



Model
390 Control Valve
 Operation, Parts and Instruction Manuals



Figure 1 390 Control Valve & DFC Actuator

Dyna-Flo 390

Operation, Parts and Instruction Manual

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!NOTICE!

These instructions are meant to be used with the Dyna-Flo Model 390 Technical (Sales) Bulletin. If you do not have the Technical Bulletin, contact Dyna-Flo immediately, or visit www.dynaflo.com

Each valve is factory checked. Check the calibration for the specific application, before a valve is put into service.

Introduction

The 390 Series control valves (Figure 1) are heavy duty globe style control valves. These valves are used in all kinds of demanding applications, including oil and gas production and chemical process. Metal seats are used for increased seat life.

390 Series valves are cage guided, single port valves that can be used in either snap on/off acting or throttling applications of either liquids or gases. A bolted bonnet is standard and a typical actuator is a Dyna-Flo DFC or DFO model linear actuator.

General

The following instructions are to be thoroughly reviewed and understood prior to installing, operating or performing maintenance on this equipment. Work on this equipment should only be done by experienced personnel. Throughout the manual, safety and caution notes appear and must be strictly followed, to prevent serious injury or equipment malfunction.

Scope

The valve configuration and construction materials were selected to meet particular pressure, pressure drop, temperature, and process fluid conditions. Some body and trim material combinations are limited in their pressure and temperature ranges. Do not apply any other conditions to the valve without first contacting your Dyna-Flo sales office.

This Manual is written to be a practical and useful guide to successfully using the Dyna-Flo Model 390 for many years.

! CAUTION !

To avoid personal injury or installation damage as a result of the sudden release of process pressure or the breaking of parts, do not install the valve assembly where service conditions could exceed the limits stated in this manual or on the equipment nameplates. Use government codes, accepted industry standards and good piping practices to select pressure-relieving equipment for protection of your installation. It is also important to wear the proper protective equipment when performing any installation or maintenance activity.



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Specifications

Configurations

See Table 1 of Sales Bulletin

Consult your Dyna-Flo sales office for other available configurations.

Sizes and Connection Styles

Models 390, 391
Size: 2", 3", 4", 6"
Rating: ASME 900 or 1500
Connections: RF / RTJ

Maximum Inlet Temperatures and Pressures

Consistent with ASME class rating as per ASME B16.34, unless limited by either material pressure or temperature limitations.

Maximum Pressure Drops

Same as maximum inlet pressure unless otherwise rated by specific trim construction. For Actuator and Valve assembly shut off pressure drops see Tables 8 and 9 of Sales Bulletin

Standard Seat Leakage Classifications

See Table 1 of Sales Bulletin

Dimensions

Valve and Actuator Assembly Dimensions
See Table 3 & 4 of Sales Bulletin

Valve and Actuator Assembly Dimensions
See Figure 2 of Sales Bulletin

Approximate Valve Body and Actuator Weights

See Table 2 of Sales Bulletin

Bonnet Bolting

Standard service body to bonnet studs are steel SA193-B7 and steel SA-194-2H nuts.

For NACE-2002 the studs are SA-193-B7M and steel SA-194-2HM for nuts.

For NACE-2003 applications contact Dyna-Flo.

Flow Characteristics

- Equal Percentage (Standard)
- Modified Equal Percentage (Same cage as Equal Percentage, different travel)
- Linear
- Anti-Cavitation Stage 2
- Anti-Cavitation Stage 3

Packing Type

The standard packing is PTFE V-Ring. Live loaded low emission, graphite and other packing arrangements are also available.

Valve Sizing Coefficients

See Table 5 of Sales Bulletin

Trim Sizes and Yoke Boss Sizes

See Table 10 of Sales Bulletin

Trim Materials

See Table 11 of Sales Bulletin

Valve Parts List, Material and Temperature Limitations

See Table 6, 7, 11 and 12 of Sales Bulletin

Parts List Page 16



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Unpacking Valve from Shipping Container

Check the packing list against materials received, while unpacking the valve. The Packing List describes the valve and accessories in each shipping container.

When lifting the valve from shipping container, it is advisable to remove 2 actuator casing bolts, 180° apart, and temporarily replace them with eyebolts and nuts. See Figure 3 for details. Position the lifting straps through the eyebolts to avoid damage to the tubing and mounted accessories.

! WARNING !

The following maintenance procedures require removing the control valve from service. To avoid personnel injury, only qualified technicians should perform the following procedures. Always ensure the control valve is fully released of pressure or process fluid before starting maintenance.

Installation

Before installing the valve, clean dirt, welding chips, scale or other foreign material from the line.

Inspect flange gasket surfaces for damage.

Check packing box bolting for proper tightness. Packing nuts should be slightly over finger-tight; however, tighten only as necessary to prevent stem leakage.

If the valve has small internal flow passages such as anti-cavitation or reduced-noise trim the installation of an upstream strainer should be considered to prevent clogging of these small passages.

! CAUTION !

Do not over tighten packing! This can cause excessive packing wear and high stem friction that may impede stem movement! Refer to Table For Packing Torque.

- 1 Install the valve with flow through the valve in the direction shown by the flow arrow on the valve body. The valve assembly may be installed in any position unless limited by vibration considerations.

! CAUTION !

The normal method is with the actuator vertical above the valve body. In some non-vertical applications, the actuator may need to be supported.

! WARNING !

**Keep hands, hair and clothing away from all moving parts when operating the valve!
Serious injury can result from failure to do so!**

- 2 When possible, stroke the valve and check for smooth operation through the full-stroke. Unsteady valve stem movement could be an indication of an internal problem.

Air Piping

The actuators are designed to accept 1/4" NPT connection. Use 3/8" OD tubing (or equivalent) for all air lines. All connections must be free of leaks.

! CAUTION !

Do not exceed maximum casing pressure indicated on serial plate located on the yoke of the actuator or in the Technical (Sales) Bulletin appropriate for the actuator type.



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Periodic Inspection

! CAUTION !

Use safe work practices and lock out procedures when isolating valves and actuators! Always be aware of flammable instrument gas!

- 1 Avoid personal injury from sudden release of process pressure! Before performing any maintenance operation:
 - a Disconnect any power supply media lines providing air / gas pressure, electric power, or a control signal to the actuator. Ensure the actuator cannot suddenly operate the valve.
 - b Isolate the valve from process pressure with bypass valves or completely shut off the process. Relieve process pressure, and drain the process fluid from the up and down stream of the valve.
 - c Vent the pneumatic actuator loading pressure and relieve any actuator spring preload.
 - d Use Safety lock-out procedures to be sure that the above provisions stay in effect while you complete the work on your equipment.
- 2 Check for process fluid leakage to the atmosphere through the body to bonnet joint and (if equipped) any NPT connection.
- 3 Examine the valve for damage caused by corrosive fumes or process drippings.
- 4 Clean the valve and repaint areas of severe oxidation.
- 5 Make sure positioner linkage (if equipped) and stem connector are securely fastened. If the stem connector is loose, check plug thread engagement and retighten. Refer to the Dyna-Flo Model DFC, or DFO Manual for detailed instructions.
- 6 Ensure all accessories, mounting brackets and fasteners are secure.
- 7 Clean any dirt and foreign material from the valve stem.

Figure 2 Needle Valve w/Gauge setup

Maintenance

Only "Certified Technicians" should be disassembling and inspecting these valves and actuators.

