

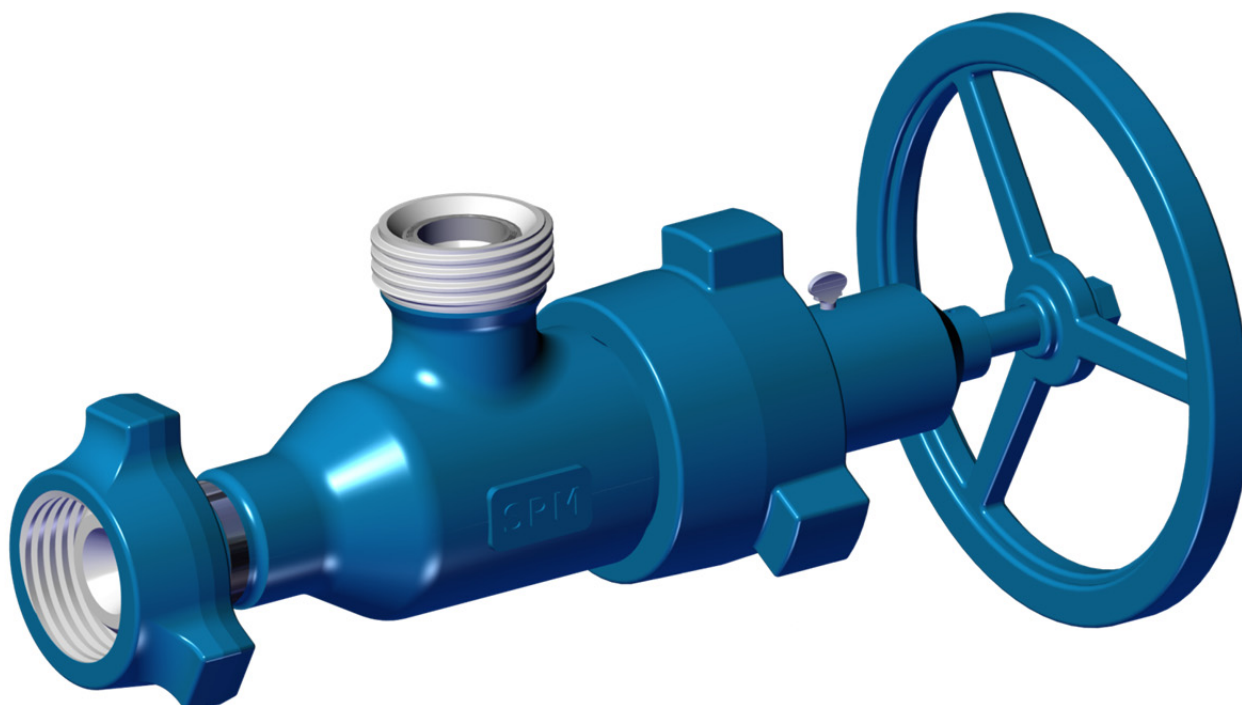
SPM®

Well Service Pumps & Flow Control Products

Choke Valves

Operation Instruction and Service Manual

Excellent
Oil & Gas
Solutions



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THE FOLLOWING ICONS DENOTE IMPORTANT INFORMATION WITHIN THIS MANUAL.



GENERAL INFORMATION



INSTALLATION AND OPERATION



MAINTENANCE AND REPAIR



SALES AND SUPPORT



NOTE



CAUTION



WARNING/ DANGER

SPM® PRODUCT SAFETY GUIDE



IMPORTANT SAFETY INFORMATION ENCLOSED. READ THIS OPERATING AND MAINTENANCE INSTRUCTIONS MANUAL BEFORE OPERATING PRODUCT.



THIS INFORMATION MUST BE AVAILABLE TO ALL PERSONNEL THAT WILL OPERATE AND MAINTAIN EQUIPMENT. FAILURE TO READ, UNDERSTAND AND FOLLOW THE OPERATING AND MAINTENANCE INSTRUCTIONS MANUAL COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH!

Most SPM® products generate, control or direct pressurized fluids; therefore, it is critical that those who work with these products be thoroughly trained in their proper application and safe handling. It is also critical that these products be used and maintained properly!!

SPM® flow products contain elastomeric seals and are not intended to provide proper functionality when exposed to fire.



MISUSE, SIDE LOADING, IMPROPER MAINTENANCE, OR DISASSEMBLY UNDER PRESSURE CAN CAUSE SERIOUS INJURY OR DEATH!

The following information is given in good faith and should aid in the safe use of your SPM® products. This information is not meant to replace existing Company's safety policies or practices.

Personal Responsibilities:

1. When working on SPM® flow control products, safety glasses, approved safety shoes and hard hat must be worn.
2. Personnel should never hammer on any component when pressure is present. Hammering on any part or component may also cause foreign material or steel slugs to become airborne.
3. It is a personal responsibility to use the proper tools when servicing the valve. It is a personal responsibility to be knowledgeable and trained in the use and handling of tools for all maintenance of the valve.
4. Hot surface may be present; it is a person's own responsibility to protect against burn injury.

On Location:

1. Each valve is clearly marked with a maximum pressure rating. This pressure must not be exceeded or **SERIOUS INJURY OR DEATH CAN OCCUR!**
2. The valve discharge connections should be properly cleaned and lightly oiled before the downstream piping is attached. Any worn, damaged or missing seals should be replaced.
3. Welding, brazing or heating any part of the valve is prohibited. If accessories must be attached, consult Weir Oil & Gas factory prior to installation.
4. A complete visual inspection of the valve must be made prior to each use. Any leaking seals, broken bolts, leaking hoses or improperly tightened parts must be remedied prior to using.
5. Any repairs or service (even routine maintenance) performed on the valve must be performed by a trained service technician who is qualified to work on high pressure flow control valves. All such service and repairs must be supervised by qualified management personnel or returned to Weir Oil & Gas for service. Only SPM® replacement parts should be utilized. Failure to do so may result in loss of warranty as well as **SERIOUS INJURY OR DEATH!**

Special Precautions:

1. The modifications to or unauthorized repair of any part of a SPM® valve, or use of components not qualified by SPM®, can lead to valve damage or failure and **SERIOUS INJURY OR DEATH!**
2. All SPM® threaded components are right hand threaded unless specifically designated otherwise. Any turning counterclockwise will unscrew the assembly. Make sure all threaded components are assembled to the correct torque value.
3. All products should be properly cleaned, greased or oiled after each use and inspected prior to each use.
4. Each integral union connection is clearly marked with a pressure code (i.e. "1502", 15,000 psi). This pressure must not be exceeded. This code should also be used with mating unions. Improper mating can result in failures. All integral union connections used must match (according to size, pressure rating, etc.). These connections must also match the service of the designated string they are installed in.

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SECTION I: General Information

This service manual covers:

2" Standard Service	2A18156-0.75	CHOKE ASSY/ADJ/2-1502FXM/0.75
	2A18156-1.00	CHOKE ASSY/ADJ/2-1502FxM/1.00
	2A18157-1.00	CHOKE ASSY/ADJ/2-1502MxM/1.00
	2A18158-0.75	CHOKE ASSY/ADJ/2-1502MxF/0.75
	2A18158-1.00	CHOKE ASSY/ADJ/2-1502MxF/1.00
	2A18159-0.75	CHOKE ASSY/ADJ/2-1502FXF/0.75
	2A18160	CHOKE ASSY/POS/2-1502MXF/W/O BEAN
	2A18160-0.75	CHOKE ASSY/POS/2-1502MxF/0.75
	2A27968	CHOKE ASSY/SFTY IRN/POS/2-15K
	2A36767	CHOKE ASSY/ADJ/2-1502/1.00/F-562-C
	2A37237	CHOKE ASSY/ADJ/2-1502FxM/1.00/F-562-C
	2A38168	CHOKE ASSY/ADJ/2-1502FXM/0.75/SFTY COLL
	2A38975	CHOKE ASSY/ADJ/2-1502FxM/F-562-C
	2A39894	CHOKE ASSY/POS/2-1502MxF/F-250-C
2" H2S	2A19461-0.75	CHOKE ASSY/ADJ/2-1502FXM/0.75/H2S
	2A19461-1.00	CHOKE ASSY/ADJ/2-1502FXM/1.00/H2S
	2A22016	CHOKE ASSY/POS/2-1502MxF/W/O BEAN/H2S
	2A23169	CHOKE ASSY/POS/2-1502FxM/W/O BEAN/H2S
	2A26745-0.75	CHOKE ASSY/ADJ/2-1502MXF/0.75/H2S
	2A36684	CHOKE ASSY/ADJ/2-1502/1.00/H2S/F-562-C
	2A38974	CHOKE ASSY/ADJ/2-1502FxM/H2S/F-562-C
3" Standard Service	2A21253	CHOKE ASSY/ADJ/3-1502FxM/2.00
	2A23149	CHOKE ASSY/POS/3-1502FxM/SS
3" H2S	2A23122	CHOKE ASSY/ADJ/3-1502FxM/2.00/LT/H2S
	2A23123	CHOKE ASSY/POS/3-1502FxM/LT/H2S/W/O BEAN

Rebuild Kits:

2" Adjustable Choke Rebuild Kit			
P22852	Standard	.75" Max Orifice	KIT/REPAIR/CHOKE/0.75/MAJOR
P40343	H2S	.75" Max Orifice	KIT/REPAIR/CHOKE/0.75/H2S/MAJOR
P40344	Standard	1.00" Max Orifice	KIT/REPAIR/CHOKE/1.00/MAJOR
P40345	H2S	1.00" Max Orifice	KIT/REPAIR/CHOKE/1.00/H2S/MAJOR
3" Adjustable Choke Rebuild Kit			
P23148	Standard	2" Max Orifice	KIT/REPAIR/CHOKE/3/MAJOR

Product Description:

SPM® Adjustable and Positive Choke Valves provide flow restriction in high pressure applications such as choke manifolds, flow through manifolds and test manifolds. Various forged-body configurations are available in 2-inch and 3-inch sizes, each rated at 15,000 psi NSCWP. Chokes are also available in sour gas configurations rated at 10,000 psi NSCWP. SPM® Chokes are designed for field applications such as drilling mud lines, including choke and kill lines and well service lines for cementing, fracturing, acidizing, and testing.

General Description of Choke Valve Operation:

The SPM® Choke Valve restricts the flow through the valve by reducing the flow area through the valve body to achieve a desired flow rate. 2" Choke Valves have a maximum orifice size of 1" while 3" Choke Valves have a maximum orifice size of 2".

Adjustable Choke Valves use a stem and seat combination to control the flow rate. The desired flow rate is adjusted by turning the hand wheel to achieve a calibrated orifice size and associated flow coefficient (C_v). The orifice size is read from the indicator which is calibrated in 1/64" increments and is lined up with a V-notch machined into the top of the bonnet.

Positive Choke Valves provide a fixed flow rate through the use of a choke bean. The flow rate is controlled by the choke bean orifice size selected.

End Connection Options:

The SPM® Choke Valve family is available with SPM® Wing Union or Safety Iron™ connections. The nameplate will indicate the allowable cold working pressure for each assembly.

