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LARGE DIAMETER SLOTTED TENSION PINS VS. ALTERNATIVE FASTENERS

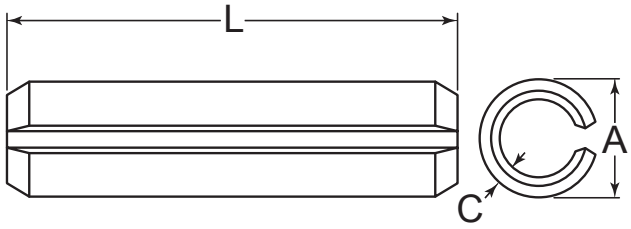
(BOLTS/NUTS, SOLID PINS, COIL PINS)

The slotted tension (spring) pin is a multi-purpose, non-threaded, versatile, and economic fastener. It is a fastener which not only simplifies design, but reduces assembly and production costs. Used in a diverse range of applications, slotted spring pins offer design characteristics that make them easy to install. They also reduce assembly costs by replacing more expensive and complex fasteners. In addition to cost savings, another big advantage is time-saving as they can be installed in a single operation.

Engineers have been quick to utilize the inherent advantages these pins provide in various applications for years. Slotted tension pins are tubular in shape, with a longitudinal slot and chamfers to facilitate hole insertion. They are available in a variety of materials and platings, the most common being thru-hardened high carbon spring steel. The combination of material, hardness, and design provides a stronger joint than many mild steel solid pins, taper pins, or grooved pins of like diameter.

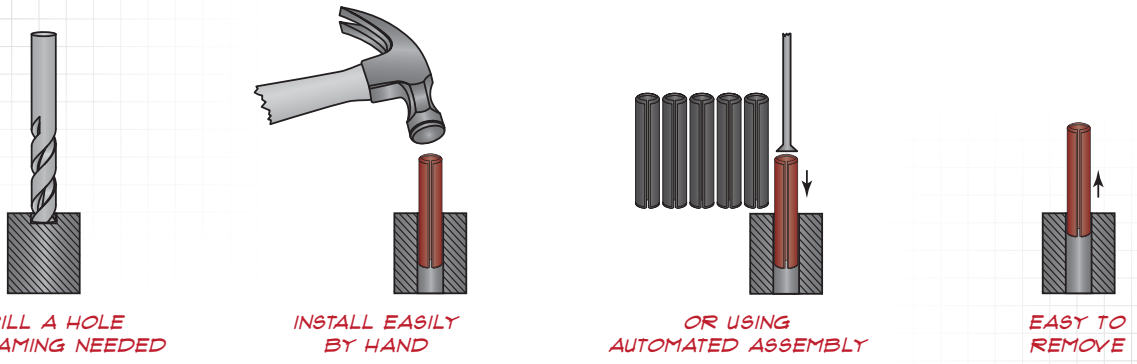
The design of the slotted tension pin in their free state – commonly known as pre-load – features a diameter slightly larger than the hole it will be inserted into. The longitudinal slot allows the pin to be compressed during insertion which provides positive radial tension and prevents loosening caused by vibration or shock. The pins slot dimension, outside diameter, and elastic limits are engineered so that this self-locking action is achieved when inserted into holes made to normal production tolerances.

Large diameter pins offer design engineers an easy cost, weight, and time saving, and they can replace a wide variety of different types of fasteners. The versatility, speed of production, and reduction of



Self-retaining slotted spring pins are single-turn lightweight, hollow, cylindrical tube-style press fit fasteners manufactured of high carbon steel (1070-1080) to a near circular "C" profile that leaves a longitudinal slot along the full length of the pin.

BENEFITS OF SLOTTED TENSION SPRING PINS



Slotted tension spring pins require only a straight drilled hole, may be installed using automated equipment, and are easily removed.

necessary application operations are why pins are so widely used in these industries: agriculture, construction, mining equipment, off-road, utility vehicles, forestry, material handling, heavy truck, and railroad.

ISO 8752 heavy duty and ISO 13337 light duty tension pins have the greatest range of sizes from 1 millimeter to 50 millimeters in diameter and up to 200 millimeters in length in the standard range. Special lengths up to 250 millimeters can be engineered and ran to order in both the ISO 8752 and ISO 13337.

ASME B18.8.2 pins generally range from 1/16 inch to ¾ inch diameters. Parts can be made in 7/8 inch and 1 inch diameters up to 9-1/2 inches in length.