! CAUTION !

Actuator spring is under compression.

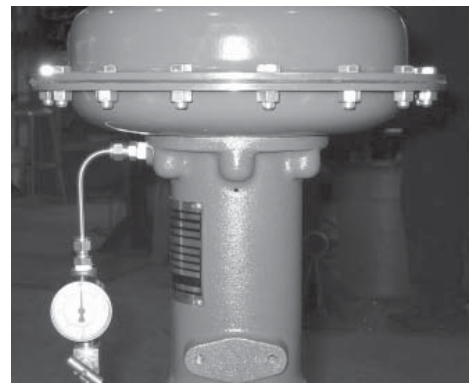
The actuator is also under pneumatic / gas pressure. Ensure actuator has been disconnected from supply lines before starting any work on the actuator.

The actuator needs to be supported before the yoke nut can be removed, failure to support actuator could result in actuator damage and/or personal injury.

Removing Actuator from Valve

Refer to the Dyna-Flo Model DFC/DFO Manual for detailed instructions.

- 1 Disconnect all pneumatic/gas supply lines and any other lines that might supply pressure to the actuator.
ON MODEL DFC (FAIL CLOSED) ACTUATORS: Connect a supply line to the inlet port of the actuator. Be sure not to exceed the maximum casing pressure. This will open the valve and take downward force off the stem connector.





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Maintenance (con't)

Removing Actuator from Valve (Con't)

- 2 Remove the stem connector (Refer to the DFC / DFO Instruction Manual for stem connector removal instructions).
- 3 Support the actuator - the actuator may be able to be removed manually on the smaller sizes. For rigging use two eyebolts in place of two of the casing bolts; make sure they are located 180° apart so that the actuator can be lifted vertically off the valve. Use a sling or chain with hooks to lift the actuator from the valve with the eyebolts. Refer to Figure 3 for rigging setup.



Figure 3 Rigging Setup

- 4 Use a blunted heavy chisel to loosen yoke nut (See Figure 4), unscrew yoke nut off of bonnet. Lift actuator off of valve and store in a safe place.

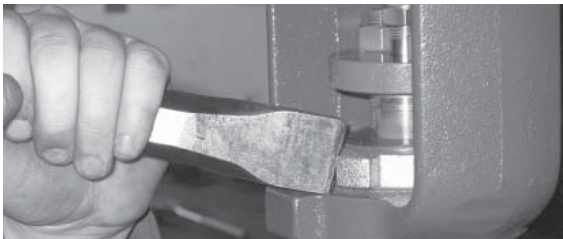


Figure 4 Yoke Nut being loosened with a Chisel

- 5 Remove the jam nuts and travel indicator from the valve stem. Refer to DFC / DFO actuator manual for disassembly procedures for actuators.
- 6 Once actuator has been removed from the valve the air pressure in the actuator can be released. (DFC actuator only)

! NOTE !

For Actuator to Valve Mounting (Assembly) see appropriate Actuator Instruction Manual.

Packing Maintenance

Refer to Figures 8, 9 & 10 for packing orientation and Key numbers for the following section.

For single (spring-loaded) packing:

- a Spring-loaded packing has constant force applied to the packing set (Key 2) through a spring (Key 5) in the packing bore. Ensure that the packing follower (Key 8) is in contact with the bonnet (Key 1), if not tighten the packing nuts (Key 12) until the packing follower comes in contact with the bonnet. If this does not stop the leak then the packing will need to be replaced. In some cases the bonnet and/or stem (Key 17) may need to be polished or replaced.
- b Refer to **Valve Disassembly** section for Packing Removal and Inspection.

! CAUTION !

Do not tighten the packing nuts past the recommended maximum torque value as this will cause high stem friction and could cause the valve to operate incorrectly.

For double packing / graphite ring packing:

- a Double packing consists of two packing sets (Key 2) separated by a lantern ring (Key 6). This style of packing requires that the packing nuts (Key 12) be kept tight to keep force on the packing. If leakage is detected from the packing, the packing nuts can be tightened to apply more force on the packing set (make sure not to exceed the maximum allowable torque values, see Table 2). If this does not seal off the leak then the packing will need to be replaced. In some cases the bonnet (Key 1) and/or stem (Key 17) may need to be polished or replaced.
- b Refer to **Valve Disassembly** section for Packing Removal and Inspection.



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Valve Disassembly

! CAUTION !

If maintenance is to be performed on the valve inline, relieve process pressure and drain the process media from the upstream and downstream sides of the valve. Check that bypass valves are used or the process has been completely shut down.

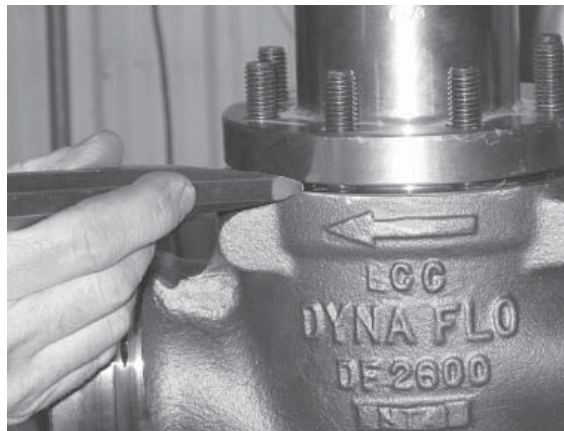
Bonnet Removal

- 1 Loosen the packing nuts (Key 12) until the packing follower (Key 8) is loose. Loosen the bonnet nuts (Key 25) one turn after contact with the bonnet is broken. The bonnet may need to be rocked loose or loosened from the body by prying at the bonnet-to-body joint (See Figure 5). Take care not to damage the gasket-sealing surface when separating the bonnet. If no process medium leaks from the bonnet-to-body joint removal of the bonnet nuts (Key 25) can proceed.
- 2 When removing the bonnet (Key 1) ensure that the stem / plug assembly (Key 19) does not drop out of the bonnet. This could damage the plug seating surface.
- 3 A razor or a pick-set can be used to remove old gaskets. Inspect the gasket-sealing surface for scratches or dents that may cause the gasket to leak.

! NOTE !

Spiral wound gaskets (Keys 22 & 23) make their seal by being crushed. Spiral wound gaskets cannot be reused.

- 4 Inspect threads on bonnet studs (Key 24) and on packing studs (Key 11) for any damage.



Trim Parts Removal (plug/seat/cage)

Refer to Figures 10 & 12 for Key numbers

! NOTE !

For instructions on Cavitation and Noise Reduction Trim contact the Dyna-Flo Sales Office.

1 seal ring (spring-loaded):

To remove the seal ring (Key 28), first pry the retaining ring (Key 26) out of the groove, then remove the metal backup ring (Key 27). Finally remove the seal ring from the plug.

piston ring:

Piston rings (Key 29) will be broken in half, simply pull apart the sections of piston ring and remove.

