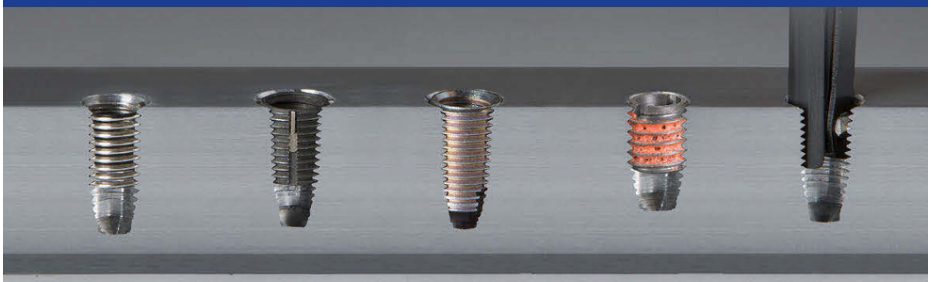
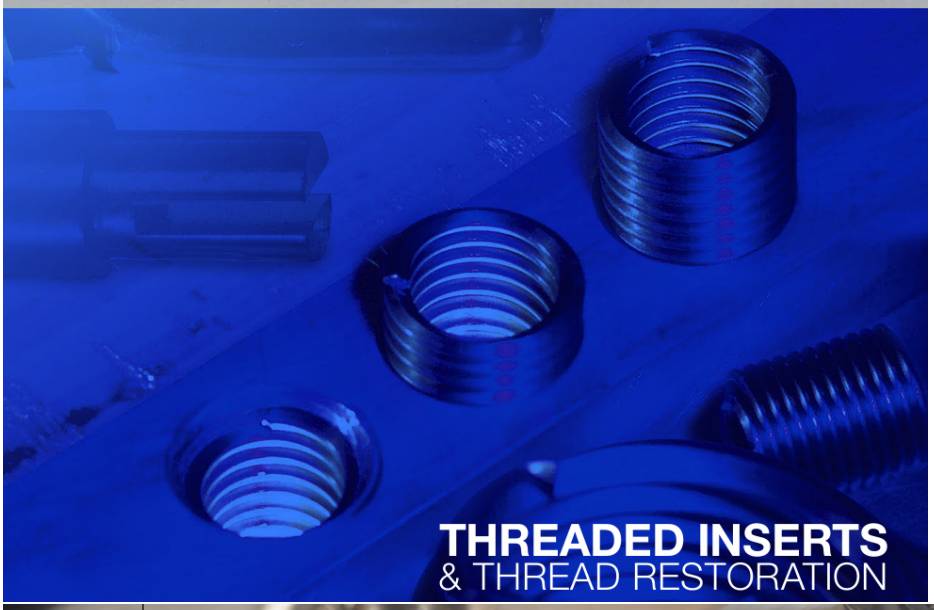
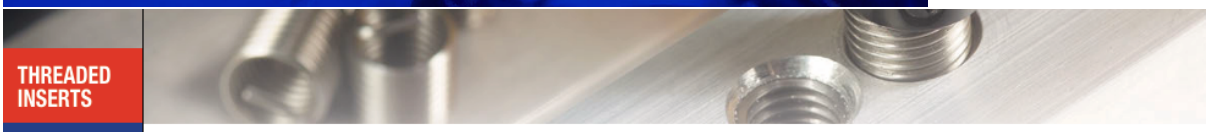
BORDO®
INDUSTRIAL TOOLS



powercoil® loksert® tapsert® bondsert® Nes®



THREADED INSERTS
& THREAD RESTORATION



THREADED INSERTS

OVERVIEW

BORDO® INDUSTRIAL TOOLS

powercoil® wire thread insert system



PowerCoil Wire Thread Inserts strengthen tapped threads in light weight parent materials such as aluminium. They are helically wound inserts made from high quality chromium nickel stainless steel with a diamond shaped cross section.

