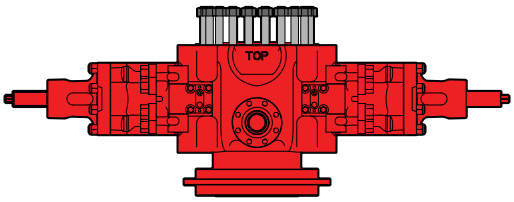

User's Manual

SL Blowout Preventer

Customer Name
Rig Name
Sales Order Number

Reference	Reference Description
Standard Distribution	

National Oilwell Varco
12950 West Little York
Houston, TX 77041
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NATIONAL OILWELL VARCO

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Change Description

Revision	Change Description
A	First issue

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Chapter 4: Maintenance

Chapter 5: Specifications and Parts Lists

General Information

Conventions

This manual is intended for use by field engineering, installation, operation, and repair personnel. Every effort has been made to ensure the accuracy of the information contained herein. National Oilwell Varco, Inc. will not be held liable for errors in this material, or for consequences arising from misuse of this material.

Notes, Cautions, and Warnings

Notes, cautions, and warnings provide readers with additional information, and to advise the reader to take specific action to protect personnel from potential injury or lethal conditions. They may also inform the reader of actions necessary to prevent equipment damage. Please pay close attention to these advisories.

Note:

The note symbol indicates that additional information is provided about the current topics.

Caution:

The caution symbol indicates that potential damage to equipment or injury to personnel exists. Follow instructions explicitly. Extreme care should be taken when performing operations or procedures preceded by this caution symbol.

Warning:

The warning symbol indicates a definite risk of equipment damage or danger to personnel. Failure to observe and follow proper procedures could result in serious or fatal injury to personnel, significant property loss, or significant equipment damage.

Illustrations

Illustrations (figures) provide a graphical representation of equipment components or screen snapshots for use in identifying parts or establishing nomenclature, and may or may not be drawn to scale.

For component information specific to your rig configuration, see the technical drawings included with your documentation.

Safety Requirements

Your equipment is installed and operated in a controlled drilling rig environment involving hazardous situations. Proper maintenance is important for safe and reliable operation. Procedures outlined in your manuals are the recommended methods of performing operations and maintenance.

To avoid injury to personnel or equipment damage, carefully observe requirements outlined in this section.

Personnel Training

All personnel performing installation, operations, repair, or maintenance procedures on the equipment, or those in the vicinity of the equipment, should be trained on rig safety, tool operation, and maintenance to ensure their safety.

Personnel should wear protective gear during installation, maintenance, and certain operations.

Contact the National Oilwell Varco training department for more information about equipment operation and maintenance training.

Recommended Tools

Service operations may require the use of tools designed specifically for the purpose described. The equipment supplier recommends that only those tools specified be used when stated. Ensure that personnel and equipment safety are not jeopardized when following service procedures or using tools not specifically recommended by the supplier.

General System Safety Practices

The equipment discussed in this manual may require or contain one or more utilities, such as electrical, hydraulic, pneumatic, or cooling water.

Read and follow the guidelines below before installing equipment or performing maintenance to avoid endangering exposed persons or damaging equipment.

- Isolate energy sources before beginning work.
- Avoid performing maintenance or repairs while the equipment is in operation.
- Wear proper protective equipment during equipment installation, maintenance, or repair.

Replacing Components

- Verify that all components (such as cables, hoses, etc.) are tagged and labeled during assembly and disassembly of equipment to ensure correct installment.
- Replace failed or damaged components with original equipment manufacturer's (OEM's) certified parts. Failure to do so could result in equipment damage or injury to personnel.

Routine Maintenance

Equipment must be maintained on a routine basis. See product-specific service manual for maintenance recommendations.

Failure to conduct routine maintenance could result in equipment damage or injury to personnel.

Proper Use of Equipment

National Oilwell Varco equipment is designed for specific functions and applications, and should be used only for its intended purpose.

Safety Precautions

Operation of the control systems may present certain hazards that require the attention and caution of operators and technicians. Normally, many hazards are avoided by observing and exercising standard safety precautions.

Electrical Precautions

Certain safety precautions must be exercised regarding the electric circuits of the control system. The following precautions will prevent damage to equipment and injury to personnel that might result from electric power:

- Personnel engaged in electrical work should receive proper instruction in accident prevention and first aid procedures.
- An electric source power must be supplied at correct voltage, current, and phase to enable safe and correct operation of equipment.
- Exercise caution when working around exposed electrical conductors, terminals, and remotely activated equipment.
- Ensure flashproof integrity of explosion-proof electrical junction boxes, connections, and circuit breakers. This will prevent fires or explosion that might result from a spark during electrical switching.
- Do not override or tamper with electrical or mechanical interlocks and safety devices.
- Before attempting any corrective action on the electrical circuit, verify that all electric power sources have been removed from the circuit. Ensure that all electrical switches are set to “Off” and the appropriate breakers are set to “Open.”
- Do not service or adjust the electrical circuits alone. Always verify that a qualified person is present who can render aid in case of accident and who is familiar with emergency shutdown procedures.
- Appropriate warning tags labelled “Requiring Open Circuit Condition” shall be placed on all necessary switches and circuit breakers to prevent accidental application of power to units of the system during maintenance procedures.
- Wear suitable protective clothing while working within 4 feet of exposed electrical equipment. Do not wear rings, wrist watches, or clothing with exposed metal buttons, zippers, or fasteners.
- Metal handles of hand-held tools should be insulated by an approved taping, coating, or sleeve method.
- Whenever it is necessary to work on electrical circuits or equipment in wet or damp locations, dry, wooden (or similar nonconducting material) platforms should be provided to prevent the possibility of contact between the wet floor and the workman’s shoes.

Hydraulic Precautions

Hydraulic source power produced by the accumulator control/pump unit is at sufficiently high pressure and volume to present a hazard if required safety practices are not followed. Exercise the following precautions to aid in preventing damage to equipment and injury to personnel that might result from hydraulic-power related accidents:

- Mop up spilled hydraulic fluid immediately. Immediately investigate and correct the cause of any leakage of hydraulic fluid.
- If clothing becomes drenched with hydraulic fluid, change immediately to dry clothing. The fluid is very irritating to eyes and skin. Prolonged contact with hydraulic fluid may cause dermatitis, which may progress to allergic sensitization.
- Ensure that only correct hydraulic fluid is supplied and used for safe and correct operation of the control systems unit.

- Hydraulic fluid must be filtered to prevent any dirt or debris from entering the hydraulic circuit.
- Ensure that the pressure relief valves are in working condition and that the valves are set to relieve at their designated pressure levels.
- Should there be a rupture or break in the hydraulic circuit (when pressurized), do not place hands, face, or any part of the body over the escaping jet stream of fluid. Severe bodily injury will result.
- Never torque leaking connections or fittings while lines are pressurized. Application of torque to fittings or connections while lines are pressurized may cause lines to rupture and result in injury to personnel.
- Before attempting any corrective action on the hydraulic circuit, verify that the electric power source is turned off, the pneumatic power source is turned off, and all hydraulic pressure is completely vented. Verify that all hydraulic gauges read 0 psi (0 bar).
- When precharging accumulators, use only dry nitrogen gas. The use of another gas may cause unit failure or explosion.

Pneumatic Precautions

Pneumatic source power supplied to the control unit is of sufficiently high pressure and volume to present a hazard if required safety practices are not followed. Exercise the following precautions to aid in preventing damage to equipment and injury to personnel that might result from pneumatic power:

- Ensure that the pneumatic source power is supplied at adequate pressure and volume to enable safe and proper operation of equipment. Maximum system air pressure is 125 psi (9 bar).
- Ensure that the air is filtered to prevent any dirt or debris from entering the pneumatic circuit.
- Ensure that air is dried and lubricated before it pilots or operates any motor (hydraulic pump); moisture can damage components and result in unit failure.
- Should there be a rupture or break in the pneumatic circuit (when pressurized), do not place hands, face, or any part of the body over the escaping air. Severe bodily injury may result.
- Before attempting any corrective action on the pneumatic circuit, verify that the pneumatic power source is cut off and that all pneumatic pressure is completely vented. Verify that all pneumatic pressure gauges read 0 psi (0 bar).

Cable and Hose Precautions

Observing the precautions listed below will prevent damage to equipment and injury to personnel that might result from damage to cables and/or hoses.

- Protect electrical cables, pneumatic hoses, and hydraulic hoses from cutting, scraping, pinching, abrasion or other physical damage.
- Route cables and hoses outside of the crews traffic patterns and away from mechanical equipment.
- Observe the prescribed minimum bend radius for cables and hoses. Twisting or bending cables or hoses beyond the minimum bend radius can rupture the insulation and damage the conductors.

BOP Control Unit Safety

Personnel responsible for the operation of blowout preventers (BOPs) should observe the following precautions:

- Never leave the shutoff valves to the accumulators in the closed position.
- Never use diesel fuel oil or kerosene in the system as a control fluid. Always use good clean lightweight hydraulic oil or soluble oil concentrate properly mixed with potable water or water and glycol.
- Never allow oxygen to be stored in the vicinity of an accumulator unit. Always precharge your accumulator bottles with nitrogen gas, which is inert. Accept no substitutes.
- Never put any locking mechanism on the handles of the four-way hydraulic control valves. A cover made of expanded metal, clear plastic, or other will serve the same purpose without hampering the operation of the valve. Be sure that the cover is large enough to allow the valve handle to operate freely for remote control operation.
- Keep a charging and gauging assembly near the unit at all times.
- Maintain and test the system periodically and operate it at its designed working pressure.
- Leave the four-way control valves in normal operating condition. Never leave in neutral or blocked position during the drilling operations.
- Do not leave electric cable connector plugs unprotected. Install protective covers when not in use.

Work Area Precautions

Work should be performed in an area free of any dangerous obstructions, chemicals or hazards of any kind in order to prevent or reduce the severity of an injury. The precautions listed below should be observed in order to maintain a safe working environment.

- Remove any dangerous obstruction located overhead, to the side, or on the surrounding floor of the work area as safely and quickly as possible utilizing the appropriate personnel.
- Remove any flammable materials located or spilled within or near the work area. Flammable materials include, but are not limited to, the following:
  - oily rags, paper products, or any combustible solid
  - kerosene, gasoline, or any combustible liquid
  - oxygen tanks, acetylene tanks, or any combustible gas
- Correct or remove any condition, situation, or circumstance that may pose serious hazard(s) to the work area.

Use Correct Replacement Parts

Many of National Oilwell Varco's system component parts are specially manufactured to system design specifications, although apparently similar to commercially available hardware. To avoid possible hazardous failures, use only National Oilwell Varco replacement parts, components, or assemblies.

Introduction

Model SL Ram

The Shaffer® Manual Lock Model SL Ram Blowout Preventer (SL BOP) provides a rugged, reliable preventer that is easily serviced in the field.

Special features include:

- Flat doors to simplify ram changes
- Door seals with special backing to prevent extrusion and pinching
- Standard internal trim
- Wear rings between the piston and cylinder to increase seal life and to virtually eliminate cylinder bore wear
- Polyurethane lip-type piston seals with lifetime lubrication
- Lip-type ram shaft seals to hold the wellbore pressure and the opening hydraulic pressure
- Secondary ram shaft seals to permit injection of plastic packing if the primary lip-type seal ever fails (see Figure 2-1)

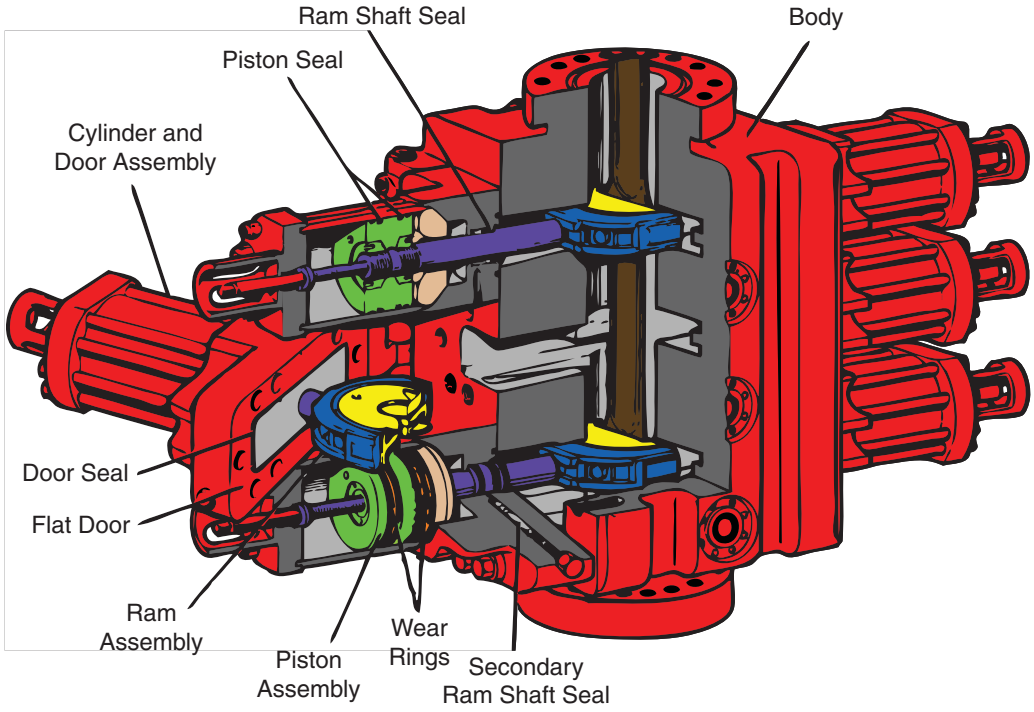


Figure 2-1. Manual Lock SL Blowout Preventer

The Manual Lock SL BOP is available in single, double, and triple models. This manual provides the installation, operation, and maintenance procedures for all Manual Lock SL BOP models.

National Oilwell Varco (NOV) supplies Shaffer Manual Lock SL BOPs in the sizes shown in the following table.

SL BOP Available Sizes and Working Pressures

Working Pressure		Size	
psi	bar	in	mm
15,000	1,035	13 5/8	346.1
		11	279.4
10,000	690	21 1/4	539.8
		18 3/4	476.3
		16 3/4	425.5
		13 5/8	346.1
		11	279.4
5,000	345	16 3/4	425.5
		13 5/8	346.1
3,000	207	13 5/8	346.1

These high-pressure, heavy-duty BOPs are designed for drilling and workover service. They are hydraulically operated and can be manually locked by rotating the handwheels. Units can be manufactured for Arctic (to –75°F). Shaffer preventers are manufactured in accordance with the American Petroleum Institute (API) specification API Spec. 6A (current edition) and the National Association of Corrosion Engineers (NACE) document “NACE Standard MR-01-75” (current revision).

Hydraulic operating fluid can be supplied by an NOV Koomey® or other BOP Closing System. 1,500 psi (103 bar) hydraulic pressure will close any model SL ram BOP with rated working pressure in the wellbore, except for the 11″ (279.4 mm) and 13 5/8″ (346.1 mm) 15,000 psi (1,034 bar) BOPs, which require 2,200 psi (152 bar). The 11″ (279.4 mm) and 13 5/8″ (346.1 mm) will close against 10,000 psi (690 bar) well pressure with less than 1,500 psi (103 bar) hydraulic pressure. However, to hold 15,000 psi (1,034 bar) wellbore pressure requires 2,200 psi (152 bar) hydraulic closing pressure. At the operator’s discretion, 3,000 psi (207 bar) closing hydraulic pressure may be used on all SL model preventers.

Operation

Inspection

The inspection process includes the activities listed below:

- Thoroughly clean the SL Manual Lock Blowout Preventer (BOP) before installation (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
- Clean and inspect the sealing surface of the ring groove for minor pits and scratches. Remove these with emery cloth. If there is excessive damage, call an NOV service representative.
- Clean and inspect studs and nuts (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11). Replace any that are damaged.
- Ensure the correct size rams are in each cavity. The part number is stamped into the block of each ram.
- Thoroughly clean and oil the inside of the SL BOP (see the section titled “Cleaning and Storing the SL BOP” on page 4-26).

Condition of BOP is Unknown

If the condition of the BOP is unknown e.g., stored for some length of time or has not been maintained on a scheduled maintenance program, perform a three-month maintenance check as described in the section titled “Three-Month Preventive Maintenance” on page 4-4. A three-month maintenance check includes:

- Visually inspecting and thoroughly greasing the inside of the BOP.
- Performing a field wellbore pressure test as described in the section titled “Field Wellbore Pressure Test” on page 4-6.
- Performing a hydraulic pressure test as described in the section titled “Hydraulic Pressure Test” on page 4-8.
- Operating the manual locks as described in the section titled “Manual Locking” on page 3-13.

BOP Maintained on a Scheduled Maintenance Program

If the BOP has been properly maintained (scheduled maintenance program), a monthly maintenance check (see the section titled “Monthly Preventive Maintenance” on page 4-3) is all that is required. A monthly maintenance check includes:

- Performing a field wellbore pressure test per the section titled “Field Wellbore Pressure Test” on page 4-6.
- Checking for external hydraulic leaks while pressure testing.

Cleaning, inspecting and testing the SL BOP immediately after completing drilling operations reduces installation time on the next well (see the section titled “Maintenance Schedule” on page 4-1).

Installation

1. Ensure that the BOP is installed right-side-up.
   - Some models have “Top” or “This Side Up” cast into the BOP housing.
   - Some models have lifting lugs above the mud flange outlets (see Figure 3-1).

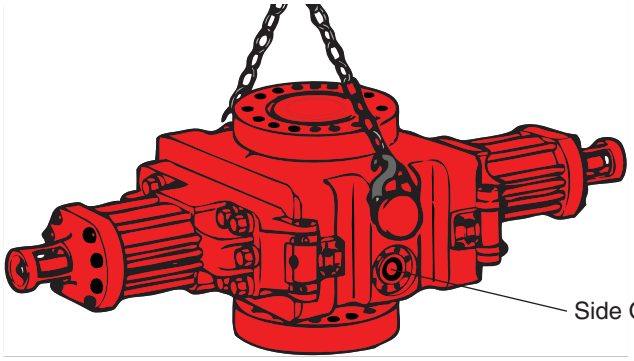


Figure 3-1. Lifting Lug Location

   - On all models and on models without stampings or lugs:
     - Externally, the side outlets for the choke and kill lines are below the rams
     - Internally, the skids in the ram compartments are below the rams, and ram sealing seats are located in the top of the ram cavity

If the BOP is installed upside-down, it will not contain wellbore pressure.

2. Lift the SL Manual Lock BOP according to the instructions below.

   - On models with lifting lugs cast into the body, the BOP is lifted by wrapping a chain or cable of sufficient strength around the lug (see Figure 3-2).

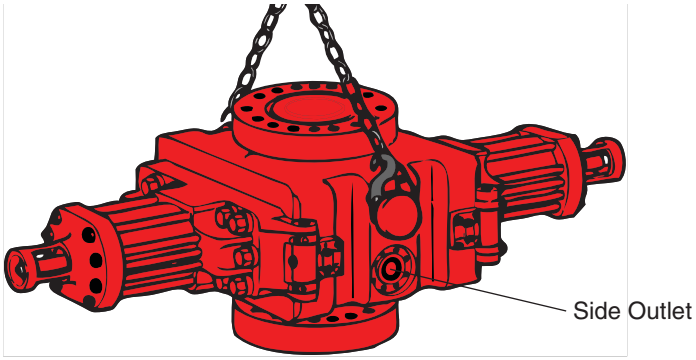


Figure 3-2. Lifting the SL Manual Lock BOP with Lifting Lugs

   - On models without lifting lugs, place a strap or chain around the door flat as close to the body as possible. Lift the BOP by attaching this chain to the lifting cable or chain (see Figure 3-3).

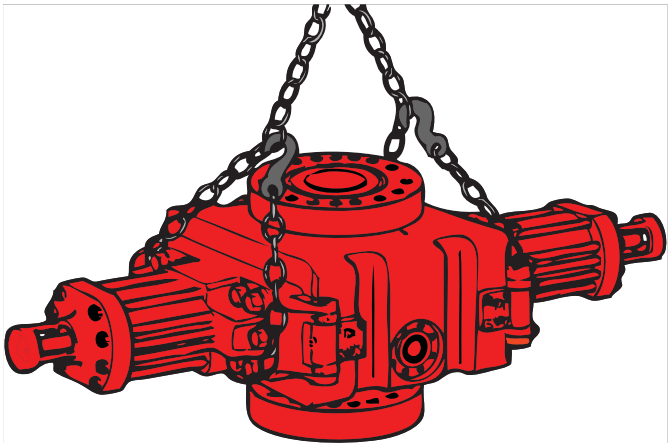


Figure 3-3. Lifting the SL Manual Lock BOP without Lifting Lugs

Do not lift the BOP by the cylinders. This will damage the cylinders, piston assembly and/or ram shaft and prevent the BOP from working correctly.

Use a chain or cable capable of lifting the weight of the BOP.

3. Flanged and studded connections are made up according to the instructions below (see Figure 3-4).

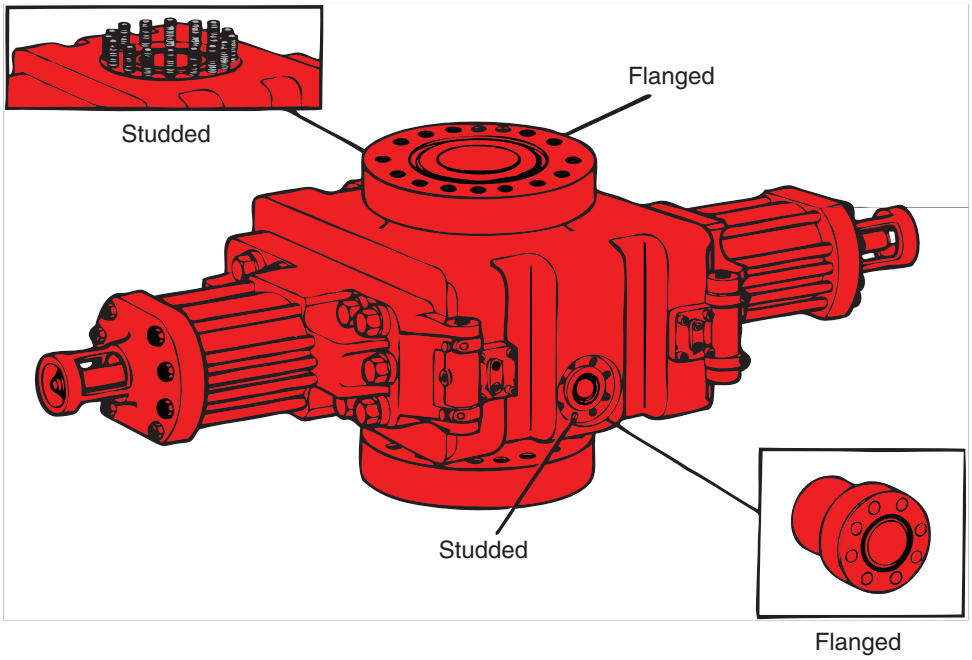


Figure 3-4. End Connections

- Install the ring gasket. See the table titled “API Ring Gaskets” on page 5-31 for the proper part number.
- Install the BOP on the mating flange.
- Lubricate the stud threads and nut faces with grease specified in API BUL SA2: Thread Compounds.
- Install the studs and/or nuts. See the table titled “API Nuts” on page 5-33 and the table titled “Tap End Studs for API Flanges” on page 5-34 for the proper part number.

Use extreme care during the removal and installation of studs and nuts. Inspect the threads of the studs and the stud hole for damage such as deformation, stripping or burns. Do not overtorque studs when installing in a studded flange. Use the specified lubricants. Do not use Loctite or similar compounds.

Tighten all nuts uniformly in a diametrically staggered pattern (see Figure 3-5).

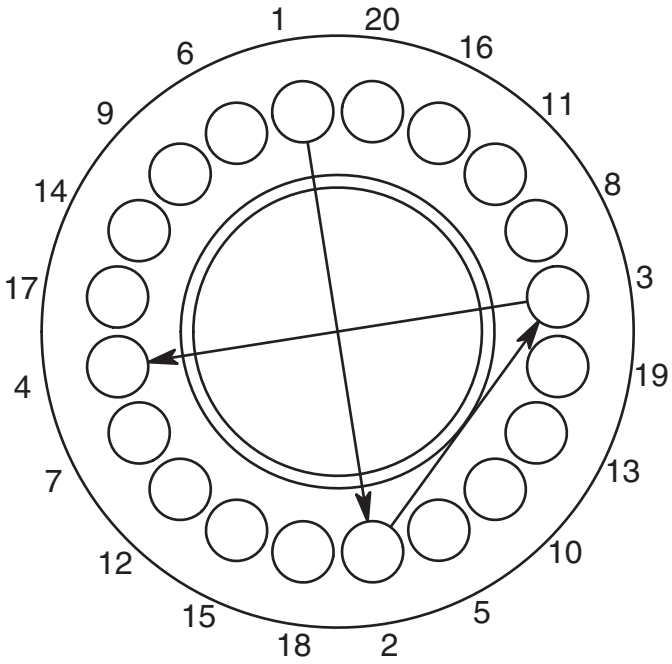


Figure 3-5. Flanged Bolting Sequence

Torque values change according to different thread lubricants and their friction coefficient.

