with a 30° inverted flare. Port connections are usually made with BSPP threads and a soft metal cutting ring for sealing.

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

The BSPP male has straight threads and a 30° seat. The BSPOR female has straight threads, a 30° seat, and O-ring. The female port has straight threads and a spot-face. The seal on the port is made with an O-ring or soft metal washer on the male.

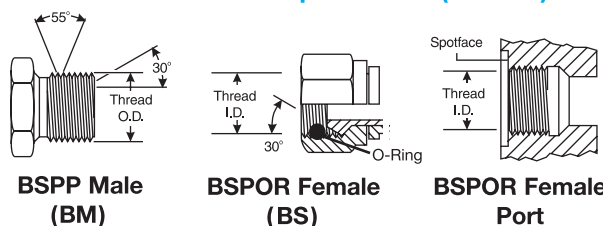
The BSPP (parallel) connector is similar to, but not interchangeable with, the NPSM connector. The thread pitch is different in most sizes, and the thread angle is 55° instead of the 60° angle found on NPSM threads.

BM / BS

British Standard Pipe Parallel (BSPP)

DASH	SIZE	THREAD	BM	BS
			MALE (OD-MM)	FEMALE (ID-MM)
02	1/8"	1/8 - 28	9.52	8.73
04	1/4"	1/4 - 19	13.20	11.90
06	3/8"	3/8 - 19	16.70	15.30
08	1/2"	1/2 - 14	21.00	19.20
10	5/8"	5/8 - 14	23.01	20.63
12	3/4"	3/4 - 14	26.40	24.60
16	1"	1 - 11	33.30	30.90
20	1-1/4"	1-1/4 - 11	41.90	39.60
24	1-1/2"	1-1/2 - 11	47.80	45.50
32	2"	2 - 11	59.70	57.40

British Standard Pipe Parallel (BSPOR)



BSPOR Male (BM)

BSPOR Female (BS)

BSPOR Female Port

British Standard Pipe Tapered

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

The BSPT male has tapered threads. When mating with either the BSPT (tapered) female or the BSPOR (parallel) female port, the seal is made on the threads.

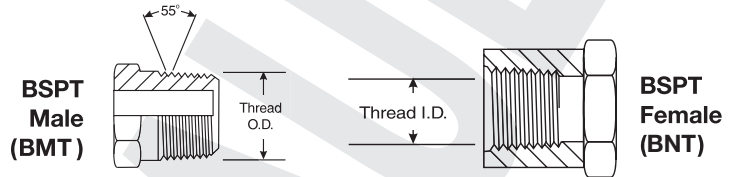
The BSPT connector is similar to, but not interchangeable with, the NPTF connector. The thread pitch is different in most cases, and the thread angle is 55° instead of the 60° angle found on NPTF threads.

BMT / BNT

British Standard Pipe Tapered (BSPT)

DASH	SIZE	THREAD	BMT	BNT
			MALE (OD-MM)	FEMALE (ID-MM)
02	1/8"	1/8 - 28	9.52	8.73
04	1/4"	1/4 - 19	13.20	11.90
06	3/8"	3/8 - 19	16.70	15.30
08	1/2"	1/2 - 14	21.00	19.20
10	5/8"	5/8 - 14	23.01	20.63
12	3/4"	3/4 - 14	26.40	24.60
16	1"	1 - 11	33.30	30.90
20	1-1/4"	1-1/4 - 11	41.90	39.60
24	1-1/2"	1-1/2 - 11	47.80	45.50
32	2"	2 - 11	59.70	57.40

British Standard Pipe Tapered (BSPT)



British Flat-Face Seal

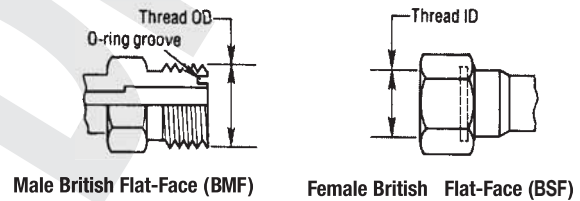
A seal is made when the O-ring in the male contacts the flat face on the female. These couplings are intended for hydraulic systems where elastomeric seals are acceptable to overcome leakage and leak resistance is crucial.

The solid male British O-ring face seal fitting will mate with a swivel female British O-ring face seal fitting only. An O-ring rests in the O-ring groove in the male.

