

DURAPAC
ENGINEERED FOR RELIABILITY

Instruction Manual

Hydraulic Bolt Tensioners
Model – DBT Series



Maximum Operating Pressure – 1,500 bar



This is a safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid injury or death

1.0 Product Information

DURAPAC – Hydraulic Bolt Tensioners are engineered to meet Industrial Standards for Performance and Safety. The DBT Series will ensure uniformed gasket compression. Compression is essential for the integrity of critical bolted flange connections. Unlike a torque wrench, the DBT Series Bolt Tensioners are capable of tightening more than one bolt at a time and can apply a consistent torque via direct axial stretching to any given number of bolts simultaneously.

These tensioners have been designed to fit all standard ANSI and API flanges with a quick release bridge and hexagon socket for fast change over. There are 10 load cells from M20 to M150 or ¾” to 5-¾” and they are light and easily handled. All cylinders are Electro-less nickel plated for extra protection and are easily maintained.

- Multiple sizes for thread adapters and hex sockets per load cell
- Knurling finish provides anti-slip grip for better handling
- Dual ports allow quick coupling of multiple tools
- Removal and rotational bridge with full bridge window to simplify positioning
- Electro-less nickel plated for extra protection
- Bridge size standard for each load cell
- Tommy bar supplied to enable easy tightening or loosening of the thread adaptor or hex socket

Special skill, knowledge and training may be required for a specific task and the product may not be suitable for all jobs. The user must ultimately make the decision regarding suitability of the product for any given task and assume the responsibility of safety for all in the work area. Contact a Durapac representative if you are unsure of your bolt tensioner’s suitability for a particular application.

2.0 Receiving Instructions

It is recommended prior to use that an inspection be done by qualified personnel and that any missing or damaged parts, decals, warning/safety labels or signs are replaced with Durapac authorised replacement parts only. Any bolt tensioner that appears to be damaged in any way, is worn, leaking or operates abnormally should be removed from service immediately until such time as repairs can be made. Any bolt tensioner that has been or suspected to have been subject to a shock load should be removed from service immediately until inspected by a Durapac authorised service centre. Owners and operators of this equipment should be aware that the use and subsequent repair of this equipment may require specialised training and knowledge.

3.0 Safety

Save these instructions. For your safety, read and understand the information contained within. The owner and operator should have an understanding of this product and safe operating procedures before attempting to use this product. Instructions and safety information should be conveyed in the operator's native language before use of this product is authorised. Make certain that the operator thoroughly understands the inherent dangers associated with the use and misuse of the product. If

any doubt exists as to the safe and proper use of this product as outlined in this factory authorised manual, remove from service immediately.

**DANGER:**

- **Never** stand in-line with the bolt axis while tensioning or de-tensioning is in progress. If the bolt should fail, serious personal injury or death could result if loose or broken parts become projectiles. All personnel must be aware of this potential hazard at all times
- To avoid personal injury keep hands and feet away from work area during operation
- **Do NOT** handle pressurised hoses. Escaping oil under pressure can penetrate the skin causing serious injury. If oil is injected under the skin, see a doctor immediately

**WARNING:**

- All hydraulic hoses and fittings used in the circuit must be rated at or above the maximum working pressure of the tensioner - 1500 bar [21,750 psi]. Install pressure gauges in the system to monitor operating pressure. It is your window to what is happening in the system
- Always wear appropriate personal protective equipment (PPE) when operating hydraulic equipment. The operator must take precaution against injury due to failure of the tool or work piece(s)
- **Do NOT** hold or stand directly in line with any hydraulic connections while pressurising
- **Do NOT** attempt to disconnect hydraulic connections under pressure. Release all line pressure before disconnecting hoses
- All personnel must be clear before pressurising or depressurising the system

**IMPORTANT:**

- If at any stage, the safety related decals become hard to read, these must be replaced
- Minimum age of the operator must be 18 years. The operator must have read and understood all instructions, safety issues, cautions and warnings before starting to operate the equipment. The operator is responsible for this activity towards other persons
- **Do NOT** lift hydraulic equipment by the hoses or couplers. Use the carrying handle or other means of safe transport
- Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Durapac authorised service centre in your area. To protect your warranty, use only high quality hydraulic oil

