PRESSURE PLUGS ■ Application Data

Pressure plugs are not pipe plugs. Pipe plugs (plumber's fittings) are limited to pressures of 600 psi, are sealed with a compound, and are made of cast iron with cut threads and protruding square drive.

Pressure plugs are made to closer tolerances, are generally of higher quality, and almost all have taper threads. Properly made and used, they will seal at pressures to 5000 psi and without a sealing compound (pressure tests are usually at 20,000 psi.) they are often used in hydraulic and pneumatic designs.

Performance Requirements

Pressure plugs used in industrial applications should:

- not leak at pressures to 5000 psi
- need no sealing compounds
- be reusable without seizure
- give a good seal when reused
- seal low viscosity fluids
- require minimum seating torque
- require minimum re-tooling or special tools.

For a satisfactory seal, the threads of the plug and those in the mating hole must not gall or seize up to maximum possible tightening torque. Galling and seizure are caused by metal pickup on the mating surfaces and are directly related to force on the surface, material hardness, lubrication used, and thread finish.

How Pressure Plugs Seal

Sealing is achieved by crushing the crest of one thread against the root of the mating thread. If too much of compressive force is required to torque the plug, it will tend to gall in the hole. Too little force will not deform the crest of threads enough to produce a seal. Increasing the hardness of the material will reduce galling but will also increase the required sealing force. Generally a hardness range of Rc 30 to 40 will meet most requirements. The tightening force must be low enough to cause no galling in this range.

Cost Considerations

Dryseal plugs are more frequently used, especially where reuse is frequent. Reason: more threads are engaged and they therefore resist leakage better. They are also preferred in soft metals to reduce of over-torquing.

TYPES OF PRESSURE PLUG THREADS

Three thread forms are commonly used for pipe plugs and pressure plugs:

NPT: National Pipe thread, Tapered. This is the thread form commonly used for commercial pipe and fittings for low pressure applications. A lubricant and sealer are generally used.

ANPT: Aeronautical National Pipe thread, Tapered. Covered by MIL-S-7105, this thread form was developed for aircraft use. It is basically the same as the NPT thread except that tolerances have been reduced about 50 percent. Plugs made with this thread should be used with lubricants and sealers. They are not to be used for hydraulic applications.

NPTF: National Pipe thread, Tapered, Fuel. This is the standard thread for pressure plugs. They make pressure-tight joints without a sealant. Tolerances are about 1/4 those for NPT threads. The standard which applies is ANSI B1.20.3. Applicable for fluid power applications.

APPLICATION DATA – DRYSEAL TYPE

nom. size	threads per inch	tap drill size+	tap drill size ++	recommended torque in.-lbs*
1/16	27	15/64	1/4	150
1/8	27	21/64	11/32	250
1/4	18	27/64	7/16	600
3/8	18	9/16	37/64	1200
1/2	14	11/16	23/32	1800
3/4	14	57/64	59/64	3000
1	11 1/2	1 1/8	1 5/32	4200
1 1/4	11 1/2	37.5mm	–	5400
1 1/2	11 1/2	43.5mm	–	6900
2	11 1/2	2 3/16	–	8500

Unbrako recommends using a tapered reamer with corresponding size tap drill (see page 27).

+With use of reamer (taper thread).

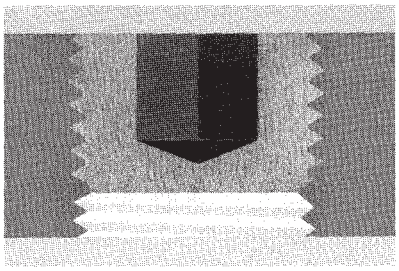
++Without use of tapered reamer.

*Recommended torques for alloy steel only. Multiply by .65 for stainless steel and .50 for brass.

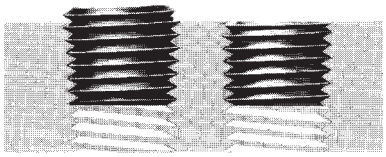
NPTF fully formed Dryseal threads achieve seal in tapped holes without need for sealing compounds.

