

Thread and End Connection Identification Guide



Swagelok®

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Introduction

Thread and End Connection Terminology

Standards are used to help identify threads and end connections. We will use the following definitions in this manual:

Thread Standard

A specific reference to a formal standard (for example, ANSI/ASME B1.1, DIN 2999, or ISO 261) which describes thread form, including a thread's angle, pitch, and diameter.

End Connection Standard

A specific reference to a national standard (such as DIN 3852 or JIS PT) or industry-group standard (such as SAE J512) which describes an end connection's components, seal area, geometry, and nominal sizes. Thread standards are usually referenced in the end connection standard.

Thread Standards and End Connection Standards

Many mechanical end connections have threads. Therefore, thread standards can be used to help define end connection standards.

Pitch

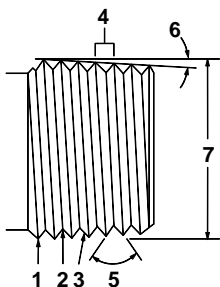
For the purposes of this guide, pitch refers to threads per inch, instead of the distance between the threads, for fractional screw threads and pipe threads. For all metric screw threads, pitch refers to the distance between adjacent threads.

General Terminology

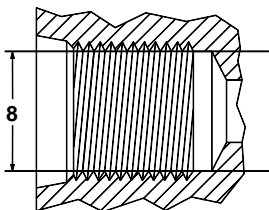
General terms and characteristics, which apply to all end connection threads, are shown below for both male and female threads.

Threads

- | | |
|-------------------|-----------------------|
| 1. Crest | 5. Thread Flank Angle |
| 2. Root | 6. Taper Angle |
| 3. Flank | 7. Male Thread OD |
| 4. Pitch (Metric) | 8. Female Thread ID |



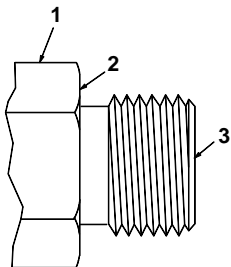
Male



Female

End Connections

1. Body Size
2. Shoulder
3. Face



End Connection

Step-by-Step Identification Procedure for Threads and End Connections

STEP 1: Determine if the thread is tapered or straight (parallel).

STEP 2: Measure the thread diameter.

STEP 3: Determine the thread pitch.

STEP 4: Determine the thread standard.

STEP 5: Identify the end connection.

NOTE: Even experienced workers sometimes have difficulty identifying threads, regardless of their thread identification procedure and the quality of their gauges.

Details

STEP 1: *Determine if the thread is **T** tapered or **S** straight (parallel).*

Use a caliper to measure the nominal male or female thread crest-to-crest diameter on the first, fourth, and last full threads. (See Figure 1.)

- T** If the diameters increase for a male end or decrease for a female end, the thread is tapered.
- S** If all the diameters are the same, the thread is straight (parallel).

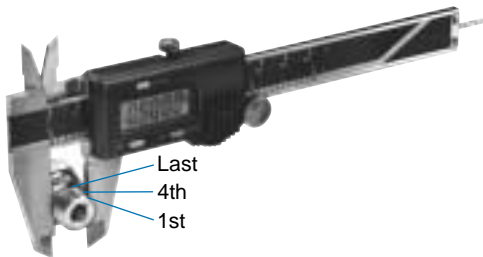


Figure 1.
Measuring Crest-to-Crest Thread Diameters

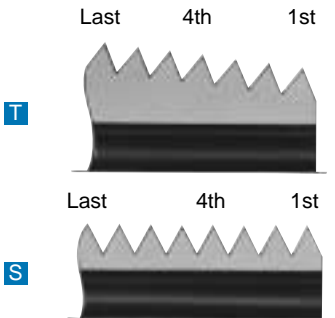


Figure 2.
Measuring the Thread Diameters

STEP 2: Measure the thread diameter.

Use a caliper to measure the nominal male or female thread diameter from crest-to-crest. (See Figure 2.)

- T** Measure the fourth or fifth full thread.
- S** Measure any full thread.

The diameter measurement obtained in this step may not be exactly the same as the listed nominal size for the given thread. The main reason for this variation is industry or manufacturing tolerances.

STEP 3: Determine the thread pitch.

To determine the thread pitch, use the Swagelok pitch gauges and check the thread against each form until you find a match. If you prefer to narrow down the choices, use the following procedure:

- a. On the appropriate thread identification reference table, locate the nominal thread diameter. Note that it is common to have the thread diameter for different threads listed multiple times.
- T** Turn to the Tapered Thread Identification Reference Tables beginning on page 12.
 - S** Turn to the Straight Thread Identification Reference Tables beginning on page 14.

- b. For each case, read across the table to the pitch column to determine the possible thread pitches for your thread.
- c. Try the appropriate pitch gauge form for the threads identified in Step b. above until you find a match. (See Figure 3.)

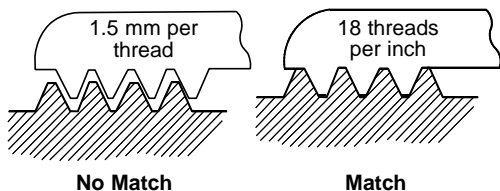


Figure 3.
Determining the Thread Pitch

STEP 4: Determine the thread standard.

Once you have determined the following about a thread, you have all the information required to identify it:

- Male or female
- Straight or tapered
- Nominal male or female diameter
- Pitch

Now, turn to the appropriate thread identification reference table and identify the thread.

STEP 5: Identify the end connection.

T If the thread is tapered:

- a. Locate the end connections that have the tapered thread you identified. (See pages 20 through 23.)
- b. Study the cross-section drawings for these end connections and determine which one matches your end connection.

S If the thread is straight:

- Locate the end connections that use the straight thread you identified. (See pages 26 through 48.)
- Study the cross-section drawings for these end connections and determine which one matches your end connection.

NOTE: The Swagelok® combination seat angle gauge set includes 45°, 37°, and 30° seat angle gauges to assist with end connection identification. (See page 52.)

- Select one of the gauges and place its angle against the seat angle of the end connection.
- If the center line of the fitting and the longitudinal axis of the gauge are parallel, the seat angle and the gauge angle are the same. If not, try another gauge.

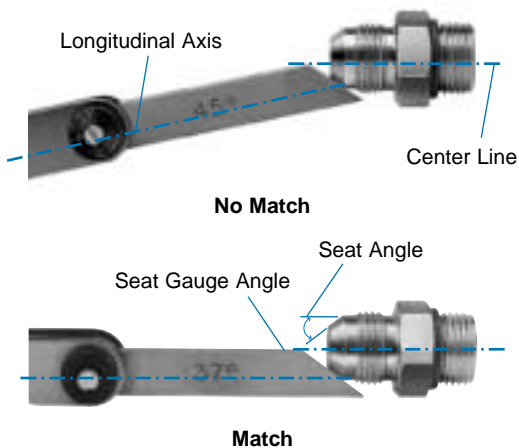


Figure 4.
Determining Seat Angle

NOTE: Fittings have seat angles other than 45°, 37°, and 30°. Contact your authorized Swagelok sales and service representative for additional information.

EXAMPLE: Thread and End Connection Identification (Steps 1-5)

You have a male fitting and you need to identify its thread.

STEP 1: *Determine if the thread is tapered or straight (parallel).*

You find that the thread is straight.

STEP 2: *Measure the thread diameter.*

You find the thread diameter to be 0.430 in.

STEP 3: *Determine the thread pitch.*

- a. Since the thread is straight, turn to the Straight Thread Identification Reference Table on page 14, and locate the thread diameter. See cut-out of table below.

Nominal Thread Size	Designation	Nominal Male Thread Diameter		Pitch ^①	Page No.
		in.	mm		
3/8	UNF	0.375 to 0.363	9.53 to 9.22	24U	29-34
	NPSM	0.658	16.71	18U	50
	ISO 228/1	0.656	16.66	19W	35-42
7/16	UNS	0.436 to 0.429	11.07 to 10.90	24U	29-34
	UNF	0.436 to 0.424	11.07 to 10.77	20U	29-34
1/2	UNF	0.500 to 0.487	12.70 to 12.36	20U	29-34
	NPSM	0.818	20.78	14U	50
	ISO 228/1	0.825	20.96	14W	35-42

① U = Unified W = Whitworth M = Metric
Labeling on each Swagelok pitch gauge form

- b. Look across the table to find the corresponding pitches. In this case, they are 20 and 24.
- c. Therefore, to determine the pitch of the thread you would use your 20 and 24 pitch gauges.