Suitable lubricants are as follows:

- Select-A-Torque 503 Moly Paste Lubricant
- Felpro Moly Paste (formally Felpro C-670)

It is critical when considering a substitute lubricant to consider the compressive resistance of the lubricant as well as its friction factor. NOV recommends the use of Sweeney Moly Paste 503 lubricant (P/N 7403582) because of its excellent compressive resistance. Failure to heed this caution and use lubricants with poor compressive resistance may cause galling of threads and high breakout torque.

Torque Values

ft-lb (@ 52,500 psi Stress) Yield Strength = 105,000 psi

Bolt Size (in)	Bolt Thread	Bolt Tension (lbf)	Select-A-Torq 503 Moly-Graph Felpro C-670 μ=0.067	Tool Joint Compound μ=0.08	Graphite w/Petrolatum μ=0.1	Dry, Machined Surfaces, 4140 Steel μ=0.133	Light Machine Oil as Shipped μ=0.15	API* Recommendation 6A, Appendix D[1] μ=0.13
1/4	20UNC	1,671	4	5	6	8	8	7
5/16	18UNC	2,753	8	10	12	15	16	15
1/2	13UNC	7,450	34	39	47	60	67	59
3/4	10UNC	17,559	114	132	159	204	228	196
7/8	9UNC	24,241	181	210	253	325	362	313
1	8UN	31,802	269	312	376	484	539	474
1 1/8	8UN	41,499	386	448	543	700	781	686
1 1/4	8UN	52,484	533	619	753	973	1,086	953
1 3/8	8UN	64,759	712	829	1,010	1,308	1,462	1,281
1 1/2	8UN	78,322	926	1,081	1,319	1,713	1,915	1,676
1 5/8	8UN	93,173	1,180	1,379	1,686	2,193	2,454	2,146
1 3/4	8UN	109,313	1,476	1,728	2,115	2,754	3,084	2,695
1 7/8	8UN	126,741	1,818	2,130	2,611	3,405	3,814	3,331
2	8UN	145,458	2,209	2,591	3,179	4,150	4,650	4,060
2 1/4	8UN	186,758	3,149	3,700	4,549	5,950	6,672	5,821
2 1/2	8UN	233,212	4,324	5,088	6,265	8,207	9,207	8,028
2 3/4	8UN	284,820	5,758	6,785	8,364	10,971	12,315	10,731
3	8UN	341,582	7,479	8,821	10,887	14,296	16,053	13,982
3 1/4	8UN	403,498	9,512	11,229	13,871	18,231	20,478	17,830
3 1/2	8UN	470,569	11,883	14,038	17,355	22,829	25,650	22,332
3 3/4	8UN	542,793	14,618	17,281	21,378	28,141	31,627	27,519
4	8UN	620,172	17,742	20,987	25,979	34,219	38,465	33,461

**Reference API specification 6A. This table shows torque values arrived at by using new commercial stud bolts and nuts, well lubricated at the threads and nut faces with API thread compound API Bul. 5A2: Thread Compounds. This produces a stress of 52,500 psi (362.0 MPa) in the bolting.*

4. Connect the side flanges as in step 3.
5. Connect the hydraulic lines from the BOP closing unit to the “Open” and “Close” ports of the BOP. Make sure all connections are clean and tight. Each set of rams requires one opening and one closing line (see Figure 3-6 and Figure 3-7).

Two opening and two closing hydraulic ports are clearly marked on the back (hinge) side of the BOP (see Figure 3-6). The extra hydraulic ports are provided to facilitate hydraulic hookup, and only one opening port and one closing port are to be used.

To facilitate testing procedures, a gauge and valve should be included in the opening and closing hydraulic lines to the BOP (see Figure 3-7).

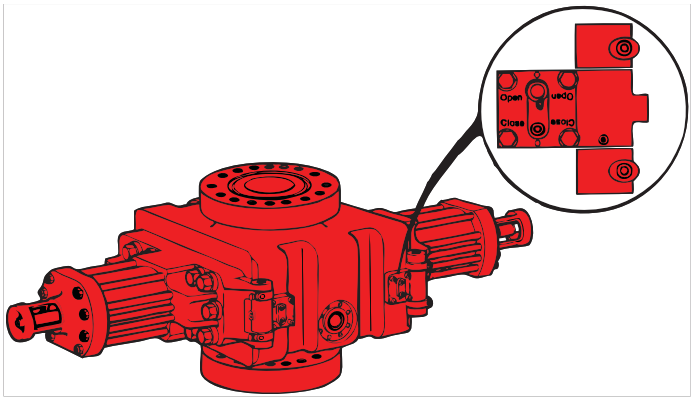


Figure 3-6. Opening and Closing Hydraulic Ports

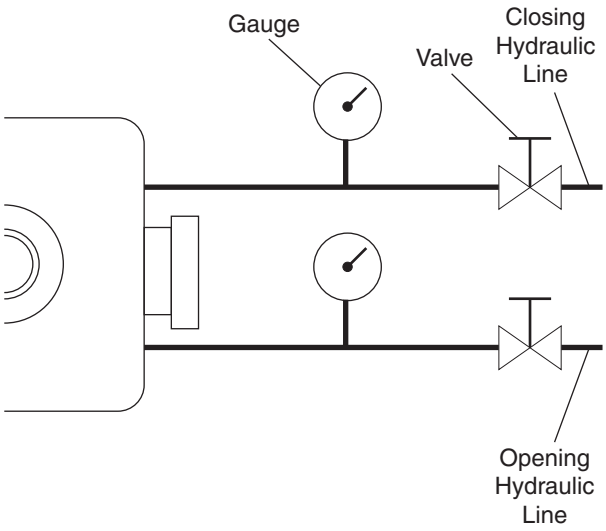


Figure 3-7. Recommended Hydraulic Line Hookup

6. A universal joint and handwheel are furnished for each locking shaft. Handwheel extensions are cut from standard weight 2″ (50.8 mm) pipe furnished by the customer.

   Fabricate a handwheel extension for each locking shaft. Attach a handwheel to one end of each extension. Attach a universal joint to the other end of each handwheel extension (see Figure 3-8).

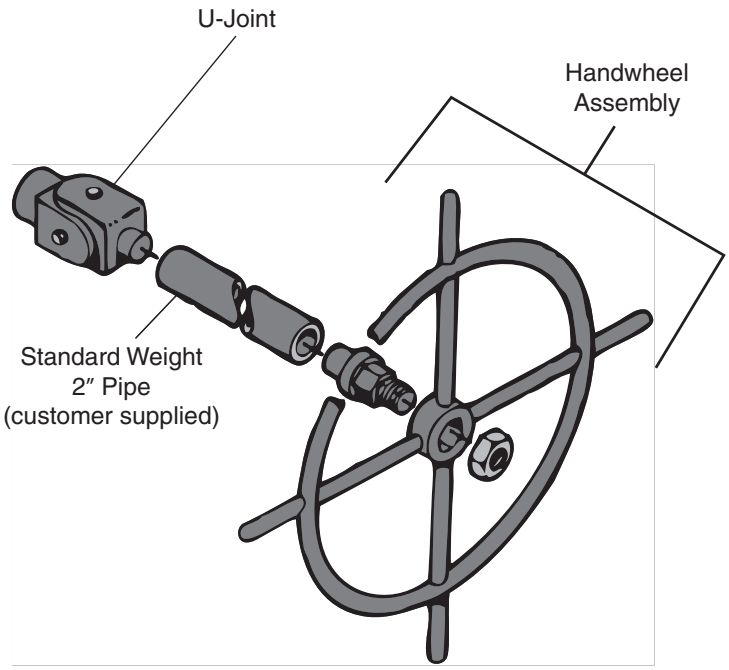


Figure 3-8. Manual Lock Handwheel Assembly

Handwheel extensions can be tack welded or pinned to the universal joints and handwheels.

7. Perform a field wellbore pressure test (see the section titled “Field Wellbore Pressure Test” on page 4-6).

Operation

The rams can be hydraulically closed and manually locked, or, should hydraulic pressure fail, the rams can be manually closed and locked. However, the rams cannot be manually opened.

When closing the rams manually, the open hydraulic line must be vented to prevent a hydraulic lock.

Hydraulic Operation

Opening and closing hydraulic pressure is applied as shown in Figure 3-9.

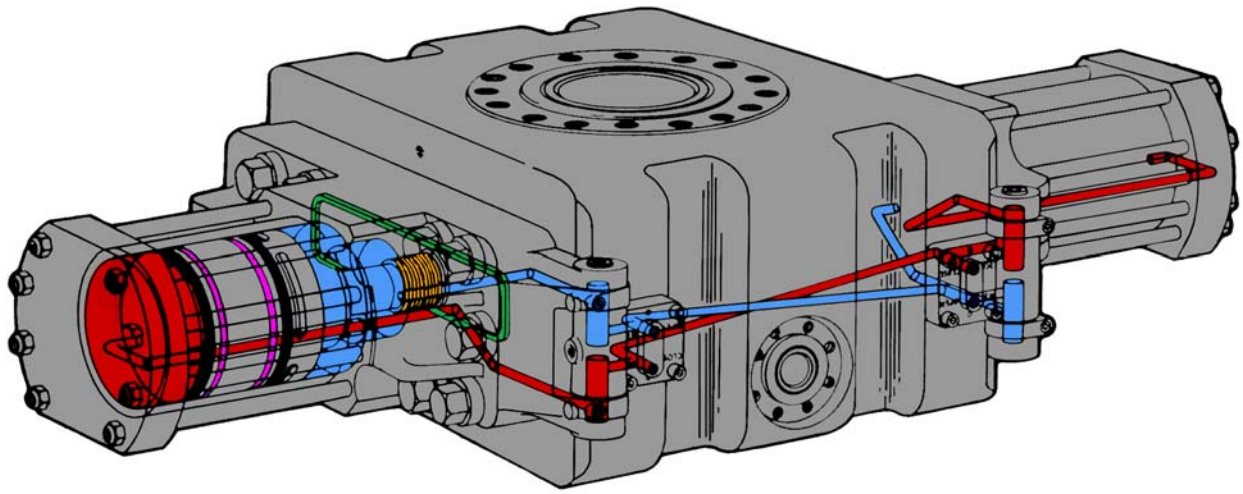


Figure 3-9. SL BOP Hydraulic

Operating Pressure

Under normal operating conditions, 1,500 psi (103 bar) hydraulic pressure is recommended. This operating pressure will close any model SL Ram BOP with its rated wellbore pressure, except the 11″ (279.4 mm) and 13⅝″ (346 mm) 15,000 psi (1,034 bar) models. Both the 11″ (279.4 mm) and 13⅝″ (346 mm) 15,000 psi (1,034 bar) models are operated at 1,500 psi (103 bar) with wellbore pressure of 10,000 psi (690 bar) or less.

For wellbore pressure greater than 10,000 psi (690 bar), the regulator must be bypassed to apply full accumulator pressure up to 3,000 psi (207 bar). Regulated pressure up to 2,500 psi (172 bar) can be used. At a working pressure of 15,000 psi (1,034 bar), a minimum of 2,200 psi (151 bar) closing pressure is necessary. Normal hydraulic operating pressure may be increased to 3,000 psi (207 bar) on any SL BOP if desired.

The following table provides closing ratio and gallons (liters) to open and close (see the section titled “Hydraulic Fluid” on page 3-10).

Fluid Volume Requirements

	Working Pressure psi (bar)									
	15,000 (1,034)		10,000 (690)					5,000 (345)		3,000 (207)
Bore (in) Bore (mm)	13⅝ 346.0	11 279.4	21¼ 539.7	18¾ 476.2	16¾ 425.4	13⅝ 346.0	11 279.4	16¾ 425.4	13⅝ 346.0	13⅝ 346.0
Piston Size (in) Piston Size (mm)	14 355.6	14 355.6	14 355.6	14 355.6	14 355.6	14 355.6	14 355.6	10 254	10 254	10 254
Closing Ratio	7.11	7.11	7.11	7.11	7.11	7.11	7.11	5.54	5.54	5.54
To Close (gal) To Close (liters)	11.0 41.6	8.9 33.6	15.7 59.4	14.1 53.3	13.1 49.5	10.6 40.1	9.3 35.2	6.5 24.6	5.3 20.0	5.3 20.0
To Open (gal) To Open (liters)	9.6 36.3	7.8 29.5	13.8 52.2	12.4 46.9	11.5 43.5	9.3 35.2	8.1 30.6	5.6 21.1	4.5 17.0	45 17.0

Hydraulic Fluid

Hydraulic fluid under pressure drives the pistons which open and close the rams. Hydraulic fluid should have the following characteristics:

- Non-freezing in cold climates
- Lubricity to reduce wear
- Chemical compatibility with the elastomer seals
- Corrosion inhibitors for metal surfaces

Recommended Control Fluid (in order of preference)

Do not use motor oil, kerosene, diesel fuel, chain oil, or petroleum products containing aromatics that can damage rubber components and seals.

- Hydraulic oil with viscosity from 200–300 SSU at 100°F (38°C). In the SL's closed hydraulic system, there is no waste of oil and fluid, and costs are negligible.
- Where pollution due to accidental spillage of hydraulic fluid is a problem. For temperatures above 35°F (2°C), use a fluid concentrate, which is capable of being mixed with potable water, as the operating fluid.

To prevent freezing in temperatures below 35°F (2°C), ethylene glycol without additives is recommended. Do not use commercial antifreeze mix products.

The following table provides the various mixing ratios based upon temperatures that are likely to be encountered.

Fluid Concentrate Mixing Ratio for a Closed Hydraulic System

For Freeze Protection to		Number of Parts Fluid Concentrate	Number of Parts Ethylene Glycol	Number of Parts Fresh Water
°F	°C			
+20	−7	1	15	85
0	−18	1	32	68
−20	−27	1	44	56
−30	−35	1	50	50
−40	−40	1	53	47

Emergency Fluid Recommendations

In an emergency, where hydraulic fluid is lost and the BOP must be operated, the fluids listed below can be substituted.

- When using hydraulic oil:
  - Add motor oil (SAE 10W is recommended, but heavier oils can be used); or
  - Add water if motor oil is not available. After the emergency, the hydraulic system must be flushed and refilled with hydraulic oil.
- When using a water/concentrate mixture, add more water. After the emergency, replace the fluid in the system with the proper mixture of concentrate and water.

Fluids to Avoid

- Diesel fuel or kerosene — these fluids cause the rubber goods to swell and deteriorate.
- Drilling mud — the grit in this fluid will cause the pistons and cylinders to wear and gall rapidly.

Closing and Opening the Rams

Closing Rams

Apply 1,500 psi (103 bar) closing hydraulic pressure. See the section titled “Manual Locking” on page 3-13 for manual locking. Verify that the rams close by observing the inward movement of the handwheels or locking shaft (see Figure 3-10).

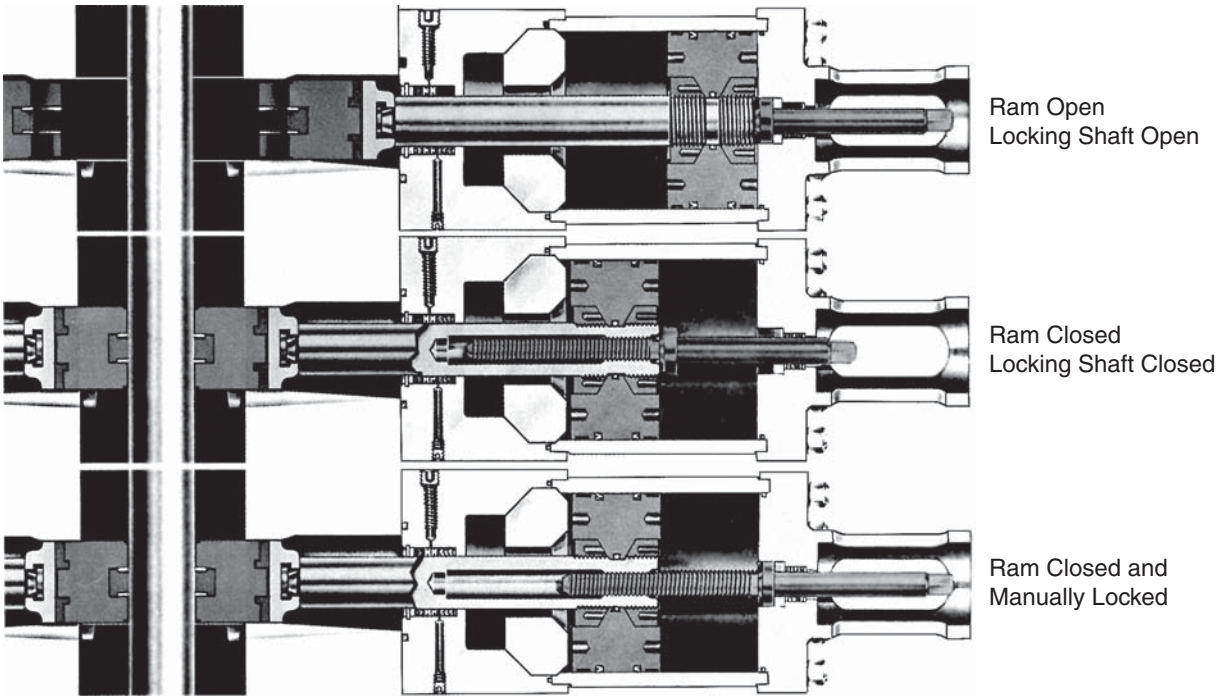


Figure 3-10. Rams: Open, Closed and Closed and Manually Locked

Opening Rams

Apply 1,500 psi (103 bar) opening hydraulic pressure. Verify that the rams open by observing the outward movement of the handwheels or locking shafts (see Figure 3-10).

Before opening the rams, turn both handwheels counterclockwise to ensure that the rams are unlocked. If the rams are partly locked, the locking shaft threads may be damaged when the rams are hydraulically opened.

Manual Locking

To hydraulically close and manually lock the rams, perform the steps listed below:

1. Apply 1,500 psi (103 bar) closing hydraulic pressure.
2. Turn each locking shaft clockwise until it locks; each locking shaft will move outward until it stops against the cylinder head (see Figure 3-10 on page 3-12).

Do not overtighten. If the locking shaft is overtightened, it can be damaged.

3. Control system pressure may be removed (if so desired) with the manual locking shaft engaged. The rams will remain in the closed position.

Unlocking Operation

1. Apply 1,500 psi (103 bar) closing hydraulic pressure.
2. Rotate the locking shaft counterclockwise until it stops.

Initial or breakout torque will be significantly higher than subsequent unlocking torque.

3. Rotate locking shaft $\frac{1}{8}$″ (3.17 mm) turn clockwise to prevent temperature changes from jamming the shaft.
4. Rams may be functioned open and closed.

Do not apply opening pressure while the preventer is manually locked, partially locked, or while it is being unlocked because this may damage the locking shaft threads.

Manually Closing the Rams

Manually close and open the rams without hydraulic pressure as described below.

Place the hydraulic control valve in the “Close” position, or vent both the open and close hydraulic lines to atmosphere to prevent a hydraulic lock. Manually turn the locking shaft clockwise until they stop in the fully extended position. Torque to 3,000 ft-lb.

When hydraulic pressure is regained and the BOP is to be reopened, follow the unlocking procedures outlined in the section titled “Unlocking Operation” on page 3-13.

The rams cannot be opened manually; hydraulic pressure is required.

Maintenance

Maintenance Schedule

The purpose of this maintenance schedule is to detect wear in a Shaffer Model SL Manual Lock BOP so it can be repaired before a failure occurs in a drilling emergency. The inspection sequence avoids repetition of work so that minimum time is required for a thorough maintenance program.

Maintenance Schedule—Manual Lock Ram BOP

	Performed		
Interval	**At**	**By**	**Summary**
Daily	Rig	Rig personnel	Operate all rams. Look for external hydraulic leaks (see the section titled “Daily Preventive Maintenance” on page 4-2).
Monthly	Rig	Rig personnel	Do not open doors. Run a field wellbore pressure test. Look for external hydraulic leaks (see the section titled “Monthly Preventive Maintenance” on page 4-3).
Three months	Rig	Rig personnel	Open doors and inspect visually. Run a field wellbore pressure test and an internal hydraulic pressure test. Operate manual locks (see the section titled “Three-Month Preventive Maintenance” on page 4-4).
Yearly	Rig	NOV service representative	Open doors. Measure rams and ram cavity. Do field repairs as needed. Run a field wellbore pressure test and an internal hydraulic pressure test. Operate manual locks (see the section titled “Yearly Preventive Maintenance” on page 4-6).
Three years	Service/Repair Facility	NOV service representative	Completely disassemble. Repair or replace all parts as required. Replace all seals. Run a field wellbore pressure test and an internal hydraulic pressure test. Operate manual locks (see the section titled “Three-Year Preventive Maintenance” on page 4-6).

When to Call a Service Representative

Repairs are performed by either the rig crew or an NOV service representative. This section describes the repairs normally performed by the rig crew and provides guidelines to determine when a service representative should be called.

- The rig crew normally performs the following:
  - Changing rams to different pipe sizes
  - Running wellbore pressure tests and hydraulic pressure tests
  - Replacing worn ram rubbers and door seals
  - Chasing damaged threaded holes on the preventer body
  - Buffing out minor scratches on the ram sealing seat and door sealing area of the body
- An NOV service representative normally will be called to:
  - Make any repairs which require the hydraulic system to be opened (including repacking the ram shaft, replacing piston seals, replacing cylinder seals, replacing manifold pipe seals, replacing hinge seals, or repacking the locking shaft).
  - Run yearly inspection, which determines if the BOP needs to be sent to a repair facility for major rework (inspection includes wellbore pressure tests, hydraulic pressure tests, inspection, and measurement of the ram cavities).

Daily Preventive Maintenance

The procedures listed below should be performed daily.

1. All rams should be functioned to verify that they operate properly. If possible, watch the rams move by using a mirror to obtain a reflected image of the rams. If this is not possible, observe the movement of the handwheels or locking shafts.

   Pipe rams should be closed on pipe. Blind rams should be closed and opened when the pipe is out of the hole.

2. Check the locking shaft seal areas, cylinder head O-ring areas, manifold pipe seals, door seal areas, weep holes, hinges, hydraulic connections, and the socket head pipe plug for possible leakage of hydraulic fluids (see Figure 4-1 on page 4-3).

   To observe if the ram shaft packings are leaking, the weep hole plugs must be removed on each door.

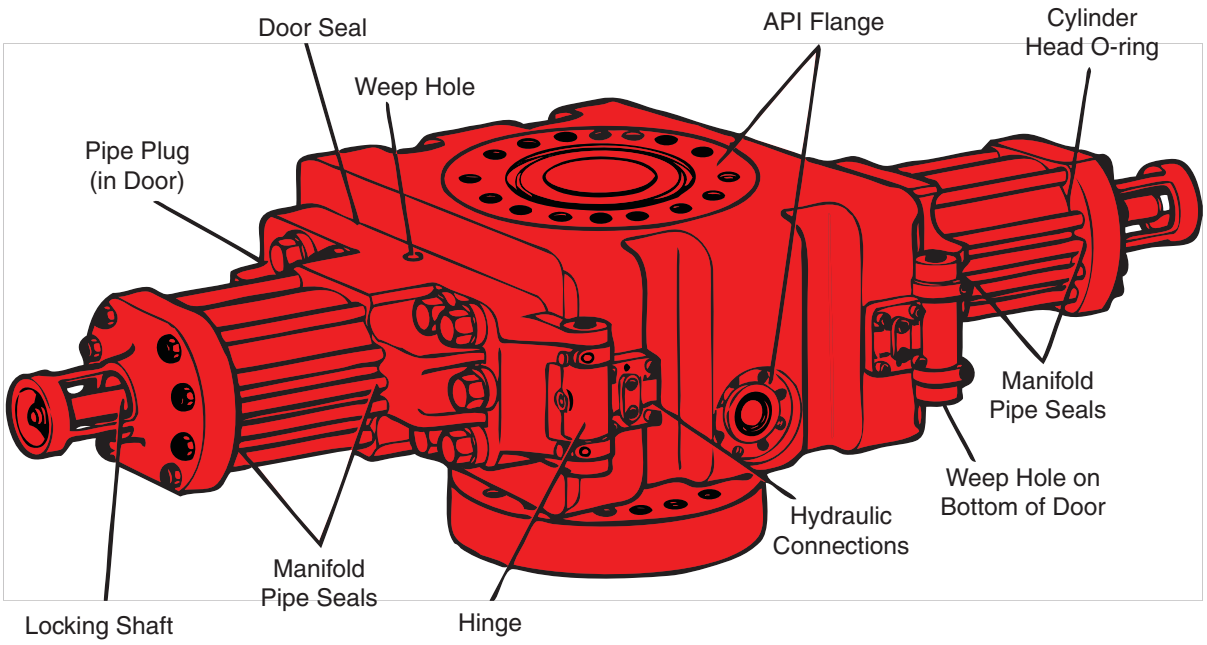


Figure 4-1. Possible Leak Areas

3. Check API flange areas for possible leakage of well fluid and/or hydraulic fluid (see Figure 4-1).

Monthly Preventive Maintenance

Run this test series before starting a new well and at least monthly while drilling. Do not open the BOP doors.