PowerCoil inserts are used in OEM applications in a wide range of industry sectors including aerospace, automotive, military and electronics. They are inexpensive when compared to other inserts and simple to install, yet are extremely tough, wear resistant and corrosion resistant.

Most importantly, PowerCoil inserts allow the stress loading from the bolt or similar threaded part to be more evenly distributed over the threads in the parent material.

In addition to PowerCoil standard 'free running' inserts, 'screw locking' inserts are also available. These inserts have polygonal grip coils within the length of the insert which exert radial pressure on the male thread, thereby gripping the bolt and preventing it from loosening under vibration or impact.

In addition to stainless steel, PowerCoil inserts can be made from Phosphor Bronze, Inconel or Nimonic 90 depending on the application. They can also be supplied with different surface finishes and coatings including cadmium, siver and zinc plating and dry film lubricant.

A complete range of Screw Thread Insert (STI) taps are available as well as low, medium and high volume installation tools and a wide range of individual and workshop repair kits. For further information we recommend you consult the technical pages in this guide, the PowerCoil website: www.powercoil.com.au or call your customer service representative.

powercoil® wire thread insert system

BORDO INDUSTRIAL TOOLS



Manufactured from high quality chromium nickel stainless steel, PowerCoil Wire Thread Inserts provide high strength internal threads that resist the effects of temperature and corrosion. Their unique design ensures superior threads whose compound performance cannot be reproduced by any other single fastening method. Available in two basic forms, free running or screw locking, they are much lighter and less expensive than any other equivalent type of thread insert and because of their compact size they can generally be incorporated into existing designs where no previous provision has been made.

FREE RUNNING

Produced from precision profiled austenitic stainless steel wire wound into a helical spiral, PowerCoil free running inserts have a spring like appearance. When installed, using any one of a variety of manual or automatic tools, they provide strong permanent internal threads which resist heat and corrosion. Once fitted, their position is maintained by the action of radial pressure between their coils and the flanks of the tapped hole. This pressure exists because their free diameter is larger by a calculated amount, than their installed diameter.

SCREW LOCKING

Screw locking (or prevailing torque) inserts are of particular value in applications subject to the effects of cyclic vibration or impact. In addition to the benefits afforded by free running inserts, PowerCoil screw locking inserts offer the additional security of prevailing locking torque. This is achieved by the action of one or more polygonal grip coils positioned within the insert's length, which exert radial pressure on the male thread. Each grip coil consists of a number of tangential locking chords which protrude inside the minor diameter of the normal free running coils. As the male thread passes through these grip coils, the locking flats are displaced thus exerting radial pressure or prevailing torque on the male thread. On removal of the male thread, the locking coils relax to their original form permitting repeated assembly whilst retaining a measurable level of prevailing torque.

Note: It is recommended that only close fit plated or lubricated bolts or screws are used with screw locking inserts.

FEATURES & BENEFITS

For many years, helically coiled wire thread inserts have been vastly underestimated. The popular misconception that they were designed for the repair of damaged threads has given this unique fastener a false image.

They are much lighter and less expensive than any other equivalent type of thread insert and because of their compact size, can generally be introduced into existing designs where no previous provision has been made. Unlike many other economic measures, their introduction increases quality and performance whilst reducing overall product cost. Their introduction may result in the use of thinner sections or lighter parent materials without sacrificing thread strength.

They protect tapped threads against failures due to stripping, seizing, corrosion and wear. PowerCoil wire thread inserts are produced from austenitic stainless steel wire which is work hardened to a tensile strength above 200,000psi and a hardness of Rc43-50.The inserts have an exceedingly smooth surface finish which virtually eliminates friction-induced thread erosion.

The continuous helically coiled design negates the need for thick wall structures to support the internal and external threads - the diamond profile wire coil *is* the thread. PowerCoil wire thread inserts can be installed in reduced size bosses or flanges and within constricted areas – saving space and weight while providing high strength.