PTFE/TEFLON-Coated LEVL-SEAL Type Dryseal Thread Form with 7/8-inch Taper per Foot

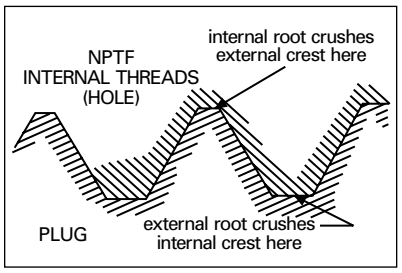
Deliberate difference in taper between the plug and the tapped hole. Ideal for use in assemblies where clearance is limited and in hydraulic lines near moving parts. Designed for use in hard materials and in thick-walled sections as well as for normal plug applications.



High pressure seal – Achieved through metal-to-metal contact at the large end of the plug. High load placed on the few mating threads near the top of the hole.



Flush seating – Design of LEVL-SEAL plug permits seating within half a pitch in a normally tapped hole. Conventional plugs have the greater tolerance of a full pitch and usually protrude above the surface.



PTF fully formed Dryseal threads designed to achieve seal in tapped holes without need for sealing compounds.

PTFE/TEFLON Coated LEVL-SEAL Type

Typical thickness is 0.0005-inch

LEVL-SEAL precision coated with tough, corrosion-resistant PTFE/TEFLON.

Installation of the new plugs is faster with the coating of PTFE/TEFLON which acts as a lubricant as well as seal. Power equipment can be used to install the smaller sizes instead of the manual wrenching required by higher torques of uncoated plugs. Suited for in assembly line production.

Higher hydraulic and pneumatic working pressures can be effectively sealed. Seal is effective without use of tapes or sealing compounds, even with liquids of very low viscosity. SPS Laboratories have tested these plugs with surges up to 13,500 psi 8 times in 5 minutes, then held peak pressure for 6 full hours without trace of leakage.

Flush seating improves appearance and adds safety. LEVL-SEAL plugs seat flush because of a combination of (1) gaging procedures, and (2) a deliberate difference in taper between the plug and a normally tapped NPTF hole. (The taper of the plug is 7/8" per foot , while that of the hole is 3/4" per foot.)

PTFE/TEFLON was selected for the coating material because of its combination of extra hardness and abrasion resistance which permit reuse up to 5 times without appreciable loss of seal.

The coating is serviceable to +450°F without deterioration.

Temperatures lower than –100°F require the use of stainless steel plugs. These are available in the same range of sizes as the alloy steel plugs.

With no tape or sealing compound involved, there is no danger of foreign matter entering and contaminating the system or equipment. The coating reduces any tendency of the plug to "freeze" in the hole because of rust or corrosion.

APPLICATION DATA – LEVL-SEAL and LEVL-SEAL with PTFE/TEFLON

nom. size	threads per inch	recommended hole diameter		tapping information tap projection thru L_1 ring		imperfect threads allowable	tap* drill size	recommended torque (inch-lbs.) alloy steel**
		max.	min.	max.	min.			
1/16	27	.2374	.2334	.375	.250	4	15/64	150
1/8	27	.3311	.3271	.375	.250	4	21/64	250
1/4	18	.4249	.4209	.521	.397	4	27/64	600
3/8	18	.5655	.5615	.516	.392	4	9/16	1200
1/2	14	.6905	.6865	.641	.517	4	11/16	1800
3/4	14	.8936	.8896	.627	.503	4	57/64	3000
1	11 1/2	1.1280	1.1240	.772	.584	4	1 1/8	4200
1 1/4	11 1/2	1.4794	1.4754	.780	.592	4	37.5mm	5400
1 1/2	11 1/2	1.7165	1.7116	.793	.605	4	43.5mm	6900
2	11 1/2	2.1905	2.8165	.761	.573	4	2 3/16	8500

*For taper thread (using tapered reamer). For tap drill size (without using tapered reamer) see table and corresponding comment on page 26.

**Maximum for PTFE/TEFLON-coated but can be reduced as much as 60% in most applications.