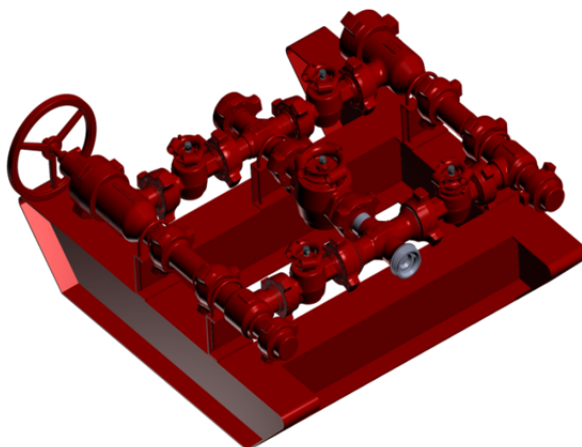
Wing union connections on the SPM® Choke Valve are interchangeable with other union connections of the same size and figure (pressure rating). Caution must be taken to avoid mixing different ratings of wing connections. There are various sizes and figures that are capable of making marginal connections. SPM® Safety Iron™ connections are universal requiring no male or female as does the wing union. Failure to observe good judgment may lead to failure of components and danger to life and limb. Always verify working pressure ratings of each connection before use.

 **WARNING: OBSERVE ALL INSTRUCTIONS, CAUTIONS AND WARNINGS AS NOTED IN THIS MANUAL. FAILURE TO DO SO CAN LEAD TO EQUIPMENT DAMAGE AND PERSONAL INJURY OR DEATH!**

SECTION II: Installation and Operation

Installation:

SPM® Choke Valves are primarily installed in-line of a flow back system on a fracturing site: Manifold Assemblies. The important thing is to ensure that the size of the choke valve meets the correct application. The figure below shows a SPM® Flow-Thru Manifold, which consists of Plug Valves, Tees, Crosses and Chokes.

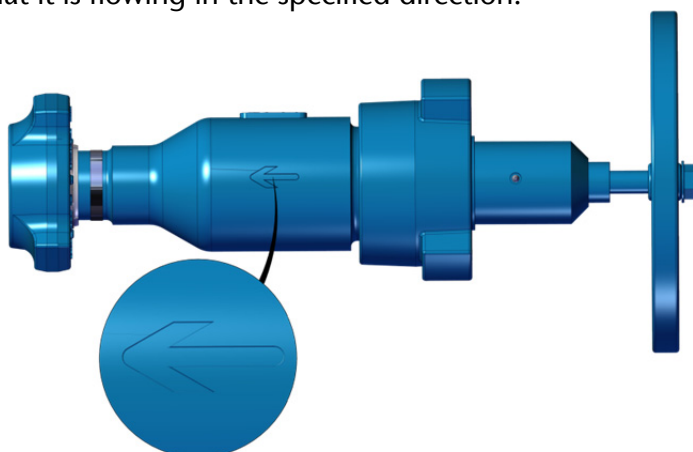


The SPM® Choke Valve should be installed in the line with the flow media coming into the inlet connection and making a 90 degree turn to pass through the orifice opening in the seat or choke bean and exiting through the outlet flange.

The SPM® Choke Valve can be installed in any orientation without affecting performance; but orientation should be addressed to ensure ease of routine maintenance and the potential for solids accumulation in the thread areas.

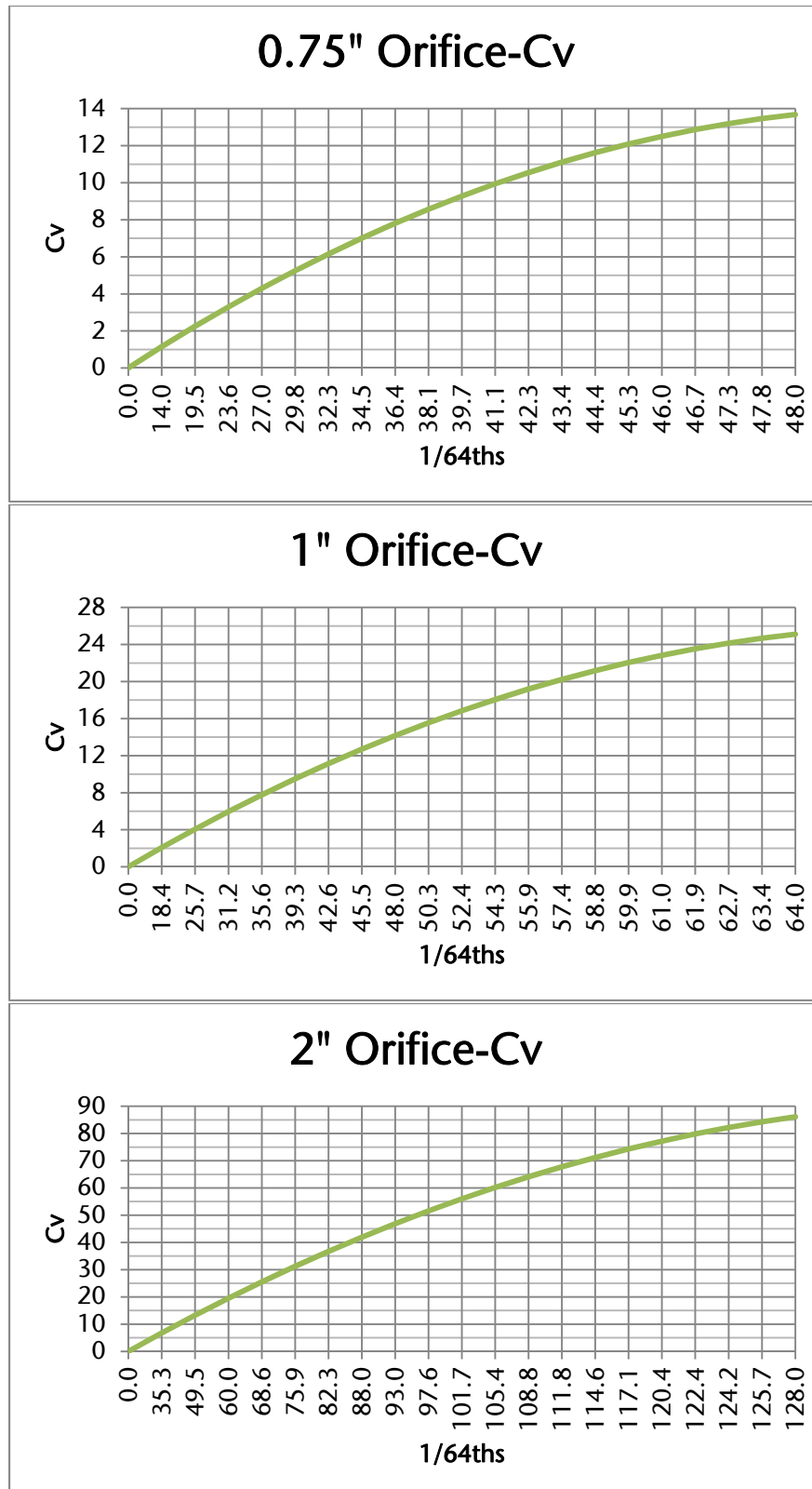
Adjustable chokes are only designed to generate a pressure drop and should **NEVER** be used to isolate a flow line. Any attempt to forcibly close the choke to isolate the flow may damage the valve stem and affect the performance of the assembly. Contact SPM® regarding the availability of 90 degree isolation plug valves specifically designed for this application.

Always install the choke so that it is flowing in the specified direction.



 **WARNING: OBSERVE ALL INSTRUCTIONS, CAUTIONS AND WARNINGS AS NOTED IN THIS MANUAL. FAILURE TO DO SO CAN LEAD TO EQUIPMENT DAMAGE AND PERSONAL INJURY OR DEATH!**

Calibration Guide:



Pressure/ Temperature Ratings:

Pressure:

The SPM[®] Choke Valve is rated for non-shock cold working pressures up to 15,000 PSI for Standard Service and up to 10,000 PSI for H₂S applications. This pressure is never to be exceeded in the field. Certified testing at SPM[®] subjects the new product to a one time test of 1.5 times the rated working pressure.

Field or customer controlled tests should be conducted with experienced personnel. Maximum working pressure should never be exceeded.

Temperature:

The maximum recommended operating temperature for the SPM[®] Choke Valve is limited to the capability of the polymer seals to withstand elevated temperatures while maintaining seal integrity under pressure.

The accepted limit for the standard seal material is 230°F (110°C). Practical experience has shown that there is a rapid drop off in seal life when caustic fluids are handled at temperatures exceeding 160°F (71°C). Generally, chemical attack, gas absorbed, compression set or tearing is accelerated in these conditions. Minimum operating temperature of -22°F (-30°C) is acceptable for the elastomer seals.

SECTION III: Maintenance and Repair



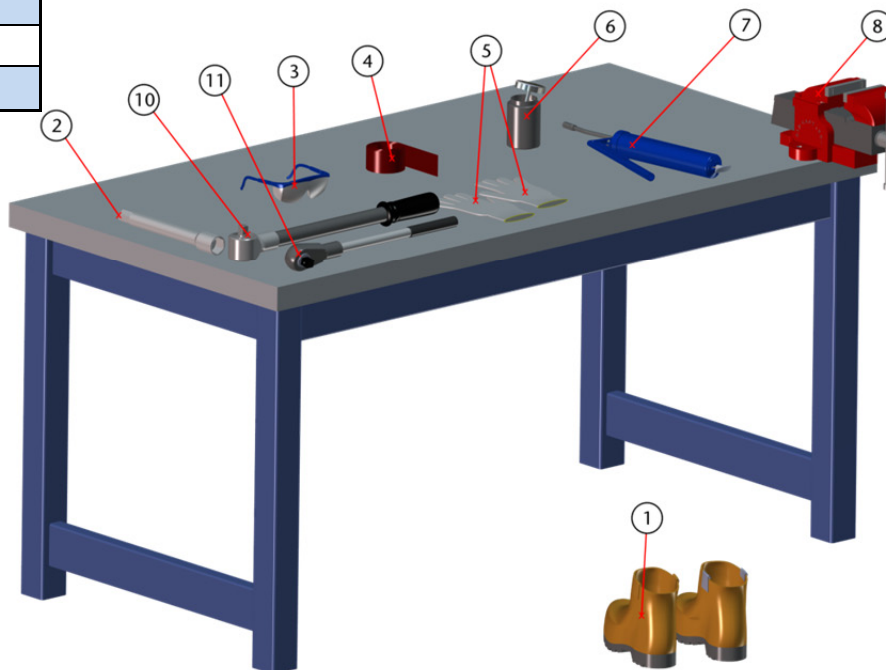
WARNING: DISASSEMBLY UNDER PRESSURE CAN CAUSE SERIOUS INJURY OR DEATH!

Always Remember:

1. Always wear PPE (personal protective equipment).
2. Only qualified technicians should perform maintenance on SPM® products.
3. Always use SPM® supplied new parts kit for reassembly.
4. Clean all components thoroughly prior to reassembly.
5. Use only SPM® parts on SPM® valves.

