



THE SOLUTION TO BOLTING PROBLEMS



SUPERBOLT[®]

Why Superbolt® Tensioners?



An Old Problem:

Large diameter bolting presents several problems. The strength of a screw fastener increases with the square of its diameter, however, the torque required increases with the third power.

Because of this, bolts with a diameter greater than 1 inch cannot be effectively torqued to capacity with hand tools. Achieving proper preload levels

requires some form of high energy equipment.

Slugging wrenches and crane wrenches are dangerous and thermal tightening can be time consuming. Hydraulic wrenching can be expensive, time consuming, inaccurate and can lead to thread galling. Hydraulic tensioning also shares some of these problems and adds problems with field retrofit.



Hydraulic Tensioning



Hydraulic Wrench



Thermal Tightening



Crane Wrench

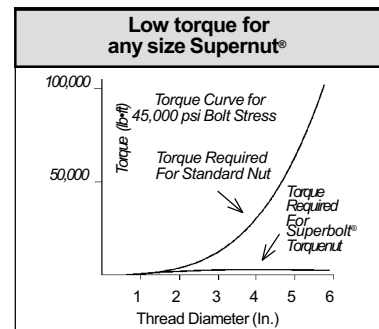


Sledgehammer



The Simple Solution:

Superbolt® Tensioners are designed as direct replacements for standard bolting. They can be threaded onto a new or existing bolt, stud, threaded rod or shaft. With our products, bolting is fast, safe, easy and accurate.



Benefits:

Only Hand Tools Required

Standard torque wrenches/small air tools can generate higher bolt tensions than any other bolting method available.

Time and Labor Savings

Vast time savings during installation/removal have been realized. Multiple workers and air tools can be used for even faster installation and removal.

Holding Power

Superbolt® products will not loosen on properly designed joints when correctly torqued. Prestressed tensioners on bolts or studs remain tight on vibrating, pulsating, or reciprocating equipment, eliminating downtime due to bolting.

Safe To Use

Eliminate common injuries associated with other bolting methods. Our products can be used in awkward locations such as overhead bolts, on top of large equipment, and also in hazardous environments such as nuclear power plants.

Accurate Preload

Our products provide precise tightening control, which is critical for sensitive applications such as gasketed flanges. Consistent tension from stud to stud is achieved.

Fits In Restricted Areas

Most applications can utilize standard Superbolt® products. However, specials can be designed to fit a wide variety of limited space applications.

Flexing - Adds Elasticity

Superbolt® Tensioners add elasticity to any bolted joint (see page 22). The joint becomes more resistant to thermal or dynamic cycles.

Flexing Can Eliminate Bolt Breakage

Flexing removes stress concentrations in the first few threads. Precise load control and reduced thread stress can eliminate bolt breakage problems.

Tightens In Pure Tension

Thread galling and stud seizure is eliminated due to tightening in pure tension. This prevents the difficulties associated with removing frozen studs.

Economical / Reusable

Superbolt® products are simple mechanical devices which cost comparatively less than other bolting methods.

Bolting Technology Takes A Step Forward:

Application Examples:



Superbolt® Multi-Jackbolt Tensioners (MJT's) eliminate the need for expensive, time consuming and unsafe bolting methods. Our products utilize a series of jackbolts threaded through the main body of the nut or bolt, to create large clamping forces.

Jackbolts are tightened with a hand torque wrench.

High compressive strength jackbolts have a small friction diameter creating a high thrust force with relatively little torque.

A hardened washer is used to transfer force while protecting the flange face and casing.

The thrust force of many jackbolts and the opposite reaction force of the main bolt head create a strong clamping force on the flange.

The thrust force from the jackbolts creates an equally strong reaction force in the main bolt head.



2,500 Ton structural foam injection molding press. Installation was accomplished in 2 hours using hand tools!



16-1/2" split nut on forging press columns.



This flexible disc coupling took 2 men 2-1/2 hours to install, saving this company 19 man hours!



High pressure steam turbine inlet flange.



MJT's on a 1,000 ton die cast machine.

Torque Comparison: Superbolt® vs. Hydraulic Wrench			
Thread Size [Inch]	Bolt Load [lbs]	Hydraulic wrench torque for standard Nut [lb•ft]	Supernut® jackbolt torque (MTX series) [lb•ft]
1	48,600	716	14
1-1/2	98,400	2,173	25
2	175,200	5,160	57
3	428,400	18,925	114
4	806,400	47,497	114
5	1,008,000	74,214	189
6	1,209,600	106,868	189

One would need 18,925 ft•lb of torque to stress a 3" stud to 428,400 lbs using a hex nut. With a 3" MTX Supernut®, only 114 ft•lbs on each of the jackbolts is needed to produce the same bolt load.

Superbolt® products are protected by trademark rights and one or more U.S. patents: RE 33490; 4,846,614; 5,083,889; 6,199,453; 6,381,827; 6,112,396; 6,263,764; other patents pending and corresponding foreign patents.

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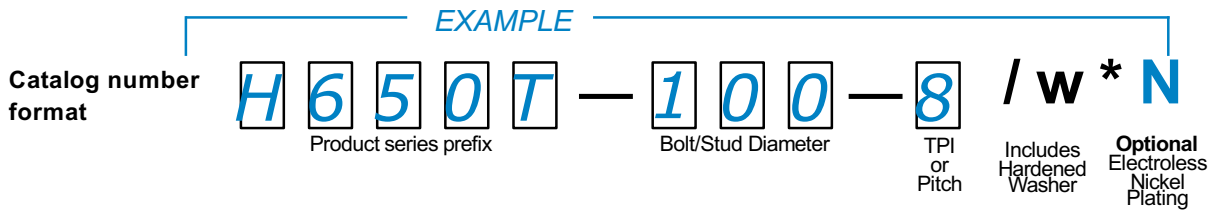
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	MT Standard Torquenut®	For machinery applications. Replaces standard hex nuts.	6
	CY High strength Torquenut®	CY tensioners can be used on grade 8 bolts and studs with high preload	7
	MTSX Ultra high strength	For extra high loads. Torquenut	8
	SJX Compact Jamnut	Where limited headroom is available.	9
	SMX Mill Motor Nut	For coupling and brake wheels on 600 and 800 series Mill Motors	9
	NI Bearing Locknut	For direct replacement of std. AN series bearing locknuts	10
	MTA Armored Torquenut®	For applications where jackbolts need to be protected from damage	11
	STUDS Studs	OEM quality studs from all materials. Rolled threads to 6" dia.	12
	EB Radial Expansion Bolts	To replace fitted bolts for large machines such as turbine couplings	13
	CN Crosshead Jamnuts	For reciprocating compressor crosshead connection.	14
	SP Piston Endnuts	Low torque method to tighten piston to piston rods on all types of cylinders	15
	SB8 Standard Torquebolts®	Std. bolt type tensioner used mostly in Grade 5 and B7 applications	16
	SB12 High strength Torquebolts®	High strength bolt type tensioner used in demanding applications (Grade 8)	17
	SBU High Strength Ultrabolts	The worlds strongest bolts made from exotic materials	17
	SSJX Torquebolts® with set screws	Bolt type tensioners that fit in a std. counterbore of socket head capscrews	18
	SX8 Flexnuts	These nuts relieve the stress concentration on high strength bolts	19
	SX12 High strength Flexnuts	Designed for use at very high stress levels	19

	H650 Med. temp. Torquenut®	Can be used on most B7 bolts or studs without modifications	20
	H650X Med. temp. Torquenut® with Moly jackbolt lube	For bolts or studs at medium temperature. Features less jackbolts	20
	H650T, H650TX Med. temp. Torquenut®	For ambient and medium high temp. applications where space is limited	21
	H1215 High temp. Torquenut® Corrosion resistant	For high temp. applications where limited space is available	23
	H1216 High temp. Torquenut® Corrosion resistant	For high temp. applications where adequate space is available	23
	H1218 Stainless Steel Torquenut® Corrosion resistant	For food, corrosion, nonmagnetic applications and high temperatures	23
	High Temp. Bolting System Reduced diameter inconel studs at high prestress	Valves, steam flanges, steam turbines	24
	Nuclear Series Approved nuclear materials	Valves, pumps, heaters, flanges, manways	25
	Monel Series Approved marine and navy materials	Various naval and salt water applications	25
	Corrosion Protection Various platings available	wet applications or chemical service	25
	Thrust Collars and Specials		26
	Tools Commercial and custom sockets	Custom sockets for higher torque values	29
	Lube JL-G (Graphite Lube) JL-M (Moly Lube)	For std. and high temp. lube. For low torque on large jackbolts.	29
	Caps Plastic Caps, Metal Caps	Low cost plastic, avail. for most sizes. Metal caps designed and made to order.	N/A

How To Order:



All standard products have a catalog number which conforms to the format above. Determine the diameter of your bolt or stud and the thread pitch as described below, and choose the product series that matches your size, temperature and material requirements. When ordering Torquebolts® the length under the head must also be specified. Please account for washer thickness.

To place an order, please review variables for product selection and call or e-mail us. Our sales engineers will be happy to discuss the details of your application.

Basic variables for product selection:

- Required bolt load or nut torque
- Temperature
- Space restrictions?
- Corrosion protection needed?
- Materials of mating components

Examples:

	Order Part No.
For 2-3/4" 8 tpi A193-B7 stud up to 650°F	H650-275-8/w
For 1-3/8" 6 tpi high strength stud	MT-137-6/w
For 56 mm, 5.5 mm pitch high strength stud	MT-M56-5.5/w
Nut for a 3-1/4" 4 tpi stud in corrosive atmosphere (with optional electroless nickel plating)	MT-325-4/w*N
Torquebolt for a 2-1/2" 4 tpi for 450°F service, 8" length under head.	SB8-250-4x8.00/w

How to measure and determine thread pitch.

Ordering Superbolt® products requires correct determination of the thread pitch. This is the most common reason for ordering errors. The table at the right lists common Threads Per Inch counts for various diameters. If your count is not shown, recheck, then contact Superbolt® for assistance (412-279-1149).

Diameter Inches	NC TPI	NF TPI	Other TPI
5/8	11	18	-
3/4	10	16	-
7/8	9	14	-
1	8	12	14
1-1/8	7	12	8
1-1/4	7	12	8
1-3/8	6	12	8
1-1/2	6	12	8
1-5/8	-	-	5,5,6,8,12
1-3/4	5	12	6, 8,10
1-7/8	-	-	5,6,8,10,12
2	4-1/2	12	6, 8,10
2-1/8	-	-	6, 8,12
2-1/4	4-1/2	12	6, 8,10
2-1/2	4	12	6, 8,10

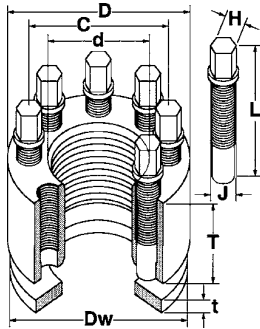
Diameter Inches	NC TPI	Other TPI
2-3/4	4	6, 8, 10, 12
3	4	6, 8, 10, 12
3-1/4	4	6, 8, 12
3-1/2	4	6, 8, 12
3-3/4	4	6, 8, 12
4	4	6, 8, 12
4-1/4	-	4, 6, 8, 12
4-1/2	-	4, 6, 8, 12
4-3/4	-	4, 6, 8, 12
5	-	4, 6, 8, 12
5-1/4	-	4, 6, 8, 12
5-1/2	-	4, 6, 8, 12
5-3/4	-	4, 6, 8, 12
6	-	3,4,6,8,12

Diameter mm	Coarse Pitch mm	Other Pitch mm
M20	2.5	1,1.5,2
M24	3	1,1.5,2
M27	3	1,1.5,2
M30	3.5	1,1.5,2
M33	3.5	1.5,2,3,4
M36	4	1.5,2,3,4
M39	4	1.5,2,3,4
M42	4.5	1.5,2,3,4
M45	4.5	1.5,2,3,4
M48	5	1.5,2,3,4
M52	5	1.5,2,3,4
M56	5.5	1.5,2,3,4
M60	5.5	1.5,2,3,4
M64	6	1.5,2,3,4
M72	6	1.5,2,3,4
M80	6	1.5,2,3,4
M90	6	2,3,4,8
M100	6	2,3,4,8
M110	6	2,3,4,8

Notes for applications engineering with Superbolt® products.

The torque and preload (bolt load) values given in the catalog tables are the "standard" values for common uses. If your application requires a higher or lower load, usually the standard product torque can be increased or decreased proportionally. However, you should check with a Superbolt® engineer prior to increases beyond rated bolt load.

The values listed in this catalog were obtained by factory tests. They are valid for new products as shipped. Repeated use, exposure to extreme heat, washing in solvents, or field lubrication can cause variations in values. Designers should use the same safety factors as for standard fasteners.



MT tensioners are used on general mechanical applications. They can be used on high or medium strength bolts and studs and will fit in the same area as a heavy hex nut. The MT series features hex-head jackbolts.

APPLICATIONS: General machinery, mining equipment, anchorbolts, gear boxes, pinion stands, tables, crushers, engines, compressors, presses etc.

NOTE: For permanent bolting applications, preload can be safely increased 30% by increasing specified torque 30%.

WHEN ORDERING: Replace the three dots (...) with the threads per inch (TPI) or the metric pitch required. Please watch for unusual thread forms. See also "HOW TO ORDER" on page 5.



MT-200-8's on a bolted spider for a large synchronous motor.



Compressor inlet filter cover.



MT Tensioners on a cable tensile testing machine.

