When it comes to Socket Set Screws, insist on "Unilok"

Here's why:

The tighter you tighten socket set screws, the better they hold and the more they resist vibration. However, the average socket set screw cannot be tightened beyond a certain limit. After a point, the socket reams or cracks or the threads get stripped. One can never be sure whether or not it will actually stay tight.

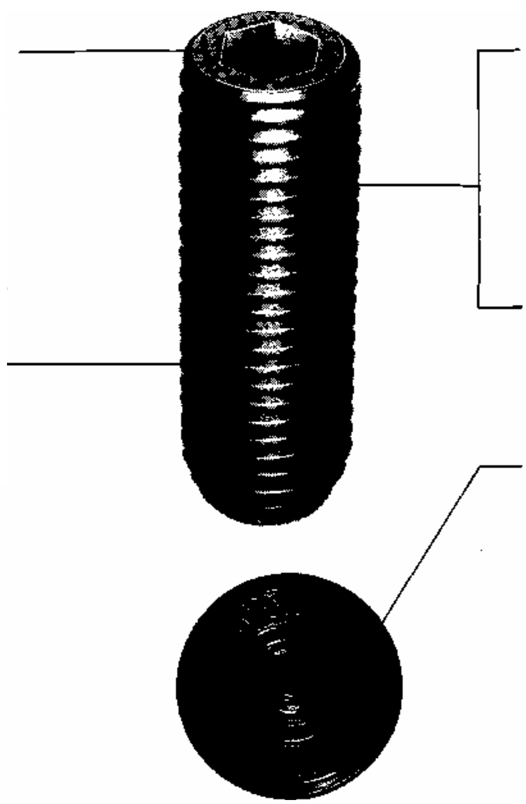
This is not so with "UNILOK" Socket Set Screws. They 'stay put' and you can tighten them until the wrench literally twists off without damage to the screws. Recommended torques are as much as 40% higher than other screws, thus giving you extra holding power and additional reliability and safety that go with it.

The reason for this extra holding power is extra strength. Here are some of the factors that make "UNILOK" screws so strong and enable them to stay tight where others fail.

Deeper sockets give more wrench engagement, let you seat screws tighter without reaming the socket or rounding off the corner of the key.

Radiused socket corners are additional safeguards against reaming. They eliminate the points of weakness where cracks start; distribute tightening stresses (Sharp corners of other set screw sockets form stress concentr-ations, even at lower tightening torques)

Fully-formed threads, rolled under extreme pressure, won't strip. Rolling compresses the metal into closely knit grain structure; flow lines follow thread contour, form "compressive bands of strength" that resist shear.



Controlled heat treatment is another vital factor in **"UNILOK"** socket screw strength Too little carbon in the furnace atmosphere (decarburization) makes screws soft-sockets ream, threads strip, points shear off when a screw is tightened. Too much carbon (carburization) makes screws brittle, liable to crack.

Customised heat treatment is literally tailored to every 'heat' of "**UNILOK**" socket set screws to maintain the necessary controlled hardness of HRc 45-53 for maximum strength

Counterbored knurled cup point- exclusive "**UNILOK**" self-locking point provides 5 times greater vibrational holding power than other knurled points (In tests, has withstood 1,750 cycles per minute for 3.5 minutes. Best competitive screw came loose in only 35 seconds).

Socket Set Screws

Selection

In a socket set screw you buy three types of holding power: torsional (resistance to rotation); axial (resistance to lateral movement); and vibration. An "**UNILOK**" set screw gives you a maximum of all three because its extra strength (up 40% more than competitive screws) lets you tighten it tighter for greater pressure between the mating parts. In addition, you have a choice of locking devices to prevent loosening from vibration.

Size selection is an important factor in holding power. As a rule-of-thumb the screw diameter should be roughly 1/2 that of the shaft.

Holding power is almost directly proportional to seating torque in Socket Set Screws. Hence, within the assembly's strength limits you can increase holding power by increasing seating torque. The **"UNILOK"** set screw's superior strength and unifomity permit use of consistently higher torques than with other screws, the greater holding power thus achieved reduces the number of screws required and the assembled cost of the product.