1. Ensure all door cap screws are properly torqued to 6,600 ft-lb (8,943 Nm).
2. Run a field wellbore pressure test as described in the section titled “Field Wellbore Pressure Test” on page 4-6.
3. While running the field wellbore pressure test, look for external hydraulic leaks (see Figure 4-1).
4. Check the universal joints to ensure they are tight on the locking shaft, and grease if equipped with alamite fittings.
5. Grease the hinges.

Three-Month Preventive Maintenance

1. Before opening the doors, run a field wellbore pressure test as described in the section titled “Field Wellbore Pressure Test” on page 4-6 and a hydraulic pressure test as described in the section titled “Hydraulic Pressure Test” on page 4-8. This information will be very helpful during the following inspections. Also, an NOV service representative can be called at this time if hydraulic system repairs are required.
2. While the rams are closed, turn the handwheels approximately two turns clockwise and then turn them back to the fully unlocked position. This will verify that the manual locks function satisfactorily.
3. Disconnect the universal joints from the locking shafts.
4. Open the rams with 1,500 psi (103 bar).
5. Bleed all hydraulic pressure.
6. Open the doors and remove the rams (see the section titled “Ram Assembly Removal and Inspection” on page 4-17).
7. Clean and inspect rams as described in the section titled “Ram Assembly Removal and Inspection” on page 4-17).
8. Wash out the inside of the BOP so it can be inspected (see the section titled “Ram Assembly Removal and Inspection” on page 4-17).
9. If any door cap screw was excessively hard to remove, chase the thread in the body with a 3″-8UN-2A tap. Replace any cap screw which has damaged threads.
10. Remove minor pits and scratches from the seat sealing surface with an emery cloth.
11. Smooth any deep gouges and scratches on the skids and side pads. These are not sealing surfaces, so remove only enough material to allow the rams to slide smoothly over them.
12. Check the bore for accidental damage. Smooth as required. Occasionally the drill pipe will rotate against the bore and cause excessive wear. Measure the maximum diameter and estimate the maximum wear on any side. If any radius is more than $\frac{1}{8}$″ (3.17 mm) oversize, send the BOP to an NOV repair facility for a complete rework.
13. Check the door sealing area on the BOP body for pits and scratches. Remove pits and scratches with an emery cloth.
14. Inspect the shafts.
    - Apply closing hydraulic pressure to fully extend both ram shafts for inspection (see Figure 4-2 on page 4-5).
    - Visually check the OD of each ram shaft for pits and scratches. The ram shafts should be replaced by an NOV service representative if pits or scratches are visible.
    - Visually check the foot end of each ram shaft for cracks in the neck between the foot end and the shaft. The ram shafts should be repaired by an NOV service representative if cracks are visible.

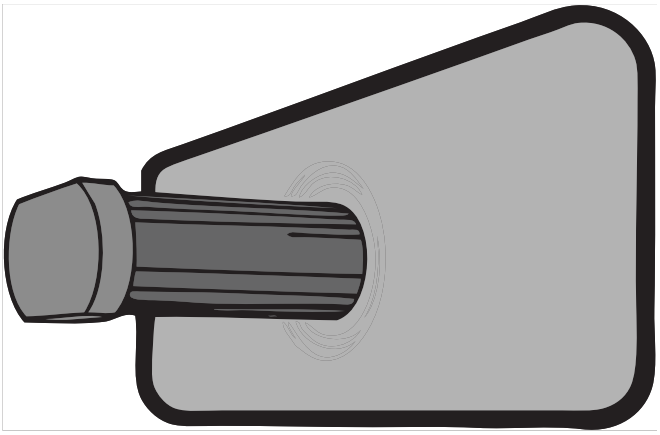


Figure 4-2. Extend Ram Shafts for Inspection

15. Inspect the locking shafts.
    - ❑ Apply opening hydraulic pressure to extend the locking shafts.
    - ❑ If a locking shaft is bent or cracked, it should be replaced. If replacement is necessary, call an NOV service representative.
16. Inspect the door seal grooves.
    - ❑ Remove the door seals (see Figure 4-3).
    - ❑ Inspect the grooves. Smooth minor pits with emery cloth.
    - ❑ Replace the door seals if extruded, brittle, cut, or nicked (see the section titled “Door Seal Replacement” on page 4-10 and the section titled “SL BOP Data Location” on page 4-30).

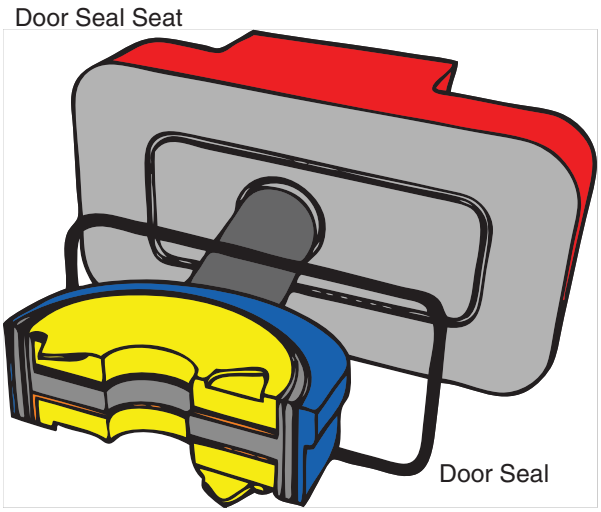


Figure 4-3. Removing the Door Seal

17. Reinstall the rams. See the section titled “Installing Rams” on page 4-19 for procedures.
18. Run a final field wellbore pressure test as described in the section titled “Field Wellbore Pressure Test” on page 4-6 before the BOP is returned to service.

Yearly Preventive Maintenance

Yearly maintenance is performed by an NOV service representative. The purpose of the yearly maintenance operation is to evaluate wear in the BOP so a major overhaul (three-year maintenance) can be scheduled at a convenient time, but before a failure occurs. The yearly maintenance includes:

- Wellbore pressure test
- Hydraulic pressure test
- Inspection and measurement of cavity for wear and damage
- Complete review of BOP performance to determine if the BOP should be sent to an NOV Repair Facility for a major overhaul

Three-Year Preventive Maintenance

Three-year maintenance is performed in an NOV repair facility after a yearly maintenance check determines it is necessary. The BOP is completely disassembled, cleaned, and inspected. All elastomer seals are replaced, and all parts are repaired or replaced as required. Hydraulic and wellbore pressure tests are run, and the BOP is returned to service.

All elastomer seals should be replaced after three years regardless of condition.

Field Wellbore Pressure Test

The final details of the test sequence will be established by the operator and contractor — therefore, modifications to the procedure may be required. See API Spec. 6A and API RP53, paragraph 7.A.2 for additional information.

Equipment Required

Connect the listed equipment as shown in Figure 4-4.

- Two pressure gauges
- Three valves
- One test pump

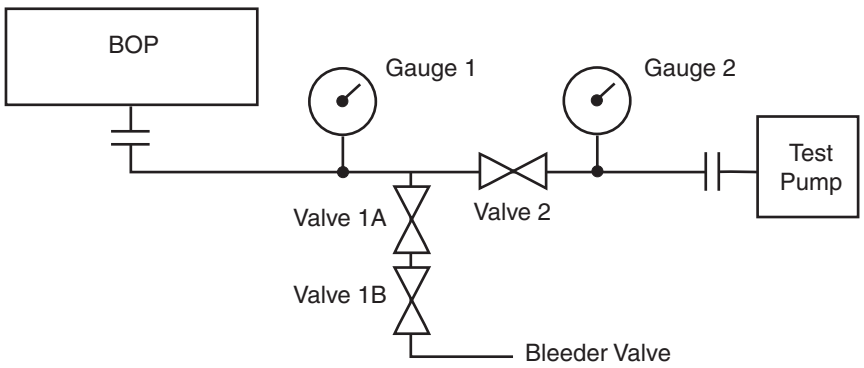


Figure 4-4. Recommended Field Wellbore Pressure Test Equipment Setup

Test Locations

The BOP can be tested in any of the following locations:

- Wellhead mounted stack
- Test stump
- Blind flange

Test Pressure

The test pressure should not exceed the lowest rated working pressure of any component or connection pressurized during the test. This includes one or more of the following:

- BOP(s)
- Wellhead
- Casing string, if it will be pressurized during the test or if a leak in the test tool could cause it to be pressurized
- All connections

Test Fluids

The recommended wellbore pressure test fluid is cold water, but drilling fluid may be used.

- Fill the BOP with water or drilling fluid.
- Close the pipe rams on an appropriate test tool using 1,500 psi (103 bar) hydraulic pressure; 3,000 psi (207 bar) is optional.

Pressure Test

1. Close valves 1A and 1B. Open valve 2 (see Figure 4-4 on page 4-6).
2. Apply 200–300 psi (14–21 bar) wellbore pressure below the rams. Close valve 2. Hold test pressure for a minimum of three minutes. Check for low pressure leaks. Monitor gauge 1.
3. Open valve 2. Increase the wellbore pressure to the test pressure determined in the section titled “Test Pressure” above.
4. Close valve 2.
5. Hold the pressure for a minimum of 3 minutes.
6. Check for leaks on pressure gauge 1, the BOP exterior at the API connections, the door seals, the ram shaft weep holes, and at the rams if they are visible (see Figure 4-1 on page 4-3).

Do not look into the ram bore while pressure is under the rams. Use a mirror to obtain a reflected image of the rams.

7. Bleed wellbore test pressure to 0 psi (0 bar).
   - ❑ Fully open valve 2.
   - ❑ Open valve 1A.
   - ❑ Open valve 1B.
8. Repeat step 1–7 for the second pressure holding period.
9. If leaks are detected, see the section titled “Troubleshooting” on page 4-29.

Leak Repair

To repair leaks, reduce all hydraulic pressure and wellbore pressure to 0 psi (0 bar).

- ❑ API connection — tighten bolts or replace the ring gasket as required (see the section titled “Installation” on page 3-2).
- ❑ Door seal — replace the door seal (see the section titled “Door Seal Replacement” on page 4-10).
- ❑ Ram shaft weep hole — call an NOV service representative. For an emergency repair, see the section titled “Emergency Ram Shaft Packing Repair” on page 4-16. As soon as possible after the emergency, call an NOV service representative to repack the ram shaft.
- ❑ Ram — replace the ram rubbers (see the section titled “Changing Pipe and Blind Ram Rubbers” on page 4-20 and the section titled “Changing Multi-Ram Rubbers” on page 4-24).

Hydraulic Pressure Test

The final details of the test sequence will be established by the operator and contractor — therefore, modifications to this procedure may be required. See API Spec. 6A and API RP53, paragraph 7.A.2 for additional information.

Pipe rams should always be closed on pipe to avoid excessive ram rubber wear. Closure on a tool joint will damage the block. Blind rams should only be closed on an open hole. Closing on pipe will damage the rubber and possibly the block.

If the hydraulic system was opened before this test, close and open the rams three times to purge air from the system.

Opening Hydraulic Pressure Test

The opening hydraulic pressure test is done in the following manner:

1. Vent hydraulic closing pressure.
2. Apply 1,500 psi (103 bar) opening pressure; 3,000 psi (207 bar) is optional.
3. Close the valve in the opening hydraulic line (see Figure 3-7 on page 3-7).
4. Observe the gauge between the valve and the BOP.
5. If there is no pressure drop, end the test.
6. If there is a pressure drop, perform the steps described below:
   - ❑ Check for external leaks at the following locations (see Figure 4-1 on page 4-3):
     - ❑ Hinge pins — if leaking, call an NOV service representative.
     - ❑ Weep holes for ram shaft seal leaks — if leaking, call an NOV service representative.
     - ❑ Cylinder seal leaks — if leaking, call an NOV service representative.
     - ❑ Door seal leaks — if leaking, see the section titled “Door Seal Replacement” on page 4-10.
   - ❑ Check for internal leaks past the pistons in the following manner:
     - ❑ Disconnect the closing hydraulic line. A small amount of oil will flow out of the BOP initially and stop. If oil continues to flow out of the BOP, it is leaking past the piston and repairs are required.
     - ❑ Reinstall the closing hydraulic line.
     - ❑ Call an NOV service representative to repair the leak.

Closing Hydraulic Pressure Test

The closing hydraulic pressure test is done according to the steps listed below:

1. Vent hydraulic opening pressure.
2. Apply 1,500 psi (103 bar) closing pressure; 3,000 psi (207 bar) is optional.
3. Close the valve on the closing hydraulic line (see Figure 3-7 on page 3-7).
4. Observe the gauge between the valve and the BOP.
5. If there is no pressure drop, end the test.
6. If there is a pressure drop, perform the steps listed below:
   - ❑ Check for external leaks at the following locations (see Figure 4-1 on page 4-3). If any are leaking, call an NOV service representative:
     - ❑ Hinge pins
     - ❑ Cylinder head seals
     - ❑ Locking shaft seals
     - ❑ Manifold pipe seals

- Check for internal leaks past the pistons as described below:
  - Disconnect the opening hydraulic line. A small amount of oil will flow out of the BOP initially and stop. If oil continues to flow out of the BOP, it is leaking past the piston and repairs are required.
  - Reinstall the opening hydraulic line.
  - Call an NOV service representative to repair the leak.

Door Seal Replacement

The door seal is replaced by performing the steps listed below:

1. Disconnect the universal joints from the locking shafts.
2. Open the doors (see the section titled “Ram Assembly Removal and Inspection” on page 4-17).
3. Remove the door seal from its seat (see Figure 4-3 on page 4-5).
4. Clean the door seal seat and face (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
5. Inspect the door seal seat for damage. Remove minor pits and scratches with emery cloth. If the seat is badly damaged, call an NOV service representative.
6. Clean and oil the door sealing surface on the body (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
7. Oil the door seal seat and face (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
8. Install a new door seal.
9. Apply thread lubricant (per API 5A2) to the door cap screws both on the threads and under the heads.
10. Close the door and tighten the door cap screws to 6,600 ft-lb (8,943 Nm) torque.

SLX Door Hinge Assembly Maintenance

All SL type rams utilize the SLX door hinge. The SLX style door hinge is more robust than the original SL door hinge. To replace or repair the SLX door hinge assembly, follow these steps.

Disassembly

1. Remove the hinge pin retainer set screw located on the hinge bracket adjacent to the grease fitting (see Figure 4-5).

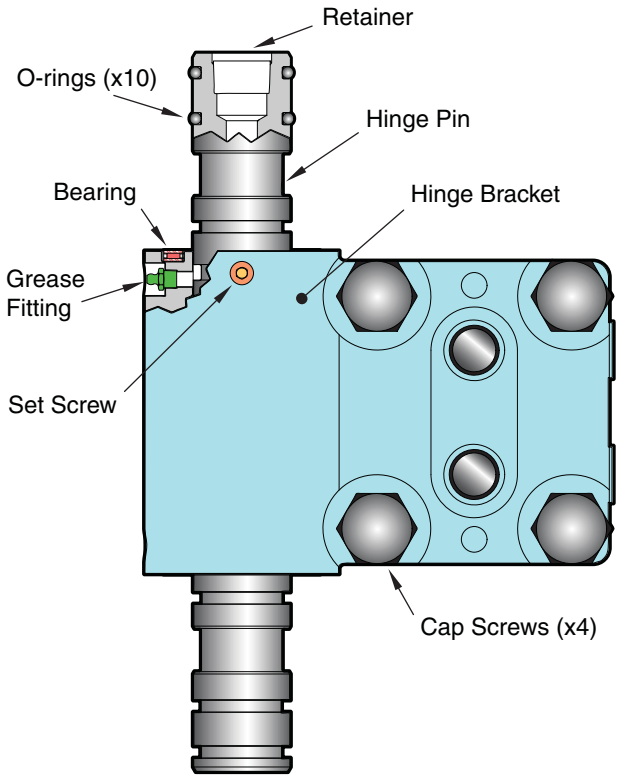


Figure 4-5. Hinge Bracket and Pin

Failure to remove the hinge pin retainer will damage the hinge pin when attempting hinge pin removal in step 3.

2. Loosen the four hinge bracket cap screws.

3. Remove the hinge pin (see Figure 4-6).

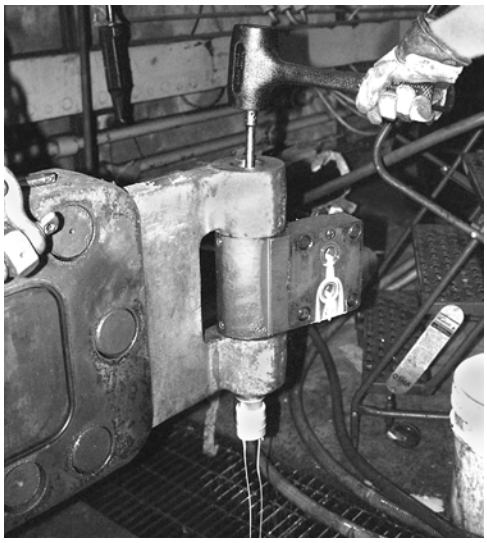


Figure 4-6. Remove Hinge Pin

4. Remove the hinge bracket (see Figure 4-7).

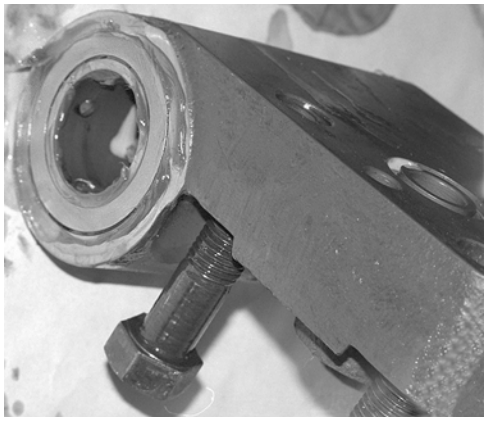


Figure 4-7. Bracket Removed

Take care not to lose the bearing races from the bottom side of the hinge bracket.

5. Clean the upper and lower bearing grooves of the hinge bracket and inspect the needle bearings and race. Replace the bearing assembly if necessary (see Figure 4-8 and Figure 4-9).

Figure 4-8. Bearing Assembly

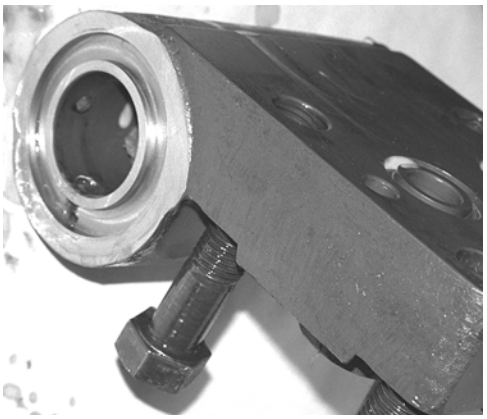


Figure 4-9. Clean Bearing Grooves

Reassemble

1. Lubricate the bearing assembly with molydisulphide grease or good quality bearing grease and install bearing assembly into the hinge bracket. (see Figure 4-10).
2. Reinstall the bearing and hinge bracket assembly on the body, leaving the four hinge bracket cap screws loose.

Inner Race

Bearing

Outer Race

Figure 4-10. Installing Bracket Bearing

3. Replace all hinge pin O-rings. Lubricate the hinge pin with oil and install through the door hinge.

Warning

Care should be taken not to cut the O-rings while inserting the hinge pin through the bracket.

4. Install the hinge pin retainer.
5. Tighten the four hinge bracket cap screws, and pump grease into the fitting until the grease extrudes between the hinge bracket and door hinge.

The door assembly may be removed with the bracket as shown, or the door may be left on the preventer body and the hinge bracket removed. Do not loosen the door bolts if only the hinge bracket is to be removed.

Hinge Bracket Assembly (P/N 126258)

Part No.	Description	Qty
126261	Hinge Bracket	1
134134	Hinge Pin	1
065002	Plug, Socket Head, 1″	4
030012	O-ring	10
011203	Screw, HHC 1″ x 4″	4
030065	O-ring	2
050096	Pin, Dowel	2
050267	Grease Fitting	2
065008	Plug, Socket Head, 1/4″	1
060810	Bearing, Thrust, Needle	2
060827	Bearing Race	4
011340	Screw, Set, 3/8″	1

Emergency Ram Shaft Packing Repair

An emergency repair can be made by reducing the hydraulic pressure to 0 psi (0 bar) and activating the secondary ram shaft seal. As soon as possible after the emergency, call an NOV service representative to repack the ram shaft.

1. Remove the pipe plug from the front of the door (see Figure 4-11).

Some preventers have a straight-in pipe plug, while others have the pipe plug set in at an angle. All are located on the same door surface of the preventer.

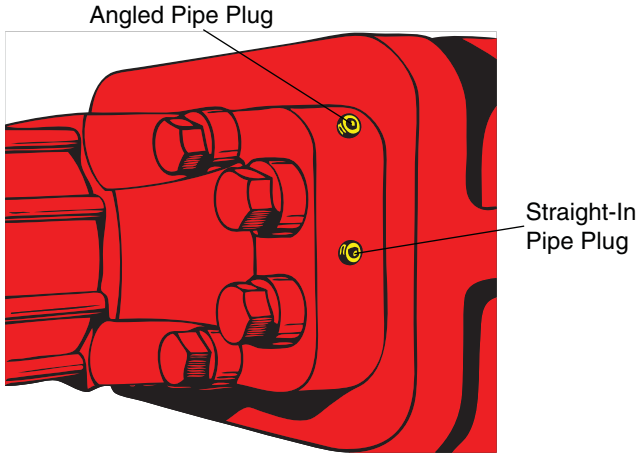


Figure 4-11. Removing the Pipe Plug

2. With the pipe plug removed, a second socket head screw plug is exposed. Tighten this to inject the secondary ram shaft seal (see Figure 4-12).

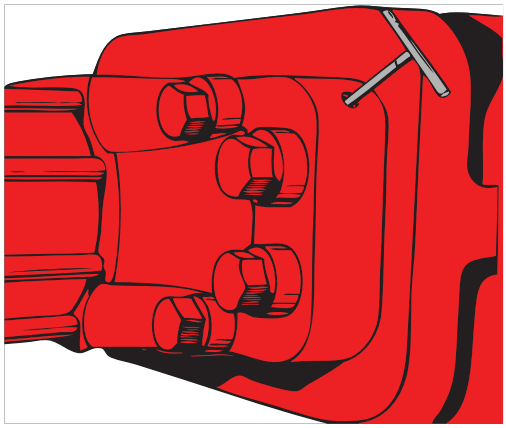


Figure 4-12. Tightening the Secondary Ram Shaft Seal

3. Replace the socket head pipe plug removed in step 1.
4. Call an NOV service representative to repack the ram shaft.

Ram Assembly Removal and Inspection

Procedures for removal and installation of pipe, blind and shear rams in the SL BOP are the same.

Removal of Rams

Remove the rams as described below:

The BOP door must be securely bolted prior to opening the rams with hydraulic pressure.

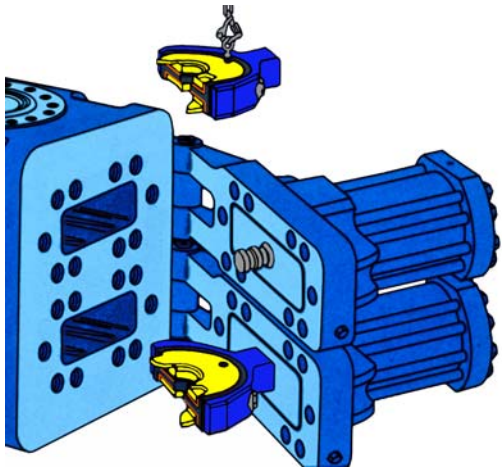
1. Open the rams with hydraulic pressure.
2. Bleed off the hydraulic pressure so the doors will swing open easily, and to prevent possible damage to the hinge pin O-rings.
3. Unscrew the door cap screws. Use a hex wrench $3\frac{1}{8}$″ (79.4 mm) across the flats.

Do not use the hydraulic system to open the door. This will severely damage the BOP. If the BOP is not flanged to a wellhead or securely fastened, open only one door at a time. The weight of two open doors can tip the BOP over.

4. Open the door.

5. Install $^{5}/_{8}$″ (15.9 mm) eyebolts in the top of the ram, as shown in Figure 4-13.

15,000 psi (1,034 bar)
Model — Vertical



5,000/10,000 psi
(345/690 bar)
Model — Horizontal

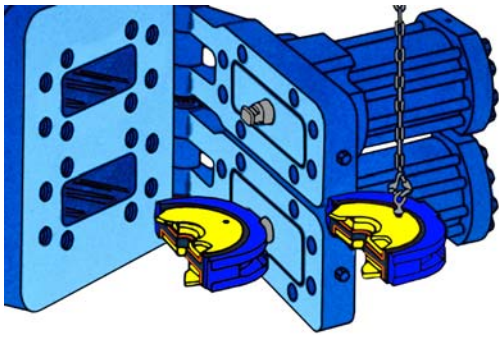


Figure 4-13. Removing the Rams from the Shafts

6. Remove the ram from the ram shaft, as shown in Figure 4-13.

On 15,000 psi (1,034 bar) models, the ram lifts off vertically (see Figure 4-13).