Part No	Nominal Thread d In	O.D. D In	Body Thick T In	B.C. C In	OAL L In	Jackbolts No Jb n	Size J In	Hex H In	Washer		Standard		Wt. Lb
									O.D. Dw In	Thick t In	Pre-Load Lb	Torq Lbft	
	3/4	1.47									20400	14	.3
	7/8	1.60									30600	14	.3
	1	1.90									48600	27	.6
	1-1/8	2.08									48600	27	.7
	1-1/4	2.25									64800	27	.8
	1-3/8	2.46									73800	49	1.3
	1-1/2	2.70									98400	49	1.5
	1-5/8	2.96									98400	49	1.8
	1-3/4	3.08											
	1-7/8	3.59									129600	75	2.3
	2	3.59									175200	114	3.6
	2	3.59									175200	114	3.5
	2-1/4	3.95									175200	114	4.1
*	2-1/2	4.45									285600	233	6.9
*	2-3/4	4.70									285600	233	7.4
*	3	5.20									428400	233	9
*	3-1/4	5.45									428400	233	10
*	3-1/2	5.70									571200	233	13
*	3-3/4	6.20									571200	233	14
*	4	6.45									642600	233	16
*	4-1/4	6.95									806400	390	22
*	4-1/2	7.20									806400	390	23
*	4-3/4	7.45									907200	390	25
*	5	7.70									1008000	390	27
*	5-1/4	8.45									1108800	390	38
*	5-1/2	8.45									1108800	390	36
*	5-3/4	8.95									1209600	390	45
*	6	8.95									1209600	390	42
Metric	mm	mm									Lb	Lbft	Lb
	M20	37									24300	11	.3
	M24	43									32400	11	.3
	M27	50									48600	27	.6
	M30	53									48600	27	.7
	M33	58									64800	27	.9
	M36	66									77400	53	1.5
	M39	69									103200	53	1.6
	M42	75									103200	53	1.9
	M45	81									157200	98	2.7
	M48	85									157200	98	2.9
	M52	94									157200	98	3.6
	M56	100									157200	98	4.1
	M60	107									196500	98	4.6
*	M64	113									285600	233	7.1
*	M72	119									285600	233	8
*	M80	132									428400	233	10
*	M90	145									571200	233	12
*	M100	164									571200	233	16
*	M110	177									709920	479	23
*	M120	189									946560	479	26
*	M140	215									1183200	479	38
*	M160	234									1419840	479	48

CONTACT MAYURA
ENGINEERING FOR
PRODUCT DETAILS
& PART NUMBER

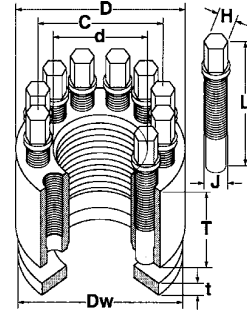
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* NOTE: The MTX series is recommended when the MT Series jackbolt torque requirement exceeds 200 FT-lbs. MTX Series features JL-M Moly lubricated jackbolts which will reduce required jackbolt torque by APPROXIMATELY HALF. All dimensions are the same as the above MT series. Contact Superbolt® for further information.

*For low temperature service, additional material testing and certification may be required.



High pressure centrifugal compressor.



CY series tensioners are used for higher bolt loads on general machinery applications. They fit in the same area as a heavy hex nut.

APPLICATIONS: Semi-cryogenic bolting, compressors, pumps, high pressure flanges, pinion stands, gear reducers, gear boxes, split gears, crushing equipment, presses, and military equipment.

NOTE: For permanent bolting applications, preload can be safely increased 30% by increasing specified torque 30%.

WHEN ORDERING: Replace the three dots (...) with the threads per inch (TPI) or the metric pitch required. Please watch for unusual thread forms. See also "HOW TO ORDER" on page 5.



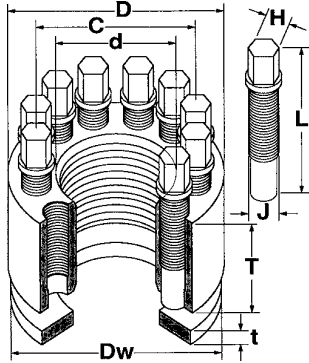
Power shovel side frames.

Part No	Nominal Thread d In	O.D. D In	Body Thick T In	B.C. C In	OAL L In	Jackbolts No Jb n	Size J In	Hex H In	Washer O.D. Dw In	Thick t In	Standard		Wt. Lb
											Pre-Load Lb	Torq Lbft	
	3/4	1.47									30600	14	.3
	7/8	1.70									40800	14	.4
	1	1.90									48600	27	.6
	1-1/8	2.08									64800	27	.7
	1-1/4	2.32									73800	49	1.2
	1-3/8	2.46									98400	49	1.3
	1-1/2	2.80									129600	75	2.0
	1-5/8	2.96									129600	75	2.1
	1-3/4	3.20									194400	75	2.5
	1-7/8	3.59									175200	114	3.6
	2	3.70									262800	114	3.8
	2-1/4	3.95									262800	114	4.1
*	2-1/2	4.45									428400	233	7.5
*	2-3/4	4.70									428400	233	8
*	3	5.20									571200	233	10
*	3-1/4	5.45									571200	233	11
*	3-1/2	5.70									642600	233	12
*	3-3/4	5.95									642600	233	12
*	4	6.20									714000	233	14
*	4-1/4	6.95									907200	390	22
*	4-1/2	7.20									907200	390	23
*	4-3/4	7.45									1008000	390	25
*	5	7.70									1008000	390	27
*	5-1/4	7.95									1108800	390	31
*	5-1/2	7.95									1108800	390	29
*	5-3/4	8.45									1209600	390	37
*	6	8.45									1209600	390	34
	Metric	mm	mm								Lb	Lbft	Lb
		M20	37								32400	11	.3
		M24	47								48600	27	.6
		M27	50								64800	27	.7
		M30	53								64800	27	.7
		M33	62								77400	53	1.2
		M36	66								103200	53	1.5
		M39	71								129000	53	1.7
		M42	75								154620	53	1.9
		M45	81								157200	98	2.7
		M48	85								196500	98	2.9
		M52	94								235800	98	3.6
		M56	97								235800	98	3.7
*		M60	107								276000	233	7.0
*		M64	113								357000	233	7.8
*		M72	119								428400	233	8
*		M80	132								571200	233	10
*		M90	145								571200	233	12
*		M100	157								571200	233	14
*		M110	177								714000	233	18
*		M120	189								1064880	479	26
*		M140	215								1301520	479	38
*		M160	226								1419840	479	43

CONTACT MAYURA
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& PART NUMBER

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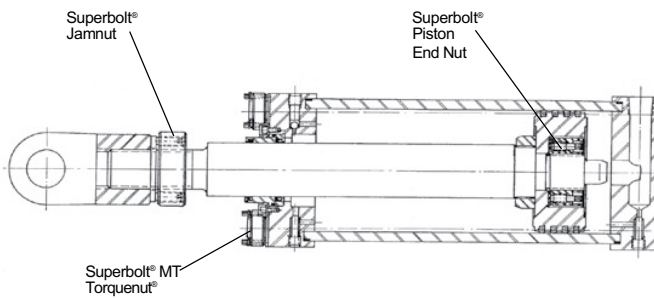
* NOTE: The CYX Series is recommended when the CY Series Jackbolt Torque requirement exceeds 200 ft-lbs. CYX Series features JL-M Moly lubricated jackbolts which reduces the jackbolt torque. All dimensions are the same as the above CY Series. Contact Superbolt® for more information.



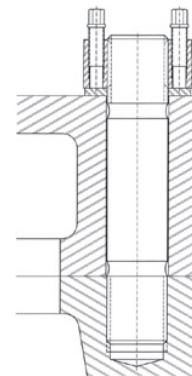
Part No	Nominal Thread d In	O.D. D In	Body Thick T In	B.C. C In	Jackbolts			Washer		Standard Pre-Load		Wt. Lb
					OAL L In	No Jb n	Size J In	Hex H In	O.D. Dw In	Thick t In	Lb	
CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER H/p:012 495 4823	4-1/4	7.45	CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER H/p:012 495 4823	CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER H/p:012 495 4823	CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER H/p:012 495 4823	CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER H/p:012 495 4823	CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER H/p:012 495 4823	CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER H/p:012 495 4823	CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER H/p:012 495 4823	1008000	189	29
	4-1/2	7.95								1193400	288	36
	4-3/4	8.20								1326000	288	42
	5	8.45								1326000	288	44
	5-1/4	8.95								1568700	435	52
	5-1/2	9.45								1743000	435	58
5-3/4	9.95	2035800	623	77								
6	9.95	2035800	623	74								
Metric	mm	mm	CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER H/p:012 495 4823						Lb	Lbft	Lb	
	M110	189							1064880	189	27	
	M120	202							1183200	230	36	
	M140	240							1638000	390	60	
	M160	264							2136000	563	84	

MTSX Torquenuts® provide extremely high preloads on large bolts or studs. Relatively little jackbolt torque is required by using JL-M MOLY paste lubrication.

Application Examples:



Example of Superbolt® Tensioners used on a hydraulic cylinder.



Example of MT Series Superbolt® Torquenut® on long studs designed to hold large machinery together.



Kaplan turbine coupling, (18) 6-3/16" studs. The previous method required 150-250 man hours utilizing a 150 lb. "dead man", a 50 ton hydraulic ram, and a 250 lb. wrench. Supernuts® were installed in 2-1/2 hours using 1/2" air impacts and hand torque wrenches.



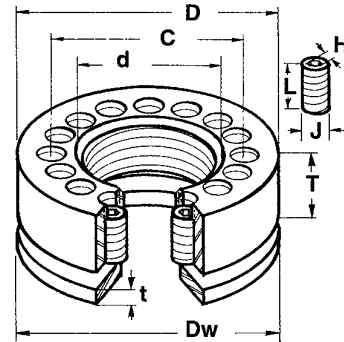
MT Supernuts® used as a closure tool. The shell had to be bolted up without the rotor assembly for measurements. The tensioners were used to speed up the maintenance schedule thus saving valuable outage time. Supernuts® are reusable for repairs on other turbines within this utility.

Operating Temperature: -50°F to 500°F* • Moly Lubricant (JL-M)

Part No	Nominal Thread d In	O.D. D In	Body Thick T In	B.C. C In	OAL L In	Jackbolts			Washer O.D. Dw In	Thick t In	Standard		Wt. Lb	
						No Jb n	Size J In	Hex H In			Pre-Load Moly Lb	Jb Torq Lbft		
	3/4	1.70									18120	7.7	.4	
	7/8	1.84									25140	7.2	.5	
	1	2.10									33060	7.1	.6	
	1-1/8	2.34									43680	14	.9	
	1-1/4	2.47									55740	14	1.1	
	1-3/8	2.72									69300	14	1.3	
	1-1/2	3.20									84000	27	2.3	
	1-5/8	3.45									100800	33	2.7	
	1-3/4	3.59									118800	31	2.8	
	1-7/8	3.72									138000	30	3.2	
	2	4.20									159000	64	4.9	
	2-1/4	4.70									205200	66	6.1	
	2-1/2	4.95									257400	69	7.1	
	2-3/4	5.70									315600	107	11	
	3	6.20									379200	137	15	
	3-1/4	6.70									449400	162	17	
	3-1/2	6.95									511875	185	19	
	3-3/4	7.20									606600	188	22	
	4	7.45									694200	289	29	
	4-1/4	7.95									787200	281	33	
	4-1/2	8.20									775950	277	34	
	4-3/4	8.45									903375	282	37	
	5	8.45									904500	282	39	
	5-1/4	8.70									883050	275	41	
	5-1/2	8.95									996150	276	43	
	5-3/4	9.45									1010625	280	48	
	6	9.45									1005000	279	47	
Metric		mm	mm									Lb	Lbft	Lb
	M20	43										20160	8.8	.4
	M24	50										29100	8.4	.5
	M27	56										38280	8.3	.6
	M30	63										46800	14	1.1
	M33	69										58440	14	1.3
	M36	75										68640	25	2.0
	M39	81										82680	24	2.3
	M42	88										94080	27	2.7
	M45	91										111120	27	2.9
	M48	100										124920	56	4.4
	M52	107										150180	54	4.9
	M56	113										173220	62	5.5
	M60	119										197520	71	6.7
	M64	126										229440	69	7.4
	M72	151										299640	114	12
	M80	157										379140	144	14
	M90	177										491700	220	22
	M100	183										618600	238	26
	M110	202										741195	249	33
	M120	208										744413	250	34
	M140	221										833490	249	41
	M160	240										932190	251	47

CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER

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SJX Jamnuts are used for applications where limited headroom and/or limited thread engagement are required. On request, Jamnuts are available with Superbolt's patented captive set screws.

APPLICATIONS: Hydraulic cylinders, shaft mounts, pipe flanges, and inaccessible places.

WHEN ORDERING: Replace the three dots (...) with the threads per inch (TPI) or the metric pitch required. Please watch for unusual thread forms. See also "HOW TO ORDER" on page 5.

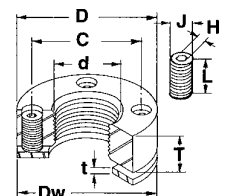


SJX-250-4 on electric motor coupling.

Part No	Nominal Thread d In	Thrd per Inch	O.D. D In	Body Thick T In	B.C. C In	OAL L In	Setscrews			Washer O.D. Dw In	Thick t In	Standard		Wt. Lb	
							No Jb n	Size J in	Hex H In			Pre-Load Moly Lb	Jb Torq Lbft		
	1	8	2.34									22000	12	1	
	1-1/4	8	2.72									33000	12	1	
	1-1/4	8	2.72									33000	12	1	
	1-1/2	8	3.59									37000	26	3	
	2	8	3.72									56000	26	3	
	2-1/4	8	4.47									66000	58	5	
	2-1/2	8	4.72									99000	58	6	
	3	8	5.47									132000	58	9	
	3-1/4	8	5.97									132000	58	10	
	3-1/2	8	6.47									132000	58	12	
	4	8	7.22									198000	58	18	
	4	8	7.72									198000	58	20	
		1/2	20	1.90									7500	3.5	.3
		5/8	18	1.90									9000	4.2	.3
		3/4	10	2.09									11000	6	.6
		3/4	14	2.09									11000	6	.6
		7/8	12	2.22									14500	8	.6
		1	12	2.34									24000	13	.9
		1	14	2.34									24000	13	.9
		1-3/4	8	3.72									56000	26	2
		1-3/4	12	3.72									56000	26	2
		2-3/4	8	5.97									92000	40	8
		3	8	6.47									132000	58	10

CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER

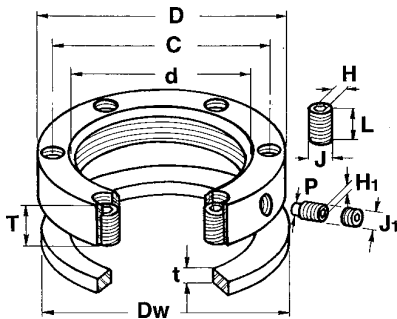
H/p :012 495 4823



SMX Mill Motor Nuts are used to replace standard mill motor armature nuts supplied by electric motor manufacturers. SMX tensioners are

available for most standard motor frame sizes. For sizes not listed, including 400 series frames, contact Superbolt® for further information. Preload matches the hub stress capacity of brake wheels and pulleys.