- 2 Inspect the valve stem (Key 17) for any deep scratching or corrosion also inspect the threads for any damage. Minor scratching or corrosion is acceptable. A minor scratch can be defined as a scratch that will not stop your fingernail when you run it across the scratch. Anything other than a minor scratch will need to be sent to the factory to be refurbished back to the 4µin finish.
- 3 Inspect the seating area on the plug (Key 16). Some minor scratching or corrosion can be lapped out of the plug. The plug can be machined and lapped to remove damage caused by normal wear, corrosion or erosion. Care must be taken not to machine the seat surface back to far as this will effect the position of the seal ring in the cage and may cause failure.
- 4 Inspect the seal ring sealing surface on the plug for any scratching.
- 5 Inspect the seat ring (Key 21) surface for any damage caused by erosion, corrosion or deep scratching. Minor scratching or corrosion can be removed by lapping or machining. Seat ring will need to be replaced if lapping or machining can not remove the damage. Also inspect the gasket-sealing surface for any damage.
- 6 Inspect the inside diameter of the cage (Key 18) for signs of erosion, corrosion or deep scratching. Cages can be polished, but any deep scratching or corrosion is cause for replacement.

Figure 5 Body being separated with a chisel



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Valve Disassembly (Cont'd)

Packing and Packing Parts Removal

! CAUTION ! _____
Concentrated gases could be trapped in the packing!

- 1 Remove all packing parts (Keys 2 through 7, 13 & 14) from the packing bore. Use a rounded tool to remove the packing set (Keys 2, 3 & 4) from the packing bore being careful not to damage the walls of the packing box. Clean all metal parts; if they are not damaged they can be reused.
- 2 Inspect the packing bore for any scratching or corrosion; minor scratching or pitting in the packing bore can be polished out.

Body Gasket Removal

- 1 A razor or a pick-set can be used to remove old gaskets.

! CAUTION ! _____
Care must be taken to avoid damaging these surfaces.

! NOTE ! _____
Spiral wound gaskets (Keys 22 & 23) make their seal by being crushed. Spiral wound gaskets cannot be reused.

- 3 Inspect the internal body surfaces for any signs of corrosion, erosion or irregular wear.

Lapping

Expect a certain amount of leakage in valves with metal seating. In some cases during maintenance or where leakage has become excessive, sealing performance of metal seats can be improved by lapping.

Before proceeding with LAPPING process, inspect the plug / stem and seat as described in **Trim Parts Removal** (page 7).

! NOTE ! _____
Spiral wound gaskets (Keys 22 & 23) make their seal by being crushed. Spiral wound gaskets cannot be reused, this includes reusing a gasket after the lapping procedure has been performed. It may be desirable to use an "old" gasket for the lapping process and replace it after with a new gasket. CAUTION: after performing the lapping process with an "old" gasket it is important not to change the position of the cage (Key 18), seat ring (Key 21) or valve plug (Key 16)! Mark their position using a soft felt marker or similar method before removal. Failure to place trim parts back into their original lapped position after replacing the spiral wound gasket may result in excessive leakage.

- 1 Ensure all valve parts have been thoroughly cleaned before lapping. If the valve plug (Key 16) and seat ring (Key 21) have minor scratches on the seating surface, lapping can remove these scratches without having to replace or machine the plug or seat ring.
- 2 Trim parts should be installed according to the instructions presented in the Assembly: Trim Parts Assembly section, install the "old" seat ring gasket (Key 23), seat ring (Key 21), cage (Key 18) and "old" bonnet gasket (Key 22).
- 3 Be sure to remove any piston rings (Key 29) or seal rings (Key 28) from the valve plug (Key 16) before proceeding. Apply fine grit lapping compound (400 - 600 grit) to the bottom of the valve plug and install the valve plug / stem assembly into the valve.



Figure 6 Handle Construction for Lapping



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Lapping (Cont'd)

- 4 Place the bonnet (Key 1) over the stem and onto the valve. Secure the bonnet using 4 of the bonnet nuts (Key 25). It may be desirable to place the packing follower (Key 8) onto the valve stem and into the packing bore before constructing a handle, this will help keep the stem and plug centered. Attach a handle to the valve stem, such as one made using two wrenches and stem lock nuts as seen in Figure 6.
- 5 Rotate the valve plug (Key 16) in a clockwise then counter-clockwise direction using the handle (only a small amount of rotation is required). After a few cycles of rotation, disassemble the set up as necessary and mark the position of the cage, seat ring, and plug with a soft tip marker before changing out the gaskets. Test for shutoff and repeat lapping procedure if necessary.

Assembly

Ensure that all parts have been cleaned and inspected as per disassembly section.

Trim Parts Assembly

! NOTE !
For instructions on Anti-Cavitation and Noise Reduction Trim contact the Dyna-Flo Sales Office.

! NOTE !
Use an anti-seize compound that is approved for the service conditions that the valve is being installed into.

! NOTE !
Spiral wound gaskets (Keys 22 & 23) make their seal by being crushed. Spiral wound gaskets cannot be reused.

- 1 Coat the seat ring gasket with nickle anti-seize compound and insert it into the seat pocket in the body. Insert seat ring (Key 21) into seat pocket.

2 Plug Seals:

For seal ring (Key 28):

- a Refer to assembly diagram (Figure 10). Lubricate plug seal diameter and install seal ring (Key 28) with cup facing the

correct direction as shown in Figure 12. Install back up ring (Key 27) and retaining ring (Key 26) as shown.

- c Allow time for the PTFE material to shrink back to its original size before installing the plug into the cage.

! NOTE !
Ensure the seal ring (Key 28) does not shift out of the plug groove when installing the plug into the cage.

For piston rings (Key 29):

! NOTE !
Replacement piston rings (Key 29) come in one piece. Before installation it is necessary to break the piston ring into two pieces. Do not saw or cut piston rings.

vise break:

piston rings can be broken into two pieces using a vise with smooth jaws or softeners add. Place the unbroken piston ring into the jaws of the vise so that they will compress the ring into an oval. Slowly compress the piston ring until the ring snaps on both sides, if one side snaps first simply keep compressing until the other side snaps.

scoring:

if no vise is present, score (don't cut) the piston ring and snap over a hard surface such as the edge of a work bench or table.

- 2 Lubricate the valve plug / stem (Key 19) assembly with light assembly grease and insert into the cage (Key 18).

Bonnet Assembly

! NOTE !
Spiral wound gaskets (Keys 22 & 23) make their seal by being crushed. Spiral wound gaskets cannot be reused.

- 1 Coat gasket sealing surface on bonnet with nickle based anti-seize compound. Place bonnet (Key 1) over stem (Key 17) and tighten bonnet nuts (Key 25) to specified torque values. Follow standard torque sequence when tightening bolts. Refer to Table 1 for specific torque values.



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Assembly (Cont'd)

Packing Assembly

Refer to Figure 8 & 9 for packing orientation and Key numbers for the following section.

- 1 Ensure all parts have been cleaned and inspected prior to replacing packing. (See Disassembly section for inspection procedures)

! NOTE !

To prevent trapping air when installing packing rings it is necessary to add packing rings one at a time. Do not force packing rings below the chamfer of the packing bore before adding another ring. Packing should not be pushed down more than the thickness of the added ring (See Figure 7).

For single style (spring-loaded) packing:

- a Lubricate the packing box ring (Key 13) and lower wiper (Key 14) with silicone-based lubricant. Insert both parts into the packing bore followed by spring (Key 5) and special washer (Key 7).
- b Lubricate the packing set (Key 2) with silicone-based lubricant and insert on top of the washer (Key 7) in the packing bore.
- c Place the packing follower (Key 8) on top of the packing set followed by the upper wiper (felt) (Key 9) and packing flange (Key 10).
- d Tighten the packing nuts (Key 12) until the packing follower comes into contact with the bonnet (Key 1).