Cleaning and Inspecting Rams

1. Clean the rams (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
2. Inspect the ram rubbers for damage such as cracking, gouging, chunking, or splitting. Replace the rubbers if damaged (see the section titled “Changing Pipe and Blind Ram Rubbers” on page 4-20).

Installing Rams

1. Thoroughly grease all ram exterior surfaces and the ram shaft mounting slot.
2. Grease the inside of the BOP body at the following locations:
   - ❑ Ram shaft mounting head (see Figure 4-2 on page 4-5)
   - ❑ Side pads in the body cavity
   - ❑ Skids in the bottom of the body cavity
   - ❑ Ram sealing seat in the top of the body cavity
3. Apply the thread lubricant specified in API 5A2 to the door cap screws both on the threads and under the heads.
4. Clean and oil the door face and replace the door seal, if damaged (see the section titled “Door Seal Replacement” on page 4-10 and the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
5. Clean and oil the door sealing surface on the body (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).

Do not use grease on door faces or sealing surfaces.

6. Mount the ram assembly on the ram shaft (see Figure 4-13 on page 4-18).
7. Close the door and make up the door cap screws to 6,600 ft-lb (8,943 Nm) torque.

Changing Pipe and Blind Ram Rubbers

The pipe and blind ram rubbers are changed according to the steps listed below:

1. Clean the ram (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
2. Remove the two ram block retracting screws as shown in Figure 4-14. See the table titled “SL Ram Block Retracting Screw Data” below for the correct wrench size.

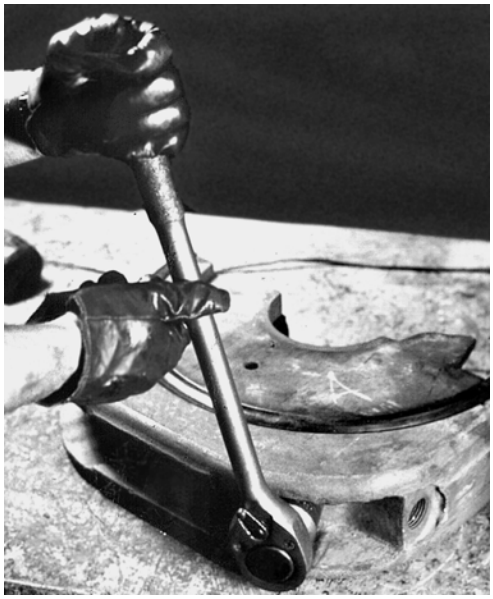


Figure 4-14. Removing the Ram Block Retracting Screws

SL Ram Block Retracting Screw Data

Working Pressure psi (bar)	Size in (mm)	Pipe Size in	Retracting Screw P/N	Thread	Torque ft-lb (Nm)	Wrench Size Across Flats in
15,000 (1,034)	13 5/8 (346) 11 (279)	CSO–7 5/8 8 5/8–10 3/4 CSO–8 5/8	142184 116190 142184	3″-8UN-2A	400–800 (542–1,084)	2 9/16 Socket
10,000 (690)	21 1/4 (540) 18 3/4 (176) 16 3/4 (425) 13 5/8 (346) 11 (279) 7 1/16	CSO–18 1/8 CSO–16 CSO–13 5/8 CSO–10 3/4 CSO–7 7 5/8–8 5/8 CSO–5 1/2	142184 142184 142184 142061 142061 142065 115577	1 7/8″-8UN-2A	200–400 (271–542)	7/8 Hex Key
5,000 (345)	16 3/4 (425) 13 5/8 (346)	CSO–13 5/8 CSO–10 3/4	141200 141200	1 1/8″-8UN-2A	100–150 (135–203)	1 3/4 Socket
3,000 (207)	13 5/8 (346)	CSO–10 3/4	141200	1 1/8″-8UN-2A	100–150 (135–203)	1 3/4 Socket

3. Remove the ram holder by sliding it away from the block.
4. Remove the two ram rubber retaining screws as shown in Figure 4-15. See the table titled “SL Ram Block Retaining Screw Data” below for the correct wrench size.

Figure 4-15. Removing the Ram Rubber Retaining Screws

SL Ram Block Retaining Screw Data

Working Pressure psi (bar)	Size in (mm)	Pipe Size in	Retracting Screw P/N	Thread	Torque ft-lb (Nm)	Wrench Size Across Flats in
15,000 (1,034)	13 5/8 (346) 11 (279)	CSO–10 3/4 CSO–8 5/8	135160 135160	1/2″-8UN-2A	100–125 (137–170)	3/8 Socket
10,000 (690)	21 1/4 (540) 18 3/4 (176) 16 3/4 (425) 13 5/8 (346) 11 (279)	CSO–18 1/8 CSO–16 CSO–13 5/8 CSO–10 3/4 CSO–8 5/8	135160 135160 135160 135546 135546	1/2″-8UN-2A	100–125 (137–170)	3/8 Socket
5,000 (345)	16 3/4 (425) 13 5/8 (346)	CSO–13 5/8 CSO-10 3/4	135160 135546	1/2″-8UN-2A	100–125 (137–170)	3/8 Socket
3,000 (207)	13 5/8 (346)	CSO–10 3/4	135546	1/2″-8UN-2A	100–125 (137–170)	3/8 Socket

5. Remove the rubber from around the back side of the block as shown in Figure 4-16. Remove this rubber from both sides of the ram block.

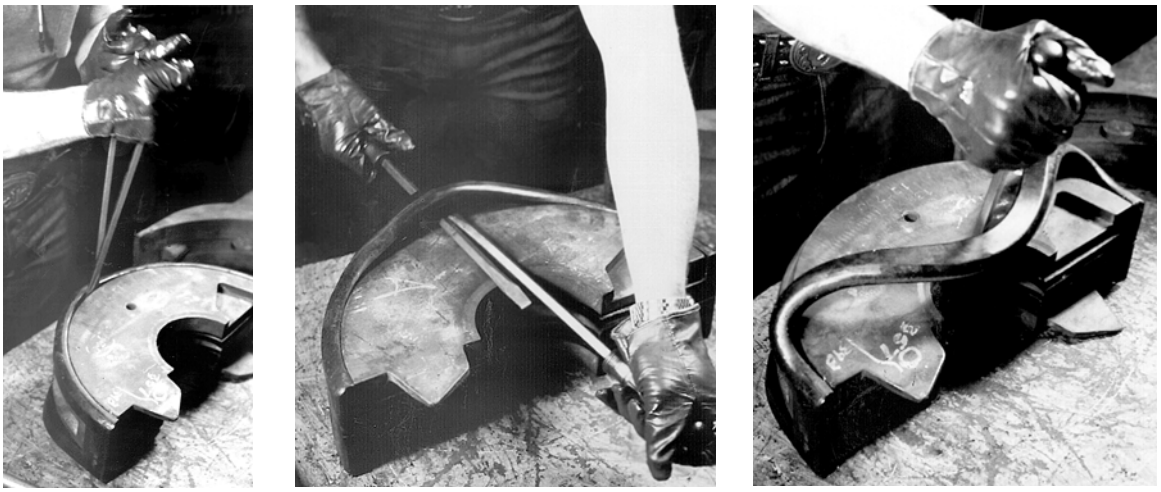


Figure 4-16. Removing the Ram Rubber

6. Insert a punch into the rubber retaining screw holes, and drive the rubber out of the ram block as shown in Figure 4-17. The punch must be smaller than the retaining screws to prevent damage to the threads.

Check the retaining screw holes in the new rubber. Clean out any rubber which is in the hole itself. This allows the retaining screws to freely engage the thread in the holes.

Figure 4-17. Driving the Ram Rubber out of the Block

7. To install a new rubber, place the rubber onto the block and drive it into position with a rubber mallet.
8. Pry the rubber onto the back side of the block using a long screwdriver. Force the rubber into position using a rubber mallet.
9. Install the ram block retracting screws and torque them to the values given in the table titled “SL Ram Block Retaining Screw Data” on page 4-21.
10. Place the ram holder into the block.
11. Install the ram block retracting screws and torque them to the values given in the table titled “SL Ram Block Retracting Screw Data” on page 4-20.

Do not use an air-impact wrench to install the ram block retracting screws, and do not exceed the recommended torques given in the table titled “SL Ram Block Retracting Screw Data” on page 4-20. Excessive torque on the retracting screws will damage the shoulders and cause them to run in too far. This will cause the holder to squeeze the rubber against the block and damage the rubber when the rams are closed.

The shoulder on the retracting screw allows the screw to stop at a point which allows the holder to float. Do not install washers or shims. If the holder is snugged down too tightly, the rams will not hold wellbore pressure.

The gap between the rubber and the block should be $^{1}/_{16}$″ (1.6 mm) (see Figure 4-18 on page 4-24).

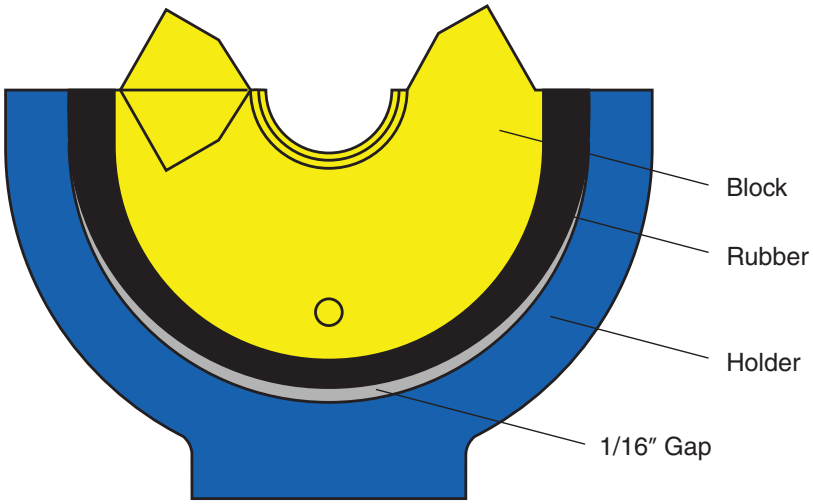


Figure 4-18. $^{1}/_{16}$" Gap Between the Rubber and the Holder

Changing Multi-Ram Rubbers

1. Clean the ram (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
2. Remove the retainer screw (see Figure 4-19).

Figure 4-19. Remove Retainer Screw

3. Install the ram block in a vertical position, and use a punch to drive the top seal retainer pins out (see Figure 4-20). Remove the top seal as shown in Figure 4-21.

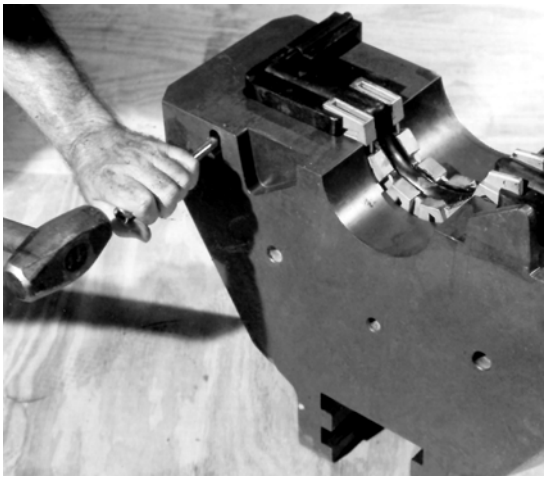


Figure 4-20. Punch Out Top Seal Retainer Pins

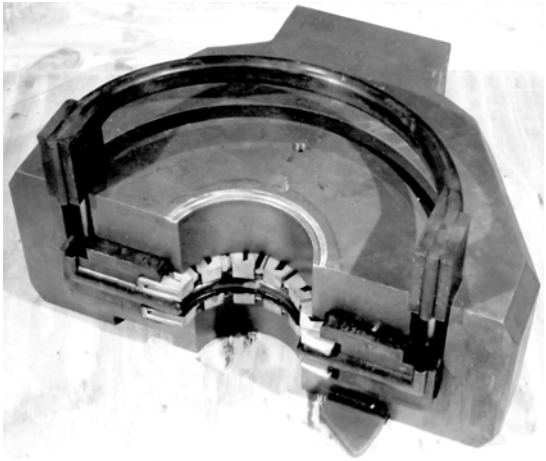


Figure 4-21. Remove Top Seal

4. Using a screwdriver, pry the face seal out of the ram block (see Figure 4-22).

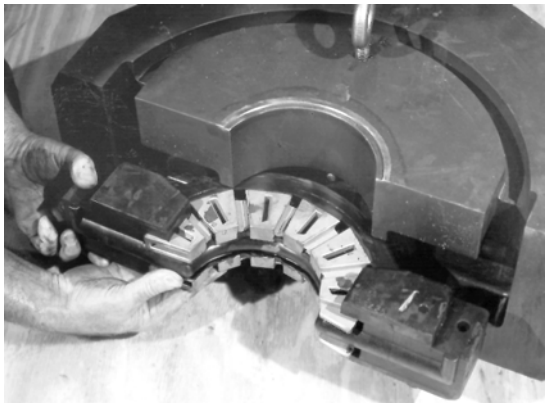


Figure 4-22. Remove Face Seal

5. For reinstalling the ram rubber, reverse this procedure.

Cleaning and Storing the SL BOP

A BOP should be cleaned immediately after it is taken out of service. Proper cleaning of a BOP before it is stored will increase its life significantly. If a BOP is in an active drilling program, this cleaning should be done approximately every three months or when the rig is between wells.

1. Open the doors and remove the rams (see the section titled “Removal of Rams” on page 4-17).

If the BOP is not flanged to a wellhead or securely fastened, open only one door at a time. The weight of two open doors can tip the BOP over.

2. Wash the inside and outside of the BOP. Remove all caked mud and cement (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
3. Thoroughly grease all inside surfaces of the BOP. Fill the ring grooves with grease (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
4. Oil the inside face of the doors and the door sealing surfaces on the body.
5. Apply thread lubricant API 5A2:
   - To the door bolt threads
   - Under the heads of the door bolts
6. Close the doors and tighten the door bolts. For storage, they should be snug but not fully torqued.

7. Close and open the rams several times with clean hydraulic oil. This will flush any water out of the cylinders and prevent rusting while the BOP is stored. After disconnecting the opening and closing hydraulic lines, insert pipe plugs in the hydraulic ports and leave oil inside the cylinders. Store the BOP with the rams removed and the piston in the open position. This will keep the ram shafts in the oil and protect them from accidental damage.
8. Paint the outside of the BOP to prevent it from rusting. The grease in the ring grooves will keep the paint out of the ring grooves and they will be ready for the next installation.
9. Remove the retracting screws and holders (see the section titled “Changing Pipe and Blind Ram Rubbers” on page 4-20). Leave the rubbers on the blocks if they are to be reused.
10. Grease the blocks and holders. Be sure to grease the ID of the holders (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
11. Apply thread lubricant API 5A2 to the retracting screw threads and to the body of the screws.
12. Reinstall the holders and retracting screws on the blocks.

Do not use an air impact wrench to install the ram block retracting screws, and do not exceed the recommended torques given in the table titled “SL Ram Block Retracting Screw Data” on page 4-20. Excessive torque on the retracting screws will damage the shoulders and cause them to run in too far. This will cause the holder to squeeze the rubber against the block, damaging the rubber when the rams are closed.

13. Store the rams outside the BOP.
14. BOPs and rams should be stored indoors or at least under a shed to keep the sun and rain off them.

Storing and Inspecting Rubber Parts

NOV rubber parts are especially compounded to give maximum storage life under normal oilfield conditions. Proper storage minimizes deterioration and increases the service life of these items.

Aging of rubber parts is based on several factors, including atmosphere, light, temperature, and size. Ozone in the atmosphere reacts with rubber parts and hastens deterioration. Rubber parts should never be stored around electrical equipment because of the occurrence of ozone.

Direct light, especially sunlight which contains ultraviolet rays, is very harmful and must be avoided.

All rubber parts undergo several kinds of changes when they are exposed to low temperature. At temperatures of –40°F (–40°C) the rubber becomes brittle and will shatter when dropped or handled roughly. Some changes occur immediately, others after prolonged exposure. All are reversible; the rubber regains its original properties when it is returned to 65°F (18°C) or room temperature.

Heat causes a gradual hardening of the rubber, especially when ozone or oxygen is present. In warm, humid climates — particularly the tropics — fungi and bacteria attack the organic content in reinforced rubber parts.

The size, composition, and function of rubber parts prevents giving a precise shelf life. Large rubber parts might suffer the same amount of deterioration as small parts and still be usable, whereas small parts become useless and should be thrown away.

Both natural and synthetic rubber parts are susceptible to deterioration from various solvents — e.g., oilfield liquid hydrocarbons — which cause swelling or shrinkage.

In the final analysis, personal judgment determines whether a rubber part should be used. If there is doubt, replace the part.

Rubber parts should be stored as described below:

- Store rubber parts in a dark place, indoors, and away from sunlight, windows, and direct artificial lighting.
- Store in a cool location (approximately 65°F [18°C]).
- Store rubber parts in their natural shape. Do not hang O-rings on nails or hooks.
- Storage areas should be kept as dry as possible. Oil, grease, or other fluids should be stored elsewhere to avoid spillage.
- If storage is for a long duration, it is recommended that rubber parts be placed in sealed containers or be given a protective surface covering impervious to temperature or light. This will extend the shelf life.
- Rubber parts should be used on a first-in, first-out basis.

Inspect rubber parts as described below:

- Each rubber part must be inspected before it is put into service.
- Bend, stretch, or compress each part and look for cracks.

Some cracks are not obvious, but when the rubber part is bent, stretched, or compressed, very minute cracks will become apparent.

- Observe if the rubber part has a hard skin or small cracks which may become chalky or bark-like in appearance.

Troubleshooting

The following troubleshooting table provides possible causes and corrective action for some of the more common problems likely to be encountered.

Troubleshooting SL Manual Lock BOP

Problem	Possible Cause	Correction
Will not hold well pressure	BOP is upside-down	When the BOP is right-side-up, the side outlets are below the skids. Inside the BOP, the side outlets are below the rams (see the section titled “Installation” on page 3-2).
Rams will not close	Bad ram rubbers	Check ram rubbers and replace, if necessary (see the section titled “Ram Assembly Removal and Inspection” on page 4-17 and the section titled “Storing and Inspecting Rubber Parts” on page 4-27).
	Damaged seat	Check the seat sealing area for cuts and sealing surface scratches. Smooth minor damage with emery cloth (see the section titled “Three-Month Preventive Maintenance” on page 4-4).
	Leaking ram shaft seal	Check the weep holes in the doors for leakage. Replace the ram shaft seal, if necessary. A temporary repair can be made by energizing the plastic packing, but the seal should be replaced as soon as possible (see the section titled “Emergency Ram Shaft Packing Repair” on page 4-16 and Figure 4-1 on page 4-3).
	Leaking door seal	Check for leaks between the doors and the body. Tighten door bolts or replace the door seals as required (see the section titled “Monthly Preventive Maintenance” on page 4-3 and the section titled “Door Seal Replacement” on page 4-10).
	Pump leaking in the test unit	Install an isolation valve in the pump line close to the BOP. Install a pressure gauge between the isolation valve and the BOP. No indication of pressure drop indicates a leak in the test unit.
One (or both) rams will open partly, but will not move out of the wellbore	Hydraulic fluid not reaching the BOP	Remove the closing line from the BOP and pump a small amount of hydraulic fluid through it. If no fluid appears, the line is plugged. Clear the closing line. Remove the opening line from the BOP and apply closing hydraulic pressure.
	Opening hydraulic line plugged or piston seal damaged	1. If hydraulic fluid spurts out of the BOP briefly and stops and rams close, the opening hydraulic line is plugged. Call an NOV service representative. 2. If hydraulic fluid spurts out of the BOP continuously, the piston seal(s) is damaged. The rams would also move, but there would be no pressure buildup. Call an NOV service representative.
	Foreign substance in the wellbore area	Open the door(s) and inspect for cement, metal fragments, etc. Clean the ram cavity (see the section titled “SLX Door Hinge Assembly Maintenance” on page 4-11).
	Both hydraulic lines are connected to an Open or Close port on the BOP	This can happen because there are two opening and two closing ports on the BOP. The closing unit will unload itself very quickly. Be sure that one line is connected to a port marked Close and the other line is connected to a port marked Open.
	Manual lock(s) partly locked	Unlock rams. Check for damage to the locking shafts, threads, or bent shaft (see the section titled “Three-Month Preventive Maintenance” on page 4-4).
	Retracting screw(s) not made up and head(s) striking BOP door	Remove ram and tighten retracting screws (see the section titled “Changing Pipe and Blind Ram Rubbers” on page 4-20).

SL BOP Data Location

Serial numbers (doors and body) and heat treat log numbers are found on a data plate and on the body in the locations shown in Figure 4-23.

- The serial number on the door is located on the hinge boss and consists of the letters SND followed by numbers.
- The body serial number is located in various places on the body and consists of SN followed by a four-digit number.
- The heat treating number consists of the letters HT followed by a series of numbers.

Always give the serial numbers and size of the SL BOP when ordering parts.

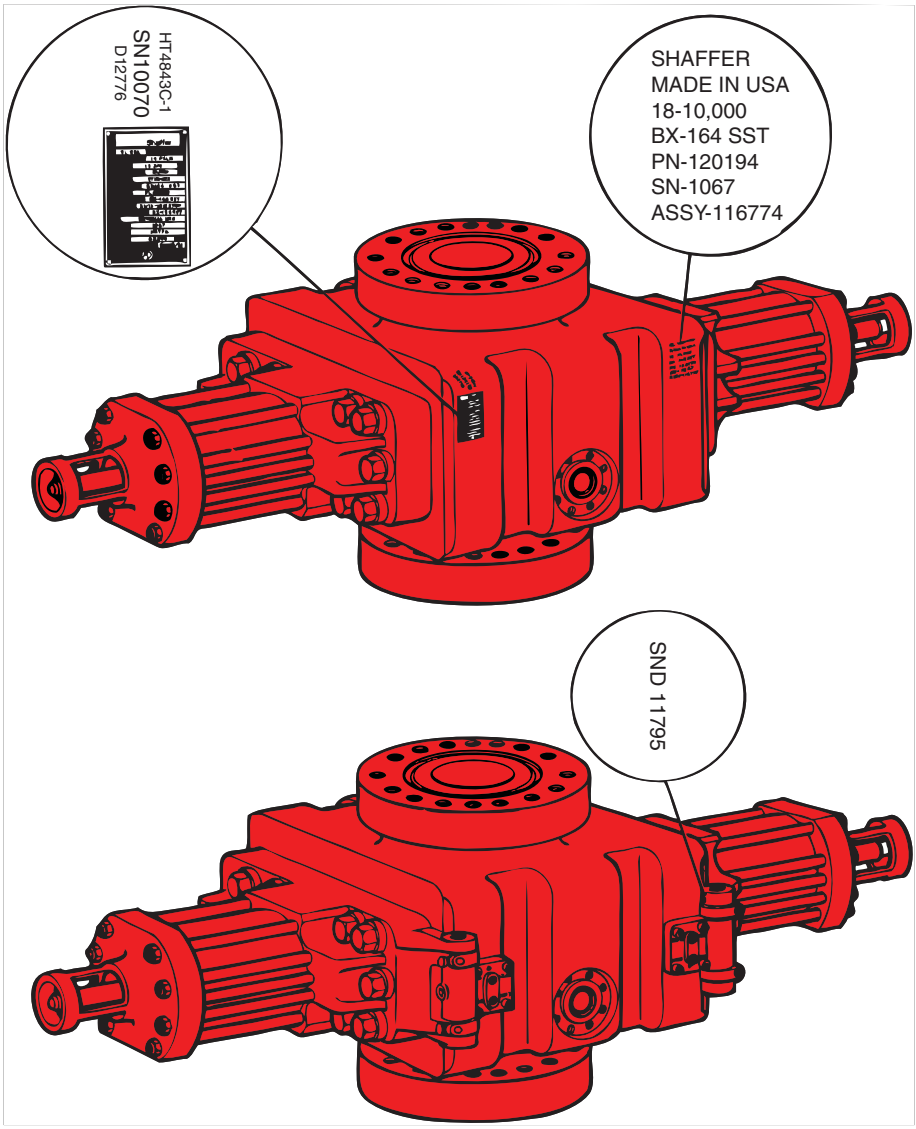


Figure 4-23. SL BOP Data Locations

Specifications and Parts Lists

Correspondence

Direct all correspondence to the appropriate address listed below:

Mailing Address

National Oilwell Varco
P.O. Box 1473
Houston, Texas 77251, U.S.A.

Shipping Address

12950 West Little York
Houston, Texas 77041
Tel. (713) 937-5000
Fax (713) 937-5779

National Oilwell Varco Repair Center Address

5100 N. Sam Houston Parkway West
Houston, Texas 77086
Tel. (281) 569-3000

Parts Lists

Parts Identification

All parts required for maintenance or repair are available from National Oilwell Varco. Assembly drawings and exploded views correspond to the parts list, which identifies each part by number. Using this part number and part name will ensure procurement of the proper part when ordering spare parts.