*See bottom of page 10 for installation examples.



(Bearing locknuts are designed to match their respective size bearing loads). NI bearing locknuts are directly interchangeable with standard AN and N series locknuts. Bearing locknuts are ideal for jacking bearings into place. They can also clamp entire shaft assemblies.

Larger sizes (NI-68 through NI-950) are also available. Contact Superbolt® for your bearing locknut needs.

APPLICATIONS: Common bearings.

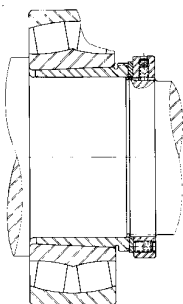
Part No.	Thread Diameter & TPI In	O.D. D In	Body B.C. C In	Thck T In	Setscrews			Side Screw			Allowable Pre-Load Lb	Moly Torq Lbft	Washer O.D. Dw In	Thick t In	Wt Lb
					No. Jb n	Size J In	Hex H In	Size J1 In	Hex H1 In	Tip P In					
	1.173-18	1.95									12750	3	1.95	.19	.3
	1.299-18	2.07									12750	3	2.07	.19	.3
	1.376-18	2.15									12750	3	2.15	.19	.4
	1.563-18	2.80									20800	6	2.80	.19	.8
	1.767-18	2.97									20800	6	2.97	.19	.9
	1.967-18	3.09									20800	6	3.09	.19	.9
	2.157-18	3.30									20800	6	3.30	.19	.9
	2.360-18	3.55									20800	6	3.55	.19	1.1
	2.548-18	3.70									20800	6	3.70	.19	1.1
	2.751-18	3.95									20800	6	3.95	.19	1.2
	2.933-12	4.09									20800	6	4.09	.19	1.8
	3.137-12	4.30									36200	12	4.30	.19	1.8
	3.340-12	4.50									36200	12	4.50	.19	1.8
	3.527-12	4.70									36200	12	4.70	.19	2.0
	3.730-12	4.95									48250	12	4.95	.19	2.2
	3.918-12	5.15									48250	12	5.15	.19	2.4
	4.122-12	5.45									48250	12	5.45	.25	3.0
	4.325-12	5.90									68000	22	5.90	.25	4.0
	4.716-12	6.22									68000	22	6.22	.25	4.3
	5.106-12	6.72									92600	20	6.72	.25	5.2
	5.497-12	7.15									92600	20	7.15	.25	5.4
	5.888-12	7.47									92600	20	7.47	.25	5.9
	6.284-8	8.35									100700	44	8.35	.31	9.4
	6.659-8	8.72									100700	44	8.72	.31	9.8
	7.066-8	9.20									100700	44	9.20	.31	11
	7.472-8	9.60									151000	44	9.60	.31	12
	7.847-8	9.95									151000	44	9.95	.31	13
	8.628-8	10.70									151000	44	10.70	.31	14
	9.442-6	11.75									201300	44	11.75	.31	18
	10.192-6	12.50									201300	44	12.50	.31	19
	11.004-6	13.30									201300	44	13.30	.31	20
	11.785-6	14.10									201300	44	14.10	.31	22
	12.562-6	14.90									201300	44	14.90	.31	24

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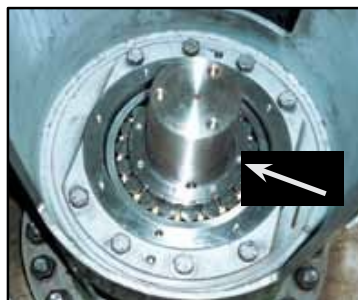
H/p:012 495 4823

Larger Inch Sizes and Metric Sizes available. Metric series is prefixed NM instead of NI.

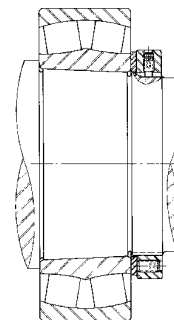
Design Examples of Superbolt® Bearing Locknuts



Locknut with standard tapered sleeve is easily tightened or easily removed.

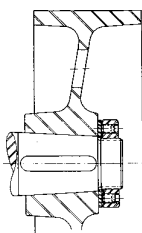


Bearing lock nut.



Locknut on tapered seat.

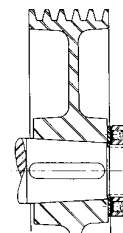
Design Examples of Superbolt® Mill Motor Nuts



Mill Motor Nut on brake wheel.



Mill Motor Nut on brake wheel.

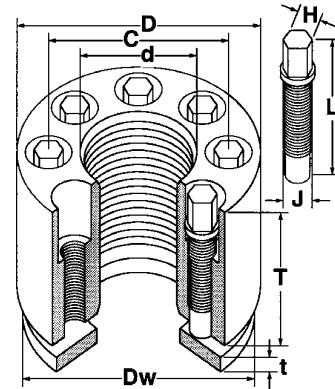


Mill Motor Nut with V-Belt pulley.

Part No	Nominal Thread d In	O.D. D In	Body Thick T In	B.C. C In	No Jb n	Jackbolts Size J In	Hex H In	Washer O.D. Dw In	Thick t In	Standard		
										Pre-Load Lb	Torq Lbft	Wt. Lb
	3/4	1.97								20400	14	.9
	7/8	2.09								30600	14	1.0
	1	2.47								42120	23	1.8
	1-1/8	2.59								48600	27	2.0
	1-1/4	2.70								64800	27	2.1
	1-3/8	3.20								73800	49	3.6
	1-1/2	3.32								98400	49	3.8
	1-5/8	3.45								98400	49	4.0
	1-3/4	3.70								129600	75	5.6
	1-7/8	3.97								175200	114	6.7
	2	4.20								175200	114	7.5
	2-1/4	4.45								219000	114	8.1
	2-1/2	5.45								285600	233	16
	2-3/4	5.70								357000	233	17
	3	5.95								357000	233	18
	3-1/4	6.20								428400	233	19
	3-1/2	6.45								428400	233	20
	3-3/4	6.70								428400	233	22
	4	7.20								499800	233	25
	4-1/4	7.45								604800	390	32
	4-1/2	7.90								604800	390	36
	4-3/4	8.20								705600	390	38
	5	8.40								705600	390	40
	5-1/4	8.60								705600	390	40
	5-1/2	8.90								806400	390	42
	5-3/4	9.20								806400	390	44
	6	9.45								806400	390	46
Metric	mm	mm								Lb	Lbft	Lb
	M20	50								24300	11	.9
	M24	63								32400	27	1.9
	M27	66								48600	27	2.0
	M30	69								48600	27	2.2
	M33	81								77400	53	3.7
	M36	84								77400	53	3.9
	M39	88								103200	53	4.2
	M42	91								103200	53	4.5
	M45	100								117900	98	6.9
	M48	100								157200	98	6.8
	M52	104								157200	98	7.1
	M56	107								196500	98	7.3
	M64	138								285600	233	17
	M72	145								357000	233	18
	M80	151								428400	233	18
	M90	164								428400	233	21
	M100	177								499800	233	24
	M110	201								709200	479	38
	M120	208								709200	479	40
	M140	234								945600	479	49
	M160	253								945600	479	54

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& PART NUMBER**

 H/p :012 495 4823



Superbolt® Armored Torquenuts® are used primarily for rough service environments. The jackbolts are recessed in the nut or bolt body protecting them from flying debris or rotating parts. Armored Torquebolts® are also available, see below.

APPLICATIONS: Mining equipment, anchorbolts, gear boxes, pinion stands, tables, crushers, engines, compressors, presses, etc.

NOTE: FOR PERMANENT BOLTING APPLICATIONS, PRELOAD CAN BE SAFELY INCREASED BY 30% BY INCREASING SPECIFIED TORQUE BY 30%.

WHEN ORDERING: Replace the three dots (...) with the threads per inch (TPI) or the metric pitch required. Please watch for unusual thread forms. See also "HOW TO ORDER" on page 5.

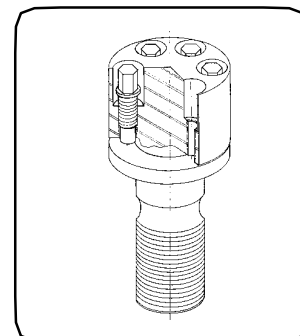
Bolt Style Superbolt® Armored Tensioner



Armored Torquenuts® used on a Kaplan turbine to secure the shaft assembly.



Armored Torquenut® on large machinery. Recessed jackbolts can be helpful when there is flying debris or when more thread engagement is needed.



SBAH Series Armored Torquenuts®



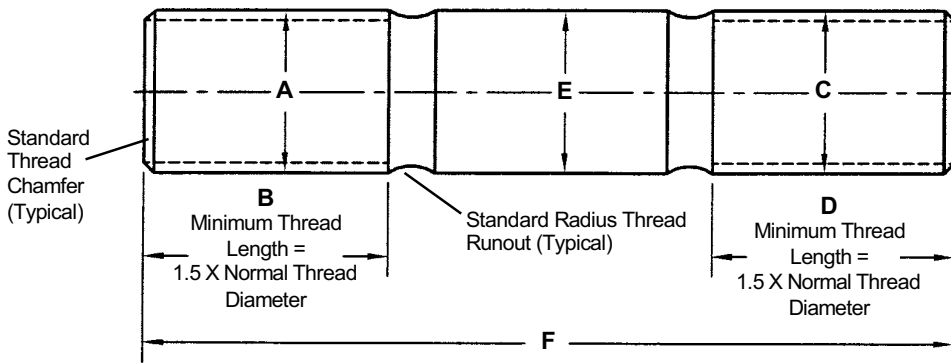
Superbolt® also manufactures high quality studs in all configurations. We can currently roll threads up to 6" in diameter.

Common materials include:

4140 H.T.	4340 H.T.	A193-B7
A193-B16	Inconel 718	Custom 450®
Astralloy®	Durehete®	AERMET 100®
Many More!		



Superbolt® custom manufactured 8" diameter load pins for naval cranes used for nuclear refueling (Shown with 8" Supernut™).



FOR A QUOTE:

Copy this page and fax to Superbolt or send existing drawing.

Fax:
412-279-1185

DETAIL	SIZE	DESCRIPTION
A		NOM. THRD. DIA.
B		MIN. THRD. LENGTH (±0.125")
C		NOM. THRD. DIA.
D		MIN. THRD. LENGTH (±0.125")
E		NOM. SHAFT DIA. (+0/-0.020")
F		OVERALL LENGTH (±0.125")
MATERIAL:		
ADDITIONAL REQUIREMENTS:		

Optional Installation / Removal hex on one end:

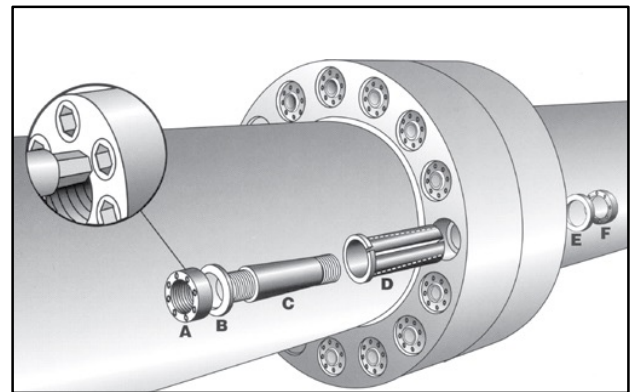
- YES
 NO

Problems:

Couplings such as those found on turbines present unique bolting problems. Alignment of shafts is a primary concern. Current practice requires the use of fitted bolts to assure proper alignment. Fitted bolts require precision machining, and installation and removal is often difficult.

Solutions:

Superbolt® has developed a custom bolting system for machines requiring large fitted bolts, such as steam turbines, generators, windmills, marine equipment and steel mill machinery. The bolting system consists of a tapered stud with threads on both ends. This stud slides into a round O.D. sleeve with an internal taper. The sleeve has a slot which allows it to expand as the tapers are drawn together. Typically, sleeves are designed .005" - .010" loose in the hole.



HOW EXPANSION BOLTS WORK

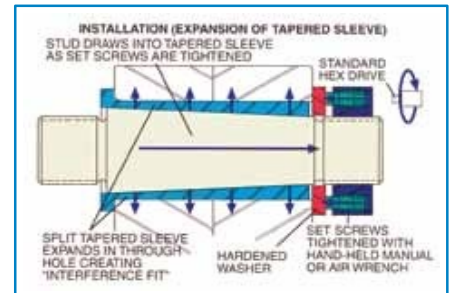
Superbolt® Expansion Bolts utilize a six piece system (shown above). The small end Torquenut® supplies the large force required to draw the tapered stud into the expandable tapered sleeve. As the tapered sleeve expands, a large, radial force is exerted uniformly against the mating through-holes. The large end Torquenut® creates additional clamping

force on the joint and is also used for easy removal of the tapered stud. Once the tapered stud is extracted, the sleeve collapses, allowing easy removal.

Expansion Bolts are specially designed and are available in all types of standard and exotic bolting materials.

