HSR series Bolt Tensioner Operating Manual

HSR系列液压螺栓拉伸器操作手册

Operating Manual

● Please read carefully following instructions, warnings, cautions. Please observe the safety prescriptions so that it can avoid personal to injury and equipments' damage when you operate the Bolt Tensioner.

Any information without mentions in operating manual, please direct to contact WREN or local distributors/partners.

WREN is not responsible for any damage and injury from operation.

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1. Attention of Receiving

Carefully inspect the hydraulic bolt tensioner upon arrival. If any shipping damage is found, please notify carrier at once. Shipping damage is not covered by warranty. The carrier is responsible for all repair or replacement cost resulting from damage in shipment.

Caution:

▲ This is dangerous sign,if you ignore this sign,it may have serious risk and cause person's injury.

2. Summarize

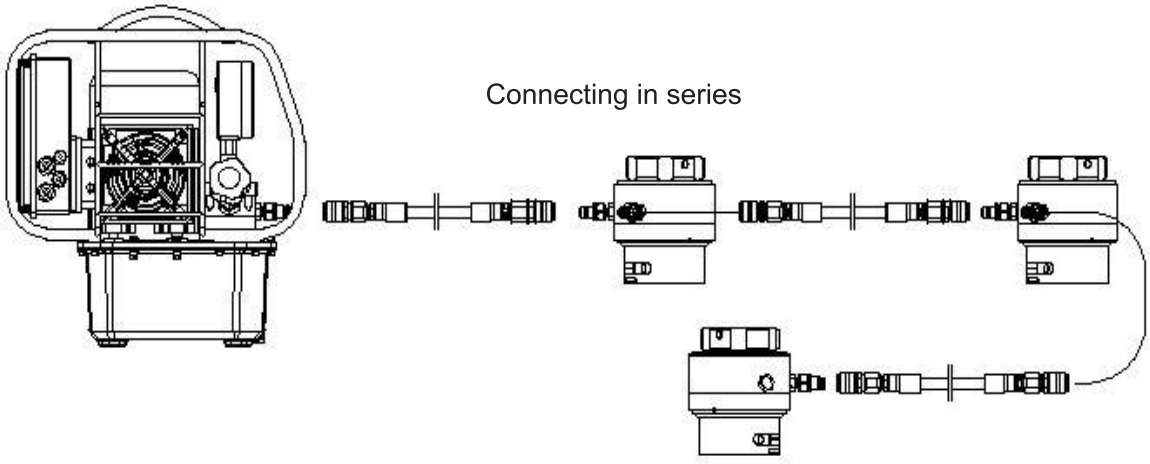
Bolt tensioner (hydraulic bolt tensioner), which has the function of bolt fastening and disassembly,and can be widely applied to metallurgical mines, Oil-gas industry, shipbuilding industry, engineering truck, wind power and other industries. It uses the power provided by the high pressure pump to stretch and deform the bolt within the allowable elastic deformation to achieve the purpose of tightening and loosening the bolt. When the bolt tensioner works, it can accurately control the pre-tightening force, does not damage the thread, is easy to operate, reduces the labor intensity, shortens the production maintenance period, effectively increases the reliability of the joint and the fatigue strength of the bolt, and improves the assembly precision and safety factor. The hydraulic tension device consists of a bolt tensioner and a high pressure pump (manual, electric or air operated).

3. Main structure and working principle

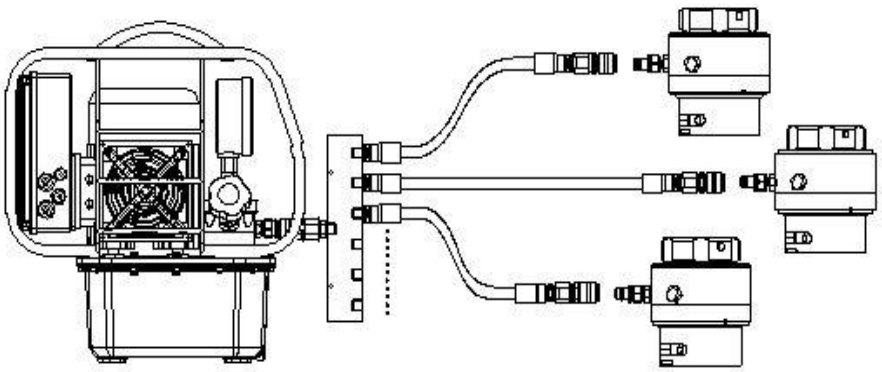
The hydraulic tension device is mainly composed of an high pressure oil pump and a tensioner, and is connected by a high pressure hose to become a complete device. A set of tension device can be combined with a single or multiple tensioners from an high pressure pump. As showed below.

Connecting drawing for tension device

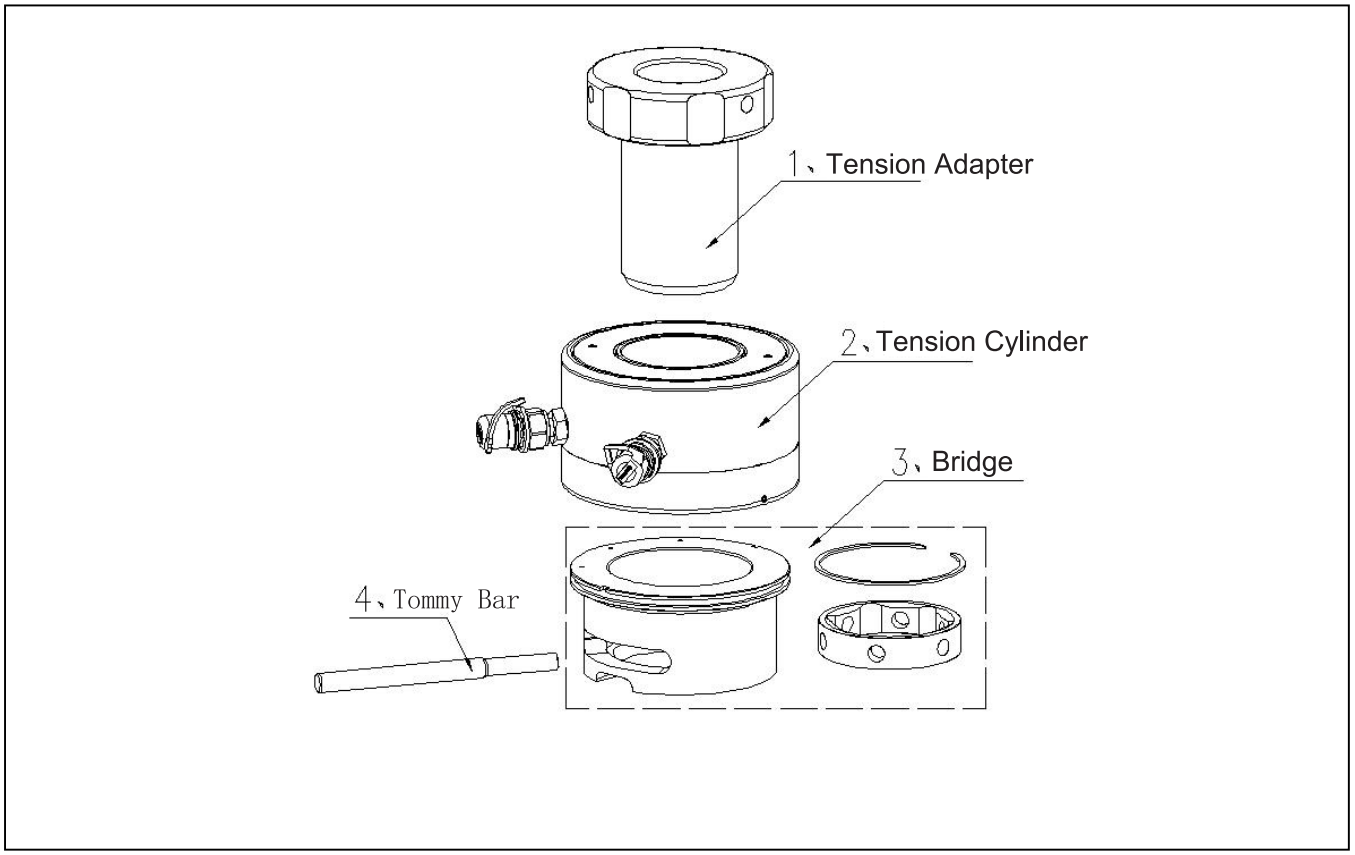
Connecting in series



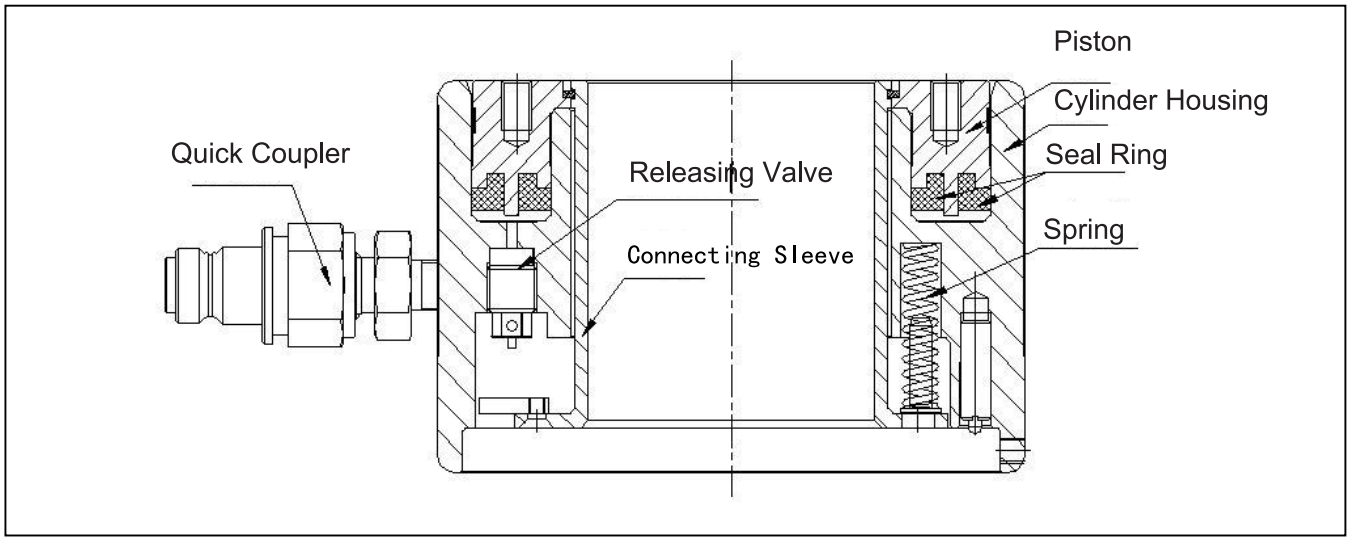
Connecting in parallel



The HSR bolt tensioner consists of a tension cylinder, a tension adapter and a bridge



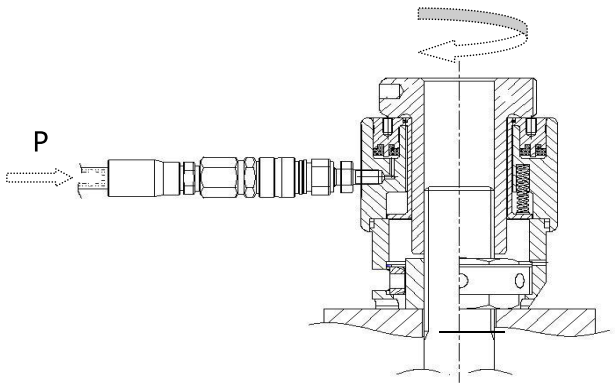
The tension cylinder includes piston, cylinder housing, connecting sleeve, sealing rings, releasing valves, automatic retraction mechanisms, quick couplings and other spare parts.



Remind:

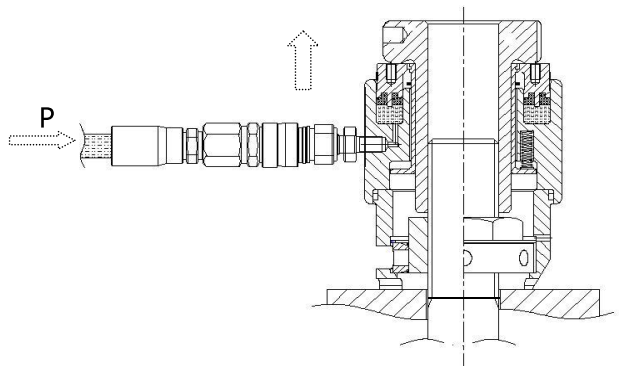
1. There are differences in the appearance parameters of the products. The above figure is for reference only, and the actual ones shall prevail.
2. If the product has improvements, it will be compiled into the new manual without prior notice.

The bolt tensioner is used in conjunction with the high pressure pump, and the work process is divided into four steps:



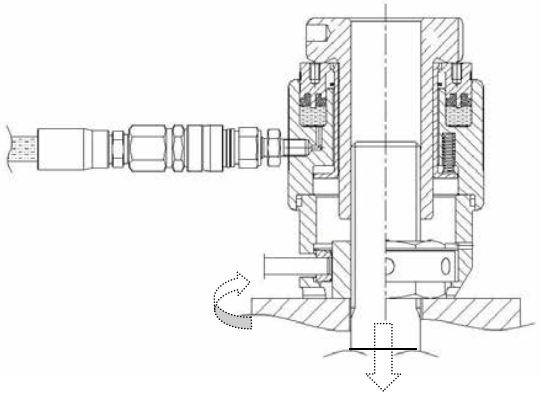
Filling oil:

Screw the HSR bolt tensioner into the bolt, the pump starts to work, the low pressure, the large flow is filled with oil, the piston in the cylinder housing starts to rise, push the tension adapter upwards, and start to tension the bolt.



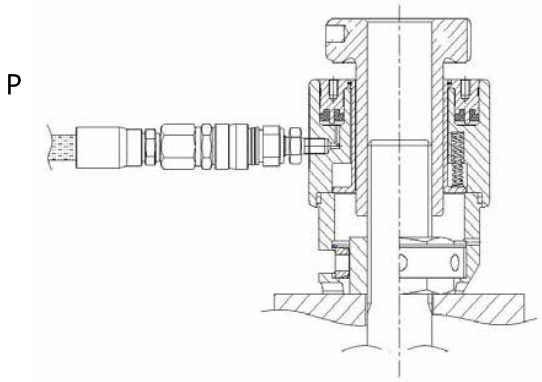
Rise Pressure:

The pump continues to pressurize, and the axial tension force will lengthen the bolt. At this time, the nut rises due to the elongation of the bolt and is separated from the flange contact surface. When the required pretighten force is reached, the pressurization is stopped.



Operation:

After the required pre-tightening force is reached, the Tommy bar can be used to turn sleeve through the window of the bridge, to lock or loosen the nut.



Release Load:

After the work is completed, the Releasing valve is opened and the oil comes back to the tank.

4. Operating Method

4.1. Operating Preparation

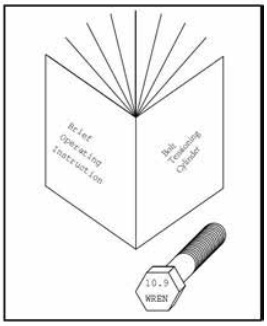


Figure 1: Operating instruction

4.1.1. Carefully read the operating manual of High Pressure Pump" and Bolt Tensioner before starting work, and pay attention to the prevention points that may cause property damage and accidents.

4.1.2. Carefully check the appearance of the pump, hose, and bolt tensioner for damage caused by improper transportation or storage. If it is damaged, please use it after confirmation from WREN.

4.1.3. Check the bolt tensioner operating data (pre-tighten force,operating pressure) and bolts (grade, thread length on the nut). It is the responsibility of the user to confirm the characteristics, pre-tighten and connection of the bolts used.

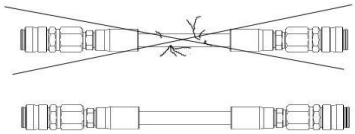


Figure 2: Hose is damaged, do not use please

Max pressure, pre-tighten force: marked on WREN Tesnioner.

Please check that the effective thread length of bolt protrusion above nut to ensure enough thread length。(Figure 3)

Normally, the thread length of protrusion above nut is (minimum)

1×M (M 100 ,H = min. 100 mm)

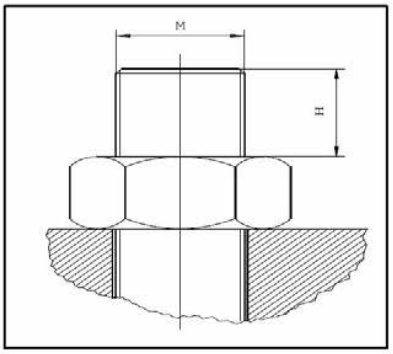


Figure 3:
Bolt protrusion above nut

Consult with WREN Professional Engineers if needed, TEL：0571-88114630。

4.1.4. Cleaning and drying: The inner and outer surfaces of the bolt tensioner and the high pressure pump, especially the exposed movable surface, must be kept clean. It should be cleaned with a special cleaning material and then wiped clean with a clean towel.

4.1.5. Determine if the oil is used correctly and enough.

The pump is filled with 32 # anti-wear hydraulic oil before leaving the factory. After use, when the oil level is insufficient, it needs to be replenished in time.

4.1.6. Check the angle α of the bolt on the support surface and correct if necessary. (Figure 4)

4.1.7. Before using the bolt tensioner, apply grease to the bolt threads. The grease type is user-defined. (Figure 5)

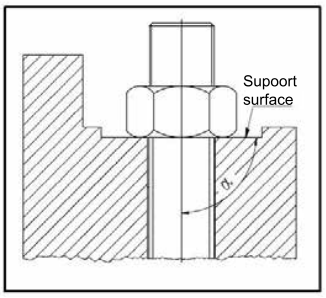


Figure 4: Angle accuracy

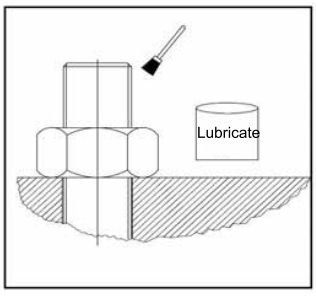
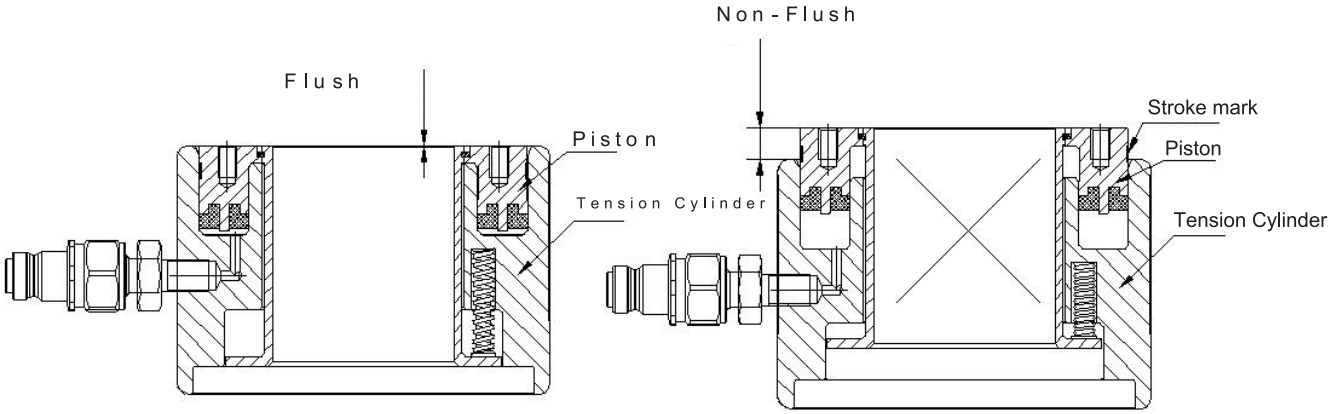


Figure 5: Lubricate

4.1.8.Before using the tensioner, make sure the piston is at its end position (for example, if the top of the piston is flush with the end face of the tension cylinder).

Consult with WREN Professional Engineers if needed，TEL：0571-88114630



4.1.9.In operation, please pay attention to the distance between the tensioner and the pump, and always observe the position of the pressure gauge and the bolt.

4.1.10.After cleaning the outlet joint of the high pressure pump, the inlet of the bolt tensioner and the joints of the high pressure hose, plug them in and tighten them to enter the working state. (The bending radius of the high pressure hose should be ≥ 200 mm.)

▲Warning： No pressure should be applied to the bolt tensioner until it is correctly placed Tensioner on the bolt.

▲Caution： Avoid severe bending and entanglement of hydraulic hose during operation.

(A)Using a bent or entangled tubing will create excessive back pressure；

(B)Severe bending and entanglement damage the inside of the hose and prematurely scrapped;

(C)Prevent heavy objects from falling or pressing onto the hose；

(D)Severe impact may cause damage to the internal metal wire of the hose. The damaged hose may be broken during pressurization; it is not possible to haul and lift other hydraulic components with hydraulic hose;

4.2. Connection and operation

▲ Note: Use WREN original high performance hydraulic components.

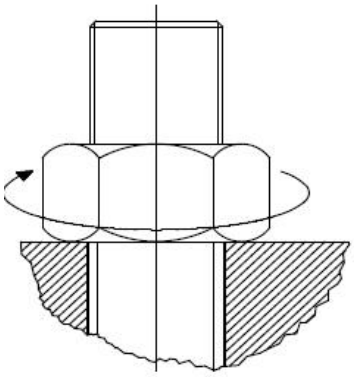
▲ Note: The pressure value of the bolt tensioner is read by the pressure gauge on the pump. Note: This pressure gauge can be selected according to the user's needs for accuracy and calibration requirements.

▲ Warning: To avoid personal injury, the maximum working pressure must not exceed 1500 bar.

▲ Warning: No-load pressure test is prohibited.

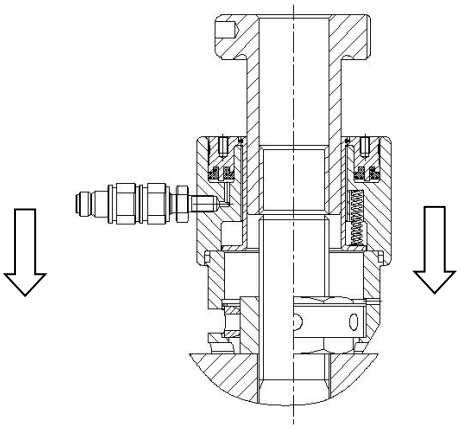
▲ Warning: Over-stroke is prohibited, the maximum stroke must not exceed 10mm.

▲ WARNING: The piston of the tensioner should be flush with the cylinder.



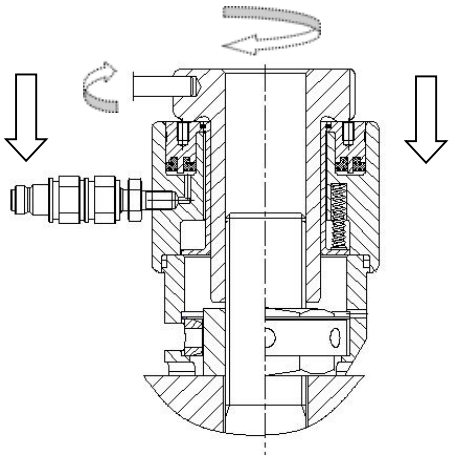
Step 1：

Once the bolt protrusion above nut is confirmed, turn the nut onto the support surface and tighten. This is to prevent the bolt from rotating inward when the bolt tensioner is rotated to the set position.



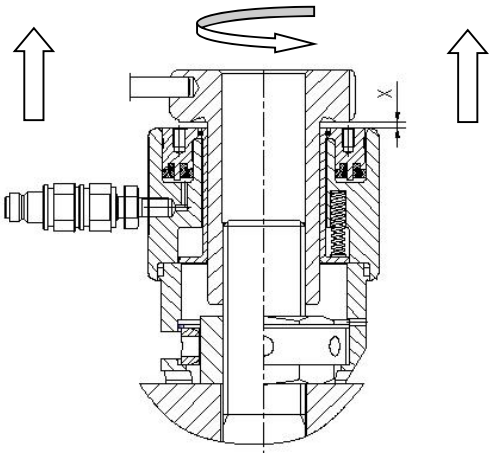
Step 2:

Place the hydraulic bolt tensioner over the outer ring of the nut and place the tension nut on the bolt that you want to tension.For rigid flat contact sealing bolts, single operation is possible; for gasketed sealing bolts, multiple joint operations are recommended.



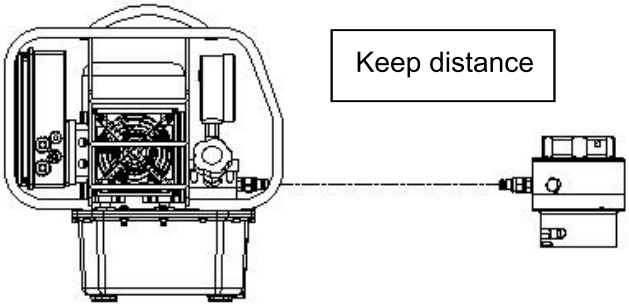
Step 3:

Rotate the bolt tensioner through the Tommy bar or manually onto the bolt to be tensioned and continue to rotate until the tension nut contacts the support surface of the Tension Cylinder.



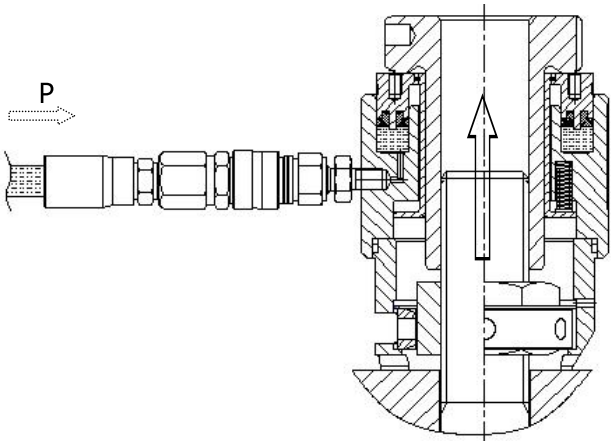
Step 4:

Use a Tommy bar or manual reverse rotation of the tension nut. For bolts up to 1000 mm in length, reserve a clearance of 2 - 3 mm between the support surface of the tension cylinder and the tension nut. For bolts with a length of 1000 mm or more, the clearance can be appropriately increased.



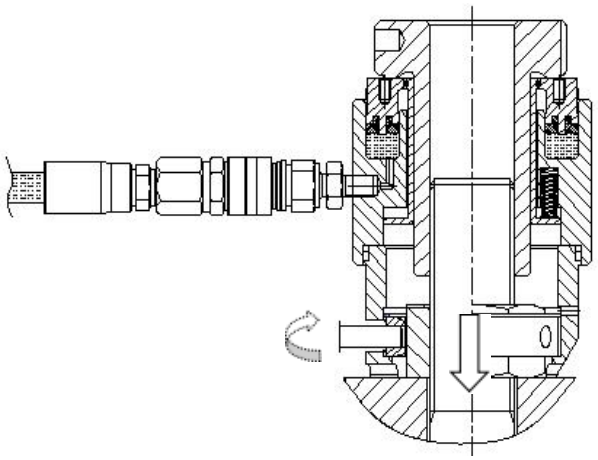
Step 5:

The bolt tensioner is connected to the pump with a high pressure hose. Keep the distance between the tensioner and pump during pressure rise so that the position of the gauge and bolt can always be observed.



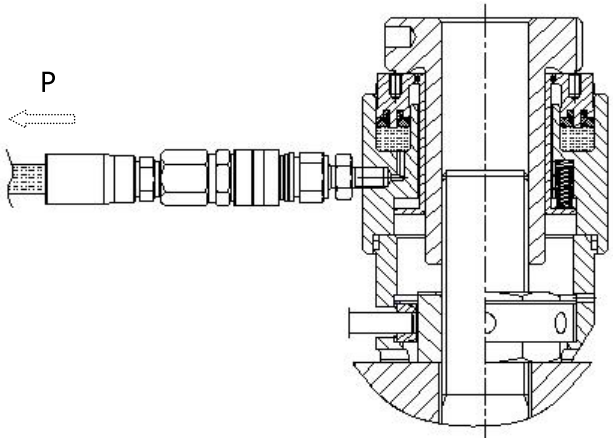
Step 6:

After the hydraulic connection, the tensioner piston is pressed, and the axial tensile force will lengthen the bolt. At this time, the nut rises due to the elongation of the bolt and is separated from the flange contact surface. According to the principle of force and reaction, the same reverse force will compress the flange. When the required tension force is reached, the pressurization is stopped.