Ordering Replacement Parts

All parts required for maintenance or repair are available from National Oilwell Varco. When ordering replacement parts, please specify the following information:

- **Part name** – list part name as called out on the applicable drawing
- **Part number** – list part number as called out on the applicable drawing
- **Drawing number** – list engineering drawing number and the item number for the drawing
- **Quantity** – list the quantity required
- **Serial number** – list the serial number (if applicable) as shown on the nameplate

Exploded Views and Parts List

Model SL PosLock and Manual-Lock Specifications

Working Pressure (psi)			15,000					10,000							5,000				3,000
Bore (inches)			18¾	13⅝	11	7 1/16	7 1/16	21¼	18¾	16¾	13⅝	11	7 1/16	7 1/16	16¾	16¾	13⅝	13⅝	13⅝
Piston Size (inches)			14	14	14	10	14	14	14	14	14	14	10	14	10	14	10	14	10
PosLock	L (length–inches) 134¾		123	111¾	79	103⅝	136¼	129⅜	127¼	109	102⅞	79	103⅝	116½	118⅜	105⅛	108	105⅛	–
	F (inches)		53⅜	48	38	–	38⅛	42 1/16	42 1/16	42⅛	37¾	36 9/16	28⅛	38⅛	37⅝	39 9/16	35 1/16	37⅜	35 1/16
	G (inches)		77¾	75	66⅝	48⅞	58⅞	84⅛	81	79 5/16	65 15/16	62⅛	48⅞	58⅞	69 11/16	71 11/16	6 21/32	64⅜	62 1/16
Manual-Lock	L (length–inches) –		142¾	135 7/32	79	128½	–	–	–	128¾	122¾	79	128½	141½	–	130¼	–	130¼	–
	F (inches)		–	51⅝	42 17/64	25¼	42¾	–	–	–	40⅝	39½	25¼	42¾	43 9/16	–	4 11/16	–	4 11/16
	G (inches)		–	77½	74 21/64	46	63½	–	–	–	68¾	65	46	63½	75 11/16	–	68 1/16	–	68 1/16
Min. α to Remove Ram Assembly 57½			49½	45½	45½	45½	45½	45½	45½	45½	45½	45½	45½	45½	45½	45½	45½	45½	–
W (width)			55⅝	56½	46⅞	30⅛	30⅛	53 15/16	56⅞	55⅛	43 1/16	38 9/16	30	30	46¾	46¾	40¾	40¾	40¾
H (height–in.)	Single:	Studded	41	38½	26¾	22⅞	22⅞	40	36 15/16	33½	28	23½	22⅞	22⅞	25	25	17¼	17¼	17¼
		Flanged	–	64½	50½	39 13/32	39 13/32	71	64½	56⅞	48⅛	42⅞	39⅜	39⅜	43½	43½	33⅜	33⅜	30⅝
		Hubbed	–	–	–	–	–	–	52	49½	38⅞	–	–	–	37¾	37¾	29¼	29¼	–
	Double:	Studded	59¼	58¼	43¾	36⅝	–	59¼	54¾	52¾	46	40⅞	36⅝	–	42⅞	42⅞	34	34	34
		Flanged	92½	84¼	67½	53⅛	–	88¾	82 5/16	75⅛	66⅛	60¼	52¾	–	61⅜	61⅜	50⅛	50⅛	47⅜
		Hubbed	79	–	–	–	–	–	71¾	67¾	56⅞	52¼	–	–	55⅝	55⅝	46	46	–
	Triple:	Studded	–	–	73¼	–	–	–	74	–	–	–	–	–	–	–	–	–	–
		Flanged	–	–	–	–	–	–	97 5/16	–	–	–	–	–	–	–	–	–	–
		Hubbed	–	–	–	–	–	–	89	–	–	–	–	–	–	–	–	–	–
D (inches)			27½	26½	19½	12½	12½	22⅞	26⅛	25¼	20	17 3/16	12½	12½	21⅝	21⅝	19⅜	19⅜	19⅜
E (inches)			28⅛	30	27⅜	17⅝	17⅝	30¾	30¾	29⅞	23 1/16	21⅜	17½	17½	25⅛	25⅛	21⅜	21⅜	21⅜
I (inches)			20	19¾	17	13¾	13¾	19¼	19¼	19¼	18	17⅜	13¾	13¾	17⅞	17⅞	16¾	16¾	16¾
J (inches)			12¾	11¼	11	8¾	8¾	15¼	11¼	11¼	11½	11⅜	8¾	8¾	12⅜	12⅜	12¼	12¼	12¼
K (inches)	Single:	Studded	14	12½	8	4¾	4¾	13⅜	11⅞	10⅛	8⅝	6¼	4¾	4¾	6⅛	6⅛	4 7/16	4 7/16	4 7/16
		Flanged	–	25½	19⅞	13	13	28⅞	25⅝	21 15/16	18⅛	15 15/16	13⅛	13⅛	15⅜	15⅜	12 7/16	12 7/16	11⅛
		Hubbed	–	–	–	–	–	–	19⅛	18⅛	13 9/16	–	–	–	12½	12½	10 7/16	10 7/16	–
	Double:	Studded	13⅛	12½	8	4¾	–	13⅜	11⅛	10⅛	8⅛	6¼	4¾	–	6⅛	6⅛	4 7/16	4 7/16	4 7/16
		Flanged	29¾	25½	19⅞	13	–	28⅛	24 15/16	2 15/16	18 3/16	15 15/16	12⅞	–	15⅜	15⅜	12 7/16	12 7/16	11⅛
		Hubbed	23	–	–	–	–	–	19⅝	17⅝	13 9/16	11 15/16	–	–	12½	12½	10 7/16	10 7/16	–
	Triple:	Studded	–	–	8⅝	–	–	–	11⅛	–	–	–	–	–	–	–	–	–	–
		Flanged	–	–	–	–	–	–	22 25/32	–	–	–	–	–	–	–	–	–	–
		Hubbed	–	–	–	–	–	–	18⅝	–	–	–	–	–	–	–	–	–	–
M (inches)	Single:	Studded	16¾	15	10¼	8 15/16	8 15/16	16	14 7/16	12¾	10¾	8¾	8 15/16	8 15/16	9¾	9¾	6⅜	6⅜	6⅜
		Flanged	–	28	22⅛	17⅛	17⅛	31½	28¼	24½	20 13/16	18 7/16	17 1/16	17 1/16	19	19	14 7/16	14 7/16	13 1/16
		Hubbed	–	–	–	–	–	–	22¼	20¾	16 3/16	–	–	–	16⅛	16⅛	12⅜	12⅜	–
	Double:	Studded	16	15	10¼	8 15/16	–	16	13¾	12¾	10¾	8¾	8 15/16	–	9¾	9¾	6⅜	6⅜	6⅜
		Flanged	32⅝	28	22⅛	17 3/16	–	3 11/16	27 17/32	23 15/16	20 13/16	18 7/16	17 7/16	–	19	19	14 7/16	14 7/16	13 1/16
		Hubbed	25⅞	–	–	–	–	–	22¼	20¼	16 3/16	14 7/16	–	–	16⅛	16⅛	12 7/16	12 7/16	–
	Triple:	Studded	–	–	10¼	–	–	–	13¾	–	–	–	–	–	–	–	–	–	–
		Flanged	–	–	–	–	–	–	25 13/32	–	–	–	–	–	–	–	–	–	–
		Hubbed	–	–	–	–	–	–	22¼	–	–	–	–	–	–	–	–	–	–
N (inches)			7¼	8½	6	5	5	8	8	8	6½	6	5	5	5½	5½	4½	4½	4½

Model SL PosLock and Manual-Lock Specifications (Continued)

Working Pressure (psi)			15,000					10,000							5,000				3,000
O* (inches)	2-inch		–	–	33 1/2	19	19	36 1/2	33 1/8	32 1/2	27 1/2	24 7/16	19	19	28 1/16	28 1/16	22 3/4	22 3/4	23 15/16
	3-inch		33 5/8	33 5/8	27 3/8	19	19	37 1/2	34 3/8	33 1/2	28 11/16	25 5/8	19	19	28 5/16	28 5/16	24 3/8	24 3/8	23 1/8
	4-inch		–	35 1/16	28 13/16	27 13/16	27 13/16	38 1/4	35 1/8	34 1/4	29 1/4	26 3/16	–	–	28 1/16	28 1/16	22 3/4	22 3/4	23 1/2
P* (inches)	2-inch		–	–	30 1/2	20 15/16	20 15/16	35 7/8	33 1/4	32 3/8	27 1/2	24 7/16	20 15/16	20 15/16	28 1/16	28 1/16	22 3/4	22 3/4	23 15/16
	3-inch		33 5/8	33 1/2	27 3/8	21 3/4	21 3/4	36 7/8	34 1/4	33 3/8	28 11/16	25 5/8	21 1/4	21 1/4	28 1/16	28 1/16	24 3/8	24 3/8	23 1/8
	4-inch		–	34 15/16	28 13/16	27 15/16	27 15/16	37 5/8	35	34 1/8	29 1/4	26 3/16	–	–	28 1/16	28 1/16	22 3/4	22 3/4	23 1/2
Total Weight Without Rams (lb)	Single:	Studded†	–	25,860	13,700	5,781	6,900	31,130	25,300	25,828	13,200	11,100	5,550	6,900	14,095	–	7,800	9,200	8,400
		Flanged	–	29,050	16,500	6,200	7,550	37,600	30,700	28,500	15,550	13,000	6,200	7,550	15,550	–	8,985	10,200	8,430
		Hubbed	–	–	–	–	–	31,800	27,100	26,600	13,700	11,708	–	–	12,850	–	8,400	9,600	7,924
	Double:	Studded†	50,000	41,940	24,700	10,016	12,350	48,705	44,792	40,600	23,400	20,560	9,900	11,350	25,285	–	15,620	18,400	15,350
		Flanged	60,000	45,130	27,400	10,300	12,950	54,860	49,117	44,300	25,500	21,780	9,830	12,300	27,169	28,000	16,900	19,100	16,500
		Hubbed	–	–	–	–	–	49,372	44,903	42,000	23,800	21,790	–	–	25,886	–	15,912	18,700	15,548
Body Weight Breakdown (lb)	1 Ram Assembly (w/holders)		565	523	381	150	150	551	589	527	504	366	150	150	255	–	334	334	334
	Door Assembly (1 each)		3,452	3,790	5,044	1,100	1,992	3,138	3,049	3,347	2,675	2,595	972	1,992	2,872	2,872	2,362	2,362	2,362
	Single:	Studded	–	17,435	7,700	3,050	3,050	22,920	18,500	18,558	7,800	5,932	3,100	3,100	8,570	8,570	3,800	4,100	4,150
		Flanged	–	21,470	11,000	3,800	3,800	30,700	23,985	21,750	10,450	7,600	3,750	3,750	10,400	10,400	5,400	5,900	4,706
		Hubbed	–	–	–	–	–	25,030	20,400	19,900	8,600	6,518	–	–	9,600	9,600	4,700	4,700	4,200
	Double:	Studded	33,100	25,935	13,200	4,750	4,750	33,725	30,000	27,200	12,700	9,100	4,900	4,600	14,700	14,900	8,100	8,100	8,000
		Flanged	43,100	29,970	16,500	5,550	5,550	41,320	35,300	30,600	15,200	11,400	5,440	5,440	16,500	16,500	9,300	9,300	8,700
		Hubbed	–	–	–	–	–	35,832	31,475	29,000	13,400	10,411	–	–	15,750	15,750	8,500	8,691	8,100
Closing Ratio			10.85	7.11	7.11	7.11	13.94	7.11	7.11	7.11	7.11	7.11	7.11	13.94	5.54	10.85	5.54	10.85	5.54
Opening Ratio			1.68	2.14	2.80	3.37	7.14	1.63	1.83	2.065	4.29	7.62	3.37	7.14	2.03	5.77	3.00	10.02	3.00
Gallons to Close			14.62	11.56	9.40	2.72	6.00	16.05	14.55	14.47	10.58	9.45	2.72	6.00	6.07	11.76	5.44	11.00	5.44
Gallons to Open			13.33	10.52	8.10	2.34	5.57	13.86	13.21	12.50	10.52	7.00	2.34	5.57	4.97	10.67	4.46	10.52	4.46
Maximum Ram Size (inches)			13 3/8	10 3/4	8 5/8	5 1/2	5 1/2	16	16	13 3/8	10 3/4	8 5/8	5 1/2	5 1/2	13 1/8	13 1/8	10 3/4	10 3/4	10 3/4
Door Screw	Across Flats (inches)		3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8
	Torque (ft-lb)		12,000	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,600

* *For flanged side outlets. Studded or hubbed side outlets are shorter.*
† *Includes studs and nuts.*

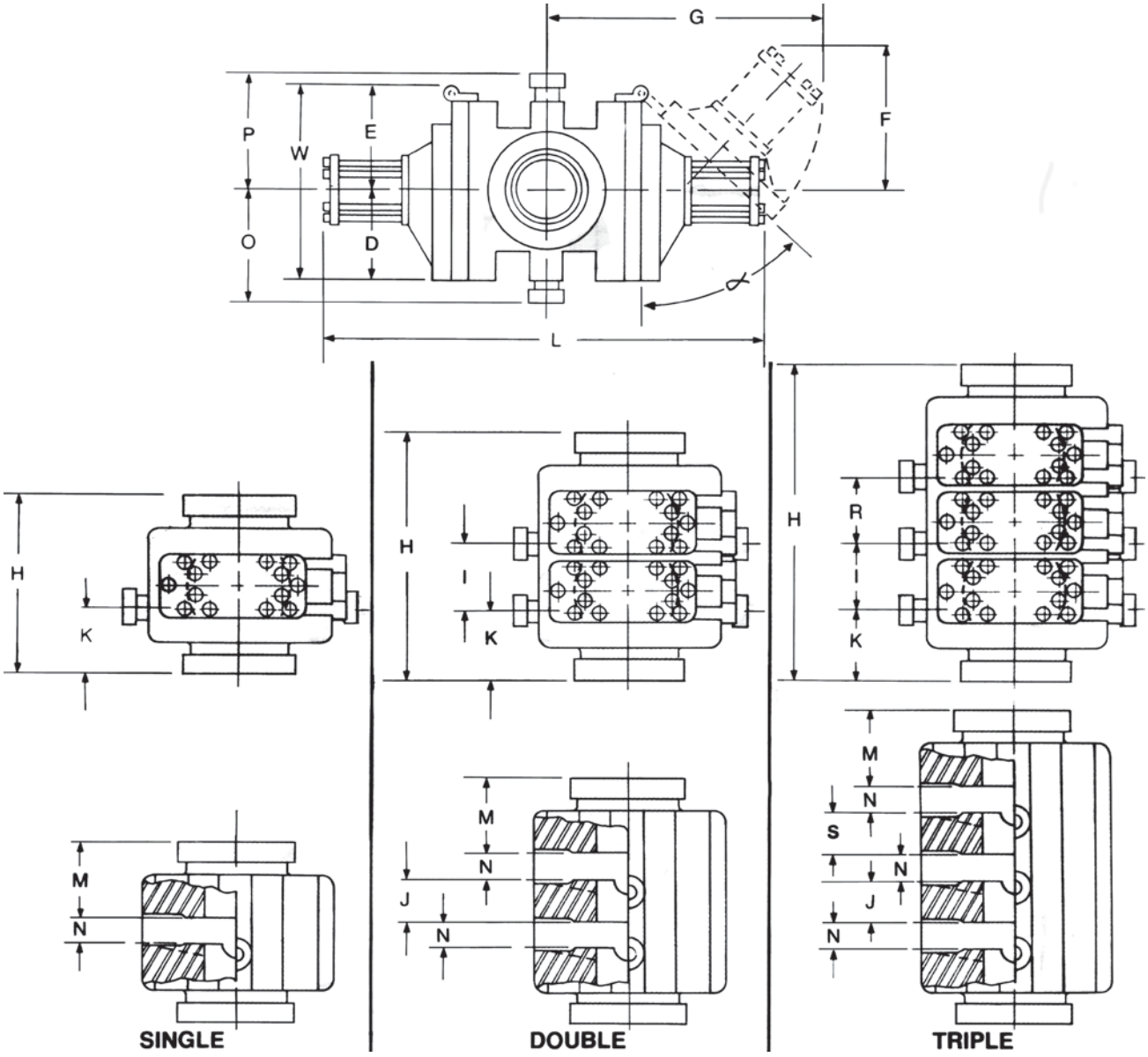


Figure 5-1. Model SL BOPs Dimensions

Rams for Model SL BOPs

BOP			Ram (Type or Model)									
			Current Assembly Components							Discontinued Components		
Working Pressure (psi)	Bore (in)	Model	UltraTemp™	Regular Duty	Support Drill Pipe	Holder	Rubber	UltraTemp™ Rubber	Block	Holder	Rubber	Block
15,000	18¾	SL	UltraTemp	SL (1)	SL-D (1)	SL	SL	UltraTemp	SL, SL-D, 75	None	None	None
	13⅝	SL		SL (1)	SL-D (1)	75	75		75-H, 75	None	None	None
	11	SL-86		SL-86 (1)	SL-D 86 (1)	SL-86	SL-86		SL-86, SL-D 86	None	None	None
	7 1/16	SL		SL (1)	–	SL	SL		SL	None	None	None
10,000	21¼	SL		SL (1)	SL-D (1)	70	75		75-H, 75	None	70	70-H, 73
	18¾	SL	UltraTemp	SL (1)	SL-D (1)	70	75		75-H, 75	None	None	None
	16¾	SL		SL (1)	SL-D (1)	70	75		75-H, 75	None	None	None
	13⅝	SL		SL (1)	SL-D (1)	70	75		75-H, 75	60	60, 70	60, 70-H, 73
	11	SL		SL (1)	SL-D (1)	75	75		75-H, 75	61, 70	61, 70	60, 70-H, 73
	7 1/16	SL		SL (1)	–	SL	SL		SL	None	None	None
5,000	21¼	SL		SL (1)	SL-D (1)	70	75		75-H, 75	None	70	70-H, 73
	16¾	SL		SL (1)	SL-D (1)	70	70		75-H, 73	60 (2)	60 (5)	60 (3)
	13⅝	SL		SL (1)	SL-D (1)	70	70		75-H, 73	60 (2)	60 (5)	60 (3)
3,000	13⅝	SL		SL (1)	SL-D (1)	70	70		75-H, 73	60 (2)	60 (5)	60 (3)

(1) SL and SL-D ram assemblies have H_2S retracting screws.
(2) Type 60 holder is interchangeable with Type 70 holder.
(3) Type 60 block can be used in current assembly, but it must be placed opposite another Type 60 block. The self-centering angular guides are of different size on the later type.
(4) These Type 70 rubbers are available.
(5) Type 70 rubbers are interchangeable with these Type 60 rubbers and can be used on the discontinued Type 60 blocks.

SL BOP Ram Assemblies–7 1/16" (10,000/15,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Rubber Sub Assy.[4]	Face Rubber
C.S.O.	SL*	115610	115611	115612	20005430	115706
1.315	SL	115613	115614	115615	115711	20005431
1.660	SL	115616	115617	115618	115716	115717
1.900	SL	115619	115620	115621	115721	115722
2 1/16	SL	115622	115623	115624	115727	115728
2 3/8	SL*	115625	115626	115627	115733	115734
2 7/8	SL*	115628	115629	115649	115739	115740
3 1/2	SL*	115650	115651	115652	115745	115746
4	SL	115653	115654	20115655	115751	115752
4 1/2	SL	115656	115657	115658	20005432	115758
5	SL	115659	115660	20115661	115763	115764
5 1/2	SL	115662	115663	115664	115769	115770

Other Part Numbers:
115609 Holder (all pipe sizes)
115577 Retracting Screw (all pipe sizes)
115778 Retaining Screw (all pipe sizes)
115774 Top Ram Rubber Ring (all pipe sizes)

* *Indicates blocks and rubbers normally available from stock.*
1 *Other pipe O.D. sizes available on request.*
2 *Includes holder, retracting screws, block, and rubber.*
3 *Includes block and rubber.*
4 *Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*

SL BOP Ram Assemblies–11" (10,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Rubber Sub Assy.[4]
C.S.O.	SL*	140366	133109	133110	133111
1.315	SL	140367	133114	133115	133116
1.660	SL	140368	133119	133120	133121
1.900	SL	140369	133124	133125	133126
2 3/8	SL*	20140370	133129	133130	133131
2 7/8	SL*	20140371	133134	133135	133136
3 1/2	SL-D*	20005626	133052	133053	133141
4	SL-D*	140347	133055	133056	133146
4 1/2	SL-D*	140348	133058	133059	133151
4 5/8	SL-D	140375	133154	133155	133156
5	SL-D*	140349	133061	133062	133160
5 1/2	SL-D	140350	133064	133065	133164
6 5/8	SL	140378	133167	133168	133169
7	SL*	140379	133172	133173	133174
7 5/8	SL	140380	133177	133178	133179
8 5/8	SL	140381	133188	133189	133190

Other Part Numbers:
131685 Holder (all pipe sizes)
142061 Retracting Screw, C.S.O. through 7"
142065 Retaining Screw, 7 5/8" and 8 5/8"
135546 Retaining Screw (all pipe sizes)

* *Indicates blocks and rubbers normally available from stock.*
1 *Other pipe O.D. sizes available on request.*
2 *Includes holder, retracting screws, block, and rubber.*
3 *Includes block and rubber.*
4 *Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*

SL BOP Ram Assemblies–11" (15,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Rubber Sub Assy.[4]	Face Seal	Top Seal
C.S.O.	SL-86*	20113005	113026	113047	113068	20113084	20113002
1.315	SL-86	113006	20113027	113048	113069	113085	20113002
1.660	SL-86	20113007	113028	113049	113070	20113086	20113002
1.900	SL-86	20005400	113029	113050	113071	113087	20113002
2 1/16	SL-86	113009	113030	113051	113072	113088	20113002
2 3/8	SL-86*	20113010	113031	113052	113073	20113089	20113002
2 7/8	SL-86*	20113011	113032	113053	113074	113090	20113002
4	SL-86*	113013	113034	113055	113076	20113092	20113002
4 1/2	SL-86*	113014	113035	113056	113077	113093	20113002
6 5/8	SL-86	113017	113038	20113059	113080	113096	20113002
7	SL-86*	113018	113039	20005401	113081	113097	20113002
7 5/8	SL-86	113019	20113040	20113061	113082	113098	20113002
8 5/8	SL-86	113020	113041	20113062	113083	113099	20113002
3 1/2	SL-D-86	113021	113042	20113063	20113075	20113091	20113002
4	SL-D-86	113022	20113043	113064	113076	20113092	20113002
4 1/2	SL-D-86	113023	113044	113065	113077	113093	20113002
5	SL-D-86	113024	113045	113066	113078	113094	20113002
5 1/2	SL-D-86	113025	113046	113067	113079	113095	20113002

Other Part Numbers: *20005673* *Holder (all pipe sizes)*
20113143 *Retracting Screw*
20113002 *Top Seal*

* *Indicates blocks and rubbers normally available from stock.*
1 *Other pipe O.D. sizes available on request.*
2 *Includes holder, retracting screws, block, and rubber.*
3 *Includes block and rubber.*
4 *Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*

SL BOP Ram Assemblies–13 5/8" (3,000/5,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Rubber Sub Assy.[4]
C.S.O.	SL*	20141581	139099	136714	136715
7/16	SL	141583	139100	136990	136991
1.315	SL	141585	139101	136994	136995
1.660	SL	141587	139102	136998	136999
1.900	SL	20141589	139103	137002	137003
2 1/16	SL	20141591	139104	137006	137007
2 3/8	SL*	141593	139105	137010	137011
2 7/8	SL*	141595	139106	137014	137015
3 1/2	SL-D*	20140777	133725	133726	136711
3 5/8	SL-D	141599	139965	142223	131181
4	SL-D*	140780	133727	133728	137023
4 1/8	SL-D	141603	139967	142228	137027
4.200	SL-D	141605	139968	142315	131187
4 1/2	SL-D*	20140783	133731	133732	136707
4 5/8	SL-D	141609	139970	142230	137031
5	SL-D*	140786	133735	133736	136701
5 1/2	SL-D	140789	133737	133738	137035
5 9/16	SL-D	20005633	139115	137038	137039
6 1/2	SL	141617	139310	140655	131212
6 5/8	SL	141619	139116	137042	137043
7	SL*	141621	139117	137046	137047
7 5/8	SL*	141623	139118	137050	137051
8 5/8	SL	20141625	139119	137054	137055
9 5/8	SL*	141627	139120	137058	137059
10 3/4	SL	141629	139121	137062	137063

Other Part Numbers: (all pipe sizes)

135551	*Holder*
135575	*Retracting Screw, Standard Trim*
141200	*Retracting Screw, H_2S Trim*
135546	*Retaining Screw*

* *Indicates blocks and rubbers normally available from stock.*
1 *Other pipe O.D. sizes available on request.*
2 *Includes holder, retracting screws, block, and rubber.*
3 *Includes block and rubber.*
4 *Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*