**CAUTION:**

- **KEEP HYDRAULIC EQUIPMENT AWAY FROM FLAMES AND HEAT.** Hydraulic fluid can ignite and burn. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings. For optimum performance do not expose equipment to temperatures of 65°C (150°F) or higher. Protect all equipment from weld spatter
- No alteration should be made to this device

3.1 Bolt Tensioners

- **Ensure** no personnel are in-line with the bolt axis when system is under pressure, failure to do so could result in death or personal injury
- **Only** allow personnel to be near pressurised hydraulic tensioners when it is absolutely necessary and only when the pressure is steady. Keep an eye on the pump pressure gauge
- **Do NOT** exceed the rated capacity of the bolt tensioner or any equipment in the system. Burst hazard exists if connection pressure exceeds rated pressure
- **Do NOT** exceed the maximum extension for the equipment
- **Do** use a gauge or other load measuring instrument to verify load
- **Do NOT** leave the pressurised system unattended
- **Do NOT** operate the system with bent or damaged couplers or damaged threads
- **Use only** Durapac approved accessories and components
- **Do NOT** overload equipment. Overloading can cause equipment failure and possible personal injury

3.2 Hydraulic Hoses & Fluid Transmission Lines

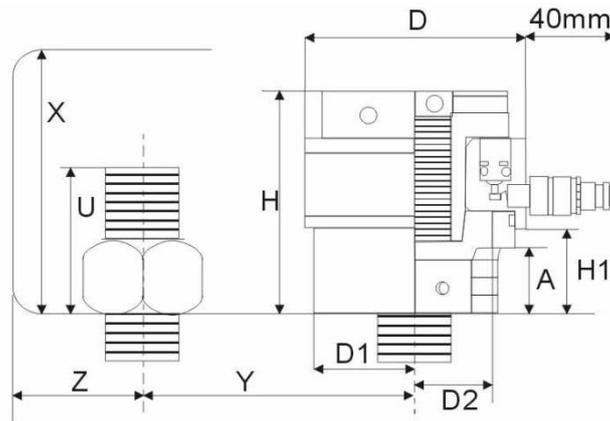
- Avoid short runs of straight line tubing. Straight line runs do not provide for expansion and contraction due to pressure and/or temperature changes
- Reduce stress in tube lines. Long tubing runs should be supported by brackets or clips. Before operating the pump, connections should be tightened securely and leak-free. Over tightening can cause premature thread failure or high pressure fittings to burst
- Should a hydraulic hose ever rupture, burst or need to be disconnected, immediately shut off the pump and release all pressure. Never attempt to grasp a leaking pressurised hose with your hands. The force of escaping hydraulic fluid can inflict injury
- **Do NOT** subject the hose to potential hazard such as fire, sharp objects, extreme heat or cold or heavy impact
- **Do NOT** allow the hose to kink, twist, curl, crush, cut or bend so tightly that the fluid flow within the hose is blocked or reduced. Periodically inspect the hose for wear
- **Ensure** that the bend radius is not less than the manufacturer's specified minimum bend radius for the type of hose being used
- Hose material and coupler seals must be compatible with the hydraulic fluid used. Hoses also must not come in contact with corrosive materials such as battery acid, creosote-impregnated objects and wet paint. Never paint a coupler or hose

FAILURE TO HEED THESE WARNINGS MAY RESULT IN PERSONAL INJURY AS WELL AS PROPERTY DAMAGE.

4.0 Installation

- 4.1 Ensure that all personnel involved in this procedure are trained and understand bolt tightening procedures and the tensioning equipment being used. Ensure that all personnel read and understand the safety information contained within this document.
- 4.2 Familiarise yourself with the specifications and illustrations in this owner’s manual. Know your bolt tensioner, its limitations and how it operates before attempting to use. Refer to the specification chart below or if in doubt, contact a Durapac representative.