The set screw point, by its penetration, can add as much as 15% to total holding power. Cone points, with deepest penetration, give the greatest increase; oval points, with minimum penetration, the least.

Relative hardness between set screw and shaft is also a factors. A 10-point differential between the screws normal HRc 50 and shaft should be maintained for full holding power. As much as 15% loss can result from a lower differential.

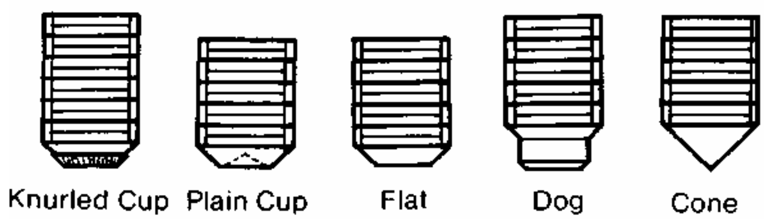
Self-locking devices maintain the vibration resistance achieved by correct size and proper tightening. The **"UNILOK"** set screw offers cup point users an exclusive self locking cup point (knurled).

Point style affects holding power. As much as 15% more can be contributed depending on the depth of penetration. The cone point (when used without a spotting hole in the shaft) gives greatest increase because of its greater penetration. The oval point, with least contact area, affords the smallest. The cup point lies in between, but is by far the most commonly used, because of the wide range of applications to which it is adaptable.

However, there is one cup point that can give you a maximum of both holding power and resistance to vibration. It is the exclusive **"UNILOK"** knurled cup point, whose locking knurls bite into the shaft and resist and tendency of the screw to back out of the tapped hole. The chart shows clearly how much better the **"UNILOK"** set screws resist vibration in comparison with other set screws. Only **"UNILOK"** knurled cup point self-locking set screws can give you such performance under conditions of extreme vibration.

POINT SELECTION

Point Selection is normally determined by the nature of the application - materials, their relative hardness, frequency of assembly and reassembly and other factors. Reviewed here are standard point types, their general features and most frequent areas of application of each type. For dimensions, mechanical properties, seating torques, etc., see following pages.



Knurled Cup
For quick and permanent location of gears, collars, pulleys or knobs on shafts. Exclusive counterclockwise locking knurls prevent screw from loosening, even in poorly tapped holes. Resists more severe vibrations. Cup counterbored for maximum locking power.

Plain Cup
Use against hardened shafts, in zinc, die castings and other soft materials where high tightening torques are impractical.

Flat
Use where parts must be frequently re-set, as it causes little or no damage to part it fears against. Can be used against hardened shafts (usually with ground flats for better contact) and as adjusting screw. Preferred for thin wall thickness and on soft plugs.

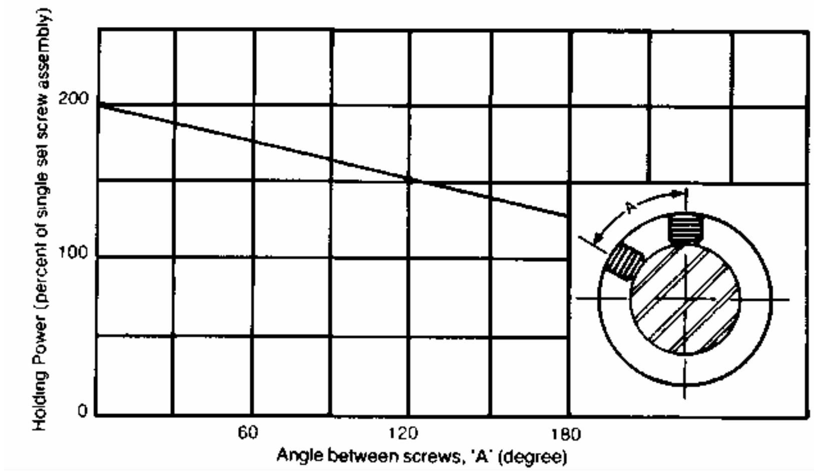
Cone
For permanent location of parts. Deep penetration gives highest axial and torsional holding power. In material over Rockwell C 15, point is spotted to half its length to develop shear strength across point. Used for pivots and fine adjustments.