SL BOP Ram Assemblies–13 5/8" (10,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Rubber Sub Assy.[4]
C.S.O.	SL*	140037	134203	134206	134204
1.315	SL	140038	134208	134211	134209
1.660	SL	140039	134213	134216	134214
1.900	SL	140040	134218	134221	134219
2 3/8	SL*	140041	134223	134226	134224
2 7/8	SL*	140042	134228	134231	134229
3 1/2	SL-D*	140057	20005621	131843	134234
4	SL-D*	20140058	20131845	20005622	134239
4 1/2	SL-D*	140059	131848	131736	134244
4 5/8	SL-D	140046	134247	134250	134248
5	SL-D*	140060	131850	131721	134253
5 1/2	SL-D	140061	131852	20131853	134257
6	SL	140049	134261	134264	134262
6 5/8	SL-D	126055	126056	126057	134267
7	SL*	20140051	134271	134274	134272
7 5/8	SL*	140052	134276	134279	134277
7 3/4	SL	20140053	134281	134284	134282
8 5/8	SL	140054	134286	134289	134287
9 5/8	SL*	140055	134291	134294	134292
10 3/4	SL	140056	134296	134299	134297

Other Part Numbers: (all pipe sizes)

138180	*Holder*
137881	*Retracting Screw, Standard Trim*
142061	*Retracting Screw, H_2S Trim*
135546	*Retaining Screw*

* *Indicates blocks and rubbers normally available from stock.*
1 *Other pipe O.D. sizes available on request.*
2 *Includes holder, retracting screws, block, and rubber.*
3 *Includes block and rubber.*
4 *Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*

SL BOP Ram Assemblies–13 5/8" (15,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Rubber Sub Assy.[4]
C.S.O.	SL*	114164	114165	114166	114168
1.315	SL	114458	114172	114173	20114175
1.660	SL	114459	114179	20114180	114182
1.900	SL	114460	114186	114187	114189
2 3/8	SL*	114461	114193	114194	20005419
2 7/8	SL*	114462	114202	114203	114205
3 1/2	SL-D*	114472	114208	114209	114211
4	SL-D*	114473	114215	114216	20114218
4 1/2	SL-D*	114474	114222	114223	20114225
5	SL-D*	114475	114229	114230	114232
5 1/2	SL-D	114476	114236	20114237	114239
6 5/8	SL	114466	114243	114244	114246
7	SL*	114467	114250	20114251	114253
7 5/8	SL	114468	114257	114258	114260
8 5/8	SL	114469	114264	114265	114266
9 5/8	SL*	114470	114270	114271	114272
10 3/4	SL	114471	114276	114277	114278

Other Part Numbers:
- *114162 Holder (all pipe sizes)*
- *142184 Retracting Screw, H_2S Trim, C.S.O. through 7 5/8"*
- *116190 Retracting Screw, H_2S Trim, 8 5/8" through 10 3/4"*
- *135160 Retaining Screw (all pipe sizes)*

* *Indicates blocks and rubbers normally available from stock.*
1 *Other pipe O.D. sizes available on request.*
2 *Includes holder, retracting screws, block, and rubber.*
3 *Includes block and rubber.*
4 *Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*

SL BOP Ram Assemblies–16¾" (5,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Rubber Sub Assy.[4]
C.S.O.	SL*	20141725	139168	137303	137304
2⅜	SL*	141733	139172	137319	137320
2⅞	SL*	141735	139173	137323	137324
3½	SL-D*	140809	133761	133762	137328
4	SL-D	20140828	133763	133764	137332
4½	SL-D	140831	133765	133766	137336
5	SL-D*	20005627	133767	133768	136902
5½	SL-D	20005628	133769	133770	137340
6⅝	SL	141747	139179	137343	137344
7	SL	141749	139180	137347	137348
7⅝	SL	141751	139181	137351	137352
8⅝	SL	141753	139182	137355	137356
9⅝	SL	141755	139183	137359	137360
10¾	SL	141757	139184	137363	137364
11¾	SL	141759	139185	137367	137368
13⅜	SL*	141761	139186	137371	137372

Other Part Numbers: (all pipe sizes)
135322 Holder
141200 Retracting Screw, H_2S Trim
135160 Retaining Screw

* *Indicates blocks and rubbers normally available from stock.*
1 *Other pipe O.D. sizes available on request.*
2 *Includes holder, retracting screws, block, and rubber.*
3 *Includes block and rubber.*
4 *Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*

SL BOP Ram Assemblies–16¾" (10,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Rubber Sub Assy.[4]
C.S.O.	SL	142726	142775	133632	142776
1.315	SL	142727	142778	133364	142779
1.660	SL	142728	142781	133637	142782
1.900	SL	142729	142784	133640	142785
4	SL-D	142746	142833	133652	142797
4½	SL-D	142747	142834	133655	142800
5	SL-D*	142748	142835	133658	142803
5½	SL-D	142749	142836	133661	142806
8⅝	SL	142740	142817	133673	142818
9⅝	SL*	142741	142820	133676	142821
10¾	SL	142742	142823	133679	142824
11¾	SL	142743	142826	133682	142827
13⅜	SL*	142744	142829	133685	142830

Other Part Numbers: (all pipe sizes)
133627 Holder
142184 Retracting Screw, H_2S Trim
135160 Retaining Screw

* *Indicates blocks and rubbers normally available from stock.*
1 *Other pipe O.D. sizes available on request.*
2 *Includes holder, retracting screws, block, and rubber.*
3 *Includes block and rubber.*
4 *Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*

SL BOP Ram Assemblies–18¾" (5,000/10,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Rubber Sub Assy.[4]
C.S.O.	SL	142750	142849	142401	142850
2⅜	SL*	142751	142852	142402	142853
2⅞	SL*	142752	142855	142404	142856
3½	SL-D*	142767	142900	133772	142859
4	SL-D	142768	142901	133774	142862
4½	SL-D	142769	142902	133776	142865
5	SL-D*	142770	142903	133778	142868
5½	SL-D	142771	142904	133780	142871
6⅝	SL	142758	126061	126062	142874
7	SL*	142759	142876	142408	142877
7⅝	SL	142760	142879	142410	142880
8⅝	SL	142761	142882	142412	142883
9⅝	SL*	142762	142885	142414	142886
10¾	SL	142763	142888	142416	142889
11¾	SL	142764	142891	142418	142892
13⅜	SL*	142765	142894	142422	142895
16	SL	142766	142897	142424	142898

Other Part Numbers: (all pipe sizes)
139413 Holder
142184 Retracting Screw, H_2S Trim
135160 Retaining Screw

* *Indicates blocks and rubbers normally available from stock.*
1 Other pipe O.D. sizes available on request.
2 Includes holder, retracting screws, block, and rubber.
3 Includes block and rubber.
4 Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).

SL BOP Ram Assemblies–18¾" (10,000/15,000 psi, UltraTemp)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Face Seal	Top Seal
3½	SL-D	170041	170052	121573	170034	171002
4	SL-D	170043	170054	121576	170035	171002
4½	SL-D	170045	170056	121579	170036	171002
5	SL-D	170047	170058	121582	170037	171002
5½	SL-D	170049	170060	121585	170038	171002
6⅝	SL-D	170062	170063	124725	170039	171002

Other Part Numbers: 121522 Holder
(all pipe sizes) 121213 Retracting Screw, H_2S Trim

1 Other pipe O.D. sizes available on request.
2 Includes holder, retracting screws, block, and rubber.
3 Includes block and rubber.
4 Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).

SL BOP Ram Assemblies–18¾" (15,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block	Rubber Sub Assy.[4]
C.S.O.	SL	20010943	20010928	121525	20010896
2⅜	SL	20121526	121527	121528	126163
2⅞	SL	121529	121530	121531	20126164
3½	SL-D*	121571	121572	121573	126165
4	SL-D	121574	121575	121576	126166
4½	SL-D	121577	121578	121579	126167
5	SL-D*	121580	121581	121582	126168
5½	SL-D	121583	121584	121585	126169
6⅝	SL	20121547	121621	124725	126170
7	SL	121550	121551	121552	126171
7⅝	SL	121553	121554	121555	126172
8⅝	SL	121556	121557	121558	126173
9⅝	SL	20121559	121560	121561	126174
10¾	SL	121562	121563	121564	126175
11¾	SL	121565	121566	121567	126176
13⅜	SL	121568	121569	121570	126177

Other Part Numbers: (all pipe sizes)
121522 Holder
121213 Retracting Screw, H_2S Trim
121103 Top Seal

* *Indicates blocks and rubbers normally available from stock.*
** *Type 75-H*
† *Type 75. Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*
1 Other pipe O.D. sizes available on request.
2 Includes holder, retracting screws, block, and rubber.
3 Includes block and rubber.
4 Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).

SL BOP Ram Assemblies–21¼" (5,000/10,000 psi)

Pipe O.D.[1] (in.)	Ram Type	Complete Ram Assy.[2]	Block Sub Assy.[3]	Block**	Rubber Sub Assy.†
C.S.O.	SL	140708	114478	114479	20114480
2⅜	SL	–	114482	114483	20114484
2⅞	SL	140710	114488	114489	20114490
3½	SL-D*	140711	114494	114591	20114496
4	SL-D	140728	114593	20114594	114502
4½	SL-D	140713	114506	20114507	114508
5	SL-D*	140730	114599	114600	114514
5½	SL-D	140731	114602	114603	114520
6⅝	SL	20140716	114524	114525	114526
8⅝	SL	140719	–	20114543	114544
9⅝	SL	140720	114548	114549	114550
10¾	SL	140721	114554	114555	114556
11¾	SL	140722	114560	114561	114562
13⅜	SL	140724	114572	114573	114574
16	SL	140725	114578	114579	114580
18⅝	SL	140726	114584	114585	114586

Other Part Numbers: (all pipe sizes)
138267 Holder
142184 Retracting Screw, H_2S Trim
135160 Retaining Screw

* *Indicates blocks and rubbers normally available from stock.*
** *Type 75-H*
† *Type 75. Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*
1 *Other pipe O.D. sizes available on request.*
2 *Includes holder, retracting screws, block, and rubber.*
3 *Includes block and rubber.*
4 *Includes two retaining screws. Rubber is nitrile (NOV spec. SS-204).*

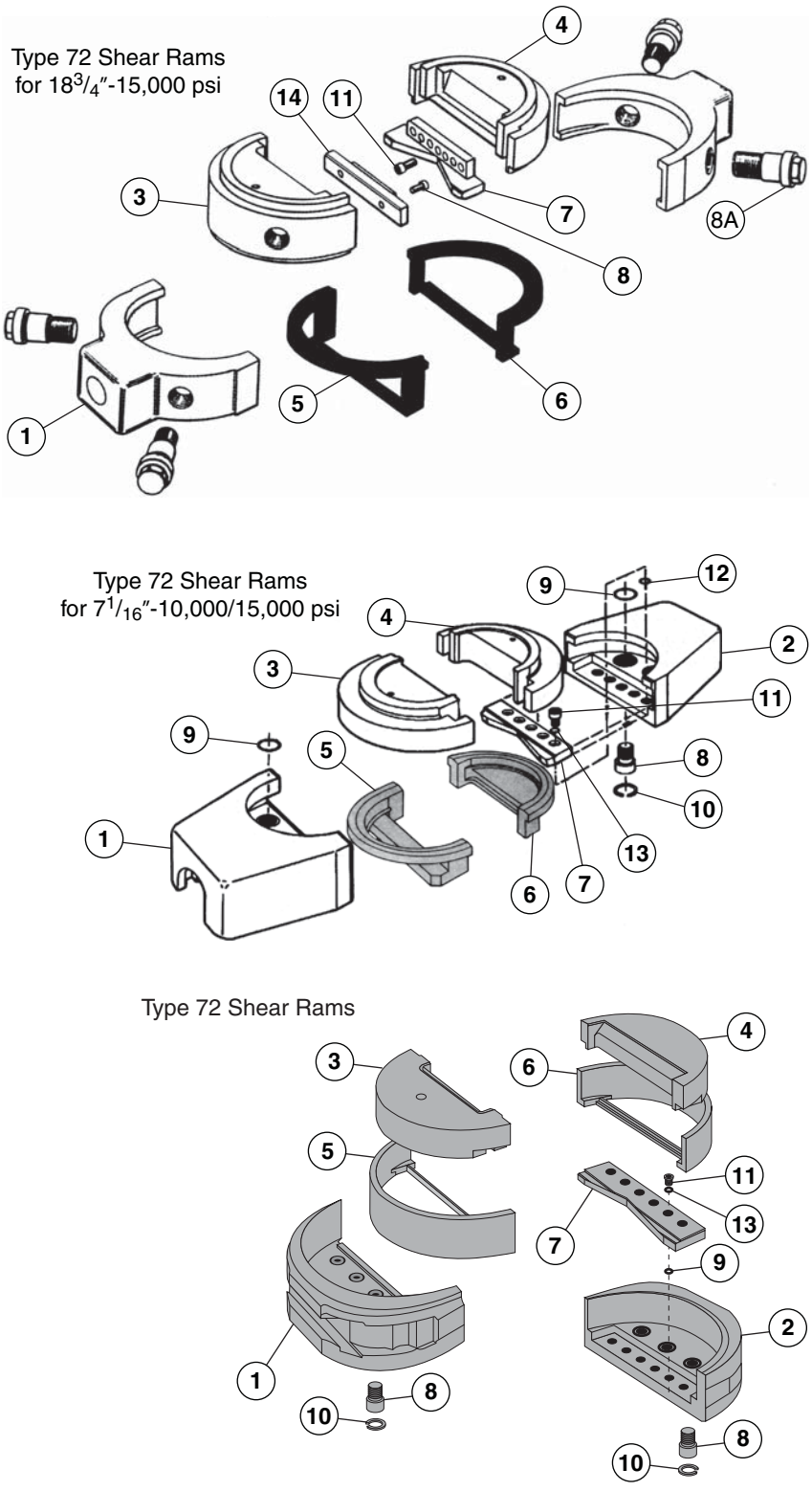


Figure 5-2. Type 72 Shear Ram

Shear Ram Assemblies–Type 72 for Standard Service

Working Pressure (psi)				15,000					10,000						5,000			3,000
Item #	Description	Qty	Spare Parts	18¾ SL	13⅝ SL	11 SL	11 SL-86	7 1/16 SL	21¼ SL/LWS	18¾ SL/LWS	16¾ SL/LWS	13⅝ SL/LWS	11 SL/LWS	7 1/16 SL	21¼ SSL	16¾ SL/LWS	13⅝ SL	13⅝ SL
–	Assembly	–	–	20121586	114144	114116	20005402	115782	138936	127114	133614	20127075	116409	115782	138936	116342	20005011	20005011
1	Holder-Upper	1	–	126522	124243	124247	20005673	122714	138937	127281	124251	126892	122612	122714	138937	124255	126541	126541
2	Holder-Lower	1	–	126522	124244	124248	20005673	122715	138938	127281	124252	126510	122619	122715	138938	20124256	126541	126541
3	Ram Block-U	1	–	121588	114148	114120	113120	115793	116167	126797	133616	127078	116414	115793	116167	116341	20005014	20005014
4	Ram Block-L	1	–	121591	20114150	114122	20113124	115797	138940	20002075	133618	126455	116422	115797	138940	138471	126564	126564
5	Rubber, Upper	1	1	122607	114151	114123	20113122	115795	138941	20028715	133620	126511	116416	115795	138941	138951	126562	126562
6	Rubber, Lower	1	1	20005469	114152	114124	20113125	115798	138942	20028716	133621	126512	116423	115798	138942	138952	20005541	20005541
7	Shear Blade (L)	1	–	121238	114155	114127	20113134	115667	138944	126868	133619	127080	116424	115667	138944	138792	20005016	20005016
8	Retainer Screw	8	8	–	136645	–	–	–	136645	–	136645	–	–	–	136645	–	–	–
		6	6	–	–	136645	–	–	–	–	–	–	136658	–	–	136645	–	–
		4	4	–	–	–	–	136658	–	–	–	–	–	136658	–	–	–	–
		2	2	011335	–	–	011288	–	–	011335	–	011335	–	–	–	–	011335	011335
8A	Retracting Screw	4	4	121213	–	–	20113143	–	–	121213	–	20126509	–	–	–	–	141200	141200
9	O-ring, Retainer Screw	8	8	–	030012	–	–	–	030012	–	030012	–	–	–	030012	–	–	–
		6	6	N/A	–	030012	N/A	–	–	N/A	–	N/A	030111	–	–	030012	N/A	N/A
		4	4	–	–	–	–	030111	–	–	–	–	–	030111	–	–	–	–
10	Retainer Ring	8	8	–	041457	–	–	–	041457	N/A	041457	–	–	–	041457	–	N/A	N/A
		6	6	N/A	–	041457	N/A	–	–	–	–	N/A	041458	–	–	041457	–	–
		4	4	–	–	–	–	041458	–	–	–	–	–	041458	–	–	–	–
11	Allen Nylok Screw	11	11	–	–	–	–	–	010881	–	–	–	–	–	010881	–	–	–
		8	8	–	010881	–	–	–	–	–	010881	–	–	–	–	–	–	–
		7	7	010884	–	010881	–	–	–	010750	–	–	–	–	–	–	–	–
		6	6	–	–	–	010706	–	–	–	–	–	010953	–	–	010883	–	–
		5	5	–	–	–	–	010953	–	–	–	010750	–	010953	–	–	012766	012766
12	O-ring, Nylok Screw	11	11	–	–	–	–	–	030009	N/A	–	–	–	–	030009	–	N/A	N/A
		8	8	–	N/A	–	–	–	–	–	030009	–	–	–	–	–	–	–
		7	7	N/A	–	030009	N/A	–	–	–	–	–	–	–	–	–	–	–
		6	6	–	–	–	–	–	–	–	–	N/A	030058	–	–	030009	–	–
		5	5	–	–	–	–	030058	–	–	–	–	–	030058	–	–	–	–
13	Copper Washer	11	11	–	–	–	–	–	025051	N/A	–	–	–	–	025051	–	N/A	N/A
		8	8	–	025051	–	–	–	–	–	025051	–	–	–	–	–	–	–
		7	7	N/A	–	025051	N/A	–	–	–	–	–	–	–	–	–	–	–
		6	6	–	–	–	–	–	–	–	–	N/A	025050	–	–	025052	–	–
		5	5	–	–	–	–	025050	–	–	–	–	–	025050	–	–	–	–
14	Upper Retainer	1	1	126609	N/A	N/A	113137	N/A	N/A	127282	N/A	126368	N/A	N/A	N/A	N/A	126563	126563

Parts List – PosLock Multi-Lock and Manual-Lock BOPs

Item #	Description	Qty.	Spare Parts	Working Pressure 15,000 psi					Working Pressure 10,000 psi							Working Pressure 5,000 psi				W. P. (psi) 3,000/5,000	
–	Bore (in)	–	–	18¾	13⅝	11	7 1/16(h)	7 1/16	21¼	18¾	16¾	13⅝	11	7 1/16(h)	7 1/16	21¼	18¾	16¾	16¾(h)	13⅝	13⅝(h)
–	Piston (in)	–	–	14	14	14	10	14	14	14	14	14	14	10	14	14	14	14	10	14	10
–	Ram Shaft (in)	–	–	4¼	5¼	4¼	3¾	3¾	5¼	5¼	5¼	5¼	5¼	3¾	3¾	5¼	5¼	4¼	4¼	4¼	4¼
–	Locking Shaft	–	–	–	–	–	2	–	–	–	2	2	2	2	–	2	–	–	2	–	2
				Common Parts																	
1	Body	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2	Ram Shaft Seal Assy.**	2	2	20113168	20130895	20113168	20115540	20115540	132492	132492	132492	132492	132492	20115540	20115540	132492	132492	132536	132536	132536	132536
2A	Piston Assy. (PosLock)	–	–	135080	134481	135080	115441	115492	134481	134481	134481	134481	134481	115441	115492	134481	134481	135080	130222	135080	130222
2B	Piston Assy. (Multi-Lock)	–	–	121892	121890	121892	–	–	121890	121890	121890	121890	121890	–	–	121890	121890	121892	–	121892	–
3	Door Seal***	2	4*	121593	120386	113150	115419	115419	031038	031038	031079	135251	131914	115419	115419	031038	031038	031079	031079	130203	130203
4	Door	2	–	121098	20005465	113162	20115425	20115414	130695	130695	139681	114650	131683	20115425	20115414	130695	130695	131778	131777	130982	120842
5	O-ring, Cylinder	2	2	030008	030108	030008	030101	030008	030108	030108	030108	030108	030108	030101	030008	030108	030108	030108	030030	030108	030030
6	Cylinder	2	–	121085	134913	113163	–	–	134472	134575	135265	134913	131687	–	–	134472	134575	135265	135270	134913	130208
	O-ring Cyl. Adapter†	2	2	–	–	–	–	030101	–	–	–	–	–	–	030101	–	–	–	–	–	–
	Backup Ring, Cyl.†	2	2	030830	–	030830	030829	030830	–	–	–	–	–	030829	030830	–	–	–	–	–	–
	Backup Ring, Cyl. Adapter†	2	2	–	–	–	–	030829	–	–	–	–	–	–	030829	–	–	–	–	–	–
7	Backup Ring, Cyl. Head	2	2	030791	030791	030791	030790	030791	030791	030791	030791	030791	030791	030790	030791	030791	030791	030791	030790	030791	030790
8	O-ring, Cyl. Head	2	2	030105	030105	030105	030100	030105	030105	030105	030105	030105	030105	030100	030105	030105	030105	030105	030100	030105	030100
9	O-ring Cyl. Manifold	8	8	030061	030061	030061	030061	030061	030061	030061	030061	030061	030061	030061	030061	030061	030061	030061	030061	030061	030061
10	Cyl. Manifold	2	–	121087	134915	20005405	–	–	134473	134576	135271	134915	134132	–	–	134473	134576	131782	135271	134915	130207
11	ESNA Nut	8	–	–	–	–	020107	–	–	–	–	–	–	020107	–	–	–	–	–	–	–
		12	–	–	–	–	020107	–	–	–	–	–	–	020107	–	–	–	–	020105	–	020105
		16	–	020105	020105	020105	–	020105	020105	020105	020105	020105	020105	–	020105	020105	020105	020105	–	020105	–
12	Stud, Cyl.	12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	135267	–	130217
		16	–	121086	134121	20005404	–	–	134474	134577	135267	134121	131688	–	–	134474	134577	135267	–	134121	–
–	Cap Screw Adpt.	16	–	–	–	–	–	010989	–	–	–	–	–	–	010989	–	–	–	–	–	–
13	Cap Screw***	8	8*	–	–	–	142084	142084	–	–	–	–	–	142084	142084	–	–	–	–	142084	142084
		10	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	142084	142084	–	
		12	12	121455	–	142084	–	–	–	–	–	–	142084	–	–	–	–	–	–	–	–
		16	16	–	–	–	–	–	–	–	–	142084	–	–	–	–	–	–	–	–	–
		20	20	–	–	–	–	–	142084	142084	142084	–	–	–	–	–	142084	–	–	–	–
		24	24	–	142084	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
14	Pipe Plug, Door and Body	2	–	–	–	–	065001	065001	–	–	–	–	–	065001	065001	–	–	–	–	–	–
		8	–	065002	065002	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		16	–	–	–	–	–	–	065002	065002	065002	065002	065002	–	–	065002	065002	065002	065002	065002	065002
		18	–	–	–	065002	065004	065004	–	–	–	–	–	065004	065004	–	–	–	–	–	–
15	Bracket Assy.**	1	–	–	–	–	126450	126450	–	–	–	–	–	126450	126450	–	–	–	–	–	–
		2	–	126258	126258	20113135	–	–	126258	126258	126258	126258	126258	–	–	126258	126258	126258	126258	126258	126258
16	Bleeder Plug	2	–	136635	136635	136635	136635	136635	136635	136635	136635	136635	136635	136635	136635	136635	136635	136635	136635	136635	136635
17	Check Valve	2	–	130368	130368	130368	130368	130368	130368	130368	130368	130368	130368	130368	130368	130368	130368	130368	130368	130368	130368
18	Sealant, Secondary	6	6	050000	050000	050000	050000	050000	050000	050000	050000	050000	050000	050000	050000	050000	050000	050000	050000	050000	050000
19	Piston Screw	2	–	010004	010004	010004	010004	010004	010004	010004	010004	010004	010004	010004	010004	010004	010004	010004	010004	010004	010004
20	Plug, Secondary	2	–	065002	065002	065002	065002	065002	065002	065002	065002	065002	065002	065002	065002	065002	065002	065002	065002	065002	065002
	Ram Assembly†**																				
–	Door Wrench†	1	–	050832	050709	050709	050709	050709	050709	050709	050709	050709	050709	050709	050709	050709	050709	050709	050709	050709	050709

Parts List – PosLock Multi-Lock and Manual-Lock BOPs (Continued)

Item #	Description	Qty.	Spare Parts	Working Pressure 15,000 psi					Working Pressure 10,000 psi							Working Pressure 5,000 psi				W. P. (psi) 3,000/5,000	
PosLock and Multi-Lock Parts																					
–	Cylinder†	2	–	–	–	113163	115428	115416	–	–	–	–	–	115428	115416	–	–	–	–	–	–
–	Stud Cylinder†	8	–	–	–	–	115430	–	–	–	–	–	–	115430	–	–	–	–	–	–	–
		16	–	–	–	20005404	–	115490	–	–	–	–	–	–	115490	–	–	–	–	–	–
–	Cyl. Manifold†	2	–	–	–	20005405	115418	115417	–	–	–	–	–	115418	115417	–	–	–	–	–	–
1	Ram Shaft	2	–	121088	120385	113166	115437	20115415	139684	134557	139684	114651	131686	115437	20115415	139684	134557	131779	131780	130297	130297
2A	Piston Assy. (PosLock)	2	–	135080	134481	–	115441	115492	134481	134481	134481	134481	134481	115441	115492	–	134481	135080	130222	135080	130222
2B	Piston Assy. (Multi-Lock)	2	–	121892	121890	121892	–	123957	121890	121890	121890	121890	121890	–	123957	121890	121890	121892	–	121892	–
3	Cyl. Head	2	–	134914	134914	134914	115429	134914	134914	134914	134914	134914	134914	115429	134914	134914	134914	134914	134110	134914	134110
–	Adapter†	2	–	–	–	–	–	115491	–	–	–	–	–	–	115491	–	–	–	–	–	–
Manual Lock Parts																					
–	Cylinder†	2	–	–	–	131687	115458	115416	–	134575	135265	–	–	115458	115416	–	134575	–	–	134913	–
–	Stud Cylinder†	4	–	–	–	131688	115460	115490	–	134577	135267	–	–	115460	115460	–	134577	–	–	134121	–
–	Cyl. Manifold†	2	–	–	–	20005405	115461	115417	–	134576	135271	–	–	115461	115417	–	134576	–	–	134915	–
1	Ram Shaft	2	–	–	114630	123666U	115462	20115540	123135	20112646	112643	114653	131913	115462	20115540	123135	20112646	–	126210	121481	139337
2	Piston Assy.**	2	–	–	114638	132650	115464	115542	131915	131915	131915	131915	131915	115464	115542	131915	131915	–	131790	132650	131790
3	Locking Shaft	2	–	–	–	114634	20115463	141247	123133	20112647	112644	20141292	141273	20115463	141247	123133	20112647	–	141297	20141292	141297
4	Locking Shaft																				
	Seal Assembly**	2	2	–	20114635	20114635	115448	132540	132540	132540	132540	132540	132540	115448	132540	132540	132540	–	132540	132540	132540
5	Cylinder Head	2	–	–	114637	114637	20115459	20003851	121765	20003851	20003851	20003851	20003851	20115459	20003851	121765	20003851	–	134111	20003851	134111
–	Cap Screw†	2	–	–	–	010881	010881	010881	–	–	–	–	–	010881	010881	–	–	–	–	–	–
–	Hand Wheel†	2	–	–	115050	–	115050	115050	–	–	–	115050	115050	115050	115050	–	–	–	–	–	115050
–	Universal Joint†	2	–	–	202007	–	202007	202007	–	–	–	202007	202007	202007	202007	–	–	–	202007	–	202007

* *Quantity for single model. Increase proportionately for dual or triple SL ram BOPs.*
** *Subassemblies which give recommended spare parts are listed elsewhere in this catalog.*
*** *Quantity for $7^{1}/_{16}$" 10,000 psi and 15,000 psi models is 2 on door seal and 4 on door cap screw.*
† *Not illustrated.*
(h) When using shear rams, models with 14" cylinders are required.