A boss radius equal to the nominal bolt diameter is usually sufficient.

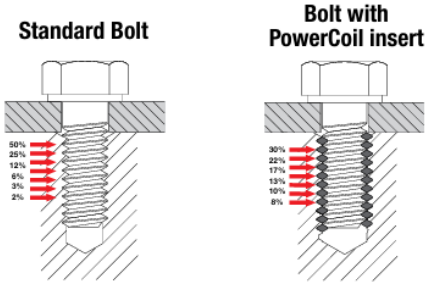
A complete range of installation tools are available to suit specific production techniques. A range of hand tools exist for small runs and repairs; electric and pneumatic tools are available for high volume production requirements.

STRENGTH

Due to their flexibility, wire thread inserts create internal threads which have a much improved distribution of residual stress loading when compared with conventional tapped holes, where 75% of the shearing forces are carried by the first three threads in the tapped hole. The flexibility of wire thread inserts helps to compensate for pitch and flank angle errors, inherent in normal tapped holes, and significantly enhances the load bearing capacity by deflecting the residual forces into a helical hoop stress which is dispersed into the wall of the tapped hole. This enables the design to be confidently based on the bolt strength utilising smaller and shorter threads even when used in low strength materials.

The high tensile coils of a wire thread insert undergo a diameter reduction during installation. The outward spring-like force of the coils "locks" the insert into place.

Each coil can flex independently to contact the greatest amount of parent material thread surface. Both static and dynamic load bearing capabilities are improved.



ELIMINATE STRESS

Virtually no stress is introduced into the parent material because there is no staking, locking, swaging or keying in place. The outward "spring action" of the insert holds it in place.

WEAR RESISTANCE

The combination of material hardness and the brilliant surface finish of wire thread inserts creates internal threads in which wear due to thread friction is virtually eliminated. This is of particular value in applications requiring repeated assembly and disassembly. The low frictional coefficient ensures that virtually all of the applied assembly torque is converted into clamping load. Thus providing threads that stay tight.

CORROSION PROTECTION

The 18/8 austenitic stainless steel wire used in PowerCoil inserts resists corrosion under normal environmental conditions. Galvanic action within the thread assembly is reduced, increasing the life of the fastening assembly.

Galvanic corrosion is most significant form of corrosion affecting



inserts and fasteners. Galvanic corrosion occurs when dissimilar metals are in contact in the presence of an electrolytic solution. All metals exhibit different degrees of "activity" or "nobility" and can be arranged in a galvanic series of increasing activity. Gold and platinum are most noble while zinc and magnesium are most active. The most common electrolytic solution encountered is ordinary water. Seawater or salt spray is more damaging because of high concentrations of dissolved salts.

The best way to preclude galvanic corrosion is to use similar potential metals and eliminate the electrolyte conductor. The active stainless steel of PowerCoil wire thread inserts are not passivated. This minimizes the possibility of galvanic corrosion occurring when they are installed in aluminum or magnesium parent materials.

Some additional precautions for reducing galvanic corrosion are:

1. Isolate the fasteners from the electrolyte. This can be done through gasketing or sealing.
2. Specify cadmium plated inserts. The cadmium plate provides a sacrificial barrier against corrosion. In addition, the cadmium plate has lubricating properties that minimize galling when stainless steel screws are used.
3. Apply corrosion inhibiting pastes or compounds to the screw. These include zinc chromate primer (MIL-P-8585) and strontium chromate primer (MIL-P-23377). Note: Pastes applied to the PowerCoil Thread Insert can become trapped between the wire and the hole and cause loss of proper tolerance. It is therefore recommended to apply the paste only to the screw, not the insert. If zinc chromate primer is applied to the tapped hole it should be thinned and applied sparingly. The insert should be installed while the primer is still wet.
4. Specify a dry film lubricant such as molybdenum disulphide on the inserts. This provides a secondary barrier against corrosion.
5. Where practical or where it will not interfere with the completed assembly, the external joint should be coated with a suitable paint.

