

# Operation Instructions

**TG Series Interchangeable Hydraulic Bolt Tensioner**

**TS Series Spring Return Hydraulic Bolt Tensioner**

**TW Series Special Multi-Stage Hydraulic Bolt Tensioner for Wind Turbine**



Please read these instructions carefully before operating. And keep instructions properly for future reference.



These instructions contain warnings, precautions, operation methods for TG, TS, and TW series hydraulic bolt tensioners.

These operation instructions are only for the reference of the end users.

## I. Receiving Notice (Unpacking Inspection)

Visually inspect all components for shipping damage. Shipping damage is not covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

## II. Warnings and Precautions

### Safety First

Please carefully read and understand the operation contents of these instructions before use and abide by these operation rules to prevent the personal injuries and equipment damages during operations of the equipment. SAIVS will not be liable for any damage arising from the incorrect operations.



**Warning:** Operate only by professionals and wear protective articles (such as goggles) during operations.



**Warning:** Keep a 3~5m distance from the bolt tensioner during the pressure rise of the hydraulic tensioner. Never stand on the straight front of force-applying direction. Ensure to carefully monitor the increasing of hydraulic oil pressure by operator (by observing the pressure gauge). During the continuous increasing of pressure, if the pressure seemingly fails to increase, immediately stop the pressure rise. In such case, it probably indicates the occurrence of stretching deformation of the bolt. Therefore, immediately check the threaded connections and dimensional fit accuracy.



**Warning:** Adjust the operating pressure of hydraulic pump based on the required tightening torque. The piston of the hydraulic tensioner is marked with red stroke warning line. Do not operate beyond this stroke during operations.



**Notice:** Do not overload or operate the hydraulic tensioner beyond the stroke limit during operations.



**Warning:** It's prohibited to use damaged, worn, or aged sealing subassembly, hydraulic

hose, or quick coupling.



**Warning:** If the hoisting, handling, or transfer of the heavy-duty tensioner is required during construction, tighten the eyebolts before operation.

### III. Overview

Also referred to as hydraulic tensioner, the hydraulic bolt tensioner boasts the tightening and disassembling functions for the bolts and can be extensively applied for metallurgy, mining, petrochemical, ship industry, and locomotive manufacturing industries. By means of the hydraulic power supplied by the super-pressure hydraulic pump and the permissible elasticity of the material, it stretches the bolts to realize the tightening and disassembling of the bolts. In addition, it can also be used as a device for applying axial force onto hydraulic interference connections for press-fit installation. Especially for the seriously polluted working environments or the working environments with limited spatial area, the hydraulic tensioner is non-replaceable by any other tool and is an ideal process equipment for assembling of large and medium machinery products and repairs of equipment.

#### **Product features of TG series hydraulic bolt tensioner:**

1. It's applicable for tensioning the bolts of diversified specifications with the change of tensioning head, featuring powerful applicability.
2. The gravity return function features simple structure, low cost, and convenient operations.
3. It features compact structure, light weight, and high tensioning force.
4. It's applicable for 3/4"- 4" (M20-M100) bolts, with torque output at 227~2,643KN, maximum operating pressure at 1,500Bar, and effective [stroke](#) at 15mm.