Common Parts

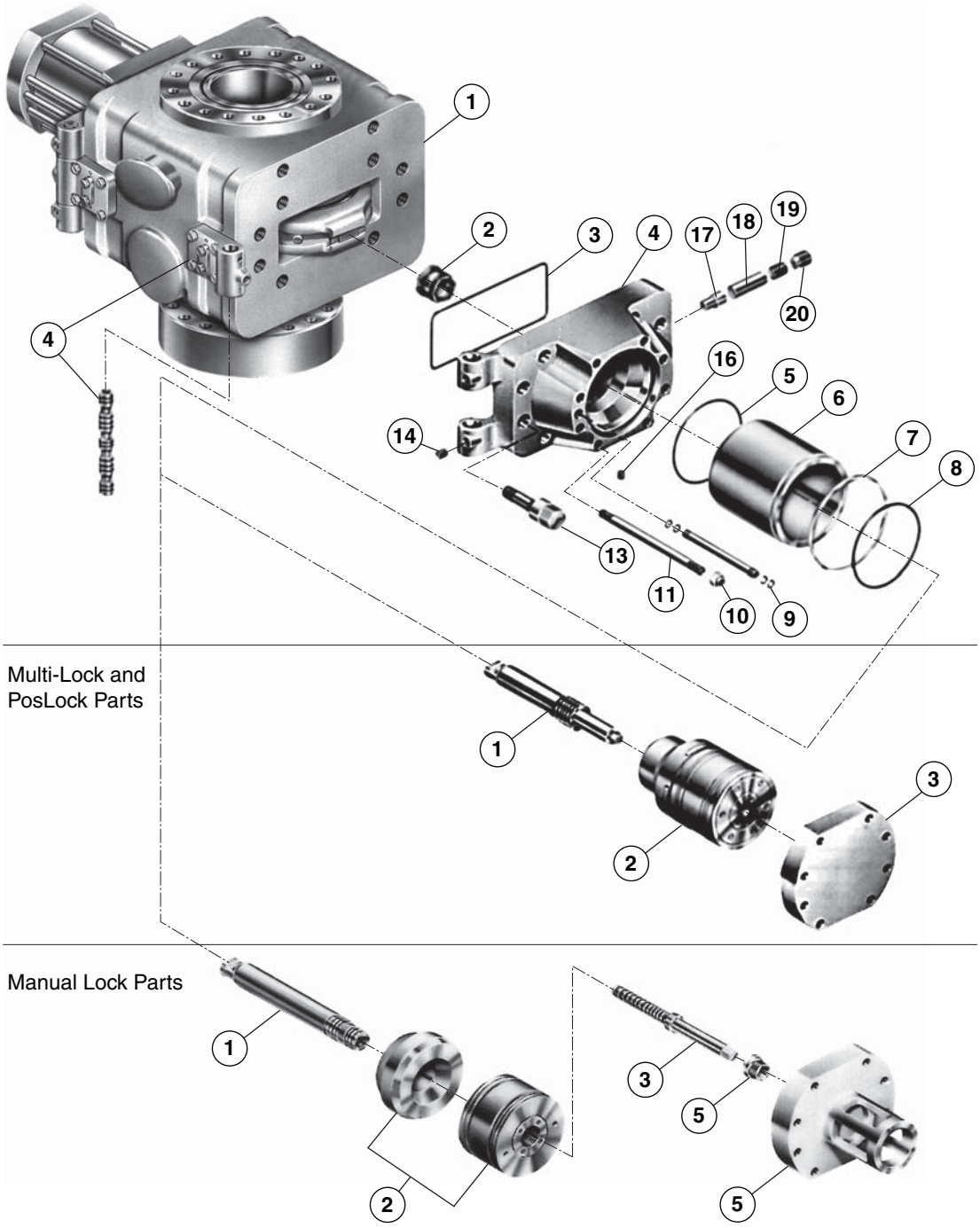
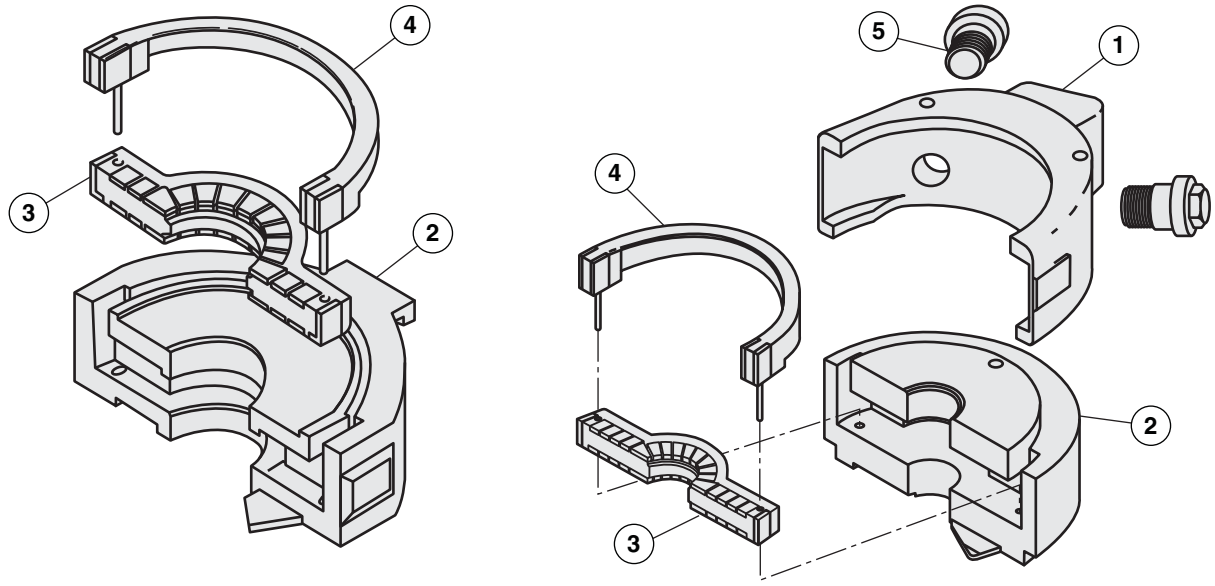


Figure 5-3. Model SL PosLock and Manual Lock BOP Parts



Multi-Ram One-Piece Pipe Ram Assembly

Multi-Ram Two-Piece Pipe Ram Assembly

Figure 5-4. Multi-Ram Assemblies

Multi-Ram Assemblies

	Working Pressure (psi)		15,000			10,000								5,000				3,000	2,000
	Bore (in)		18¾	7 1/16	7 1/16	18¾	18¾	16¾	13⅝	13⅝	11	7 1/16	7 1/16	13⅝	13⅝	11	7 1/16	20¾	21¼
	Lower Range		3½	2⅜	2⅜	3½	3½	3½	3½	3½	3½	2⅜	2⅜	2⅞	4½	3½	2⅜	3½	3½
	Upper Range		5	3½	3½	5½	5	5	5	5	5	3½	3½	5½	7	5	3½	5½	5½
	Pipe Suspension (000 lb)																		
	3½		200	N/A	N/A	200	200	200	200	NO	NO	N/A	N/A	NO	N/A	NO	N/A	200	200
	4		200	N/A	N/A	200	200	200	200	NO	NO	N/A	N/A	NO	N/A	NO	N/A	200	200
	4½		400	N/A	N/A	200	400	400	400	400	400	N/A	N/A	NO	N/A	400	N/A	200	200
	5		600	N/A	N/A	600	600	600	600	600	600	N/A	N/A	600	N/A	600	N/A	600	600
	5½		N/A	N/A	N/A	600	N/A	N/A	N/A	N/A	N/A	N/A	N/A	600	N/A	N/A	N/A	600	600
Item #	Description	Qty. Reqd.*	(2) SL	SL	LWS	(2) SL	(2) SL	(2) SL	(2) SL	(2) SL	(2) SL	SL	LWS	(1) SL/LWS	(1) (3) SL/LWS	LWS	LWS	(1) LWS	(1) LWS
–	Complete Assy.	–	126027	122932	122889	167148	125105	125110	125120	125125	125130	122932	122889	125134	124195	126161	122896	20122834	20122834
–	Block Sub Assy.	–	126028	N/A	N/A	167151	125106	125111	125121	125126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	122835	122835
–	Rubber Assy.	–	20125102	122891	122891	124564	20125107	125112	125117	125127	125131	122891	122891	125135	122598	126215	122898	122838	122838
1	Holder-Ram	1	126522	N/A	N/A	139413	139413	133627	138180	138180	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20005150	20005150
2	Block	1	126029	122933	122890	167152	20126002	125113	125123	20125118	125132	122933	122890	125197	124196	121058	20122897	20005482	20005482
3	Seal-Face	1	20125104	122892	122892	123378	125109	20125114	20125119	125129	125133	122892	122892	125137	20122601	126216	122899	20005485	20005485
4	Seal-Top	1	121261	122451	122451	124562	124562	121027	121010	121010	121036	122451	122451	121055	123192	121062	122451	122839	122839
5	Screw, Retracting	2	121213	N/A	N/A	N/A	142184	142184	142061	142061	N/A	N/A	N/A	N/A	N/A	N/A	N/A	142061	142061
6	Screw, Retaining	1	122864	N/A	N/A	N/A	N/A	125124	N/A	125128	125128	N/A	N/A	125122	N/A	N/A	N/A	122864	122864

(1) 10″ cylinder required (minimum)
(2) 14″ cylinders (manual or multilocks)
(3) 10″ cylinders use 3,000 psi operating
14″ cylinders use 1,500 psi operating

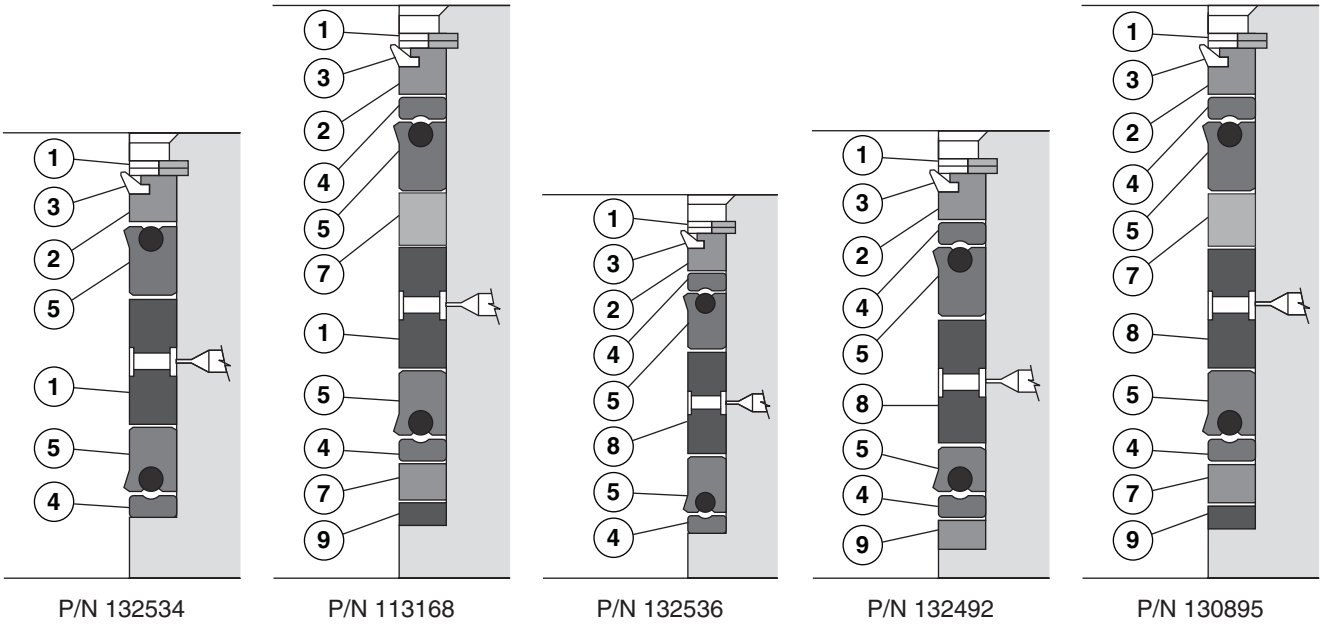


Figure 5-5. Ram Shaft Seal Assemblies

Parts List – Ram Shaft Seal Assembly

Item #	Qty.	Description	P/N					
		Ram Shaft (in)	3¾	4¼	4¼	4¼*	5¼	5¼
		Assembly Number	115450	20113168	132536	132536-A	132492	20130895
1	1	Retainer	142536	141317	141317	141317	142514	142514
2	1	Holder, Wiper Ring	115452	113151	116241	–	116233	116088
3	1	Wiper Ring	031176	20005436	20005436	–	116204	116204
4	2	Packing End Ring	031175	116239	116239	030216	116206	116206
5A	1	Packing	–	–	–	–	20116207	–
5	1	Packing	–	–	–	–	116203	–
	2		031174	116238	116238	–	–	20116207
6	2	Bearing	062236	062265	–	–	–	116205
7	1	Packing Adapter	115451	20113148	116164	116164	134484	130609
8	1	Backup Ring	115453	141366	–	–	116087	116087
9	1	Header Ring	–	–	–	–	–	–

**Optional locking shaft seal assemblies to be used for field replacement only.*

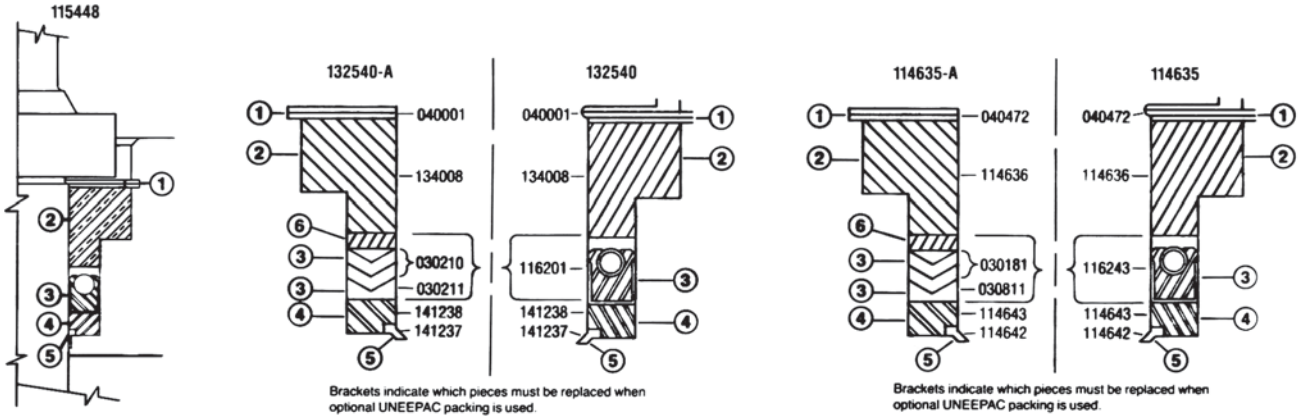


Figure 5-6. Locking Shaft Seal Assemblies

Parts List – Locking Shaft Seal Assembly

Item #	Qty.	Description / Ram Shaft (in) / Assembly Number	P/N 2 115448	P/N 2* 132540	P/N 2* 132540-A	P/N 2½ 20114635	P/N 2½* 20114635-A
1	1	Retainer, Bushing	040001	040001	040001	040472	040472
2	1	Thrust Bushing	115449	134008	134008	114636	114636
3	1	Packing	062255	116201	030210	116243	030181
	1		–	–	030211	–	030811
4	1	Holder, Wiper Ring	115488	141238	141238	114633	114633
5	1	Wiper Ring	141237	141237	141237	114642	114642
6	1	Header Ring	–	–	–	–	–

**Optional locking shaft seal assemblies to be used for field replacement only.*

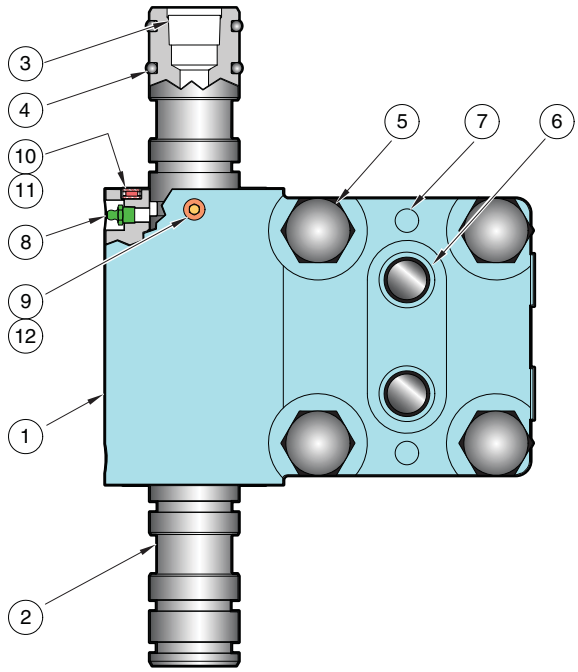


Figure 5-7. SL Hinge Bracket

Parts List – SL Hinge Bracket Assembly

Item #	Description	P/N	Qty. Req.*	Spare Parts
Assembly	Hinge Bracket Assembly	126258	–	–
1	Hinge Bracket	126261	1	–
2	Hinge Pin (2¼″ Diameter)	134134	1	–
3	Socket Head for Hinge Pin	065002	4	2
4	O-ring, Hinge Pin	030012	10	20
5	Cap Screw, Hinge Bracket	011203	4	–
6	O-ring, Hinge Bracket	030065	2	4
7	Dowel Pin	050096	2	–
8	Grease Fitting	050267	2	–
9	Socket Head Plug	065008	1	–
10	Thrust Bearing	060810	2	–
11	Bearing Race	060827	4	–
12	Set Socket Screw	011340	1	–

**Quantities shown are for one assembly. A single model requires two assemblies, a double model requires four assemblies, and a triple model requires six assemblies. Increase quantities appropriately.*

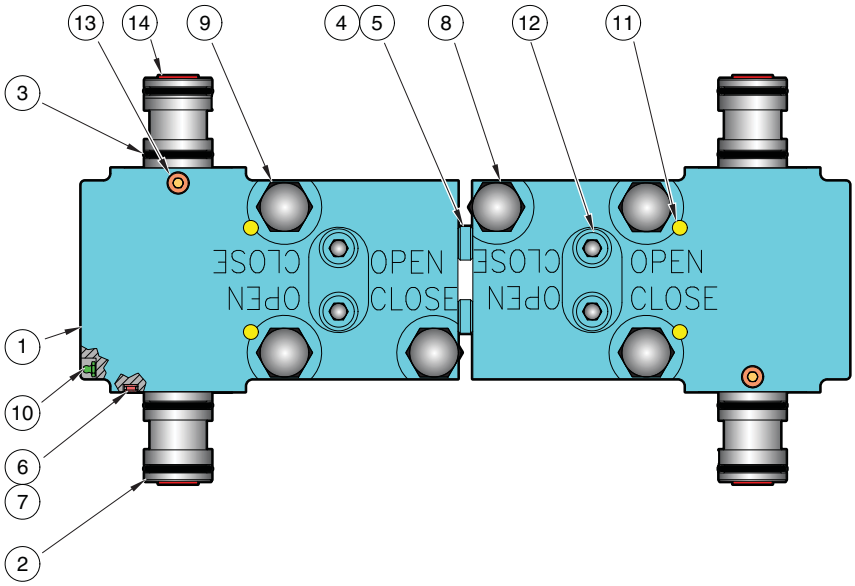


Figure 5-8. Hinge Bracket Assembly 7-10/15M

Parts List – SL Hinge Bracket Assembly 7-10/15M

Item #	Description	P/N	Qty. Req.*	Spare Parts
Assembly	Hinge Bracket Assembly	126450	–	–
1	Hinge Bracket 7-15M	126448	2	–
2	Hinge Pin (2¼″ Diameter)	115456	2	–
3	O-ring, Hinge Pin	030012	14	28
4	Hinge Bracket Manifold	126449	4	–
5	O-ring	030054	16	–
6	Thrust Needle Bearing	060810	4	–
7	Washer Bearing Race	060827	8	–
8	Screw (Hardened)	011069	2	–
9	Screw	010990	4	–
10	Grease Fitting	050267	4	–
11	Dowell Pin	050083	4	–
12	Plug (¾″ NPT)	065004	12	–
13	Retainer Pin	20005563	2	–
14	Plug (1″ NPT)	065002	4	–

**Quantities shown are for one assembly. A single model requires two assemblies, a double model requires four assemblies, and a triple model requires six assemblies. Increase quantities appropriately.*

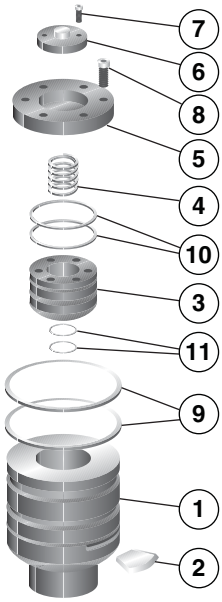


Figure 5-9. PosLock and Multi-Lock Piston Assembly

PosLock and Multi-Lock Piston Assemblies

Item #	Description	Qty.*	Spare Parts*	P/N							
–	Piston Assembly	–	–	Multi	Pos	Pos	Pos	Pos	Multi	Pos	Multi
–	Model	–	–	SL	SL	SL	SL	SL/LWS	SL/LWS	SL	SL/LWS
–	Assembly Part Number	–	–	123957	115441	115492	130222	135080	121892	134481	121890
–	Piston Size (in)	–	–	14	10	14	10	14	14	14	14
–	Ram Shaft Size (in)	–	–	3 3/4	3 3/4	3 3/4	4 1/4	4 1/4	4 1/4	5 1/4	5 1/4
1	Mandrel Assembly	1	–	123962	115443	115525	130211	115648	121893	134467	20121881
2	Locking Segment	4	–	N/A	135072	135082	135072	135082	N/A	135082	N/A
2A	Locking Segment, Small	2	–	121884	N/A	N/A	N/A	N/A	121884	N/A	121884
2B	Locking Segment, Large	2	–	20123958	N/A	N/A	N/A	N/A	121886	N/A	121886
3	Locking Cone	1	–	123960	115446	115529	135073	135083	121883	135083	121883
4	Spring	1	–	134674	134674	134674	134674	134674	134674	134674	134674
5	Retainer Plate	1	–	115530	115447	115530	135075	135084	135084	135084	135084
6	Locking Plate	1	–	20124535	115442	20124535	135074	135074	135074	135074	135074
7	Cap Screw	2	–	010687	010691	010687	010691	010691	010691	010691	010691
8	Cap Screw	6	–	010883	010614	010739	010614	010739	010739	010739	010739
9	Seal	2	4	031181	031180	031181	030778	030785	030785	030785	030785
10	Seal (outer)	2	4	136321	136334	136321	136334	136321	136321	136321	136321
11	Seal (inner)	2	4	136322	136322	136322	136322	136322	136322	136322	136322
12[3]	Wear Ring, Mandrel	2	–	119263	115489	155524	119262	119263	119263	119263	119263
13[3]	Wear Ring, Locking Cone	2	–	N/A	N/A	N/A	N/A	N/A	121997	N/A	121997
14[3]	Guide Pin	1	–	121891	N/A	N/A	N/A	N/A	121891	N/A	121891

** Quantities shown are for one assembly. A single model requires two assemblies, a double model requires four assemblies, and a triple model requires six assemblies. Increase quantities appropriately.*
2 Use only quantity of one seal per assembly. Spares would be reduced to two.
3 Not shown.