For double style packing:

- a Lubricate packing box ring (Key 13), lower wiper (Key 14) and lower packing set (Key 2) with silicone-based lubricant. Insert these parts into the packing bore followed by the lantern ring (Key 6).
- b Lubricate the upper packing set (Key 2) and place it into the packing bore followed by the packing follower (Key 8).
- c Insert the upper wiper (felt) (Key 9) and the packing flange (Key 10) over the stem (Key 17) and tighten the packing nuts (Key 12) to the proper torque value as specified in Table 2.

For double style graphite packing:

- a Refer to Figures 8 & 9 for single and double packing arrangements. Choose proper arrangement based on stem size and single or double configurations.

Install bonnet as described in the Assembly section. Install packing box ring and packing arrangement as shown. Note that Key 4 is graphite filament wound material that typically looks like rope.

Key 3 is graphite ribbon compressed into rings and not split as the graphite filament ring is. Install packing follower (Key 8) and flange (Key 10) and torque as per Table 2.

! CAUTION !

Graphite ribbon packing damages easily, care is to be taken when installing it into the packing bore.

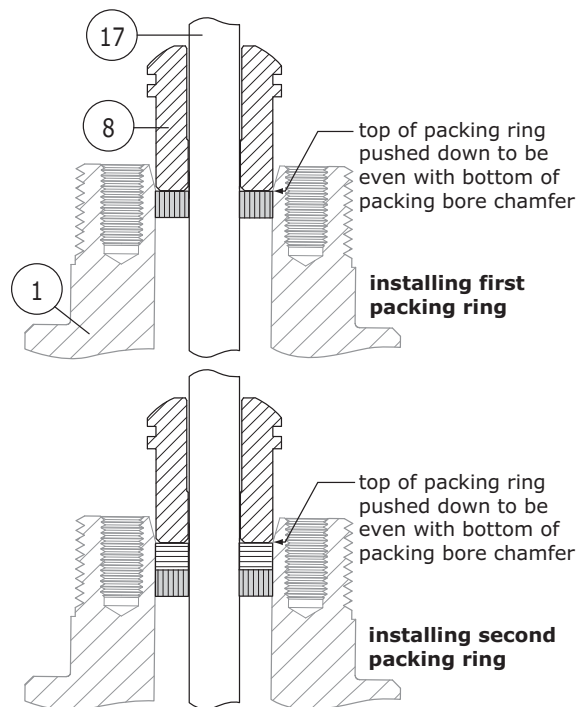


Figure 7 Packing Ring Installation



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Table 1

Body to Bonnet Stud Torque

Valve Sizes (Inch)	Bolt Torques			
	SA193-B7/B7M Studs		SA193-B8/B8M Studs	
	N•m	Ft-lbs.	N•m	Ft-lbs.
2	390	290	240	180
3	730	540	530	390
4	970	720	730	540
6	1650	1220	1650	1220

Table 2

Packing Nut Torque Values

Valve Stem Diameter Inch (mm)	ANSI Class	Packing Flange Nuts (Not Live Loaded)			
		Min. Torque		Max. Torque	
		Ft-lbs.	N•m	Ft-lbs.	N•m
1/2 (12.7)	900	9	12	13	18
	1500	11	15	16	22
3/4 (19.1)	900	20	27	30	41
	1500	25	34	37	50
1 (25.4)	900	31	42	46	62
	1500	38	52	57	77
1-1/4 (31.8)	900	41	56	61	83

Table 3

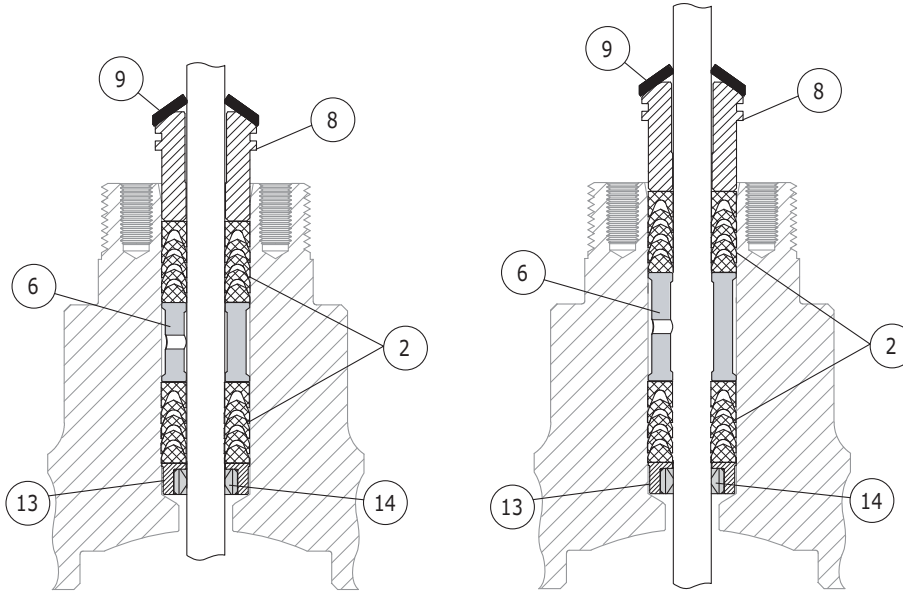
Valve Stem Connection Assembly Torque and Pin Replacement

Valve Size Inches	VSC* Diameter Inches (mm)	Torque Ft-lbs. (N•m)		Hole Size Inches (mm)
		Minimum	Maximum	
2	1/2 (12.7)	60 (81)	85 (115)	1/8 (3.175)
	3/4 (19.1)	175 (237)	250 (339)	3/16 (4.763)
3	1/2 (12.7)	60 (81)	85 (115)	1/8 (3.175)
	3/4 (19.1)	175 (237)	250 (339)	3/16 (4.763)
4	3/4 (19.1)	175 (237)	250 (339)	3/16 (4.763)
	1 (25.4)	310 (420)	355 (481)	1/4 (6.350)
6	3/4 (19.1)	175 (237)	250 (339)	3/16 (4.763)
	1 (25.4)	310 (420)	355 (481)	1/4 (6.350)
	1-1/4 (31.8)	610 (827)	670 (908)	1/4 (6.350)

*VSC - Valve Stem Connection

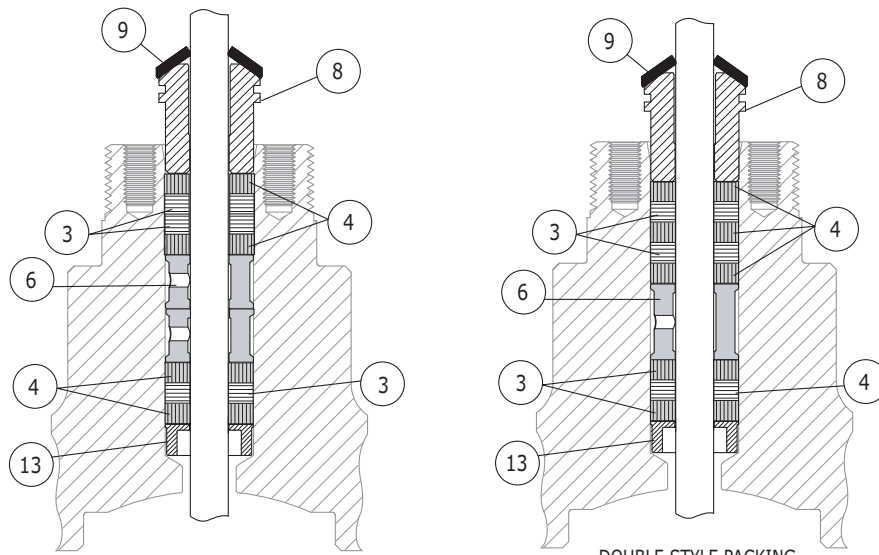


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DOUBLE STYLE PACKING
 PTFE
 1/2" (12.7mm) Stem