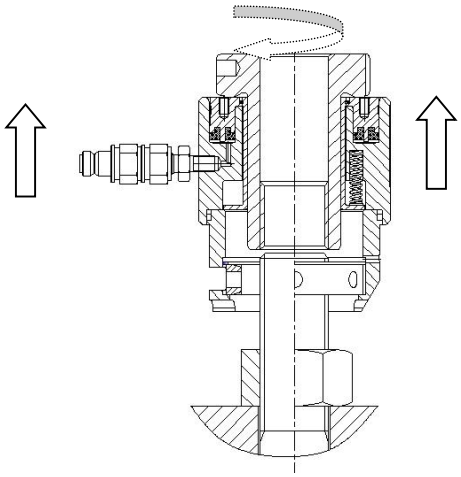
Step 7:

After the required tension force is reached, under the pressure holding status, the tommy bar can be used to pass through the window of the briage, and the dial nut sleeve is pushed to tighten or loosen the nut on the support surface.



Step 8:

Tighten or loosen the nut to complete the work and unload the pump. Release the pressure, the tensioner automatically returns to the position, and the hydraulic oil flows back to the oil tank.



Step 9:

When the piston returns to the initial position, remove the hose. Remove the bolt tensioner by tommy bar or manually loosen the tension adapter. Prepare for the next job

▲ WARNING: Before removing the tensioner, make the stroke of the tensioner "0" before tension again.

▲ Note: After the device is used, it should be wiped clean and sealed after rust prevention. After the hose is coiled, insert the handle of the pump to avoid shaking.

Note: 1. Users should not disassemble the hydraulic tension device to avoid damage.

2.The bolt tensioner cannot exceed its maximum stroke. For the stroke parameters, see the main data sheet of the HSR series bolt tensioner. A mark that can be seen on the piston when the maximum stroke is reached. If the tensioner operates beyond its maximum stroke, it will automatically unload and relieve pressure and will not function at all.

3.This product is constantly undergoing technological innovation. If the contents of this manual are updated, we will not notify individually. Please understand.

5.Safety and Caution

5.1. Make sure the high pressure hose is not broken or kinked before using the bolt tensioner. Do not use damaged or unqualified high pressure hose. Do not use kinking hose. The bending radius of the high pressure hose should be ≥ 200 mm.

5.2. After the hydraulic tension device is finished, the pump pressure should be reduced to zero, otherwise the hydraulic oil will be sprayed out, polluting the clothes, and may cause harm to the human body.

6.Maintenance

6.1. When uses, it should be handled lightly. The mating surface of the bolt tensioner is very precise. It should be protected during installation and disassembly, and the relevant mating surface should not be damaged.

6.2. When installs and replaces the seal ring, clean the surface of the seal ring and the matching surface of the tension cylinder and piston with a special cleanser.

6.3. Store the tool in a dry place after use.

6.4. The high pressure pump can be found in the instruction manual.

7.Trouble Shooting

The bolt tensioner itself generally does not malfunction. During work, the hydraulic oil leaks out at the joint between the hole and the shaft of the tension cylinder. It may be that the seal is poorly sealed. It should be disassembled to check whether the seal is installed correctly and the shape is complete. If the shape of the seal is deformed or broken, the seal must be replaced.

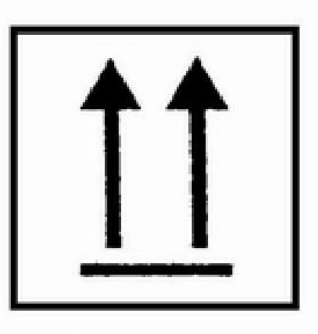
Trouble shooting of the pump, see its manual.

8.Noise and transportation of Bolt Tensioner

8.1. Hydraulic tensioner noise / vibration statement

Hydraulic tensioner using
noise value: ≤ 70 db

8.2. Hydraulic tensioner transport information

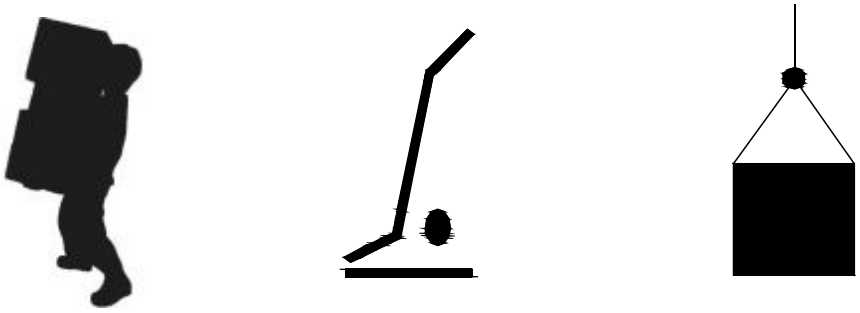


（ Figure 9）

8.2.1.Pay attention to hande when moves tools.

8.2.2.The product should be lifted upright as shown in Figure 9.

8.2.3.Product handling is generally carried by hand or trolley to move, hoist and move, as shown in Figure 10.



（Figure 10）

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9.Data sheet for HSR3 series bolt tensioner

The bolt tensioner tensile force (F) is directly related to the pressure (P). The pressure unit, indicated by the pressure gauge on the pump, is determined using the table of (9.4) or calculated by the following formula.

$$P(bar) = 10000 \times \frac{F(kN)}{A(mm^2)}$$

$$F(kN) = \frac{P(bar) \times A(mm^2)}{10000}$$

P= Bolt tensioner operating pressure（ bar ）
F = Pre-tighten force （kN）
A = Effective area of bolt tensioner
（ mm ）（See 9.1 data sheet）

9.1 Mian parameter table

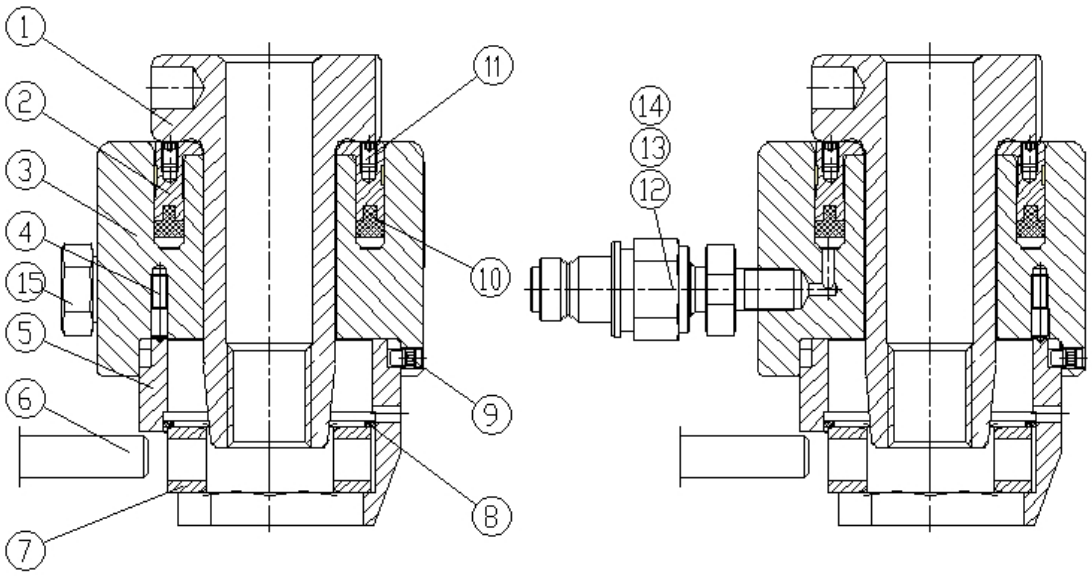
Paramter Table for HSR series										
Model	Bolt		Effective Ares		Max Operating Pressure		Max Load		Stroke	Weight
	Imperial	Metric	mm^2	in^2	Bar	PSI	KN	tonf	mm	Kg
HSR0	3/4″	M20	1067	1.65	1500	21750	160	16.3	10	
	7/8″	M22								
HSR1	1″	M24	1867	2.89	1202	17429	224	22.8	10	
		M27								
	1-1/8″				1500	21750	280	28.6		
HSR2	1″	M24	3003	4.65	747	10832	224	22.8	10	4.1
		M27								
	1-1/8″	M30			983	14254	295	30.1		4.1
	1-1/4″	M33			1253	18169	376	38.3		4.2
	1-3/8″	M36			1500	21750	450	45.9		4.2
HSR3	1-1/4″	M33	4400	6.82	854	12383	376	38.3	10	6.0
	1-3/8″	M36			1060	15370	466	47.5		
	1-1/2″	M39			1280	18560	567	57.8		6.2
	1-5/8″	M42			1500	21750	660	67.3		6.1
HSR4	1-1/2″	M39	6669	10.34	850	12325	566	57.7	10	8.8
	1-5/8″	M42			1014	14703	676	68.9		8.8
	1-3/4″	M45			1193	17299	795	81.1		9.0
	1-7/8″	M48			1390	20155	927	94.5		8.9
	2″				1500	21750	1000	102.0		

★ ： There is no tension adapter in the weight.

Paramter Table for HSR series										
Model	Bolt		Effective Ares		Max Operating Pressure		Max Load		Stroke	Weight
	Imperial	Metric	mm^2	in^2	Bar	PSI	KN	tonf	mm	Kg
HSR5	2″	M52	10002	15.50	1067	15472	1067	108.8	10	14.0
	2-1/4″	M56			1373	19909	1373	140.0		14.8
		M60								
	2-1/2″	M64			1500	21750	1500	153.0		14.5
		M68								
		M70								
	2-3/4″									15.2
HSR6	2-3/4″	M72	16670	25.84	1131	16400	1885	192.2	10	
	3″	M76			1357	19677	2262	230.7		23.1
		M80								23.3
	3-1/4″	M85			1500	21750	2500	254.9		23.3
	3-1/2″	M90								23.0
HSR7	3-1/2″	M90	21336	33.07	1481	21475	3159	322.1	10	
		M95								
	3-3/4″	M100			1500	21750	3200	326.3		33.5
	4″									34.2
HSR8	4″	M105	27336	42.37	1500	21750	4100	418.1	10	
		M110								
	4-1/4 “	M115								43.0
	4-1/2 “									44.0

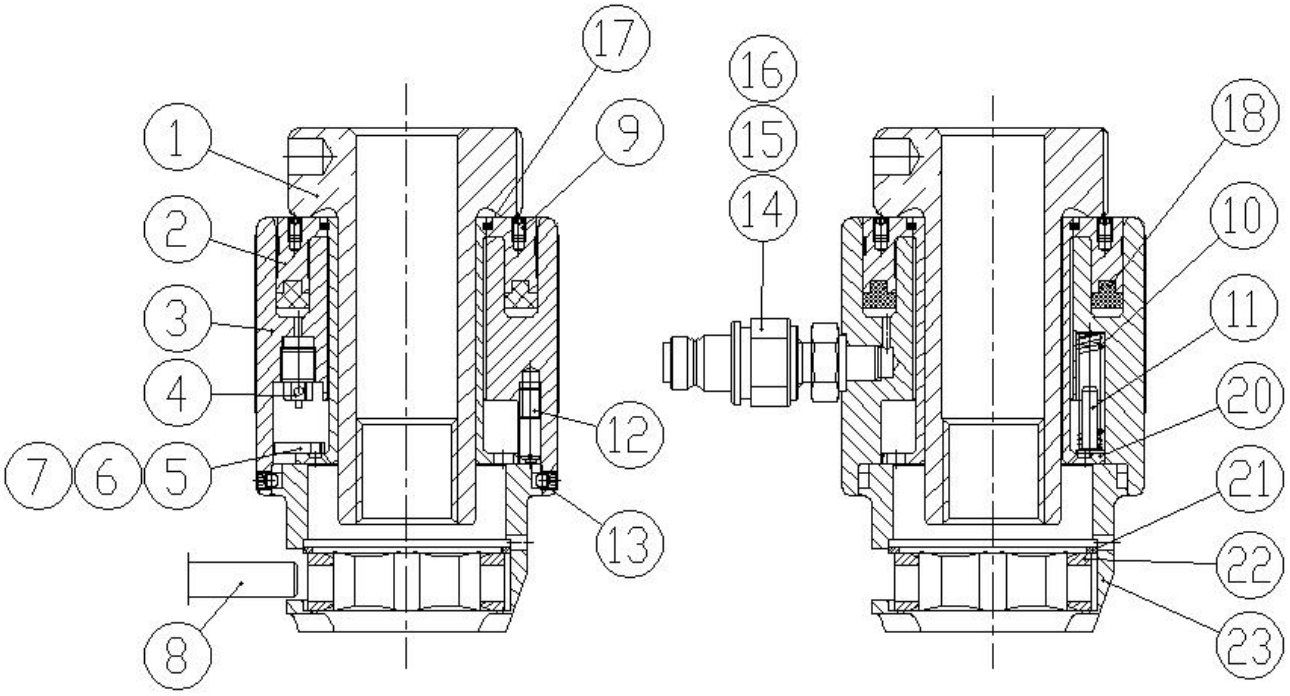
9.2 Part List

HSR0



Part List for HSR 0 Bolt Tensioner										
Item	Name	Part Number	QTY	Remark		Item	Name	Part Number	QTY	Remark
1	Tension Adapter		1			12	Fitting	J02-115	1	
2	Piston	HSR0-01	1			13	Gasket		2	
3	Tension Cylinder	HSR0-02	1			14	Quick Coupler		1	
4	Threaded Lock Pin		1							
5	Bridge		1							
6	Tommy Bar	TY1710	1							
7	Nut Sleeve		1							
8	Clip for bridge		1							
9	Screw Pin		2							
10	Seal Ring	HSR0-03	1							
11	Nylon Plug		2							

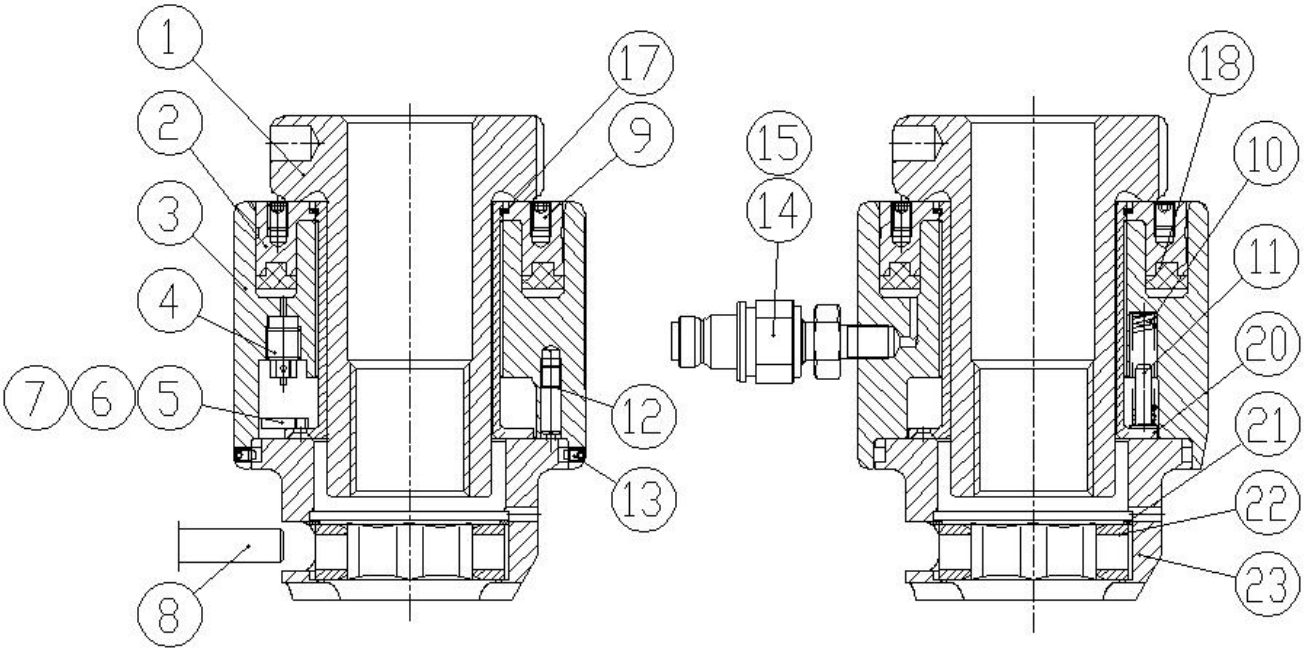
HSR1



Part List for HSR 1 Bolt Tensioner

Item	Name	Part Number	QTY	Remark		Item	Name	Part Number	QTY	Remark
1	Tension Adapter		1			12	Threaded Lock Pin		1	
2	Piston	HSR1-01	1			13	Screw Pin		2	
3	Tension Cylinder	HSR1-02	1			14	Fitting	J02-115	2	
4	Releasing Valve	HSR. 01	1			15	Quick Coupler		2	
5	Retaining Plate	HSR2-06	1			16	Gasket		2	
6	Screw		1			17	Connecting Clip	HSR1-05	1	
7	Pin		1			18	Seal Ring	HSR1-03	1	
8	Tommy Bar	TY1710	1			20	Connecting Sleeve	HSR1-04	1	
9	Nylon Plug		2			21	Clip for bridge		1	
10	Spring I	HSR-01	4			22	Nut Sleeve		1	
11	Spring Seat	HSR-02	4			23	Bridge		1	

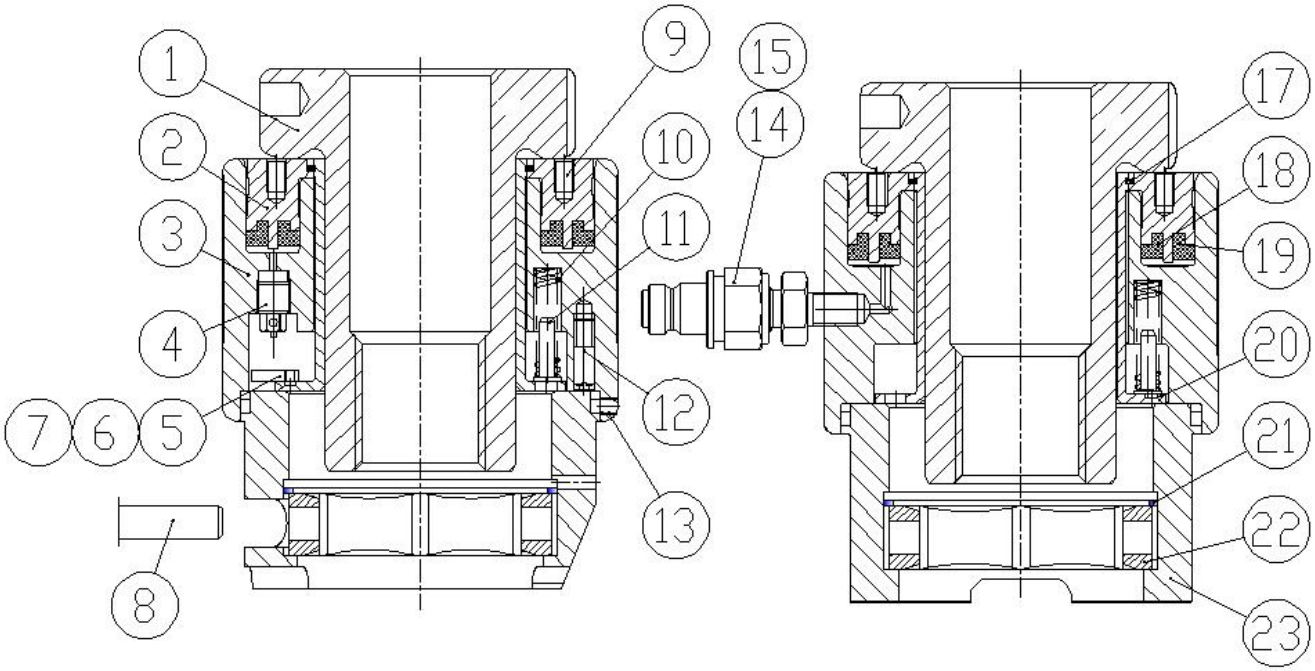
HSR2



Part List for HSR 2 Bolt Tensioner

Item	Name	Part Number	QTY	Remark	Item	Name	Part Number	QTY	Remark
1	Tension Adapter		1		12	Threaded Lock Pin		1	
2	Piston	HSR2-01	1		13	Screw Pin		2	
3	Tension Cylinder	HSR2-02	1		14	Fitting	J02-116	2	
4	Releasing Valve	HSR. 01	1		15	Quick Coupler		2	
5	Retaining Plate	HSR2-06	1		17	Connecting Clip	HSR2-05	1	
6	Screw		1		18	Seal Ring	HSR2-03	1	
7	Pin		1		20	Connecting Sleeve	HSR2-04	1	
8	Tommy Bar	TY1710	1		21	Clip for bridge		1	
9	Nylon Plug		2		22	Nut Sleeve		1	
10	Spring I	HSR-01	6		23	Bridge		1	
11	Spring Seat	HSR-02	6						

HSR3---HSR8



Part List for HSR 3 Bolt Tensioner

Item	Name	Part Number	QTY	Remark
1	Tension Adapter		1	
2	Piston	HSR3-01	1	
3	Tension Cylinder	HSR3-02	1	
4	Releasing Valve	HSR. 01	1	
5	Retaining Plate	HSR2-06	1	
6	Screw		1	
7	Pin		1	
8	Tommy Bar	TY1710	1	
9	Nylon Plug		2	
10	Spring I	HSR-01	8	
11	Spring Seat	HSR-02	8	

Item	Name	Part Number	QTY	Remark
12	Threaded Lock Pin		1	
13	Screw Pin		2	
14	Fitting	J02-116	2	
15	Quick Coupler		2	
17	Connecting Clip	HSR3-06	1	
18	Seal for axes	HSR3-04	1	
19	Seal for Hole	HSR3-03	1	
20	Connecting Sleeve	HSR3-05	1	
21	Clip for bridge		-	
22	Nut Sleeve		-	
23	Bridge		-	

Part List for HSR Bolt Tensioner

(1)

	Item	Name	Part Number	QTY	Remark		Item	Name	Part Number	QTY	Remark
HSR4	1	Tension Adapter		1			12	Threaded Lock Pin		1	
	2	Piston	HSR4-01	1			13	Screw Pin		2	
	3	Tension Cylinder	HSR4-02	1			14	Fitting	J02-23	2	
	4	Releasing Valve	HSR. 01	1			15	Quick Coupler		2	
	5	Retaining Plate	HSR2-06	1			17	Connecting Clip	HSR4-06	1	
	6	Screw		1			18	Seal for axes	HSR4-04	1	
	7	Pin		1			19	Seal for Hole	HSR4-03	1	
	8	Tommy Bar	TY1710 (14)	1	2″using TY1714		20	Connecting Sleeve	HSR4-05	1	
	9	Nylon Plug		2			21	Clip for bridge		1	
	10	Spring I	HSR-01III	8			22	Nut Sleeve		1	
	11	Spring Seat	HSR-02III	8			23	Bridge		1	

	Item	Name	Part Number	QTY	Remark		Item	Name	Part Number	QTY	Remark
HSR5	1	Tension Adapter		1			12	Threaded Lock Pin		1	
	2	Piston	HSR3-01	1			13	Screw Pin		2	
	3	Tension Cylinder	HSR3-02	1			14	Fitting	J02-116	2	
	4	Releasing Valve	HSR. 01	1			15	Quick Coupler		2	
	5	Retaining Plate	HSR2-06	1			17	Connecting Clip	HSR3-06	1	
	6	Screw		1			18	Seal for axes	HSR3-04	1	
	7	Pin		1			19	Seal for Hole	HSR3-03	1	
	8	Tommy Bar	TY1710	1			20	Connecting Sleeve	HSR3-05	1	
	9	Nylon Plug		2			21	Clip for bridge		1	
	10	Spring I	HSR-01	8			22	Nut Sleeve		1	
	11	Spring Seat	HSR-02	8			23	Bridge		1	

Part List for HSR Bolt Tensioner

(2)

	Item	Name	Part Number	QTY	Remark		Item	Name	Part Number	QTY	Remark
HSR6	1	Tension Adapter					12	Threaded Lock Pin		1	
	2	Piston	HSR6-01	1			13	Screw Pin		2	
	3	Tension Cylinder	HSR6-02	1			14	Fitting	J02-23	2	
	4	Releasing Valve	HSR. 01	1			15	Quick Coupler		2	
	5	Retaining Plate	HSR2-06	1			17	Connecting Clip	HSR6-06	1	
	6	Screw		1			18	Seal for axes	HSR6-04	1	
	7	Pin		1			19	Seal for Hole	HSR6-03	1	
	8	Tommy Bar	TY1714	1			20	Connecting Sleeve	HSR5-05	1	
	9	Nylon Plug		2			21	Clip for bridge		1	
	10	Spring I	HSR-01III	18			22	Nut Sleeve		1	
	11	Spring Seat	HSR-02III	18			23	Bridge		1	

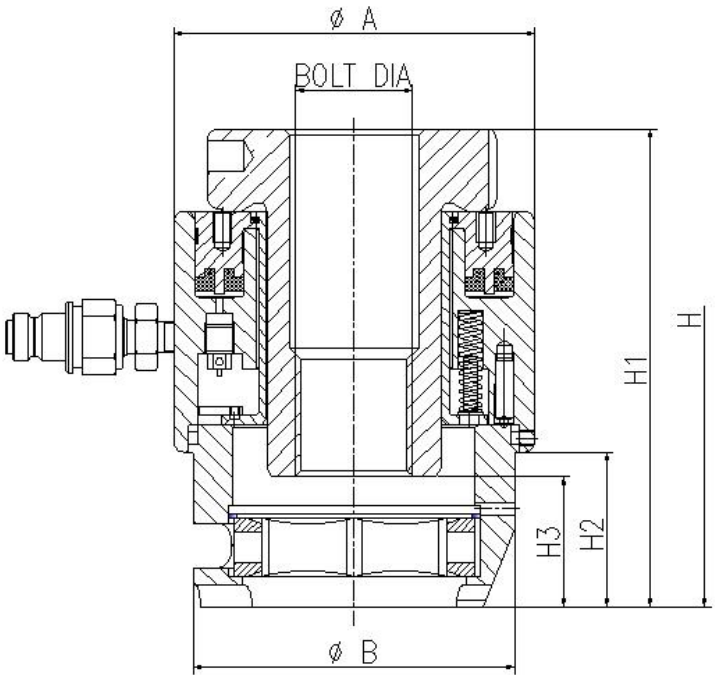
	Item	Name	Part Number	QTY	Remark		Item	Name	Part Number	QTY	Remark
HSR7	1	Tension Adapter					12	Threaded Lock Pin		1	
	2	Piston	HSR7-01	1			13	Screw Pin		2	
	3	Tension Cylinder	HSR7-02	1			14	Fitting	J02-23	2	
	4	Releasing Valve	HSR. 01	1			15	Quick Coupler		2	
	5	Retaining Plate	HSR2-06	1			17	Connecting Clip	HSR7-06	1	
	6	Screw		1			18	Seal for axes	HSR7-04	1	
	7	Pin		1			19	Seal for Hole	HSR7-03	1	
	8	Tommy Bar	TY1714	1			20	Connecting Sleeve	HSR7-05	1	
	9	Nylon Plug		2			21	Clip for bridge		1	
	10	Spring I	HSR-01III	25			22	Nut Sleeve		1	
	11	Spring Seat	HSR-02III	25			23	Bridge		1	

Part List for HSR Bolt Tensioner

(3)

	Item	Name	Part Number	QTY	Remark		Item	Name	Part Number	QTY	Remark
HSR8	1	Tension Adapter					12	Threaded Lock Pin		1	
	2	Piston	HSR8-01	1			13	Screw Pin		2	
	3	Tension Cylinder	HSR8-02	1			14	Fitting	J02-23	2	
	4	Releasing Valve	HSR. 01	1			15	Quick Coupler		2	
	5	Retaining Plate	HSR2-06	1			17	Connecting Clip	HSR8-06	1	
	6	Screw		1			18	Seal for axes	HSR8-04	1	
	7	Pin		1			19	Seal for Hole	HSR8-03	1	
	8	Tommy Bar	TY1714	1			20	Connecting Sleeve	HSR8-05	1	
	9	Nylon Plug		2			21	Clip for bridge		1	
	10	Spring I	HSR-01III	32			22	Nut Sleeve		1	
	11	Spring Seat	HSR-02III	32			23	Bridge		1	

