skoflo
Industries

Surface CIMV, Low Flow, HTV
15,000 psi

SF15000HTVB-2S

Operations and
Maintenance Manual

DOC-04169 Rev A

Pioneering an Industry

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About SkoFlo

Our experience and track record speak for itself. SkoFlo has delivered over 20,000 valves since 1988. We are the only company that proves our products by testing in surface applications before deploying them subsea. The result is that SkoFlo products have amassed over 25 million continuous operating hours. This level of experience is unparalleled and provides the basis for being the solution provider to our served market.

General Information

Product Overview

The SF15000HTVB is a pressure independent chemical injection and metering valve (CIMV), used in the petroleum industry to accurately control chemical injection rates. The SF15000HTVB regulates flow to counter pressure changes on the inlet and outlet of the unit. This is referred to as "pressure independence".

Pressure Independence

SkoFlo defines pressure independence as the percent (%) of reading change for each 1,000 psi (69 bar) change in supply or outlet pressure.

Pressure independence in the SF15000HTVB is a completely mechanical process, requiring zero power.

The principle of pressure independence is that the valve maintains a constant differential pressure (dP) across an internal orifice (the 'gate'), thus resulting in a constant flow rate through that orifice.

The pressure that is generated by flow through the gate is applied to either side of a spring balanced piston that carries a regulating pin. The piston will travel to a position where the spring force equals the pressure force.

Minimum Differential Pressure

For the SF15000HTVB to provide pressure independent performance, a minimum differential pressure (min dP) is required across the valve to allow the spring-balanced piston to move to a truly balanced location.

In general, higher flows and/or viscosities require a higher min dP across the valve. Refer to the product datasheet for specific information.

Guidelines for Using this Manual

The following instructions are provided to ensure a safe and proper installation and operation.

- Read all instructions prior to installation and operation of this product.
- Follow all warning and caution notes.
- Install this product as specified in the instructions provided by SkoFlo.
- Prior to use, educate personnel in the proper installation, operation, and maintenance of this product.
- Only use replacement parts specified by SkoFlo.

Warning, Caution, Notice

Throughout this manual there are steps and procedures which, if not followed, may result in a hazard. The following flags are used to identify the level of potential hazard.

! WARNING

WARNING IS USED TO INDICATE THE PRESENCE OF A HAZARD WHICH CAN CAUSE SEVERE INJURY, DEATH, OR SUBSTANTIAL PROPERTY DAMAGE IF THE WARNING IS IGNORED.

! CAUTION

CAUTION IS USED TO INDICATE THE PRESENCE OF A HAZARD WHICH CAN CAUSE INJURY OR PROPERTY DAMAGE IF THE WARNING IS IGNORED.

! NOTICE

NOTICE IS USED TO NOTIFY PEOPLE OF INSTALLATION, OPERATION, OR MAINTENANCE INFORMATION, WHICH IS IMPORTANT BUT NOT HAZARD RELATED.

Abbreviations and Acronyms

CIMV	Chemical Injection and Metering Valve
dP	Differential Pressure
GA	General Arrangement
GPD	Gallons Per Day
HTV	High Turn-Down Valve
LPH	Liters Per Hour
SHCS	Socket Head Cap Screw
psi	Pounds per Square Inch

Hydraulic Ratings

! WARNING

REFER TO THE GENERAL SECTION OF THE PRODUCT DATASHEET FOR DESIGN PRESSURE DETAILS.

! NOTICE

THE SF15000HTVB REQUIRES A MINIMUM DIFFERENTIAL PRESSURE ACROSS THE VALVE OF 300 PSI (20.7 BAR) TO ACHIEVE FULL RATED FLOW.

Max Working Pressure: 15,000 psi (1,034 bar)

Hydro-Pressure: 22,500 psi (1551 bar)

Flow Ranges:

- 0.6 to 600 GPD (0.09 to 95 LPH)
- 25 to 2500 GPD (3.9 to 394 LPH)

Min Differential Pressure (DP) for Max Rated Flow: 300 psi*

* Lower flow rates require a lower DP

Storage

! NOTICE

IT IS RECOMMENDED TO STORE THE ASSEMBLIES IN THE SHIPPING CRATE, IF POSSIBLE.