MATERIALS

PowerCoil standard inserts are manufactured from fully certified, aircraft quality, 304 (18/8) austenitic stainless steel in accordance with DTD 734A. Alternative materials include 316 stainless steel and a variety of application specific surface coatings.

ALTERNATIVE MATERIALS

Phosphor Bronze

Non ferrous copper/tin alloy in accordance with BS2783 PB 102 EH – is suitable for operation in temperatures ranging from -200°C to +300°C.

Inconel X-750

Heat resisting precipitation hardenable nickel base alloy (equivalent specifications SAE AS 7246, DIN/NF 3018, W.NR 2.4669, UNS N07750). Inconel X-750 is suitable for operation in temperatures ranging from -200°C to +550°C.

Nimonic 90

Heat resisting precipitation hardenable nickel base alloy in accordance with BS2 HR 501 (equivalent specifications W.NR 2.4632, UNS N07090).

Nimonic 90 is suitable for operation in temperatures ranging from -100°C to +650°C.

Insert Material	Max. Temp. Peak	Max. Temp. Cont.	Typical Applications	Coatings
Stainless 304	425°C 800°F	315°C 600°F	Most general applications in all materials	FL, AG, CD
Stainless 316	425°C 800°F	315°C 600°F	Increased corrosion resistance for salt water applications	FL, AG, CD
Phosphor Bronze	300°C 572°F	235°C 455°F	Copper parts, non-magnetic, low permeability applications	AG, CD
Iconel X-750	650°C 1200°F	550°C 1020°F	Aerospace, turbines, corrosive environments, high temp. use	AG
Nimonic 90	650°C 1200°F	550°C 1020°F	Aerospace and turbine applications	AG

ALTERNATIVE FINISHES & COATINGS

Cadmium Plate

Electro-deposited Cadmium in accordance with DTD 904/Def Stan 03-19 (equivalent specifications FED. QQ-P-416, LN 9368). Cadmium plating provides an excellent barrier between dissimilar metals dramatically reducing the effects of galvanic corrosion, its high lubricity and excellent corrosion resistance prevents seizure and galling between threaded components. Cadmium plate is suitable for operation in temperatures ranging from -200°C to +235°C.

Cadmium plated parts must not be

- subjected to temperatures exceeding 235°C (455°F)
- come into contact with fuel or hot oil
- come into contact with food or drinking water
- be used with titanium components (either directly or indirectly). At elevated temperatures embrittlement and subsequent component failure may occur.
- Cadmium is highly toxic – consequently extreme care must be taken when shipping, handling and installing.

Zinc Plate

Electrolytically deposited zinc in accordance with BS 3382. Electro-deposited zinc is the most widely applied electroplated finish in industry. Zinc is suitable for operation in temperatures ranging from -200°C to +250°C.

Silver Plate

Electrolytically deposited silver in accordance with DTD 939. Silver plating is used to prevent seizure and galling between thread components in high temperature applications and is most commonly applied to aero-engine fasteners. Silver plate is suitable for operation in temperatures ranging from -200°C to +650°C. Silver plated wire inserts may be installed in various materials including aluminium alloys, magnesium alloys, corrosion and heat resistant materials etc.

Silver plated inserts are not recommended for installation in titanium alloy which may exceed a service temperature of 300°C (570°F). Stress corrosion as a result of the combination of silver and titanium may occur in the housing material.

Dry Film Lubricant

Solid film heat cured molybdenum disulphide dry film lubricant coating in accordance with MIL-L-0046010 provides a low frictional coefficient coating with excellent load bearing capabilities. Dry film lubricant prevents seizing and galling between threaded components and is particularly effective in screw locking insert applications. Dry film lubricant is suitable for operation in temperatures ranging from -100°C to +250°C.