9.3 Dimension drawing



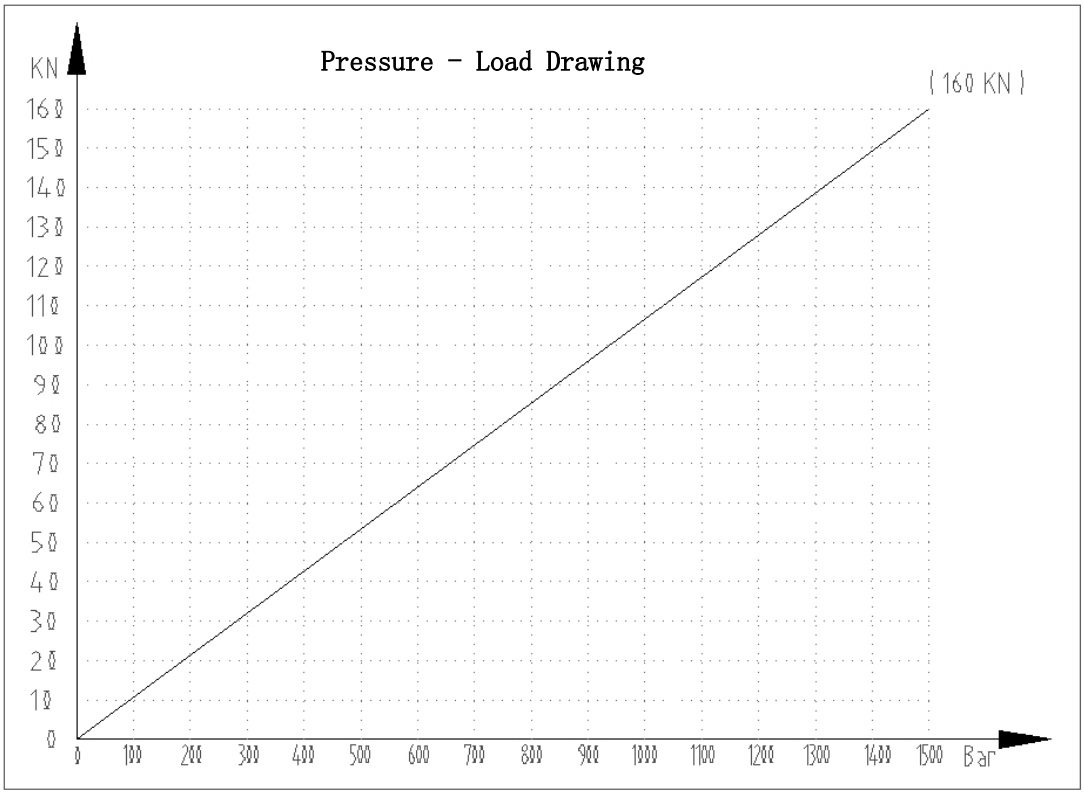
Dimension table for HSR series Bolt Tensioner ----Metric												
Model	Threads	Nut Size	A		B		H1		H2		H3	
	mm	mm	in	mm	in	mm	in	mm	in	mm	in	mm
HSR0	M20X2.5	30	2.9	74.8	2.5	63	4.5	113.5	1.4	36	0.7	19
	M22X2.5	34			2.5	63	4.5	113.5	1.4	36	0.8	21
HSR1	M24×3	36	3.3	85	2.7	68	5.6	141.5	1.5	38	0.9	23
	M27×3	41			2.7	68	5.6	141.5	1.5	38	1.0	26
HSR2	M24×3	36	4.1	103	3.0	75	5.6	141.5	1.5	38	0.9	23
	M27×3	41			3.0	75	5.6	141.5	1.5	38	1.0	26
	M30×3.5	46			3.1	80	5.7	144.5	1.6	41	1.1	28
	M33×3.5	50			3.3	84	5.8	147.5	1.7	44	1.2	30
	M36×4	55			3.5	88.5	5.9	150.5	1.9	47	1.3	33
HSR3	M33×3.5	50	4.6	118	3.6	92	5.9	149.5	1.7	44	1.2	30
	M36×4	55			3.8	96	6.0	152.5	1.9	47	1.3	33
	M39×4	60			4.1	105	6.1	156	2.0	50.5	1.4	35.5
	M42×4.5	65			4.1	104.5	6.3	159	2.1	53.5	1.5	38
HSR4	M39×4	60	5.5	140.5	4.4	112	6.4	163.5	2.0	50.5	1.4	35.5
	M42×4.5	65			4.5	114	6.6	166.5	2.1	53.5	1.5	38
	M45×4.5	70			5.0	126	6.7	170	2.2	57	1.6	40
	M48×5	75			4.8	123	6.8	173	2.4	60	1.7	42
HSR5	M52×5	80	6.9	175.5	5.3	134	7.4	187	2.5	63	1.8	46
	M56×5.5	85			5.8	148	7.6	193.5	2.7	69.5	1.9	49
	M60×5.5	90			5.8	148	7.6	193.5	2.7	69.5	2.0	52
	M64×6	95			6.0	153	7.9	200	3.0	76	2.2	55
	M68×6	100			6.0	153	7.9	200	3.0	76	2.3	58
	M70×6	102			6.0	153	7.9	200	3.0	76	2.3	58
HSR6	M72×6	105	8.6	219	6.8	172	8.5	216	3.2	82	2.4	62
	M76×6	110			7.2	182	8.8	223	3.5	89	2.6	65
	M80×6	115			7.2	182	8.8	223	3.5	89	2.7	68
	M85×6	120			7.5	190	9.0	229	3.7	95	2.8	72
	M90×6	130			8.1	205	9.3	235	4.0	101	3.0	76
HSR7	M90×6	130	9.9	252	9.1	230	9.5	241	4.0	101	3.0	76
	M95×6	135			9.1	230	9.5	241	4.0	101	3.1	80
	M100×6	145			9.3	235	9.7	247	4.2	107	3.3	84
HSR8	M105×6	15	11.1	283	10.0	255	9.5	241	4.0	101	3.5	88
	M110×6	155			10.0	255	9.5	241	4.0	101	3.6	92
	M115×6	165			10.2	260	9.7	247	4.2	107	3.8	96

Dimension table for HSR series Bolt Tensioner ----Imperial

Model	Threads	Nut Size	A		B		H1		H2		H3	
			in	mm	in	mm	in	mm	in	mm	in	mm
HSR0	3/4"-10UN	1 1/4″	2.9	74.8	2.5	63	4.5	113.5	1.4	36	0.9	22
	7/8"-9UN	1 7/16″			2.5	63	4.5	113.5	1.4	36	1.0	25
HSR1	1"-8UN	1 5/8″	3.3	85	2.7	68	5.6	141.5	1.5	38	1.2	30
	1 1/8"-8UN	1 13/16″			3.0	76	5.7	144.5	1.6	41	1.3	33
HSR2	1″-8UN	1 5/8″	4.1	103	3.0	75	5.6	141.5	1.5	38	1.2	30
	1 1/8″-8UN	1 13/16″			3.1	80	5.7	144.5	1.6	41	1.3	33
	1 1/4″-8UN	2″			3.3	84	5.8	147.5	1.7	44	1.4	36
	1 3/8″-8UN	2 3/16″			3.5	88.5	5.9	150.5	1.9	47	1.5	39
HSR3	1 1/4″-8UN	2″	4.6	118	3.6	92	5.9	149.5	1.7	44	1.4	36
	1 3/8″-8UN	2 3/16″			3.8	96	6.0	152.5	1.9	47	1.5	39
	1 1/2″-8UN	2 3/8″			4.1	105	6.1	156	2.0	50.5	1.7	42.5
	1 5/8″-8UN	2 9/16″			4.1	104.5	6.3	159	2.1	53.5	1.8	45.5
HSR4	1 1/2″-8UN	2 3/8″	5.5	140.5	4.4	112	6.4	163.5	2.0	50.5	1.7	42.5
	1 5/8″-8UN	2 9/16″			4.5	114	6.6	166.5	2.1	53.5	1.8	45.5
	1 3/4″-8UN	2 3/4″			5.0	126	6.7	170	2.2	57	1.9	49
	1 7/8″-8UN	2 15/16″			4.8	123	6.8	173	2.4	60	2.0	52
	2″-8UN	3 1/8″			5.0	128	6.9	176	2.5	63	2.2	55
HSR5	2″-8UN	3 1/8″	6.9	175.5	5.3	134	7.4	187	2.5	63	2.2	55
	2 1/4″-8UN	3 1/2″			5.8	148	7.6	193.5	2.7	69.5	2.4	61.5
	2 1/2″-8UN	3 7/8″			6.0	153	7.9	200	3.0	76	2.7	68
	2 3/4″-8UN	4 1/4″			6.5	165	8.1	206	3.2	82	2.9	74
HSR6	2 3/4″-8UN	4 1/4″	8.6	219	6.8	172	8.5	216	3.2	82	2.9	74
	3″-8UN	4 5/8″			7.2	182	8.8	223	3.5	89	3.2	81
	3 1/4″-8UN	5″			7.5	190	9.0	229	3.7	95	3.4	87
	3 1/2″-8UN	5 3/8″			8.1	205	9.3	235	4.0	101	3.7	93
HSR7	3 1/2″-8UN	5 3/8″	9.9	252	9.1	230	9.5	241	4.0	101	3.7	93
	3 3/4″-8UN	5 3/4″			9.3	235	9.7	247	4.2	107	3.9	99
	4″-8UN	6 1/8″			9.5	242	10.0	254	4.5	114	4.2	106
HSR8	4″-8UN	6 1/8″	11.1	283	10.0	255	10.4	264	4.5	114	4.2	106
	4 1/4″-8UN	6 1/2″			10.2	260	10.6	270	4.7	120	4.4	112
	4 1/2″-8UN	6 7/8″			10.6	270	10.9	277	5.0	127	4.7	119

9.4 Pressure - Tension Force table

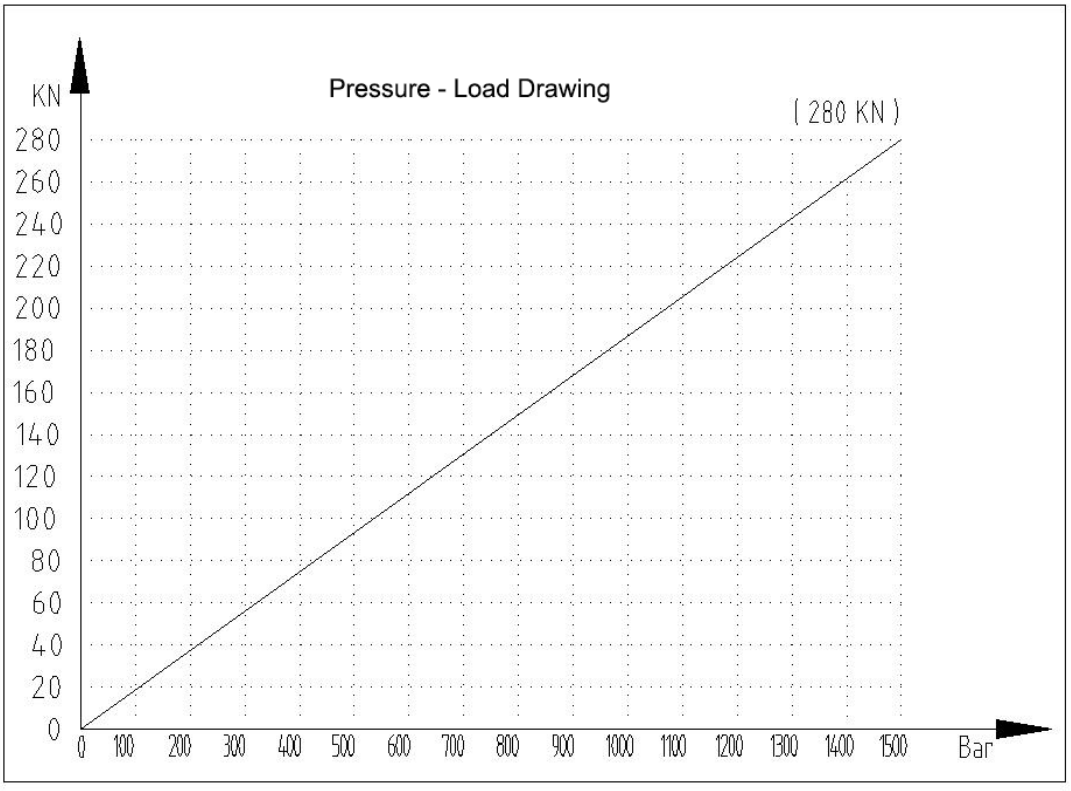
HSR0 Bolt Tensioner:Pressure.Load.Tensioner Force chart								
Operating Pressuer	Load	Tension Force	Operating Pressuer	Load	Tension Force	Operating Pressuer	Load	Tension Force
(Mpa)	(KN)	(t)	(Mpa)	(KN)	(t)	(Mpa)	(KN)	(t)
2	2.1	0.2	52	55.5	5.7	102	108.8	11.1
4	4.3	0.4	54	57.6	5.9	104	110.9	11.3
6	6.4	0.7	56	59.7	6.1	106	113.1	11.5
8	8.5	0.9	58	61.9	6.3	108	115.2	11.8
10	10.7	1.1	60	64.0	6.5	110	117.3	12.0
12	12.8	1.3	62	66.1	6.7	112	119.5	12.2
14	14.9	1.5	64	68.3	7.0	114	121.6	12.4
16	17.1	1.7	66	70.4	7.2	116	124.0	12.7
18	19.2	2.0	68	72.5	7.4	118	125.9	12.8
20	21.3	2.2	70	74.7	7.6	120	128.0	13.1
22	23.5	2.4	72	76.8	7.8	122	130.1	13.3
24	25.6	2.6	74	78.9	8.1	124	132.3	13.5
26	27.7	2.8	76	81.1	8.3	126	134.4	13.7
28	29.9	3.0	78	83.2	8.5	128	136.5	13.9
30	32.0	3.3	80	85.3	8.7	130	138.7	14.1
32	34.1	3.5	82	87.5	8.9	132	140.8	14.4
34	36.3	3.7	84	89.6	9.1	134	142.9	14.6
36	38.4	3.9	86	91.7	9.4	136	145.1	14.8
38	40.5	4.1	88	93.9	9.6	138	147.2	15.0
40	42.7	4.4	90	96.0	9.8	140	149.3	15.2
42	44.8	4.6	92	98.1	10.0	142	151.5	15.5
44	46.9	4.8	94	100.3	10.2	144	153.6	15.7
46	49.1	5.0	96	102.4	10.4	146	155.7	15.9
48	51.2	5.2	98	104.5	10.7	148	157.9	16.1
50	53.3	5.4	100	106.7	10.9	150	160.0	16.3
	Formula:	Load (KN) =Operating Pressure (Mpa) /150x160				Tension Force (t)=Load (KN)/9.8		



HSR1 Bolt Tensioner: Pressure. Load. Tensioner Force chart

Operating Pressure	Load	Tension Force	Operating Pressure	Load	Tension Force	Operating Pressure	Load	Tension Force
(Mpa)	(KN)	(t)	(Mpa)	(KN)	(t)	(Mpa)	(KN)	(t)
2	3.7	0.4	52	97.1	9.9	102	190.4	19.4
4	7.5	0.8	54	100.8	10.3	104	194.1	19.8
6	11.2	1.1	56	104.5	10.7	106	197.9	20.2
8	14.9	1.5	58	108.3	11.0	108	201.6	20.6
10	18.7	1.9	60	112.0	11.4	110	205.3	21.0
12	22.4	2.3	62	115.7	11.8	112	209.1	21.3
14	26.1	2.7	64	119.5	12.2	114	212.8	21.7
16	29.9	3.0	66	123.2	12.6	116	216.5	22.1
18	33.6	3.4	68	126.9	13.0	118	220.3	22.5
20	37.3	3.8	70	130.7	13.3	120	224.0	22.9
22	41.1	4.2	72	134.4	13.7	122	227.7	23.2
24	44.8	4.6	74	138.1	14.1	124	231.5	23.6
26	48.5	5.0	76	141.9	14.5	126	235.2	24.0
28	52.3	5.3	78	145.6	14.9	128	238.9	24.4
30	56.0	5.7	80	149.3	15.2	130	242.7	24.8
32	59.7	6.1	82	153.1	15.6	132	246.4	25.1
34	63.5	6.5	84	156.8	16.0	134	250.1	25.5
36	67.2	6.9	86	160.5	16.4	136	253.9	25.9
38	70.9	7.2	88	164.3	16.8	138	257.6	26.3
40	74.7	7.6	90	168.0	17.1	140	261.3	26.7
42	78.4	8.0	92	171.7	17.5	142	265.1	27.0
44	82.1	8.4	94	175.5	17.9	144	268.8	27.4
46	85.9	8.8	96	179.2	18.3	146	272.5	27.8
48	89.6	9.1	98	182.9	18.7	148	276.3	28.2
50	93.3	9.5	100	186.7	19.0	150	280.0	28.6

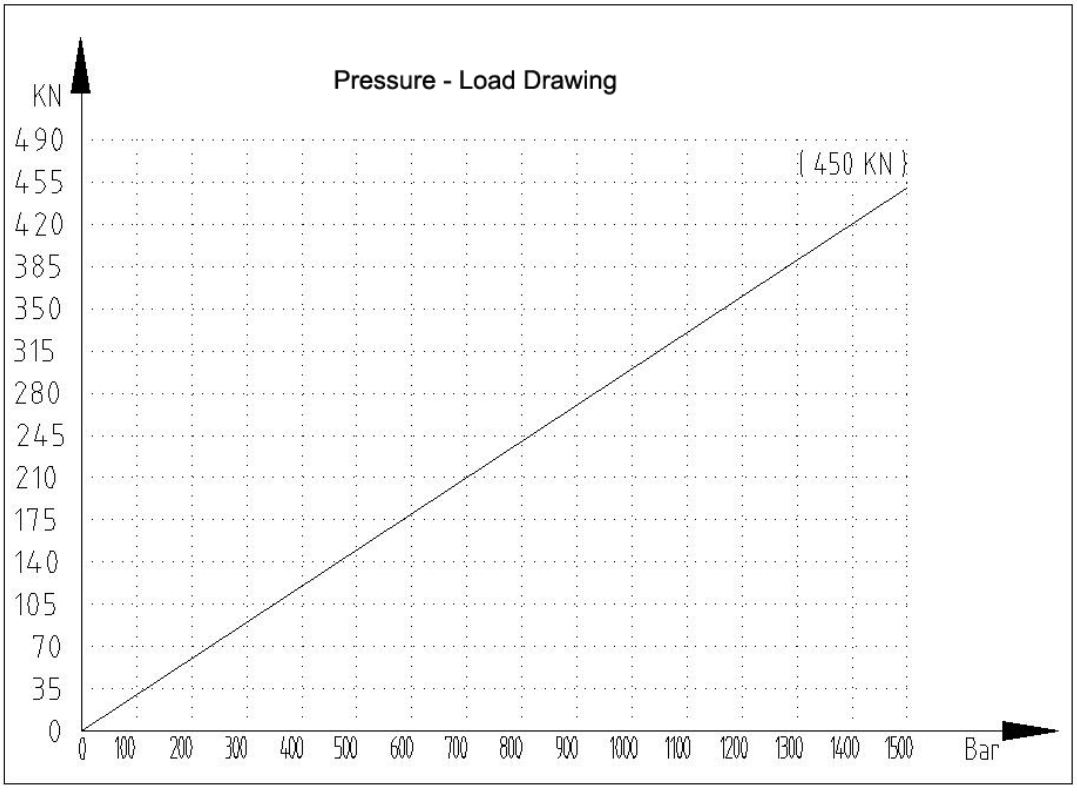
Formula: Load(KN) =Operating Pressure(Mpa)/150x280 Tension Force(t)= Load (KN)/9.8



HSR2 Bolt Tensioner: Pressure. Load. Tension Force chart

Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)
2	6	0.6	52	156.0	15.9	102	306.0	31.2
4	12.0	1.2	54	162.0	16.5	104	312.0	31.8
6	18.0	1.8	56	168.0	17.1	106	318.0	32.4
8	24.0	2.4	58	174.0	17.8	108	324.0	33.1
10	30.0	3.1	60	180.0	18.4	110	330.0	33.7
12	36.0	3.7	62	186.0	19.0	112	336.0	34.3
14	42.0	4.3	64	192.0	19.6	114	342.0	34.9
16	48.0	4.9	66	198.0	20.2	116	348.0	35.5
18	54.0	5.5	68	204.0	20.8	118	354.0	36.1
20	60.0	6.1	70	210.0	21.4	120	360.0	36.7
22	66.0	6.7	72	216.0	22.0	122	366.0	37.3
24	72.0	7.3	74	222.0	22.7	124	372.0	38.0
26	78.0	8.0	76	228.0	23.3	126	378.0	38.6
28	84.0	8.6	78	234.0	23.9	128	384.0	39.2
30	90.0	9.2	80	240.0	24.5	130	390.0	39.8
32	96.0	9.8	82	246.0	25.1	132	396.0	40.4
34	102.0	10.4	84	252.0	25.7	134	402.0	41.0
36	108.0	11.0	86	258.0	26.3	136	408.0	41.6
38	114.0	11.6	88	264.0	26.9	138	414.0	42.2
40	120.0	12.2	90	270.0	27.6	140	420.0	42.9
42	126.0	12.9	92	276.0	28.2	142	426.0	43.5
44	132.0	13.5	94	282.0	28.8	144	432.0	44.1
46	138.0	14.1	96	288.0	29.4	146	438.0	44.7
48	144.0	14.7	98	294.0	30.0	148	444.0	45.3
50	150.0	15.3	100	300.0	30.6	150	450.0	45.9

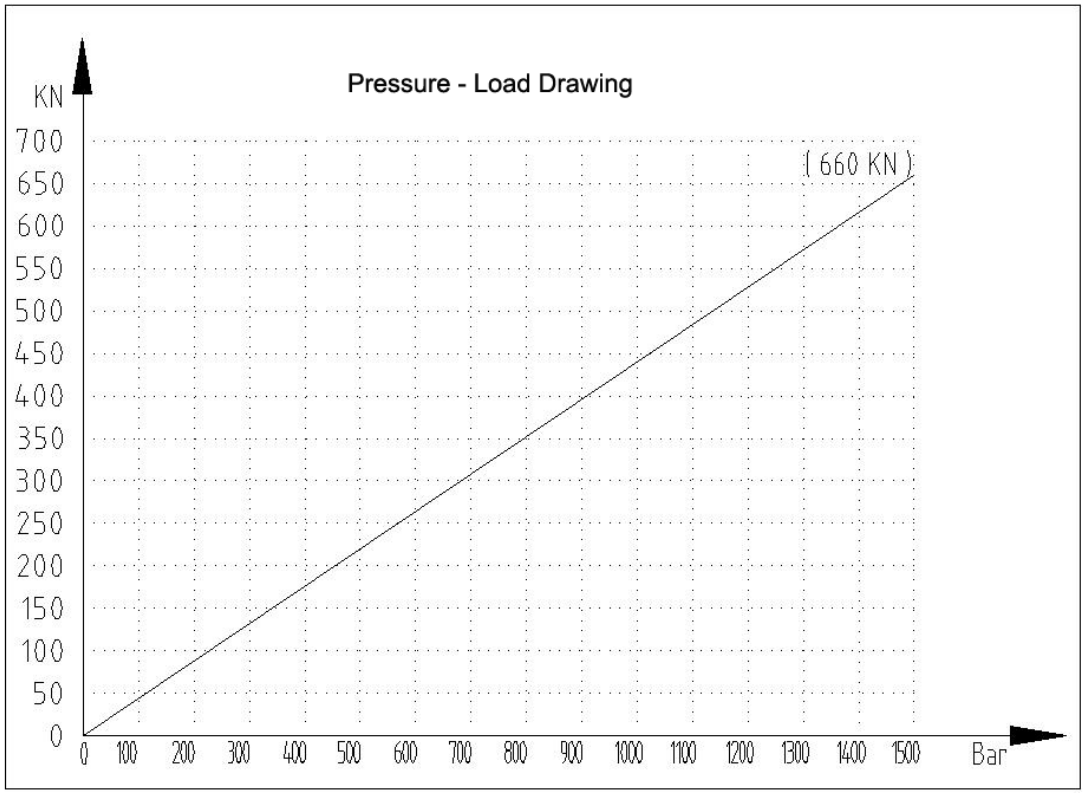
Formula: Load(KN) =Operating Pressure(Mpa)/150x450 | Tension Force(t)= Load (KN)/9.8



HSR3 Bolt Tensioner: Pressure. Load. Tension Force chart

Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)
2	8.8	0.9	52	228.8	23.3	102	448.8	45.8
4	17.6	1.8	54	237.6	24.2	104	457.6	46.7
6	26.4	2.7	56	246.4	25.1	106	466.4	47.6
8	35.2	3.6	58	255.2	26.0	108	475.2	48.5
10	44.0	4.5	60	264.0	26.9	110	484.0	49.4
12	52.8	5.4	62	272.8	27.8	112	492.8	50.3
14	61.6	6.3	64	281.6	28.7	114	501.6	51.2
16	70.4	7.2	66	290.4	29.6	116	510.4	52.1
18	79.2	8.1	68	299.2	30.5	118	519.2	53.0
20	88.0	9.0	70	308.0	31.4	120	528.0	53.9
22	96.8	9.9	72	316.8	32.3	122	536.8	54.8
24	105.6	10.8	74	325.6	33.2	124	545.6	55.7
26	114.4	11.7	76	334.4	34.1	126	554.4	56.6
28	123.2	12.6	78	343.2	35.0	128	563.2	57.5
30	132.0	13.5	80	352.0	35.9	130	572.0	58.4
32	140.8	14.4	82	360.8	36.8	132	580.8	59.3
34	149.6	15.3	84	369.6	37.7	134	589.6	60.2
36	158.4	16.2	86	378.4	38.6	136	598.4	61.1
38	167.2	17.1	88	387.2	39.5	138	607.2	62.0
40	176.0	18.0	90	396.0	40.4	140	616.0	62.9
42	184.8	18.9	92	404.8	41.3	142	624.8	63.8
44	193.6	19.8	94	413.6	42.2	144	633.6	64.7
46	202.4	20.7	96	422.4	43.1	146	642.4	65.6
48	211.2	21.6	98	431.2	44.0	148	651.2	66.4
50	220.0	22.4	100	440.0	44.9	150	660.0	67.3

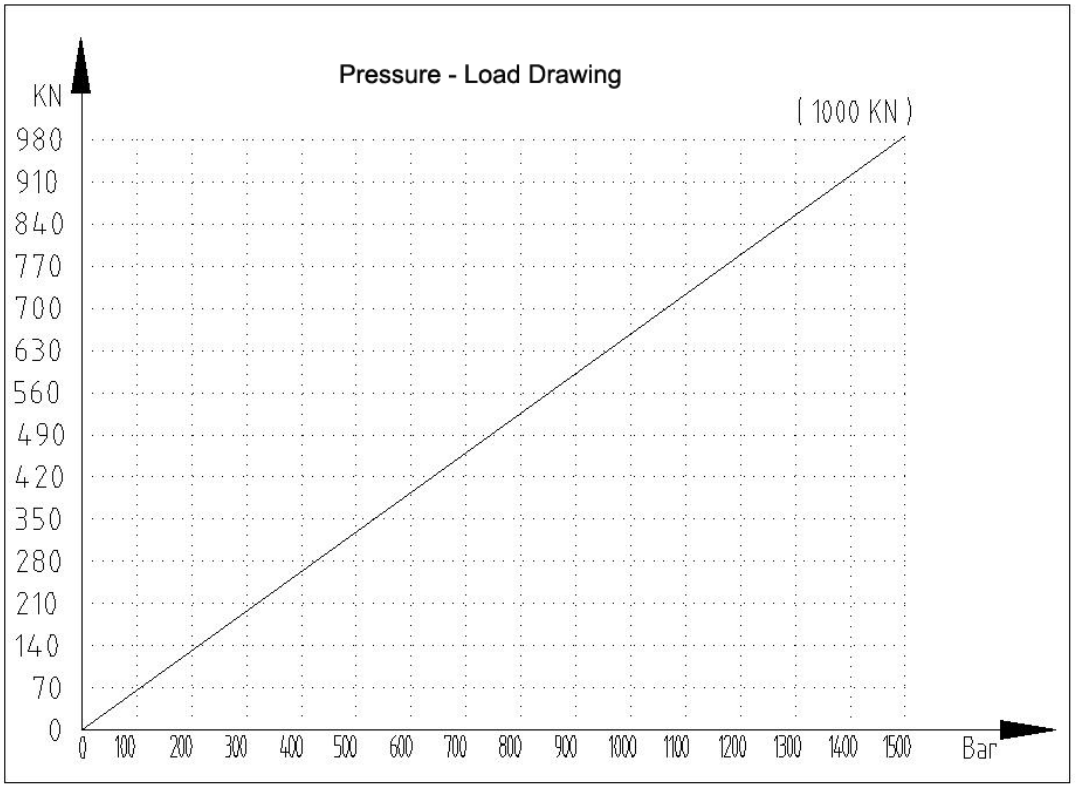
Formula: Load(KN) =Operating Pressure(Mpa)/150x660 Tension Force(t)= Load (KN)/9.8