DOUBLE STYLE PACKING
 PTFE
 3/4" (19.1mm) Stem
 1" (25.4 mm) Stem
 1-1/4" (31.8 mm) Stem



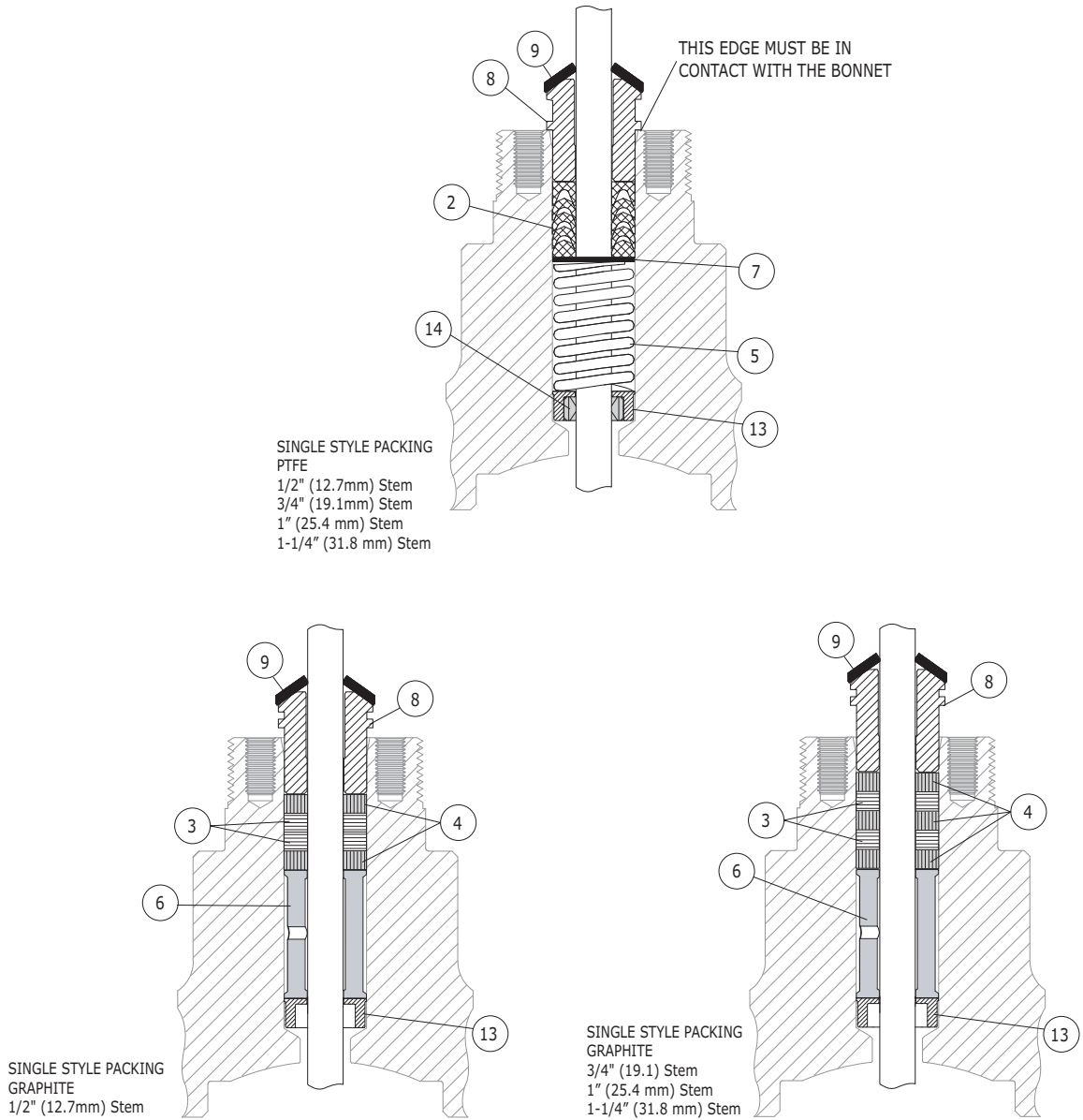
DOUBLE STYLE PACKING
 GRAPHITE
 1/2" (12.7mm) Stem

DOUBLE STYLE PACKING
 GRAPHITE
 3/4" (19.1mm) Stem
 1" (25.4 mm) Stem
 1-1/4" (31.8 mm) Stem

Figure 8 390 Series Control Valve Packing Diagrams



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▲
Figure 9 390 Series Control Valve Packing Diagrams



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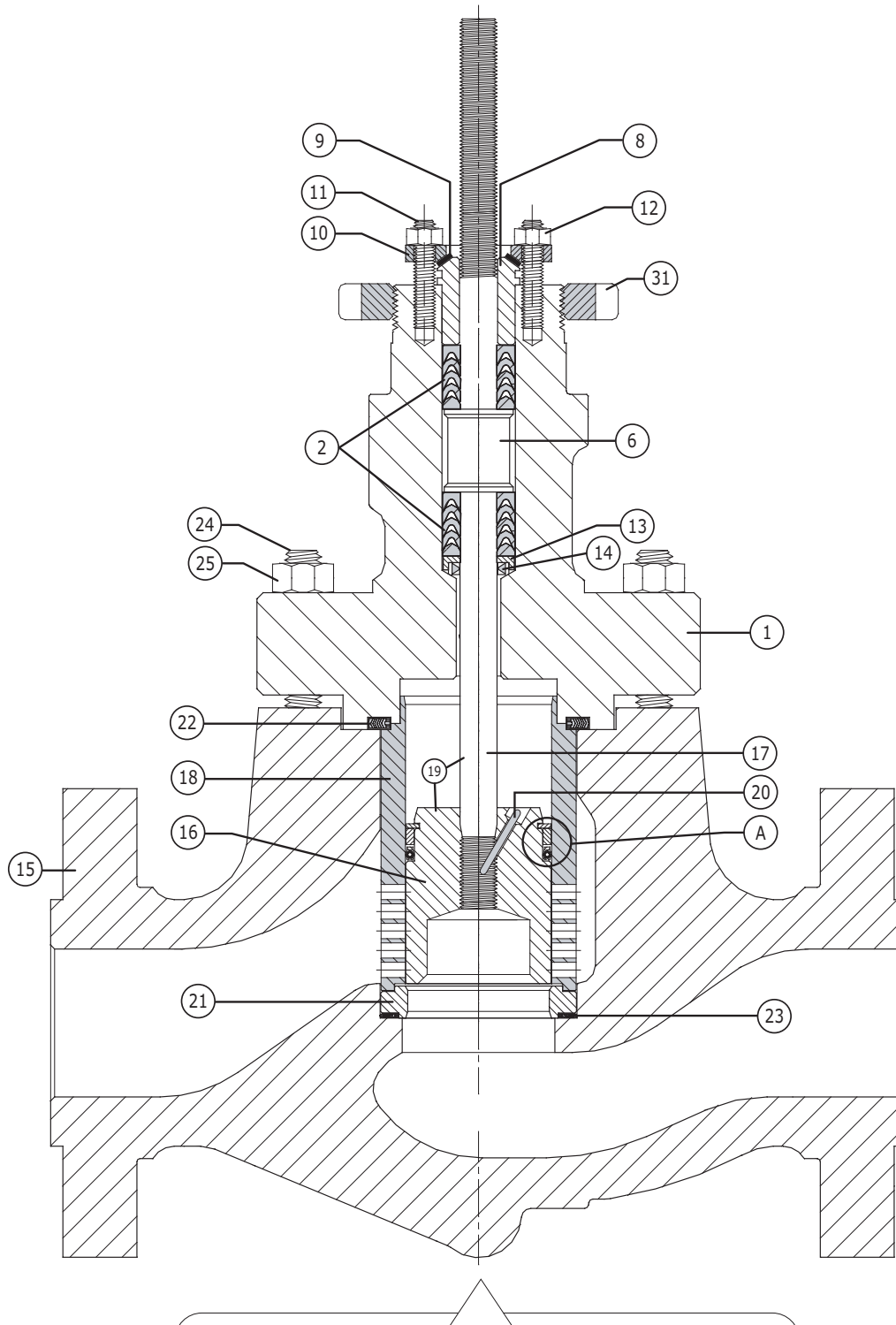