The SF15000HTVB should be stored in a shelter and be protected from moisture and particulates. Storage temperatures shall be between –50°F and 158°F (–45°C and 70°C).

Any open hydraulic connections will be furnished with plastic blanking plugs.

It is important not to store the SF15000HTVB with production chemicals in the unit. These chemicals can settle, possibly resulting in damage to the unit. SkoFlo recommends that the valve be stored with a mixture of glycol in water as the preservation fluid.

Installation

! WARNING

CHEMICAL COMPATIBILITY SHALL BE DONE AND CHECKED BEFORE USE, EXCEPT FOR MEG AND WATER MIXTURES.

! WARNING

THE SF15000HTVB SHALL NOT BE INSTALLED SUBSEA.

1. Mounting

The SF15000HTVB can be panel or base mounted in any orientation. See Appendix B – SF15000HTVB GA and BOM Drawings for more details.

If panel mounting, unscrew the handle fastener with a 2mm Allen wrench and remove the handle. Mount the valve, then replace the handle and tighten the fastener in place.

Where applicable, the orientation of a Rotork actuator can be adjusted relative to the valve, however, disconnecting the actuator from the valve may require recalibration. The recalibration procedure for the Rotork actuator can be found in the Rotork Actuator Quick Setup Guide (DOC-03828). Note: actuator jams/stalls are possible if the procedure is not followed accurately.

2. Hydraulic Installation

Install the SF15000HTVB so that the flow is in the proper direction. The IN (inlet) and OUT (outlet) connections are marked respectively. See Appendix B – SF15000HTVB GA and BOM Drawings for details.

Install an inline filter upstream of the SF15000HTVB. Clean chemicals and proper filtering are very important. Omitting the filter can cause the valve to become plugged.

Table 1 lists the filter requirements for the various flow ranges. Note: if coarser filters are used, the adjustment handle may need to be periodically opened to flush out any debris (see Section 5)

Table 1 – Filter Specification

Flow Range	Filter Micron Size
0.6 to 10 GPD	40
10 to 700 GPD	80
> 700 GPD	200

A pulsation dampener is recommended to be installed on the inlet header supplying the SF15000HTVB for improved longevity and set point consistency. A bladder type pulsation dampener is preferred over a piston type. Reactive dampeners that use baffles will do little to dampen the pressure over the full flow range of the valve.

The SF15000HTVB is not a positive shut off device, therefore, an isolation valve on the inlet or outlet will be required to meet shutoff specifications. The preferred location of the isolation valve is on the outlet of the SkoFlo valve to minimize the shock to internal parts during start up.

! CAUTION

IF OPERATING WITH AN INLET ISOLATION VALVE, AVOID INDUCING PRESSURE SHOCKS BY OPENING SLOWLY.

A check valve shall be Installed immediately downstream of the SF15000HTVB (within 6 inches) to prevent damage to the piston cup seal and to prevent well fluids entering the valve. The 6-inch maximum is required to eliminate stored pressure build up during startup. Check valve cracking pressure is recommended to be under 15 psi to enhance longevity of check valve seats.

An example of a typical chemical injection system is given in Appendix A – A Typical Chemical Injection System.

3. Start Up Procedures

3.1 Open the supply isolation valve to the SkoFlo valve slowly (> 1 second). This will allow pressures within the unit to equalize slowly, the valve will stabilize quickly.

3.2 Turn the rate adjustment handle clockwise until you are at the desired flow rate.

3.3 Always start at a flow rate above the desired flow and decrease to the desired setting (turn handle clockwise to decrease flow rate).

- For the most consistent set point results, rotate handle ½ turn clockwise to reach the set point.
- When increasing the flowrate of a Rotork actuated valve, always overshoot the intended setpoint by 2mA for consistent results.