LOCATION OF LOCKING COILS

For 1D, 1.5D, and 2D diameter lengths: The center of the locking coil (or coils) equals 1/2 the number of free coils. For 2.5D and 3D diameter lengths: The locking coil is located the same distance from the tang as 2D length inserts.

Screw locking inserts are dyed red for easy identification purposes only. It is alcohol soluble and can be removed if desired.

RED DYE COATING

PowerCoil screw locking inserts are generally colour coded with an organic red dye for identification purposes. The dye does not affect the installation or performance of the insert and does not need to be removed (in most situations). In situations requiring extreme cleanliness (such as assembly of precision instruments in clean room conditions) the dye may be removed by soaking the inserts in a denatured alcohol solution prior to installation.

POWERCOIL LOCKING INSERT TORQUE VALUES

METRIC COARSE

Thread mm x mm	Torque Max (Nm)	Torque Min (Nm)
M2.2x0.45	0.14	0.02
M2.5x0.45	0.23	0.05
M3.0x0.50	0.45	0.10
M3.5x0.60	0.68	0.12
M4.0x0.70	0.90	0.15
M5.0x0.80	1.60	0.30
M6.0x1.00	3.00	0.40
M7.0x1.00	4.50	0.60
M8.0x1.25	6.00	0.80
M10.0x1.50	10.50	1.40
M12.0x1.75	15.50	2.10
M14.0x2.00	23.50	3.00
M16.0x2.00	31.50	4.20
M18.0x2.50	42.00	5.50
M20.0x2.50	54.00	7.00
M22.0x2.50	67.50	9.00
M24.0x3.00	80.00	10.50
M27.0x3.00	94.00	12.00
M30.0x3.50	108.00	14.00
M33.0x3.50	122.00	15.50
M36.0x4.00	136.00	17.50
M39.0x4.00	150.00	19.50

METRIC FINE

Thread mm x mm	Torque Max (Nm)	Torque Min (Nm)
M8.0x1.00	6.00	0.80
M10.0x1.00	10.50	1.40
M10.0x1.25	10.50	1.40
M12.0x1.25	15.50	2.10
M12.0x1.50	15.50	2.10
M14.0x1.50	23.50	3.00
M16.0x1.50	31.50	4.20
M18.0x1.50	42.00	5.50
M20.0x1.50	54.00	7.00
M22.0x1.50	67.50	9.00
M18.0x2.00	42.00	5.50
M20.0x2.00	54.00	7.00
M22.0x2.00	67.50	9.00
M24.0x2.00	80.00	10.50
M27.0x2.00	94.00	12.00
M30.0x2.00	108.00	14.00
M33.0x2.00	122.00	15.50
M36.0x2.00	136.00	17.50
M39.0x2.00	150.00	19.50
M36.0x3.00	136.00	17.50

Locking torque values conform to MP3329, MP3330, MP3331

UNIFIED NATIONAL COARSE – UNC

Thread inch x tpi	Torque Max (lb in)	Torque Min (lb in)
2x56	1.25	0.19
3x48	2.00	0.44
4x40	3.00	0.63
5x40	4.69	0.81
6x32	6.00	1.00
8x32	9.00	1.50
10x24	13.00	2.00
12x24	24.00	3.00
1/4x20	30.00	4.50
5/16x18	60.00	7.50
3/8x18	80.00	12.00
7/16x14	100.00	16.50
1/2x13	150.00	24.00
9/16x12	200.00	30.00
5/8x11	300.00	40.00
3/4x10	400.00	60.00
7/8x9	600.00	82.00
1x8	800.00	110.00
11/8x7	900.00	137.00
11/4x7	1000.00	165.00
13/8x6	1150.00	185.00
11/2x6	1350.00	210.00

