

Finding the Right Thread Type

The increasing demand for hydraulic and pneumatic equipment has resulted in numerous fittings and connectors worldwide. This has resulted in a variety of threads making the task of identifying the right thread type difficult.

Pipe threads are the most common to people involved in fluid and pneumatic industry. For identification purposes tube fittings and threaded connectors can be divided into four different thread types:

- **UN/NF**
- **NPT/NPTF**
- **BSPP/BSPT(tapered)**
- **Metric parallel/Metric tapered**

Pipe threads can be broadly classified as:

- **Joining threads** These joints are made pressure tight by sealing the threads. The threads are tapered externally and are tapered parallel. They may also taper internal threads.
- **Fastening threads** Here both threads are parallel and sealing is performed by compression of a soft material on to a flat gasket.

Taper vs. Parallel thread

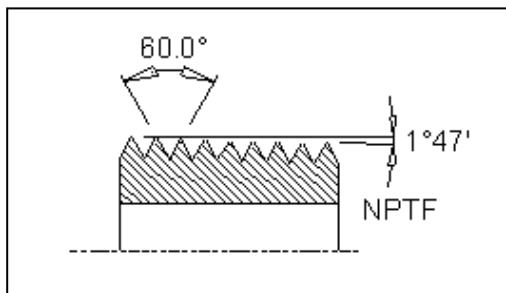
Most of the pneumatic fittings are based on Taper threads. The main advantage of using Taper threads is the self sealing of threads. Because of taper a pipe thread can only screw into a fitting a certain distance before it jams. The standard calls the distance as effective length of engagement. A simple rule of thumb is finger tight plus two turns with a wrench. A parallel thread will have some means of sealing at the top of the thread, either by O-ring, gasket, metal seal, or possibly by a machined ring in the hex itself.

Most widely used taper thread is NPT thread type. It has taper of $1/16''$ or $3/4''$ for an overall length of $1''$ or 1 foot respectively. The NPT threads can be external (Male) or internal (Female). The external threads are usually designated as MPT and internal as FPT.

When joining NPT tapered pipe thread to make a leak-proof seal, professionals recommend using a sealer such as polytetrafluoroethylene (PTFE) pipe thread tape. PTFE, more commonly known as Teflon®, is also the name of the best known brand of sealing tape. Sealing tape makes it easy to drive the male pipe deeper by allowing the threads to slip past one another, while filling minute gaps to prevent seepage. Pipe thread tape also makes it easier to disassemble the joint later, if need be, by reducing thread galling, or the tendency of some types of pipe threads to stick together over time.

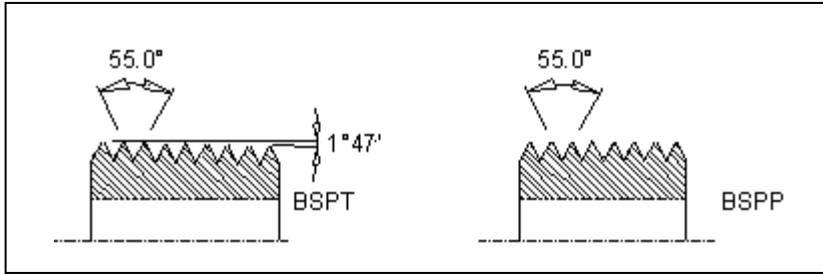
Despite the various available standards Taper Pipe threads are inexact and are susceptible to leakage during the course of use. The area where the crest and the root of the thread meet can form spiral leak path.

A number of variations of the NPT threads have been introduced to overcome the problem of spiral leakage and are known as Dry-seal threads. The most common is NPTF. The design ensures that the crest displaces or crushes material into the root of the mating thread thus providing effective sealing.



British Standard Pipe Thread

Two of the more popular thread forms used in the world today is the British Standard Pipe Tapered (BSPT) and the British Standard Parallel Pipe (BSPP). Both of these thread forms have a 55° thread flank angle as shown below. BSPT has a taper of 1 inch for an overall length of 16 inches equivalent to 1° 47' as shown below.