Standard ASME B18.8.2-2000 slotted tension pins are stronger than standard duty ASME B18.8.2 coiled pins. This is also true when comparing standard ISO 8752 slotted pins to ISO 8750 coiled pins. In fact; standard slotted tension pins are stronger than the mild steel solid pins, taper pins, or grooved pins of like diameter, and can handle the most demanding applications. More strength, versatility for hole design, and ease of installation make slotted pins a "go to" for many applications.

Slotted tension pins are manufactured from high carbon steel, 18-8 stainless steel, 316 stainless steel, A2, and A4; other alloys are available upon request. Though most often they are plain finish, other platings and finishes are available including: mechanical zinc, black oxide, or a variety of other dip spin plating options.

LARGE DIAMETER PIN APPLICATION EXAMPLES

Agricultural Equipment – tractors, combines, and tillers

Mining Equipment – surface, subsurface, and underground equipment; conveyor systems

Forestry Equipment – booms and bucket applications

Railroad – maintenance equipment, engines, and rail cars

Construction Equipment – arms, buckets, cylinder attachments, booms, hitch joints, and slow rotation pivot points

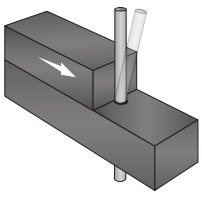
Communication Domes – used as locating devices and in pivot joints

Windpower – turbines, towers, inverters

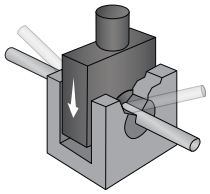
SHEAR STRENGTH

Shear strength is tested by measuring the force necessary to slice a sample into two pieces for single shear, or three pieces for double shear. In a single shear test the workpiece is supported on only one end whereas in a double shear test the workpiece is supported from both ends which requires greater force to break a middle piece free. Both tests result in strength ratings that categorize the metal.

Procedures for testing shear strength are defined in ISO 8749, ASME B18.8.2, ASME B18.8.4M, SAE J496, and NASM 10971, which are identical in substance.



SINGLE SHEAR TESTING



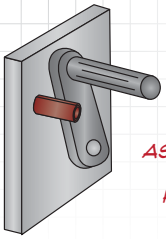
DOUBLE SHEAR TESTING

DOUBLE SHEAR STRENGTH: SLOTTED VS. COILED

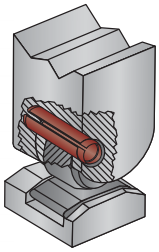
ISO 8752 Slotted Pins vs. ISO 8750				ASME Slotted Pins vs. ASME Standard Coiled Pins			
Diameter (mm)	Double Shear ISO 8752 Slotted Spring pins (kN)	Double Shear ISO 8750 Coiled Pins (kN)	Shear Strength Gain	Diameter (inch)	Double shear ASME B18.8.2 Slotted Spring pins (pounds)	Double Shear ASME B18.8.2 Medium Duty Coiled Pins (pounds)	Shear Strength Gain
1.5	1.58	1.45	**8.2%**	1/16	430	330	**23.3%**
2	2.82	2.5	**11.3%**	5/64	800	550	**31.3%**
2.5	4.38	3.9	**11.0%**	3/32	1,150	775	**32.6%**
3	6.32	5.5	**13.0%**	1/8	1,875	1400	**25.3%**
3.5	9.06	7.5	**17.2%**	5/32	2,750	2200	**20.0%**
4	11.24	9.6	**14.6%**	3/16	4,150	3150	**24.1%**
5	17.54	15	**14.5%**	7/32	5,850	4200	**28.2%**
6	26.04	22	**15.5%**	1/4	7,050	5500	**22.0%**
8	42.76	39	**8.8%**	5/16	10,800	8700	**19.4%**
10	70.16	62	**11.6%**	3/8	16,300	12600	**22.7%**
12	104.1	89	**14.5%**	7/16	19,800	17000	**14.1%**
14	144.7	120	**17.1%**	1/2	27,100	22500	**17.0%**
16	171	155	**9.4%**	5/8	46,000	35000	**23.9%**
20	280.6	250	**10.9%**	3/4	66,000	50000	**24.2%**

**M21 to M50 are not included since coiled pins cannot be made to those diameters.*

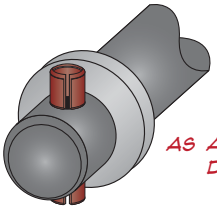
SLOTTED TENSION SPRING PINS APPLICATIONS