BSF

British Flat-Face Seal

DASH	SIZE	THREAD	BMF	BSF
			MALE (OD-MM)	FEMALE (ID-MM)
06	3/8"	3/8 - 19	16.70	15.30
08	1/2"	1/2 - 14	21.00	19.20
12	3/4"	3/4 - 14	26.40	24.60



French

Popular couplings are French GAZ. These have a 24° seat and metric threads. These are similar to German DIN couplings, but the threads are different in some sizes. Although both are metric threads, the French use fine threads in all sizes and German DIN couplings use coarse threads in larger sizes. Most port connections are flange connections. French flanges are different than SAE—they have a lip that protrudes from the flange face. These are called Poclairn-style flanges.

GAZ 24°

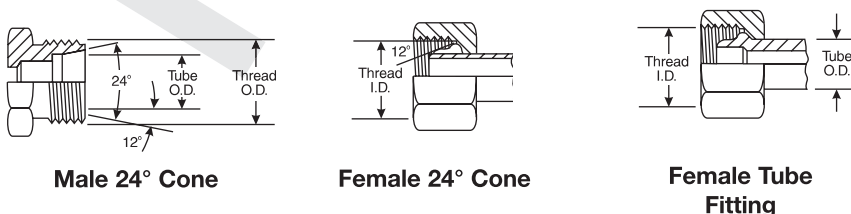
The French Metric (GAZ) male will mate with the female 24° cone or the female tube fitting.

The male has a 24° seat and straight metric threads. The female has a 24° seat or a tubing sleeve and straight metric threads.

When measuring the flare angle with the seat angle gauge, use the 12° gauge. (The seat angle gauge measures the angle from the connector centerline.)

Metric Thread Size	Female Thread I.D. (mm)	Male Thread O.D. (mm)	Tube O.D. (mm)
M20x1.5	18.5	20.0	13.25
M24x1.5	22.5	24.0	16.75
M30x1.5	28.5	30.0	21.25
M36x1.5	34.5	36.0	26.75
M45x1.5	43.5	45.0	33.50
M52x1.5	50.5	52.0	42.25

French Metric (GAZ)



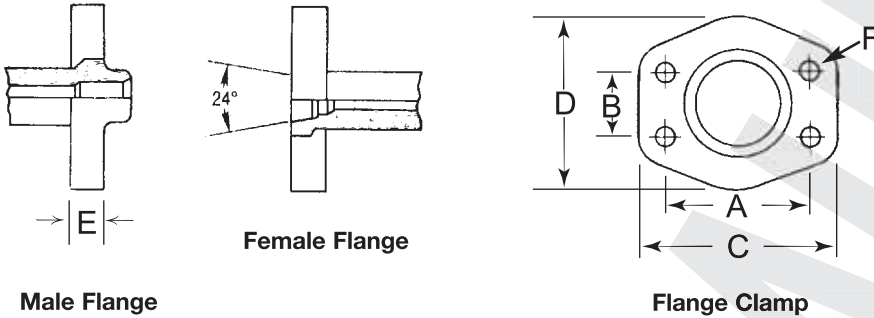
GAZ Poclairn 24° Flange

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

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

Nominal Size (In.)	A (In.)	B (In.)	C (In.)	D (In.)	E (In.)	F (In.)
1/2	1.57	.72	2.20	1.89	.55	.35
5/8	1.57	.72	2.20	1.89	.55	.35
3/4	2.00	.94	2.75	2.38	.71	.43

Poclairn (French GAZ)



German DIN (Deutsche Industrial Norme)

Popular couplings are German DIN (Deutsche Industrial Norme). A coupling referred to as "metric" usually means a DIN coupling.

DIN 24° Cone

The DIN 24° cone male will mate with any of the females shown.

The male has a 24° seat, straight metric threads, and a recessed counterbore which matches the tube O.D. of the coupling used with it. The mating female is a 24° cone with O-ring, a metric tube fitting or a universal 24° and 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. but a thicker wall section than the light.)

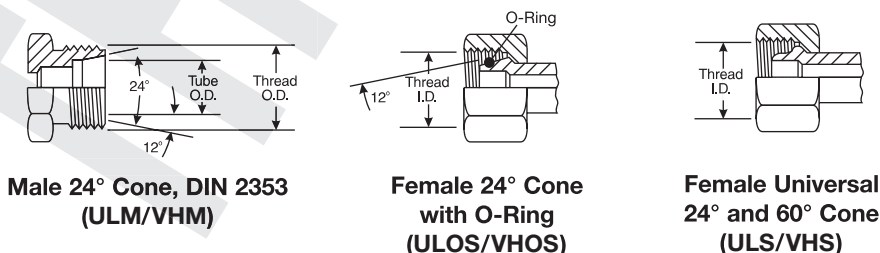
When measuring the flare angle with the seat angle gauge, use the 12° gauge. (The seat angle gauge measures the angle from the connector centerline.)