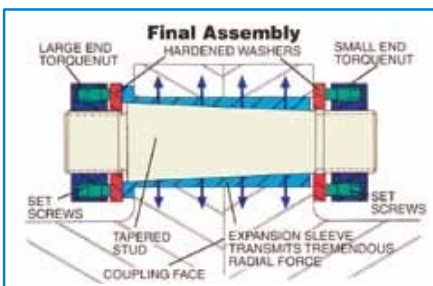
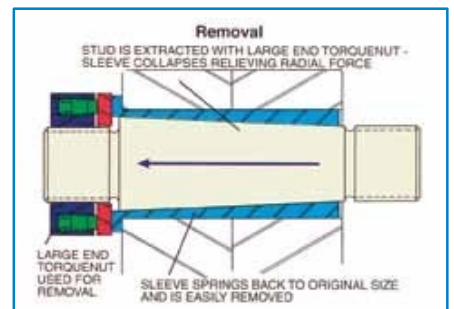
Installation:

- 1) Insert expandable tapered sleeve (D) into through-hole
- 2) Insert tapered stud (C) into tapered sleeve
- 3) Slip washer (E) over threaded small end of tapered stud
- 4) Thread Torquenut® (F) onto small end of tapered stud
- 5) Tighten set screws on Torquenut® (F) to prescribed torque
- 6) Install washer (B), Torquenut® (A), and tighten set screws



Removal:

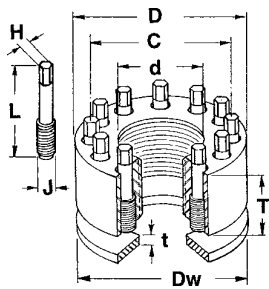
- 1) Removing Torquenut® (F)
- 2) Extracting the stud with Torquenut® (A). Once the tapered stud is extracted, the sleeve collapses, allowing easy removal.



Large turbine/generator coupling. Installation 4 hours, removal 1 hour.

Benefits:

- Fast Installation and Removal
- Provides a Strong Rigid Connection
- Eliminates High Powered Tools, Bolt Heating, Drilling out Seized Studs
- Line Boring Only (No Precision Honing Required)
- The Loose Fit Sleeves Tolerate Variations in Diameters



CN Crosshead Jamnuts are safe and easy to install/remove on compressor crossheads. They were designed in conjunction with a major compressor manufacturer. Crosshead Jamnuts have Superbolt®

patented "captive" machinery type jackbolts as an added safety feature. The bolt circle is larger than on standard torquenuts to allow wrench clearance from the piston rod.

Customer Application Worksheet is available for non-standard applications.

CN Crosshead Jamnuts® are also available in metric thread sizes - Contact Superbolt for further information.

Part No	Nominal Thread d In	O.D. D In	Body Thick T In	B.C. C In	OAL L In	Jackbolts No Jb n	Size J In	Hex H In	Washer O.D. Dw In	Washer Thick t In	Standard		Wt. incl. Wash. h. Lb
											Pre-Load Lb	Torq Lbft	
	1	2.75									18000		1.8
	1-1/8	2.88									24000		2.1
	1-1/4	3.00									31000		2.2
	1-3/8	3.13									38000		2.3
	1-1/2	3.75									46000		4.7
	1-5/8	3.75									55000		4.6
	1-3/4	4.00									65000		5.2
	1-7/8	4.00									76000		5.0
	2	4.20									87000		5.4
	2-1/4	4.45									112000		6.7
	2-1/2	4.90									142000		8.1
	2-3/4	5.40									173000		14
	3	5.90									210000		17
	3-1/4	5.90									250000		16
	3-1/2	6.40									290000		18
	3-5/8	6.53									310000		19
	3-3/4	6.90									333000		21
	4	6.90									375000		20
	4-1/4	7.40									433000		30
	4-1/2	7.90									475000		34
	4-3/4	7.90									544000		32
	5	8.40									600000		37
	5-1/4	8.65									650000		39
	5-1/2	9.15									720000		44
	5-3/4	9.40									808000		45
	6	9.90									891000		51

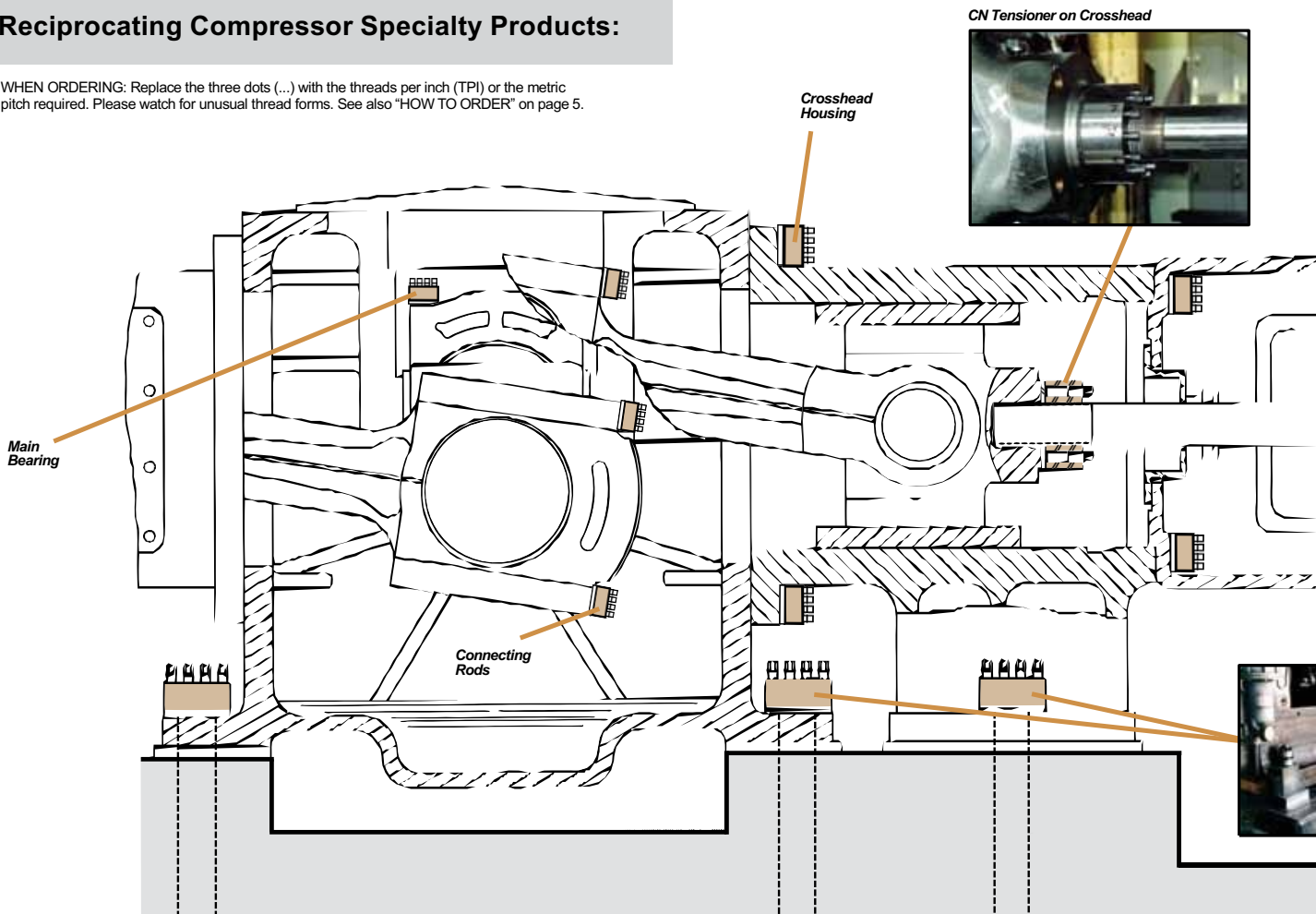
CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER

H/p:012 495 4823

Special note on CN Jackbolt torque: Jackbolt torques dependent on lubricant. Older jamnuts were lubricated with oil while new production specifies a Moly based lubricant. Still others supplied on OEM basis may be lubricated with DOW Corning GN Paste. Proper torque values are stamped on the jamnut body and are supplied with installation instructions.

Reciprocating Compressor Specialty Products:

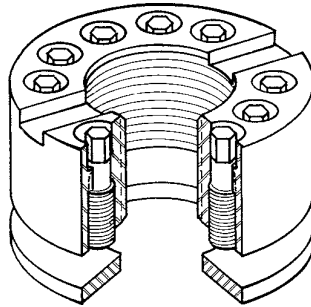
WHEN ORDERING: Replace the three dots (...) with the threads per inch (TPI) or the metric pitch required. Please watch for unusual thread forms. See also "HOW TO ORDER" on page 5.



Examples

Piston End Nut Applications:

Superbolt® offers the SP series in custom designed Piston End Nuts. These nuts are "Torquenut" type multi-jackbolt tensioners designed to properly attach compressor pistons to the piston rod. There is no need to clamp the piston rod when installing or removing Superbolt® Piston End Nuts. Because almost every compressor piston is custom designed to accommodate different gases at different temperatures, the Piston End Nuts that attach the pistons to the rods also vary. The space available for Piston End Nuts varies. Nut material may also vary due to corrosion resistance requirements. Superbolt® has an extensive data base of previously designed and installed Piston End Nuts. New applications can usually be designed by modifying an



Spanner wrench groove optional as shown.

existing design. Most Piston End Nuts have Superbolt® patented "captive" machinery type jackbolts as an added safety feature. Contact Superbolt® for Customer Application Worksheet.

OTHER APPLICATIONS: Hydraulic Pistons.



SP Tensioner on piston.



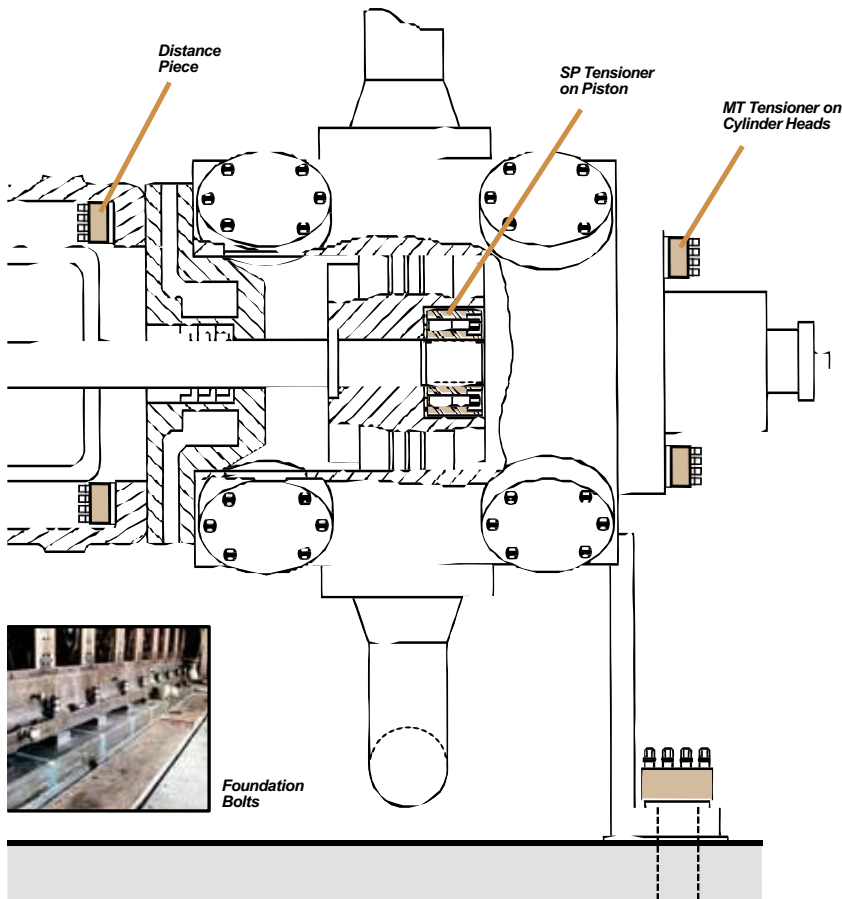
Original nuts were replaced with Superbolt® Torquenuts® on this connecting rod. Accurate preload was achieved quickly with a 3/8" torquewrench, increasing worker safety.



Cylinder head.



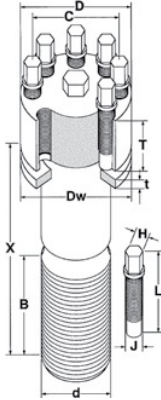
Anchor bolts.



Our products are especially useful in limited space applications, such as this distance piece on a reciprocating compressor.



Anchorbolts on crank case and distance piece of a compressor.



Torquebolts® are most often used for applications with tapped holes. Additionally, the diameter of the Torquebolt® head is smaller than a nut type tensioner, allowing Torquebolts® to fit tighter areas. Also includes an external hex for ease of installation.

NOTE: For permanent bolting applications, preload can be safely increased 30% by increasing specified torque 30%.

ORDERING INFORMATION: To the part numbers in the table, add your threads per inch (or pitch) requirement and the length required under the head (please account for washer thickness). Example: for a 2", 8TPI bolt 9" long, order SB8-200-8 x 9.00/w (The /w specifies the standard hardened washer).



Torquebolts are also available for high temperature service and can be made from a variety of materials. Includes external installation hex on bolt heads for ease of use.



Original bolt (top) and replacement Torquebolt (bottom).