#### **Product features of TS series hydraulic bolt tensioner:**

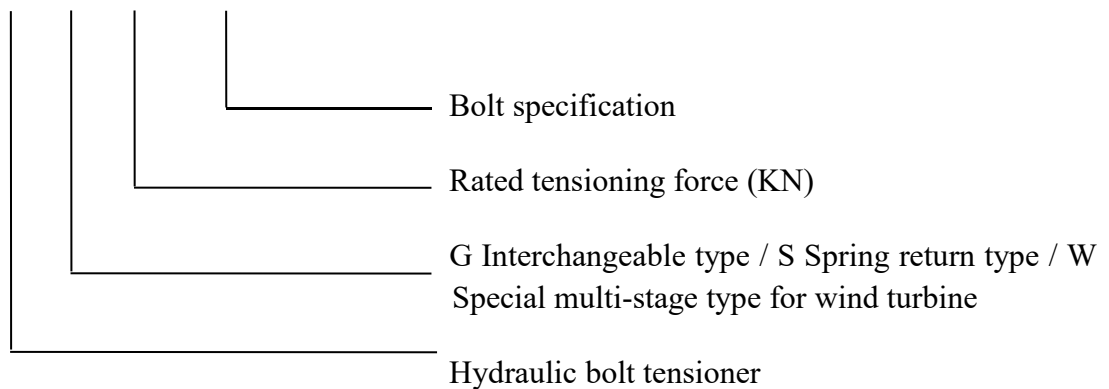
1. It's applicable for tensioning the bolts of diversified specifications with the change of tensioning head, featuring powerful applicability.
2. The spring return functions features simpler operations.
3. It features high accuracy, fast speed, and high operating safety.
4. It's applicable for 3/4"- 4" (M20-M100) bolts, with torque output at 180~3,109KN, maximum operating pressure at 1,500Bar, and effective [stroke](#) at 15mm.

## Product Features of TW Series Special Multi-Stage Hydraulic Bolt Tensioner for Wind Turbine

1. The multi-stage cylinder design maximizes the tensioning length.
2. With compact structure, high tensioning force, and high carrying capacity, it's suitable for operations in narrow space.
3. The automatic spring return function and over-stroke protection function are suitable for frequent operations.
4. It features 700~1500bar operating pressure and 10mm effective stroke.
5. It's extensively applied for installation of wind turbine towers.

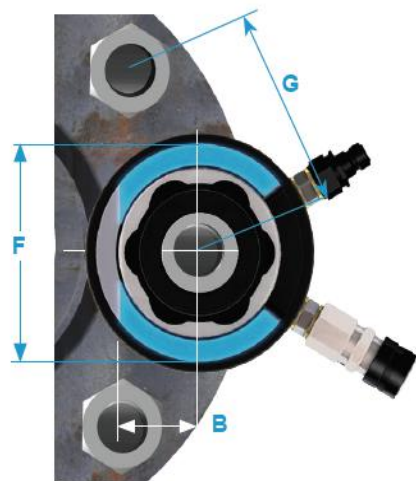
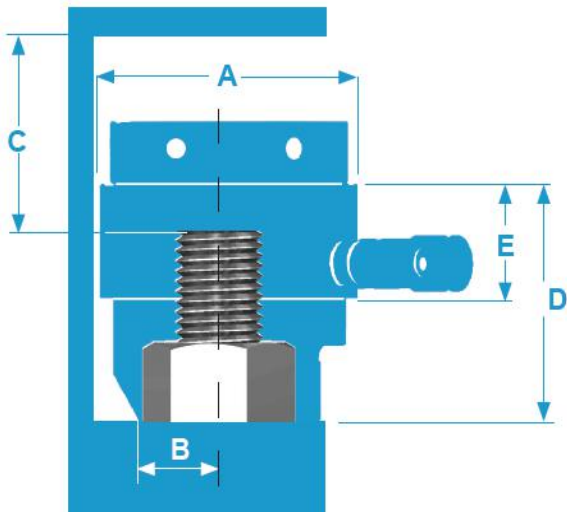
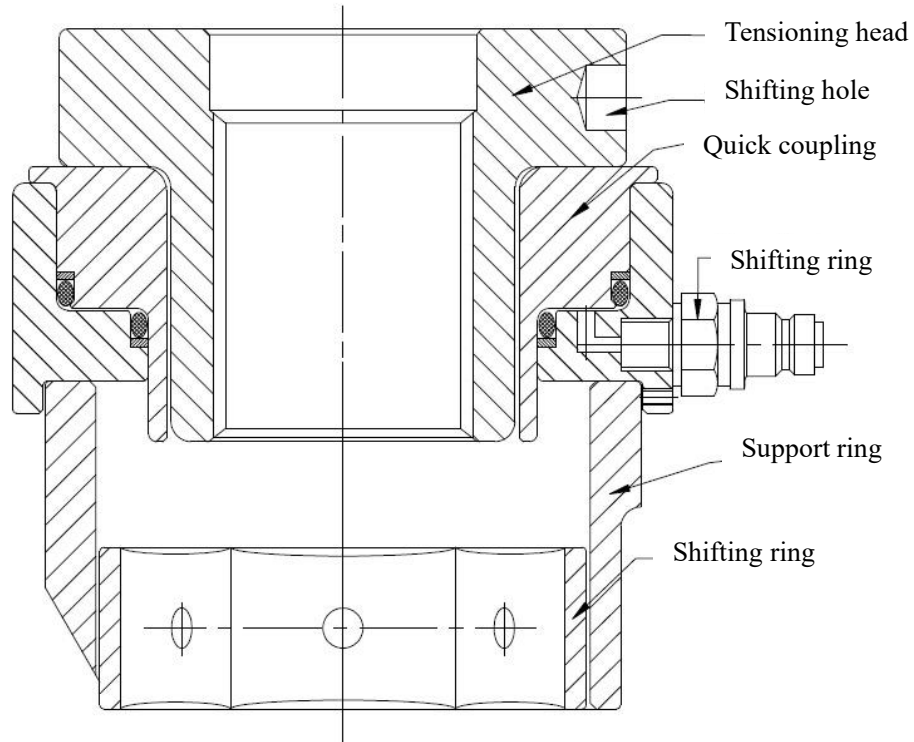
### IV. Model Description