Model	DBT-20	DBT-35	DBT-50	DBT-60	DBT-90	DBT-130	DBT-160	DBT-200	DBT-250	DBT-310
Metric Bolt Dimension (Ø * pitch)	M20*2.5	M27*3	M36*4	M42*4.5	M45*4.5	M60*5.5	M72*6	M80*6	M100*6	M125*6
	M22*2.5	M30*3.5	M39*4	M45*4.5	M48*5	M64*6	M76*6	M85*6	M110*6	M130*6
	M24*3	M33*3.5	M42*4.5	M48*5	M52*5	M68*6	M80*6	M90*6	M120*6	M140*6
	M27*3	M36*4	M45*4.5	M52*5	M56*5.5	M72*6		M95*6	M125*6	M150*6
					M60*5.5	M76*6		M100*6		
Imperial Threads (Ø in-)	3/4"-10	1"-8	1-3/8"-6	1-1/2"-6	1-3/4"-5	2-1/2"-4	2-3/4"-4	3-1/4"-4	3-3/4"-4	5"-4
	7/8"-9	1-1/8"-7	1-1/2"-6	1-3/4"-5	2"-4-1/2	2-3/4"-4	3"-4	3-1/2"-4	4"-4	5-1/4"-4
	1"-8	1-1/4"-7	1-3/4"-5	2"-4-1/2	2-1/4"-4-1/2	3"-4	3-1/4"-4	3-3/4"-4	4-1/4"-4	5-1/2"-4
		1-3/8"-6							4-1/2"-4	5-3/4"-4
									4-3/4"-4	
Maximum Pressure (bar)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Effective Area (cm ²)	20	35	50	60	90	130	160	200	250	310
Maximum Force (kN)	300	525	750	900	1,350	1,950	2,400	3,000	3,750	4,850
Piston Stroke (mm)	8	8	8	8	8	8	10	10	10	10
D (mm)	86	109	128	144	170	198	220	244	300	340
H (mm)	105	116	128	140	154	185	190	203	235	268
H1 (mm)	30	40	49	54	65	82	86	106	131	156
D1 (mm)	74	97	116	133	154	187	203	232	272	313
D2 (mm)	56	73	90	102	114	137	145	180	223	260
A (mm)	26	31	38	40	42	50	50	60	73	86
U (mm)	38	52	69	80	86	114	137	152	190	238
	42	57	74	86	92	122	145	162	209	247
	46	63	80	92	99	130	152	171	228	266
	52	69	86	99	107	137		181	238	285
					114	145		190		
X (mm)	138	168	197	220	240	293	327	355	425	506
	142	173	202	226	246	301	335	365	444	515
	146	179	208	232	253	309	342	374	463	534
	152	185	214	239	261	316		384	473	553
					268	324		393		
Y (mm)	56	73.5	91	91	119	147	163.5	184.5	222	262.5
	57	76.5	94	92	122	150	166.5	187.5	227.5	265
	59	79	97	94	124.5	153	169.5	193	236	274
	62	81	100	96	127.5	155.5		196	242	280
					130.5	158.5		202		
Z (mm)	44.5	56	65.5	69.4	84.5	101	109	124	144	164.5
Weight (kg)	3	5	8	11	18	25	33	39	56	77



4.3 Check all system fittings and connections to be sure they are tight and leak free.

4.4 Check oil level in reservoir before operating pump.

5.0 Operation



IMPORTANT:

- Ensure that the bolt material is capable of taking the initial load to be applied. DBT Series tensioners are powerful tools that are capable of yielding or breaking studs/bolts if bolt material properties are not sufficient to support the load being applied
- Ensure that all calculations (bolt load, hydraulic pressure, etc.) have been made prior to starting the tensioning process and that they have been reviewed and approved by a qualified engineer
- Check that the hydraulic harness is fully connected. There should be no loose ends and every male nipple should be connected to a corresponding female connector
- Check that each female connector is securely locked in position on the corresponding nipple by physically pulling the connection
- Check that the threaded portion of the tensioning tool is screwed on the stud and that the thread engagement is sufficient. Note: The thread projection of the stud above the top of the nut should be sufficient to allow the tensioning tool to engage the stud a minimum of one stud diameter
- **ONLY** an unused female coupler or a blanking plug is to be used at the end of end of the tensioner circuit. A female coupler can remain disconnected (open ended) while under pressure. However, as a precaution, it is strongly recommended that a blanking plug be installed in the coupler before beginning pressurisation
- **Ensure** no personnel are in-line with the bolt axis when system is under pressure, failure to do so could result in death or personal injury