HSR4 Bolt Tensioner: Pressure. Load. Tension Force chart

Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)
2	13.3	1.4	52	346.7	35.4	102	680.0	69.4
4	26.7	2.7	54	360.0	36.7	104	693.3	70.7
6	40.0	4.1	56	373.3	38.1	106	706.7	72.1
8	53.3	5.4	58	386.7	39.5	108	720.0	73.5
10	66.7	6.8	60	400.0	40.8	110	733.3	74.8
12	80.0	8.2	62	413.3	42.2	112	746.7	76.2
14	93.3	9.5	64	426.7	43.5	114	760.0	77.6
16	106.7	10.9	66	440.0	44.9	116	773.3	78.9
18	120.0	12.2	68	453.3	46.3	118	786.7	80.3
20	133.3	13.6	70	466.7	47.6	120	800.0	81.6
22	146.7	15.0	72	480.0	49.0	122	813.3	83.0
24	160.0	16.3	74	493.3	50.3	124	826.7	84.4
26	173.3	17.7	76	506.7	51.7	126	840.0	85.7
28	186.7	19.0	78	520.0	53.1	128	853.3	87.1
30	200.0	20.4	80	533.3	54.4	130	866.7	88.4
32	213.3	21.8	82	546.7	55.8	132	880.0	89.8
34	226.7	23.1	84	560.0	57.1	134	893.3	91.2
36	240.0	24.5	86	573.3	58.5	136	906.7	92.5
38	253.3	25.9	88	586.7	59.9	138	920.0	93.9
40	266.7	27.2	90	600.0	61.2	140	933.3	95.2
42	280.0	28.6	92	613.3	62.6	142	946.7	96.6
44	293.3	29.9	94	626.7	63.9	144	960.0	98.0
46	306.7	31.3	96	640.0	65.3	146	973.3	99.3
48	320.0	32.7	98	653.3	66.7	148	986.7	100.7
50	333.3	34.0	100	666.7	68.0	150	1000.0	102.0

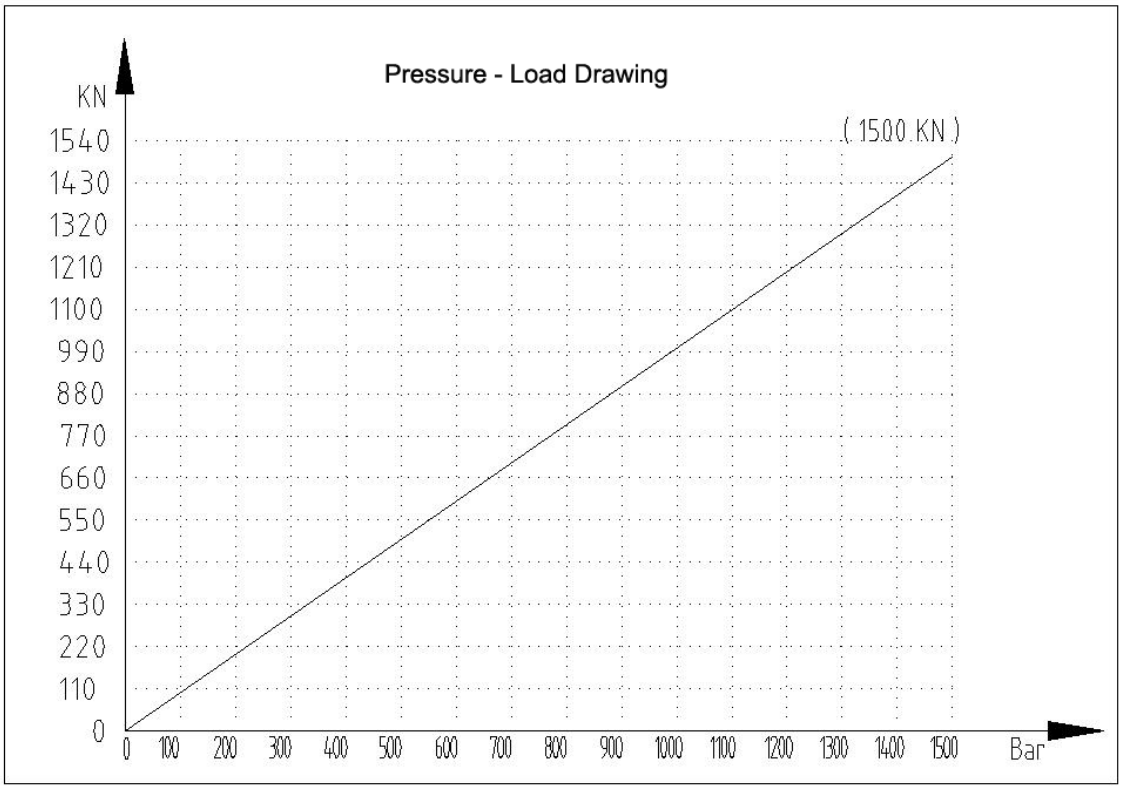
Formula: Load(KN) =Operating Pressure(Mpa)/150x1000 | Tension Force(t)= Load (KN)/9.8



HSR5 Bolt Tensioner: Pressure. Load. Tension Force chart

Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)
2	20	2.0	52	520.0	53.1	102	1020.0	104.1
4	40.0	4.1	54	540.0	55.1	104	1040.0	106.1
6	60.0	6.1	56	560.0	57.1	106	1060.0	108.2
8	80.0	8.2	58	580.0	59.2	108	1080.0	110.2
10	100.0	10.2	60	600.0	61.2	110	1100.0	112.2
12	120.0	12.2	62	620.0	63.3	112	1120.0	114.3
14	140.0	14.3	64	640.0	65.3	114	1140.0	116.3
16	160.0	16.3	66	660.0	67.3	116	1160.0	118.4
18	180.0	18.4	68	680.0	69.4	118	1180.0	120.4
20	200.0	20.4	70	700.0	71.4	120	1200.0	122.4
22	220.0	22.4	72	720.0	73.5	122	1220.0	124.5
24	240.0	24.5	74	740.0	75.5	124	1240.0	126.5
26	260.0	26.5	76	760.0	77.6	126	1260.0	128.6
28	280.0	28.6	78	780.0	79.6	128	1280.0	130.6
30	300.0	30.6	80	800.0	81.6	130	1300.0	132.7
32	320.0	32.7	82	820.0	83.7	132	1320.0	134.7
34	340.0	34.7	84	840.0	85.7	134	1340.0	136.7
36	360.0	36.7	86	860.0	87.8	136	1360.0	138.8
38	380.0	38.8	88	880.0	89.8	138	1380.0	140.8
40	400.0	40.8	90	900.0	91.8	140	1400.0	142.9
42	420.0	42.9	92	920.0	93.9	142	1420.0	144.9
44	440.0	44.9	94	940.0	95.9	144	1440.0	146.9
46	460.0	46.9	96	960.0	98.0	146	1460.0	149.0
48	480.0	49.0	98	980.0	100.0	148	1480.0	151.0
50	500.0	51.0	100	1000.0	102.0	150	1500.0	153.1

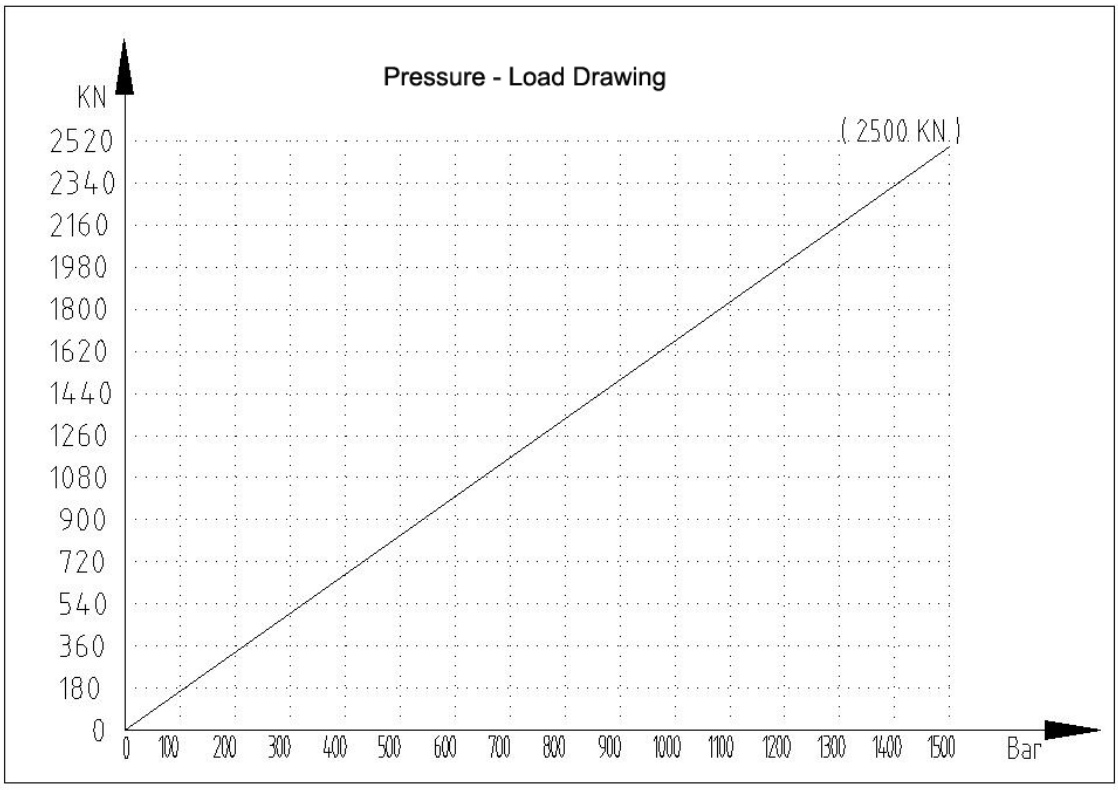
Formula: Load(KN) =Operating Pressure(Mpa)/150x1500 | Tension Force(t)= Load (KN)/9.8



HSR6 Bolt Tensioner: Pressure. Load. Tension Force chart

Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)
2	33.3	3.4	52	866.7	88.4	102	1700.0	173.5
4	66.7	6.8	54	900.0	91.8	104	1733.3	176.9
6	100.0	10.2	56	933.3	95.2	106	1766.7	180.3
8	133.3	13.6	58	966.7	98.6	108	1800.0	183.7
10	166.7	17.0	60	1000.0	102.0	110	1833.3	187.1
12	200.0	20.4	62	1033.3	105.4	112	1866.7	190.5
14	233.3	23.8	64	1066.7	108.8	114	1900.0	193.9
16	266.7	27.2	66	1100.0	112.2	116	1933.3	197.3
18	300.0	30.6	68	1133.3	115.6	118	1966.7	200.7
20	333.3	34.0	70	1166.7	119.0	120	2000.0	204.1
22	366.7	37.4	72	1200.0	122.4	122	2033.3	207.5
24	400.0	40.8	74	1233.3	125.9	124	2066.7	210.9
26	433.3	44.2	76	1266.7	129.3	126	2100.0	214.3
28	466.7	47.6	78	1300.0	132.7	128	2133.3	217.7
30	500.0	51.0	80	1333.3	136.1	130	2166.7	221.1
32	533.3	54.4	82	1366.7	139.5	132	2200.0	224.5
34	566.7	57.8	84	1400.0	142.9	134	2233.3	227.9
36	600.0	61.2	86	1433.3	146.3	136	2266.7	231.3
38	633.3	64.6	88	1466.7	149.7	138	2300.0	234.7
40	666.7	68.0	90	1500.0	153.1	140	2333.3	238.1
42	700.0	71.4	92	1533.3	156.5	142	2366.7	241.5
44	733.3	74.8	94	1566.7	159.9	144	2400.0	244.9
46	766.7	78.2	96	1600.0	163.3	146	2433.3	248.3
48	800.0	81.6	98	1633.3	166.7	148	2466.7	251.7
50	833.3	85.0	100	1666.7	170.1	150	2500.0	255.1

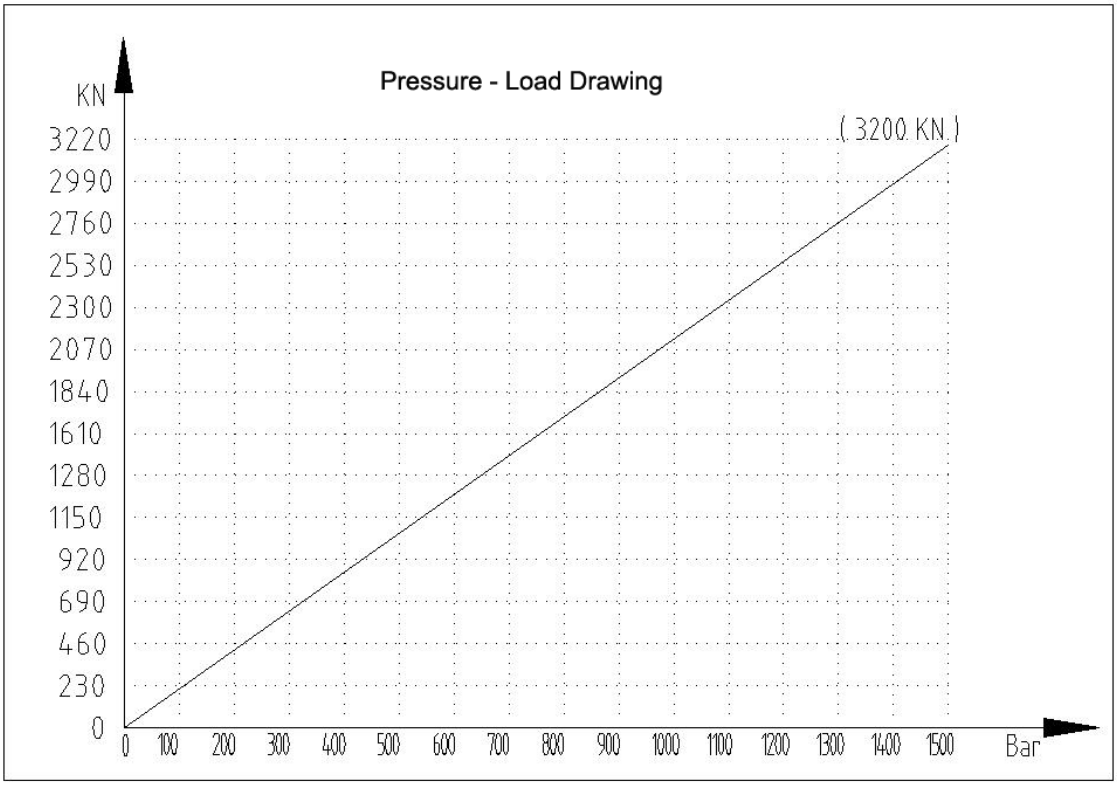
Formula: Load(KN) =Operating Pressure(Mpa)/150x2500 Tension Force(t)= Load (KN)/9.8



HSR7 Bolt Tensioner: Pressure. Load. Tension Force chart

Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)
2	42.7	4.4	52	1109.3	113.2	102	2176.0	222.0
4	85.3	8.7	54	1152.0	117.6	104	2218.7	226.4
6	128.0	13.1	56	1194.7	121.9	106	2261.3	230.7
8	170.7	17.4	58	1237.3	126.3	108	2304.0	235.1
10	213.3	21.8	60	1280.0	130.6	110	2346.7	239.5
12	256.0	26.1	62	1322.7	135.0	112	2389.3	243.8
14	298.7	30.5	64	1365.3	139.3	114	2432.0	248.2
16	341.3	34.8	66	1408.0	143.7	116	2474.7	252.5
18	384.0	39.2	68	1450.7	148.0	118	2517.3	256.9
20	426.7	43.5	70	1493.3	152.4	120	2560.0	261.2
22	469.3	47.9	72	1536.0	156.7	122	2602.7	265.6
24	512.0	52.2	74	1578.7	161.1	124	2645.3	269.9
26	554.7	56.6	76	1621.3	165.4	126	2688.0	274.3
28	597.3	61.0	78	1664.0	169.8	128	2730.7	278.6
30	640.0	65.3	80	1706.7	174.1	130	2773.3	283.0
32	682.7	69.7	82	1749.3	178.5	132	2816.0	287.3
34	725.3	74.0	84	1792.0	182.9	134	2858.7	291.7
36	768.0	78.4	86	1834.7	187.2	136	2901.3	296.1
38	810.7	82.7	88	1877.3	191.6	138	2944.0	300.4
40	853.3	87.1	90	1920.0	195.9	140	2986.7	304.8
42	896.0	91.4	92	1962.7	200.3	142	3029.3	309.1
44	938.7	95.8	94	2005.3	204.6	144	3072.0	313.5
46	981.3	100.1	96	2048.0	209.0	146	3114.7	317.8
48	1024.0	104.5	98	2090.7	213.3	148	3157.3	322.2
50	1066.7	108.8	100	2133.3	217.7	150	3200.0	326.5

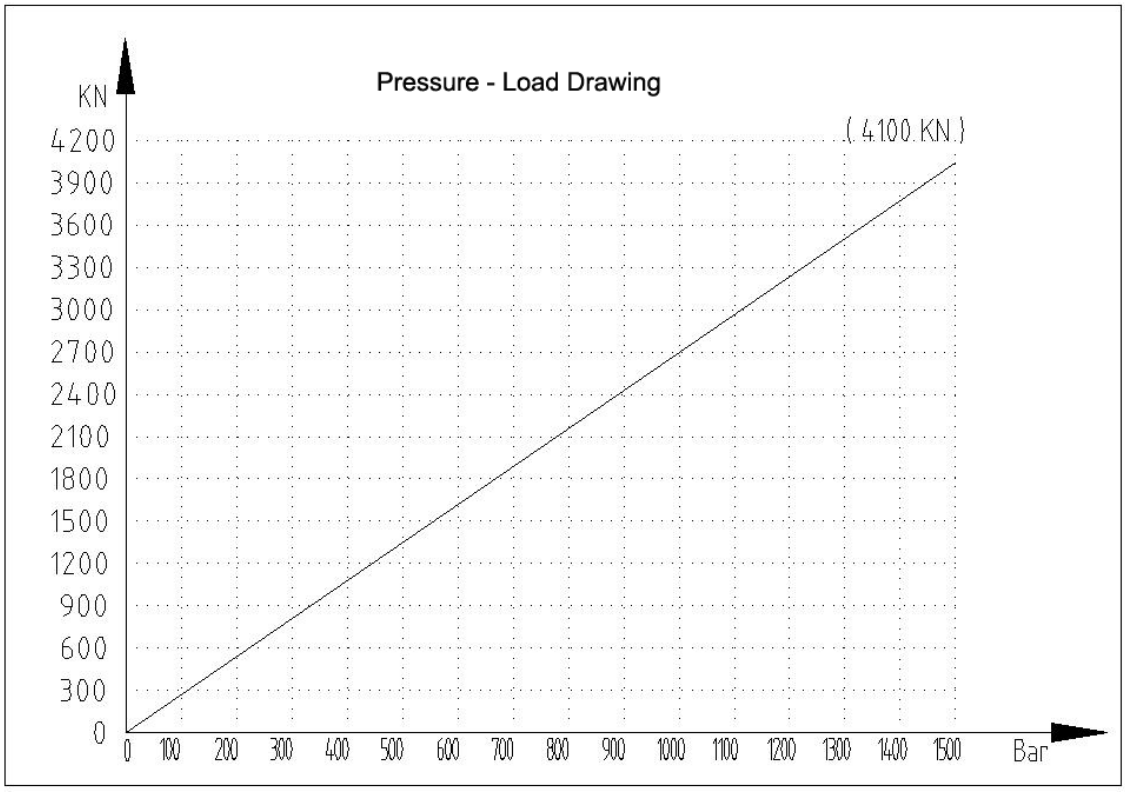
Formula: Load(KN) =Operating Pressure(Mpa)/150x3200 | Tension Force(t)= Load (KN)/9.8



HSR8 Bolt Tensioner: Pressure. Load. Tension Force chart

Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)	Operating Pressure (Mpa)	Load (KN)	Tension Force (t)
2	54.7	5.6	52	1421.3	145.0	102	2788.0	284.5
4	109.3	11.2	54	1476.0	150.6	104	2842.7	290.1
6	164.0	16.7	56	1530.7	156.2	106	2897.3	295.6
8	218.7	22.3	58	1585.3	161.8	108	2952.0	301.2
10	273.3	27.9	60	1640.0	167.3	110	3006.7	306.8
12	328.0	33.5	62	1694.7	172.9	112	3061.3	312.4
14	382.7	39.0	64	1749.3	178.5	114	3116.0	318.0
16	437.3	44.6	66	1804.0	184.1	116	3170.7	323.5
18	492.0	50.2	68	1858.7	189.7	118	3225.3	329.1
20	546.7	55.8	70	1913.3	195.2	120	3280.0	334.7
22	601.3	61.4	72	1968.0	200.8	122	3334.7	340.3
24	656.0	66.9	74	2022.7	206.4	124	3389.3	345.9
26	710.7	72.5	76	2077.3	212.0	126	3444.0	351.4
28	765.3	78.1	78	2132.0	217.6	128	3498.7	357.0
30	820.0	83.7	80	2186.7	223.1	130	3553.3	362.6
32	874.7	89.3	82	2241.3	228.7	132	3608.0	368.2
34	929.3	94.8	84	2296.0	234.3	134	3662.7	373.7
36	984.0	100.4	86	2350.7	239.9	136	3717.3	379.3
38	1038.7	106.0	88	2405.3	245.4	138	3772.0	384.9
40	1093.3	111.6	90	2460.0	251.0	140	3826.7	390.5
42	1148.0	117.1	92	2514.7	256.6	142	3881.3	396.1
44	1202.7	122.7	94	2569.3	262.2	144	3936.0	401.6
46	1257.3	128.3	96	2624.0	267.8	146	3990.7	407.2
48	1312.0	133.9	98	2678.7	273.3	148	4045.3	412.8
50	1366.7	139.5	100	2733.3	278.9	150	4100.0	418.4

Formula: Load(KN) =Operating Pressure(Mpa)/150x4100 Tension Force(t)= Load (KN)/9.8



Appendix

A(Normative appendix)

8.8 Class of bolts allow axial force, pre-tightening force and pre-tightening torque

A 1： Refer to this appendix to easily determine the pre-tightening force of the performance class 8.8 bolt and the corresponding pre-tightening torque. This appendix does not apply to bolts and expansion bolts with fine thread.

A 2： The allowable axial force FA listed in Table A1 calculated the fatigue strength of the bolted joint.

A 3： The conditions for using this appendix are:

a. The thread conforms to GB 196;

b. The axial force is transmitted along the center of the bolt;

c. Ambient temperature -50-300 ℃

d. Lubricate the bearing surfaces of the threads, bolt heads and nuts during pre-tightening.

A 4： For fasteners with soft materials (such as A3, etc.), in order to avoid excessive loss of pre-tightening force, special washers for high-strength bolts should be installed under the bolt head or nut.