UNIFIED NATIONAL FINE – UNF

Thread inch x tpi	Torque Max (lb in)	Torque Min (lb in)
3x56	0.13	0.44
4x48	0.19	0.63
6x40	6.00	1.00
8x36	9.00	1.50
10x32	13.00	2.00
1/4x28	30.00	3.50
5/16x24	60.00	6.50
3/8x24	80.00	9.50
7/16x20	100.00	14.00
1/2x20	150.00	18.00
9/16x18	200.00	24.00
5/8x18	300.00	32.00
3/4x16	400.00	50.00
7/8x14	600.00	70.00
1x12	800.00	90.00
11/8x12	900.00	117.00
11/4x12	1000.00	143.00
13/8x12	1150.00	165.00
11/2x12	1350.00	190.00

Locking torque values conform to NASM8846

Note: It is also essential that the bolt fully engages all insert coils for maximum strength.

PowerCoil screw locking inserts can be designed to suit a customer's specific needs. In certain instances and applications prevailing torque can be lessened or increased to cater for a specific application. In these situations please contact your PowerCoil representative to discuss your specific requirements.

Please Note: Installation of PowerCoil screw locking inserts requires the use of a pre-winder tool. Please discuss other installation options with your PowerCoil agent.

WIRE THREAD REPAIR KITS

METRIC COARSE

powercoil®
wire thread insert system



GROUP	PCRK
INSERT TYPE	WIRE THREAD
INSERT MATERIAL	304 STAINLESS STEEL
STYLE	**FREE RUNNING**

BORDO® INDUSTRIAL TOOLS

METRIC COARSE

MC

INSERT						INCLUDED IN KIT					TAPPING DRILL	
D	MM	INSTALLED LENGTH		$	PART #	#	MM	PART #	PART #	PART #	MM	INCH
2.00	0.40	1.5D	3.00MM	**134.71**	3520-2.00K	20	2.1	3520-2.00I	3500-HIT2	3500-TB1	2.1	#45*
2.20	0.45	1.5D	3.30MM	**128.98**	3520-2.20K	20	2.3	3520-2.20I	3500-HIT2	3500-TB2	2.3	#42*
2.50	0.45	1.5D	3.75MM	**96.60**	3520-2.50K	20	2.6	3520-2.50I	3500-HIT3	3500-TB3	2.6	#37*
3.00	0.50	1.5D	4.50MM	**96.45**	3520-3.00K	20	3.2	3520-3.00I	3500-HIT4	3500-TB4	3.2	#1/8*
3.50	0.60	1.5D	5.25MM	**97.31**	3520-3.50K	20	3.7	3520-3.50I	3500-HIT5	3500-TB5	3.7	#27*
4.00	0.70	1.5D	6.00MM	**79.89**	3520-4.00K	20	4.2	3520-4.00I	3500-HIT6	3500-TB6	4.2	11/64*
5.00	0.80	1.5D	7.50MM	**69.30**	3520-5.00K	20	5.2	3520-5.00I	3500-HIT8	3500-TB8	5.2	13/64*
6.00	1.00	1.5D	9.00MM	**71.00**	3520-6.00K	20	6.3	3520-6.00I	3500-HIT9	3500-TB9	6.3	1/4*
7.00	1.00	1.5D	10.50MM	**87.58**	3520-7.00K	20	7.3	3520-7.00I	3500-HIT10	3500-TB11	7.3	9/32*
8.00	1.25	1.5D	12.00MM	**85.83**	3520-8.00K	20	8.3	3520-8.00I	3500-HIT11	3500-TB12	8.3	21/64*
9.00	1.25	1.5D	13.50MM	**101.55**	3520-9.00K	15	9.4	3520-9.00I	3500-HIT13	3500-TB12	9.4	3/8*
10.00	1.50	1.5D	15.00MM	**108.56**	3520-10.00K	15	10.4	3520-10.00I	3500-HIT13	3500-TB13	10.4	13/32*
11.00	1.50	1.5D	16.50MM	**135.84**	3520-11.00K	10	11.4	3520-11.00I	3500-HIT14	3500-TB14	11.4	7/16*
12.00	1.75	1.5D	18.00MM	**141.53**	3520-12.00K	10	12.4	3520-12.00I	3500-HIT15	3500-TB15	12.4	31/64*
13.00	1.75	1.5D	19.50MM	**128.98**	3520-13.00K	10		3520-13.00I	3500-HIT15		13.5*	33/64*
14.00	2.00	1.5D	21.00MM	**145.95**	3520-14.00K	10		3520-14.00I	3500-HIT16		14.5*	37/64*
15.00	2.00	1.5D	22.50MM	**157.64**	3520-15.00K	10		3520-15.00I	3500-HIT16		15.5*	39/64*
16.00	2.00	1.5D	24.00MM	**169.98**	3520-16.00K	10		3520-16.00I	3500-HIT18		16.5*	21/32*
18.00	2.50	1.5D	27.00MM	**229.30**	3520-18.00K	5		3520-18.00I	3500-HIT20		18.5*	47/64*
20.00	2.50	1.5D	30.00MM	**272.29**	3520-20.00K	5		3520-20.00I	3500-HIT21		20.8*	13/16*
22.00	2.50	1.5D	33.00MM	**322.45**	3520-22.00K	5		3520-22.00I	3500-HIT22		22.8*	57/64*
24.00	3.00	1.5D	36.00MM	**408.44**	3520-24.00K	5		3520-24.00I	3500-HIT23		25.0*	31/32*
27.00	3.00	1.5D	40.50MM	**503.53**	3520-27.00K	5		3520-27.00I	3500-HIT24		28.0*	1.3/32*
30.00	3.50	1.5D	45.00MM	**627.57**	3520-30.00K	5		3520-30.00I	3500-HIT25		31.0*	1.7/32*
33.00	3.50	1.5D	49.50MM	**669.53**	3520-33.00K	5		3520-33.00I	3500-HIT26		34.0*	1.21/64*
36.00	4.00	1.5D	54.00MM	**671.70**	3520-36.00K	5		3520-36.00I	3500-HIT28		37.0*	1.29/64*
42.00	4.50	1.5D	63.00MM	**1,026.77**	3520-42.00K	3		3520-42.00I	3500-HIT28		43.0*	1.11/16*