For the purposes of this example, assume that

the pitch is 24.

STEP 4: *Determine the thread standard.*

At this point you know that the thread has the following characteristics:

- a. Male
- b. Straight
- c. Nominal thread diameter of 0.430 in.
- d. Pitch equals 24

Looking at the cut-out portion of the straight thread identification reference table, you see that the only thread with all of these characteristics is a 7/16 in. UNS thread.

STEP 5: *Identify the end connection.*

So far you know that you have a 7/16 in. UNS thread. To identify the end connection, you:

- a. Identify the type of seal.
- b. Turn to the section in this manual entitled “End Connections That Use Unified Screw Threads” (pages 28 through 34), and find the configuration that matches your end connection.

Thread Identification Reference Tables

T Tapered—Male

NOTE: Measured thread diameters may not match table measurements exactly. All threads have tolerances regarding many parts of the threads. The information in this chart is not intended to be used as inspection criteria for threaded fittings. It is intended to be used as a guide to help identify various threads.

Nominal Thread Size, in.	Designation	Nominal Male Thread Diameter		Pitch	Page No.
		in.	mm		
1/16	ISO 7/1	0.304	7.72	28W	25
	NPT	0.308	7.84	27U	23 to 24
1/8	ISO 7/1	0.383	9.73	28W	25
	NPT	0.401	10.18	27U	23 to 24
1/4	ISO 7/1	0.518	13.16	19W	25
	NPT	0.533	13.54	18U	23 to 24
3/8	ISO 7/1	0.656	16.86	19W	25
	NPT	0.668	16.98	18U	23 to 24
1/2	ISO 7/1	0.825	20.96	14W	25
	NPT	0.832	21.14	14U	23 to 24
3/4	ISO 7/1	1.041	26.44	14W	25
	NPT	1.043	26.49	14U	23 to 24
1	NPT	1.305	33.14	11.5U	23 to 24
	ISO 7/1	1.309	33.25	11W	25
1 1/4	NPT	1.649	41.90	11.5U	23 to 24
	ISO 7/1	1.650	41.91	11W	25
1 1/2	ISO 7/1	1.882	47.80	11W	25
	NPT	1.888	47.97	11.5U	23 to 24
2	ISO 7/1	2.347	59.61	11W	25
	NPT	2.362	60.00	11.5U	23 to 24

① U = Unified W = Whitworth M = Metric
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NOTE: 1/2 and 3/4 in. ISO 7/1 and NPT threads can be difficult to identify because they are very close in design. Positive identification may not be possible without the use of an optical comparator. Contact your authorized Swagelok representative for additional information.

T Tapered—Female

NOTE: Measured thread diameters may not match table measurements exactly. All threads have tolerances regarding many parts of the threads. The information in this chart is not intended to be used as inspection criteria for threaded fittings. It is intended to be used as a guide to help identify various threads.

Nominal Thread Size, in.	Designation	Nominal Male Thread Diameter		Pitch	Page No.
		in.	mm		
1/16	NPT	0.244	6.22	27U	23 to 24
	ISO 7/1	0.258	6.56	28W	25
1/8	NPT	0.336	8.54	27U	23 to 24
	ISO 7/1	0.337	8.57	28W	25
1/4	NPT	0.436	11.07	18U	23 to 24
	ISO 7/1	0.451	11.45	19W	25
3/8	NPT	0.571	14.49	18U	23 to 24
	ISO 7/1	0.589	14.95	19W	25
1/2	NPT	0.705	17.90	14U	23 to 24
	ISO 7/1	0.734	18.63	14W	25
3/4	NPT	0.914	23.21	14U	23 to 24
	ISO 7/1	0.949	24.12	14W	25
1	NPT	1.148	29.15	11.5U	25
	ISO	1.193	30.29	11W	23 to 24
1 1/4	NPT	1.491	37.87	11.5U	23 to 24
	ISO 7/1	1.534	38.95	11W	25
1 1/2	NPT	1.730	43.49	11.5U	23 to 24
	ISO 7/1	1.766	44.85	11W	25
2 1/4	NPT	2.203	55.95	11.5U	23 to 24
	ISO 7/1	2.231	56.66	11W	25

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NOTE: 1/2 and 3/4 in. ISO 7/1 and NPT threads can be difficult to identify because they are very close in design. Positive identification may not be possible without the use of an optical comparator. Contact your authorized Swagelok representative for additional information.

S Straight—Male

NOTE: Measured thread diameters may not match table measurements exactly. All threads have tolerances regarding many parts of the threads. The information in this chart is not intended to be used as inspection criteria for threaded fittings. It is intended to be used as a guide to help identify various threads.

Nominal Thread Size	Designation	Nominal Male Thread Diameter		Pitch ^①	Page No.
		in.	mm		
Fractional					
1/16	ISO 228/1	0.304	7.72	28W	35-41
1/8	ISO 228/1	0.383	9.73	28W	35-41
	NPSM	0.394	10.01	27U	49
1/4	ISO 228/1	0.518	13.16	19W	35-41
	NPSM	0.522	13.26	18U	49
5/16	UNF	0.313 to 0.301	7.95 to 7.77	24U	29-34
	UN	0.313 to 0.305	7.95 to 7.75	28U	29-34
3/8	UNF	0.375 to 0.363	9.53 to 9.22	24U	29-34
	NPSM	0.658	16.71	18U	49
	ISO 228/1	0.656	16.66	19W	35-41
7/16	UNS	0.436 to 0.429	11.07 to 10.90	24U	29-34
	UNF	0.436 to 0.424	11.07 to 10.77	20U	29-34
1/2	UNF	0.500 to 0.487	12.70 to 12.36	20U	29-34
	NPSM	0.818	20.78	14U	49
	ISO 228/1	0.825	20.96	14W	35-41
9/16	UNF	0.563 to 0.548	14.29 to 13.92	18U	29-34
5/8	UNF	0.625 to 0.611	15.88 to 15.52	18U	29-34
	ISO 228/1	0.902	22.91	14W	35-41
11/16	UN	0.688 to 0.677	17.46 to 17.19	16U	29-34
3/4	UNS	0.749 to 0.740	19.02 to 18.80	18U	29-34
	UNF	0.750 to 0.734	19.05 to 18.65	16U	29-34
	NPSM	1.029	26.14	14U	49
	ISO 228/1	1.041	26.44	14W	35-41
13/16	UN	0.813 to 0.802	20.64 to 20.36	16U	29-34
7/8	UNF	0.875 to 0.858	22.23 to 21.79	14U	29-34
	UNS	0.874 to 0.865	22.20 to 21.97	18U	29-34
	ISO 228/1	1.189	30.20	14W	35-41

① U = Unified W = Whitworth M = Metric
Labeling on each Swagelok pitch gauge form

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S Straight—Male

Nominal Thread Size	Designation	Nominal Male Thread Diameter		Pitch ^①	Page No.
		in.	mm		
Fractional					
1	UNS	1.000 to 0.983	25.40 to 24.97	14U	29-34
	NPSM	1.287	32.69	11.5U	49
	ISO 228/1	1.309	33.25	11W	35-41
1 1/16	UN	1.063 to 1.049	27.00 to 26.64	12, 14U	29-34
	UN	1.063 to 1.051	27.00 to 26.70	16U	29-34
1 1/8	ISO 228/1	1.492	37.90	11W	35-41
1 3/16	UN	1.188 to 1.174	30.16 to 29.83	12U	29-34
1 1/4	UNF	1.250 to 1.231	31.75 to 31.57	12U	29-34
	NPSM	1.632	41.45	11.5U	49
	ISO 228/1	1.650	41.91	11W	35-41
1 5/16	UN	1.313 to 1.299	33.34-33.00	12U	29-34
1 3/8	UNF	1.375 to 1.356	34.93 to 34.44	12U	29-34
1 7/16	UN	1.438 to 1.424	36.51 to 36.18	12U	29-34
1 1/2	NPSM	1.871	47.52	11.5U	49
	ISO 228/1	1.882	47.80	11W	35-41
1 5/8	UN	1.625 to 1.612	41.28 to 40.94	12, 20U	29-34
1 11/16	UN	1.688 to 1.674	42.86 to 42.53	12U	29-34
1 3/4	ISO 228/1	2.116	53.75	11W	35-41
1 7/8	UN	1.875 to 1.862	47.63 to 47.29	12U	29-34
2	UN	2.000 to 1.987	50.80 to 50.46	12U	29-34
	ISO 228/1	2.347	59.61	11W	35-41
	NPSM	2.345	59.56	11.5U	49
2 1/2	UN	2.500 to 2.487	63.50 to 63.16	12U	29-34
Metric					
8	Metric	0.310	7.88	1.0M	42-48
10		0.389	9.88	1.0M	42-48
12		0.467	11.85	1.5M	42-48
		0.468	11.88	1.0M	42-48
14		0.545	13.85	1.5M	42-48
16		0.624	15.85	1.5M	42-48
18		0.703	17.85	1.5M	42-48