ULM/ULS - VHM/VHS

DIN 24° Cone

ULM/ULS		VHM/VHS		THREAD	MALE (OD-MM)	FEMALE (ID-MM)
Light	Heavy	Light	Heavy			
6				M12x1.5	12.00	10.50
8	6			M14x1.5	14.00	12.50
10	8			M16x1.5	16.00	14.50
12	10			M18x1.5	18.00	16.50
	12			M20x1.5	20.00	18.50
15	14			M22x1.5	22.00	20.50
	16			M24x1.5	24.00	22.50
18				M26x1.5	26.00	24.50
22	20			M30x2.0	30.00	28.00
28	25			M36x2.0	36.00	34.00
	30			M42x2.0	42.00	40.00
35				M45x2.0	45.00	43.00
42	38			M52x2.0	52.00	50.00

DIN 24° Male and Mating Females



DIN 60° Cone

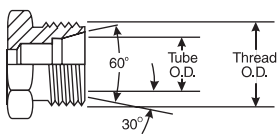
The DIN 60° cone male will mate with the female universal 24° or 60° cone connector only.

The male has a 60° seat and straight metric threads. The female has a 24° and 60° universal seat and straight metric threads.

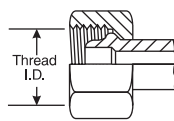
When measuring the flare angle with the seat angle gauge, use the 30° gauge. (The seat angle gauge measures the angle from the connector centerline.)

Metric Thread Size	Female Thread	Male Thread	Tube O.D.
	I.D. (mm)	O.D. (mm)	(mm)
M14x1.5	12.5	14.0	8
M16x1.5	14.5	16.0	10
M18x1.5	16.5	18.0	12
M22x1.5	20.5	22.0	15
M26x1.5	24.5	26.0	18
M30x1.5	28.5	30.0	22
M38x1.5	36.5	38.0	28
M45x1.5	43.5	45.0	35
M52x2.0	50.5	52.0	42

DIN 60° Male and Mating Female



Male
60° Cone, DIN 6711



Female
Universal 24° and
60° Cone
(ZIS)

Hose & Coupling Selection

Japanese

There are two popular types of coupling styles in Japan, Japanese Industrial Standard and Komatsu. These couplings look similar to Male JIC and Female JIC Swivel couplings. There are two major differences: The threads are BSP and the seat angle is only 30° instead of 37° for JIC.

1. **Japanese Industrial Standard.** Most Japanese equipment use this type of coupling with a 30° seat and British Standard Pipe Parallel threads. **They are not interchangeable with British couplings, since the flare is not inverted.**
2. **Komatsu.** All Komatsu equipment uses couplings with a 30° seat and metric fine threads. All flanges are Code 61 or Code 62, except -10 which utilizes a special Komatsu-style flange that does not conform to SAE standard sizing.

Japanese 30° Flare Parallel Threads

The Japanese 30° flare male connector will mate with a Japanese 30° flare female only.

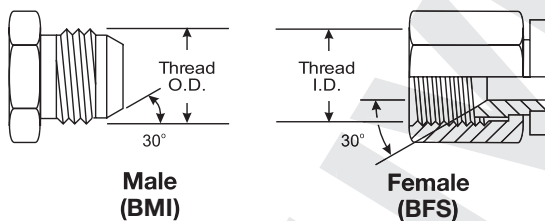
The male and female have straight threads and a 30° seat. The seal is made on the 30° seat.

The threads on the Japanese 30° flare connector conform to JIS B 0202, which are the same as the BSPOR threads. Both the British and Japanese connectors have a 30° seat, but they are not interchangeable because the British seat is inverted.

BMI / BFS Japanese 30° Flare Parallel Threads (JIS B 0202)

DASH	SIZE	THREAD	BMI	BFS
			MALE (OD-MM)	FEMALE (ID-MM)
02	1/8"	1/8 - 28	9.52	8.73
04	1/4"	1/4 - 19	13.20	11.90
06	3/8"	3/8 - 19	16.70	15.30
08	1/2"	1/2 - 14	21.00	19.20
10	5/8"	5/8 - 14	23.01	20.63
12	3/4"	3/4 - 14	26.40	24.60
16	1"	1 - 11	33.30	30.90
20	1-1/4"	1-1/4 - 11	41.90	39.60
24	1-1/2"	1-1/2 - 11	47.80	45.50
32	2"	2 - 11	59.70	57.40

Japanese 30° Flare



Japanese Tapered Pipe Thread

The Japanese tapered pipe thread connector is identical to and fully interchangeable with the BSPT (tapered) connector. **The Japanese connector does not have a 30° flare and will not mate with the BSPOR female.**

The threads conform to JIS B 0203, which are the same as BSPT threads.