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## V. Main Technical Specification

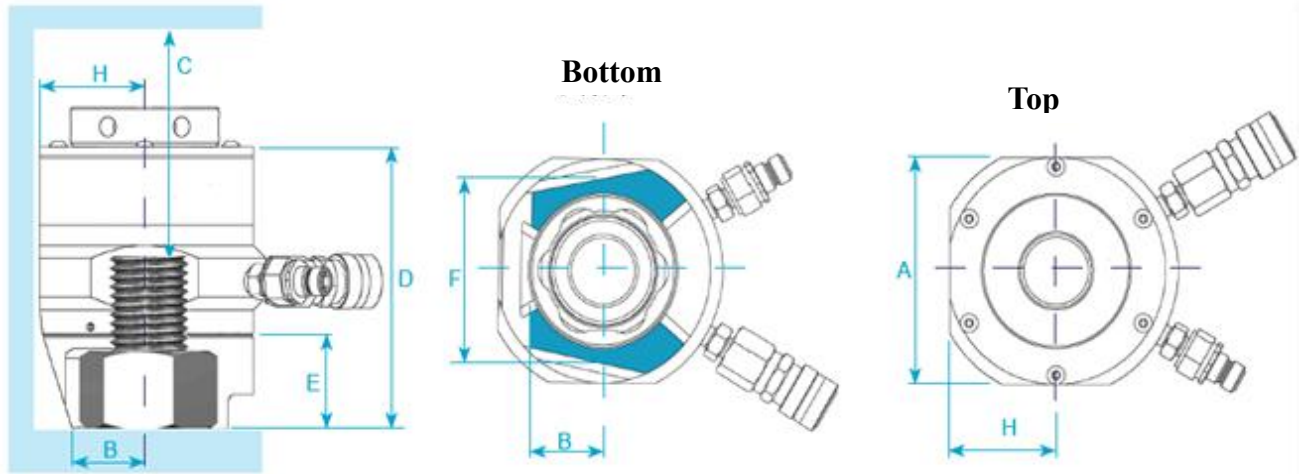
### TG Series



Type	Model	Bolt		Model	Rated force KN	Maximum stroke		Weight kg	A	B	C	D	E	F	G	
	<u>Imperial</u>	inch	mm	Metric		mm	mm		mm							
TG2	TG2-N3/4	3/4"-10UNC	M20x2.5	TG2-M20	227.81	10	2.0	73.5	21.0	67.0	71.0	45	62	49.5		
	TG2-N7/8	7/8"-9UNC	M22x2.5	TG2-M22			1.9		24.0	64.0	71.0		63	53		
	TG2-N1	1"-8UN	M24x3	TG2-M24			1.9		24.0	69.0	78.0		69	58.5		
	TG2-N1-1/8	1.1/8"-8UN	M27x3	TG2-M27			1.9		24.0	66.0	79.0		74	63.5		
TG4	TG4-N1-1/8	1.1/8"-8UN	M27x3	TG4-M27	443.00	15	4.8	102	27.0	85.0	92.0	54	82	67.6		
			M30x3.5	TG4-M30			4.9		32.0	85.0	93.0		85	69		
	TG4-N1-1/4	1.1/4"-8UN	M33x3.5	TG4-M33			4.6		31.0	84.0	95.0		85	72		
	TG4-N1-3/8	1.3/8"-8UN	M36x4	TG4-M36			4.6		34.0	84.0	98.0		91	78		
TG4-N1-1/2	1.1/2"-8UN	M39x4	TG4-M39		4.7	36.5	82.0	100.0	90	80						
TG8	TG8-N1-1/2	1.1/2"-8UN	M39x4	TG8-M39	810.85	15	9.5	133	36.5	98.0	109.0	56	97	83.5		
	TG8-N1-5/8	1.5/8"-8UN	M42x4.5	TG8-M42			9.0		37.5	93.0	107.0		110	92.5		
	TG8-N1-3/4	1.3/4"-8UN	M45x4.5	TG8-M45			9.3		40.5	98.5	116.0		115	98		
	TG8-N1-7/8	1.7/8"-8UN	M48x5	TG8-M48			9.0		42.5	95.0	116.0		116	101		
TG8-N2	2"-8UN	M52x5	TG8-M52		8.6	50.0	93.5	117.0	120	106						
TG12	TG12-N1-7/8	1.7/8"-8UN	M48x5	TG12-M48	1273.16	15	16.1	163	43.5	106.0	118.0	57	130	108		
	TG12-N2	2"-8UN	M52x5	TG12-M52			15.7		46.0	102.5	117.0		124	108		
	TG12-N2-1/4	2.1/4"-8UN	M56x5.5	TG12-M56			18.3		55.0	103.0	123.0		134	118.5		
			M60x5.5	TG12-M60			18.3		54.0	121.5	145.5		150	127		
TG12-N2-1/2	2.1/2"-8UN	M64x6	TG12-M64		15.1	58.0	102.5	130.0	147	130.5						
TG18	TG18-N2-1/2	2.1/2"-8UN	M64x6	TG18-M64	1828.99	15	22.7	193	64.0	107.5	133.0	60	147	130.5		
			M68x6	TG18-M68			23.6		80.0	111.0	141.0		160	138		
	TG18-N2-3/4	2.3/4"-8UN	M72x6	TG18-M72			24.7		72.0	115.0	147.0		161	143		
	TG18-N3	3"-8UN	M76x6	TG18-M76			22.2		77.0	108.0	146.0		170	153		
TG26	TG26-N3	3"-8UN	M76x6	TG26-M76	2643.43	15	38.5	233	77.0	120.0	153.0	64	170	153		
			M80x6	TG26-M80			38.3		78.0	117.0	154.0		178	155.5		
	TG26-N3-1/4	3.1/4"-8UN	M85x6	TG26-M85			38.1		78.0	114.0	154.0		182	165.5		
	TG26-N3-1/2	3.1/2"-8UN	M90x6	TG26-M90			37.0		86.0	114.0	160.0		191	174.5		
	TG26-N3-3/4	3.3/4"-8UN	M95x6	TG26-M95			37.0		99.0	116.0	168.0		210	183.5		
TG26-N4	4"-8UN	M100x6	TG26-M100		36.4	105.0	116.0	174.0	220	200						