① U = Unified W = Whitworth M = Metric
 Labeling on each Swagelok pitch gauge form
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S Straight—Male

Nominal Thread Size	Designation	Nominal Male Thread Diameter		Pitch ^①	Page No.
		in.	mm		
Metric					
20	Metric	0.781	19.85	1.5M	42-48
22		0.860	21.85	1.5M	42-48
24		0.939	23.85	1.5M	42-48
26		1.018	25.85	1.5M	42-48
27		1.056	26.82	2.0M	42-48
		1.057	26.85	1.5M	42-48
30		1.174	29.82	2.0M	42-48
		1.175	29.85	1.5M	42-48
33		1.292	32.82	2.0M	42-48
		1.293	32.85	1.5M	42-48
36		1.410	35.82	2.0M	42-48
		1.411	35.85	1.5M	42-48
38		1.490	37.85	1.5M	42-48
39		1.528	38.92	2.0M	42-48
		1.530	38.85	1.5M	42-48
42		1.647	41.82	2.0M	42-48
		1.648	41.85	1.5M	42-48
45		1.765	44.82	2.0M	42-48
		1.766	44.85	1.5M	42-48
48		1.883	47.82	2.0M	42-48
		1.884	47.85	1.5M	42-48
50		1.961	49.82	2.0M	42-48
52		2.040	51.82	2.0M	42-48
		2.041	51.85	1.5M	42-48
56		2.198	55.82	2.0M	42-48
60		2.355	59.82	2.0M	42-48

① U = Unified W = Whitworth M = Metric
Labeling on each Swagelok pitch gauge form

NOTE: 1/2 and 3/4 in. ISO 7/1 and NPT threads can be difficult to identify because they are very close in design. Positive identification may not be possible without the use of an optical comparator. Contact your authorized Swagelok representative for additional information.

S Straight—Female

NOTE: Measured thread diameters may not match table measurements exactly. All threads have tolerances regarding many parts of the threads. The information in this chart is not intended to be used as inspection criteria for threaded fittings. It is intended to be used as a guide to help identify various threads.

Nominal Thread Size	Designation	Nominal Female Thread Diameter		Pitch ^①	Page No.
		in.	mm		
Fractional					
1/16	ISO 228/1	0.259	6.56	28W	35-41
1/8	ISO 228/1	0.337	8.57	28W	35-41
	NPSM	0.361	9.17	27U	49
1/4	ISO 228/1	0.451	11.45	19W	35-41
	NPSM	0.474	12.04	18U	49
5/16	UNF	0.277 to 0.267	7.04 to 6.78	24U	29-34
	UN	0.281 to 0.274	7.14 to 6.96	28U	29-34
3/8	UNF	0.340 to 0.330	8.64 to 8.38	24U	29-34
	ISO 228/1	0.589	14.95	19W	35-41
	NPSM	0.608	15.44	18U	49
7/16	UNF	0.395 to 0.383	10.03 to 9.73	20U	29-34
	UNS	0.402 to 0.392	10.21 to 9.96	24U	29-34
1/2	UNF	0.457 to 0.446	11.61 to 11.33	20U	29-34
	ISO 228/1	0.734	18.63	14W	35-41
	NPSM	0.753	19.13	14U	49
9/16	UNF	0.515 to 0.502	13.08 to 12.75	18U	29-34
5/8	UNF	0.578 to 0.565	14.68 to 14.35	18U	29-34
	ISO 228/1	0.811	20.59	14W	35-41
11/16	UN	0.634 to 0.620	16.10 to 15.75	16U	29-34
3/4	UNS	0.703 to 0.690	17.86 to 17.53	18U	29-34
	UNF	0.707 to 0.682	17.96 to 17.32	16U	29-34
	ISO 228/1	0.949	24.12	14W	35-41
	NPSM	0.964	24.49	14U	49
13/16	UN	0.759 to 0.745	19.28 to 18.92	16U	29-34
7/8	UNF	0.814 to 0.798	20.68 to 20.27	14U	29-34
	UNS	0.828 to 0.815	21.03 to 20.70	18U	29-34
	ISO 228/1	1.098	27.88	14W	35-41

① U = Unified W = Whitworth M = Metric
 Labeling on each Swagelok pitch gauge form
 (continued on next page)

S Straight—Female

Nominal Thread Size	Designation	Nominal Female Thread Diameter		Pitch ^①	Page No.
		in.	mm		
Fractional					
15/16	UN	1.240 to 1.222	31.50 to 31.04	12U	29-34
1	UNS	0.938 to 0.923	23.83 to 23.44	14U	29-34
	ISO 228/1	1.193	30.29	11W	35-41
	NPSM	1.206	30.63	11.5U	49
1 1/16	UN	0.990 to 0.972	25.15 to 24.69	12, 14U	29-34
1 1/8	ISO 228/1	1.376	34.94	11W	35-41
1 3/16	UN	1.115 to 1.097	28.32 to 27.86	12U	29-34
1 1/4	UNF	1.178 to 1.160	29.92 to 29.45	12U	29-34
	ISO 228/1	1.534	38.95	11W	35-41
	NPSM	1.550	39.37	11.5U	49
1 3/8	UNF	1.303 to 1.285	33.10 to 32.64	12U	29-34
1 7/16	UN	1.365 to 1.347	34.67 to 34.21	12U	29-34
1 1/2	NPSM	1.780	45.47	11.5U	49
	ISO 228/1	1.766	44.85	11W	35-41
1 5/8	UN	1.582 to 1.535	40.18 to 38.99	12, 20U	29-34
1 11/16	UN	1.615 to 1.59	41.02 to 40.56	12U	29-34
1 3/4	ISO 228/1	2.000	50.79	11W	35-41
1 7/8	UN	1.803 to 1.785	45.80 to 45.35	12U	29-34
2	UN	1.928 to 1.910	48.97 to 48.51	12U	29-34
	ISO 228/1	2.231	56.66	11W	35-41
	NPSM	2.264	57.51	11.5U	49
2 1/2	UN	2.428 to 2.410	61.67 to 61.21	12U	29-34
Metric					
8	Metric	0.286	7.98	1.0M	42-48
10		0.356	9.04	1.0M	42-48
12		0.430	10.92	1.5M	42-48
		0.444	11.27	1.0M	42-48
14		0.509	12.92	1.5M	42-48

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 Labeling on each Swagelok pitch gauge form
 (continued on next page)

S Straight—Female

Nominal Thread Size	Designation	Nominal Female Thread Diameter		Pitch ^①	Page No.
		in.	mm		
Metric					
16	Metric	0.587	14.92	1.5M	42-48
18		0.666	16.92	1.5M	42-48
20		0.745	18.92	1.5M	42-48
22		0.824	20.92	1.5M	42-48
24		0.887	22.53	1.5M	42-48
26		0.966	24.53	1.5M	42-48
27		1.005	25.53	1.5M	42-48
		1.007	25.58	2.0M	42-48
30		1.125	28.58	2.0M	42-48
		1.139	28.92	1.5M	42-48
33		1.241	31.53	1.5M	42-48
		1.243	31.58	2.0M	42-48
36		1.359	34.53	1.5M	42-48
		1.361	34.58	2.0M	42-48
38		1.438	36.53	1.5M	42-48
39		1.477	37.53	1.5M	42-48
		1.479	37.58	2.0M	42-48
42		1.596	40.53	1.5M	42-48
		1.598	40.58	2.0M	42-48
45		1.694	43.02	2.0M	42-48
		1.729	43.92	1.5M	42-48
48		1.832	46.53	1.5M	42-48
		1.834	46.57	2.0M	42-48
50		1.891	48.02	2.0M	42-48
52		1.969	50.02	2.0M	42-48
		1.989	50.23	1.5M	42-48
56		2.149	54.57	2.0M	42-48
60		2.284	58.02	2.0M	42-48

① U = Unified W = Whitworth M = Metric
Labeling on each Swagelok pitch gauge form

Tapered Threads

The following characteristics and information should be considered when using tapered threads:

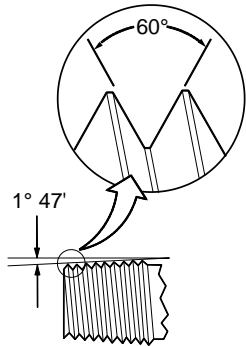
- The seal is designed to take place between the tapered threads.
- Tapered pipe threads always need a sealant to seal system fluids and reduce the potential for galling of the threads.
- Products such as Swagelok PTFE tape, SWAK[®], anaerobic pipe thread sealant with PTFE, and PTFE Free SWAK perform both the lubricating and sealing functions. If the two pieces of metal are forced against each other without lubrication, galling is possible.
- After following the sealant and lubricant application instructions, the amount of tightening is discretionary. There is no standard for torque or number of turns.