Dog
Used for permanent location of one part to another. Point is spotted in hole drilled in shaft or against flat milled). Often replaces dowel pins.

Socket Set Screws

Unilok

Selection



Number of set screws : Two screws give more holding power than one, but not necessarily twice as much. Tabulated torsional and/or axial holding powers can be multiplied by from 1.30 to 2.00, depending on the angle between the two screws. Holding power is approximately doubled when the second screw is installed in an axial line with the first, but only about 30% greater when the screws are diametrically opposed. The above figure shows how much to compensate for any angle in between. Where design calls for two screws to be installed on the same circumferential line an angle of 60° is recommended as the best compromise between maximum holding power and minimum metal between the tapped holes. This arrangement gives 1.75 times the static holding power of a single set screw.

You're really buying holding power

To perform its basic functions, a set screw must develop a powerful clamping force. This must be sufficient to resist any external forces the screw will encounter in the application. How much is developed, however, depends directly on the screw's wrenchability, or the amount of tightening that can safely be applied to it.

Because it is a compression fastener, all of a set screw's clamping force is concentrated in the point when it is seated, holding the assembled parts tightly together and providing the primary locking action that keeps them form loosening.

In a typical shaft-and-collar assembly, when you tighten the set screw the force exerted by the point (1) on the shaft produces an equal force by the collar against the shaft on the opposite side. (2) This clamping action creates friction in both places — between shaft and point and between shaft and collar.

These two areas of friction provide most of the collar's resistance to movement on the shaft. Penetration of the point into the shaft (3) contributes additional resistance.

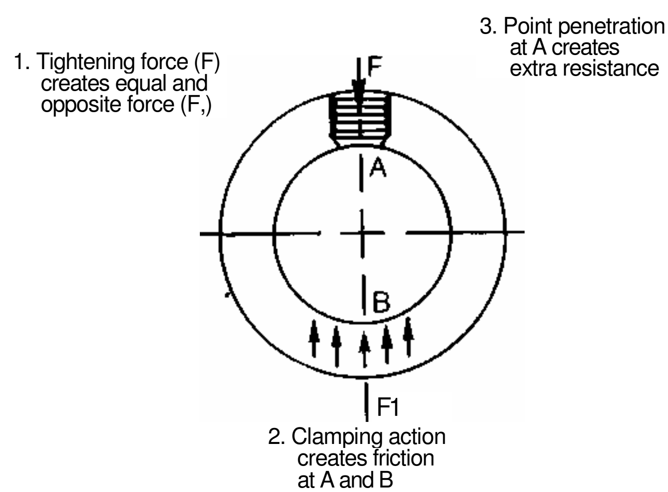
Holding power, which is what you're really buying in a set screw, is of two kinds-static and dynamic... Static holding power is resistance (under load) to movement between the parts being held together, or in the case above, between the collar and the shaft. It includes both axial, or lateral movement, and torsional. or rotational movement. Static holding power is directly proportional to the seating torque of the screw. In other words, the tighter you wrench the screw, the greater its holding power.

Other contributing factors are the hardness of the point (it must be able to take all the clamping force of the screw without collapsing or deforming) and its penetration into the shaft, as mentioned previously.

Cup point and cone point set screws are normally used without a spotting hole. In these cases they penetrate the shaft more than oval or flat point set screws because of their smaller face area.

It's in this area of holding power than "**UNILOK**" set screws, with recommended torques as much as 20% higher than those of ordinary screws, give you a lot more value for your fastener money.

For example, a M6 **"UNILOK"** screw seated on a 12 mm shaft has a recommended seating torque of 7.8 Nm. Accordingly, the resulting static holding power is 4200 N. Under the same conditions, an ordinary set screw would develop only 3500 N of holding power because its recommended torque is approximately 20% less than that of the **"UNILOK"** screw.