5.1 Force / Pressure Table

	DBT-20	DBT-35	DBT-50	DBT-60	DBT-90	DBT-130	DBT-160	DBT-200	DBT-250	DBT-310	
Bar	kN	kN	kN	kN	kN	kN	kN	kN	kN	kN	psi
100	20	35	50	60	90	130	160	200	250	310	1,450
200	40	70	100	120	180	260	320	400	500	620	2,901
300	60	105	150	180	270	390	480	600	750	930	4,351
400	80	140	200	240	360	520	640	800	1,000	1,240	5,801
500	100	175	250	300	450	650	800	1,000	1,250	1,550	7,252
600	120	210	300	360	540	780	960	1,200	1,500	1,860	8,702
700	140	245	350	420	630	910	1,120	1,400	1,750	2,170	10,152
800	160	280	400	480	720	1,040	1,280	1,600	2,000	2,480	11,603
900	180	315	450	540	810	1,170	1,440	1,800	2,250	2,790	13,053
1,000	200	350	500	600	900	1,300	1,600	2,000	2,500	3,100	14,503
1,100	220	385	550	660	990	1,430	1,760	2,200	2,750	3,410	15,954
1,200	240	420	600	720	1,080	1,560	1,920	2,400	3,000	3,720	17,404
1,300	260	455	650	780	1,170	1,690	2,080	2,600	3,250	4,030	18,854
1,400	280	490	700	840	1,260	1,820	2,240	2,800	3,500	4,340	20,305
1,500	300	525	750	900	1,350	1,950	2,400	3,000	3,750	4,650	21,755

5.2 Tensioning Procedure

- 5.2.1 Determine the correct pump pressure as per 5.1 Force / Pressure Table.
- 5.2.2 Lubricate the threads on the stud and two mating surfaces of the tensioner.
- 5.2.3 Ensure the correct choice of pump for the application.
- 5.2.4 Select the correct tensioner, including the bridge, cylinder, threaded adaptor, hex socket and nut-turning bar for the size of stud to be tensioned

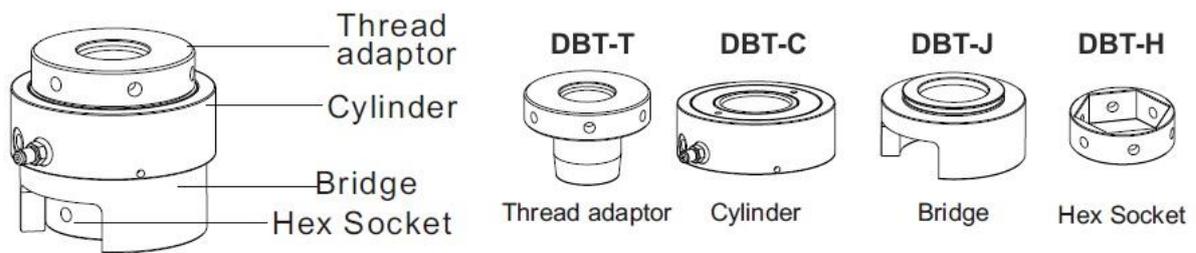


Figure 1 – Bolt Tensioner Components

- 5.2.5 Check that the studs and nuts have been assembled correctly as per Figure 2. Note: The thread projection of the stud above the top of the nut should be sufficient to allow the tensioning tool to engage the stud a minimum of one stud diameter, e.g. if a DBT-35 is used to pull a M36*4 bolt, a minimum of 36mm thread projection of the stud would need to be preserved above the top of the nut.

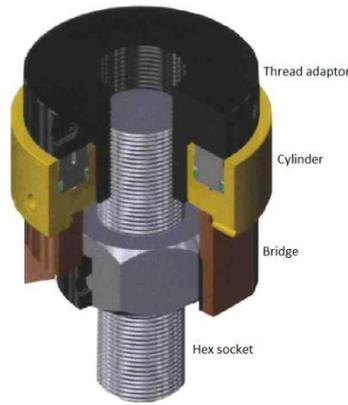


Figure 2 – Bolt Tensioner Assembly

- 5.2.6 Hand-tighten the nut using a manual hand wrench. Note - excessive force is not required as the tensioners will do the work.
- 5.2.7 Place the tensioner assembly over the stud and nut.
- 5.2.8 Screw the thread adaptor onto the stud until the cylinder body is tight against the bridge. Note - the body should be snug but not tightened too hard onto the bridge.
- 5.2.9 Assemble any additional tools following the above steps. Note – tools should be equally spaced and a balanced tightening sequence used. For the best results, every other stud or more should have a tensioner on it. If not, the studs should be tensioned in multiple steps, at much less than a full load. If in doubt, contact your Durapac representative.
- 5.2.10 Connect the hydraulic harness as shown in Figure 3.