NPT

(also known as
ANSI/ASME B1.20.1)

Characteristics

- Tapered thread ($1^{\circ} 47'$)
- Truncation of roots and crests are flat
- 60° thread angle
- Pitch is measured in threads per inch

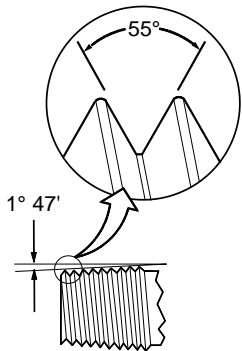


ISO 7/1

(also known as BS 21,
DIN 2999, and JIS B0203)

Characteristics

- Tapered thread ($1^{\circ} 47'$)
- Truncation of roots and crests are rounded
- 55° thread angle
- Pitch is measured in threads per inch



End Connections That Use Tapered Threads

- **NPT**
- **NPT with O-Seal**
- **BSPT**

Nominal Size in.	Thread Size-Pitch		
	NPT	NPT with O-Seal	ISO 7/1
1/16	1/16-27	1/16-27	1/16-28
1/8	1/8-27	1/8-27	1/8-28
1/4	1/4-18	1/4-18	1/4-19
3/8	3/8-18	3/8-18	3/8-19
1/2	1/2-14	1/2-14	1/2-14
3/4	3/4-14	3/4-14	3/4-14
1	1-11.5	1-11.5	1-11
1 1/4	1 1/4-11.5	1 1/4-11.5	1 1/4-11
1 1/2	1 1/2-11.5	1 1/2-11.5	1 1/2-11
2	2-11.5	2-11.5	2-11

NOTE: 1/2 and 3/4 in. BSPT and NPT threads can be difficult to identify because they are very close in design. Positive identification may not be possible without the use of an optical comparator. Contact your authorized Swagelok representative for additional information.

End Connections That Use Tapered Threads



Seal Location	Applicable Standards	
	Fittings	Thread
On threads (sealant required)	NPT	ANSI/ASME B1.20.1

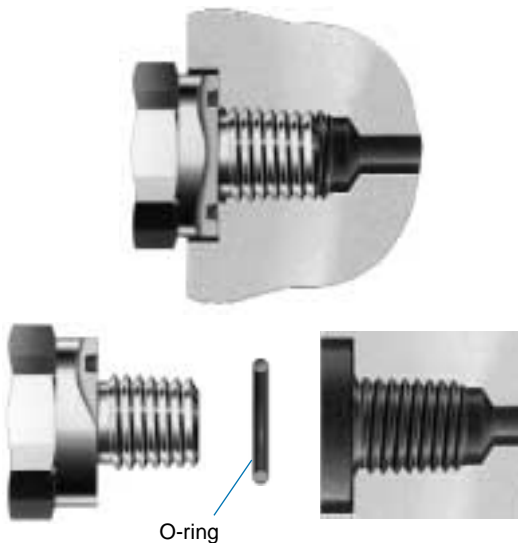
Male: The male end has a 1° 47' tapered thread with a 60° thread angle.

Female: The female end has a 1° 47' tapered thread with a 60° thread angle.

Seal: The seal is designed to take place on the tapered thread.

End Connections That Use Tapered Threads

NPT with O-Seal



TAPERED

Seal Location	Applicable Standards	
	Fittings	Thread
O-Ring Compression	None	ANSI/ASME B1.20.1

Male: The male end has an undersized NPT thread and an O-ring groove on the shoulder of the hex.

Female: The female end has an NPT thread and a smooth, flat surface.

Seal: The seal takes place by compressing the O-ring against the face of the female component.

End Connections That Use Tapered Threads

BSPT

JIS PT

DIN 3852 Part 2, Type C



Seal Location	Applicable Standards	
	Fittings	Thread
On Threads (Sealant Required)	JIS B8363 BS 5200 DIN 3852 Part 2	ISO 7/1

Male: The male end has a 1° 47' tapered thread with a 55° thread angle.

Female: The female end has a 1° 47' tapered thread with a 55° thread angle.

Seal: The seal is designed to take place on the tapered thread.

Straight Threads

Worldwide, there are many end connections available with straight threads. Each end connection, however, will generally have threads that are one of the three most common: ANSI B1.1 (unified screw thread), ISO 228/1, or ISO 261 straight threads.

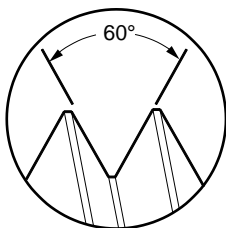
Because the threads of the mating fittings are parallel to each other, there is no interference between the flanks, crests, and roots. Consequently, the seal must be made with a gasket, O-ring, or some metal-to-metal contact. A sealant is not required or recommended on straight threads. Depending on the application and materials, thread lubricant may be used.

Unified Screw Thread

(also known as ANSI/ASME B1.1)

Characteristics

- Straight thread
- Truncation of roots and crests are flat
- 60° flank angle
- Diameter and pitch measured in inches



Thread Series

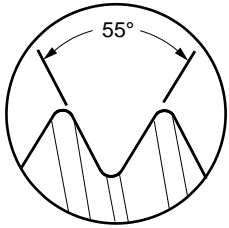
- UN: Male and female screw thread
- UNR: Male screw thread only (more rounded crest)
- UNC/UNRC: Coarse thread series
- UNF/UNRF: Fine thread series
- UNEF/UNREF: Extra fine thread series
- UNS/UNRS: Selected special combinations of diameters, pitches, and lengths of engagement.

ISO 228/1

(also known as BSPP, JIS B0202)

Characteristics

- Straight thread
- Truncation of roots and crests are rounded
- 55° flank angle
- Threads are measured in inches

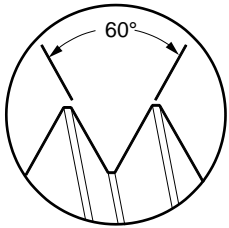


Metric

(also known as ISO 261, JIS B0205, ANSI B1.13M)

Characteristics

- Straight thread
- Truncation of roots and crests are flat
- 60° flank angle
- Threads are measured in millimeters

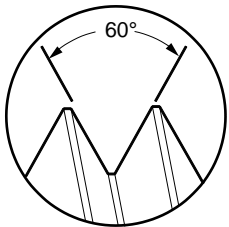


NPSM

(also known as ANSI B1.20.1)

Characteristics

- Straight thread
- Truncation of roots and crests are flat
- 60° flank angle
- Threads are measured in inches



End Connections That Use Unified Screw Threads

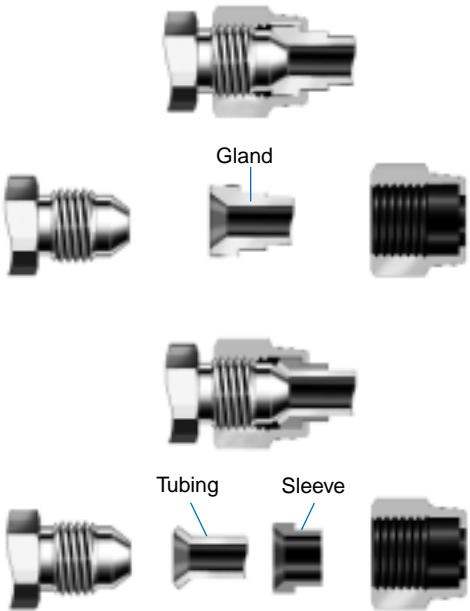
- **SAE 37° (JIC)**
- **SAE Straight Thread O-Ring Boss**
- **Straight Thread O-Seal**
- **SAE 45°**
- **SAE J1453 O-Ring Face Seal**
- **ISO 8434-3**
- **SAE 42° Inverted Flare**