A 5： If the other performance grade bolts, pre-tightening force and pre-tightening torque can be used, the following factors can be converted:

Class 5.6：$Fv(5.6)=0.47\times Fv(8.8)$

$MA(5.6)=0.47\times MA(8.8)$

Class 10.9：$Fv(10.9)=1.41\times Fv(8.8)$

$MA(10.9)=1.41\times MA(8.8)$

Class 12.9：$Fv(12\,9)=1.69\times Fv(8\,8)$

$M_{A(12.96)}=1.69\times M_{A(8.8)}$

Table A1

Remark: HC Tightening thickness

Threads Size		Stress area Ac(mm)	Allowable axial force KN Hc/d					Pretighten Force (Fv)	Pretighten Torque (Ma)
Diameter d(mm)	Pitch size(mm)		2	3	4	6	>6	KN	N.m
M6	1	20.1	3	3	3	3	3	6.8	7
M8	1.25	36.6	7	7	7	7	7	12.5	18
M10	1.5	58	11	11	11	11	11	19.9	35
M12	1.75	84.3	16	17	17	16	16	29.1	61
M14	2	115.4	20	23	24	23	23	39.8	96
M16	2	157	27	32	33	32	32	55.3	149
M18	2.5	192	31	36	38	37	36	67.5	205
M20	2.5	245	36	42	49	51	50	86.3	290
M24	3	353	52	61	71	73	72	124.4	500
M30	3.5	561	85	100	115	118	116	199.1	1004
M36	4	817	124	146	168	173	170	291.4	1749
M42	4.5	1121	175	206	237	239	235	401.2	2806
M48	5	1473	231	273	314	315	310	528.6	4236
M56	5.5	2030	299	354	408	440	432	732.2	6791
M64	6	2676	384	454	583	586	574	958.9	10147
M72	6	3463	486	575	663	768	752	1265	14689
M80	6	4344	608	716	907	934	920	1563	19626
M90	6	5590	782	922	1168	1202	1185	2012	28584
M100	6	7000	980	1155	1463	1505	1484	2520	39960
M110	6	8560	1198	1412	1789	1840	1815	3081	53939
M120	6	10300	1442	1700	2152	2215	2183	3708	71034
M125	6	11200	1568	1848	2340	2408	2374	4032	80567
M140	6	14200	1988	2343	2968	3053	3010	5112	114800
M160	6	18700	2618	3085	3098	4020	3964	6732	173400

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液压螺栓拉伸器操作保养手册

● 本操作手册内容为液压螺栓拉伸器的操作规程、警告和注意事项以及故障排除。使用前，请仔细阅读本手册，彻底理解其内容并妥善保管。本说明书仅作为最终用户参考。

● 任何在此书上未提到的问题或使用方法，请在安装和使用之前询问供应商。

● 雷恩拒绝承担由以下情况引起的任何责任：

不适当的使用或者由非专业人士操作使用；安装错误；

用油错误；

不进行保养维护；

未经生产商授权的改装或者拆卸；

使用非原装部件，　使用型号不适用。

一 收货须知（ 开箱检查）

仔细检查产品外观有无损伤，是否有运输损坏。运输损坏不包括在保修范围内。如果发现因货运受损，应及时向货运商申报。货运商应支付运输损坏带来的所有维修和更换费用。

安全提示：

▲ 这是危险标记。每当你看到此标记，就意味着对人、动物和物品可能存在或或少的危多险。　在此手册中这种危险和相关的预防措施都用此标记标出。

▲ 危险：忽略此警告可能会对人、动物或物品的安全存在重大风险。

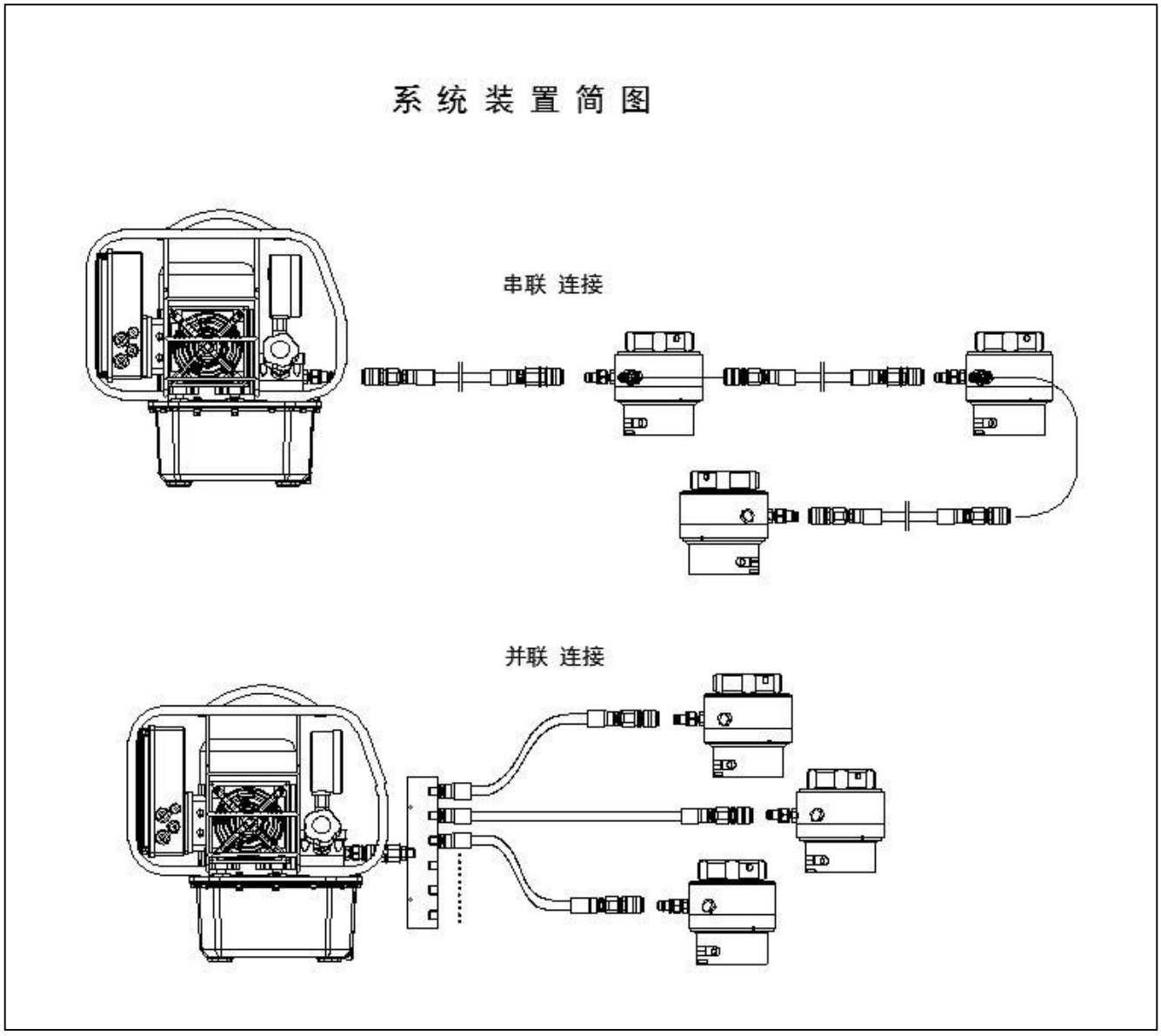
敬请使用者仔细遵守这些操作，生产商拒绝对任何由使用不当引起的损坏和伤害承担任何责任。

二 概述

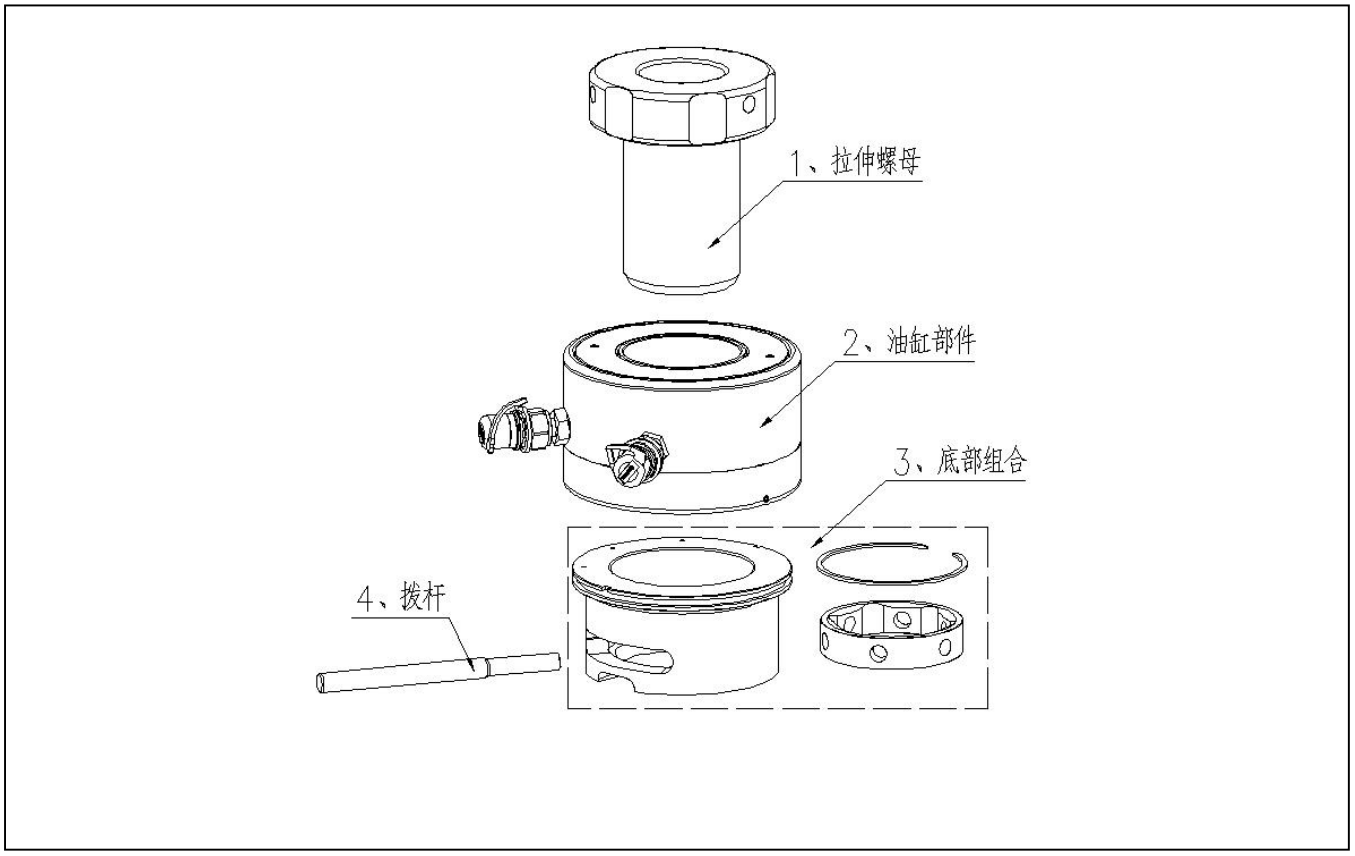
螺栓拉伸器（液压螺栓拉伸器），它具有螺栓紧固和拆卸的功能，可广泛适用于冶金矿山、石油化工、船舶工业、机车车辆、风力发电等行业。它是借助超高压泵提供的动力，将螺栓在允许的弹性变形内拉伸变形，达到紧固螺栓和拆卸螺栓的目的。螺栓拉伸器工作时能精确控制预紧力、不损伤螺纹、操作简便、减轻劳动强度、缩短生产维修周期、有效地增加联接的可靠性及螺栓的抗疲劳强度、提高装配精度及安全系数。液压拉伸装置由螺栓拉伸器及高压油泵（手动、电动）组成。

三 主要结构及工作原理

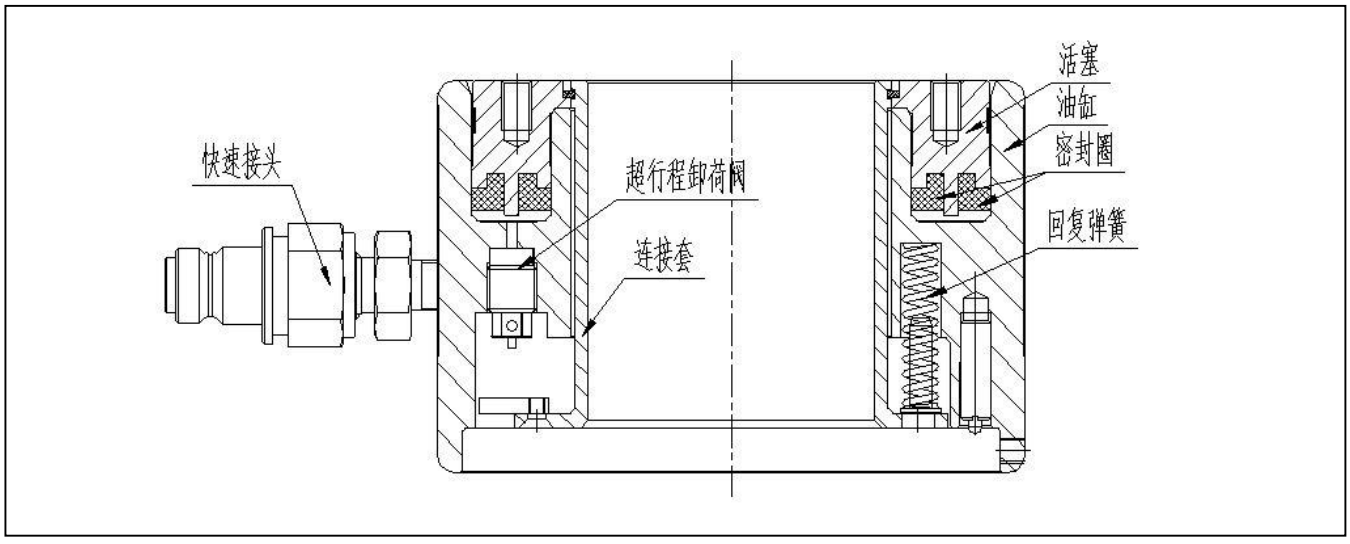
液压拉伸装置主要由超高压油泵和拉伸器两部分组成， 由高压软管连接， 成为一个完整的装置。 一套拉伸装置可由1台超高压油泵与单台或多台拉伸器组合使用。 如下图。



HSR螺栓拉伸器由油缸部件、拉伸螺母和底座部件三部分组成。



其中油缸部件包含了活塞、油缸、连接套、密封圈、卸荷阀、自动回复机构、 快速接头等零配件。

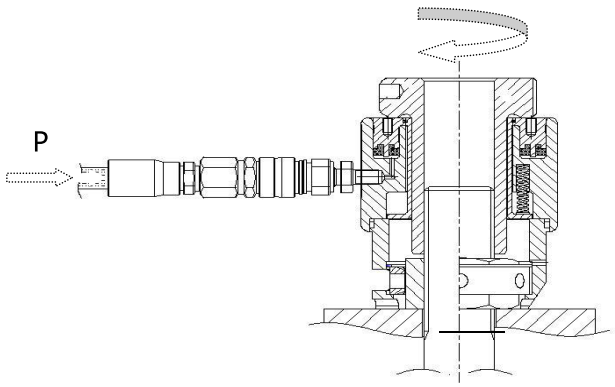


温馨提示：

1、 产品外观参数各有所异，上图仅供参考，具体以实物为准。

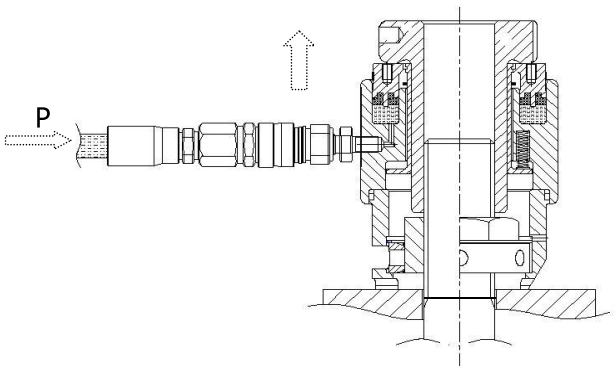
2、 产品若有实物改进，会编进新版说明书，恕不另行通知。

螺栓拉伸器与超高压油泵配合使用，同步进行，工作过程分为四步：



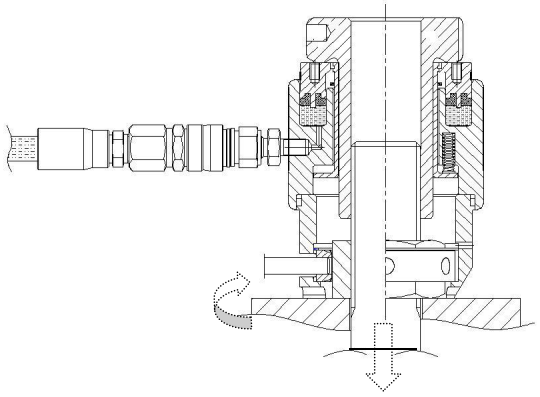
充 油：

将 HSR螺栓拉伸器旋入螺栓，油泵开始工作，低压，大流量充油，油缸里的活塞开始上升，推动拉伸螺母向上移动，开始拉伸螺栓。



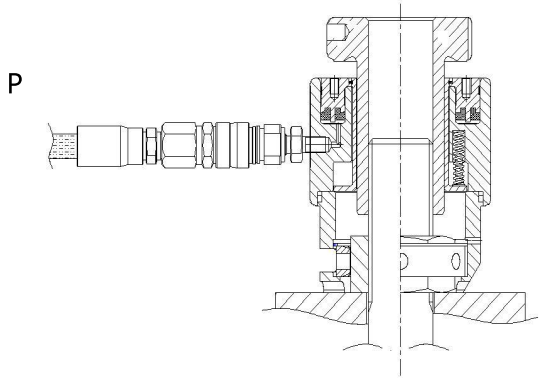
升 压：

油泵继续加压，轴向拉伸力将拉长螺栓，这时螺母因螺栓的伸长而上升，与法兰接触面脱离开来。当达到要求的预紧力时，停止加压。



工作：

当达到要求的预紧力后，可用拨杆穿过底座的窗口，拨动拨套，锁紧或拆松螺母。



卸 荷：

工作完毕，打开卸荷阀，液压油流回油泵储油箱。

四 使用方法

㈠使用前的准备

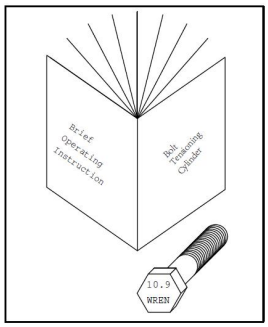


图 1：操作指导

1 阅读使用说明书：在开始工作前仔细阅读“ 超高压油泵”和“ 螺栓拉伸器” 的使用说明书,注意易引起财产损失和事故的防范要点。

2 检查：①仔细检查油泵、软管、螺栓拉伸器外观有否因运输或存贮不当所造成的损坏。如有损坏请酌情处理后再使用。

② 检查螺栓拉伸器的操作数据（预紧力,操作压力）和螺栓（等级，螺母上的螺纹长度）。用户有责任确认所用螺栓的特性、预紧力和连接方式。

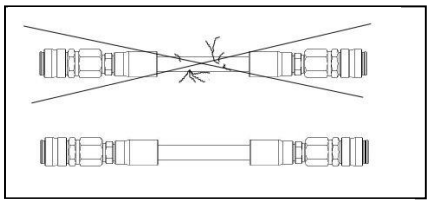


图 2：油管损坏，不要使用

最大压力，预紧力：标注在雷恩（WREN）拉伸器油缸上。

③检查螺栓露出螺母的有效螺纹长度，确保在螺母上有足够的螺纹突出量。（如图3）

通常情况下，螺母上的螺纹突出量为（最小）

1×M（对于 M 100 ,H = min. 100 mm ）

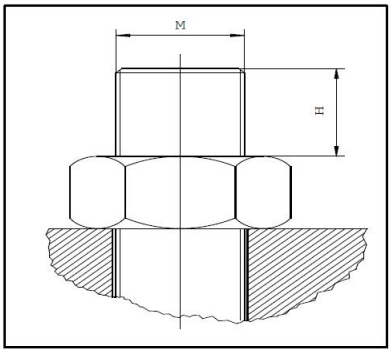


图 3：螺纹突出量

如需要，可向雷恩（WREN）专业工程师咨询，电话：0571-88114630。

3 清洗、擦干：螺栓拉伸器及超高压油泵的内外表面特别是外露的活动表面必须保持清洁，需用专用清洗剂清洗，然后用清洁毛巾擦拭干净。

4 确定用油牌号是否适当及油量是否充足。

出厂前随泵配备32 #抗磨液压油。使用以后，当油量不足时， 需及时补足。

5 检查螺栓在支撑面上的角度α，如需要， 应修正。（如图4 ）

6 在使用螺栓拉伸器之前， 在螺栓螺纹上涂抹润滑脂， 润滑脂品种由用户自定。（如图5 ）

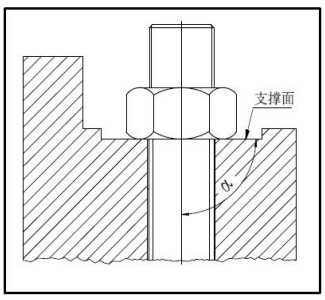


图 4:角度精准

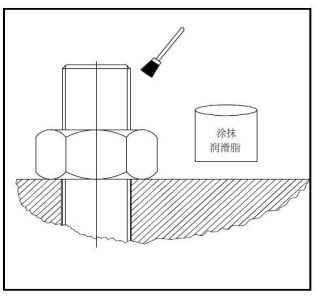
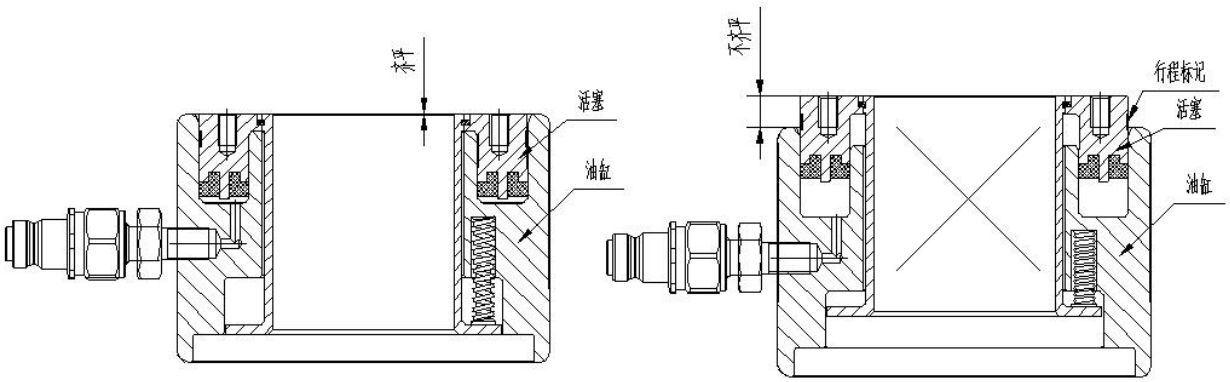


图 5：润滑

7 在使用拉伸器之前， 确保活塞在它的末端位置（例如：活塞顶端与油缸端面是否齐平）。

如需要，可向雷恩（WREN）专业工程师 咨询，电话：0571-88114630



8 在工作中，注意拉伸器与油泵的距离，在操作过程中要始终能够观察到压力表和螺栓的位置 。

9 将超高压油泵出口接头、螺栓拉伸器进口接头及高压软管两端接头清洗干净后，相互插上 ，拧紧，即可进入工作状态。（高压软管的弯曲半径应≥200 mm。）

▲警告：在没有与螺栓联接紧固牢靠之前，不应向螺栓拉伸器输送压力。

▲注意：使用中应该避免液压油管严重弯曲和缠绕；

使用弯曲或缠绕的油管将产生过大的背压；

严重弯曲和缠绕使油管内部损坏，从而过早报废；

防止将重物掉到或压到油管上；

严重冲击可引起油管内部金属线损坏，加压时被损坏的油管可能破裂；不能用液压油管拖拉及吊拿其它液压部件。

▲注意：使用WREN原厂高性能的液压配件。

▲注意：螺栓拉伸器的压力值由油泵上的压力表读取。注：**该压力表可根据用户的需求选择精度与校准要求。**

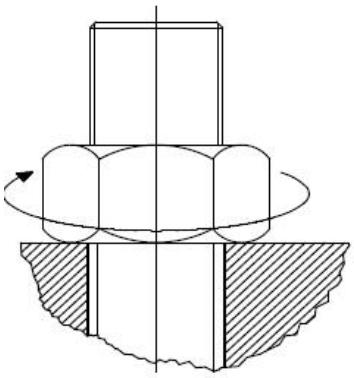
㈡连接与操作

▲警告：为避免人身伤害，最高工作压力不得大于1500bar。

▲警告：禁止空载试压。

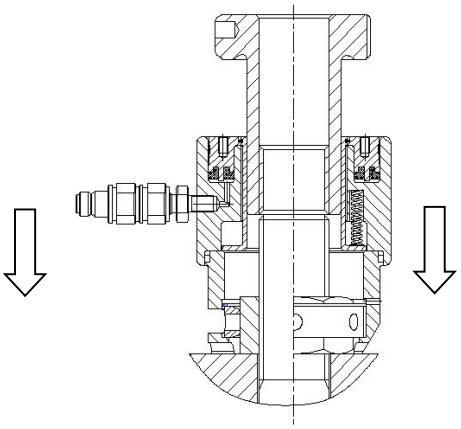
▲警告：禁止超行程，最大行程不得大于10mm。

▲警告：拉伸器的活塞应与油缸齐平。



步骤一：

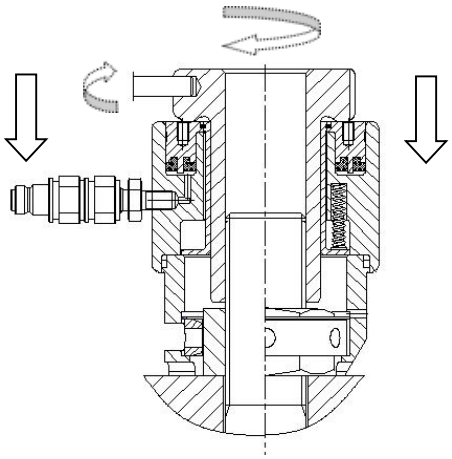
螺母上的螺纹突出量一旦确认足够时，将螺母旋向支撑表面，拧紧。这是为了防止当螺栓拉伸器在旋转到安放位置时，螺栓向内旋转。



步骤二：

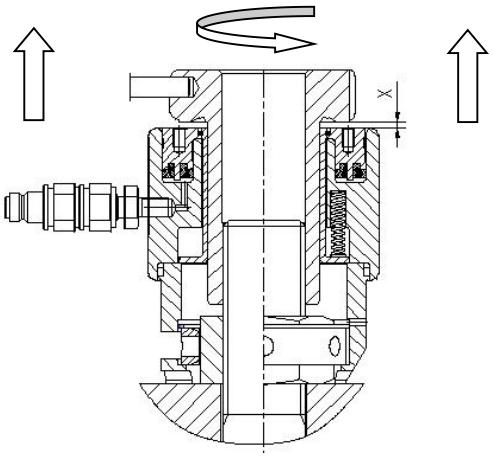
将液压螺栓拉伸器套在螺母外圈，拉伸螺母置于所需拉伸的螺栓上。

对于刚性平面接触的密封螺栓，可单只操作；对于带垫片的密封螺栓建议采用多台共同操作。



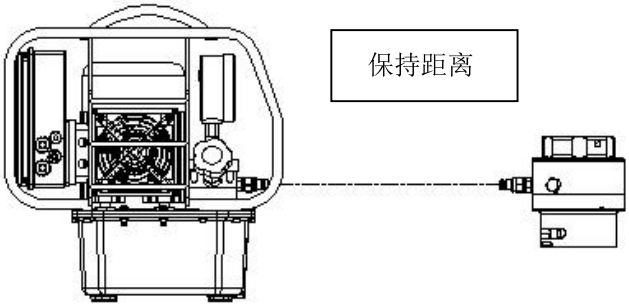
步骤三：

将螺栓拉伸器通过拨杆或手动旋在所需拉伸的螺栓上，持续旋转，直到拉伸螺母与油缸部件支撑面接触。



步骤四：

通过拨杆或手动反向旋转拉伸螺母，对于长度1000mm以内的螺栓，在油缸部件支撑面与拉伸螺母之间预留2 – 3mm间隙；对于长度1000mm以上的螺栓，可以适当加大间隙。

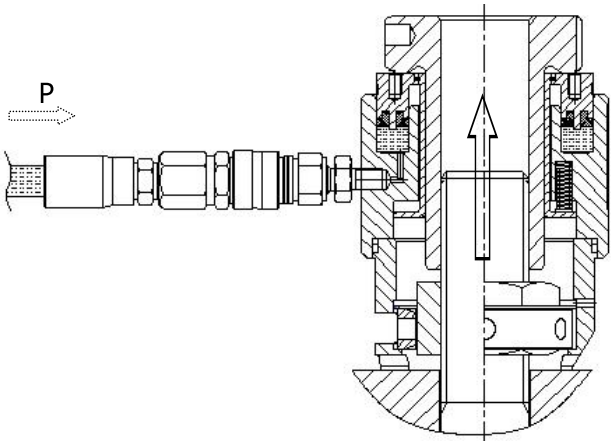


步骤五：

用高压油管将螺栓拉伸器与油泵相联接。

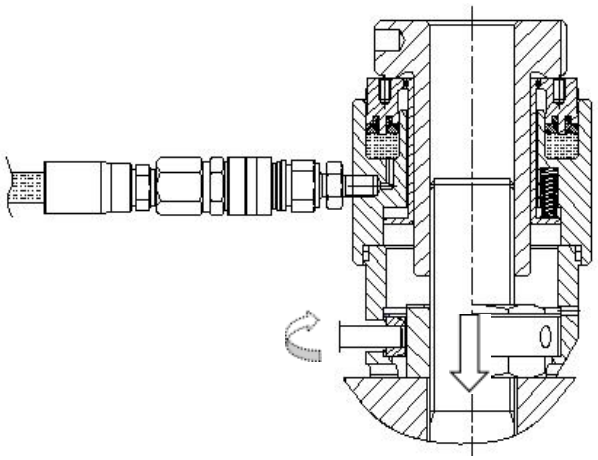
第一次使用油泵应先打开排气螺钉，充油排完空气后拧紧。

在压力升高过程中，保持两者间的距离，做到始终能够观察到压力表和螺栓的位置。



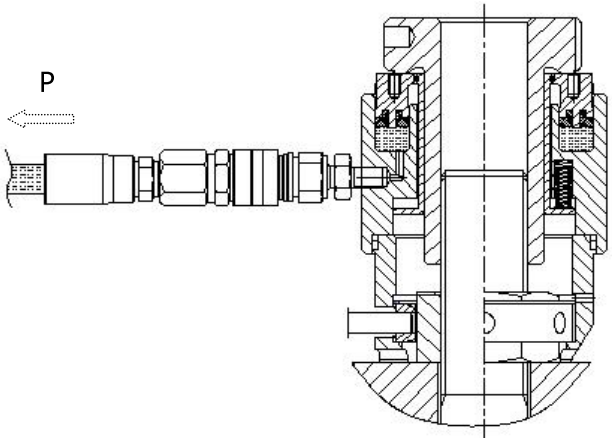
步骤六：

液压连接后，拉伸器活塞受压，轴向拉伸力将拉长螺栓，这时螺母因螺栓的伸长而上升，与法兰接触面脱离开来。根据作用力与反作用力原理，同样大小的反向作用力将会压缩法兰。当达到要求的载荷力时，停止加压。