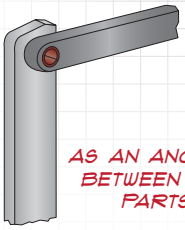
AS A PIVOT FOR A HANDLE



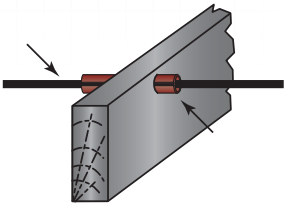
ABSORBS SHOCK AND VIBRATIONS



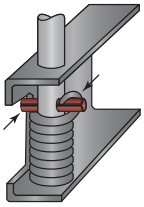
AS A HOLDING DEVICE



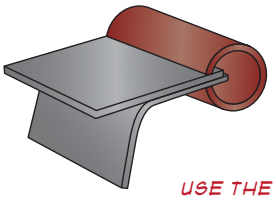
AS AN ANCHOR BETWEEN TWO PARTS



HOLLOW DESIGN IS USEFUL IN NON-PIN APPLICATIONS SUCH AS A SLEEVE

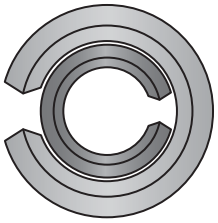


DUAL PURPOSE APPLICATION AS A STOP AND A SPRING RETAINER



USE THE SLOT AS A CUP OR AN ANCHORING CLIP

DOUBLING UP FOR HEAVY DUTY APPLICATIONS

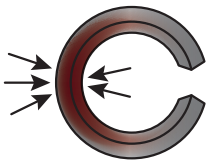


For additional shear strength, two slotted pins may be used in combination to construct a single assembly made up of two different slotted pins (one pin inserted inside of a second pin). This common practice makes the pins much stronger than ISO 8748 heavy duty or ASME B18.8.2 standard coiled pins. It is important to have the slots staggered by 180 degrees. It is also recommended when using a doubled-up pin to have the hole size to the high side of the tolerance. The reason for this is due to the higher installation force required to push the doubled-up pins into the application.

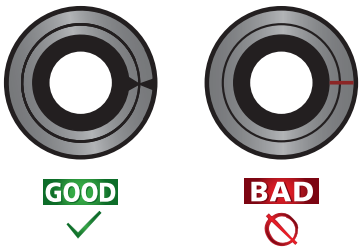
Inch Range		Metric Range	
ASME B18.8.2		ISO 8752	
Outer Pin	Inner Pin	Outer Pin	Inner Pin
5/32	3/32	5MM	3MM
7/32	1/8	6MM	3.5MM
1/4	5/32	8MM	5MM
5/16	3/16	10MM	6MM
3/8	7/32	12MM	7MM
1/2	5/16	13MM	8MM
5/8	3/8	14MM	8MM
3/4	1/2	16MM	10MM
1	5/8	18MM	11MM
		20MM	12MM
		21MM	13MM
		25MM	16MM
		30MM	18MM
		32MM	20MM
		35MM	21MM
		40MM	25MM

ORIENTATION AND STRESS

While installing slotted spring pins is easy, it is important to consider orientation during installation as stress is concentrated directly opposite the slot.



After installing a slotted pin in a hole, the slot must remain open slightly to ensure that applied forces are absorbed. If fully closed, the slotted pin will transfer loads to the host material and damage to the hole or assembly may occur.



SUMMARY

A truly unique feature of large diameter slotted pins is the diameter and size range. Standard ISO pins are available in a multitude of diameters and lengths. However, if you need something that is non-standard, special diameters, lengths, and slot designs are available as engineered applications.

Coiled pins, tapered pins, groove pins, and bolts cannot economically offer the range of diameter and lengths found with slotted tension pins.

Made on state of the art punch press machines, the design possibilities are endless. We helped work on a crankshaft application to supply a special replacement part in an ISO 13337 thin walled slotted tension pin to replace parts made back in the 1950's. If you can think it, we can build it for you!

Most assembly holes can be drilled or pierced to standard industrial tolerance without special tools. There is no need for the extra cost of reaming, threading, or counter boring the holes. Standard hole size tolerances are published within the ASME B.18.8.2 standard taking any of the guess work out of your design. The holes do not require the close tolerances of a solid pin and can be used where the holes of a solid pin have become worn as a replacement fastener.

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