British Pipe threads have similar sizes as American Pipe threads BSP but they are not interchangeable due to different flank angle except at ½" and ¾" where both have same pitch.

How to identify a correct thread type

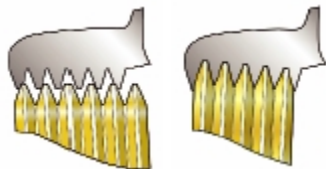
The thread identification process can be greatly simplified using the following 4-step processes:

1. **Check if the thread is taper or parallel:** Taper thread diameter reduces as we move from one end to other while parallel threads maintain the same diameter.



Note: The threaded pipe is tapered and so the Caliper touches the Pipe at two points

2. **Determine Pitch:** Pitch is defined as number of threads per inch (TPI) Usually the pitch is measured using a Pitch gauge. To determine the correct pitch several gauges have to be used to ensure that the right gauge mate the required thread type.



3. **Determine Size:** The two methods for sizing threads are based on fact that the threads are either pipe or non-pipe. Pipe sizes do not refer to any physical dimensions. To determine the size of a pipe, the outside diameter of each pipe or fitting must be measured and compared to the table for size identification. Refer to the table at the end of the

article for Taper and Straight thread dimensions. Pipe threads are base on inside diameter ⁽¹⁾ (ID). For non pipe type threads the actual size is measured using the caliper.

4. **Designate the thread** This process is designating the thread type in standard format. For example a Pipe thread with a nominal inside diameter of ¼"having a defined pitch of 18 is designated as ¼" -18 NPT. The most common global pipe thread forms are

NPT	American Standard Pipe Taper Thread
NPSC	American Standard Coupling Pipe Thread
NPTR	American Standard Taper Railing Pipe Thread
NPSM	American Standard Straight Mechanical Pipe Thread
NPSL	American Standard Straight Locknut Pipe Thread
NPTF	American Standard Pipe Thread Tapered(Dry seal)
BSPP	British Standard Pipe Thread Parallel
BSPT	British Standard Pipe Thread Tapered

The British standard threads are usually designated by letter 'G'. A typical reference on a drawing might be "G1/2", for internal thread; "G1/2 A", for external thread, class A and "G 1/2 B", for external thread, class B. Where no class reference is stated for external threads that of class B will be assumed.

Nominal Dimensions of Standard Pipe Thread

ODM- Outside Dimater of Male		IDF-Inside Diameter of Female					TPI-Threads Per Inch					
Tapered Thread				Straight Threads								
		NPT	BSPT	NPSH			NPSM			BSPP		
Size (in)	Pipe O.D.	TPI	TPI	TPI	ODM (max)	IDF (min)	TPI	ODM (max)	IDF (min)	TPI	ODM (max)	IDF (min)
1/8	0.405	27	28				27	0.397	0.358	28	0.383	0.337
1/4	0.54	18	19				18	0.526	0.468	19	0.516	0.45
3/8	0.675	18	19				18	0.662	0.603	19	0.656	0.588
1/2	0.84	14	14	14	0.843	0.739	14	0.823	0.747	14	0.825	0.733
3/4	1.05	14	14	14	1.035	0.95	14	1.034	0.958	14	1.041	0.95
1	1.315	11.5	11	11.5	1.295	1.192	11.5	1.293	1.2	11	1.309	1.193
1 1/4	1.66	11.5	11	11.5	1.639	1.536	11.5	1.638	1.546	11	1.65	1.534
1 1/2	1.9	11.5	11	11.5	1.8788	1.7758	11.5	1.877	1.785		1.882	1.766

1) Nominal diameter: Nominal size is different than the actual size. It is a dimensionless number. The nominal is a theoretical size with no tolerances. In reality the actual diameter is never equal to nominal diameter. For example a 1/2" bolt when measured is usually less than 1/2".