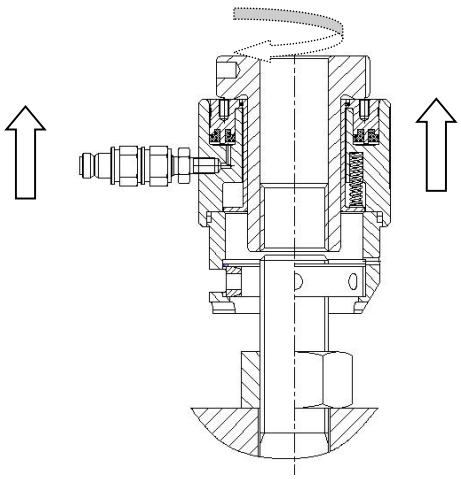
步骤七：

当达到要求的载荷力后，在保压状态下，可用拨杆穿过底座的开口处，拨动拨套，旋紧或者拆松支撑面上的螺母。



步骤八：

旋紧或者拆松螺母工作结束，油泵卸荷。释放油泵压力，拉伸器自动回复到位，液压油流回油泵储油箱。



步骤九：

当活塞回到初始位置（即活塞与油缸齐平），拆下油管。

通过拨杆或手动旋松拉伸母，取出螺栓拉伸器。准备下次工作。

▲警告：拆下拉伸器前，使拉伸器的行程为“0”，方可再次拉伸。

▲注意：装置使用完毕，应擦拭干净，防锈后装箱；其中软管盘卷后，套入油泵手柄，以免窜动。

注意：1.用户请勿随意拆卸液压拉伸装置，以免造成损坏。

2.螺栓拉伸器不能超过它的最大行程，行程参数见（HSR系列螺栓拉伸器的主要数据表）。当达到最大行程时，在活塞上可以看见的标记。如果拉伸器操作超过它的最大的行程，它将自动卸荷泄压，不在起任何功能。

3.本产品不断进行科技创新，若本说明书内容更新，恕不通知，敬请谅解。

五 安全注意事项

1 在使用螺栓拉伸器之前，确保油管没有破损或扭结。不要使用损坏或不合格的油管。不要使用扭结的油管。高压软管的弯曲半径应≥200 mm。

2 在压力升高过程中，保持与螺栓拉伸器3 - 5米的距离。绝对不要站在施加预紧力的正前方。液压油压的升高必须由操作人员仔细监视（通过压力表观察）。 在连续的压力升高过程中，如发现压力似乎没有升高，应立即停止升压。 此症状可能说明螺栓有翘曲和变形的情况存在。 因此必须立即检查螺联接的情况及尺寸配合的精度。

3 螺栓拉伸器不能超过它的最大行程。当达到最大行程时，在活塞上可以看到的标记。如果螺栓拉伸器操作超过它的最大行程，螺栓拉伸器不在起到任何功能。并且会由漏油现象发生。

4 液压拉伸装置工作完毕后，需将油泵压力减为零，否则液压油会喷射出来，污染衣物，且对人体可能会造成伤害。

5 超高压油泵见其使用说明书。

六 维护与保养

1 使用时，应轻装轻卸。螺栓拉伸器的配合面很精密，安装、拆卸时要注意保护，不可损坏有关配合面。

2 安装、更换密封圈时，要将密封圈表面及油缸，活塞的配合面用专用清洗剂清洗干净。

3 使用完以后请将工具存放在干燥的地方。

4 超高压油泵见其使用说明书。

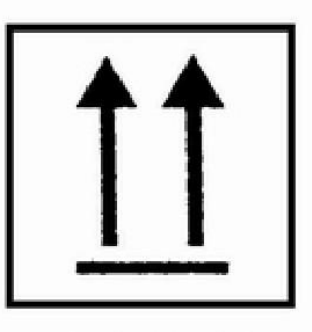
七 故障与排除

螺栓拉伸器本身一般不会出现故障。在工作中，液压油在油缸的孔与轴的配合处渗出， 可能是密封圈密封不良，应拆开检查密封圈的安装是否正确， 外形是否完整。若密封圈外形变形、断裂，必须更换密封圈。

油泵的故障与排除、见油泵使用说明书。

八拉伸器的使用噪音及运输

1、液压拉伸器噪音/振动声明液压拉伸器
使用噪声值为: ≤70 db



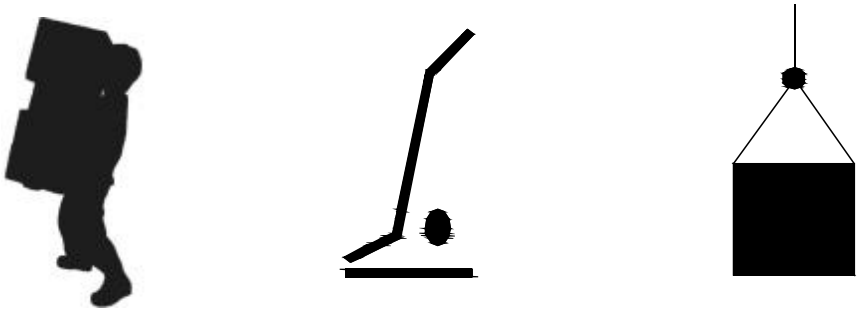
2、液压拉伸器运输信息

2.1 搬运时注意轻拿轻放。

2.2 装运时应将产品立式向上，如图9所示。

（ 图 9 ）

2.3 产品搬运一般采用手提式或小车搬运移动、吊装移动，如图10所示。



（ 图 10 ）

九 HSR系列螺栓拉伸器数据资料

螺栓拉伸器拉伸力载荷力（F）直接和压力（P）有关。压力单位，由油泵上的压力表显示，使用（9.4）的表来决定或通过以下公式计算

$$P(bar)=10000\times\frac{F(kN)}{A(mm^2)}$$

$$F(kN)=\frac{P(bar)\times A(mm^2)}{10000}$$

P = 螺栓拉伸器的操作压力（bar）
F = 预紧力（kN）
A = 螺栓拉伸器的有效作用面积（mm）（见9.1数据表）

9.1 主要参数表

HSR系列拉伸器参数表

型号	螺栓		作用面积		最大工作压力		最大工作载荷		行程	重量
	英制	公制	mm^2	in^2	Bar	PSI	KN	tonf	mm	Kg
HSR0	3/4″	M20	1067	1.65	1500	21750	160	16.3	10	
	7/8″	M22								
HSR1	1″	M24	1867	2.89	1202	17429	224	22.8	10	
		M27								
	1-1/8″				1500	21750	280	28.6		
HSR2	1″	M24	3003	4.65	747	10832	224	22.8	10	4.1
		M27								
	1-1/8″	M30			983	14254	295	30.1		4.1
	1-1/4″	M33			1253	18169	376	38.3		4.2
	1-3/8″	M36			1500	21750	450	45.9		4.2
HSR3	1-1/4″	M33	4400	6.82	854	12383	376	38.3	10	6.0
	1-3/8″	M36			1060	15370	466	47.5		
	1-1/2″	M39			1280	18560	567	57.8		6.2
	1-5/8″	M42			1500	21750	660	67.3		6.1
HSR4	1-1/2″	M39	6669	10.34	850	12325	566	57.7	10	8.8
	1-5/8″	M42			1014	14703	676	68.9		8.8
	1-3/4″	M45			1193	17299	795	81.1		9.0
	1-7/8″	M48			1390	20155	927	94.5		8.9
	2″				1500	21750	1000	102.0		

★ ： 重量中不含拉伸螺母。

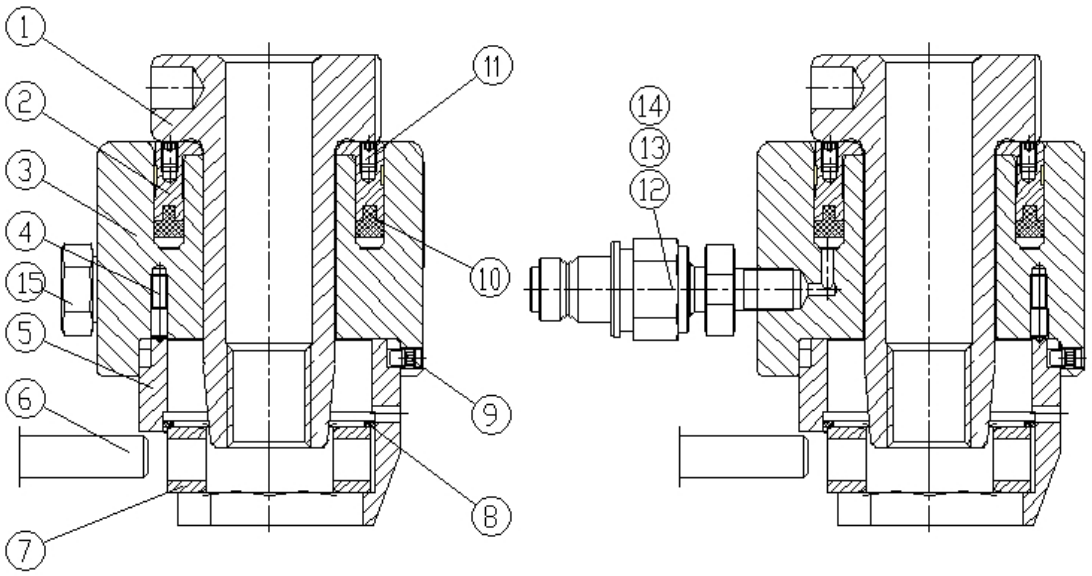
H S R 系 列 拉 伸 器 参 数 表

（续表）

型号	螺 栓		作用面积		最大工作压力		最大工作载荷		行程	重量
	英制	公制	mm^2	in^2	Bar	PSI	KN	tonf	mm	Kg
HSR5	2″	M52	10002	15.50	1067	15472	1067	108.8	10	14.0
	2-1/4″	M56			1373	19909	1373	140.0		14.8
		M60								
	2-1/2″	M64			1500	21750	1500	153.0		14.5
		M68								
		M70								
	2-3/4″									15.2
HSR6	2-3/4″	M72	16670	25.84	1131	16400	1885	192.2	10	
	3″	M76			1357	19677	2262	230.7		23.1
		M80								23.3
	3-1/4″	M85			1500	21750	2500	254.9		23.3
	3-1/2″	M90								23.0
HSR7	3-1/2″	M90	21336	33.07	1481	21475	3159	322.1	10	
		M95								
	3-3/4″	M100			1500	21750	3200	326.3		33.5
	4″									34.2
HSR8	4″	M105	27336	42.37	1500	21750	4100	418.1	10	
		M110								
	4-1/4 “	M115								43.0
	4-1/2 “									44.0

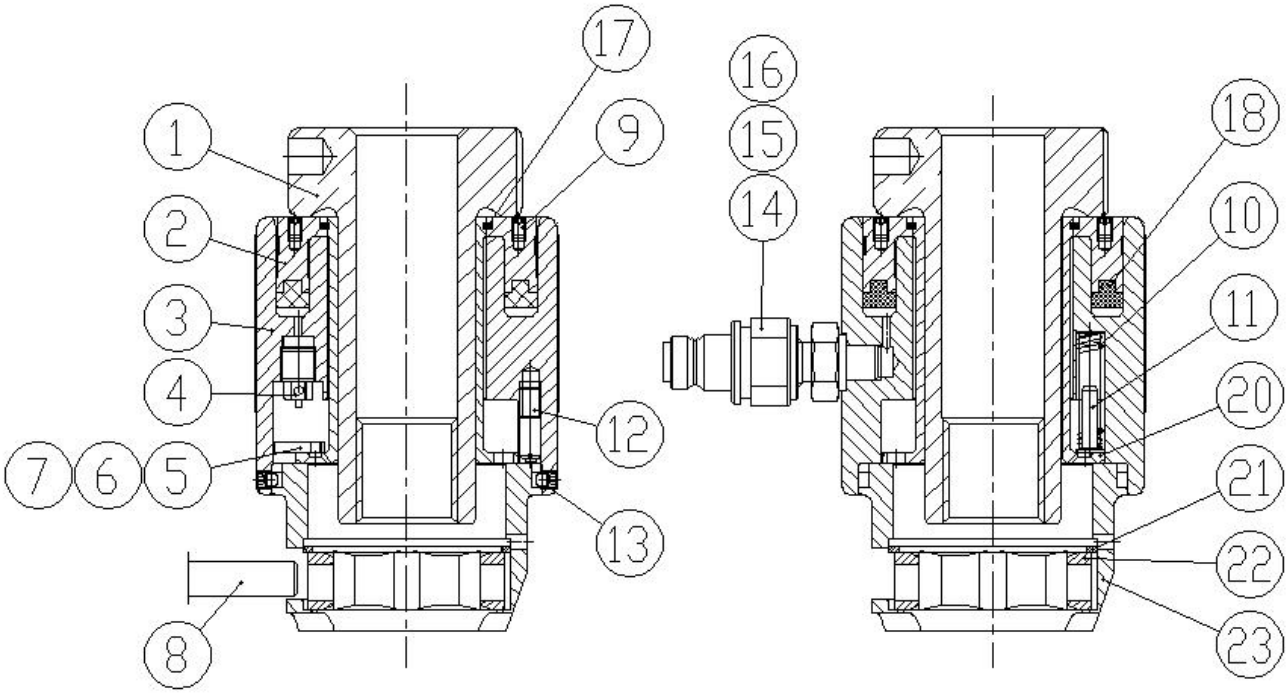
9.2 螺栓拉伸器明细表

HSR0



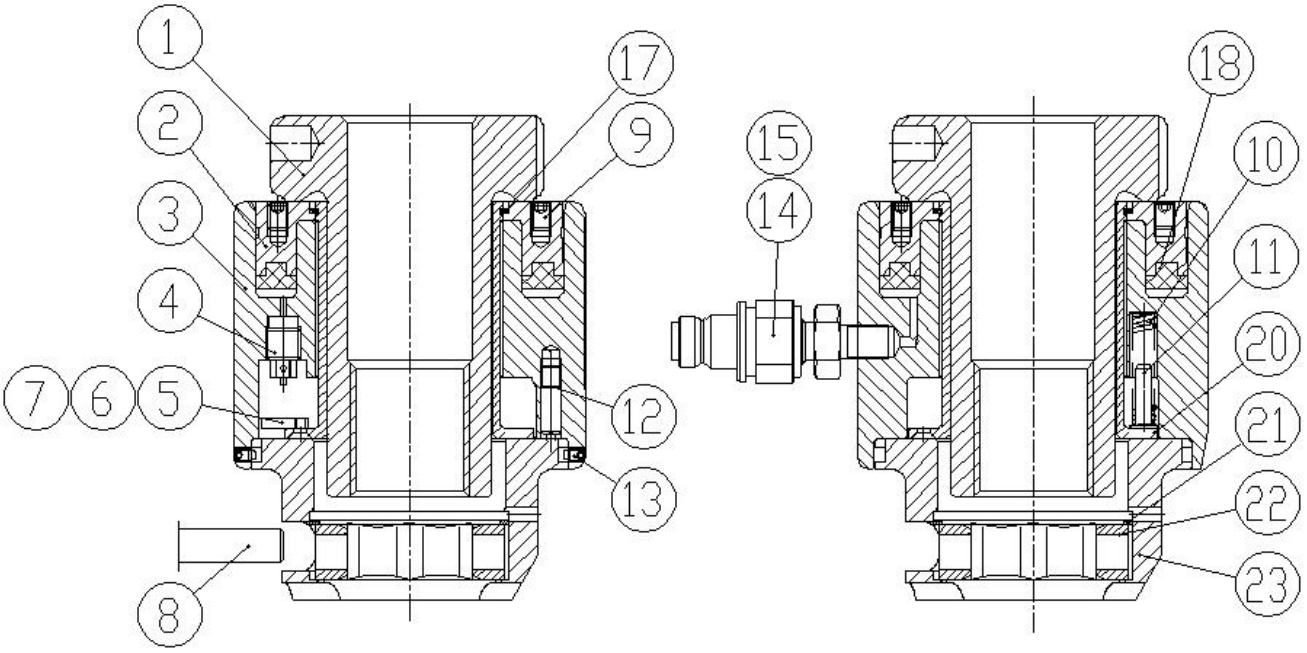
H S R 0 系 列 螺 栓 拉 伸 器 明 细 表									
序号	名 称	代 号	数量	备注		序号	名 称	代 号	数量	备注
1	拉伸螺母		1	说明 1		12	过渡接头	J02-115	1	
2	活塞	HSR0-01	1			13	组合垫圈		2	
3	油缸	HSR0-02	1			14	快速接头		1	
4	螺纹锁销		1			15	堵头	J10-30	1	
5	底座		1	说明 2						
6	拨杆	TY1710	1							
7	拨套		1	说明 3						
8	底座卡簧		1	说明 4						
9	圆柱端螺钉		2							
10	密封圈	HSR0-03	1							
11	尼龙堵头		2							
说明	1、拉伸螺母代号与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 2、底座代号与螺母，垫片尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。 3、拨套代号与相关螺母尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。 4、底座卡簧代号与与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。									

HSR1



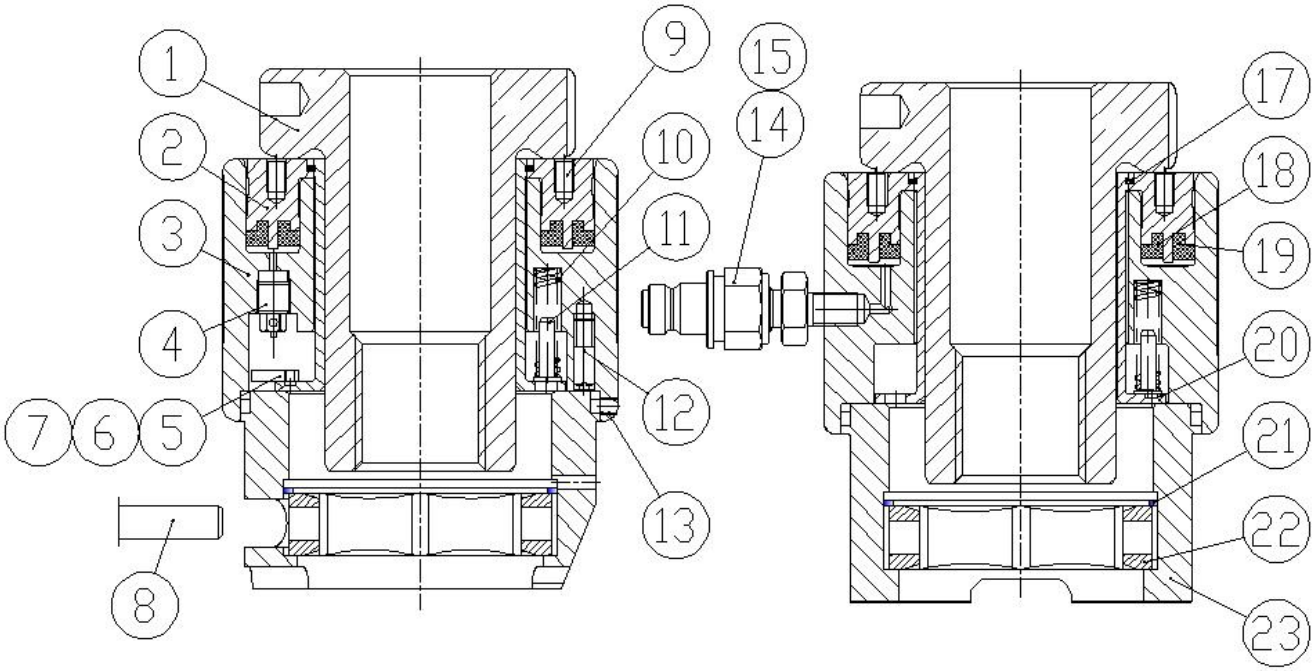
H S R 1 系 列 螺 栓 拉 伸 器 明 细 表										
序号	名 称	代 号	数量	备注		序号	名 称	代 号	数量	备注
1	拉伸螺母		1	说明1		12	螺纹锁销		1	
2	活塞	HSR1-01	1			13	圆柱端螺钉		2	
3	油缸	HSR1-02	1			14	过渡接头	J02-115	2	
4	卸荷阀	HSR.01	1			15	快速接头		2	
5	挡板	HSR2-06	1			16	组合垫圈		2	
6	沉头螺钉		1			17	连接套卡簧	HSR1-05	1	
7	销		1			18	密封圈	HSR1-03	1	
8	拨杆	TY1710	1			20	连接套	HSR1-04	1	
9	尼龙堵头		2			21	底座卡簧		1	说明2
10	弹簧Ⅰ	HSR-01	4			22	拨套		1	说明3
11	弹簧托	HSR-02	4			23	底座		1	说明4
说明	1、拉伸螺母代号与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 2、底座卡簧代号与与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 3、拨套代号与相关螺母尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。 4、底座代号与螺母，垫片尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。									

HSR2



H S R 2 系 列 螺 栓 拉 伸 器 明 细 表										
序号	名 称	代 号	数量	备注		序号	名 称	代 号	数量	备注
1	拉伸螺母		1	说明1		12	螺纹锁销		1	
2	活塞	HSR2-01	1			13	圆柱端螺钉		2	
3	油缸	HSR2-02	1			14	过渡接头	J02-116	2	
4	卸荷阀	HSR.01	1			15	快速接头		2	
5	挡板	HSR2-06	1			17	连接套卡簧	HSR2-05	1	
6	沉头螺钉		1			18	密封圈	HSR2-03	1	
7	销		1			20	连接套	HSR2-04	1	
8	拨杆	TY1710	1			21	底座卡簧		1	说明2
9	尼龙堵头		2			22	拨套		1	说明3
10	弹簧Ⅰ	HSR-01	6			23	底座		1	说明4
11	弹簧托	HSR-02	6							
说明	1、拉伸螺母代号与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 2、底座卡簧代号与与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 3、拨套代号与相关螺母尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。 4、底座代号与螺母，垫片尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。									

HSR3---HSR8



H S R 3 系 列 螺 栓 拉 伸 器 明 细 表										
序号	名 称	代 号	数量	备注		序号	名 称	代 号	数量	备注
1	拉伸螺母		1	说明1		12	螺纹锁销		1	
2	活塞	HSR3-01	1			13	圆柱端螺钉		2	
3	油缸	HSR3-02	1			14	过渡接头	J02-116	2	
4	卸荷阀	HSR.01	1			15	快速接头		2	
5	挡板	HSR2-06	1			17	连接套卡簧	HSR3-06	1	
6	沉头螺钉		1			18	轴用密封	HSR3-04	1	
7	销		1			19	孔用密封	HSR3-03	1	
8	拨杆	TY1710	1			20	连接套	HSR3-05	1	
9	尼龙堵头		2			21	底座卡簧		1	说明2
10	弹簧Ⅰ	HSR-01	8			22	拨套		1	说明3
11	弹簧托	HSR-02	8			23	底座		1	说明4
说明	1、拉伸螺母代号与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 2、底座卡簧代号与与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 3、拨套代号与相关螺母尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。 4、底座代号与螺母，垫片尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。									

H S R 系 列 螺 栓 拉 伸 器 明 细 表

续 表 (1)

	序号	名 称	代 号	数量	备注		序号	名 称	代 号	数量	备注
HSR4	1	拉伸螺母		1	说明1		12	螺纹锁销		1	
	2	活塞	HSR4-01	1			13	圆柱端螺钉		2	
	3	油缸	HSR4-02	1			14	过渡接头	J02-23	2	
	4	卸荷阀	HSR.01	1			15	快速接头		2	
	5	挡板	HSR2-06	1			17	连接套卡簧	HSR4-06	1	
	6	沉头螺钉		1			18	轴用密封	HSR4-04	1	
	7	销		1			19	孔用密封	HSR4-03	1	
	8	拨杆	TY1710（14）	1	2″采用TY1714拨杆		20	连接套	HSR4-05	1	
	9	尼龙堵头		2			21	底座卡簧		1	说明2
	10	弹簧Ⅰ	HSR-01Ⅲ	8			22	拨套		1	说明3
	11	弹簧托	HSR-02Ⅲ	8			23	底座		1	说明4

	序号	名 称	代 号	数量	备注		序号	名 称	代 号	数量	备注
HSR5	1	拉伸螺母		1	说明1		12	螺纹锁销		1	
	2	活塞	HSR3-01	1			13	圆柱端螺钉		2	
	3	油缸	HSR3-02	1			14	过渡接头	J02-116	2	
	4	卸荷阀	HSR.01	1			15	快速接头		2	
	5	挡板	HSR2-06	1			17	连接套卡簧	HSR3-06	1	
	6	沉头螺钉		1			18	轴用密封	HSR3-04	1	
	7	销		1			19	孔用密封	HSR3-03	1	
	8	拨杆	TY1710	1			20	连接套	HSR3-05	1	
	9	尼龙堵头		2			21	底座卡簧		1	说明2
	10	弹簧Ⅰ	HSR-01	8			22	拨套		1	说明3
	11	弹簧托	HSR-02	8			23	底座		1	说明4

说明	1、拉伸螺母代号与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 2、底座卡簧代号与与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 3、拨套代号与相关螺母尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。 4、底座代号与螺母，垫片尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。

H S R 系 列 螺 栓 拉 伸 器 明 细 表

续 表 (2)

	序号	名 称	代 号	数量	备注		序号	名 称	代 号	数量	备注
HSR6	1	拉伸螺母			说明1		12	螺纹锁销		1	
	2	活塞	HSR6-01	1			13	圆柱端螺钉		2	
	3	油缸	HSR6-02	1			14	过渡接头	J02-23	2	
	4	卸荷阀	HSR.01	1			15	快速接头		2	
	5	挡板	HSR2-06	1			17	连接套卡簧	HSR6-06	1	
	6	沉头螺钉		1			18	轴用密封	HSR6-04	1	
	7	销		1			19	孔用密封	HSR6-03	1	
	8	拨杆	TY1714	1			20	连接套	HSR5-05	1	
	9	尼龙堵头		2			21	底座卡簧		1	说明2
	10	弹簧Ⅰ	HSR-01Ⅲ	18			22	拨套		1	说明3
	11	弹簧托	HSR-02Ⅲ	18			23	底座		1	说明4

	序号	名 称	代 号	数量	备注		序号	名 称	代 号	数量	备注
HSR7	1	拉伸螺母			说明1		12	螺纹锁销		1	
	2	活塞	HSR7-01	1			13	圆柱端螺钉		2	
	3	油缸	HSR7-02	1			14	过渡接头	J02-23	2	
	4	卸荷阀	HSR.01	1			15	快速接头		2	
	5	挡板	HSR2-06	1			17	连接套卡簧	HSR7-06	1	
	6	沉头螺钉		1			18	轴用密封	HSR7-04	1	
	7	销		1			19	孔用密封	HSR7-03	1	
	8	拨杆	TY1714	1			20	连接套	HSR7-05	1	
	9	尼龙堵头		2			21	底座卡簧		1	说明2
	10	弹簧Ⅰ	HSR-01Ⅲ	25			22	拨套		1	说明3
	11	弹簧托	HSR-02Ⅲ	25			23	底座		1	说明4

说明	1、拉伸螺母代号与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 2、底座卡簧代号与与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 3、拨套代号与相关螺母尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。 4、底座代号与螺母，垫片尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。

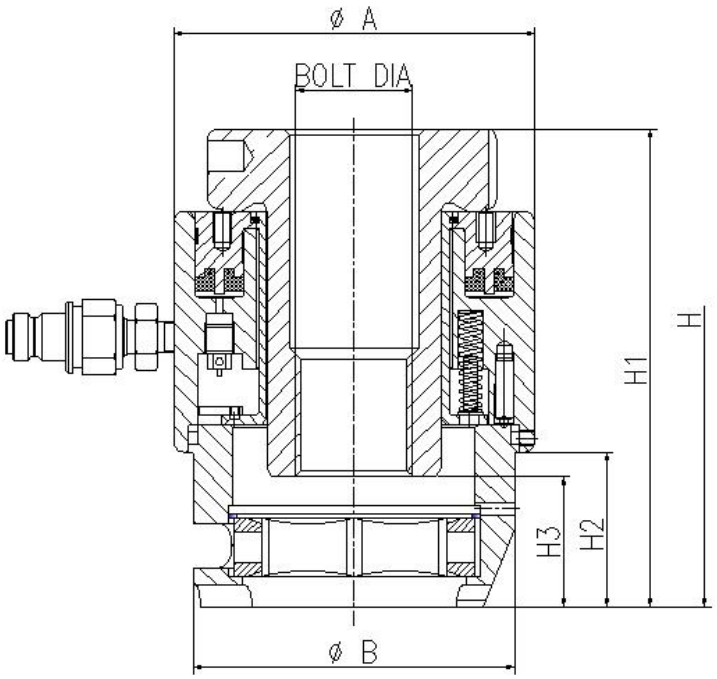
H S R 系 列 螺 栓 拉 伸 器 明 细 表

续 表 （3）

	序号	名 称	代 号	数量	备注		序号	名 称	代 号	数量	备注
HSR8	1	拉伸螺母			说明1		12	螺纹锁销		1	
	2	活塞	HSR8-01	1			13	圆柱端螺钉		2	
	3	油缸	HSR8-02	1			14	过渡接头	J02-23	2	
	4	卸荷阀	HSR.01	1			15	快速接头		2	
	5	挡板	HSR2-06	1			17	连接套卡簧	HSR8-06	1	
	6	沉头螺钉		1			18	轴用密封	HSR8-04	1	
	7	销		1			19	孔用密封	HSR8-03	1	
	8	拨杆	TY1714	1			20	连接套	HSR8-05	1	
	9	尼龙堵头		2			21	底座卡簧		1	说明2
	10	弹簧Ⅰ	HSR-01Ⅲ	32			22	拨套		1	说明3
	11	弹簧托	HSR-02Ⅲ	32			23	底座		1	说明4