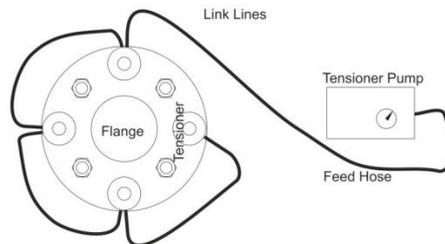


Figure 3 – Typical Hydraulic Hose Arrangement

- 5.2.11 Operate the pump and pressurise the tensioners up to approximately 70 bar. Check for oil leaks. If no leaks are found, continue pressurising the tensioners to the calculated value.
- 5.2.12 Observe the extension and pressure constantly during the operation until the desired operating pressure is reached.

Do not exceed the required pressure for the application. If the maximum extension is reached before the necessary pressure is attained, immediately stop the pump and release the pressure slowly to avoid possible damage. Return the threaded insert to zero extension. This is done by tightening the threaded insert onto the stud with the nut-turning bar until zero extension is achieved. As the fluid from each tool has to flow back to the pump, the

return stroke may be quite slow. Make sure the needle valve on the power supply is fully open.

- 5.2.13 While holding the operating pressure constant, use the nut-turning bar to screw down the nut onto the top face of the flange. Ensure that the nut is properly seated and using the nut-turning bar tighten to ensure that the nut is snug.
- 5.2.14 Release the pressure slowly to avoid possible gauge damage.
- 5.2.15 Return the threaded insert to zero extension. This is done by tightening the thread adaptor on the stud with the nut-turning bar until zero extension is achieved. Note – as the fluid from each tool has to flow back to the pump, the return stroke may be quite slow. Make sure the needle valve on the power supply is fully open.
- 5.2.16 Unscrew the thread adaptor and remove the body and bridge.
- 5.2.17 Reposition the tools over the next set of studs to be tensioned and continue as before until all the studs have been tensioned once. This will complete the first cycle.
- 5.2.18 Reposition the tensioners on the first set of studs, tightened and repeat steps 5.1.7 to 5.1.14.
- 5.2.19 If the nut can be turned, then another complete tensioning cycle must be performed.
- 5.2.20 When no further rotation with the nut-turning bar is possible then the stud tensioning is complete.

5.3 De-tensioning Procedure

The de-tensioning procedure is identical to the tensioning procedure with the following exceptions:

- 5.3.1 When screwing the tensioning head onto the stud, the thread adaptor must be screwed down until there is zero extension.

Note – the thread adaptor must now be turned back one half turn. This is to prevent the tensioner from becoming locked onto the stud. One half turn is usually sufficient, but if for any reason the tensioner is locked onto the stud then retighten as per the tensioning procedure and repeat, then turn back $\frac{3}{4}$ of a turn.
- 5.3.2 When the required pressure is reached, the nut must be unscrewed using the nut-turning bar. If for any reason the nut will not unscrew (i.e. corrosion or thread damage), **Do NOT** increase the pressure beyond the recommended maximum operating pressure of the tensioner or above the maximum stress of the stud. Once the nut has been lifted off the face of the flange, further increasing the pressure will not assist.