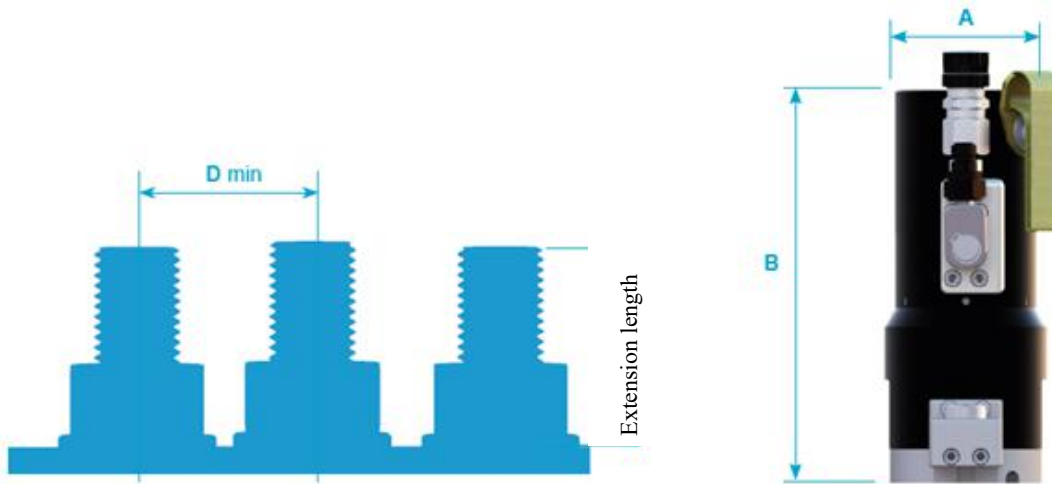
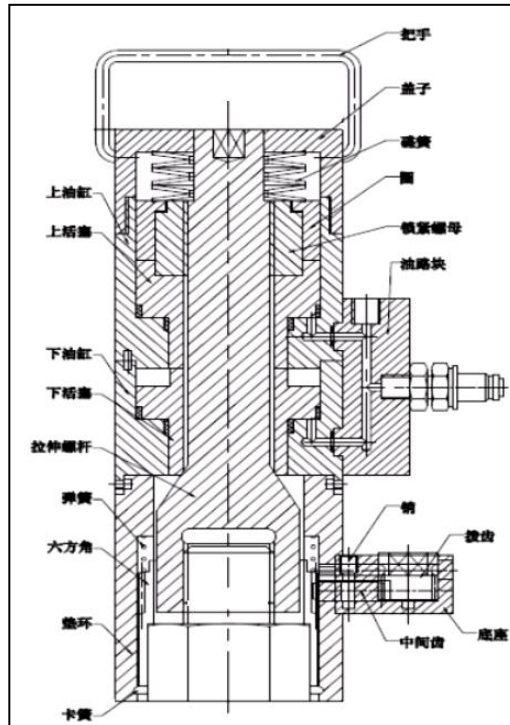