SAE (Society of Automotive Engineers) Fitting Types

Nominal Size in.	Thread Size-Pitch					
	37°	O-Ring Boss	O-Seal	45°	J1453	Inverted 42° Flare
1/8	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	7/16-20	7/16-20	7/16-20	7/16-20	9/16-18	7/16-24
5/16	1/2-20	1/2-20	1/2-20	1/2-20	—	1/2-20
3/8	9/16-18	9/16-18	9/16-18	5/8-18	11/16-16	5/8-18
7/16	—	—	—	11/16-16	—	11/16-16
1/2	3/4-16	3/4-16	3/4-16	3/4-16	13/16-16	3/4-16
5/8	7/8-14	7/8-14	7/8-14	7/8-14	1-14	7/8-14
3/4	1 1/16-12	1 1/16-12	1 1/16-12	1 1/16-14	1 3/16-12	1 1/16-1
7/8	1 3/16-12	1 3/16-12	1 3/16-12	1 1/4-12	—	1 1/4-12
1	1 5/16-12	1 5/16-12	1 5/16-12	—	1 7/16-12	—
1 1/4	1 5/8-12	1 5/8-12	1 5/8-12	—	1 11/16-12	—
1 1/2	1 7/8-12	1 7/8-12	1 7/8-12	—	2-12	—
2	2 1/2-12	2 1/2-12	2 1/2-12	—	—	—

End Connections That Use Unified Screw Threads

SAE 37° (JIC)



Seal Location	Applicable Standards	
	Fittings	Thread
Mating 37° Flared Surfaces	SAE J514	ANSI/ASME B1.1

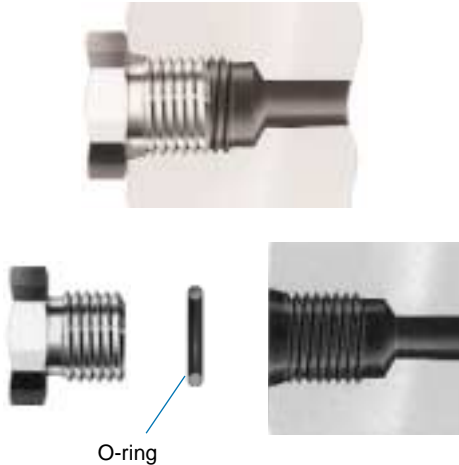
Male: The male end has a straight thread and a 37° cone taper.

Female: The female end has a straight thread and a nut captured on tubing with a mating 37° flare or a 37° tapered gland.

Seal: The seal takes place between the male taper and the ID of the tapered gland or flared tubing.

End Connections That Use Unified Screw Threads

SAE Straight Thread O-Ring Boss



Seal Location	Applicable Standards	
	Fittings	Thread
O-Ring Compression	SAE J1926 ISO 11926	ANSI/ASME B1.20.1

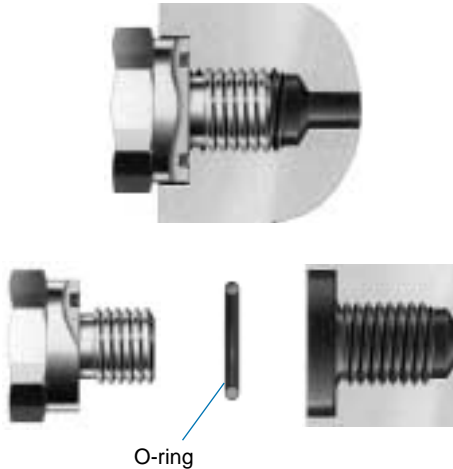
Male: The male end has a straight thread and an O-ring.

Female: The female end has a straight thread and a taper to accept the O-ring.

Seal: The seal takes place by compressing the O-ring into the taper.

End Connections That Use Unified Screw Threads

Straight Thread O-Seal

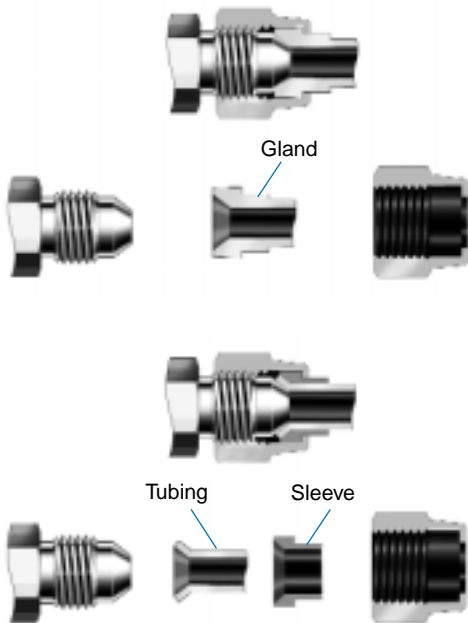


Seal Location	Applicable Standards	
	Fittings	Thread
O-Ring Compression	None	ANSI/ASME B1.1

- Male:** The male end has a straight thread and an O-ring groove on the shoulder of the hex.
- Female:** The female end has a straight thread and a smooth, flat surface.
- Seal:** The seal takes place by compressing the O-ring against the face of the female component.

End Connections That Use Unified Screw Threads

SAE 45°



Seal Location	Applicable Standards	
	Fittings	Thread
Mating 45° Flared Surface	SAE J512 SAE J513	ANSI/ASME B1.1

Male: The male end has a straight thread and a 45° cone taper.

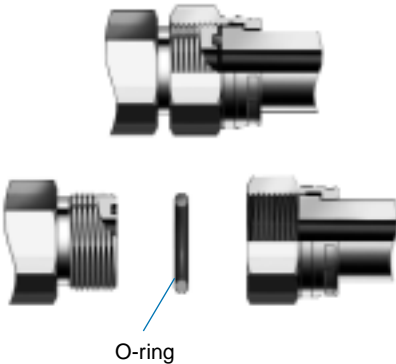
Female: The female end has a straight thread and a nut captured on tubing with a mating 45° flare or a 45° tapered gland.

Seal: The seal takes place between the male taper and the ID of the tapered gland or flared tubing.

End Connections That Use Unified Screw Threads

SAE J1453 O-Ring Face Seal

ISO 8434-3



Seal Location	Applicable Standards	
	Fittings	Thread
O-Ring Compression Face of Fitting	SAE J1453 ISO 8434-3	ANSI/ASME B1.1

Male: The male end has a straight thread and an O-ring in a groove on the face of the fitting.

Female: The female end has a straight thread. A gland with a flat face is held against the body by a female nut that threads onto the body.

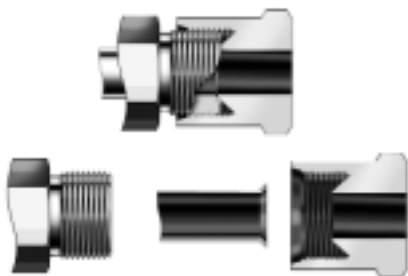
Seal: The seal takes place by compressing the O-ring between the faces of the fitting.

End Connections That Use Unified Screw Threads

SAE 42° Inverted Flare



Without Flared Tubing



With Flared Tubing

Seal Location	Applicable Standards	
	Fittings	Thread
Mating Angled and Flared Surfaces	SAE J512	ANSI/ASME B1.1

Male: The male end has a straight thread and can have either a 42° or 45° taper.

Female: The female end has a straight thread and a 42° inverted flare seat or gland.

Seal: The seal takes place between the taper in the male fitting and flared tubing or directly on the inverted flare seat.