Part No	Nominal Thread	Head O.D. D In	Dimensions		Nom. Thrd Lgth X In	Nom. Thrd Lgth B In	OAL L In	Jackbolts		Hex H In	Washer		Standard		Wt. Lb		
			Thick T In	B.C. C In				No Jn	Size J In		O.D. Dw In	Thick t In	Pre-Load Lb	Torq Lbft			
	5/8	1.21											20400	11	.5		
	3/4	1.35											20400	14	.7		
	7/8	1.48											30600	14	.9		
	1	1.59											40800	14	1.3		
	1-1/8	1.83											48600	27	1.9		
	1-1/4	1.98											64800	27	2.6		
	1-3/8	2.23											73800	49	3.9		
	1-1/2	2.35											98400	49	4.6		
	1-5/8	2.47											123000	49	5.3		
	1-3/4	2.73											129600	75	6.7		
	1-7/8	2.98											175200	114	7.9		
	2	3.20											175200	114	11		
	2-1/4	3.45											219000	114	13		
	2-1/2	3.94											285600	233	18		
	2-3/4	4.20											357000	233	25		
	3	4.47											428400	233	33		
	3-1/4	4.70											499800	233	41		
	3-1/2	4.95											571200	233	47		
	3-3/4	5.44											705600	390	65		
	4	5.70											806400	390	73		
	4-1/4	5.94											806400	390	82		
	4-1/2	6.22											907200	390	105		
	4-3/4	6.44											907200	390	123		
	5	6.70											1008000	390	147		
	5-1/4	6.94											1008000	390	186		
	5-1/2	7.20											1008000	390	203		
	5-3/4	7.44											1008000	390	221		
	6	7.69											1008000	390	240		
Metric		mm	mm														
	M16	31													16200	11	.5
	M20	34												24300	11	.7	
	M24	40												32400	11	1.2	
	M27	45												48600	27	1.7	
	M30	50												48600	27	2.4	
	M33	57												77310	53	3.6	
	M36	59												77310	53	4.2	
	M39	63												103080	53	4.9	
	M42	66												103080	53	5.5	
	M45	74												157200	98	7.3	
	M48	75												157200	98	9.6	
	M52	81												196500	98	11	
	M56	85												196500	98	13	
	M60	90												235800	98	15	
	M64	100												285600	233	21	
	M72	111												357000	233	27	
	M80	119												428400	233	39	
	M90	126												571200	233	48	
	M100	145												709200	479	72	
	M110	158												827400	479	99	
	M120	170												945600	479	119	
	M140	188												1182000	479	206	
	M160	208												1182000	479	266	

CONTACT MAYURA ENGINEERING FOR PRODUCT DETAILS & PART NUMBER

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1200 MW Hydro Plant Nozzles on Pelton Turbines. Engineers were able to decrease the size of the nozzles with close spacing of the torquebolts®. Shown is the test plate being installed for hydro testing. Each 400 MW unit has five nozzles.

*For low temperature service, additional material testing and certification may be required.

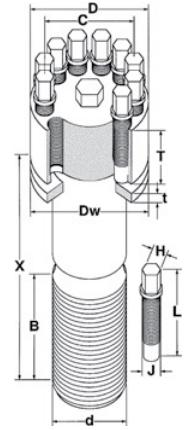
Part No	Jack bolt Lube	Nominal Thread d In	Head O.D. D In	Dimensions Thick T In	B.C. C In	Nom. Thrd Lgth X In	Thrd Lgth B In	OAL L In	Jackbolts No Jb n	Size J In	Hex H In	Washer O.D. Dw In	Thck t In	Standard		Wt. Lb
														Pre-Load Lb	Torq Lbft	
	JL-G	3/4	1.35											27180	12	.7
	JL-G	7/8	1.48											37710	13	.9
	JL-G	1	1.73											49590	28	1.6
	JL-G	1-1/8	1.85											65520	27	1.9
	JL-G	1-1/4	1.98											83610	23	2.7
	JL-G	1-3/8	2.23											103950	41	3.9
	JL-G	1-1/2	2.35											126000	42	4.6
	JL-G	1-5/8	2.47											151200	50	5.3
	JL-G	1-3/4	2.73											178200	69	6.7
	JL-G	1-7/8	2.98											207000	108	7.9
	JL-G	2	3.20											238500	103	11
	JL-G	2-1/4	3.45											258500	111	14
	JL-G	2-1/2	3.95											321750	210	18
	JL-G	2-3/4	4.20											394500	214	27
	JL-G	3	4.45											474000	220	35
	JL-M	3-1/4	4.95											561750	176	43
	JL-M	3-1/2	5.20											656250	176	49
	JL-M	3-3/4	5.70											758250	276	69
	JL-M	4	5.90											867750	270	78
	JL-M	4-1/4	6.45											984000	410	94
	JL-M	4-1/2	6.70											1108500	396	118
	JL-M	4-3/4	6.95											1237500	442	130
	JL-M	5	7.45											1350000	624	168
	JL-M	5-1/4	7.70											1522500	603	208
	JL-M	5-1/2	7.95											1459875	578	227
	JL-M	5-3/4	8.20											1561875	619	246
	JL-M	6	8.45											1708500	592	266
Metric														Lb	Lbft	Lb
	JL-G	M20	34											30240	10	.7
	JL-G	M24	43											43650	24	1.5
	JL-G	M27	47											57420	24	1.8
	JL-G	M30	50											70200	23	2.5
	JL-G	M33	57											87660	45	3.6
	JL-G	M36	59											102960	43	4.2
	JL-G	M39	63											124020	43	4.9
	JL-G	M42	66											141120	49	5.5
	JL-G	M45	74											166680	83	7.3
	JL-G	M48	75											187380	93	9.6
	JL-G	M52	81											187725	78	11
	JL-G	M56	85											216525	90	13
	JL-G	M60	90											246900	87	15
	JL-G	M64	100											286800	187	21
	JL-G	M72	111											374550	203	28
	JL-G	M80	119											473925	220	39
	JL-M	M90	138											614625	199	51
	JL-M	M100	145											773250	214	74
	JL-M	M110	164											950250	373	109
	JL-M	M120	177											1145250	385	129
	JL-M	M140	201											1311975	490	227
	JL-M	M160	221											1722525	562	291

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SB12 Torquebolts® offer higher strength and are more suitable for low temperatures. Other features are the same as SB8 Torquebolts®.

APPLICATIONS: Gear boxes, BOF applications, mining equipment, pinion stands, clamp type flange connections, and wind tunnels.



ORDERING INFORMATION: To the part numbers in the table, add threads per inch (or pitch) requirement and the length you require under the head (please account for washer thickness). EXAMPLE: For a 2", 8TPI bolt 9" long, order - SB12-200-8 x 9.00/w (the /w specifies the standard hardened washer).

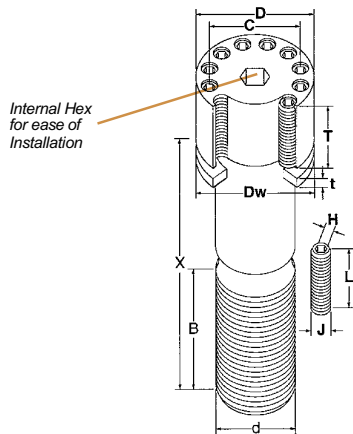
NOTE: For permanent bolting applications, preload can be safely increased 30% by increasing specified torque 30%.

Ultrabolts are the strongest fasteners available, when applied correctly (usually with Flexnuts). Ultrabolts are custom designed, utilizing special and/or exotic materials. Bolt stress up to 120,000 psi is normal. Some Ultrabolts are capable of withstanding 300,000 psi tensile stress with 250,000 psi yield strength. Preloading repeatedly to 250,000 psi, with only the jackbolts, has been successfully accomplished without damage. For those applications requiring a nut with the Ultrabolt, SXU Flexnuts are recommended (grade 8 nuts are not strong enough for Ultrabolts). Contact Superbolt® for your high strength and extra high strength requirements.



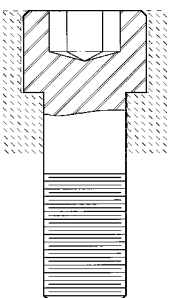
SSJX Torquebolts® offer Multi-Jackbolt features in the same countersink as large standard socket head cap screws. They feature Moly lubricated setscrews.

APPLICATIONS: Gear boxes, BOF applications, mining equipment, pinion stands, clamp type flange connections, wind tunnels, machine tools, presses.



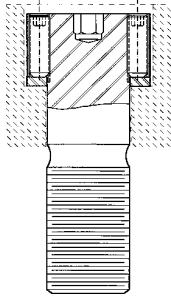
ORDERING INFORMATION: For part numbers in the table, add threads per inch (or pitch) requirement and the length you require under the head (please account for washer thickness). **EXAMPLE:** For a 2", 8TPI bolt 9" long, order - SSJX-200-8 x 9.00/w (The /w specifies the standard hardened washer).

Before:



Normal socket head cap screw shown in a countersunk application.

After:



SSJX Torquebolt® with the same countersink as the socket head cap screw shown at left.

Part No	Nominal Thread d In	Head O.D. D In	Head Dimensions			Nom. Lgth X In	Thrd Lgth B In	OAL L In	Jackbolts No Jn	Jackbolts Size J In	Hex H In	Washer O.D. Dw In	Washer Thick t In	Standard		
			Thick T In	B.C. C In	Pre-Load Lb									Torq Lbft	Wt. Lb	
	5/8	.98												15453	4	.4
	3/4	1.17												22440	5	.6
	7/8	1.35												31365	5	.8
	1	1.49												39780	5	1.3
	1-1/8	1.70												52650	9	1.8
	1-1/4	1.85												63180	9	2.5
	1-3/8	2.10												79950	16	3.7
	1-1/2	2.22												95940	16	4.3
	1-5/8	2.43												95940	16	5.1
	1-3/4	2.60												111930	16	5.9
	1-7/8	2.80												142350	37	7.7
	2	2.98												170820	37	11
	2-1/4	3.40												199290	37	14
	2-1/2	3.80												243360	74	18
	2-3/4	4.15												283920	74	26
	3	4.45												283920	74	34
	3-1/4	4.90												353340	123	43
	3-1/2	5.15												412230	123	49
	3-3/4	5.65												490230	187	71
	4	5.97												571935	187	80
	4-1/4	6.18												571935	187	89
	4-1/2	6.45												653640	187	113
	4-3/4	6.68												653640	187	125
	5	6.93												653640	187	149
	5-1/4	7.45												859560	283	192
	5-1/2	7.70												859560	283	209
	5-3/4	7.95												967005	283	228
	6	8.20												967005	283	247
Metric		mm	mm											Lb	Lbft	Lb
	M16	25												15795	3.6	.4
	M20	31												25110	3.6	.7
	M24	35												31590	3.6	1.1
	M27	41												41340	9	1.6
	M30	45												51675	9	2.3
	M33	50												62010	9	3.1
	M36	55												74100	18	4.0
	M39	59												88920	18	4.6
	M42	63												88920	18	5.3
	M45	69												131040	32	6.6
	M48	71												131040	32	9.4
	M52	76												131040	32	11
	M56	84												131040	32	13
	M60	88												152918	32	14
	M64	97												250380	75	21
	M72	108												292110	75	27
	M80	117												336960	75	37
	M90	134												458640	149	54
	M100	144												458640	149	76
	M110	154												524160	149	104
	M120	164												589680	149	122
	M140	184												655200	149	205
	M160	204												720720	149	265

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Standard 2" SSJX Torquebolt®.

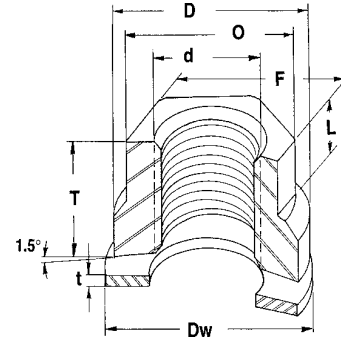


SSJX Torquebolts® used on a coiler in a steel mill.

Part No	Nominal Thread d In	O.D. D In	Flexnut Thick T In	Relief Angle Degree	Hex O.D. O In	Dimensions Flats F In	Length L In	Washer O.D. Dw In	Thick t In	Max. Design Load Stress psi	Minor Area Load Lb	Wt. Lb
	3/4	1.30								120000	36240	.2
	7/8	1.52								120000	50280	.3
	1	1.73								120000	66120	.4
	1-1/8	1.95								120000	87360	.6
	1-1/4	2.17								120000	111480	.8
	1-3/8	2.38								120000	138600	1.1
	1-1/2	2.60								120000	168000	1.4
	1-5/8	2.81								120000	201600	1.7
	1-3/4	3.03								120000	237600	2.1
	1-7/8	3.25								120000	276000	2.6
	2	3.46								120000	318000	3.2
	2-1/4	3.90								100000	342000	4.5
	2-1/2	4.33								100000	429000	6.1
	2-3/4	4.76								100000	526000	8
	3	5.20								100000	632000	10
	3-1/4	5.63								100000	749000	13
	3-1/2	6.06								100000	875000	17
	3-3/4	6.50								100000	1011000	20
	4	6.93								100000	1157000	25
	4-1/4	7.36								100000	1312000	29
	4-1/2	7.79								100000	1478000	35
	4-3/4	8.23								100000	1650000	41
	5	8.66								100000	1800000	48
	5-1/4	9.09								100000	2030000	55
	5-1/2	9.53								100000	2290000	62
	5-3/4	9.96								100000	2450000	72
	6	10.39								100000	2680000	82
Metric	mm	mm	mm	Degree	mm	mm	mm	mm	mm	psi	Lb	Lb
	M20	35								120000	40320	.2
	M24	42								120000	58200	.4
	M27	47								120000	76560	.5
	M30	52								120000	93600	.7
	M33	57								120000	116880	.9
	M36	62								120000	137280	1.2
	M39	66								120000	165360	1.4
	M42	73								120000	188160	1.9
	M45	77								120000	222240	2.2
	M48	83								120000	249840	2.8
	M52	88								120000	300360	3.3
	M56	97								120000	346440	4.4
	M60	105								100000	329200	5.6
	M64	111								100000	382400	6.6
	M72	125								100000	499400	9
	M80	139								100000	631900	13
	M90	156								100000	819500	18
	M100	173								100000	1031000	24
	M110	191								100000	1267000	32
	M120	208								100000	1527000	41
	M140	243								100000	2058000	66
	M160	277								100000	2702000	98

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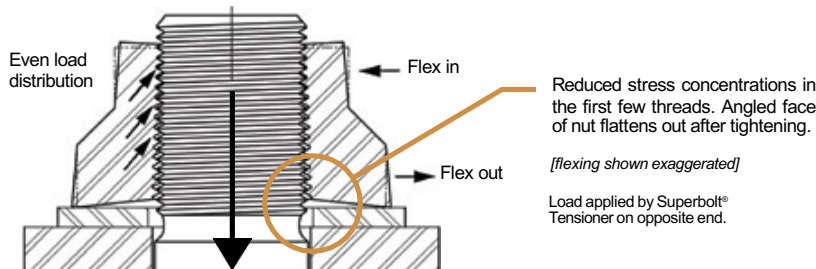
Patented SX8 series Flexnuts are designed to flex within the bolt stress range common for most torquebolts. They are ideal for reducing stress concentrations and also for adding flexibility to gasketed joints. They are suitable for SB8, SB12, and SSJX Torquebolts®, and also in conjunction with through studs and Torquenuts.