# TS Series



Type	Model	Bolt		Model	Rated force	Maximum stroke	Weight	A	B	C	D	E	F	G	H
		Imperial	inch												
TS1	TS1-N3-1/4	3/4"-10UNC	M20x2.5	TS1-M20	180.25	15	2.62	72.00	21.50	90.00	99.50	68.50	61.75	49.00	36.00
	TS1-N7-1/8	7/8"-8UNC	M22x2.5	TS1-M22			2.68		24.75	89.25	100.75		72.00	57.50	
TS2	TS2-N3-1/4	3/4"-10UNC	M20x2.5	TS2-M20	236.06	15	3.24	80.50	21.00	90.00	99.50	68.50	59.75	49.00	38.80
	TS2-N7-1/8	7/8"-8UNC	M22x2.5	TS2-M22			3.32		25.00	89.25	100.75		70.00	56.50	
TS3	TS3-N1	1"-8UN	M24x3	TS3-M24			3.41		28.00	90.00	104.00		80.50	64.25	
	TS3-N7-1/8	7/8"-8UNC	M22x2.5	TS3-M22	380.38	15	3.21	99.00	24.75	93.00	104.50	71.50	76.00	59.50	47.90
TS3	TS3-N1	1"-8UN	M24x3	TS3-M24			3.25		27.50	89.00	107.00		80.50	64.25	
	TS3-N1-1/8	1 1/8"-8UN	M27x3	TS3-M27			3.53		28.00	86.00	113.50		90.75	72.00	
TS3			M30x3.5	TS3-M30			3.54		35.00	84.00	114.00		85.00	69.00	
	TS3-N1-1/4	1 1/4"-8UN	M33x3.5	TS3-M33			3.56		34.50	85.00	114.50		89.88	73.00	
TS3	TS3-N1-1/8	1 1/8"-8UN	M27x3	TS3-M27	564.85	15	3.76	116.50	33.00	118.50	135.50	87.00	90.75	73.00	56.50
			M30x3.5	TS3-M30			3.71		35.00	121.00	136.00		85.00	72.00	
TS4	TS3-N1-1/4	1 1/4"-8UN	M33x3.5	TS3-M33			3.02		35.00	122.00	140.00		89.88	77.00	
	TS3-N1-3/8	1 3/8"-8UN	M36x4	TS3-M36			3.08		42.00	121.00	142.00		93.14	83.00	
TS4	TS3-N1-1/2	1 1/2"-8UN	M39x4	TS3-M39			3.08		39.00	121.00	145.00		93.41	83.00	
	TS7-N1-3/8	1 3/8"-8UN	M36x4	TS7-M36	768.94	15	12.71	134.75	42.00	131.50	152.50	107.50	93.14	83.00	63.38
TS5	TS7-N1-1/2	1 1/2"-8UN	M39x4	TS7-M39			12.93		45.00	131.50	155.50		100.53	88.00	
	TS7-N1-5/8	1 5/8"-8UN	M42x4.5	TS7-M42			13.09		45.00	136.00	159.00		111.54	96.00	
TS5	TS7-N1-3/4	1 3/4"-8UN	M45x4.5	TS7-M45			13.42		46.00	136.00	162.00		118.72	103.00	
	TS9-N1-5/8	1 5/8"-8UN	M42x4.5	TS9-M42	851.41	15	13.67	148.25	48.00	135.75	158.75	107.50	111.54	96.00	72.53
TS6	TS9-N1-3/4	1 3/4"-8UN	M45x4.5	TS9-M45			16.07		48.00	136.00	162.00		118.72	103.00	