End Connections That Use ISO 228/1 Threads

- **BSPP (British Standard Pipe Parallel)
JIS Parallel Pipe**
- **JIS 30° Flare**
- **DIN EN 837-1 and EN 837-3, Type B**
- **DIN 3852 Part 2, Type A**
- **DIN 3852 Part 2, Type B**
- **BS 5380: 1984 (British Standard)**

Nominal Size in.	Thread Size-Pitch, in.					
	BSPP ^①	JIS 30° Flare	DIN 16 288 Type B	DIN 3852 Part 2, Type A	DIN 3852 Part 2, Type B	BS 5380: 1984
1/16	—	—	—	—	1/16-28	—
1/8	1/8-28	—	1/8-28	1/8-28	1/8-28	1/8-28
1/4	1/4-19	1/4-19	1/4-19	1/4-19	1/4-19	1/4-19
3/8	3/8-19	3/8-19	—	3/8-19	3/8-19	3/8-19
1/2	1/2-14	1/2-14	1/2-14	1/2-14	1/2-14	1/2-14
5/8	5/8-14	—	—	5/8-14	5/8-14	5/8-14
3/4	3/4-14	3/4-14	—	3/4-14	3/4-14	3/4-14
7/8	—	—	—	7/8-14	7/8-14	—
1	1-11	1-11	—	1-11	1-11	1-11
1 1/8	—	—	—	1 1/8-11	1 1/8-11	—
1 1/4	1 1/4-11	1 1/4-11	—	1 1/4-11	1 1/4-11	1 1/4-11
1 1/2	1 1/2-11	1 1/2-11	—	1 1/2-11	1 1/2-11	1 1/2-11
1 3/4	—	—	—	1 3/4-11	1 3/4-11	—
2	2-11	2-11	—	2-11	2-11	2-11

① Also known as JIS Parallel Pipe.

End Connections That Use ISO 228/1 Threads

BSPP
(British Standard Pipe Parallel)

JIS Parallel Pipe



Seal Location	Applicable Standards	
	Fittings	Thread
Mating 30° Angled Surfaces or O-Ring Compression	BS 5200 JIS B8363	ISO 228/1

NOTE: BSPP and JIS parallel pipe fittings are identical in design, appearance, and dimensions.

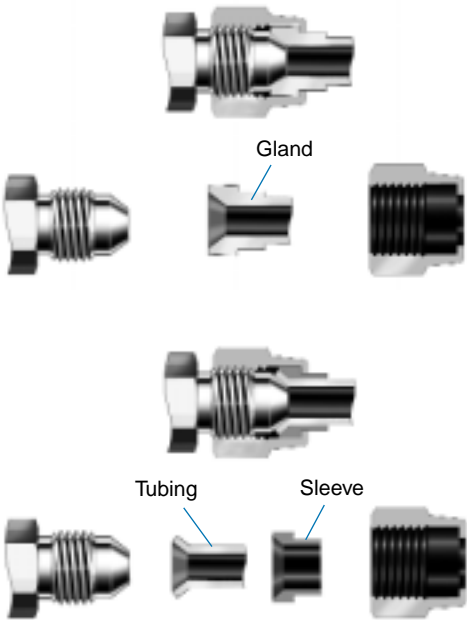
Male: The male end has a straight thread and a 30° taper.

Female: The female end is a nut with a straight thread captured on a 30° cone tapered gland.

Seal: The seal takes place between the taper in the male fitting and the 30° cone tapered gland.

End Connections That Use ISO 228/1 Threads

JIS 30° Flare



Seal Location	Applicable Standards	
	Fittings	Thread
Mating 30° Angled or Flared Surfaces	JIS B8363	ISO 228/1

Male: The male end has a straight thread and a 30° cone taper.

Female: The female end has a straight thread and a nut captured on tubing with a mating 30° flare or a 30° tapered gland.

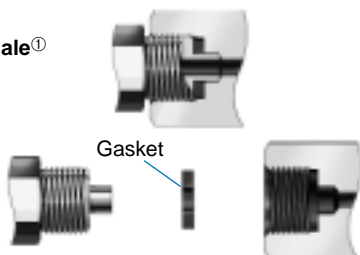
Seal: The seal takes place between the male taper and the ID of the tapered gland or flared tubing.

End Connections That Use ISO 228/1 Threads

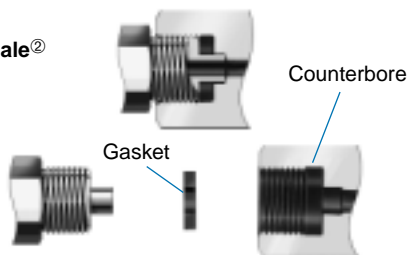
DIN EN 837-1 AND EN 837-3, Type B

JIS B0202

Female^①



Female^②



Seal Location	Applicable Standards	
	Fittings	Thread
Gasket Compression	DIN 16 288	ISO 228/1 JIS B0202

Male: The male fitting has a straight thread and a spigot which fits through the ID of the gasket.

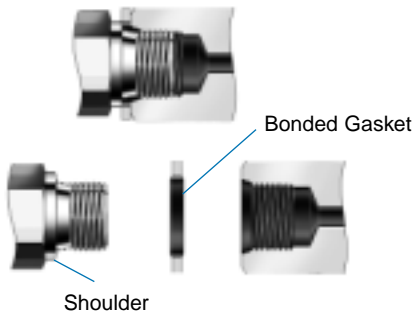
① Female: The female has a straight thread and a counterbore in the ID of the fitting to accept a gasket.

② Female: The female has a straight thread and a counterbore in the ID of the fitting to accept a gasket. The counterbore is larger to help ensure the male end compresses the gasket into a sealing position.

Seal: The seal takes place by compressing a gasket between the male and female fittings.

End Connections That Use ISO 228/1 Threads

DIN 3852 Part 2, Type A



Seal Location	Applicable Standards	
	Fittings	Thread
Gasket Compression	DIN 3852 Part 2	ISO 228/1

Male: The male end has a straight thread and a straight shoulder.

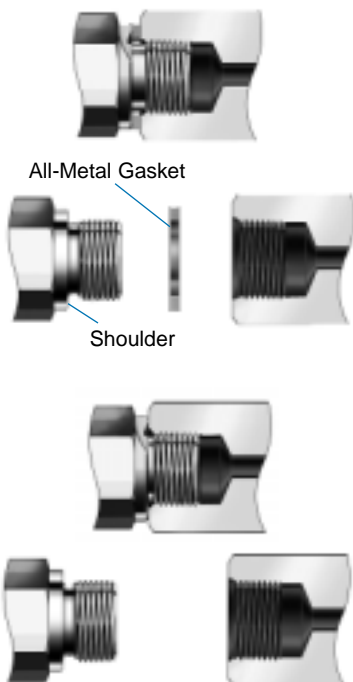
Female: The female end has a straight thread and a flat, smooth surface.

Seal: The seal takes place by compressing a gasket between the straight shoulder and the flat, smooth surface.

Gasket: This gasket could be either all metal or metal with a bonded elastomer on the ID.

End Connections That Use ISO 228/1 Threads

DIN 3852 Part 2, Type B

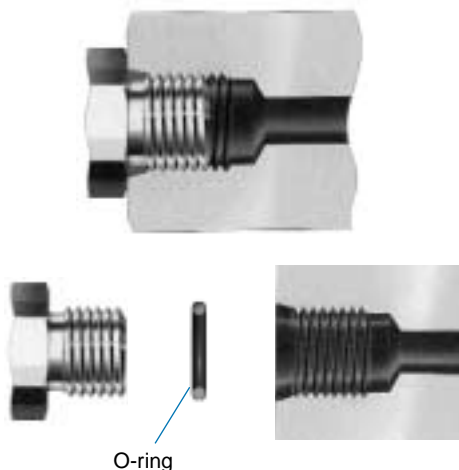


Seal Location	Applicable Standards	
	Fittings	Thread
Gasket Metal-to-Metal	DIN 3852 Part 2	ISO 228/1

- Male:** The male end has a straight thread and an angled shoulder.
- Female:** The female end has a straight thread and a flat, smooth surface.
- Seal:** The seal takes place by compressing a gasket between the angled shoulder and the flat, smooth surface.
- Gasket:** Use of a metal gasket is suggested.

End Connections That Use ISO 228/1 Threads

BS 5380: 1984 (British Standard)



Seal Location	Applicable Standards	
	Fittings	Thread
O-Ring Compression	BS 5380: 1984	ISO 228/1

Male: The male end has a straight thread and an O-ring.

Female: The female end has a straight thread and a taper to accept the O-ring.

Seal: The seal takes place by compressing the O-ring into the taper.