说明	1、拉伸螺母代号与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 2、底座卡簧代号与与螺纹规格相关，如需要请咨询 雷恩（WREN ）专业工程师。 3、拨套代号与相关螺母尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。 4、底座代号与螺母，垫片尺寸相关，如需要请咨询 雷恩（WREN ）专业工程师。

9.3 螺栓拉伸器尺寸图



H S R 系 列 螺 栓 拉 尺 寸 表
----公制

规格	螺纹	对边	A		B		H1		H2		H3	
	mm	mm	in	mm	in	mm	in	mm	in	mm	in	mm
HSR0	M20X2.5	30	2.9	74.8	2.5	63	4.5	113.5	1.4	36	0.7	19
	M22X2.5	34			2.5	63	4.5	113.5	1.4	36	0.8	21
HSR1	M24×3	36	3.3	85	2.7	68	5.6	141.5	1.5	38	0.9	23
	M27×3	41			2.7	68	5.6	141.5	1.5	38	1.0	26
HSR2	M24×3	36	4.1	103	3.0	75	5.6	141.5	1.5	38	0.9	23
	M27×3	41			3.0	75	5.6	141.5	1.5	38	1.0	26
	M30×3.5	46			3.1	80	5.7	144.5	1.6	41	1.1	28
	M33×3.5	50			3.3	84	5.8	147.5	1.7	44	1.2	30
	M36×4	55			3.5	88.5	5.9	150.5	1.9	47	1.3	33
HSR3	M33×3.5	50	4.6	118	3.6	92	5.9	149.5	1.7	44	1.2	30
	M36×4	55			3.8	96	6.0	152.5	1.9	47	1.3	33
	M39×4	60			4.1	105	6.1	156	2.0	50.5	1.4	35.5
	M42×4.5	65			4.1	104.5	6.3	159	2.1	53.5	1.5	38
HSR4	M39×4	60	5.5	140.5	4.4	112	6.4	163.5	2.0	50.5	1.4	35.5
	M42×4.5	65			4.5	114	6.6	166.5	2.1	53.5	1.5	38
	M45×4.5	70			5.0	126	6.7	170	2.2	57	1.6	40
	M48×5	75			4.8	123	6.8	173	2.4	60	1.7	42
HSR5	M52×5	80	6.9	175.5	5.3	134	7.4	187	2.5	63	1.8	46
	M56×5.5	85			5.8	148	7.6	193.5	2.7	69.5	1.9	49
	M60×5.5	90			5.8	148	7.6	193.5	2.7	69.5	2.0	52
	M64×6	95			6.0	153	7.9	200	3.0	76	2.2	55
	M68×6	100			6.0	153	7.9	200	3.0	76	2.3	58
	M70×6	102			6.0	153	7.9	200	3.0	76	2.3	58
HSR6	M72×6	105	8.6	219	6.8	172	8.5	216	3.2	82	2.4	62
	M76×6	110			7.2	182	8.8	223	3.5	89	2.6	65
	M80×6	115			7.2	182	8.8	223	3.5	89	2.7	68
	M85×6	120			7.5	190	9.0	229	3.7	95	2.8	72
	M90×6	130			8.1	205	9.3	235	4.0	101	3.0	76
HSR7	M90×6	130	9.9	252	9.1	230	9.5	241	4.0	101	3.0	76
	M95×6	135			9.1	230	9.5	241	4.0	101	3.1	80
	M100×6	145			9.3	235	9.7	247	4.2	107	3.3	84
HSR8	M105×6	15	11.1	283	10.0	255	9.5	241	4.0	101	3.5	88
	M110×6	155			10.0	255	9.5	241	4.0	101	3.6	92
	M115×6	165			10.2	260	9.7	247	4.2	107	3.8	96

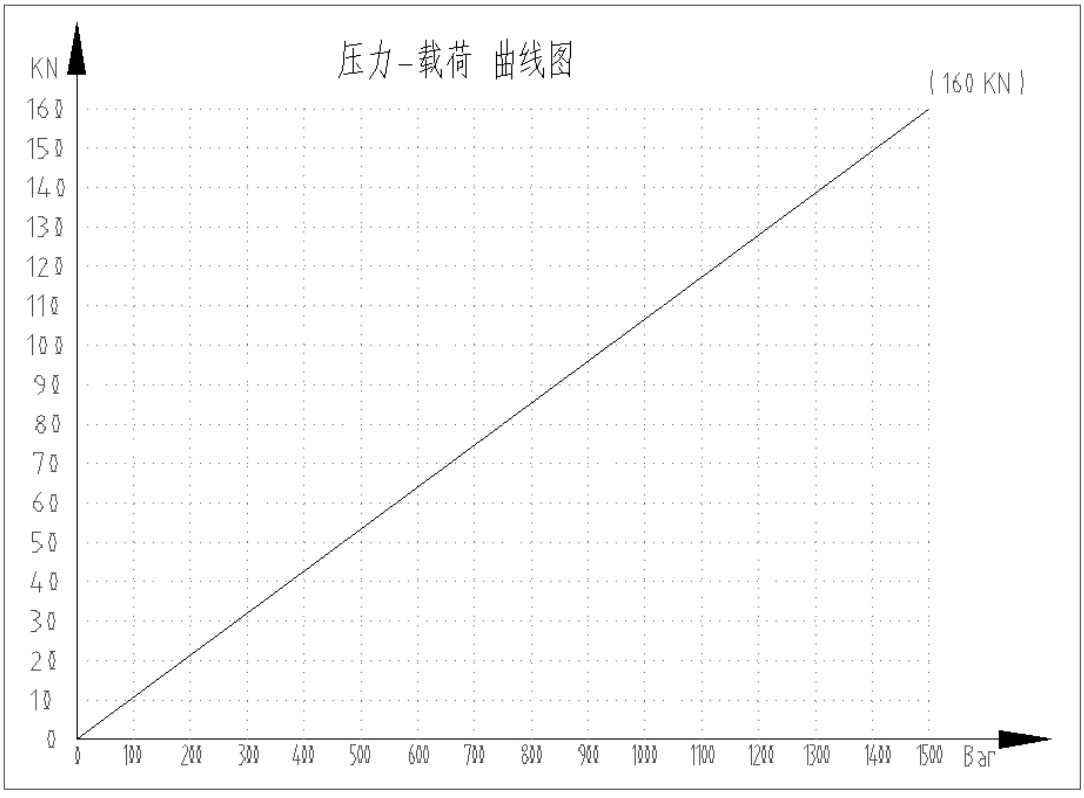
H S R 系 列 螺 栓 拉 尺 寸 表

----英制

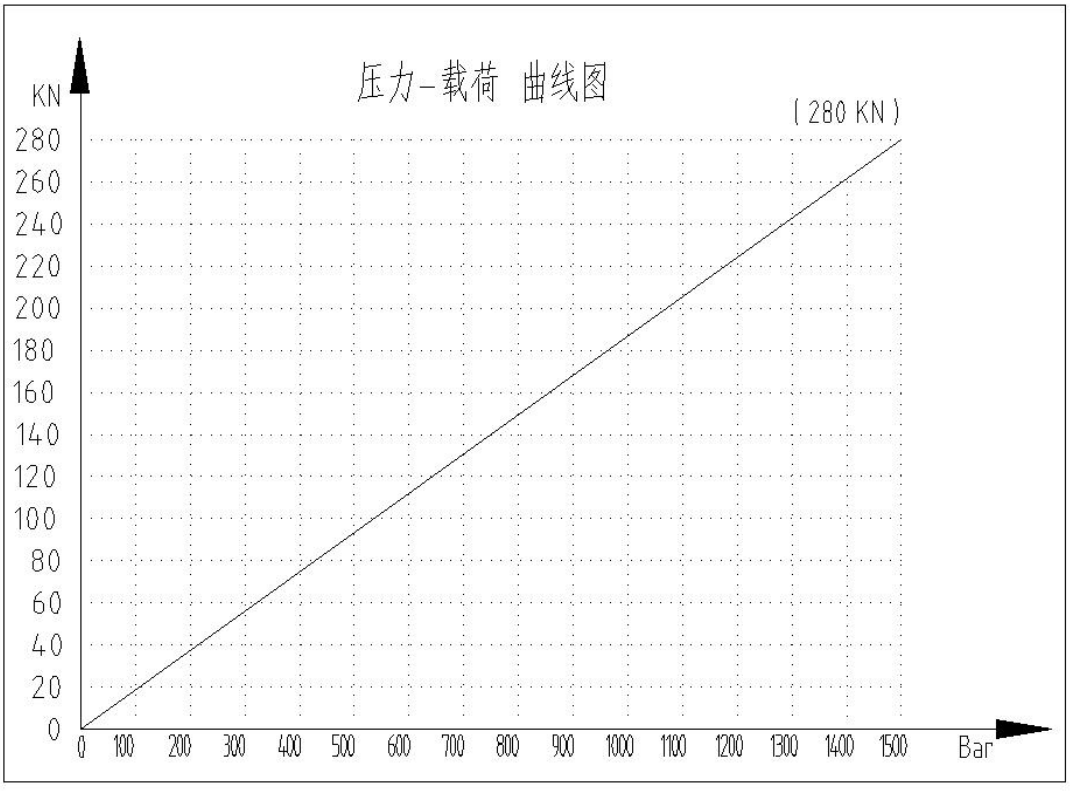
规格	螺纹	对边	A		B		H1		H2		H3	
			in	mm	in	mm	in	mm	in	mm	in	mm
HSR0	3/4"-10UN	1 1/4″	2.9	74.8	2.5	63	4.5	113.5	1.4	36	0.9	22
	7/8"-9UN	1 7/16″			2.5	63	4.5	113.5	1.4	36	1.0	25
HSR1	1"-8UN	1 5/8″	3.3	85	2.7	68	5.6	141.5	1.5	38	1.2	30
	1 1/8"-8UN	1 13/16″			3.0	76	5.7	144.5	1.6	41	1.3	33
HSR2	1″-8UN	1 5/8″	4.1	103	3.0	75	5.6	141.5	1.5	38	1.2	30
	1 1/8″-8UN	1 13/16″			3.1	80	5.7	144.5	1.6	41	1.3	33
	1 1/4″-8UN	2″			3.3	84	5.8	147.5	1.7	44	1.4	36
	1 3/8″-8UN	2 3/16″			3.5	88.5	5.9	150.5	1.9	47	1.5	39
HSR3	1 1/4″-8UN	2″	4.6	118	3.6	92	5.9	149.5	1.7	44	1.4	36
	1 3/8″-8UN	2 3/16″			3.8	96	6.0	152.5	1.9	47	1.5	39
	1 1/2″-8UN	2 3/8″			4.1	105	6.1	156	2.0	50.5	1.7	42.5
	1 5/8″-8UN	2 9/16″			4.1	104.5	6.3	159	2.1	53.5	1.8	45.5
HSR4	1 1/2″-8UN	2 3/8″	5.5	140.5	4.4	112	6.4	163.5	2.0	50.5	1.7	42.5
	1 5/8″-8UN	2 9/16″			4.5	114	6.6	166.5	2.1	53.5	1.8	45.5
	1 3/4″-8UN	2 3/4″			5.0	126	6.7	170	2.2	57	1.9	49
	1 7/8″-8UN	2 15/16″			4.8	123	6.8	173	2.4	60	2.0	52
	2″-8UN	3 1/8″			5.0	128	6.9	176	2.5	63	2.2	55
HSR5	2″-8UN	3 1/8″	6.9	175.5	5.3	134	7.4	187	2.5	63	2.2	55
	2 1/4″-8UN	3 1/2″			5.8	148	7.6	193.5	2.7	69.5	2.4	61.5
	2 1/2″-8UN	3 7/8″			6.0	153	7.9	200	3.0	76	2.7	68
	2 3/4″-8UN	4 1/4″			6.5	165	8.1	206	3.2	82	2.9	74
HSR6	2 3/4″-8UN	4 1/4″	8.6	219	6.8	172	8.5	216	3.2	82	2.9	74
	3″-8UN	4 5/8″			7.2	182	8.8	223	3.5	89	3.2	81
	3 1/4″-8UN	5″			7.5	190	9.0	229	3.7	95	3.4	87
	3 1/2″-8UN	5 3/8″			8.1	205	9.3	235	4.0	101	3.7	93
HSR7	3 1/2″-8UN	5 3/8″	9.9	252	9.1	230	9.5	241	4.0	101	3.7	93
	3 3/4″-8UN	5 3/4″			9.3	235	9.7	247	4.2	107	3.9	99
	4″-8UN	6 1/8″			9.5	242	10.0	254	4.5	114	4.2	106
HSR8	4″-8UN	6 1/8″	11.1	283	10.0	255	10.4	264	4.5	114	4.2	106
	4 1/4″-8UN	6 1/2″			10.2	260	10.6	270	4.7	120	4.4	112
	4 1/2″-8UN	6 7/8″			10.6	270	10.9	277	5.0	127	4.7	119

9.4 螺栓拉伸器压力对照表与曲线图

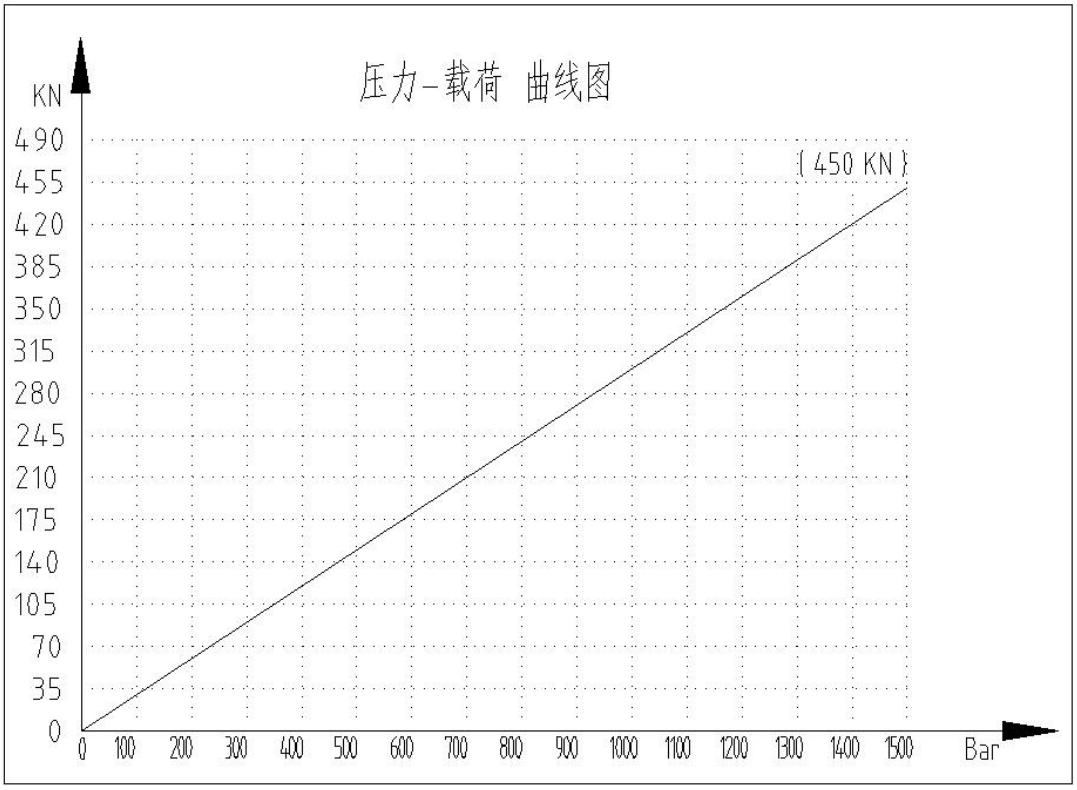
HSR0 拉伸器：压力、负载、拉伸力对照表									
工作压力	负载	拉伸力	工作压力	负载	拉伸力	工作压力	负载	拉伸力
(Mpa)	(KN)	(t)	(Mpa)	(KN)	(t)	(Mpa)	(KN)	(t)
2	2.1	0.2	52	55.5	5.7	102	108.8	11.1
4	4.3	0.4	54	57.6	5.9	104	110.9	11.3
6	6.4	0.7	56	59.7	6.1	106	113.1	11.5
8	8.5	0.9	58	61.9	6.3	108	115.2	11.8
10	10.7	1.1	60	64.0	6.5	110	117.3	12.0
12	12.8	1.3	62	66.1	6.7	112	119.5	12.2
14	14.9	1.5	64	68.3	7.0	114	121.6	12.4
16	17.1	1.7	66	70.4	7.2	116	124.0	12.7
18	19.2	2.0	68	72.5	7.4	118	125.9	12.8
20	21.3	2.2	70	74.7	7.6	120	128.0	13.1
22	23.5	2.4	72	76.8	7.8	122	130.1	13.3
24	25.6	2.6	74	78.9	8.1	124	132.3	13.5
26	27.7	2.8	76	81.1	8.3	126	134.4	13.7
28	29.9	3.0	78	83.2	8.5	128	136.5	13.9
30	32.0	3.3	80	85.3	8.7	130	138.7	14.1
32	34.1	3.5	82	87.5	8.9	132	140.8	14.4
34	36.3	3.7	84	89.6	9.1	134	142.9	14.6
36	38.4	3.9	86	91.7	9.4	136	145.1	14.8
38	40.5	4.1	88	93.9	9.6	138	147.2	15.0
40	42.7	4.4	90	96.0	9.8	140	149.3	15.2
42	44.8	4.6	92	98.1	10.0	142	151.5	15.5
44	46.9	4.8	94	100.3	10.2	144	153.6	15.7
46	49.1	5.0	96	102.4	10.4	146	155.7	15.9
48	51.2	5.2	98	104.5	10.7	148	157.9	16.1
50	53.3	5.4	100	106.7	10.9	150	160.0	16.3
计算公式：	负载（KN）=工作压力（Mpa）/150x160					拉伸力（t)=负载（KN)/9.8		



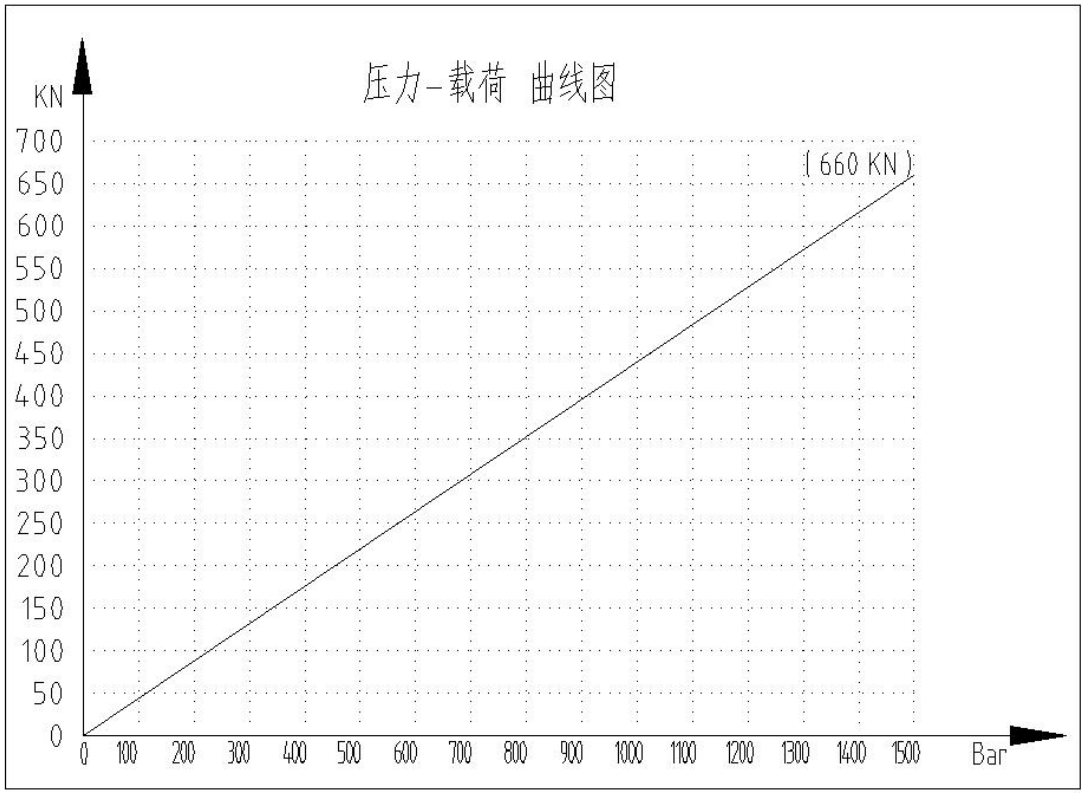
HSR1 拉伸器：压力、负载、拉伸力对照表									
工作压力	负载	拉伸力	工作压力	负载	拉伸力	工作压力	负载	拉伸力
(Mpa)	(KN)	(t)	(Mpa)	(KN)	(t)	(Mpa)	(KN)	(t)
2	3.7	0.4	52	97.1	9.9	102	190.4	19.4
4	7.5	0.8	54	100.8	10.3	104	194.1	19.8
6	11.2	1.1	56	104.5	10.7	106	197.9	20.2
8	14.9	1.5	58	108.3	11.0	108	201.6	20.6
10	18.7	1.9	60	112.0	11.4	110	205.3	21.0
12	22.4	2.3	62	115.7	11.8	112	209.1	21.3
14	26.1	2.7	64	119.5	12.2	114	212.8	21.7
16	29.9	3.0	66	123.2	12.6	116	216.5	22.1
18	33.6	3.4	68	126.9	13.0	118	220.3	22.5
20	37.3	3.8	70	130.7	13.3	120	224.0	22.9
22	41.1	4.2	72	134.4	13.7	122	227.7	23.2
24	44.8	4.6	74	138.1	14.1	124	231.5	23.6
26	48.5	5.0	76	141.9	14.5	126	235.2	24.0
28	52.3	5.3	78	145.6	14.9	128	238.9	24.4
30	56.0	5.7	80	149.3	15.2	130	242.7	24.8
32	59.7	6.1	82	153.1	15.6	132	246.4	25.1
34	63.5	6.5	84	156.8	16.0	134	250.1	25.5
36	67.2	6.9	86	160.5	16.4	136	253.9	25.9
38	70.9	7.2	88	164.3	16.8	138	257.6	26.3
40	74.7	7.6	90	168.0	17.1	140	261.3	26.7
42	78.4	8.0	92	171.7	17.5	142	265.1	27.0
44	82.1	8.4	94	175.5	17.9	144	268.8	27.4
46	85.9	8.8	96	179.2	18.3	146	272.5	27.8
48	89.6	9.1	98	182.9	18.7	148	276.3	28.2
50	93.3	9.5	100	186.7	19.0	150	280.0	28.6
计算公式：	负载（KN）=工作压力（Mpa）/150x280					拉伸力（t)=负载（KN)/9.8		



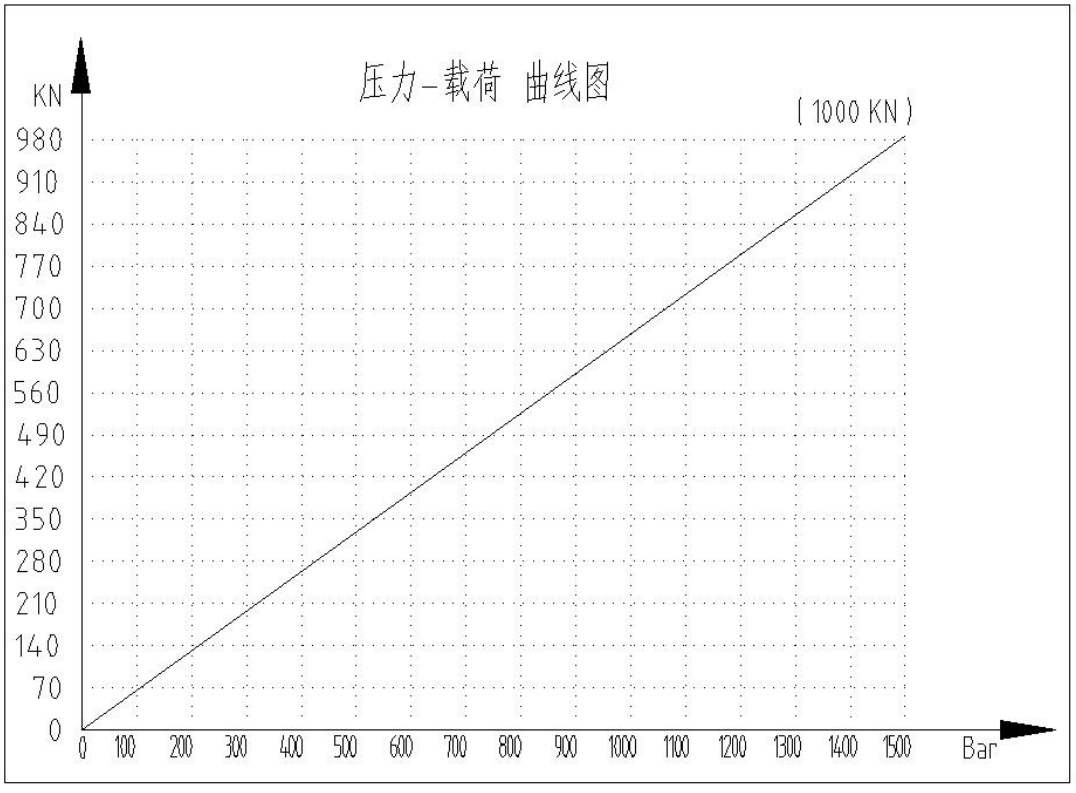
HSR2 拉伸器：压力、负载、拉伸力对照表										
工作压力	负载	拉伸力		工作压力	负载	拉伸力		工作压力	负载	拉伸力
（Mpa）	（KN）	（t）		（Mpa）	（KN）	（t）		（Mpa）	（KN）	（t）
2	6	0.6		52	156.0	15.9		102	306.0	31.2
4	12.0	1.2		54	162.0	16.5		104	312.0	31.8
6	18.0	1.8		56	168.0	17.1		106	318.0	32.4
8	24.0	2.4		58	174.0	17.8		108	324.0	33.1
10	30.0	3.1		60	180.0	18.4		110	330.0	33.7
12	36.0	3.7		62	186.0	19.0		112	336.0	34.3
14	42.0	4.3		64	192.0	19.6		114	342.0	34.9
16	48.0	4.9		66	198.0	20.2		116	348.0	35.5
18	54.0	5.5		68	204.0	20.8		118	354.0	36.1
20	60.0	6.1		70	210.0	21.4		120	360.0	36.7
22	66.0	6.7		72	216.0	22.0		122	366.0	37.3
24	72.0	7.3		74	222.0	22.7		124	372.0	38.0
26	78.0	8.0		76	228.0	23.3		126	378.0	38.6
28	84.0	8.6		78	234.0	23.9		128	384.0	39.2
30	90.0	9.2		80	240.0	24.5		130	390.0	39.8
32	96.0	9.8		82	246.0	25.1		132	396.0	40.4
34	102.0	10.4		84	252.0	25.7		134	402.0	41.0
36	108.0	11.0		86	258.0	26.3		136	408.0	41.6
38	114.0	11.6		88	264.0	26.9		138	414.0	42.2
40	120.0	12.2		90	270.0	27.6		140	420.0	42.9
42	126.0	12.9		92	276.0	28.2		142	426.0	43.5
44	132.0	13.5		94	282.0	28.8		144	432.0	44.1
46	138.0	14.1		96	288.0	29.4		146	438.0	44.7
48	144.0	14.7		98	294.0	30.0		148	444.0	45.3
50	150.0	15.3		100	300.0	30.6		150	450.0	45.9
计算公式：		负载（KN）=工作压力（Mpa）/150x450						拉伸力（t)=负载（KN)/9.8		