* Tapping drill size – not included in thread repair kit.

Some large repair kits over 24mm may be supplied with HIM tools (hex installation mandrels) in place of HIT tools (hand installation tools).

IMPORTANT

It is recommended that when repairing the thread on spark plug ports that you remove the head.

If you do not remove the head it is essential that you protect the engine from the ingress of chips and swarf generated by the tapping process.



SPARK PLUG

INSERT						INCLUDED IN KIT				
D	MM	INSTALLED LENGTH		$	PART #	#	MM	PART #	PART #	PART #
10.00	1.00		1/2"	**118.94**	3522-10.00K	5		3522-10.00PN	3500-HIT13	3500-TB13
			0.339"			5				
12.00	1.25		1/2"	**137.58**	3522-12.00K	5		3522-12.00PN	3500-HIT15	3500-TB15
			3/4"			5				
14.00	1.25		3/8"	**124.69**	3522-14.00K	5		3522-14.00PN	3500-HIT17	
			1/2"			5				
			3/4"			5				
14.00	1.25	8.4MM		**149.03**	3522-14.00K1	5		3522-14.00PN	3500-HIT17	
		12.4MM				5				
		16.4MM				5				
18.00	1.50		1/2"	**250.79**	3522-18.00K	5		3522-18.00PN	3500-HIT20	



STI Pilot Nose Taps are used to repair damaged threads and do not require the drilling of a pilot hole.

These taps use the existing thread as a guide in tapping a straight hole. STI Pilot Nose Taps are most commonly used to tap holes for the repair of spark plug threads.