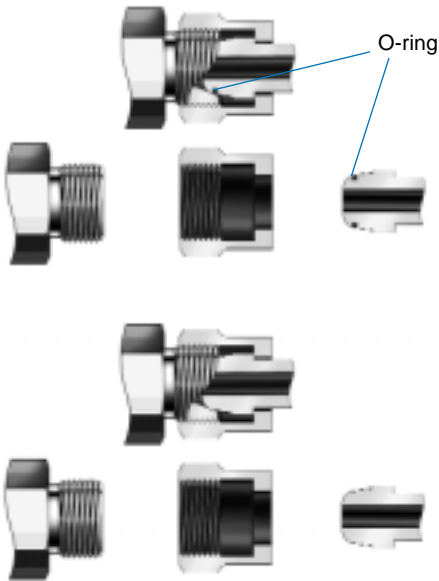
End Connections That Use Metric (ISO 261) Threads

- **DIN 7631**
- **JIS Parallel Pipe Metric**
- **DIN EN 837-1 and EN 837-3, Type B**
- **DIN 3852 Part 1, Type A**
- **DIN 3852 Part 1, Type B**
- **ISO 6149-1, ISO 6149-2, and ISO 6149-3**

Nominal Size mm	Thread Size-Pitch					
	DIN 7631	JIS Parallel Pipe Metric	DIN 16 288 Type B	DIN 3852 Part 1 Type A	DIN 3852 Part 1 Type B	DIN 3852 Part 3
M8	—	—	—	M8 × 1	M8 × 1	M8 × 1
M10	M10 × 1	—	M10 × 1	M10 × 1	M10 × 1	M10 × 1
M12	M12 × 1.5	—	M12 × 1.5	M12 × 1.5	M12 × 1.5	M12 × 1.5
M14	M14 × 1.5	M14 × 1.5	—	M14 × 1.5	M14 × 1.5	M14 × 1.5
M16	M16 × 1.5	—	—	M16 × 1.5	M16 × 1.5	M16 × 1.5
M18	M18 × 1.5	M18 × 1.5	—	M18 × 1.5	M18 × 1.5	M18 × 1.5
M20	—	—	M20 × 1.5	M20 × 1.5	M20 × 1.5	M20 × 1.5
M22	M22 × 1.5	M22 × 1.5	—	M22 × 1.5	M22 × 1.5	M22 × 1.5
M24	—	—	—	M24 × 1.5	M24 × 1.5	—
M26	M26 × 1.5	—	—	M26 × 1.5	M26 × 1.5	M26 × 1.5
M27	—	M27 × 2.0	—	M27 × 2.0	M27 × 2.0	M27 × 2.0
M30	M30 × 1.5	—	—	M30 × 1.5	M30 × 1.5	—
	—	—	—	M30 × 2.0	M30 × 2.0	—
M33	—	M33 × 2.0	—	M30 × 2.0	M30 × 2.0	M30 × 2.0
M36	—	—	—	M36 × 1.5	M36 × 1.5	—
	—	—	—	M36 × 2.0	M36 × 2.0	—
M38	M38 × 1.5	—	—	M38 × 1.5	M38 × 1.5	—
M39	—	—	—	M39 × 1.5	M39 × 1.5	—
M42	—	M42 × 1.5	—	M42 × 2.0	M42 × 2.0	M42 × 2.0
	—	—	—	M42 × 2.0	M42 × 2.0	—
M45	M45 × 2.0	—	—	M45 × 1.5	M45 × 1.5	—
	—	—	—	M45 × 2.0	M45 × 2.0	—
M48	—	—	—	M48 × 1.5	M48 × 1.5	M48 × 2.0
	—	—	—	M48 × 2.0	M48 × 2.0	—
M50	—	M50 × 2.0	—	—	—	M50 × 2.0
M52	M52 × 1.5	—	—	M52 × 1.5	M52 × 1.5	—
	—	—	—	M52 × 2.0	M52 × 2.0	—
M56	—	—	—	M56 × 2.0	M56 × 2.0	—
M60	—	M60 × 2.0	—	M60 × 2.0	M60 × 2.0	M60 × 2.0

End Connections That Use Metric (ISO 261) Threads

DIN 7631



Seal Location	Applicable Standards	
	Fittings	Thread
Globe Seal Nose Tapered Angle	DIN 7631	Metric (ISO 261)

Male: The male end has a straight thread and a 30° taper.

Female: The female end is a nut with a straight thread captured on a globe seal nose gland. The globe seal nose may contain an O-ring.

Seal: The seal takes place between the taper in the male fitting and the globe seal nose.

End Connections That Use Metric (ISO 261) Threads

JIS Parallel Pipe Metric



Seal Location	Applicable Standards	
	Fittings	Thread
Mating 30° Angled Surfaces	JIS B8363	Metric (ISO 261)

Male: The male end has a straight thread and a 30° taper.

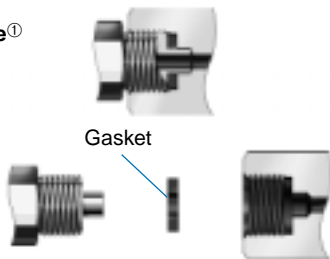
Female: The female end is a nut with a straight thread captured on a 30° cone tapered gland.

Seal: The seal takes place between the taper in the male fitting and the 30° cone tapered gland.

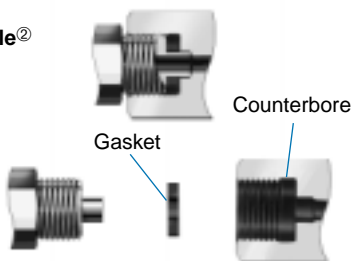
End Connections That Use Metric (ISO 261) Threads

DIN EN 837-1 and EN 837-3, Type B

Female^①



Female^②

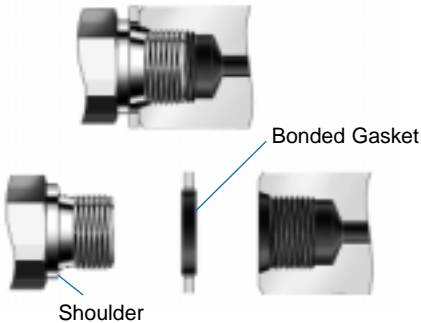


Seal Location	Applicable Standards	
	Fittings	Thread
Gasket Compression	DIN EN 837-1 and EN 837-3	ISO 261

- Male:** The male fitting has a straight thread and a spigot which fits through the ID of the gasket.
- ① Female:** The female has a straight thread and a counterbore in the ID of the fitting to accept a gasket.
- ② Female:** The female has a straight thread and a counterbore in the ID of the fitting to accept a gasket. The counterbore is larger to help ensure the male end compresses the gasket into a sealing position.
- Seal:** The seal takes place by compressing a gasket between the male and female fittings.

End Connections That Use Metric (ISO 261) Threads

DIN 3852 Part 1, Type A



Seal Location	Applicable Standards	
	Fittings	Thread
Gasket Compression	DIN 3852 Part 1	Metric (ISO 261)

Male: The male end has a straight thread and a straight shoulder.

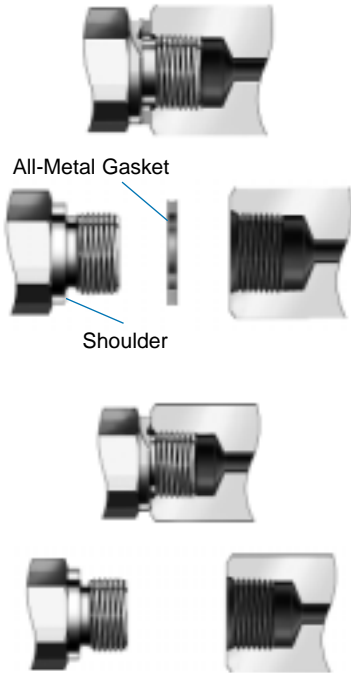
Female: The female end has a straight thread and a flat, smooth surface.

Seal: The seal takes place by compressing a gasket between the straight shoulder and the flat, smooth surface.

Gasket: This gasket could be either all metal or metal with a bonded elastomer on the ID.