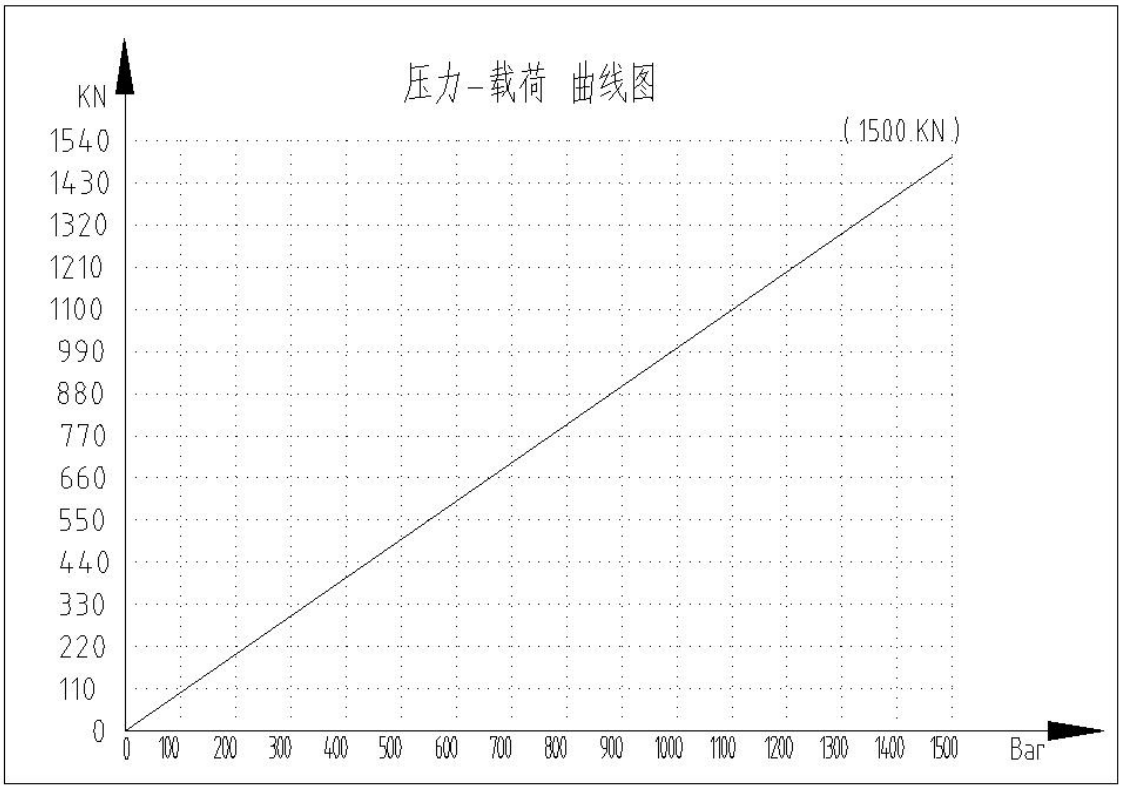
HSR3 拉伸器：压力、负载、拉伸力对照表										
工作压力	负载	拉伸力		工作压力	负载	拉伸力		工作压力	负载	拉伸力
（Mpa）	（KN）	（t）		（Mpa）	（KN）	（t）		（Mpa）	（KN）	（t）
2	8.8	0.9		52	228.8	23.3		102	448.8	45.8
4	17.6	1.8		54	237.6	24.2		104	457.6	46.7
6	26.4	2.7		56	246.4	25.1		106	466.4	47.6
8	35.2	3.6		58	255.2	26.0		108	475.2	48.5
10	44.0	4.5		60	264.0	26.9		110	484.0	49.4
12	52.8	5.4		62	272.8	27.8		112	492.8	50.3
14	61.6	6.3		64	281.6	28.7		114	501.6	51.2
16	70.4	7.2		66	290.4	29.6		116	510.4	52.1
18	79.2	8.1		68	299.2	30.5		118	519.2	53.0
20	88.0	9.0		70	308.0	31.4		120	528.0	53.9
22	96.8	9.9		72	316.8	32.3		122	536.8	54.8
24	105.6	10.8		74	325.6	33.2		124	545.6	55.7
26	114.4	11.7		76	334.4	34.1		126	554.4	56.6
28	123.2	12.6		78	343.2	35.0		128	563.2	57.5
30	132.0	13.5		80	352.0	35.9		130	572.0	58.4
32	140.8	14.4		82	360.8	36.8		132	580.8	59.3
34	149.6	15.3		84	369.6	37.7		134	589.6	60.2
36	158.4	16.2		86	378.4	38.6		136	598.4	61.1
38	167.2	17.1		88	387.2	39.5		138	607.2	62.0
40	176.0	18.0		90	396.0	40.4		140	616.0	62.9
42	184.8	18.9		92	404.8	41.3		142	624.8	63.8
44	193.6	19.8		94	413.6	42.2		144	633.6	64.7
46	202.4	20.7		96	422.4	43.1		146	642.4	65.6
48	211.2	21.6		98	431.2	44.0		148	651.2	66.4
50	220.0	22.4		100	440.0	44.9		150	660.0	67.3
计算公式：		负载（KN）=工作压力（Mpa）/150x660					拉伸力（t)=负载（KN)/9.8			



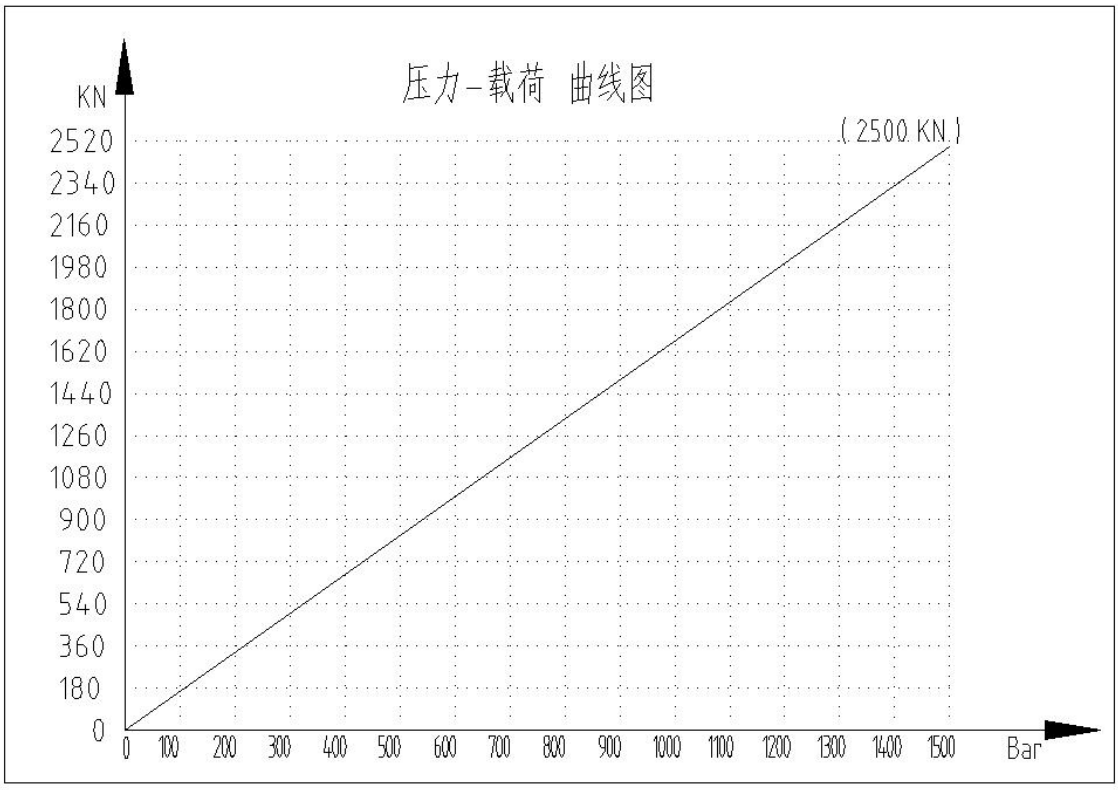
HSR4 拉伸器：压力、负载、拉伸力对照表									
工作压力	负载	拉伸力		工作压力	负载	拉伸力		工作压力	负载	拉伸力
（Mpa）	（KN）	（t）		（Mpa）	（KN）	（t）		（Mpa）	（KN）	（t）
2	13.3	1.4		52	346.7	35.4		102	680.0	69.4
4	26.7	2.7		54	360.0	36.7		104	693.3	70.7
6	40.0	4.1		56	373.3	38.1		106	706.7	72.1
8	53.3	5.4		58	386.7	39.5		108	720.0	73.5
10	66.7	6.8		60	400.0	40.8		110	733.3	74.8
12	80.0	8.2		62	413.3	42.2		112	746.7	76.2
14	93.3	9.5		64	426.7	43.5		114	760.0	77.6
16	106.7	10.9		66	440.0	44.9		116	773.3	78.9
18	120.0	12.2		68	453.3	46.3		118	786.7	80.3
20	133.3	13.6		70	466.7	47.6		120	800.0	81.6
22	146.7	15.0		72	480.0	49.0		122	813.3	83.0
24	160.0	16.3		74	493.3	50.3		124	826.7	84.4
26	173.3	17.7		76	506.7	51.7		126	840.0	85.7
28	186.7	19.0		78	520.0	53.1		128	853.3	87.1
30	200.0	20.4		80	533.3	54.4		130	866.7	88.4
32	213.3	21.8		82	546.7	55.8		132	880.0	89.8
34	226.7	23.1		84	560.0	57.1		134	893.3	91.2
36	240.0	24.5		86	573.3	58.5		136	906.7	92.5
38	253.3	25.9		88	586.7	59.9		138	920.0	93.9
40	266.7	27.2		90	600.0	61.2		140	933.3	95.2
42	280.0	28.6		92	613.3	62.6		142	946.7	96.6
44	293.3	29.9		94	626.7	63.9		144	960.0	98.0
46	306.7	31.3		96	640.0	65.3		146	973.3	99.3
48	320.0	32.7		98	653.3	66.7		148	986.7	100.7
50	333.3	34.0		100	666.7	68.0		150	1000.0	102.0
计算公式：		负载（KN）=工作压力（Mpa）/150x1000					拉伸力（t）=负载（KN）/9.8			



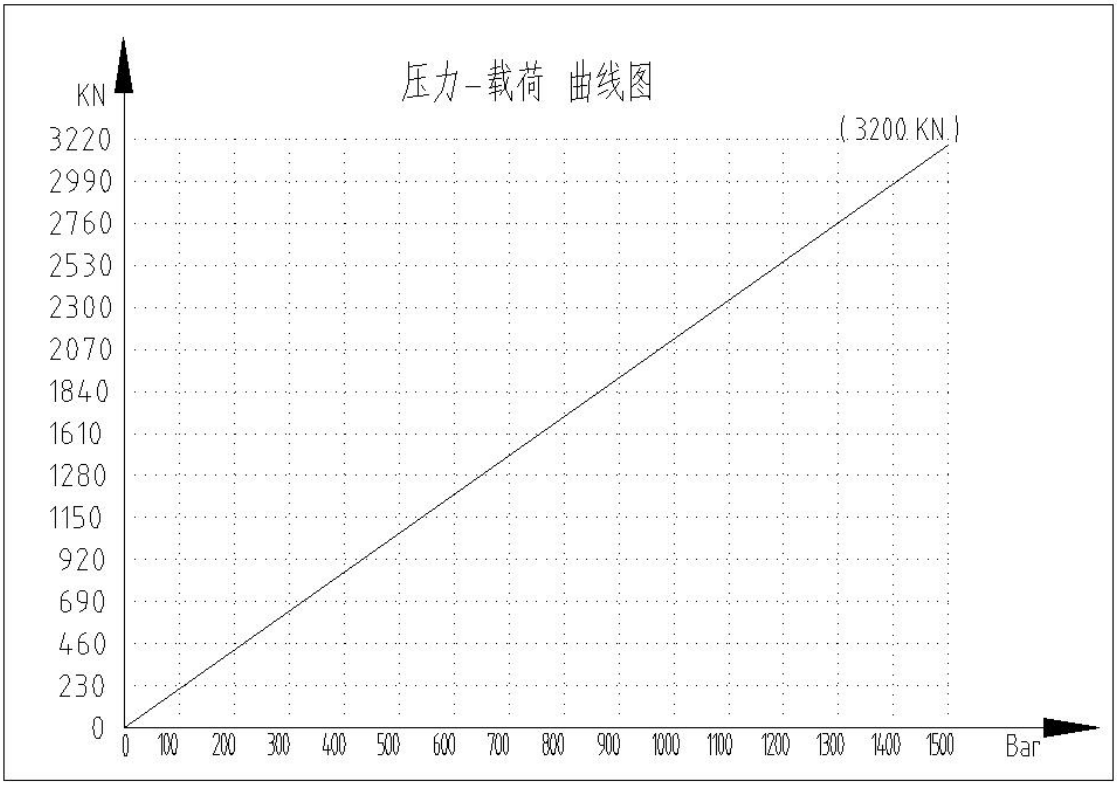
HSR5 拉伸器：压力、负载、拉伸力对照表								
工作压力	负载	拉伸力	工作压力	负载	拉伸力	工作压力	负载	拉伸力
（Mpa）	（KN）	（t）	（Mpa）	（KN）	（t）	（Mpa）	（KN）	（t）
2	20	2.0	52	520.0	53.1	102	1020.0	104.1
4	40.0	4.1	54	540.0	55.1	104	1040.0	106.1
6	60.0	6.1	56	560.0	57.1	106	1060.0	108.2
8	80.0	8.2	58	580.0	59.2	108	1080.0	110.2
10	100.0	10.2	60	600.0	61.2	110	1100.0	112.2
12	120.0	12.2	62	620.0	63.3	112	1120.0	114.3
14	140.0	14.3	64	640.0	65.3	114	1140.0	116.3
16	160.0	16.3	66	660.0	67.3	116	1160.0	118.4
18	180.0	18.4	68	680.0	69.4	118	1180.0	120.4
20	200.0	20.4	70	700.0	71.4	120	1200.0	122.4
22	220.0	22.4	72	720.0	73.5	122	1220.0	124.5
24	240.0	24.5	74	740.0	75.5	124	1240.0	126.5
26	260.0	26.5	76	760.0	77.6	126	1260.0	128.6
28	280.0	28.6	78	780.0	79.6	128	1280.0	130.6
30	300.0	30.6	80	800.0	81.6	130	1300.0	132.7
32	320.0	32.7	82	820.0	83.7	132	1320.0	134.7
34	340.0	34.7	84	840.0	85.7	134	1340.0	136.7
36	360.0	36.7	86	860.0	87.8	136	1360.0	138.8
38	380.0	38.8	88	880.0	89.8	138	1380.0	140.8
40	400.0	40.8	90	900.0	91.8	140	1400.0	142.9
42	420.0	42.9	92	920.0	93.9	142	1420.0	144.9
44	440.0	44.9	94	940.0	95.9	144	1440.0	146.9
46	460.0	46.9	96	960.0	98.0	146	1460.0	149.0
48	480.0	49.0	98	980.0	100.0	148	1480.0	151.0
50	500.0	51.0	100	1000.0	102.0	150	1500.0	153.1
计算公式：	负载（KN）=工作压力（Mpa）/150x1500					拉伸力（t)=负载（KN)/9.8		



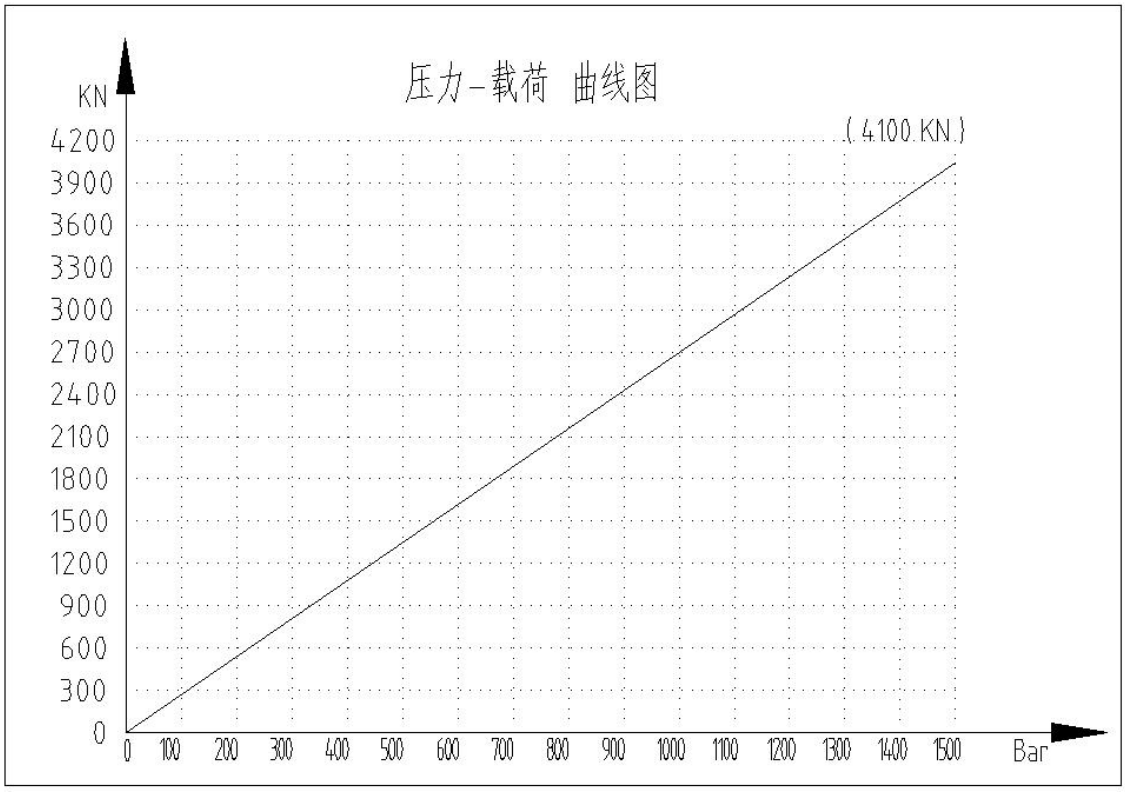
HSR6 拉伸器：压力、负载、拉伸力对照表									
工作压力	负载	拉伸力		工作压力	负载	拉伸力		工作压力	负载	拉伸力
（Mpa）	（KN）	（t）		（Mpa）	（KN）	（t）		（Mpa）	（KN）	（t）
2	33.3	3.4		52	866.7	88.4		102	1700.0	173.5
4	66.7	6.8		54	900.0	91.8		104	1733.3	176.9
6	100.0	10.2		56	933.3	95.2		106	1766.7	180.3
8	133.3	13.6		58	966.7	98.6		108	1800.0	183.7
10	166.7	17.0		60	1000.0	102.0		110	1833.3	187.1
12	200.0	20.4		62	1033.3	105.4		112	1866.7	190.5
14	233.3	23.8		64	1066.7	108.8		114	1900.0	193.9
16	266.7	27.2		66	1100.0	112.2		116	1933.3	197.3
18	300.0	30.6		68	1133.3	115.6		118	1966.7	200.7
20	333.3	34.0		70	1166.7	119.0		120	2000.0	204.1
22	366.7	37.4		72	1200.0	122.4		122	2033.3	207.5
24	400.0	40.8		74	1233.3	125.9		124	2066.7	210.9
26	433.3	44.2		76	1266.7	129.3		126	2100.0	214.3
28	466.7	47.6		78	1300.0	132.7		128	2133.3	217.7
30	500.0	51.0		80	1333.3	136.1		130	2166.7	221.1
32	533.3	54.4		82	1366.7	139.5		132	2200.0	224.5
34	566.7	57.8		84	1400.0	142.9		134	2233.3	227.9
36	600.0	61.2		86	1433.3	146.3		136	2266.7	231.3
38	633.3	64.6		88	1466.7	149.7		138	2300.0	234.7
40	666.7	68.0		90	1500.0	153.1		140	2333.3	238.1
42	700.0	71.4		92	1533.3	156.5		142	2366.7	241.5
44	733.3	74.8		94	1566.7	159.9		144	2400.0	244.9
46	766.7	78.2		96	1600.0	163.3		146	2433.3	248.3
48	800.0	81.6		98	1633.3	166.7		148	2466.7	251.7
50	833.3	85.0		100	1666.7	170.1		150	2500.0	255.1
计算公式：		负载（KN）=工作压力（Mpa）/150x2500						拉伸力（t）=负载（KN）/9.8		



HSR7 拉伸器：压力、负载、拉伸力对照表									
工作压力	负载	拉伸力		工作压力	负载	拉伸力		工作压力	负载	拉伸力
(Mpa)	(KN)	(t)		(Mpa)	(KN)	(t)		(Mpa)	(KN)	(t)
2	42.7	4.4		52	1109.3	113.2		102	2176.0	222.0
4	85.3	8.7		54	1152.0	117.6		104	2218.7	226.4
6	128.0	13.1		56	1194.7	121.9		106	2261.3	230.7
8	170.7	17.4		58	1237.3	126.3		108	2304.0	235.1
10	213.3	21.8		60	1280.0	130.6		110	2346.7	239.5
12	256.0	26.1		62	1322.7	135.0		112	2389.3	243.8
14	298.7	30.5		64	1365.3	139.3		114	2432.0	248.2
16	341.3	34.8		66	1408.0	143.7		116	2474.7	252.5
18	384.0	39.2		68	1450.7	148.0		118	2517.3	256.9
20	426.7	43.5		70	1493.3	152.4		120	2560.0	261.2
22	469.3	47.9		72	1536.0	156.7		122	2602.7	265.6
24	512.0	52.2		74	1578.7	161.1		124	2645.3	269.9
26	554.7	56.6		76	1621.3	165.4		126	2688.0	274.3
28	597.3	61.0		78	1664.0	169.8		128	2730.7	278.6
30	640.0	65.3		80	1706.7	174.1		130	2773.3	283.0
32	682.7	69.7		82	1749.3	178.5		132	2816.0	287.3
34	725.3	74.0		84	1792.0	182.9		134	2858.7	291.7
36	768.0	78.4		86	1834.7	187.2		136	2901.3	296.1
38	810.7	82.7		88	1877.3	191.6		138	2944.0	300.4
40	853.3	87.1		90	1920.0	195.9		140	2986.7	304.8
42	896.0	91.4		92	1962.7	200.3		142	3029.3	309.1
44	938.7	95.8		94	2005.3	204.6		144	3072.0	313.5
46	981.3	100.1		96	2048.0	209.0		146	3114.7	317.8
48	1024.0	104.5		98	2090.7	213.3		148	3157.3	322.2
50	1066.7	108.8		100	2133.3	217.7		150	3200.0	326.5
计算公式：		负载（KN）=工作压力（Mpa）/150x3200					拉伸力（t)=负载（KN)/9.8			



HSR8 拉伸器：压力、负载、拉伸力对照表								
工作压力	负载	拉伸力	工作压力	负载	拉伸力	工作压力	负载	拉伸力
(Mpa)	(KN)	(t)	(Mpa)	(KN)	(t)	(Mpa)	(KN)	(t)
2	54.7	5.6	52	1421.3	145.0	102	2788.0	284.5
4	109.3	11.2	54	1476.0	150.6	104	2842.7	290.1
6	164.0	16.7	56	1530.7	156.2	106	2897.3	295.6
8	218.7	22.3	58	1585.3	161.8	108	2952.0	301.2
10	273.3	27.9	60	1640.0	167.3	110	3006.7	306.8
12	328.0	33.5	62	1694.7	172.9	112	3061.3	312.4
14	382.7	39.0	64	1749.3	178.5	114	3116.0	318.0
16	437.3	44.6	66	1804.0	184.1	116	3170.7	323.5
18	492.0	50.2	68	1858.7	189.7	118	3225.3	329.1
20	546.7	55.8	70	1913.3	195.2	120	3280.0	334.7
22	601.3	61.4	72	1968.0	200.8	122	3334.7	340.3
24	656.0	66.9	74	2022.7	206.4	124	3389.3	345.9
26	710.7	72.5	76	2077.3	212.0	126	3444.0	351.4
28	765.3	78.1	78	2132.0	217.6	128	3498.7	357.0
30	820.0	83.7	80	2186.7	223.1	130	3553.3	362.6
32	874.7	89.3	82	2241.3	228.7	132	3608.0	368.2
34	929.3	94.8	84	2296.0	234.3	134	3662.7	373.7
36	984.0	100.4	86	2350.7	239.9	136	3717.3	379.3
38	1038.7	106.0	88	2405.3	245.4	138	3772.0	384.9
40	1093.3	111.6	90	2460.0	251.0	140	3826.7	390.5
42	1148.0	117.1	92	2514.7	256.6	142	3881.3	396.1
44	1202.7	122.7	94	2569.3	262.2	144	3936.0	401.6
46	1257.3	128.3	96	2624.0	267.8	146	3990.7	407.2
48	1312.0	133.9	98	2678.7	273.3	148	4045.3	412.8
50	1366.7	139.5	100	2733.3	278.9	150	4100.0	418.4
计算公式：	负载（KN）=工作压力（Mpa）/150x4100					拉伸力（t）=负载（KN）/9.8		



附 录

A(规范性附录)

8.8级螺栓许用轴向力、预紧力和预紧扭矩

A 1：参照本附录可方便地确定性能等级为8.8螺栓的预紧力和相应的预紧扭矩。本附录不适用于细牙螺纹的螺栓和膨胀螺栓。

A 2：表A1中所列的许用轴向力F_A考虑到了螺栓连接的疲劳强度。

A 3：采用本附录的条件为：

a. 螺纹符合GB 196；

b. 轴向力沿螺栓中心传递；

c. 环境温度-50—300℃；

d. 预紧时螺纹、螺栓头和螺母的承载面涂润滑油。

A 4：对于材质较软的（如A3等）被紧固件，为避免预紧力损失过大，应在螺栓头或螺母下加装高强度螺栓专用垫圈。

A 5：如采用其他性能等级的螺栓、预紧力和预紧扭矩可以按下列系数换算：

5.6级：$F_{V(5.6)} = 0.47 \times F_{V(8.8)}$

$M_{A(5.6)} = 0.47 \times M_{A(8.8)}$

10.9级：$F_{V(10.9)} = 1.41 \times F_{V(8.8)}$

$M_{A(10.9)} = 1.41 \times M_{A(8.8)}$

12.9级：$F_{V(12\ 9)} = 1.69 \times F_{V(8\ 8)}$

$M_{A(12.96)} = 1.69 \times M_{A(8.8)}$

表 A1

注:hc为紧固厚度

螺纹尺寸		螺纹公称应力截面积Ac(mm)	许用轴向力 KN Hc/d					预紧力Fv KN	预紧扭MA N.m
直径 d(mm)	螺距 p(mm)		2	3	4	6	>6		
M6	1	20.1	3	3	3	3	3	6.8	7
M8	1.25	36.6	7	7	7	7	7	12.5	18
M10	1.5	58	11	11	11	11	11	19.9	35
M12	1.75	84.3	16	17	17	16	16	29.1	61
M14	2	115.4	20	23	24	23	23	39.8	96
M16	2	157	27	32	33	32	32	55.3	149
M18	2.5	192	31	36	38	37	36	67.5	205
M20	2.5	245	36	42	49	51	50	86.3	290
M24	3	353	52	61	71	73	72	124.4	500
M30	3.5	561	85	100	115	118	116	199.1	1004
M36	4	817	124	146	168	173	170	291.4	1749
M42	4.5	1121	175	206	237	239	235	401.2	2806
M48	5	1473	231	273	314	315	310	528.6	4236
M56	5.5	2030	299	354	408	440	432	732.2	6791
M64	6	2676	384	454	583	586	574	958.9	10147
M72	6	3463	486	575	663	768	752	1265	14689
M80	6	4344	608	716	907	934	920	1563	19626
M90	6	5590	782	922	1168	1202	1185	2012	28584
M100	6	7000	980	1155	1463	1505	1484	2520	39960
M110	6	8560	1198	1412	1789	1840	1815	3081	53939
M120	6	10300	1442	1700	2152	2215	2183	3708	71034
M125	6	11200	1568	1848	2340	2408	2374	4032	80567
M140	6	14200	1988	2343	2968	3053	3010	5112	114800
M160	6	18700	2618	3085	3098	4020	3964	6732	173400

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