APPLICATIONS: Test equipment, aircraft equipment, rocket and space, nuclear, mining, crushers, gasketed flanges, etc.

WHEN ORDERING: Replace the three dots (...) with the threads per inch (TPI) or the metric pitch required. Please watch for unusual thread forms. See also "HOW TO ORDER" on page 5.

How Flexnuts Work:

Flexnuts are used on through bolt applications on the opposite end of a Torquenut® or Torquebolt®. They are designed to flex out at the bottom and flex in toward the top of the nut. This distributes the bolt load along many threads, adds elasticity, and prevents stress concentrations in the first few threads.



Patented SX12 Flexnuts are designed for use at very high stress levels. Call for more information.



Split Gear segment on rotating kiln.

H650

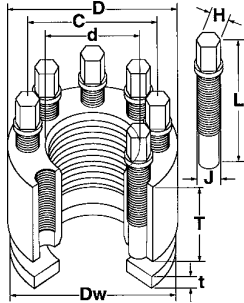
Medium Temperature
Torquenuts®
Graphite Lubricant (JL-G)



Bolt stress at standard preload: 45,000 psi
Operating Temperature: -50°F to 650°F

Tensioner Body
Material:
ASTM-A193-B7

H650 tensioners are used for medium temperature, pressure vessel applications on A193-B7 bolts and studs. Material certification provided upon request.



Preload and torque values are based on 45,000 psi bolt stress, the value most commonly used by pressure vessel designers. Depending on operating temperature, jackbolt torque and preload may be increased.



Heat exchanger.

Part No	Nominal Thread d In	O.D. D In	Body Thick T In	B.C. C In	OAL L In	Jackbolts No Jb n	Jackbolts Size J In	Hex H In	Washer O.D. Dw In	Washer Thick t In	Standard @45k psi Pre-Load Lb	Stress Torq Lbft	Wt. Lb
	3/4	1.47									13590	9	.3
	7/8	1.60									18855	8	.3
	1	1.90									24795	14	.6
	1-1/8	2.08									32760	18	.7
	1-1/4	2.25									41805	17	.8
	1-3/8	2.46									51975	34	1.3
	1-1/2	2.70									63000	31	1.5
	1-5/8	2.96									75600	37	1.8
	1-3/4	3.08									89100	52	2.3
	1-7/8	3.59									103500	67	3.4
	2	3.59									119250	78	3.5
	2-1/4	3.95									153900	100	4.1
	2-1/2	4.45									193050	157	6.9
	2-3/4	4.70									236700	193	7
	3	5.20									284400	154	9
	3-1/4	5.45									337050	183	10
	3-1/2	5.70									393750	160	11
	3-3/4	6.20									454959	185	14
	4	6.45									520650	188	16
	4-1/4	6.95									590400	286	22
	4-1/2	7.20									665100	322	23
	4-3/4	7.45									742500	319	25
	5	7.70									810000	313	27
Metric	mm	mm									Lb	Lbft	Lb
	M20	37									15120	7	.3
	M24	43									21825	7	.3
	M27	50									28710	16	.7
	M30	53									35100	20	.7
	M33	58									43830	18	.9
	M36	66									51480	35	1.5
	M39	69									62010	32	1.6
	M42	75									70560	36	1.9
	M45	81									83340	52	2.7
	M48	85									93690	58	2.9
	M52	94									112635	70	3.6
	M56	100									129915	81	4.1
	M60	107									148050	74	4.6
	M64	113									172080	140	7.1
	M72	119									224730	183	7.9
	M80	132									284355	154	9.5
	M90	145									368775	150	12
	M100	164									463950	189	16
	M110	177									570150	385	23
	M120	189									687150	348	26

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FOR PRODUCT
DETAILS & PART
NUMBER

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H650X

Medium Temperature
Torquenuts®
Moly Lubricant (JL-M)

Bolt stress at standard preload: 45,000 psi
Operating Temperature: -50°F to 650°F

Tensioner Body Material:
ASTM-A193-B7

- Fewer jackbolts
- Bigger jackbolts
- Moly lubricant to reduce torque

APPLICATIONS: Boiler feed pumps, boiler circulating pumps, reactors, heat exchangers, etc.



Boiler feed pump rebuild utilizing Superbolt® H650X Tensioners.

Part No	Nominal Thread d In	O.D. D In	Body Thick T In	B.C. C In	OAL L In	Jackbolts No Jb n	Jackbolts Size J In	Hex H In	Washer O.D. Dw In	Washer Thick t In	Standard @45k psi Pre-Load Lb	Stress Torq Lbft	Wt. Lb
	1-1/4	2.34									41805	14	1.0
	1-3/8	2.59									51975	20	1.6
	1-1/2	2.90									63000	27	2.0
	1-5/8	3.05									75600	33	2.4
	1-3/4	3.34									89100	45	3.0
	1-7/8	3.70									103500	55	4.2
	2	3.90									119250	63	4.6
	2-1/4	4.15									153900	82	5.0
	2-1/2	4.55									193050	121	7.7
	2-3/4	4.92									236700	148	8.9
	3	5.30									284400	133	10
	3-1/4	5.30									337050	158	12
	3-1/2	5.90									393750	148	15
	3-3/4	6.15									454950	142	16
	4	6.70									520650	163	20
Metric	mm	mm									Lb	Lbft	Lb
	M30	59									35100	12	1.0
	M33	66									43830	15	1.3
	M36	74									51480	21	2.1
	M39	74									62010	26	2.0
	M42	77									70560	29	2.4
	M45	94									83340	45	4.3
	M48	94									93690	51	4.2
	M52	99									112635	61	4.5
	M56	105									129915	70	5.1
	M60	116									148140	112	8.1
	M64	116									172080	131	7.7
	M72	131									224730	128	9.9
	M80	135									284355	184	12.4
	M90	150									368775	179	15
	M100	170									463950	148	20

CONTACT MAYURA
ENGINEERING FOR
PRODUCT
DETAILS & PART
NUMBER

H/p :012 495 4823

H650T

Medium Temperature Torquenuts®
Tall Profile Series
Graphite Lubricant (JL-G)

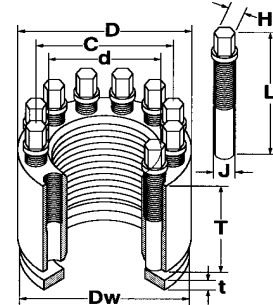


Operating Temperature: -50°F to 650°F • Bolt stress at standard preload: 45,000 psi

Part No	Jack Bolt Lube	Nominal Thread d In	O.D. D In	Torquenut Thick T In	B.C. C In	OAL L In	Jackbolts			Washer		Standard @45k psi		Wt. Lb
							No Jb n	Size J In	Hex H In	O.D. Dw In	Thick t In	Pre-Load Lb	Torq Lbft	
/	JL-G	1	1.67									24795	8.6	.5
/	JL-G	1-1/8	1.80									32760	11	.6
/	JL-G	1-1/4	1.92									41805	9.6	.6
/	JL-G	1-3/8	2.08									51975	10	.7
/	JL-G	1-1/2	2.34									63000	22	1.3
/	JL-G	1-5/8	2.47									75600	22	1.4
/	JL-G	1-3/4	2.62									89100	22	1.5
/	JL-G	1-7/8	2.79									103500	22	1.7
/	JL-G	2	3.06									119250	39	2.5
/	JL-G	2-1/4	3.37									153900	38	2.9
/	JL-G	2-1/2	3.75									193050	55	4.1
/	JL-G	2-3/4	4.13									236700	86	6
/	JL-G	3	4.49									284400	91	7
/	JL-G	3-1/4	4.87									337050	96	8
/	JL-G	3-1/2	5.30									393750	182	12
/	JL-G	3-3/4	5.62									454950	184	13
/	JL-G	4	5.97									520650	187	15
Metric		mm	mm									Lb	Lbft	Lb
/	JL-G	M24	41									21825	7.1	.5
/	JL-G	M27	43									28710	7.4	.5
/	JL-G	M30	46									35100	7.6	.6
/	JL-G	M33	49									43830	8.1	.6
/	JL-G	M36	53									51480	8.3	.7
/	JL-G	M39	61									62010	21	1.4
/	JL-G	M42	64									70560	20	1.5
/	JL-G	M45	67									83340	20	1.6
/	JL-G	M48	72									93690	22	1.8
/	JL-G	M52	79									112590	39	2.7
/	JL-G	M56	84									129915	38	3.0
/	JL-G	M60	90									148140	38	3.5
/	JL-G	M64	96									172080	71	5.3
/	JL-G	M72	106									224730	70	6
/	JL-G	M80	118									284355	78	8
/	JL-G	M90	135									368775	171	13
/	JL-G	M100	149									463950	188	15

CONTACT
MAYURA
ENGINEERING FOR
PRODUCT DETAILS
& PART NUMBER

H/p:012 495 4823



Tensioner Body Material:
ASTM-A193-B7

H650T torquenuts® replace “acorn” and “castle” nuts and are intended for use where space is limited. They are lubricated with JL-G graphite lubricant.

H650TX

Medium Temperature
Tall Profile Series
Moly Lubricant (JL-M)

Operating Temperature: -50°F to 650°F • Bolt stress at standard preload: 45,000 psi

Part No	Jack Bolt Lube	Nominal Thread d In	O.D. D In	Torquenut Thick T In	B.C. C In	OAL L In	Jackbolts			Washer		Standard		Wt. Lb
							No Jb n	Size J In	Hex H In	O.D. Dw In	Thick t In	Pre-Load Lb	Torq Lbft	
/	JL-M	4-1/4	6.40									590400	158	22
/	JL-M	4-1/2	6.66									665100	156	23
/	JL-M	4-3/4	7.10									742500	155	27
/	JL-M	5	7.40									810000	152	29
/	JL-M	5-1/4	7.90									913500	156	33
/	JL-M	5-1/2	8.25									1030500	161	39
/	JL-M	5-3/4	8.80									1102500	159	46
/	JL-M	6	9.40									1206000	162	53
Metric		mm	mm									Lb	Lbft	Lb
/	JL-M	M110	166									570150	185	24
/	JL-M	M120	180									687150	191	28
/	JL-M	M140	198									926100	180	36
/	JL-M	M160	236									1215900	197	47

CONTACT
MAYURA
ENGINEERING FOR
PRODUCT DETAILS
& PART NUMBER
H/p: 012 495 4823

Tensioner Body Material:
ASTM-A193-B7

H650TX torquenuts® replace “acorn” and “castle” nuts and are intended for use where space is limited.



Ingersoll Rand boiler feed pump with 6" diameter studs (H650TX-600-8/w). With air tools, tightening required only 2-1/2 hours.

High Temperature Products



New Patented Technology



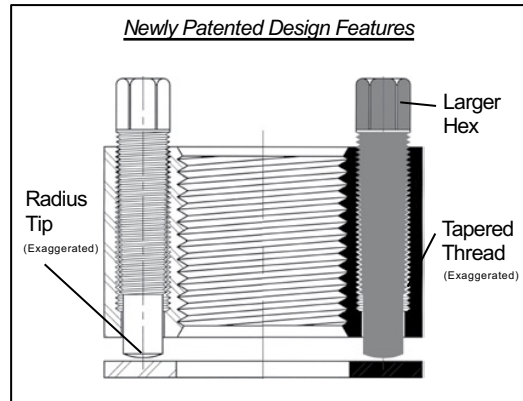
High temperature bolting applications still remain the most challenging for engineering and maintenance personnel. Using our years of bolting experience, Superbolt® has improved upon the original Multi-Jackbolt design. The result is, simply the best high temperature bolting method available.



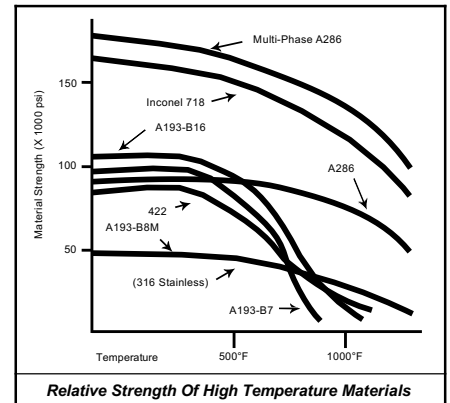
Improvements on the Original Design:

- Tapered Jackbolt Thread reduces the friction factor by distributing the load more evenly over the threads. This reduces torque requirements and greatly reduces removal effort. Threads are precision rolled for improved toughness and hardness.

- The Rc 45 rolled jackbolt thread exhibits consistently easy breakaway performance when mated with the softer nut body thread, even after the lubricant has burnt off.



- Rounded jackbolt tip reduces friction and leaves only minor marking of the washer. This also results in reduced torque requirements and easier removal.

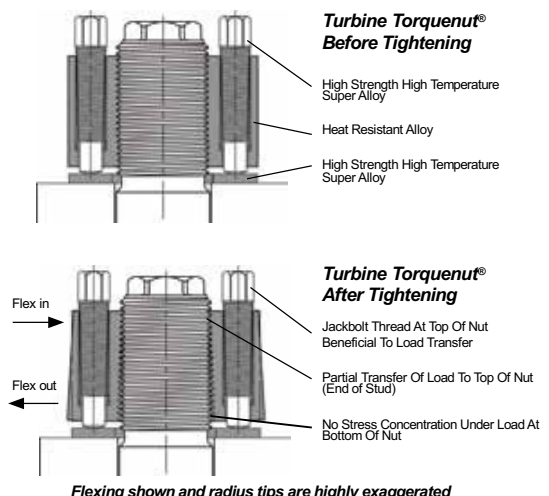


- Larger hex is cold worked and cold formed. The larger hex and lower torque requirements, eliminate socket breaking.

High Flexibility for Tighter and More Permanent Joints

The increased elasticity of Multi-Jackbolt tensioners on high temperature flange and joint applications is critical to permanent sealing under operating conditions. Increasing bolting elasticity can compensate for flange and joint instability caused by temperature changes, changes in internal pressure and joint movement.