	TS9-N1-7/8	1 7/8"-8UN	M48x5	TS9-M48			16.01		46.50	137.50	166.50		119.52	103.00	
TS6	TS9-N2	2"-8UN	M52x5	TS9-M52			16.00		53.50	135.00	168.50		120.47	110.00	
	TS14-N1-7/8	1 7/8"-8UN	M48x5	TS14-M48	1458.89	15	24.30	178.50	55.00	141.25	170.24	109.50	121.45	107.00	87.50
TS7	TS14-N2	2"-8UN	M52x5	TS14-M52			24.35		55.00	142.50	176.00		128.42	114.00	
	TS14-N2-1/4	2 1/4"-8UN	M56x5.5	TS14-M56			24.89		59.00	148.25	180.75		132.61	119.00	
TS7			M60x5.5	TS14-M60			24.26		60.00	145.50	182.00		144.80	127.00	
	TS14-N2-1/2	2 1/2"-8UN	M64x6	TS14-M64			24.81		67.00	141.50	182.00		144.80	130.00	
TS8	TS19-N2-1/4	2 1/4"-8UN	M56x5.5	TS19-M56	1669.25	15	33.68	206.75	65.00	151.25	184.75	110.50	134.60	119.00	103.40
			M60x5.5	TS19-M60			34.80		60.00	145.50	183.00		170.00	137.00	
TS8	TS19-N2-1/2	2 1/2"-8UN	M64x6	TS19-M64			34.64		66.00	152.50	184.00		144.80	130.00	
			M68x5.5	TS19-M68			32.83		70.00	151.00	186.50		160.00	141.00	
TS8	TS19-N2-3/4	2 3/4"-8UN	M72x6	TS19-M72			35.08		76.00	147.75	197.25		158.23	146.00	
	TS19-N3	3"-8UN	M76x6	TS19-M76			34.73		80.50	146.75	198.75		169.93	151.00	
TS9	TS27-N2-3/4	2 3/4"-8UN	M72x6	TS27-M72	2753.32	15	48.80	239.00	80.00	154.75	204.25	112.50	170.18	149.00	119.50
	TS27-N3	3"-8UN	M76x6	TS27-M76			48.86		81.00	160.75	211.75		169.93	151.00	
TS9			M80x6	TS27-M80			47.70		78.00	158.50	213.50		180.00	164.00	
	TS27-N3-1/4	3 1/4"-8UN	M83x6	TS27-M83			50.82		88.00	159.00	219.00		181.37	160.00	
TS9	TS27-N3-1/2	3 1/2"-8UN	M89x6	TS27-M89			51.08		94.00	158.50	223.50		187.38	172.00	
	TS31-N3-1/4	3 1/4"-8UN	M83x6	TS31-M83	3109.94	15	59.28	257.50	87.00	165.00	223.00	112.50	181.87	163.00	128.80
TS10	TS31-N3-1/2	3 1/2"-8UN	M89x6	TS31-M89			60.07		95.50	166.50	228.50		187.38	171.00	
	TS31-N3-3/4	3 3/4"-8UN	M93x6	TS31-M93			58.69		100.00	157.75	225.75		209.44	185.00	
TS10	TS31-N4	4"-8UN	M100x6	TS31-M100			56.90		105.00	152.00	223.50		215.64	194.00	