Figure 10 Model 390 Control Valve Cross Section



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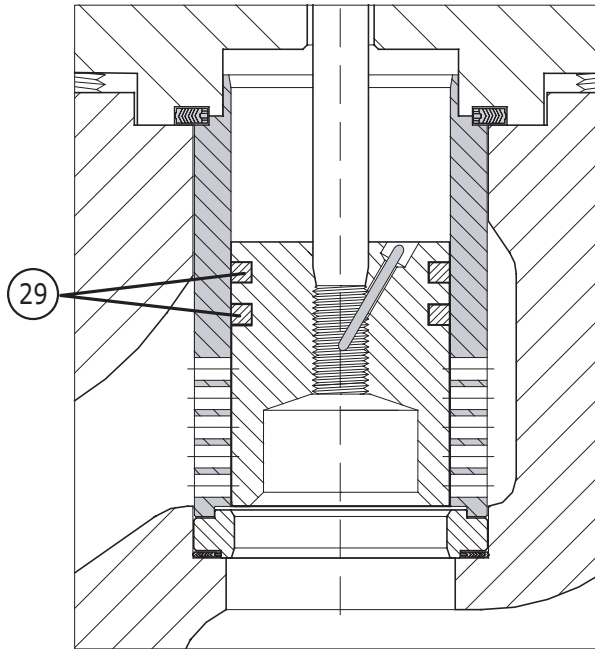
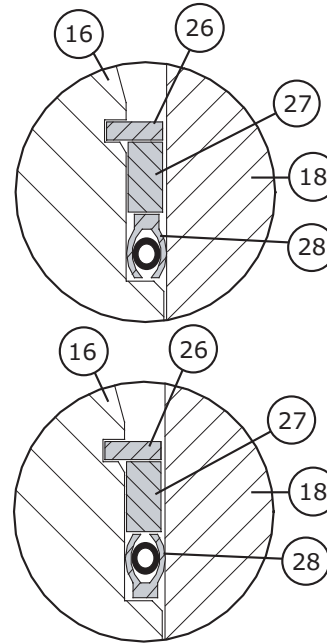


Figure 11 391 Control Valve Piston Ring Diagram



ONE-PIECE SEAL RING
Spring-Loaded
Flow Down
(Cup Faces Down)

ONE-PIECE SEAL RING
Spring-Loaded
Flow Up
(Cup Faces Up)

Figure 12 Detail A - 390 Seal Ring Diagrams

Parts

Key	Description	Part Number
1	Bonnet , if you need a bonnet as a replacement part, order by valve size and stem diameter, serial number and desired material	
2 - 7	Packing Box Parts Refer to Packing Box Parts Table 4.	
8	Packing Follower S31600	
	1/2 inch (13 mm) Stem	1E94433507D
	3/4 inch (19 mm) Stem	1E94473507D
	1 inch (25.4 mm) Stem	1H98233507D
	1-1/4 inch (31.8 mm) Stem	1H99843507D
9	Upper Wiper Felt	
	1/2 inch (13 mm) Stem	1J87270633D
	3/4 inch (19 mm) Stem	1J87280633D
	1 inch (25.4 mm) Stem	1J87290633D
	1-1/4 inch (31.8 mm)	1J87300633D

10	Packing Flange Carbon Steel-Plated	
	1/2 inch (13 mm) Stem	1E94422307D
	3/4 inch (19 mm) Stem	1E94482307D
	1 inch (25.4 mm) Stem	0V00242505D
	1-1/4 inch (31.8 mm) Stem	0W08562507D
	S31600	
	1/2 inch (13 mm) Stem	1F38033507D
	3/4 inch (19 mm) Stem	1F38043507D
	1 inch (25.4 mm) Stem	1H78823507D
	1-1/4 inch (31.8 mm) Stem	1J10073507D
11	Packing Stud SA-193-B7 (Qty. 2)	
	1/2 inch (13 mm) Stem	1E94443103D
	3/4 inch (19 mm) Stem	1E94493103D
	1 inch (25.4 mm) Stem	0V00253522D
	1-1/4 inch (31.8 mm) Stem	0W08693103D



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Key	Description	Part Number
11	Packing Stud (Continued)	
	SA-193-B8M (Qty. 2)	
	1/2 inch (13 mm) Stem	1E94443522D
	3/4 inch (19 mm) Stem	1E94493522D
	1 inch (25.4 mm) Stem	0V00253522D
	1-1/4 inch (31.8 mm) Stem	0W08693522D
12	Packing Nut	
	SA-194-2H (Qty. 2)	
	1/2 inch (13 mm) Stem	1E94452411D
	3/4 inch (19 mm) Stem	1E94462411D
	1 inch (25.4 mm) Stem	1A34332411D
	1-1/4 inch (31.8 mm) Stem	1A36812411D
	SA-194-8M (Qty. 2)	
	1/2 inch (13 mm) Stem	1E94453525D
	3/4 inch (19 mm) Stem	1E94463525D
	1 inch (25.4 mm) Stem	1A34333525D
	1-1/4 inch (31.8 mm) Stem	1A36813525D
13	Packing Box Ring	
	S31600	
	1/2 inch (13 mm) Stem	1J87323507D
	3/4 inch (19 mm) Stem	1J87333507D
	1 inch (25.4 mm) Stem	1J87343507D
	1-1/4 inch (31.8 mm) Stem	1J87353507D
14	Lower Wiper	
	Teflon	
	1/2 inch (13 mm) Stem	1J87220699D
	3/4 inch (19 mm) Stem	1J87230699D
	1 inch (25.4 mm) Stem	1J87240699D
	1-1/4 inch (31.8 mm) Stem	1J87250699D
15	Body , if you need a body as a replacement part, order by valve size and stem diameter, serial number and desired material.	
16	Valve Plug	Refer to Table 5
17	Valve Stem	Refer to Table 6
18	Cage	Refer to Table 7
19	Valve Plug/Stem Assembly	(Keys 16, 17 & 20)
20	Pin	
	S31600	
	1/2 inch (12.7mm) Stem	1V32273507D
	3/4 inch (19.1mm) Stem	1V32603507D
	1 inch (25.4 mm) Stem	1V33403507D
	1-1/4 inch (31.8 mm) Stem	1V33403507D
21	Seat Ring	
	S31600 - CoCr-A Seat	
	2 inch (1-7/8" Port)	22B6005X01D