The flexing action in Superbolt® nut type tensioners is also beneficial in reducing stress concentrations on the male thread. When the jackbolts are tightened, the nut body flexes in slightly at the top (clamping the threads tighter) and flexes out at the bottom. This nut body flexing removes stress concentrations from the first few threads and distributes the stresses more evenly along the entire length of the threaded area, significantly improving load capacity and fatigue resistance.



High Temperature Products



Torquenuts® (650°F - 1200°F*)

Materials: Various material combinations are available including ASTM A193 Grade B16, 300 and 400 series stainless, nitrogen strengthened austenitic, and other various superalloys such as A286 and Inconels. Besides use for high temperature applications over 650°F, these products are also suitable for food, corrosion, and non magnetic applications down to -423°F (For low temperature service, additional material testing and certification may be required).

*Note: The temperature at the nut location is often lower than the process temperature. If the nut temperature is below 650°F, the medium temperature series on pages 20 and 21 can also be used.



Turbine control valve



HP turbine and valve



Turbine control valve



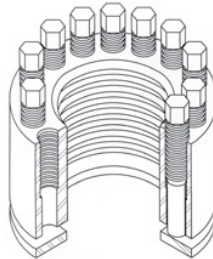
IP turbine



Turbine stop valve

H1215

Body OD / Stud Dia = 1.5 (approx.)



Ex: 2-1/4" stud size
(16) 10mm jackbolts

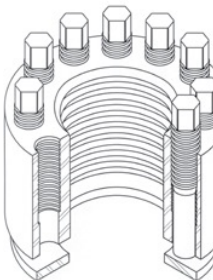
H1215 Supernuts® have the smallest spotface design and will retrofit even the tightest nut spacing.

- Replaces "castle" and "acorn" nuts
- Smallest nut O.D., approx. 1.5x stud dia.
- Most number of jackbolts
- Smallest diameter jackbolts
- Lowest jackbolt torque
- For stud sizes up to 6" diameter and over

Prestress: Usually limited to 45,000 psi bolt stress.

H1216

Body OD / Stud Dia = 1.6 (approx.)



Ex: 2-1/4" stud size
(12) 12mm jackbolts

H1216 Supernuts® feature a slightly larger spotface than the H1215 Series. The H1216 is preferred to the H1215 if flange spotface room exists.

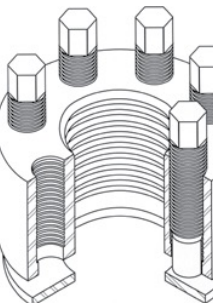
- Replaces many "acorn" & "castle" nuts.*
- Intermediate series, approx. 1.6x stud dia.
- Usually fewer jackbolts than 1215 series
- Some sizes have the same number of jackbolts as H1215 but of a larger dia.
- Some sizes can achieve higher preloads than the H1215 series
- For stud sizes up to 4" diameter

Prestress: 45,000 psi - 60,000 psi bolt stress.

*Usually the H1216 has a slightly larger OD than the original acorn or castle nut, but it can be used as long as spot face room is available on the flange.

H1218

Body OD / Stud Dia = 1.8 (approx.)



Ex: 2-1/4" stud size
(8) 16mm jackbolts

H1218 Supernut® Tensioners have the largest diameter of the three series.

The larger diameter nut body permits larger diameter jackbolts, resulting in fewer jackbolts. This allows the H1218 to be installed and removed in the shortest time.

- Typically replace heavy hex nuts. Can also replace "acorn" and "castle" nuts if flange spotface room exists
- Largest nut O.D., approx. 1.8x stud dia.
- Least number of jackbolts
- Largest diameter jackbolts
- For stud sizes up to 2-3/4" diameter

Prestress: 45,000 psi - 60,000 psi. Higher prestress available with custom design.

High Temperature Bolting System



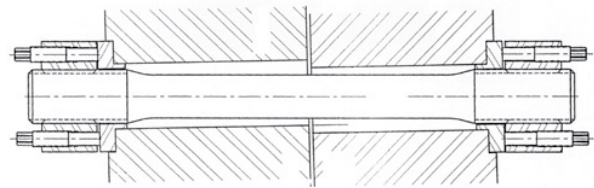
PROBLEM: The strength of ASTM A193 Grade B16 material falls away rapidly approaching 1,000° F (See chart on page 22) When used for studs above 950° F, leaks can occur if the joint is not engineered properly to withstand the high temperature creep of the studs. 12% chrome material (422 SS) can sometimes improve the situation as it's creep strength is slightly better (See page 22). However, 422 SS has a very different expansion coefficient than typical CrMoV housings. This can cause leakage problems for equipment that operates through frequent temperature cycles.

SOLUTION: A smaller diameter Inconel stud tensioned to a higher stress level. Inconel can easily hold higher stress levels (80-90ksi) at 1,000° F+ service and it has an expansion coefficient compatible with the CrMoV housing. A Superbolt® Tensioner is used to achieve this high bolt stress level where traditional tightening methods cannot. With a smaller stud and the same nut O.D., larger jackbolts can be used making the high powered Supernut highly stable at 1,000° F+. The system has many benefits which work together to improve integrity of the joint.



High pressure steam lead with rotational misalignment of bolt holes. Solved leakage and history of bolt failures.

Applications: Steam Inlet flanges, stop valves, control valves, turbines, high temperature vessels, and more.



Smaller diameter Inconel studs can be inserted with rotational misalignment of bolt holes. Jackbolts compensate for non-perpendicular surface.

Benefits:

Increased clamping load on the joint at elevated temperature - Inconel 718 studs are highly stable at temperatures up to 1000° F and maintain preload throughout operation.

load, galling of the main thread will not occur. Additionally, studs are easily extracted from the housing even after long-term service.

Lower contact stress to housing - Utilizing the original bolt pattern, the smaller O.D. studs result in lower contact stress to the housing material.

Reduce man hours and downtime - Most tensioners can be installed or removed in only a few minutes.

Improved bolt elasticity - The tensioner body expands at the base and contracts at the top very slightly. This "flexing" action introduces a stored energy to the bolt. Bolts also have added elasticity due to the smaller diameter and their higher operating stresses. The result is an improved elasticity. The joint is more forgiving and will maintain the clamping load even through harsh, thermal cycling.

For new designs, reduce the size of the flange or housing - Due to the small space requirements of Superbolt® systems, our tensioners can be positioned to the point of nearly touching, saving you space and materials in your design.

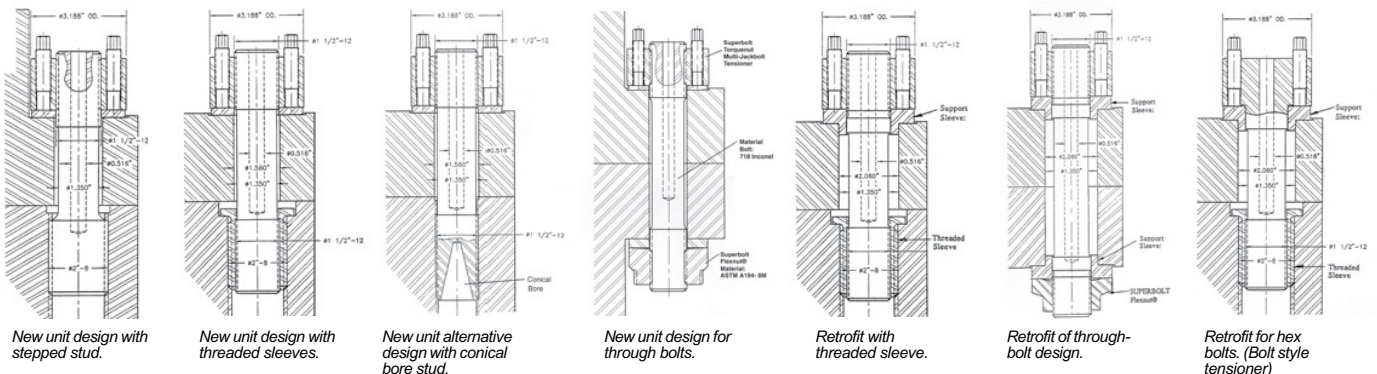
Improved preload accuracy - Even precision torquing of standard nuts yields substantial scatter in bolt preload. Accuracy of SB Tensioners is 5-10%.

Lower initial cost - Less expensive than utilizing full size Inconel 718 studs.

Eliminates galling - Stud preload is achieved in pure tension (no torsional stress component). Since the main thread does not slide under

THE RESULT

Solves leakage problems on difficult joints! Even designs prone to leakage can often be sealed permanently.





Main steam inlet flange.



Control valve.



Nuclear plant turbine generator bearing housing. (6) MT-300-8/w Supernuts®.

Supernuts® are ideal for nuclear plant critical and high radiation applications. Significant savings in worker exposure and outage time are realized.

Applications: valves, heaters, manways, pumps, turbines.

Manufactured from approved ASME materials.



Corrosion Resistant Hull Integrity Stud/Bolt Tensioners

Monel Multi-Jackbolt Tensioners are designed as an alternative to Mil-N-25027/1 Heavy Hex Monel Self-Locking nuts. They are shock qualified and salt water proof, ideally suited for commercial marine, Navy, and offshore applications. They are especially useful where space limitations exist.

(LEFT) Superbolt® tensioners passing shock qualifications at hull integrity levels at the HiTest Laboratories facility, Arvonia, VA.

Corrosion Protection Options



Electroless nickel plated tensioner.

From the top: Black oxide coated tensioner, Xylan coated torquebolt, Xylan body with Dacromet® jackbolts, Cadmium plated tensioner, stainless steel tensioner, and bright zinc plating tensioner.

Superbolt® manufactures tensioners from various materials for all types of corrosive applications. We also offer various coatings and platings for our standard carbon alloy steel tensioners. A Superbolt® sales associate will be able to discuss with you the various material and plating options.

Materials: including various martensitic, austenitic, and precipitation hardening stainless steels, Inconels and Monels.

Thrust Collars



Superbolt® thrust collars consist of unthreaded rings with jackbolts which are used primarily on the bearings on large steel mill rolls. The thrust collar is positioned close to the bearing, then a split ring is inserted behind the collar. As the jackbolts are tightened, the collar is thrust against the split ring to preload the bearing.

Thrust collars have been shipped in sizes up to 40" inside diameter, capable of creating 4,500,000 lbs of bearing preload. Typical inside diameters range from 5" to 30", but virtually any size can be designed and produced.

Due to the massive size of the rolls and associated equipment, thrust collars have proven to be advantageous for worker safety and injury reduction. Previously, the large bearing locknut arrangements were difficult to tighten and to keep tight. Sledge hammers, large pry bars, and overhead crane rigging were utilized, with back, hand and muscle injuries very common. Superbolt® thrust collars are usually installed with air power wrenches, followed by a standard torque wrench to verify the final target jackbolt torque.



Multiple Superbolt® Thrust Collars used on a rolling mill.

Specials



Superbolt® manufactures its products in special sizes, threads, configurations, materials and ratings. Our engineers encourage discussion of special problem applications. Where drawings are available, a comprehensive review will determine requirements,

identify restrictions and develop solutions to specific problems. From 1" special mill motor nuts to 12" tensioners to 40" thrust collars, the Superbolt design team is ready to help.



External thread Compression screw. Patent pending. Retrofit setscrew / jamscrew, any size.



Tensioner used to secure Canadarm 2 during space launch.



Large Multi-Jackbolt split tensioner for use on a forging press with 28 inch diameter threaded tie-rods.



3"-8 tpi covered Supermut®. Used on pressure vessel hydrotest and final assembly.



The worlds largest Torquebolt® being installed on a large hydraulic forging press.

Installation and Removal Tips

(Procedure on back)



Installation Preparation:

				
<p>Superbolt® Product: Confirm jackbolts are lubricated with correct Superbolt lubricant (JL-G or JL-M). New product is lubricated at the factory. Make sure the jackbolt tips are flush (or recessed) with the bottom of the nut body.</p>	<p>Torque Wrenches: Select appropriate hand tools, depending on your target torque.</p>	<p>Sockets: High hex stresses require the use of quality six-point impact sockets. Have several spares handy for each job and replace them at the first sign of wear. Special Superbolt® sockets may be required when using a 3/4" impact or torque wrench when jackbolt spacing is close.</p>	<p>Installation Sheet (shipped with product). Determine the target jackbolt torque. NOTE: The jackbolt torque stamped on the tensioner is a standard value for that part and may not be correct for your application.</p>	<p>Air Impacts: If using air impacts, select a tool with an output of about 100% - 110% of the target torque. See "Air Impact Tool Selection" below.</p>
		<p>Further Preparation Steps:</p> <ol style="list-style-type: none"> 1) Lubricate the thread of the main stud. 2) Slide the hardened washer onto the stud. 3) Lubricate the washer face or jackbolt tips with the correct Superbolt® lubricant (JL-G or JL-M). 		
<p>Lubricants: Jackbolts are pre-lubricated from the factory with either JL-G or JL-M lubricant. For the main stud any standard anti-seize lubricant can be used. For reuse after temperature service, remove, clean, and re-lubricate the jackbolts with the correct Superbolt® lubricant.</p>	<p>Washers: Apply the correct Superbolt® lubricant to the washer face or to the jackbolt tips.</p>	<p>For flanges: To speed up installation, use two workers at 180° apart, following OEM pattern for tightening.</p>		

Helpful Tips :