# TW Series



Model	Bolt	Extension length of bolt (mm)		Maximum stroke mm	Rated force kN	A mm	B mm	D mm	Weight kg
		Min	Max						
TW4B-M30	M30	59	69	8	517.08	72	205	64	6.16
TW5B-M33	M33	64	73	10	639.91	79	217.5	71	7.24
TW6B-M36	M36	71	81	10	753.61	84.5	229.5	77	8.75
TW8B-M39	M39	76	86	10	900.63	92	263	83	11.12
TW9B-M42	M42	83	93	10	1032.96	97	262.5	95	12.75
TW10B-M45	M45	88	98	10	1199.42	155	275.5	94.5	15.86
TW12B-M48	M48	94	104	10	1357.29	111	286.5	100.5	17.84
TW16B-M56	M56	110	120	10	1873.54	132	314	115	26.5
TW22B-M64	M64	124	134	10	2469.19	150	352	124	35



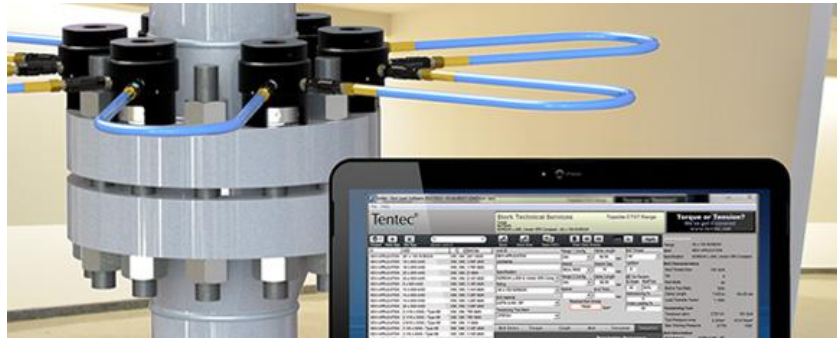
## **VI. Working condition**

1. Perform the theoretic calculation for the tightening torque or lifting pressure of the material as per the working demands, in order to determine the requirements on the tensioning force of hydraulic tensioner and the tensioning length of the bolt.
2. The working environment shall provide a certain working space and the contact datum for support ring of hydraulic tensioner must be level to ensure the smooth tensioning.
3. The use of the bolt tensioning process has the following requirements on the nuts:
  - A. Whenever possible, use round nuts to ease tightening. If the hexagon nuts are used, the position and depth of the nut shifting hole must be guaranteed.
  - B. The height of the nut shall be less than the height of hydraulic tensioner support ring and the reserved space shall be no less than the gap of tensioning length.
  - C. The diameter and position of the nut shifting hole shall be determined as per related dimensions of the hydraulic tensioner.