Required Tools:

BOM ID	DESCRIPTION
1	STEEL TOE BOOTS
2	SPM® 1" WRENCH 3P23644 or SPM® 2" WRENCH 3A15906
3	SAFETY GLASSES
4	400 GRIT SAND PAPER
5	GLOVES (ANY OTHER PPE)
6	ANTI SIEZE
7	GREASE GUN
8	WISE
9	TORQUE WRENCH
10	SOCKET WRENCH



Maintenance Requirements:

The SPM® Choke Valve is made from high quality materials selected to provide the best service to the customer. However, the application of this product subjects it to handling fluids which are by their very nature corrosive and abrasive and operate at high velocities, and usually at high pressures. Some fluids may also require being conveyed at elevated temperatures. Combinations of any and all of these conditions will speed up the deterioration of internal surfaces including seals and seal surfaces.

Valve unions should be clean and lightly oiled prior to each use. Union seals should be checked and replaced when worn or damaged. Always flush valve with water, then oil after each use. If valves are used with acid services, they should be washed with fresh water as soon as possible.

For Adjustable Chokes, the stem threads should be lubricated with a high quality moly-based lubricant at least every three months. The Choke is equipped with a grease fitting for this purpose.

Preventative Maintenance:

Re-grease the stem threads on adjustable chokes periodically to ensure easier operation of the turn wheel. During operation, visually inspect the Choke Valve for any leaks at the bonnet (adjustable) or blanking cap (positive) seal and the autoclave fitting.

Periodic Inspection:

Periodic inspections are required to ensure that all internal components of the valve are working properly and are to Weir Oil & Gas Engineering's specifications. It is imperative that a qualified Weir Oil & Gas Technician follow the assembly/disassembly/inspection instructions beginning on page 22.

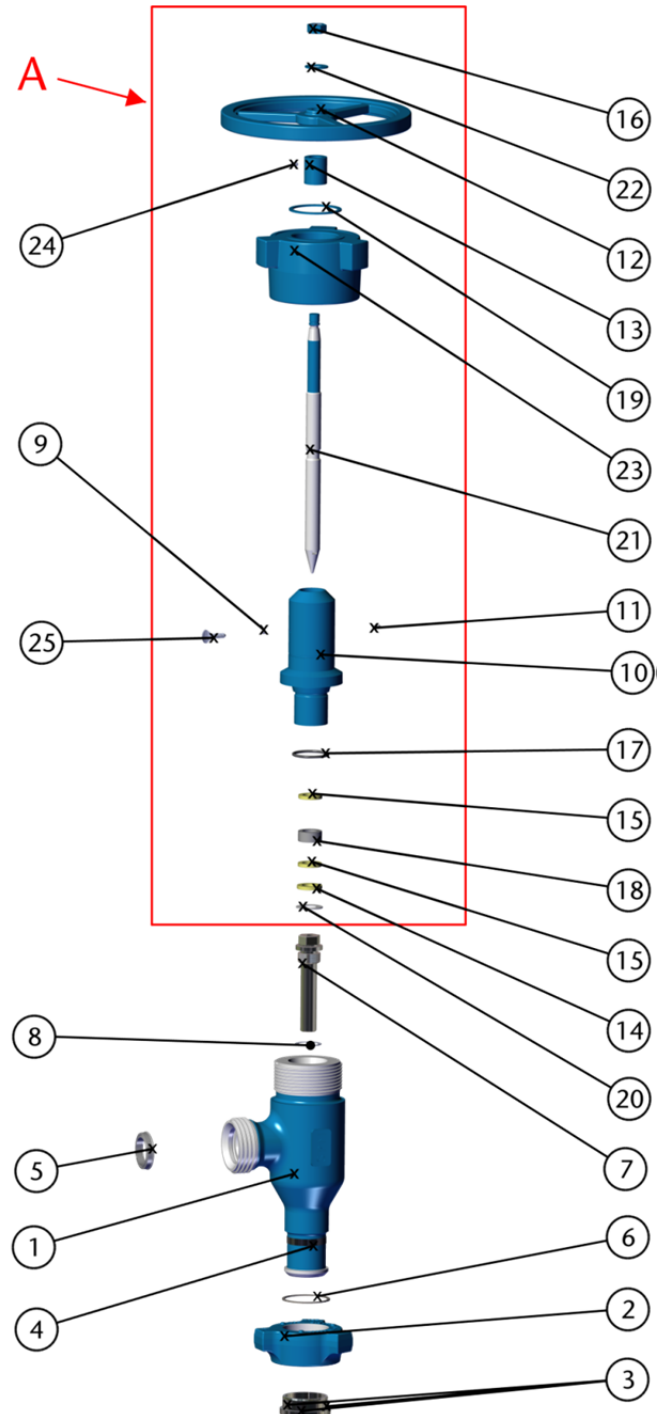
Rebuild Kits are available through Weir Oil & Gas Service Centers. They are referenced on page 7.

Periodic Inspection will include recertification of the Choke Valve which will include the following:

- Inspection of sealing surfaces, evidence of wear and pitting of all components.
- Disassembly
- New Kitting
- Ultra-Sonic Inspection / Minimum Wall Inspection
- Reassembly
- Pressure testing to 100% the product's normal working pressure per SPM® Specification 4S12497
- Magnetic Particle Inspection (Per Request)

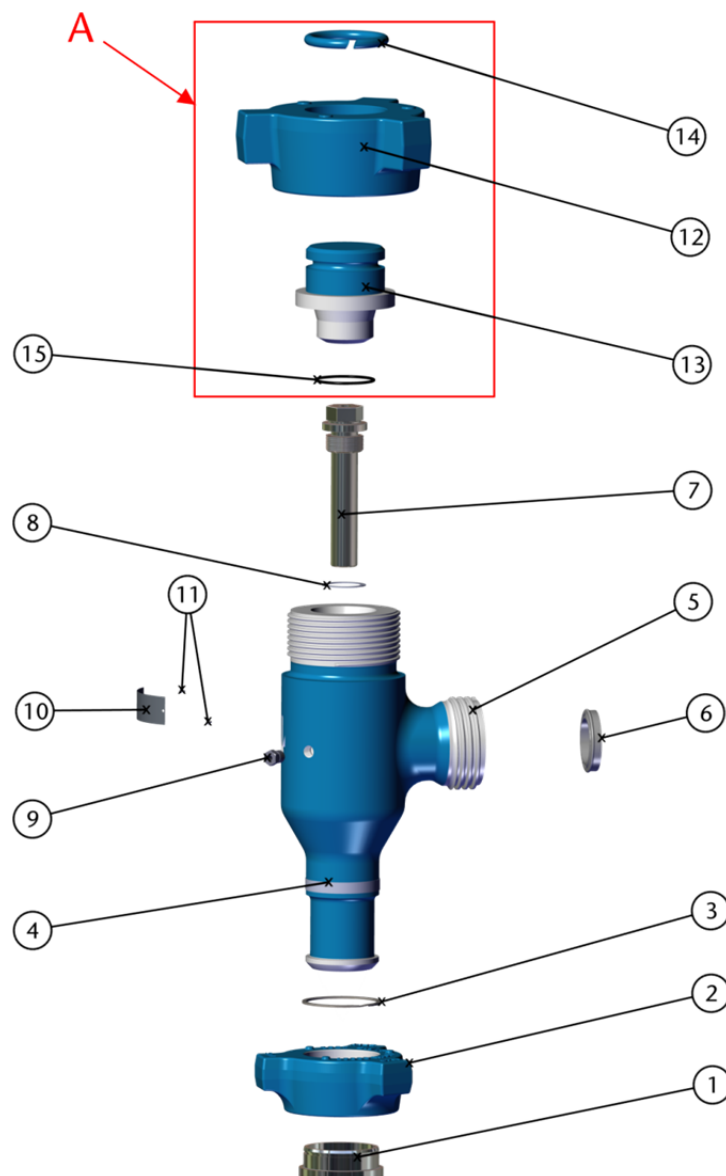
Adjustable Choke BOM: (2A18156-1.00)

BOM ID	PART NUM	Qty	DESCRIPTION
1	1P16807	1	CHOKE BODY
2	3P10228	1	WING NUT
3	3P10231	3	RET SEGMENTS
4	3P17138	1	DATA BAND
5	4P10229	1	UNION SEAL
6	P10232	1	SEG RETAINER
7	P20791	1	SEAT
8		1	SEAT GASKET
A	2A22169	1	BONNET ASSEMBLY
9		1	BALL
10		1	BONNET
11		1	GREASE FITTING
12		1	HAND WHEEL
13		1	INDICATOR
14		1	JUNK RING LOWER
15		2	JUNK RING
16		1	NUT
17		1	O-RING
18		1	PACKING
19		1	RETAINER RING
20		1	RETAINER RING
21		1	STEM
22		1	WASHER
23		1	WING NUT
24		1	SET SCREW
25		1	THUMB SCREW



Positive Choke BOM: (2A39894)

BOM ID	PART NUM	Qty	DESCRIPTION
1	3P10231	3	RET SEGMENTS
2	3P10228	1	WING NUT
3	P10232	1	RET RING
4	3P17138	1	DATA BAND
5	2P39891	1	BODY
6	4P10229	1	UNION SEAL
7	P20791	1	SEAT
8		1	SEAT GASKET
9	P114434	1	GLAND
10	3P14871	1	NAME PLATE
11	P18055	2	SCREWS
A	P18936	1	BLANKING CAP ASSEMBLY
12		1	WING NUT
13		1	BLANKING CAP
14		1	RETAINER RING
15		1	O-RING



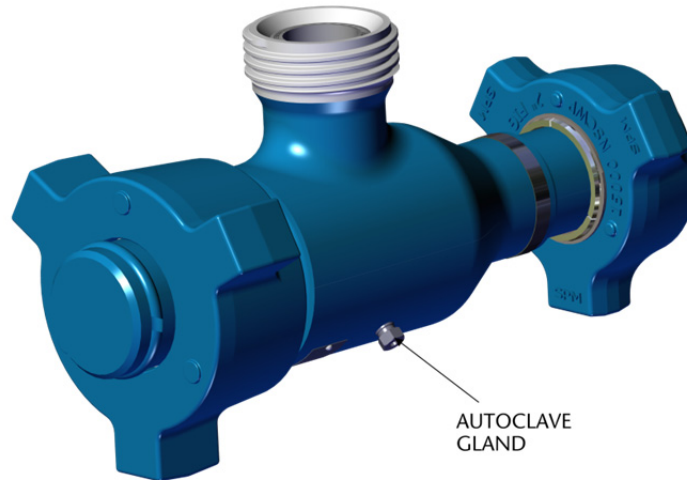
Disassembly of Adjustable Choke:



WARNING: DISASSEMBLY UNDER PRESSURE CAN CAUSE SERIOUS INJURY OR DEATH!