	3 inch (2-7/8" Port)	22B6095X01D
	4 inch (3-5/8" Port)	22B9339X01D
	6 inch (5-3/8" Port)	23B0094X01D
	S41600	
	2 inch (1-7/8" Port)	22B6004X01D
	3 inch (2-7/8" Port)	22B6094X01D
	4 inch (3-5/8" Port)	22B9338X01D
	6 inch (5-3/8" Port)	23B0093X01D
	2 Stage Anti-Cavitation S44004 (440C SST) with Heat Treatment	
	2 inch	23B0163X01D
	3 inch	22B6096X01D
	4 inch	22B9342X01D
	6 inch	23B0097X01D
	2 Stage Anti-Cavitation S31600 - CoCr-A Seat	
	2 inch	23B0164X01D
	3 inch	22B6097X01D
	4 inch	22B9343X01D
	6 inch	23B0098X01D
	3 Stage Anti-Cavitation S44004 with Heat Treatment	
	2 inch	22B6068X01D
	3 inch	22B6098X01D
	4 inch	22B9344X01D
	6 inch	22B0099X01D
	2 Stage Anti-Cavitation S31600 - CoCr-A Seat	
	2 inch	22B6069X01D
	3 inch	22B6099X01D
	4 inch	22B9345X01D
	6 inch	23B0100X01D
22	Bonnet Gasket (spiral wound) N06600 / Graphite	
	(Refer to Table 9 for Part Numbers)	
23	Seat Ring Gasket (spiral wound) N06600 / Graphite	
	(Refer to Table 9 for Part Numbers)	
24	Bonnet Stud (Qty. 8) SA-193-B7	
	2 inch	1A36573101D
	3 inch	11A5789X01D
	4 inch	1P92523101D
	6 inch	12A0595X01D



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Key	Description	Part Number	
24	Bonnet Stud (Qty. 8) (Continued)		
	SA-193-B8M		
	2 inch	1D1712X006D	
	3 inch	11A5189X02D	
	4 inch	1P9252X005D	
	6 inch	12A0595X07D	
	SA-193-B7M		
	2 inch	1A3657X006D	
	3 inch	11A5189X02D	
	4 inch	1P9252B7MDD	
	6 inch	12A0595B7MD	
	25	Bonnet Nut (Qty. 8)	
		SA-194-2H	
		2 inch	1C17272407D
3 inch		1A44522407D	
4 inch		1A44532407D	
6 inch		1A50112407D	
SA-194-8M			
2 inch		1C17273525D	
3 inch		1A44523525D	
4 inch		1A4453X002D	
6 inch		1A5011X002D	
SA-194-2HM			
2 inch		1C1727X004D	
3 inch		1A44522HMDD	
4 inch	1A44532HMDD		
6 inch	1A501122HMD		
26	Retaining Ring		
	S31600		
	1-7/8" Port	10A4220X01D	
	2-1/2" Port	17A4311X01D	
	2-7/8" Port	10A4219X01D	
	3-7/16" Port	10A5350X01D	
	3-5/8" Port	16A5484X01D	
	4-3/8" Port	10A4225X01D	
	4-9/16" Port	17A4415X01D	
	5-1/4" Port	17A4398X01D	
5-3/8" Port	10A5410X01D		
27	Backup Ring		
	S31600		
	2 inch (1-7/8" Port)	10A4218X01D	
	3 inch (2-7/8" Port)	10A4217X01D	
	4 inch (2-7/8" Port)	10A4217X02D	
	4 inch (3-5/8" Port)	16A5483X02D	
	6 inch (4-3/8" Port)	10A4224X02D	
	6 inch (5-3/8" Port)	10A5409X02D	

2	2 Stage Anti-Cavitation (S31600)		
	2 inch (1-3/4" Port)	13A8520X02D	
	3 inch (2-1/2" Port)	17A4310X02D	
	4 inch (3-7/8" Port)	10A5349X02D	
	6 inch (5-1/4" Port)	17A4397X02D	
	3 Stage Anti-Cavitation (S31600)		
3 inch (1-7/8" Port)	10A4218X01D		
4 inch (2-7/8" Port)	10A4217X02D		
6 inch (4-9/16" Port)	17A4414X02D		
28	Seal Ring		
	Carbon / PTFE / R30003		
	2 inch (1-7/8" Port)	10A4216X03D	
	3 inch (2-7/8" Port)	10A4215X03D	
	4 inch (2-7/8" Port)	10A4215X03D	
	4 inch (3-5/8" Port)	16A5485X06D	
	6 inch (4-3/8" Port)	10A4223X01D	
	6 inch (5-3/8" Port)	10A5411X02D	
	2 Stage Anti-Cavitation (CPTFE/R30003)		
	2 inch	17A2296X01D	
	3 inch	17A4306X01D	
	4 inch	10A5351X02D	
	6 inch	17A4396X01D	
	3 Stage Anti-Cavitation (CPTFE/R30003)		
2 inch	—		
3 inch	10A4215X03D		
4 inch	10A4215X03D		
6 inch	17A4413X01D		
29	Piston Ring (model 391)		
	Carbon / Graphite		
	-425°F to 800°F (-253°C to 426°C)		
	2 inch (1-7/8" Port) Qty:2	1U2216X001D	
	3 inch (2-7/8" Port) Qty:2	1U2300X001D	
	4 inch (2-7/8" Port) Qty:2	1U2300X001D	
	4 inch (3-5/8" Port) Qty:2	16A5482X01D	
	6 inch (4-3/8" Port) Qty:4	1U2392X001D	
	6 inch (5-3/8" Port) Qty:3	11A9727X02D	
	30	Flow Arrow	
		S30400	1V10603898D
	31	Yoke Nut	
Steel / Zinc Plated			
2-13/16 inch yoke boss		1E80742306D	
3-9/16 inch yoke boss	1E83272306D		
32	Nameplate		
	SST	NAME12SLIDD	



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Keys 2, 3, 4, 5, 6 & 7 Packing Box Parts

Table 4

Description	Key No.	Stem Diameter inch (mm)			
		1/2 (12.7)	3/4 (19.1)	1 (25.4)	1-1/4 (31.8)
PTFE V-Ring Packing					
Packing Set (PTFE) (Refer to Table 8 for Repair Kits)	2	1R2902010DD	1R2904010DD	1R2906010DD	1R2908010DD
Spring (SST) (for single only)	5	1F12553701D	1F12563701D	1D58293701D	1D38743701D
Lantern Ring (SST) (for double only)	6	DFX0000001D	0N02843507D	0U09973507D	0W08713507D
Quantity Required	Double	1	1	1	1
Special Washer (SST) (for Single only)	7	1F12513604D	1F12503604D	1H98223604D	1H99593604D
Graphite Ribbon / Graphite Filament					
Graphite Ribbon (Ring)	3	1V3802X002D	1V2396X002D	1U6768X002D	1V5666X002D
Quantity Required	Single	2	2	2	2
	Double	3	3	3	3
Graphite Filament (Ring)	4	1E3190X022D	1E191X028D	1D7518X013D	1D7520X016D
Quantity Required	Single	2	3	3	3
	Double	4	5	5	5
Lantern Ring (SST)	6	1J96233507D	0N02843507D	0U09973507D	0W08713507D
Quantity Required	Single	3	2	2	2
	Double	2	1	1	1