End Connections That Use Metric (ISO 261) Threads

DIN 3852 Part 1, Type B

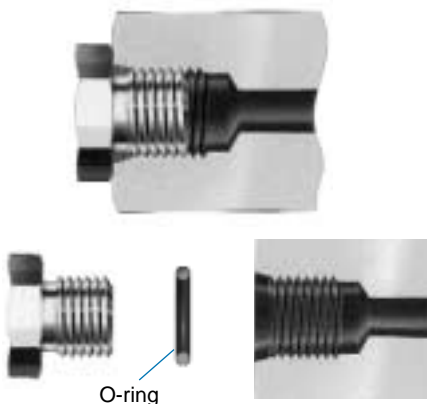


Seal Location	Applicable Standards	
	Fittings	Thread
Gasket Metal-to-Metal	DIN 3852 Part 1	Metric (ISO 261)

- Male:** The male end has a straight thread and an angled shoulder.
- Female:** The female end has a straight thread and a flat, smooth surface.
- Seal:** The seal takes place by compressing a gasket between the angled shoulder and the flat, smooth surface.
- Gasket:** Use of a metal gasket is suggested.

End Connections That Use Metric (ISO 261) Threads

ISO 6149-1, ISO 6149-2, AND ISO 6149-3



Seal Location	Applicable Standards	
	Fittings	Thread
O-Ring Compression	DIN 3852 Part 3 ISO 6149-1	Metric (ISO 261)

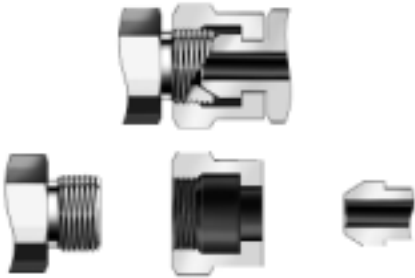
Male: The male end has a straight thread and an O-ring.

Female: The female end has a straight thread and a taper to accept the O-ring.

Seal: The seal takes place by compressing the O-ring into the taper.

End Connections That Use NPSM Threads

NPSM



Applicable Standards	
Fittings	Thread
NPSM	ANSI/ASME B1.20.1

Nominal Size, in.	NPSM Thread Size-Pitch
1/8	1/8-27
1/4	1/4-18
3/8	3/8-18
1/2	1/2-14
3/4	3/4-14
1	1-11.5
1 1/4	1 1/4-11.5
1 1/2	1 1/2-11.5
2	2-11.5

Male: The male end has a straight thread and a 30° taper.

Female: The female end is a nut with a straight thread captured on a 30° cone tapered gland.

Seal: The seal takes place between the taper in the male fitting and the 30° cone tapered gland.

End Connection to Thread Matrix

End Connection	Page	Thread Standard	Page
BSP (British Pipe Standard)			
BSPP (5200)	36	ISO 228/1	27
BSPT (5200)	25	ISO 7/1	21
BS 5380: 1984	41	ISO 228/1	27
DIN (Deutsches Institut für Normung e.V.)			
DIN EN 837-1 and EN 837-3, Type B	41	ISO 228/1	27
DIN EN 837-1 and EN 837-3, Type B	38	Metric (ISO 261)	45
DIN 3852 Part 1, Type A	46	Metric (ISO 261)	27
DIN 3852 Part 1, Type B	47	Metric (ISO 261)	
DIN 3852 Part 2, Type A	39	ISO 228/1	
DIN 3852 Part 2, Type B	40	ISO 228/1	
DIN 3852 Part 2, Type C	25	ISO 7/1	21
ISO 6149-1, ISO 6149-2, and ISO 6149-3	48	Metric (ISO 261)	27
DIN 7631	43	Metric (ISO 261)	
JIS (Japanese Industrial Standard)			
JIS 30° Flare (B8363)	37	ISO 228/1	27
JIS Parallel Pipe (B8363)	36	ISO 228/1	
JIS Parallel (Metric) (B8363)	44	Metric (ISO 261)	
JIS PT (B8363)	25	ISO 7/1	
NPSM (National Pipe Straight Mechanical)			
NPSM	49	ANSI/ASME B1.20.1	27
NPT (National Pipe Taper)			
NPT	23	ANSI/ASME B1.20.1	21
SAE (Society of Automotive Engineers)			
SAE J1453 O-ring Face Seal	33	ANSI/ASME B1.1	26
SAE 37° (JIC) (J514)	29		
SAE 42° Inverted Flare (J512)	34		
SAE 45° (J512, J513)	32		
SAE Straight Thread O-Ring Boss (J1926)	30		

Thread to End Connection Matrix

End Connection	Page	Thread Standard	Page
ISO 7/1			
BS (21)	21	BSPT (5200)	25
DIN 2999		DIN 3852 Part 2, Type C	
JIS B0203		JIS PT (B8363)	
ISO 228/1			
ISO 228/1	27	BSP (5200)	36
		DIN EN 837-1 and EN 837-3, Type B	38
		DIN 3852 Part 2, Type A	39
		DIN 3852 Part 2, Type B	40
JIS B0202	27	JIS 30° Flare (B8363)	37
		JIS Parallel Pipe (B8363)	36
Metric			
ISO 261	27	DIN 16 288, Type B	45
		DIN 3852 Part 1, Type A	46
		DIN 3852 Part 1, Type B	47
ANSI/ASME B1.13M		DIN 3852 Part 1	48
JIS B0205		27	DIN 7631
	JIS Parallel Pipe Metric (B8363)		44
ANSI/ASME B1.20.1			
ANSI/ASME B1.20.1	27	NPSM	49
	21	NPT	23
Unified Screw Thread ANSI/ASME B1.1			
ANSI/ASME B1.1	26	SAE J1453 O-Ring Face Seal	33
		SAE 37° (JIC) (J514)	29
		SAE 42° Inverted Flare (J512)	34
		SAE 45° (J512, J513)	32
		SAE Straight Thread O-Ring Boss (J1926)	30

Thread Identification Tools

Caliper

A caliper is used to determine the thread diameter. (Calibration of calipers is the responsibility of the end user.)



Combination Seat and Pitch Gauge

Seat and pitch gauges are conveniently combined into one tool.

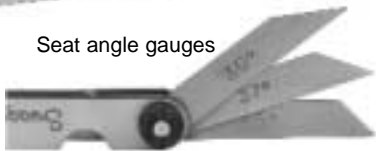
The seat gauge is used to determine end connection seat angles of 45° , 37° , and 30° .

The pitch gauge is used to identify the thread pitch. Note that a pitch gauge may be Unified (threads per inch), Whitworth (threads per inch), or metric (millimeters per thread) as marked on the back of each gauge form.

Thread pitch gauges



Seat angle gauges



Glossary

ANSI/ASME	B1.1. See <i>Unified Screw Threads</i> . B1.20.1. See <i>NPT</i> . B1.13M. See <i>ISO 261</i> .
BSPP	British Standard Pipe Parallel per ISO 228/1.
BSPT	British Standard Pipe Tapered per BS 21. See <i>ISO 7/1</i> .
DIN 2999	Deutsche Institut für Normung e.V. 2999 (male thread only). See <i>ISO 7/1</i> .
DIN	Deutsche Institut für Normung e.V.
ISO 228/1	International Standards Organization Specification 228/1, straight threads, reference specification: BSPP, DIN 259, JIS B0202.
ISO 261	International Standards Organization Specification 261, straight threads, metric measurements, often referred to as the “pure metric straight” fitting, JIS B0205.
ISO 7/1	International Standards Organization Specification 7/1, tapered threads, imperial measurements, reference specifications: BSPT (BS 21), DIN 2999 (male thread only), JIS B0203.
JIS	Japanese Industrial Standard.
JIS B0202	Japanese Industrial Standard B0202. See <i>ISO 228/1</i> .
JIS B0203	Japanese Industrial Standard B0203. See <i>ISO 7/1</i> .
JIS B0205	Japanese Industrial Standard B0207. See <i>ISO 261</i> .
Metric	See <i>ISO 261</i> .
Metric Straight	See <i>ISO 261</i> .
NPT	National Pipe Tapered.

Pitch	For the purposes of this guide, pitch refers to threads per inch, instead of the distance between the threads, for fractional screw threads and pipe threads. For all metric screw threads, pitch refers to the distance between adjacent threads.
SAE	Society of Automotive Engineers.
UN	Unified Constant-Pitch Thread Series.
UNC/UNRC	Unified Coarse Thread Series.
UNEF/UNREF	Unified Extra-Fine Thread Series.
UNF/UNRF	Unified Fine Thread Series.
UNR	Male Screw Thread only.
UNS/UNRS	Selected special combinations of diameter, pitch, and length of engagement.
Unified	<i>See ANSI B1.1 and ANSI B1.20.1.</i>
Whitworth	<i>See ISO 228/1 and ISO 7/1.</i>

Safe Product Selection

When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user. The complete catalog contents must be reviewed to ensure that the system designer and user make a safe product selection.