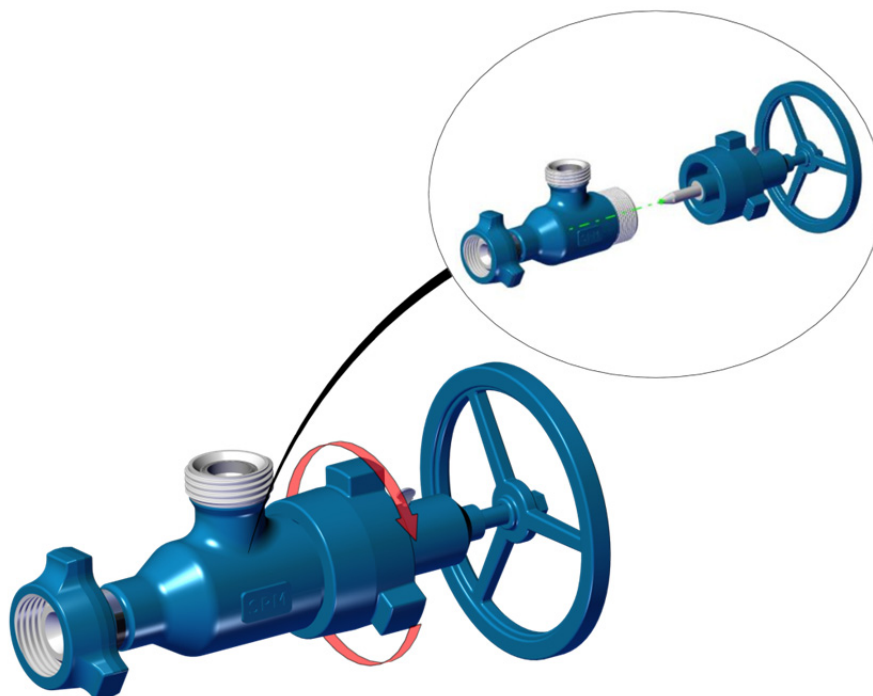
Step 1:

Remove all pressure in the system with the choke in the full open position. Loosen the autoclave gland to detect any remaining pressure in the system (if available).



Step 2:

Unscrew stem and bonnet assembly and remove from choke valve body.

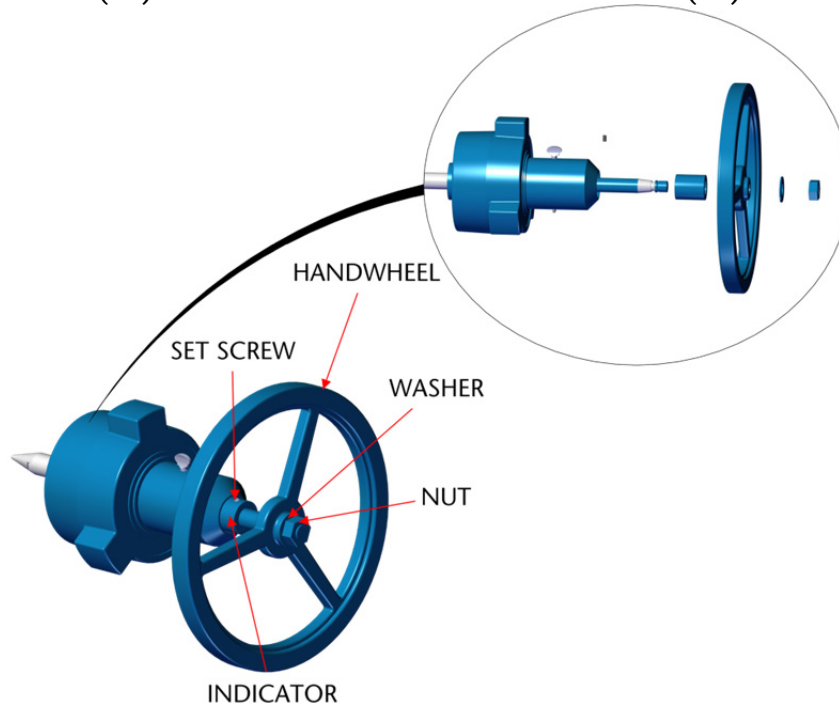


Step 3:

Remove hand wheel nut (16) and washer (22).

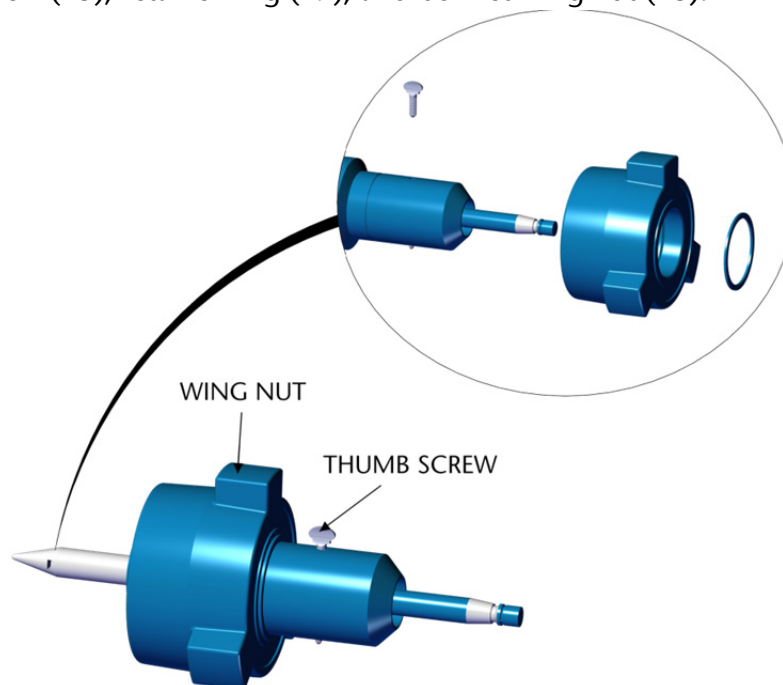
Remove hand wheel (12).

Loosen indicator set screw (24) with allen wrench and remove indicator (13).



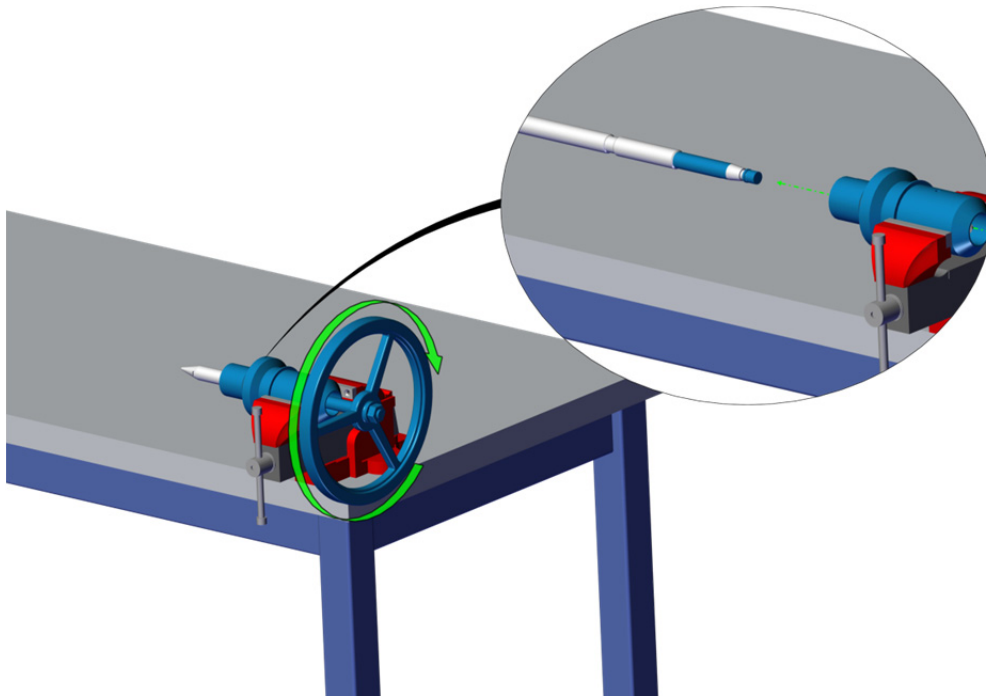
Step 4:

Remove thumb screw (25), retainer ring (19), and bonnet wing nut (23).



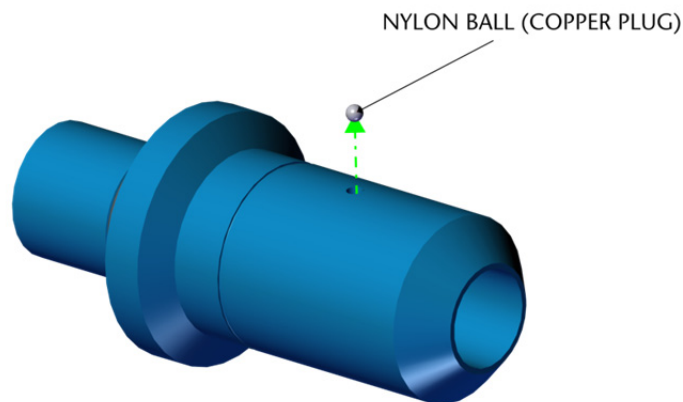
Step 5:

Secure bonnet in soft jaw vise and use **hand wheel** (no need to secure hand wheel with washer and nut) to rotate clockwise to release stem from the bonnet.



Step 6:

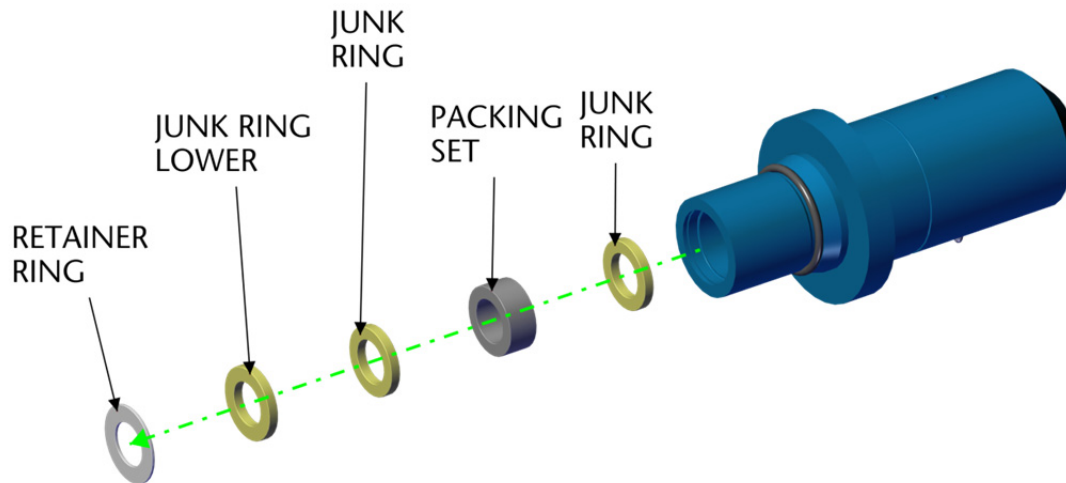
Remove nylon balls (9) (or copper plugs) from thumb screw hole.