6.0 Maintenance



IMPORTANT:

- Durapac tensioners utilise a NOK seal. In the event of leakage from this connection or if this connection needs to be remade, it is important to remember that NOK seals should not be reused and a new seal should always be fitted. If in doubt, contact a Durapac representative
- Check oil level regularly
- Use only good quality hydraulic fluid. **Do NOT** use brake fluid, transmission fluid, turbine oil, motor oil, alcohol, glycerine etc. Use of anything other than good quality hydraulic oil will void warranty and damage the pump, hose, and application. We recommend Durapac Hydraulic Oil or equivalent
- Equipment must only be serviced by a qualified hydraulic technician. For repair service, contact your local Durapac authorised service centre
- Damage to hydraulic hoses may not be detected during visual inspections. For this reason, Durapac recommends that hydraulic hoses be replaced on a regular basis
- Tighten connections as needed. Use non-hardening pipe thread compound when servicing connections

The tensioner is of a rugged construction and utilises reliable seals. The only maintenance that may occasionally be required is the repair of a hydraulic fitting or the replacement of a seal.

6.1 Replacement of Hydraulic Seals

The following precautions must be taken during the replacement of hydraulic seals:

- Avoid sharp edges and do not use sharp instruments to assist in positioning the seal, as this may damage the seal
- Ensure sealing device and all surfaces, which will be traversed on the way to the groove; be free of all foreign material. The cleaning procedure should include a solvent rinse of all components (including the tools used) followed by a wipe-down with a clean, lint-free cloth

Both the inner and outer sealing device is made up of two parts; (1) seal (2) back-up ring.

Back-up ring – Prior to installing the seals, install the backup rings as shown on the part breakdown.

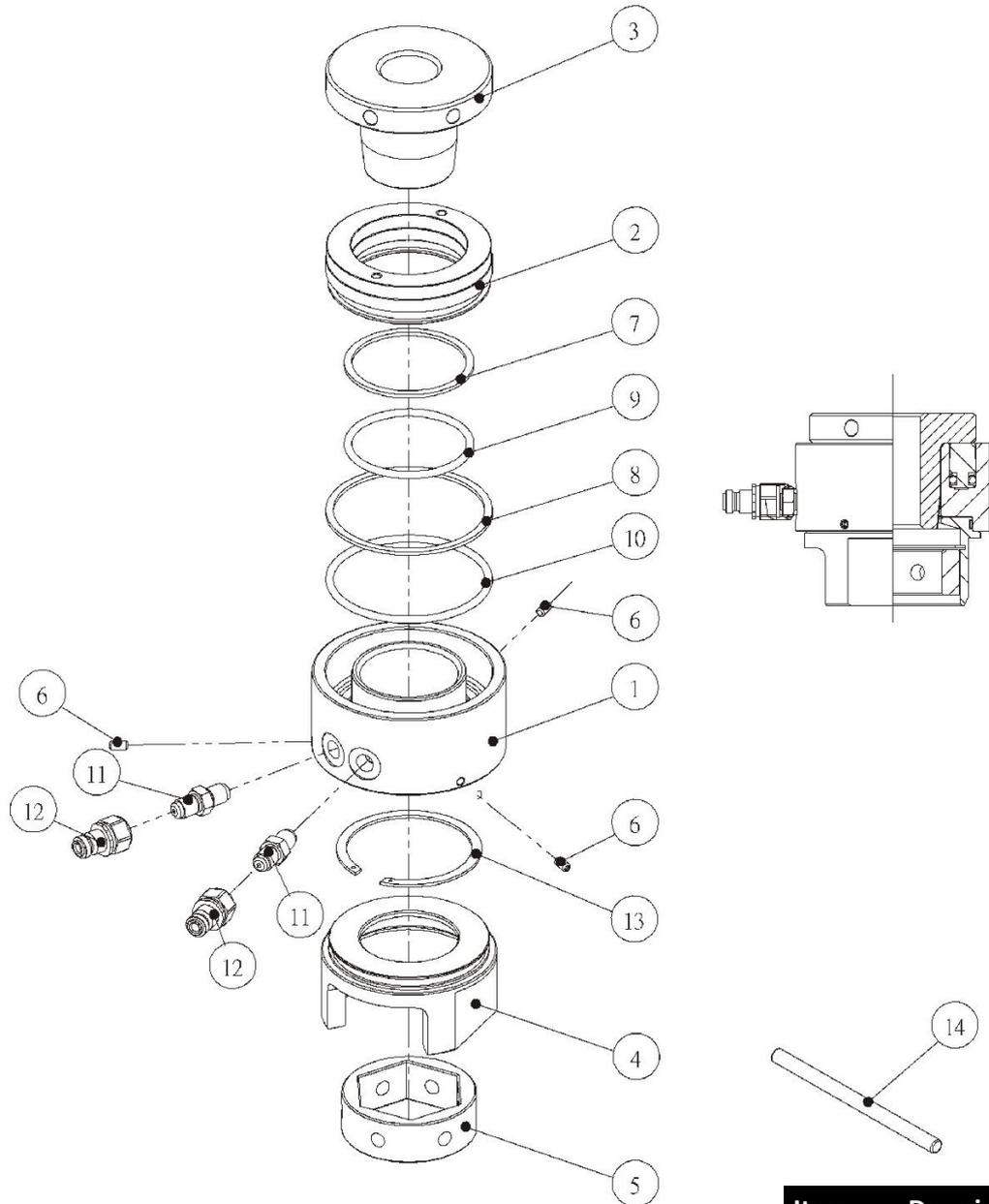
Inner Seal – After the back-up ring is in place, insert the seal by folding it but avoid sharp bends. Care should be taken to ensure the lip edge faces toward the pressure end of the piston.