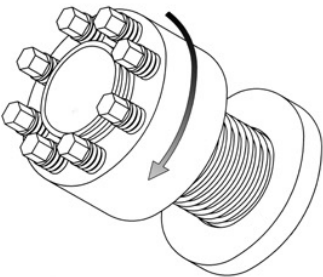
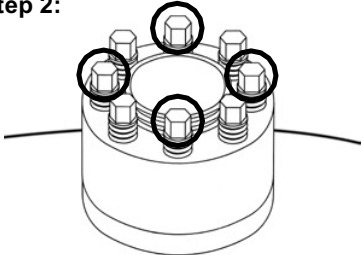
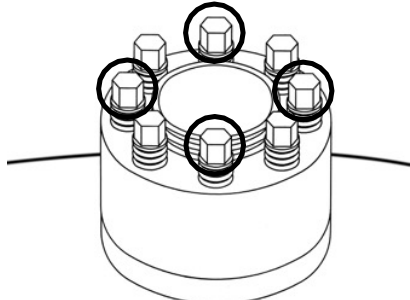
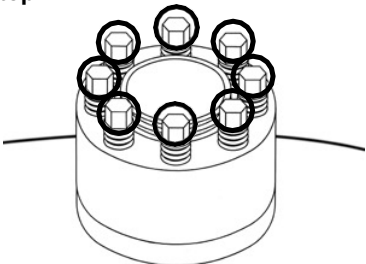
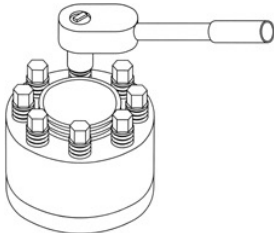
<p>Prior to Tightening:</p>
<p>1)Check threads of main stud: If possible, verify that the tensioners spin on prior to the installation date. If a tensioner is tight or will not thread on, try using lapping compound on the main thread and work the tensioner in a back and forth motion making small advances when the thread loosens up. If necessary, chase the studs with a die.</p> <p>2)Use of spacers: Tensioners should be positioned at the ends of the studs to minimize exposed threads and facilitate easy access to the jackbolts. A spacer (or stacked washers) can be used beneath the special hardened washer to accomplish this. A spacer will also "step over" a damaged area on a stud where years of bolting have deformed the first few threads.</p> <p>3)Back the tensioner off before tightening to provide 1/16" to 1/8" gap: The additional jackbolt extension provides easy access for oiling the jackbolt tips prior to removal. This is especially beneficial for oiling when the tensioners are inverted. Note: There may be insufficient jackbolt stroke to allow this step when tensioning exceptionally long bolts or tie rods, or when closing a gap between flanges.</p> <p>4)For spinning the tensioner on and off the stud: Custom "sockets" which grip the tensioner are available. Also, two deep well sockets inserted over two jackbolt hex's at 180° apart can serve as "handles" for spinning the tensioners on and off the studs.</p>
<p>For Tightening:</p>
<p>5)To improve efficiency when using impacts: Don't wait for the socket to stall completely on a specific jackbolt before advancing to the next jackbolt. It is faster, overall, to move quickly between jackbolts.</p> <p>6)Overshooting the target torque: You may want to use 110 - 120% of the target torque for Step 3, Step 4, and for 1-2 rounds of Step 5. This may eliminate a tightening round. Be careful not to stabilize all of the jackbolts at this torque however. For long bolts or tie rods, you may want to experiment using even higher torque values. Call Superbolt before using more than 120% target torque.</p> <p>7)For gasketed joints: During gasket compression, the load is transferred to the jackbolts (i.e. stud) being tightened. Don't be concerned if some jackbolts (or tensioners) become loose during the procedure. Continue following the procedure. Don't spin down tensioners that become loose during gasket compression.</p>

<p>Air Impact Tool Selection 90 psi air pressure</p>
<p>(Call Superbolt® for additional help with air tool selection)</p>
<p>NOTE: The jackbolt torque actually achieved by an air impact wrench is usually only 30 - 50% of its rated output. For minimum hand work, use an air impact with an output of 110% - 120% target torque. For maximum power, use the largest air line fitting.</p>
<p>Up to 70 ft-lbs: For 15 - 35 ft-lbs use a right angle ratchet or light duty 3/8" impact. For 35 - 70 ft-lbs use a heavy duty 3/8" impact. 70 - 100 ft-lbs: Use a light duty 1/2" impact at a reduced pressure or setting. (Be careful not to overtighten! Calibrate the impact before starting.) 100 - 170 ft-lbs: For 100 - 130 ft-lbs use a light duty 1/2" impact. For 130 - 170 ft-lbs use a heavy duty 1/2" impact. 170 - 200 ft-lbs: Use a light duty 3/4" impact on low setting. Some heavy duty 1/2" impacts will also reach this range. Over 200 ft-lbs: For 200 - 300 ft-lbs, use a light to medium duty 3/4" impact. Over 300 ft-lbs, use a heavy duty 3/4" impact.</p>
<p>Calibrating an air impact wrench: Tighten one jackbolt until the socket rotation stops and check the jackbolt with a torque wrench. The torque required to move the jackbolt further is the output of the impact as measured on Superbolt® tensioners.</p>

<p>Helpful Tips For Removal:</p>
<p>8)1/4 turn or less! Removing the jackbolts more than a 1/4 turn will increase the removal torque of the remaining jackbolts and you may get stuck. If this happens, you will have to retighten and start again.</p>
<p>9)Stuck jackbolt removal: If a jackbolt will not turn, remove, relube, and retighten a neighboring jackbolt and then try to turn it.</p>

For stubborn removal, please call for alternate procedure

Installation Procedure (This procedure excludes piston end, crosshead, mill motor & bearing lock nuts)

<p>Step 1:</p>  <p>Spin the tensioner onto the main thread until it seats against the washer. You may want to back off the tensioner slightly as mentioned in Helpful Tip #3.</p>	<p>Step 2:</p>  <p>Tighten (4) jackbolts at 90° apart (12:00, 6:00, 9:00, and 3:00) on all studs with a partial torque (30-70%). This serves to seat the flange. If using an air impact, use a reduced setting or lightly pulse the trigger at the full setting.</p>	<p>Step 3:</p>  <p>At 100% target torque, tighten the same (4) jackbolts on all studs.</p>
<p>Step 4:</p>  <p>At 100% target torque, tighten all jackbolts in a circular pattern. Do this for all studs (1 round only). See Helpful Tip #7 about using up to 120% torque.</p>	<p>Step 5:</p>  <p>Repeat "STEP 4" until all jackbolts are stabilized (less than 10° rotation). This usually requires 2-4 additional passes. If using air tools, switch to a torque wrench when socket rotation is small. Use the torque wrench to stabilize at the target torque.</p>	<div style="border: 1px solid black; padding: 5px;"> <p>NOTE: Product with 4 or 6 jackbolts - use a star pattern for all steps.</p> </div>

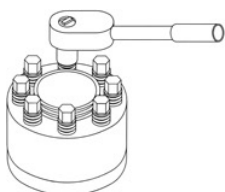
Removal Procedure

CAUTION! Jackbolts must be unloaded gradually. If some jackbolts are fully unloaded prematurely, the remaining jackbolts will carry the entire load and may be hard to turn. With extreme abuse, a jackbolt tip can deform, making removal difficult.

Service Under 250°F

Preparation: Spray jackbolts with penetrating oil or hydraulic oil prior to start (especially if product is in corrosive environment).

Step 1:



Loosen each jackbolt 1/8 turn following a circular pattern around one by one. For long bolts or tie the tensioner (1 round rods, additional rounds may be required before removing the around and get back to jackbolts with an impact tool. the first jackbolt, it will be tight again. Do this for all studs on the joint prior to the next step.

Step 2: Repeat a 2nd round as above for all studs, now loosening each jackbolt 1/4 turn in a circular pattern.

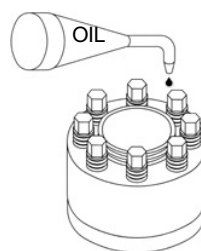
Step 3: Continue loosening 1/4 turn for 3rd and successive rounds until all jackbolts are loose. *NOTE: Usually after the 3rd or 4th*

Step 4: Remove, clean and re-lubricate the jackbolts prior to next use with correct Superbolt lubricant (JL-G or JL-M).

Service Over 250°F

Preparation: Above 300°F the petroleum base of the lubricant burns off. Oil per "STEP 1" below to reduce the removal torque.

Step 1:



As the equipment is cooling down (around 300°F), apply hydraulic oil to the jackbolts and washer and let sit for several hours. Thoroughly "wet-down" all components and re-apply during equipment cool down period. If the tensioner is inverted,

squirt oil in the gap between the nut body and the washer. Synthetic oil can be used for oiling above 300°F.

Step 2: Wait for tensioners to cool below 200°F. Using a circular pattern, "crack" each jackbolt only enough to ensure movement. Do not turn beyond the break loose point. Do this for all studs.

Step 3: Now begin with "STEP 1" of the procedure for service under 250°F.

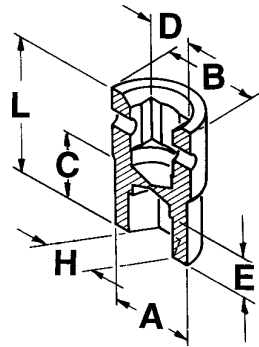
NOTE: Heating Rods can be used to reduce the removal torque required.

Sockets

Web-site



Superbolt® offers a line of extra strong socket tools designed to torque external hex jackbolts. For the classic ST series, as well as those products which have setscrews for jackbolts, a collection of Allen type hex bits is available. As a service, Superbolt®, Inc. can



provide various torquing devices in all common drive sizes.

Special tools, including wrench units which encompass the jackbolts are also available.



Our web-site offers extensive application examples, basic bolting information, and features an online help section for installation and removal.

Also, if you don't have it already, you can request our "Solution To Bolting Problems" DVD, and our "Installing and Removing Superbolt Tensioners" CD-Rom online.

Lubricants

The torque-preload relationship of Superbolt® tensioners depends on the tensioner body and jackbolt materials, heat treatment, plating, lubricants, and other factors. Superbolt® engineers have performed extensive tests to determine the best lubricants for the various materials utilized by Superbolt®, Inc. In an emergency, a number of commercially available graphite or nickel based lubricant compounds can be used for jackbolt re-lubrication in the field, however, obtained preload may not be accurate.

Copper bearing compounds have not performed well as jackbolt lubricants.

Two custom lubricants, JL-G and JL-M are RECOMMENDED by Superbolt®. Both compounds have a higher solids content than commercially available compounds. They have performed better as jackbolt lubricants, particularly in high temperature applications. JL-G and JL-M are available in various container sizes and can be ordered directly from Superbolt®.

Proper Lubricant should be applied to the tips of the Jackbolts prior to installation.

JL-G is a lubricant paste made from selected flaky graphite and pure mineral oil. It has a relatively uniform friction factor of 0.130 under widely varying conditions.

JL-G is used in the assembly of most Superbolt® products. Tests show that as long as the lubricant is intact, the torque-preload relationship does not change appreciably in subsequent tightenings. Re-lubrication of jackbolts after lengthy or high temperature service restores Superbolt® products to their original performance.

JL-M is a lubricant paste with a high concentration of Molybdenum Disulfide powder. JL-M lubricant has the lowest coefficient of friction available commercially. Friction factors approach 0.055, once broken in.

In addition to being used on several product lines, this lubricant is used on products with larger jackbolts (roughly 5/8" and up) enabling high bolt preload capacities with a low torque input (approximately 1/2 the torque of JL-G). This also helps reduce wear



on sockets and adds the possibility of using smaller wrenches. JL-M should not be used on applications above 650° F.

As with all lubricants, it is important to apply some to the jackbolts prior to installation.

Application Examples:

Gas Compression:

Applications include: Crosshead jamnuts, counterweight crosshead jamnuts, couplings, connecting rod nuts, distance pieces, end plates, compressor cylinders, doghouse bolting, piston end nuts, valve jackbolts, and more...



Reciprocating compressor, distance piece.



Crosshead nut.



52 two inch tensioners on a centrifugal compressor were tightened in 2-1/2 hours.

Petrochemical:

Applications include: Reactor covers, heat exchanger heads, turbine control valves, turbine joints, pipe flanges, anchorbolts, couplings, and more...



Installation and removal requires only 1-2 hours for this reactor cover.



Steam turbine easily installed despite inverted position.



Large methanol reactor with 11" studs. Six hours with Superbolt® vs. two days with Hydraulic Tensioners.

Mining:

Applications include: Boom points, ring gears, side frames, hoist motors and pedestal tie-downs, draglines, pinion gears, hoist and drag drums, split gears, bolted segments, excavator bearing caps, and more...



Gyratory crusher.



Ring Gear.



Hoist and drag drums.

Hydro Power:

Applications include: Turbine couplings, blade bolts, turbine wheel to shaft bolting, pelton turbine nozzels, servo piston nuts, bearing housings, and more...



Kaplan blade bolts.



Coupling bolt installation utilizing Expansion Bolts.



Overhead work is simplified with the low torque requirement on this Turbine Wheel to Shaft bolting. Galling and seizure is eliminated.

Presses:

Applications include: Press columns, tie rods, bearing blocks, high pressure piping, die cushions, cylinder ram bolting, anchorbolts, and more...



Press Platen repaired with tie bolts and Supernuts®.



8 Superbolt® column nuts required only 12 man hours vs. 2-1/2 full days for heating of columns.



Stamping press.

Steam Power:

Applications include: Turbine couplings, stay rods, manway doors, inlet flanges, boiler circ pump main flange, boiler feed pump head and barrel casing, and more...



Two workers needed only 1 hour and 21 minutes to tighten these 5" tensioners.



Steam turbine inlet flange. 30 minutes to install, 15 minutes to remove.



High pressure feedwater heater.

Steel Mills:

Applications include: Thrust collars, coupling bolts, tie rod nuts, anchor bolts, mill motors, bearings, shaft mounts, roll tables, BOF applications, EAF applications, coilers, hydraulic cylinders, machine tools, cranes, slitter knives, universal joints, back-up roll bearings, work roll bearings, pipe mills, and more...



Side Trimmer Nuts.



Mill Motor Nuts - SMX Series on crane motor brake drums.



EAF Electrode Arm Assembly.

For More Application Examples:

Visit <http://www.mayuraengineering.com> to see more examples of Superbolt® products in action. There you can see more detailed descriptions of the bolting problems our clients were experiencing and how our products solved them.



Petro-Chemical

Steam Power

Hydro Power

Steel & Industrial

Mining

Automotive

Miscellaneous



Across every industry, in the toughest of conditions, Superbolt® products have proven themselves as the most reliable, cost-effective bolting solution available. We look forward to solving your bolting problems!



THE SOLUTION TO YOUR BOLTING PROBLEMS!

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