Step 7:

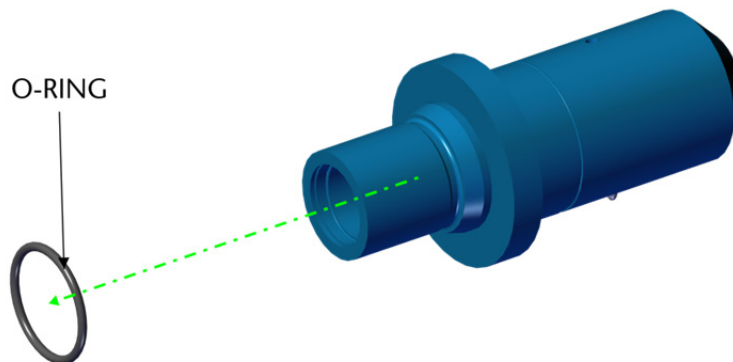
Remove retainer ring (20) with snap ring pliers.

Remove lower junk ring (14), junk ring (15), packing set (18), and junk ring (15).



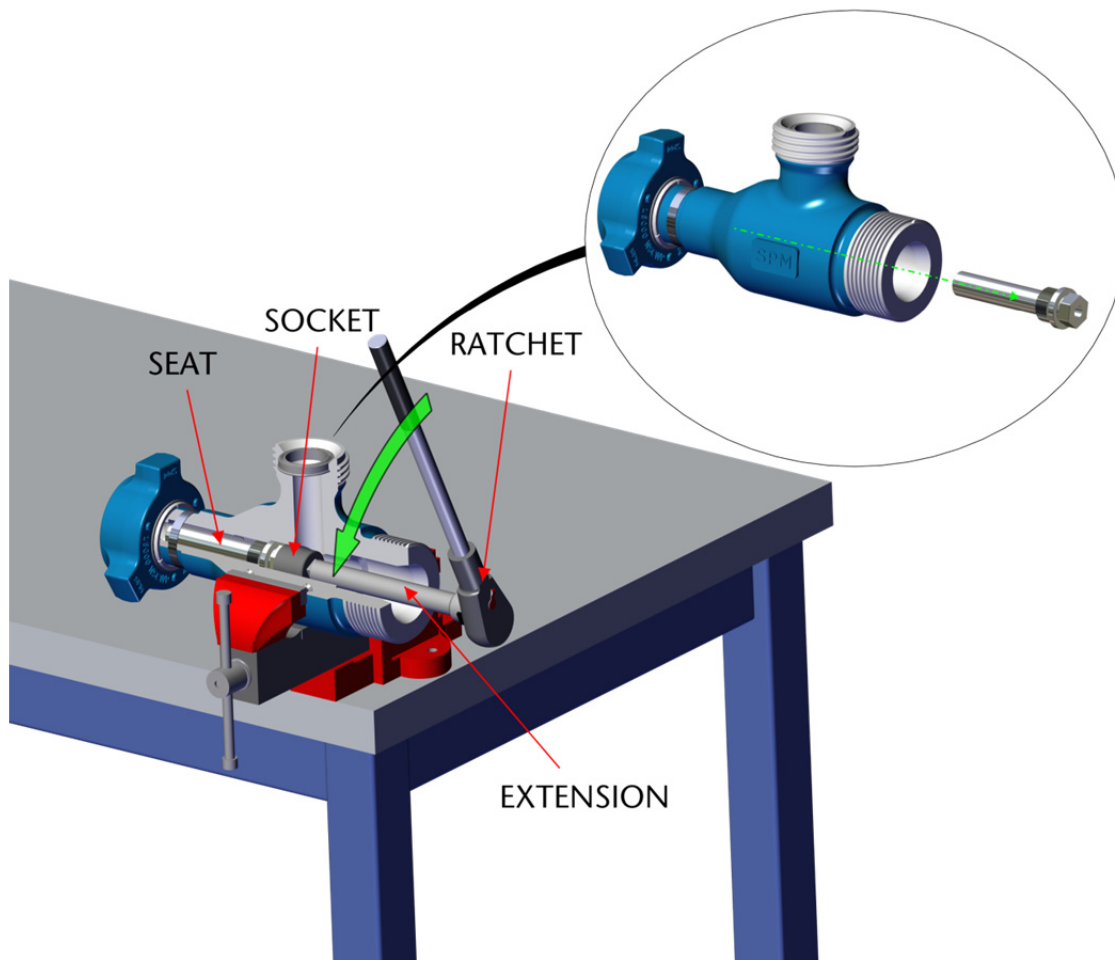
Step 8:

Remove O-ring (17).



Step 9:

Secure valve body and use a socket wrench with seat socket (Required Tool 2) to remove the seat from the choke valve body.
Remove autoclave gland (if necessary).



Inspection of Adjustable Choke:

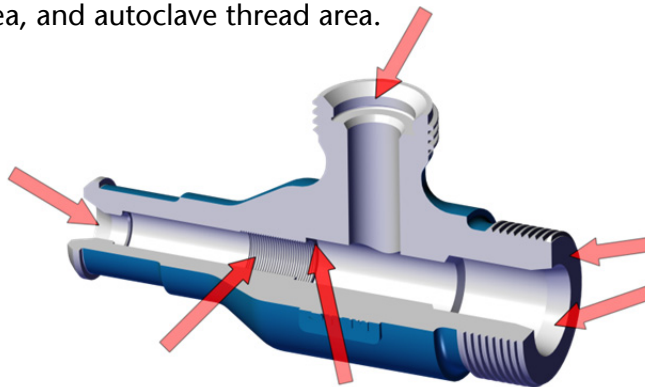
Weir Oil and Gas recommends complete replacement of the stem and bonnet assembly for best results and efficient use of time (i.e., remove Disassembly Steps 3-8).

Inspect all parts for damage, corrosion, or erosion and replace as necessary. Use 400 grit sandpaper to clean all seal surfaces.

The following areas are critical for the function of the valve:

Body

Visually inspect the following: seat seal surface, bonnet seal surface, intake and discharge ports and seal surfaces, seat thread area, and autoclave thread area.



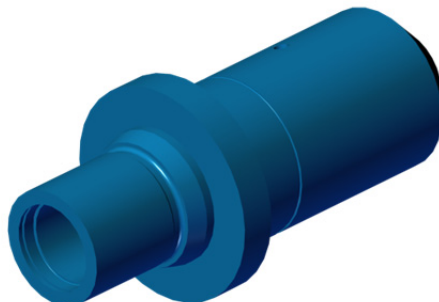
Stem

Visually inspect the following: tip, threads, and packing seal area.



Bonnet

Visually inspect the following: bonnet seal surface, stem thread area, and packing box.



Assembly of Adjustable Choke:

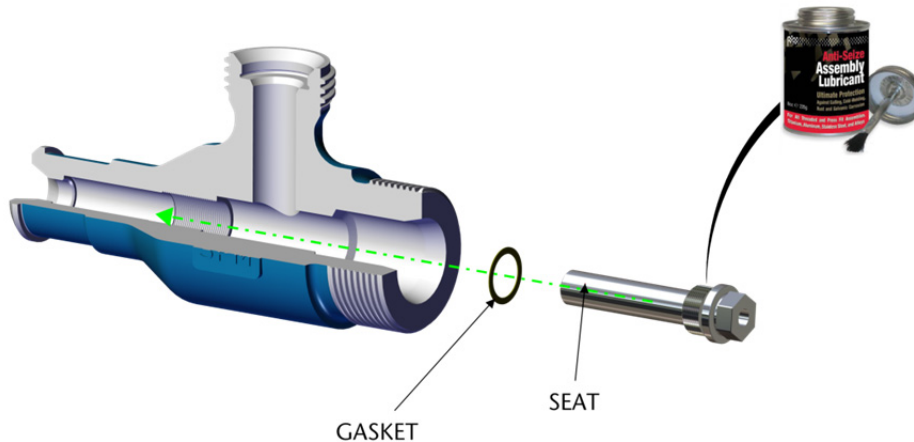
- Visually inspect all new parts and remove any foreign contaminants.

Step 1:

Install seat gasket onto seat.

Lubricate threads on seat with anti-seize lubricant.

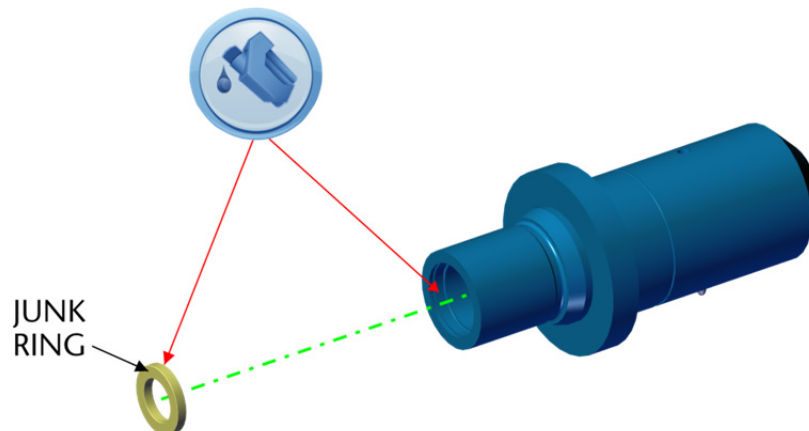
Install seat into choke body using seat socket (Required Tool 2) with seat gasket. Recommended torque is 230 ft-lbs. for 2" Choke Valves and 600 ft.-lbs for 3" Choke Valves.



Step 2:

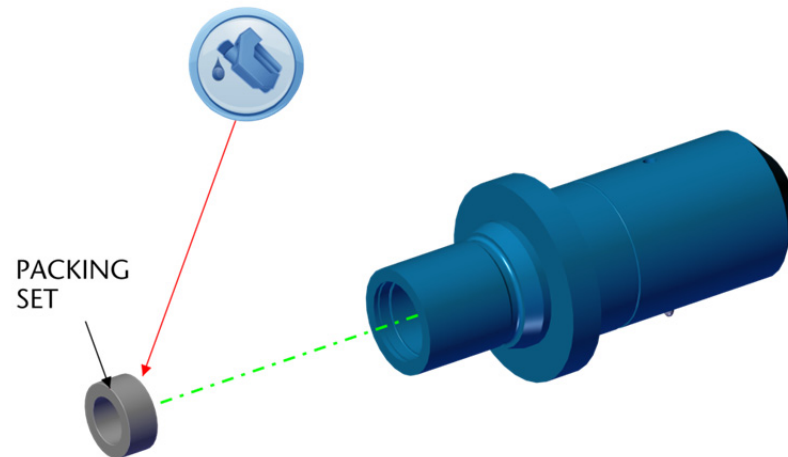
Grease inside of packing box.

Grease junk ring (15) and place into packing box.



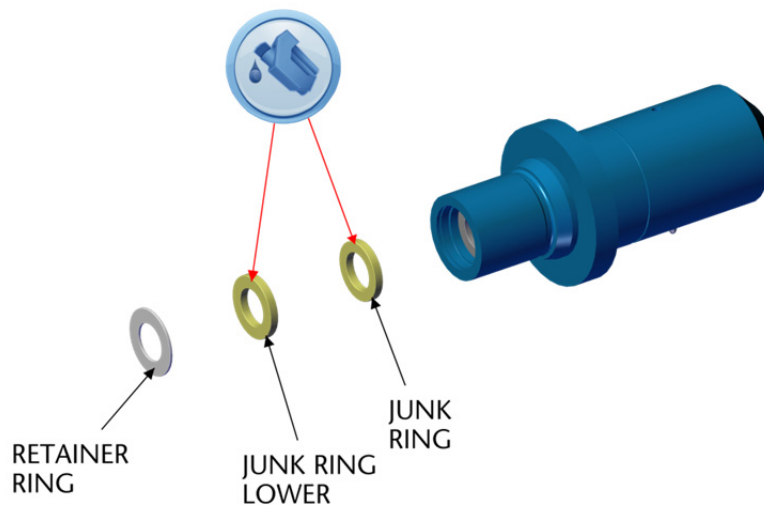
Step 3:

Grease packing set (18) and install into packing box. If the Choke equips pressure-energized spring loaded packing, ensure that the internal spring faces the internal pressure of the choke body. If the Choke equips Chevron style packing with V-rings, ensure that the wide end of the V shape faces the internal pressure of the choke body.