Figure 5-10. Manual Lock Piston Assembly

Manual-Lock Piston Assemblies

Item #	Description	Qty.*	Spare Parts*	P/N				
–	Assembly Part Number	–	–	115464	131790	131915	132650	115542
–	Piston Size (in)	–	–	10	10	14	14	14
–	Ram Shaft Size (in)	–	–	$3^1/_4$	$4^1/_4$	$5^1/_4$	$4^1/_4$	$3^3/_4$
1	Piston Spacer	1	–	N/A	20131928	134127	134127	115551
2	Lock Nut (inner)	1	–	N/A	134124	N/A	134124	N/A
3	Piston Seal	2	4	031180	030778	030785	030785	031181
4	Piston	1	–	115466	130997	132651	134123	115543
5	O-ring, Piston	2	2	030122	030014	030014	030014	030014
6	Lock Nut (outer)	1	–	N/A	134125	134125	134125	115552
7	Set Screw	1	–	N/A	010000	010000	010000	010000
8†	Wear Ring	2	–	115489	119262	119263	119263	115524
9†	Locking Plate	1	–	115467	N/A	N/A	N/A	N/A
10†	Cap Screw	4	–	010609	N/A	N/A	N/A	N/A

** Quantities shown are for one assembly. A single model requires two assemblies, a double model requires four assemblies, and a triple model requires six assemblies. Increase quantities appropriately.*
† Not shown.

API Ring Gaskets

Flange			R (Oval)			RX	
Working Pressure psi (bar)	Nominal Size in (mm)	R or RX Number	Soft Iron Cad. Plated	Type 304 Stainless Steel	Rubber Coated	Soft Iron Cad. Plated	Type 304 Stainless Steel
2,000 (138) 3,000 (207), 5,000 (345)	2 1/16 (52.4) 2 1/16 (52.4)	23 24	050192 050193	050567 050568	– –	050376 050380	– 050604
2,000 (138) 3,000 (207), 5,000 (345)	2 9/16 (65.1) 2 9/16 (65.1)	26 27	050194 050195	050569 050570	– –	– 050382	– 050607
2,000 (138), 3,000 5,000 (345)	3 1/8 (79.4) 3 1/8 (79.4)	31 35	050196 050197	050571 050572	– –	050383 050384	050608 050609
2,000 (138), 3,000 (207) 5,000 (345)	4 1/16 (103.2) 4 1/16 (103.2)	37 39	050198 050199	050573 050574	050427 –	050385 050386	050610 050611
3,000 (207) 5,000 (345)	5 1/8 (130.2) 5 1/8 (130.2)	41 44	– –	050575 050576	050429 –	050387 050388	050612 050613
2,000 (138), 3,000 (207) 5,000 (345)	7 1/16 (179.4) 7 1/16 (179.4)	45 46	050201 050202	050577 050578	– 050431	050373 050389	050614 050615
2,000 (138), 3,000 (207) 5,000 (345)	9 (228.6) 9 (228.6)	49 50	050203 050204	050580 050581	– –	050390 050391	– –
2,000 (138), 3,000 (207) 5,000 (345)	11 (279.4) 11 (279.4)	53 54	050205 050206	050582 050583	– 050436	050377 050392	050619 050620
2,000 (138), 3,000 (207) 5,000 (345)	13 5/8 (346.1) 13 5/8 (346.1)	57 63	050207 –	050584 –	– –	050393 –	050621 –
2,000 (138) 3,000 (207)	16 3/4 (425.5) 16 3/4 (425.5)	65 66	050209 050210	050586 050587	– –	– 050396	– –
2,000 (138) 3,000 (207)	17 3/4 (450.9) 17 3/4 (450.9)	69 70	050306 –	– –	– –	– –	– –
2,000 (138) 3,000 (207)	21 1/4 (539.8) 20 3/4 (527.1)	73 74	050211 050156	050590 050591	– –	050397 050398	050627 050628
2,000 (138), 3,000 (207)	9 (228.6)	99	–	050601	–	–	–

API BX Ring Gaskets

Flange				
Working Pressure psi (bar)	Nominal Size in (mm)	BX Number	Soft Iron Cad. Plated	Type 304 Stainless Steel
10,000 (690), 15,000 (1034)	1 13/16 (46.0)	151	050352	050644
20,000 (1379)	2 1/16 (52.4)	152	050353	050645
	2 9/16 (65.1)	153	050354	050646
10,000 (690), 15,000 (1034)	3 1/16 (77.8)	154	050355	050647
	4 1/16 (103.2)	155	050366	050648
	7 1/16 (179.4)	156	050356	050649
	9 (228.6)	157	050227	–
	11 (279.4)	158	050350	050651
10,000 (690)	13 5/8 (346.1)	159	050357	050652
5,000 (345)	13 5/8 (346.1)	160	050462	050653
5,000 (345)	16 3/4 (425.5)	161*	050536	–
5,000 (345), 10,000 (690)	16 3/4 (425.5)	162	050661	050662
5,000 (345)	18 3/4 (476.3)	163	050663	050664
10,000 (690)	18 3/4 (476.3)	164	050665	050666
5,000 (345)	21 1/4 (539.8)	165	050667	050668
10,000 (690)	21 1/4 (539.8)	166	050690	050691

* *For obsolete 16 3/4", 5,000 psi (425.4 mm, 345 bar) WP 7,500 psi (517 bar) test flange.*

API Nuts

	Normal Temperature		Low Temperature
Heavy Hex Nuts	Black A194, Gr 2H	Cad. Plated A194, Gr 2H	A194 Gr 4 or 7
1/4″-20UNC	020018	020300	020301
5/16″-18UNC	020019	020304	020305
3/8″-16UNC	020020	020308	–
7/16″-14UNC	020021	020312	–
1/2″-13UNG	020006	020316	020317
9/16″-12UNC	020007	020320	–
5/8″-11UNC	020008	020324	020325
3/4″-10UNC	020004	020328	020329
7/8″-9UNC	020009	020333	020334
1″-8UNC	020001	020338	020339
1 1/8″-8UN	020003	020343	020344
1 1/4″-8UN	020010	020347	020348
1 3/8″-8UN	020011	020351	020352
1 1/2″-8UN	020000	020356	020357
1 5/8″-8UN	020012	020361	020362
1 3/4″-8UN	020013	020366	020367
1 7/8″-8UN	020014	020371	020372
2″-8UN	020015	020376	020377
2 1/4″-8UN	020016	020381	020382
2 1/2″-8UN	020017	020386	020387
2 3/4″-8UN	020034	020391	020392
3″-8UN	020035	020396	020397

Tap End Studs for API Flanges

	Normal Temperature		Low Temperature
Tap End Studs	Black A193 B7	Cad. Plated A193 B7	A320 L7
1/2″ x 2 3/4″	011000	012050	012051
5/8″ x 3 1/2″	011001	012055	012056
3/4″ x 3 3/4″	011002	012060	012061
3/4″ x 4″	011003	012065	012066
7/8″ x 4″	011004	012070	012071
7/8″ x 4 1/4″	011005	012075	012076
7/8″ x 4 1/2″	011006	012080	012081
1″ x 4″	011037	–	–
1″ x 4 3/4″	011007	012085	012086
1″ x 5″	011008	012090	012091
1 1/8″ x 5 1/4″	011009	012095	012096
1 1/8″ x 5 1/2″	011010	012100	012101
1 1/8″ x 5 3/4″	011011	012105	012106
1 1/8″ x 7″	011036	012110	012111
1 1/4″ x 6″	011012	012115	012116
1 1/4″ x 6 1/4″	011013	012120	012121
1 3/8″ x 6 1/2″	011014	012125	012126
1 3/8″ x 6 3/4″	011015	012130	012131
1 3/8″ x 7 1/4″	011016	012135	012136
1 3/8″ x 7 1/2″	011017	012140	012141
1 1/2″ x 7 1/4″	011019	012145	012146
1 1/2″ x 7 3/4″	011020	012150	012151
1 1/2″ x 8 1/4″	011021	012155	012156
1 1/2″ x 8 1/2″	011022	012160	012161
1 5/8″ x 8 1/4″	011023	012165	012166
1 5/8″ x 8 1/2″	011024	012170	012171
1 5/8″ x 13 1/8″	152150	012175	012176
1 3/4″ x 8 1/4″	011034	012180	012181

Tap End Studs for API Flanges (Continued)

	Normal Temperature		Low Temperature
Tap End Studs	Black A193 B7	Cad. Plated A193 B7	A320 L7
1¾″ x 9½″	011025	012185	012186
1⅞″ x 9½″	011026	012190	012191
1⅞″ x 10¼″	011018	012195	012196
1⅞″ x 10¾″	011033	012200	012201
1⅞″ x 11¼″	011027	012205	012206
2″ x 10¼″	011028	012210	012211
2″ x 11¼″	011035	012215	012216
2″ x 11½″	011029	012220	012221
2″ x 12″	011030	012225	012226
2¼″ x 12¼″	012240	012241	012242
2¼″ x 13¼″	012246	012247	012248
2¼″ x 14¼″	011031	012230	012231
2¼″ x 15½″	011032	012235	012236

All Thread Studs and Nuts for API Flanges

All Thread Studs With Two Nuts Each	Normal Temperature		Low Temperature
	Black A193 B7	Cad. Plated A193 B7	A320 L7
1/2″ x 4 1/2″	011440	011442	011444
5/8″ x 4 1/2″	011449	011451	011453
5/8″ x 5 3/4″	011458	011460	011462
5/8″ x 6″	011467	011469	011471
3/4″ x 4″	011476	011478	011480
3/4″ x 5 1/4″	011485	011487	011489
3/4″ x 6″	011496	011498	011500
3/4″ x 7″	011505	011507	011509
7/8″ x 4 1/2″	011514	011516	011518
7/8″ x 5 1/2″	011523	011525	011527
7/8″ x 6″	011532	011534	011536
7/8″ x 7 1/2″	011543	011545	011547
7/8″ x 8″	011552	011554	011556
1″ x 6″	011561	011563	011565
1″ x 6 1/2″	011570	011572	011574
1″ x 7″	011579	011581	011583
1″ x 7 1/4″	011588	011590	011592
1″ x 7 3/4″	011606	011608	011610
1″ x 9 1/4″	011615	011617	011619
1″ x 10″	–	011991	–
1 1/8″ x 7″	011624	011626	011628
1 1/8″ x 7 1/2″	011633	011635	011637
1 1/8″ x 8 1/4″	011644	011646	011648
1 1/8″ x 9″	011655	011657	011659
1 1/4″ x 8″	011664	011666	011668
1 1/4″ x 8 3/4″	011673	011675	011677
1 1/4″ x 9 1/4″	011682	011684	011686
1 1/4″ x 12″	011691	011693	011695
1 3/8″ x 9″	011700	011702	011704

All Thread Studs and Nuts for API Flanges (Continued)

All Thread Studs With Two Nuts Each	Normal Temperature		Low Temperature
	Black A193 B7	Cad. Plated A193 B7	A320 L7
1⅜″ x 9½″	011709	011711	011713
1⅜″ x 10¼″	011720	011722	011724
1⅜″ x 10¾″	011729	011731	011733
1⅜″ x 12½″	011738	011740	011742
1⅜″ x 13¼″	011747	011749	011751
1½″ x 10¼″	011756	011758	011760
1½″ x 11¼″	011765	011767	011769
1½″ x 13″	011776	011778	011780
1⅝″ x 11″	011787	011789	011791
1⅝″ x 11¾″	011796	011798	011800
1⅝″ x 12″	011805	011807	011809
1⅝″ x 12½″	011814	011816	011818
1⅝″ x 17″	011825	011827	011829
1¾″ x 12¼″	011836	011838	011840
1¾″ x 14¼″	011845	011847	011849
1¾″ x 15″	011856	011858	011860
1⅞″ x 13¾″	011867	011869	011871
1⅞″ x 14½″	011876	011878	011880
1⅞″ x 15¾″	011887	011889	011891
1⅞″ x 17½″	011898	011900	011902
1⅞″ x 18½″	011909	011911	011913
2″ x 14½″	011918	011920	011922
2″ x 17¼″	011927	011929	011931
2″ x 17½″	011938	011940	011942
2″ x 18½″	011947	011949	011951
2″ x 19¼″	011958	011960	011962
2¼″ x 22¼″	011969	011971	011973
2½″ x 24¼″	011980	011982	011984

Recommended Spare Parts

The following tables provide recommended spare parts coverage for the SL manual lock and Poslock BOP.

SL Manual Lock BOP Spare Parts List

P/N	Description	Qty.
140286	Spare parts kit for 2 years service on Shaffer 13 5/8″, 3,000/5,000 psi SL BOP with 10″ manual-lock cylinders (elastomer parts). Kit consists of the following:	1
132536	Ram Shaft Seal Assembly	2
132540	Locking Shaft Seal Assembly	4
130203	Door Seal	2
030030	Cylinder O-ring	2
030790	Cylinder Head Backup Ring	2
030100	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030778	Piston Seal	4
030000	Piston O-ring	4
119262	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
140289	Spare parts kit for 2 years service on Shaffer 16 3/4″, 5,000 psi SL BOP with 10″ manual-lock cylinders (elastomer parts). Kit consists of the following:	1
132536	Ram Shaft Seal Assembly	2
132540	Locking Shaft Seal Assembly	4
130203	Door Seal	2
030030	Cylinder O-ring	2
030790	Cylinder Head Backup Ring	2
030100	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030778	Piston Seal	4

SL Manual Lock BOP Spare Parts List (Continued)

P/N	Description	Qty.
030000	Piston O-ring	4
119262	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
140287	Spare parts kit for 2 years service on Shaffer 11″, 10,000 psi SL BOP with 14″ manual-lock cylinders (elastomer parts). Kit consists of the following:	1
132492	Ram Shaft Seal Assembly	2
132540	Locking Shaft Seal Assembly	4
131914	Door Seal	2
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2
030105	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030785	Piston Seal	4
030014	Piston O-ring	4
119263	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
141993	Spare parts kit for 2 years service on Shaffer 13⅝″, 10,000 psi SL BOP with 14″ manual-lock cylinders (elastomer parts). Kit consists of the following:	1
132492	Ram Shaft Seal Assembly	2
132540	Locking Shaft Seal Assembly	4
135251	Door Seal	2
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2
030105	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030785	Piston Seal	4

SL Manual Lock BOP Spare Parts List (Continued)

P/N	Description	Qty.
030014	Piston O-ring	4
119263	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
–	Spare parts kit for 2 years service on Shaffer 16¾″, 10,000 psi SL BOP with 14″ manual-lock cylinders (elastomer parts). Kit consists of the following:	1
132492	Ram Shaft Seal Assembly	2
132540	Locking Shaft Seal Assembly	4
031079	Door Seal	2
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2
030105	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030785	Piston Seal	4
030014	Piston O-ring	4
119263	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
–	Spare parts kit for 2 years service on Shaffer 18¾″, 10,000 psi SL BOP with 14″ manual-lock cylinders (elastomer parts). Kit consists of the following:	1
132492	Ram Shaft Seal Assembly	2
132540	Locking Shaft Seal Assembly	4
131038	Door Seal	2
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2
030105	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030785	Piston Seal	4

SL Manual Lock BOP Spare Parts List (Continued)

P/N	Description	Qty.
030014	Piston O-ring	4
119263	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
142070	Spare parts kit for 2 years service on Shaffer 21¼″, 10,000 psi SL BOP with 14″ manual-lock cylinders (elastomer parts). Kit consists of the following:	1
132492	Ram Shaft Seal Assembly	2
132540	Locking Shaft Seal Assembly	4
131038	Door Seal	2
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2
030105	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030785	Piston Seal	4
030014	Piston O-ring	4
119263	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
140288	Spare parts kit for 2 years service on Shaffer 11″, 15,000 psi SL BOP with 14″ manual-lock cylinders (elastomer parts). Kit consists of the following:	1
20130895	Ram Shaft Seal Assembly	2
132540	Locking Shaft Seal Assembly	4
131774	Door Seal	2
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2
030105	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030785	Piston Seal	4

SL Manual Lock BOP Spare Parts List (Continued)

P/N	Description	Qty.
030014	Piston O-ring	4
119263	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
140290	Spare parts kit for 2 years service on Shaffer 13 5/8″, 15,000 psi SL BOP with 14″ manual-lock cylinders (elastomer parts). Kit consists of the following:	1
20130895	Ram Shaft Seal Assembly	2
132540	Locking Shaft Seal Assembly	4
120386	Door Seal	2
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2
030105	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030785	Piston Seal	4
030014	Piston O-ring	4
119263	Piston Wear Ring	4
050000	Secondary Seal Sealant	6

SL Manual Lock BOP Emergency Parts List

P/N	Description	Qty.
140263	Emergency parts kit for Shaffer 13⅝″, 3,000/5,000 psi SL BOP with manual-lock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
139337	Ram Shaft	2
141297	Locking Shaft	2
142084	Door Screw	8
140262	Emergency parts kit for Shaffer 16¾″, 5,000 psi SL BOP with manual-lock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
20131929	Ram Shaft	2
141297	Locking Shaft	2
142084	Door Screw	8
140260	Emergency parts kit for Shaffer 11″, 10,000 psi SL BOP with manual-lock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
131913	Ram Shaft	2
141273	Locking Shaft	2
142084	Door Screw	12
20140261	Emergency parts kit for Shaffer 13⅝″, 10,000 psi SL BOP with manual-lock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
114653	Ram Shaft	2
20141292	Locking Shaft	2
142084	Door Screw	16
–	Emergency parts kit for Shaffer 16¾″, 10,000 psi SL BOP with manual-lock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
112643	Ram Shaft	2
112644	Locking Shaft	2
142084	Door Screw	16
–	Emergency parts kit for Shaffer 18¾″, 10,000 psi SL BOP with manual-lock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
20112646	Ram Shaft	2
20112647	Locking Shaft	2
142084	Door Screw	16

SL Manual Lock BOP Emergency Parts List (Continued)

P/N	Description	Qty.
142073	Emergency parts kit for Shaffer 21¼″, 10,000 psi SL BOP with manual-lock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
112649	Ram Shaft	2
112650	Locking Shaft	2
142084	Door Screw	16
140264	Emergency parts kit for Shaffer 11″, 15,000 psi SL BOP with manual-lock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
114673	Ram Shaft	2
114634	Locking Shaft	2
142084	Door Screw	20
140265	Emergency parts kit for Shaffer 13⅝″, 15,000 psi SL BOP with manual-lock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
114630	Ram Shaft	2
114634	Locking Shaft	2
142084	Door Screw	20

SL Poslock BOP Spare Parts List

P/N	Description	Qty.
140278	Spare parts kit for 2 years service on Shaffer 13⅝″, 3,000/5,000 psi SL BOP with 14″ Poslock cylinders. Kit consists of the following:	1
030012	Hinge Pin O-ring	20
030061	Cylinder Manifold O-ring	8
030065	Hinge Bracket O-ring	4
030105	Cylinder Head O-ring	2
030108	Cylinder O-ring	2
030785	Piston Seal	4
030791	Cylinder Head Backup Ring	2
050000	Secondary Seal Sealant	6
119263	Piston Wear Ring	4
130203	Door Seal	4

SL Poslock BOP Spare Parts List (Continued)

P/N	Description	Qty.
132536	Ram Shaft Seal Assembly	2
136321	Piston Outer Seal	4
136322	Piston Inner Seal	4
140280	Spare parts kit for 2 years service on Shaffer 11″, 10,000 psi SL BOP with 14″ Poslock cylinders (elastomer parts). Kit consists of the following:	1
030061	Cylinder Manifold O-ring	8
030105	Cylinder Head O-ring	2
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2
050000	Secondary Seal Sealant	6
131914	Door Seal	2
132492	Ram Shaft Seal Assembly	2
178168	Seal Kit for Operator Assembly	2
178170	Seal Kit for Bracket Hinge	2
140282	Spare parts kit for Shaffer 18¾″, 10,000 psi SL BOP with 14″ Poslock cylinders. Kit consists of the following:	1
132492	Ram Shaft Seal Assembly	1
031038	Door Seal	1
030105	Cylinder Head O-ring	1
030791	Cylinder Head Backup Ring	1
030061	Cylinder Manifold O-ring	1
030108	Cylinder O-ring	1
178168	Seal Kit for Operator Assembly	1
178170	Seal Kit for Bracket Hinge	1
050000	Secondary Seal Sealant	3
140283	Spare parts kit for 2 years service on Shaffer 21¼″, 10,000 psi SL BOP with 14″ Poslock cylinders. Kit consists of the following:	1
132492	Ram Shaft Seal Assembly	2
031038	Door Seal	4
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2

SL Poslock BOP Spare Parts List (Continued)

P/N	Description	Qty.
030105	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030785	Piston Seal	4
136321	Piston Outer Seal	4
136322	Piston Inner Seal	4
119263	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
140284	Spare parts kit for 2 years service on Shaffer 11″, 15,000 psi SL BOP with 14″ Poslock cylinders. Kit consists of the following:	1
20130895	Ram Shaft Seal Assembly	2
131774	Door Seal	4
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2
030105	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030785	Piston Seal	4
136321	Piston Outer Seal	4
136322	Piston Inner Seal	4
119263	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
140285	Spare parts kit for 2 years service on Shaffer 13$^{5}/_{8}$″, 15,000 psi SL BOP with 14″ Poslock cylinders. Kit consists of the following:	1
20130895	Ram Shaft Seal Assembly	2
120386	Door Seal	4
030108	Cylinder O-ring	2
030791	Cylinder Head Backup Ring	2

SL Poslock BOP Spare Parts List (Continued)

P/N	Description	Qty.
030105	Cylinder Head O-ring	2
030061	Cylinder Manifold O-ring	8
030012	Hinge Pin O-ring	20
030065	Hinge Bracket O-ring	4
030785	Piston Seal	4
136321	Piston Outer Seal	4
136322	Piston Inner Seal	4
119263	Piston Wear Ring	4
050000	Secondary Seal Sealant	6
124681	Spare parts kit for Shaffer 16¾″, 5,000 psi SL BOP with 14″ Poslock cylinders. Kit consists of the following:	1
124561	Ram Shaft	2
135082	Locking Shaft	8
142084	Cap Screw	8
142003	Spare parts kit for 2 years service on Shaffer 13⅝″, 10,000 psi SL BOP with 14″ Poslock cylinders. Kit consists of the following:	1
132492	Ram Shaft Seal Assembly	4
127216	Door Seal	8
030108	Cylinder O-ring	4
030791	Cylinder Head Backup Ring	4
030105	Cylinder Head O-ring	4
030061	Cylinder Manifold O-ring	16
030012	Hinge Pin O-ring	40
030065	Hinge Bracket O-ring	8
030785	Piston Seal	8
136321	Piston Outer Seal	8
136322	Piston Inner Seal	8
119263	Piston Wear Ring	8
050000	Secondary Seal Sealant	12

SL Poslock BOP Emergency Parts List

P/N	Description	Qty.
140269	Emergency parts kit for Shaffer 13 5/8″, 3,000/5,000 psi SL BOP with 14″ Poslock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
142084	Door Screw	8
130297	Ram Shaft	2
135082	Locking Shaft	8
140257	Emergency parts kit for Shaffer 7 1/16″, 15,000 psi SL BOP with 14″ Poslock cylinders. Standard and internal H_2S service. Kit consists of the following:	1
20115415	Ram Shaft	2
135082	Locking Shaft	8
142084	Door Screw	8