## **VII. Operation Method**

### **1. Preparations**

- A. Screw the hexagon nut onto the bolt, attach the shifting ring into the hexagon nut, and shift the shifting ring by shifting rod, till there is basically no gap.
- B. Attach the hydraulic bolt tensioner cylinder onto the bolt and cover the round spiral by support ring. In such case, notice to rotate the opening of shifting hole on the support ring to an appropriate position to help shift the nut by shifting rod.
- C. Screw the tensioning head suitable for the bolt into the bolt and tighten by shifting rod, till the fits of all portions are basically free of gap.
- D. If multiple hydraulic tensioners are simultaneously used for tensioning, check and ensure that the quick male connector of the hydraulic distributor is securely connected with the quick female connector of the hydraulic hose before operating the super-pressure hydraulic pump.
- E. At completion of the installation, insert the quick female connector of the hydraulic hose from the super-pressure hydraulic pump into the quick male connector of hydraulic tensioner (Connect the multiple tensioners for simultaneous tensioning as shown in Figure 1).



(Figure 1)

## 2. Start

- A. Operate the super-pressure hydraulic pump to input hydraulic oil into the cylinder of hydraulic tensioner so that the piston starts working and the hydraulic tensioner enters working state (The piston is marked with red stroke warning line. Do not operate beyond this stroke. In such case, notice the operating pressure of super-pressure hydraulic pump and the tensioning length of bolt to control them within the specified ranges).
- B. When the reading of the pressure gauge of the super-pressure pump starts to increase, notice to shift the shifting ring continuously by shifting rod to prevent the seizure between hexagon nut and cylinder bottom of hydraulic tensioner.
- C. When the operating pressure and the tensioning length of the hydraulic tensioner reach the rated values, immediately stop the super-pressure hydraulic pump, insert the shifting rod into the shifting hole of shifting ring, and shift the hexagon nut clockwise to tighten in place.
- D. During operations, if the multiple tensioning and tightening cycles are specified for the bolts by the process requirements, after the first tightening cycle for the hexagon nuts as per the process requirements, unload the super-pressure hydraulic pump as per the operation procedure, insert the shifting rod into the shifting hole of tensioning head and shift clockwise to return the piston, and then operate as per item “A”, till the process requirements are met.

## 3. Disassembling

After the operations of hydraulic tensioner, unload the super-pressure pump before disassembling. There are two disassembling methods at your choice depending on the working environment:

- A. Under the connected state of the super-pressure hydraulic pump, after the unloading of the pump, insert the shifting rod into the shifting hole of tensioning head and rotate the threaded sleeve clockwise to fully drain the hydraulic oil from the cylinder and return the piston (This

operation is omitted for the TS series spring return type). Then, disconnect the quick coupling connected with high pressure hose, unscrew the tensioning head, and take out the hydraulic tensioner cylinder to complete the tensioning process.

- B. Disconnect the quick coupling connected with high pressure hose, unscrew the tensioning head from bolt, take out the hydraulic tensioner cylinder, and loosen the plug screws on the cylinder by an Allen wrench. Levelly clamp the hydraulic tensioner on a vice and slowly tighten the screw to fully drain the residual hydraulic oil from the cylinder, till the piston is completely returned (Alternatively, knock uniformly by a rubber hammer to fully drain the hydraulic oil of cylinder and return the piston).

## **VIII. Maintenance**

1. Ensure to operate strictly as per the methods and procedures specified by the operation [instructions](#) and do not increase the input operating pressure of hydraulic tensioner or the stretching length of bolts, in order to prevent damaging the seals and related fitting parts.
2. At completion of the operations, wipe clean for proper preservation and especially guard the oil inlet port against ingress of dirt into the cylinder from damaging the cylinder and piston

**Note:**

- 1. Our company reserves the modification right for these operation instructions of this bolt tensioner without further notice.**
- 2. For more detailed information, please contact our company.**

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