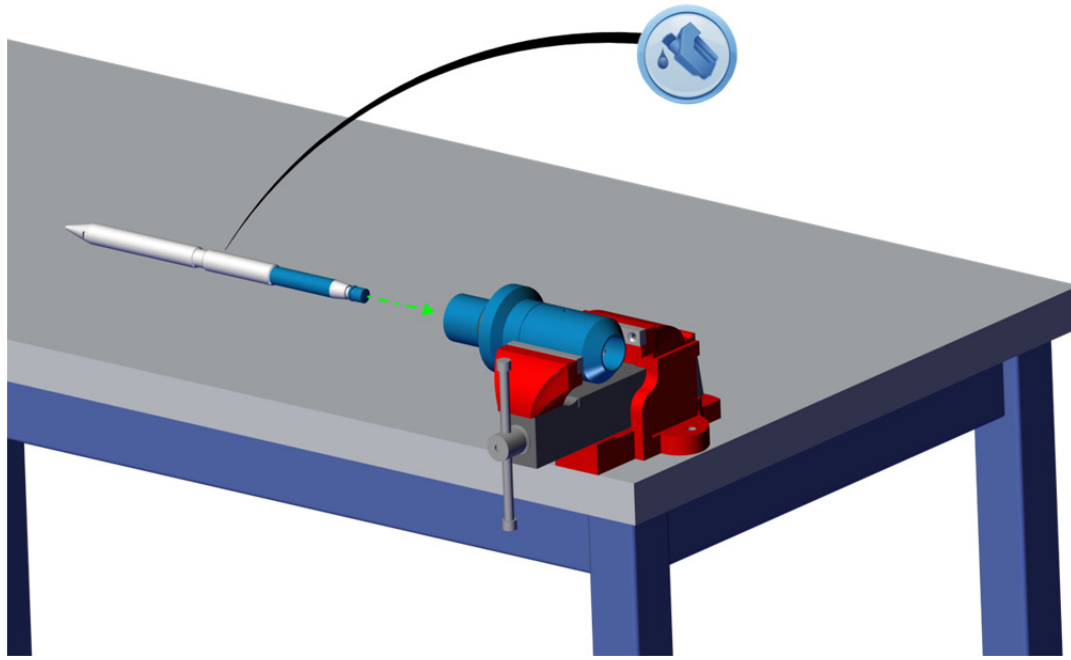
Step 4:

Grease the junk ring (15) and lower junk ring (14) and install into packing box. Install packing retainer ring (20) using snap ring pliers.



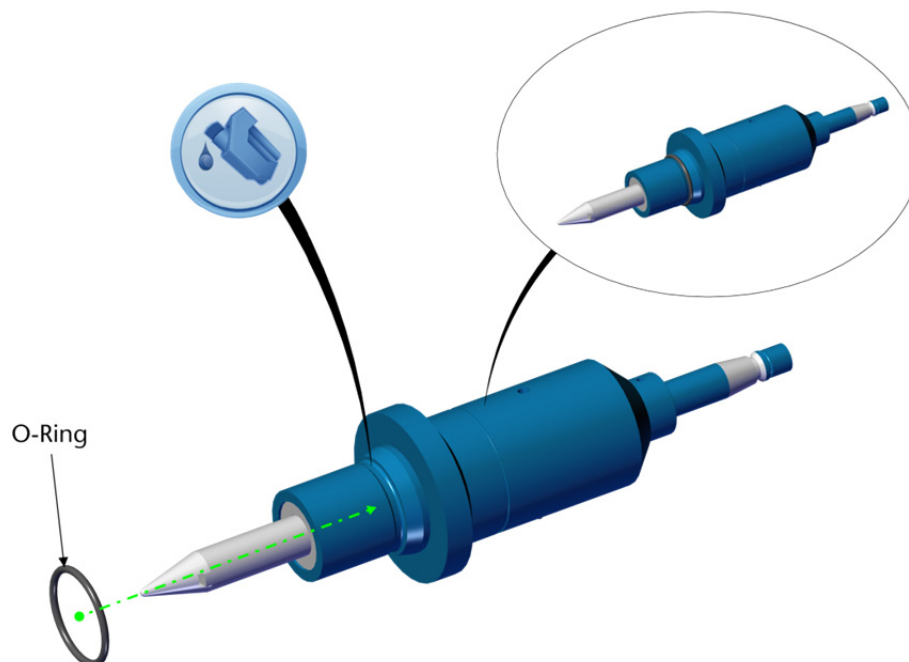
Step 5:

Lubricate stem threads with anti-seize lubricant.
Secure bonnet in soft jaw vice and insert stem.
Tighten by hand until the threads are just visible at the top of the bonnet.



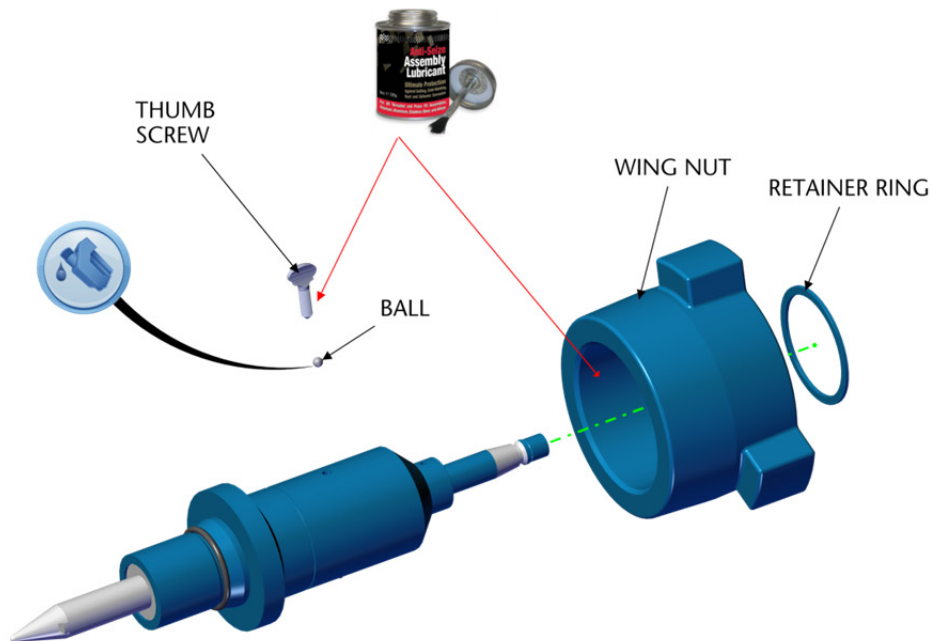
Step 6:

Grease the area around the groove on the bonnet. Grease and install the O-ring (17).



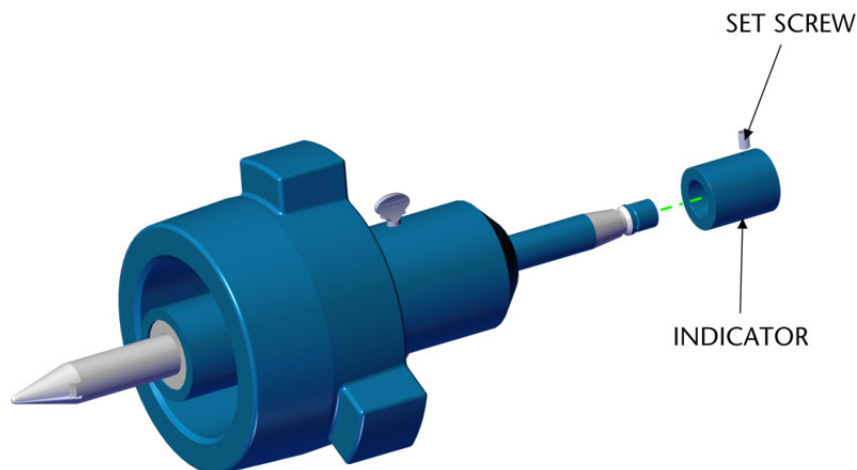
Step 7:

Lubricate threads on wing nut (22) with anti-seize lubricant.
Install wing nut and retainer ring (19) on bonnet.
Grease and install nylon balls (9) (or copper plugs) into the thumb screw hole.
Lubricate the threads on the thumb screw (25) with anti-seize lubricant.
Install thumbscrew onto the bonnet.



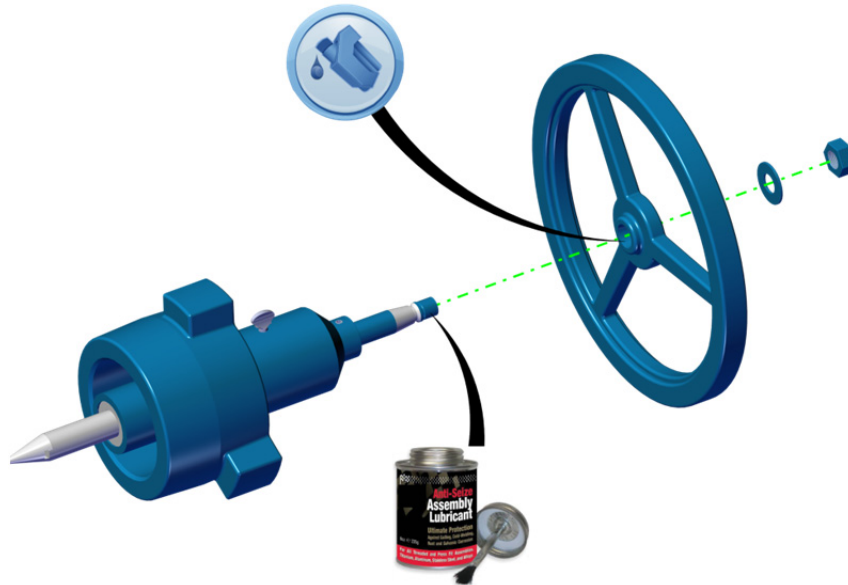
Step 8:

Install the indicator (13) on the stem. Do not tighten down set screw (24) at this time.



Step 9:

Grease the inside of the hand wheel (12).
Install onto the stem (21).
Lubricate the stem thread with anti-seize lubricant.
Install washer (22) and nut (16) onto stem using socket wrench.