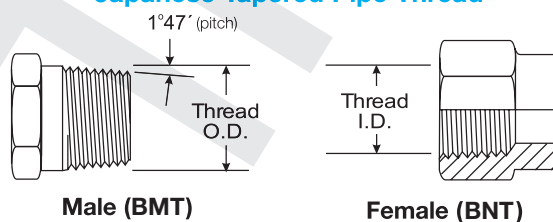
The seal on the Japanese tapered pipe thread connector is made on the threads.

BMT / BNT

British Standard Pipe Tapered (BSPT)

DASH	SIZE	THREAD	BMT	BNT
			MALE (OD-MM)	FEMALE (ID-MM)
02	1/8"	1/8 - 28	9.52	8.73
04	1/4"	1/4 - 19	13.20	11.90
06	3/8"	3/8 - 19	16.70	15.30
08	1/2"	1/2 - 14	21.00	19.20
10	5/8"	5/8 - 14	23.01	20.63
12	3/4"	3/4 - 14	26.40	24.60
16	1"	1 - 11	33.30	30.90
20	1-1/4"	1-1/4 - 11	41.90	39.60
24	1-1/2"	1-1/2 - 11	47.80	45.50
32	2"	2 - 11	59.70	57.40

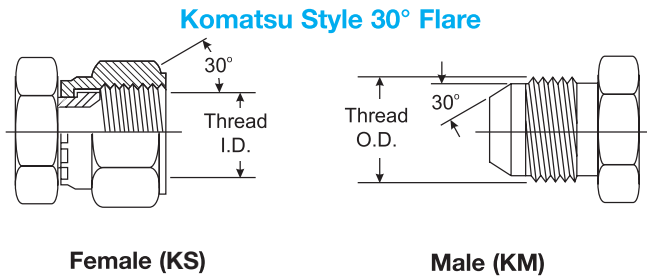
Japanese Tapered Pipe Thread



Komatsu Style 30° Flare Parallel Threads

The Komatsu style 30° flare parallel thread connector is identical to the Japanese 30° flare parallel thread connector except for the threads. The Komatsu style connector uses metric fine threads which conform to JIS B 0207. Gates identifies these as Komatsu-style by marking the hex nuts with two small notches.

The Komatsu style connector seals on the 30° flare.



Dash Size	Nominal Size		Thread Size	Female Thread I.D. (mm)	Male Thread (O.D.) (mm)
	(In.)	(mm)			
-6	3/8	9.5	M18x1.5	16.5	18
-8	1/2	13	M22x1.5	20.5	22
-10	5/8	16	M24x1.5	22.5	24
-12	3/4	19	M30x1.5	28.5	30
-16	1	25	M33x1.5	31.5	33
-20	1-1/4	32	M36x1.5	34.5	36
-24	1-1/2	38	M42x1.5	40.5	42

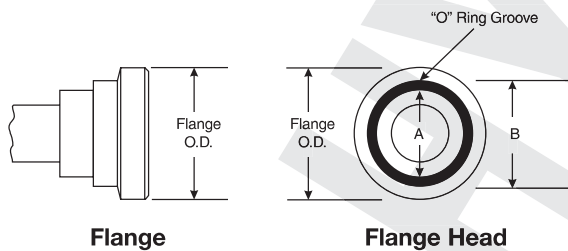
Komatsu Style Flange Fitting

The Komatsu style 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 style flange with an SAE style flange, an SAE style O-ring must always be used.

KOMATSU STYLE FLANGE FITTING

Komatsu Style Flange Fitting

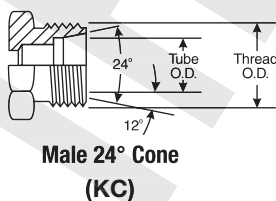


DASH	SIZE	Flange (OD-MM)	Thick(MM)
08	1/2"	30.18	6.73
10	5/8"	34.16	6.73
12	3/4"	38.10	6.73
16	1"	44.45	8.00
20	1-1/4"	50.80	8.00
24	1-1/2"	60.33	8.00
32	2"	71.42	9.53

Metric Kobelco Metric Bite Sleeve

These are similar to the German DIN 24° Cone, but the DIN style uses courser threads.

Therefore, the Kobelco and German DIN are not interchangeable.



Dash Size	Metric Thread Size	Female Thread I.D. (mm)	Male Thread O.D. (mm)
-22	M30X1.5	28	30
-28	M36X1.5	34	36
-35	M45X1.5	43	45