Outer Seal – After the back-up ring is in place, position part of the outer seal in the groove and work around the outer diameter stretching the seal over the boss until it finally slips completely into the groove. Be advised that a reasonable amount of force may be required to stretch the seal.

7.0 Troubleshooting

Problem	Cause	Solution
Pump loses pressure	Leaking system components	<ul style="list-style-type: none"> • Repair or replace as necessary
Pump not delivering fluid	Low fluid level in reservoir	<ul style="list-style-type: none"> • Check fluid level
	Worn seats	<ul style="list-style-type: none"> • Repair seats • Replace pump body
Pump does not reach rated capacity	Low fluid level in reservoir	<ul style="list-style-type: none"> • Check fluid level
	Leaking system components	<ul style="list-style-type: none"> • Repair or replace as necessary
	Fluid leaking past inlet or outlet checks	<ul style="list-style-type: none"> • Repair inlet or outlet checks • Replace high pressure piston seal
Tensioner will not extend	Loose couplers	<ul style="list-style-type: none"> • Tighten couplers
	Low fluid level in pump reservoir	<ul style="list-style-type: none"> • Fill and bleed the system
	Leaking tensioner seals	<ul style="list-style-type: none"> • Replace worn seals • Look for excessive contamination or wear
Tensioner extends only partially	Low fluid level in pump reservoir	<ul style="list-style-type: none"> • Fill and bleed the system
	Load above capacity of system	<ul style="list-style-type: none"> • Use correct equipment
Tensioner extends slower than normal	Loose couplers	<ul style="list-style-type: none"> • Tighten couplers
	Restricted hydraulic line or fitting	<ul style="list-style-type: none"> • Clean and replace if damaged
	Pump not operating correctly	<ul style="list-style-type: none"> • Check pump's operating instructions • Repair or replace as necessary
	Low fluid level in pump reservoir	<ul style="list-style-type: none"> • Fill and bleed the system
Tensioner does not hold pressure	Leaky connection	<ul style="list-style-type: none"> • Clean, reseal with thread sealant, and tighten connection
	Leaking tensioner seals	<ul style="list-style-type: none"> • Replace worn seals • Look for excessive contamination or wear • Replace contaminated fluid
	Pump or valve not operating correctly	<ul style="list-style-type: none"> • Repair or replace as necessary
Tensioner will not retract	Closed pump release valve	<ul style="list-style-type: none"> • Open pump release valve
	Loose couplers	<ul style="list-style-type: none"> • Tighten couplers
	Blocked hydraulic lines	<ul style="list-style-type: none"> • Clean and flush lines
	Pump reservoir too full	<ul style="list-style-type: none"> • Drain fluid to correct level

8.0 Parts Breakdown and List



Item	Description	Qty
1	Cylinder	1
2	Piston rod	1
3	Thread adapter	1
4	Bridge	1
5	Hex socket	1
6	Bolt	3
7	Back-up ring*	1
8	Back-up ring*	1
9	O-ring*	1
10	O-ring*	1
11	Nipple	2
12	Coupler	2
13	Stop ring	1
14	Nut-turning bar	1

Items marked with a * are contained within a standard Repair Kit. Serial number and model need to be quoted when ordering parts.