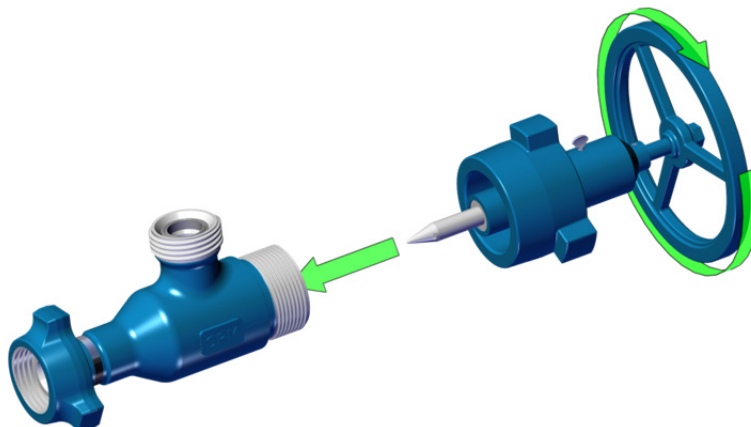
Step 10:

Open stem to full open position by rotating the hand wheel **counter-clockwise** until it stops.
Install onto choke body and tighten by hand.
Rotate the hand wheel until the stem is fully closed and then back to fully open to ensure proper operation and clearance.



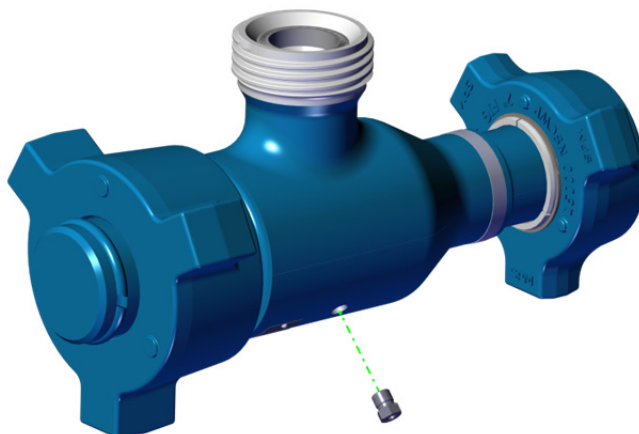
CAUTION: DO NOT FORCE STEM INTO SEAT DURING CLOSING.

Use sledge hammer to tighten securely.



Step 11:

Install autoclave gland (if applicable) using Teflon tape or pipe dope and socket wrench.



Step 12:

Set the indicator:

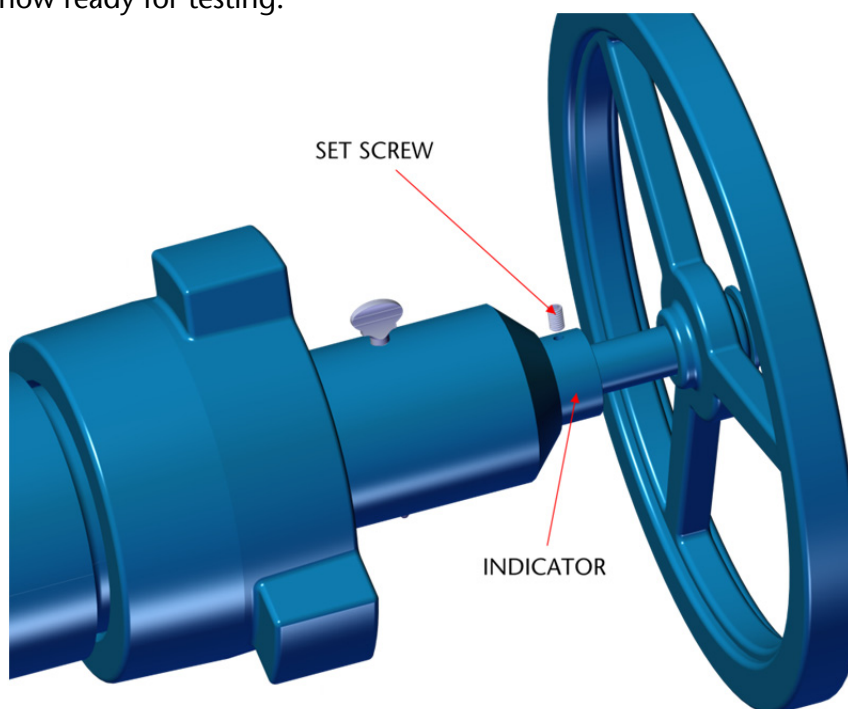
Rotate the hand wheel until the stem is seated. Do not tighten or force the stem into the seat.

Align the "0" mark with the mark on the top of the bonnet.

Tighten the set screw. Do not over-tighten the set screw as the indicator may crack or the threads strip.

Rotate the hand wheel to full open position as indicated for the maximum orifice size to ensure full movement and correct indicator setting.

The choke valve is now ready for testing.



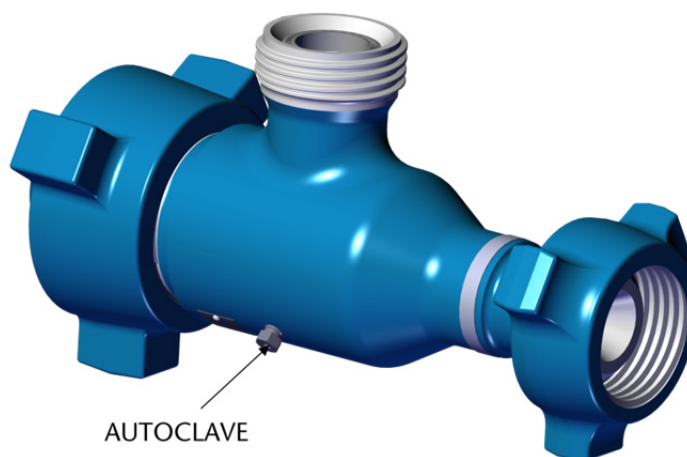
Disassembly of Positive Choke:



WARNING: DISASSEMBLY UNDER PRESSURE CAN CAUSE SERIOUS INJURY OR DEATH!

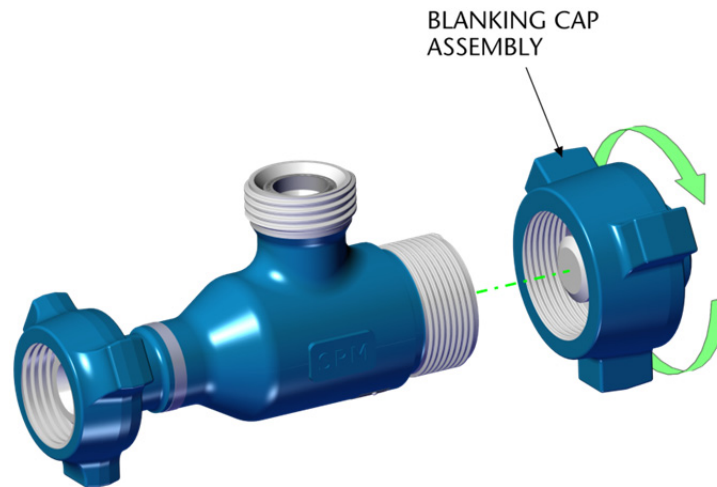
Step 1:

Remove all pressure in the system with the choke in the full open position. Loosen the autoclave gland to detect any remaining pressure in the system.



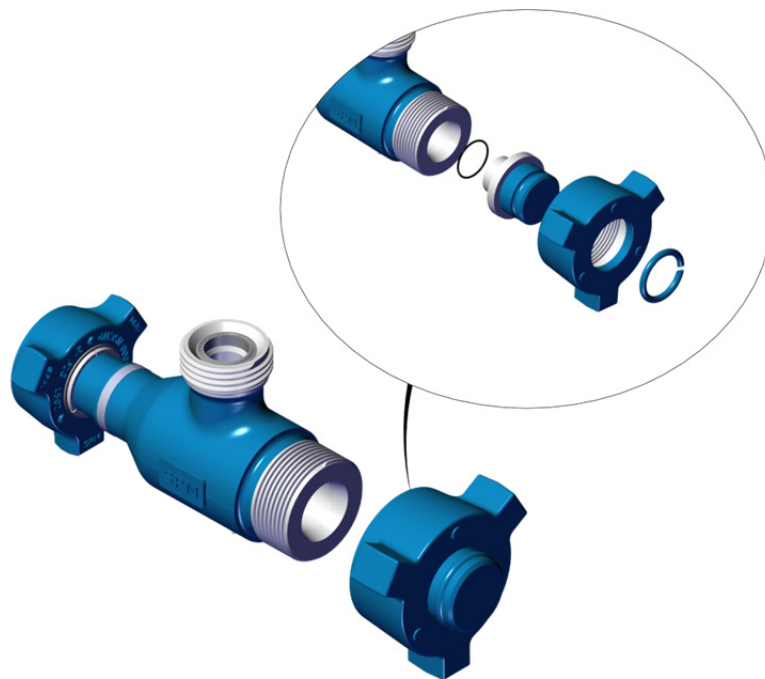
Step 2:

Unscrew blanking cap assembly and remove from choke valve body.



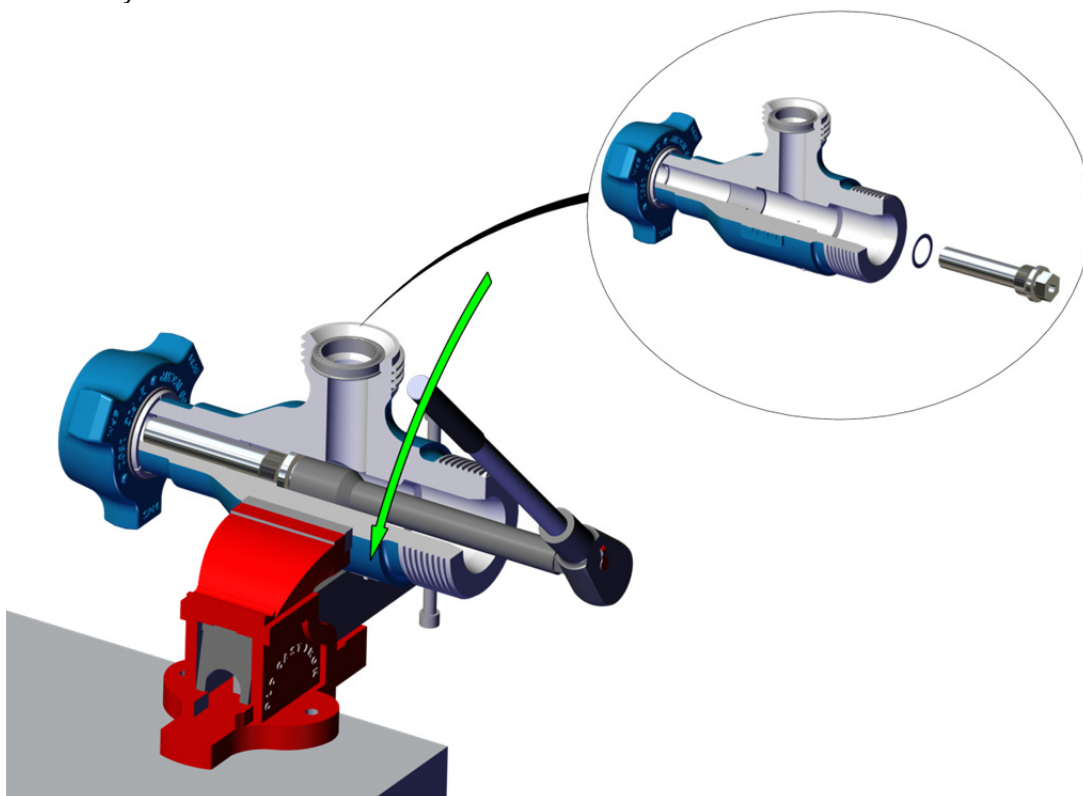
Step 3:

Remove blanking cap retainer ring (14) and separate blanking cap (13) from the wing nut (12).
Remove O-ring (15).