Unilok

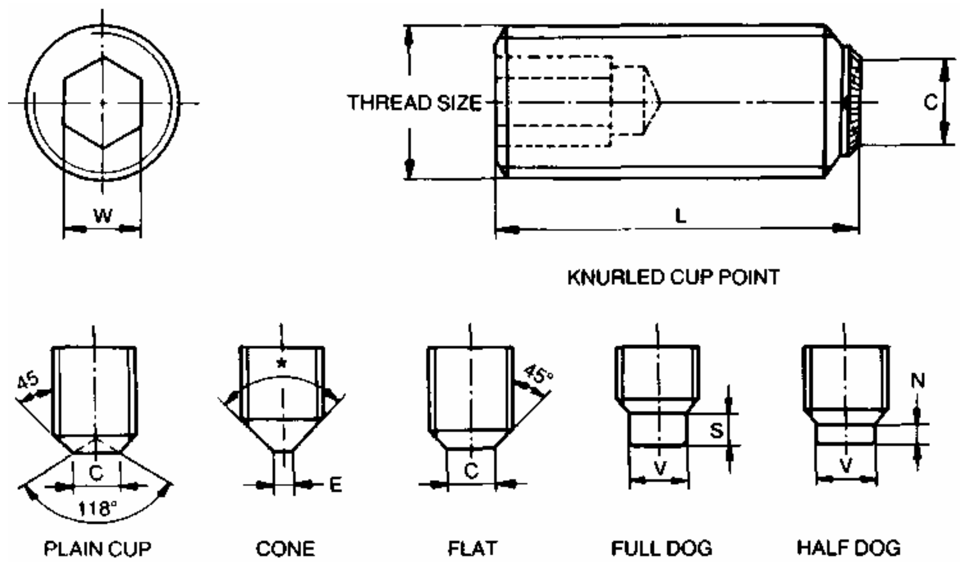
Socket Set Screws

Metric Series

Dimensions - Physical Properties - Tightening Torques

Notes :

1. The screws will generally conform to IS : 6094, DIN : 913/914/915 & 916 ISO : 4026/4027/4028 & 4029
2. Threads will conform to class 4g6g of IS: 4218. ISO-261/965, Coarse Series
3. Material : "UNILOK" High Grade Alloy Steel
4. Heat Treatment : HRc 45-53.
5. All dimensions are in millimeters.



* Cone angle will be 120° for screw lengths equal to or shorter than thread diameters, and 90° for longer lengths.

* * Half Dog will be applicable for nominal lengths up to 'L' listed in the table. For longer lenghts Full Dog will be applicable.

Thread Size	Pitch	All Points	Cup Point	Cone Point	Flat Point	Dog Point**		Dog Dia.	Nominal Length **
						Full Dog	Half Dog		
		W	C	E	C	S	N	V	L
		A/F	Max.	Max.	Max.	Max.	Max.	Max.	
M3	0.50	1.5	1.4	Sharp	2.0	1.75	1.00	2.0	5.0
M4	0.70	2.0	2.0	Sharp	2.5	2.25	1.25	2.5	6.0
M5	0.80	2.5	2.5	Sharp	3.5	2.75	1.50	3.5	6.0
M6	1.00	3.0	3.0	1.5	4.0	3.25	1.75	4.0	8.0
M8	1.25	4.0	5.0	2.0	5.5	4.30	2.25	5.5	10.0
M10	1.50	5.0	6.0	2.5	7.0	5.30	2.75	7.0	12.0
M12	1.75	6.0	8.0	3.0	8.5	6.30	3.25	8.5	16.0
M16	2.00	8.0	10.0	4.0	12.0	8.36	4.30	12.0	20.0
M20	2.50	10.0	14.0	5.0	15.0	10.36	5.30	15.0	25.0

Typical Tightening Torque (Max.) And Axial Holding Power (For Knurled Cup Point)

Thread Size	**Tightening Torque**		**Axial Holding Power**	
	Nm	**Kgfm**	**N**	**Kgf**
M3	0.87	0.089	710	72
M4	2.20	0.224	1,700	173
MS	4.60	0.469	2,500	255
M6	7.80	0.795	4,200	428
M8	18.00	1.835	6,700	683
M10	36.00	3.670	9,300	948
M12	62.00	6.320	12,000	1,223
M16	150.00	15.300	18,000	1,835
M20	290.00	29.560	23,000	2,345

1. These values hold for a circular shaft without a spotted hole or ground flat.
2. Tightening Torque values are not applicable for screws having threaded portion length « diameter.