Key 16 Valve Plug

Table 5

Valve Model	Valve Size inch	Port Size inch (mm)	Stem Diameter inch (mm)	Materials		
				S41600	S31600 ¹	
390	2	1-7/8 (47.6)	1/2 (12.7)	32B6010X01D	32B6011X01D	
			3/4 (19.1)	32B6012X01D	32B6013X01D	
	3	2-7/8 (73)	1/2 (12.7)	36A5350X01D	36A5429X01D	
			3/4 (19.1)	36A5351X01D	36A5430X01D	
			1 (25.4)	36A5352X01D	36A5431X01D	
	4	3-5/8 (98)	3/4 (19.1)	36A5358X01D	36A5437X09D	
			1 (25.4)	36A5359X01D	36A5438X06D	
	6	5-3/8 (136.5)	3/4 (19.1)	36A5365X01D	36A5444X01D	
			1 (25.4)	36A5366X01D	36A5445X01D	
			1-1/4 (31.8)	36A5367X01D	36A5446X01D	
	391	2	1-7/8 (47.6)	1/2 (12.7)	32B6006X01D	32B6007X02D
				3/4 (19.1)	32B6008X01D	32B6008X02D
3		2-7/8 (73)	1/2 (12.7)	32B8246X01D	32B8247X03D	
			3/4 (19.1)	32B8248X01D	32B8249X03D	
			1 (25.4)	32B8250X01D	32B8251X03D	
4		3-5/8 (98)	3/4 (19.1)	32B9346X01D	32B9347X02D	
			1 (25.4)	32B9348X01D	32B9349X02D	
6		5-3/8 (136.5)	3/4 (19.1)	36A5362X01D	36A5441X10D	
			1 (25.4)	36A5363X01D	36A5442X11D	
			1-1/4 (31.8)	36A5364X01D	36A5443X09D	

1 - S31600 (316 SST) Plug with CoCr-A Seat and Guide.



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Table 5 Continued

Key 16 Valve Plug Continued

Valve Model	Valve Size inch	Port Size inch (mm)	Stem Diameter inch (mm)	Materials		
				S44004 ²	S31600 ¹	
390 2 Stage Anti- Cavitation	2	1-7/8 (47.6)	1/2 (12.7)	37A2294X05D	37A2295X10D	
			3/4 (19.1)	37A2294X06D	37A2295X11D	
	3	2-7/8 (73)	1/2 (12.7)	37A4303X05D	37A4306X03D	
			3/4 (19.1)	37A4304X05D	37A4307X04D	
			1 (25.4)	37A4305X06D	37A4308X06D	
	4	3-5/8 (98)	3/4 (19.1)	24A5259X09D	24A5280X05D	
			1 (25.4)	24A5260X07D	24A5281X09D	
	6	5-3/8 (136.5)	3/4 (19.1)	37A4390X04D	37A4393X04D	
			1 (25.4)	37A4391X07D	37A4394X05D	
			1-1/4 (31.8)	37A4392X05D	37A4395X05D	
	390 3 Stage Anti- Cavitation	3	2-7/8 (73)	1/2 (12.7)	37A4320X05D	37A4322X04D
				3/4 (19.1)	37A4321X11D	37A4323X10D
1 (25.4)				37A4321X14D	37A4323X12D	
4		3-5/8 (98)	3/4 (19.1)	38A0014X06D	38A0016X06D	
			1 (25.4)	38A0015X03D	38A0017X03D	
6		5-3/8 (136.5)	3/4 (19.1)	37A4407X04D	37A4410X04D	
			1 (25.4)	37A4408X06D	37A4411X05D	
			1-1/4 (31.8)	37A4409X05D	37A4412X05D	

1 - S31600 (316 SST) Plug with CoCr-A Seat and Guide.
 2 - S4404 (440C SST) with heat treatment.

Table 6

Key 17 Valve Stem, S20910 (Nitronic 50) with standard bonnet

Valve Size inches	Max Valve Travel inches (mm)	Stem Diameter inches (mm)	Part Number	
			390 Valve	391 Valve
2	1-1/2 (38.1)	1/2 (12.7)	1N8210X009D	1N8210X009D
		3/4 (19.1)	1P6696NT50D	1P6696NT50D
3	2 (50.8)	1/2 (12.7)	1U4369NT50D	1U2179NT50D
		3/4 (19.1)	1P6696NT50D	10A9265XV6D
		1 (25.4)	1K7447X004D	1L1446X005D
4	2 (50.8)	3/4 (19.1)	10A6088X05D	1L4001X004D
		1 (25.4)	1P5164NT50D	11A3429X65D
6	3 (76.2)	3/4 (19.1)	1U5071NT50D	1U5071NT50D
		1 (25.4)	11A3429X65D	11A3429X65D
		1-1/4 (31.8)	10A6073X07D	10A6073X07D



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Key 18 Cage

Table 7

S17400 DH 1150 SST (Standard)

Valve Size, inches	Linear	Equal Percentage	Anti-Cavitation Stage 2	Anti-Cavitation Stage 3
2	32B6025X01D	32B6028X01D	—	—
3	42B8242X01D	42B8240X01D	—	—
4	42B9322X01D	42B9320X01D	—	—
6			—	—

S17400 DH 1150

Valve Size, inches	Linear	Equal Percentage	Anti-Cavitation Stage 2	Anti-Cavitation Stage 3
2	32B6025X03D	32B6028X03D	33B0160X02D	32B6070X02D
3	42B8242X03D	42B8240X03D	32B8522X02D	32B8255X02D
4	42B9322X03D	42B9320X03D	32B9331X02D	32B9334X02D
6	43B0079X03D	43B0078X03D	33B0088X02D	33B0091X02D

S31600 (ENC)

Valve Size, inches	Linear	Equal Percentage	Anti-Cavitation Stage 2	Anti-Cavitation Stage 3
2	32B6026X01D	32B6029X01D	—	—
3	42B8243X01D	42B8241X01D	—	—
4	42B9323X01D	42B9321X01D	—	—
6	43B0081X01D	43B0080X01D	—	—

Packing Repair Kits

Table 8

Stem Diameter [Yoke Boss Diameter] inches (mm)	Single		Double		
	PTFE	Graphite	PTFE	Graphite	PTFE/Composition
1/2 (12.7) [2-13/16 (71)]	RPACKX0002D	RPACKX0011D	RPACKX0005D	RPACKX0017D	RPACKX0008D
3/4 (19.1) [3-9/16 (90)]	RPACKX0003D	RPACKX0012D	RPACKX0006D	RPACKX0018D	RPACKX0009D
1 (25.4) [5 (127)]	—	—	—	—	—
1-1/4 (31.8) [5 (127)]	—	—	—	—	—

Keys 22 & 23, Gasket Kits (Qty: 2/kit)

Table 9

Description	Part Number
2 inch	12B7100X03D
3 inch	12B7100X05D
4 inch	12B7100X08D
6 inch	

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