Step 4:

Secure valve body and use a socket wrench with seat socket (Required Tool 2) to remove the choke bean from the choke valve body.

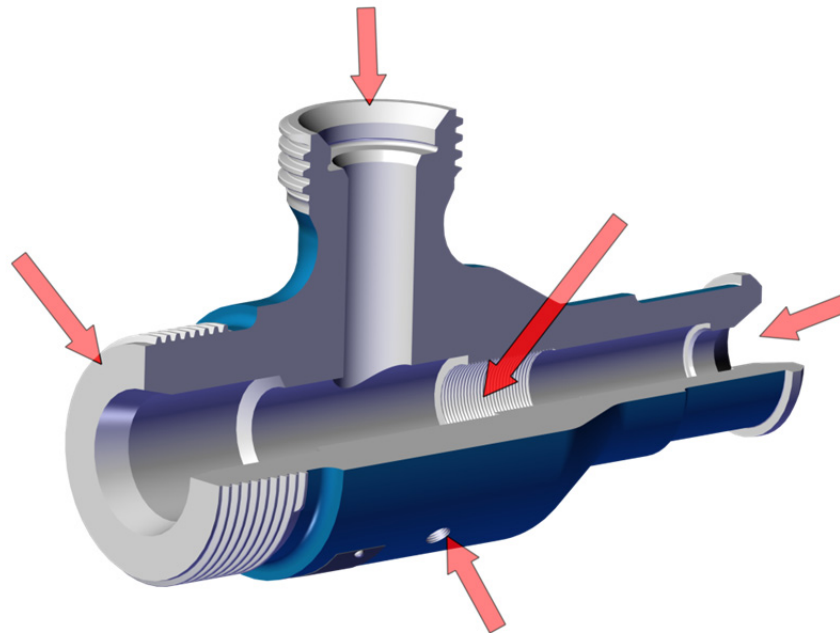


Inspection of Positive Choke:

Inspect all parts for damage, corrosion, or erosion and replace as necessary. The following areas are critical for the function of the valve:

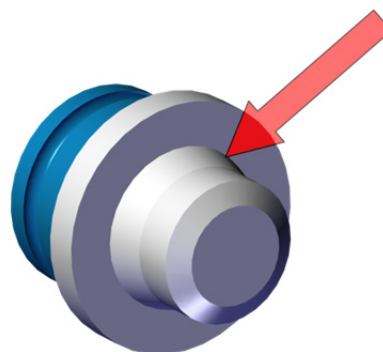
Body

Visually inspect the following: bean seal surface, bonnet seal surface, intake and discharge ports and seal surfaces, bean thread area, and autoclave thread area.



Blanking Cap

Visually inspect the following: blanking cap seal surface.



Assembly of the Positive Choke:

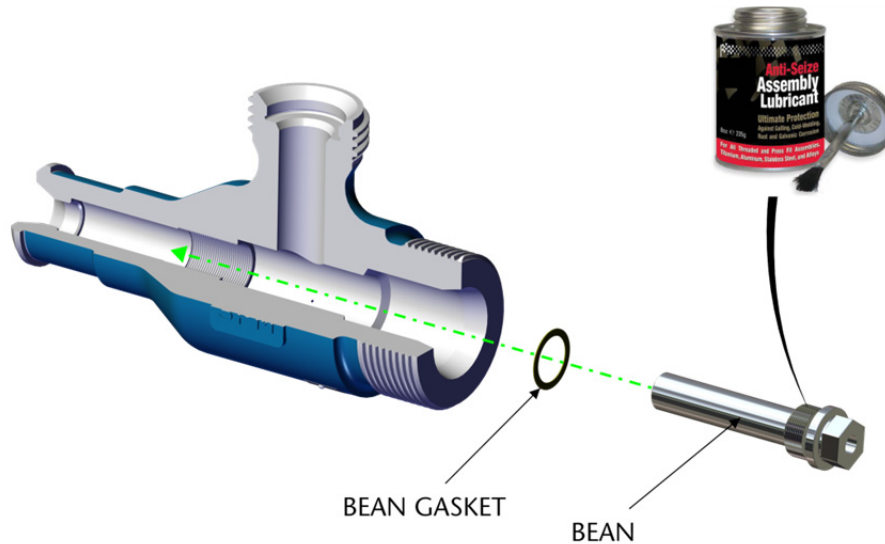
- Visually inspect all new parts and remove any foreign contaminants.

Step 1:

Install bean gasket (8) onto bean (7).

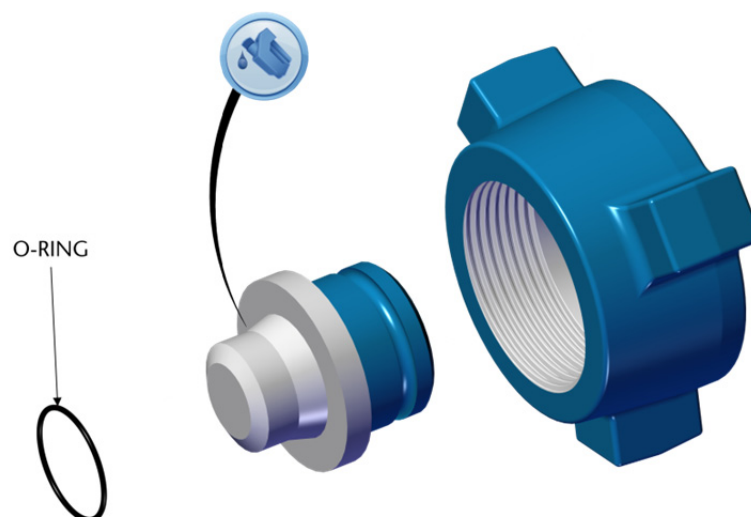
Lubricate threads on bean with anti-seize lubricant.

Install bean into choke body using seal socket (Required Tool 2). Recommended torque is 230 ft.-lbs. for 2" Choke Valves and 600 ft.-lbs for 3" Choke Valves.



Step 2:

Grease the area around the groove on the bonnet. Grease and install the O-ring (15).



Step 3:

Lubricate threads on wing nut (12) with anti-seize lubricant.

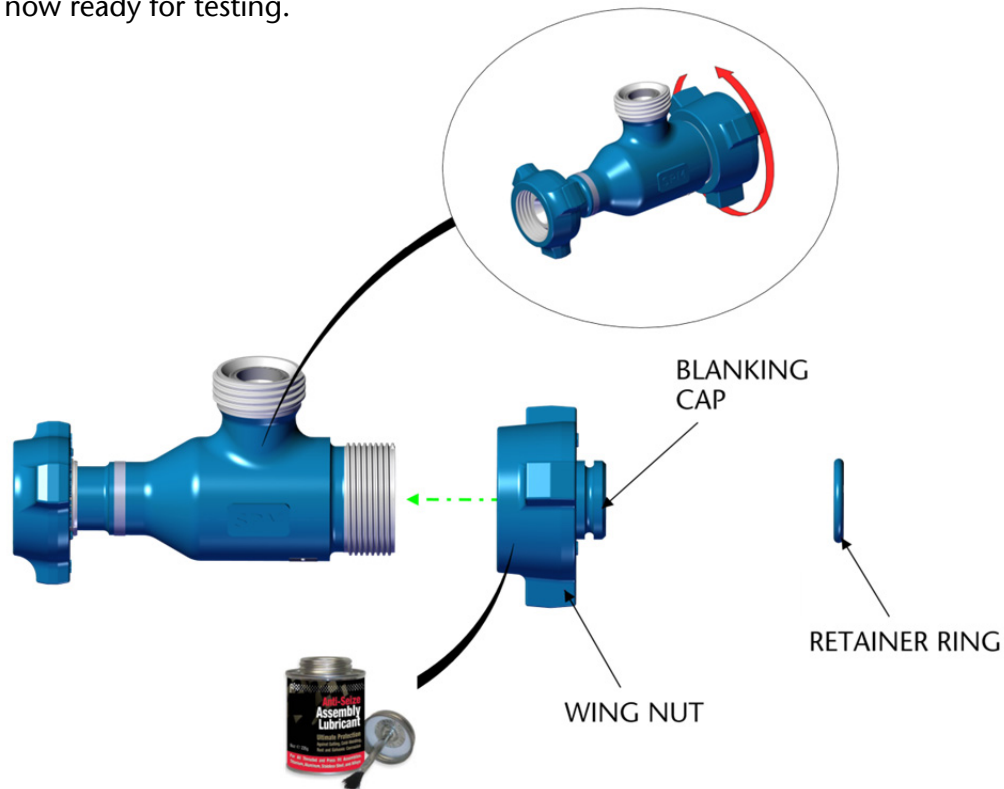
Install wing nut on blanking cap (13).

Install blanking cap retainer ring (14) onto blanking cap.

Install onto choke body and tighten by hand.

Use sledge hammer to tighten securely.

The choke valve is now ready for testing.



Vessel Test Procedures:

Prior to shipment, product testing procedure 4S12497 requires that each Choke Valve pass a one-time vessel test at 150% of its rated working pressure; then, when conducting subsequent vessel tests on used or re-certified valves, limit the pressure to 100% of rated working pressure as required by 4S12497.

Choke Valves should always be vessel tested in accordance with product testing procedure 4S12497.

Troubleshooting Guide:

TROUBLESHOOTING GUIDE

Always follow existing SPM® procedures concerning identifying equipment for inspection and removing equipment from service. The following is intended as a general guide in helping resolve most problems encountered in repairing choke valves. If problems not covered here are encountered, contact Weir Oil & Gas for assistance at 1-800-342-7458.

SYMPTOM		PROBLEM		SOLUTION	
1	Valve leaks past stem toward hand wheel.		Packing set installed incorrectly.		Reinstall packing set in correct orientation.
2	Valve leaks around bonnet wing nut.		O-Ring damaged.		Replaced damaged seal.
3	Reduced flow or no flow.		Possible obstruction due to stem tip breaking off.		Remove obstruction and replace stem and seat. Stem should not be forcibly tightened onto the stem as it could be sheared off.

SECTION IV: Service and Support

Service Center Order Information:

Weir Oil and Gas stocks a large inventory of genuine original equipment replacement parts. In order to expedite a parts order and avoid any delays, please provide the following information with your order:

- The part number and description (refer to drawings and parts lists in this section) of each item ordered.
- The quantity of each part, kit, or assembly ordered.
- The model number and serial number.
- Your purchase order number.
- Specify method of shipment, complete shipping address, complete billing address and telephone number at the destination of the shipment.

Refer to location sheet on the following page.

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