3.4 The flow controller is now set, and further adjustments are not required.

4. Adjustment and Calibration

The SF15000HTVB is a pressure independent flow control device. Once the valve is set at a desired flow rate, that flow rate is maintained even though the pressure conditions upstream and/or downstream of the valve may change considerably.

The flow rate can be set using an inline flow meter; however, it must be capable of withstanding the process pressure. Another method of calibrating the SF15000HTVB is with a 3-way valve and a line to a calibration beaker. Once the flow rate is set, the 3-way valve is switched to direct the chemical to the process (see Figure 1).

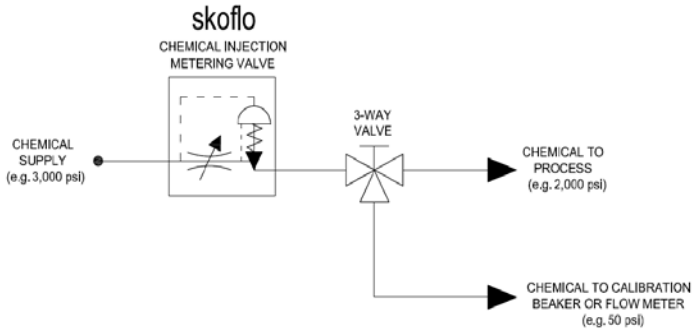


Figure 1 – Valve Calibration Schematic

Since the SkoFlo valve regulates the flow independent of the pressure differential across it, the flow rate to the process is the same as the flow rate set using the beaker. Overall monitoring of the flow is done by taking inventory of the usage from the supply tank.

5. Debris Flushing

Insufficient inline filtering can lead to debris getting trapped in narrow passages within the valve. This can manifest in falling flow delivery, or an inability to regulate at low flow rates.

The SF15000HTVB has a flushing piston, which disengages the regulating pin and generates the high flowrates necessary to flush any debris trapped in the gate or seat.

To clear any debris that is influencing the flow performance of the SF15000HTVB, slowly open (CCW) the handle until the valve is at the top stop. Apply 1,000psi DP across the valve and wait for 60s before closing the valve back to the original stem setpoint.

To achieve an effective flush, the flowrate should exceed 1,000 gal/day (160 LPH). It may be necessary to isolate other valves in the system to achieve this flowrate.

Note: opening the valve to a flushing position may outpace the supply pump, impacting other valves in the system.

MAINTENANCE

! WARNING

ANY SERVICE REPAIR SHALL BE PERFORMED BY TRAINED PERSONNEL.

! NOTICE

IF ANY ABNORMALITIES ARE FOUND THROUGHOUT THE MAINTENANCE, PLEASE REPORT TO THE RESPECTIVE ENGINEERS.

6. General

Spares kits available for typical maintenance items are listed in Table 2 – SF15000HTVB Spares Kit Part Numbers See Table 3, Table 4, and Table 5 for part number guides.

Table 2 – SF15000HTVB Spares Kit Part Numbers

ITEM	PART NUMBER
Complete Rebuild Kit	31655-15-XXXX-XXXX-2X-XX-XX
Seal Kit	31664-15-XXXX-2X
Stem Assembly Kit	31625-15-XXXX-XXXX-2X-XX
Piston Assembly Kit	31623
Gate Pad	30570
Washer Spring Stack	30513
Seal Installation Tool Kit	31804

Table 3 – SF15000HTVB Rebuild Kit Number Guide

31655	-	XX	-	XXXX	-	XXXX	-	XX	-	XX	-	XX

CODE	WORKING PRESSURE
15	15KSI
10	10KSI
5	5KSI

FLOW RANGE	CODE
0.2 to 150gpd	150D
0.6-600gpd	600D
25-2500gpd	2500D

SEAL MATERIAL
FFKM
FKM
EPDM

STAGE SELECTION	CODE
DUAL-INT. CUP SEAL	2X
DUAL-INT. O-RING	XH
SINGLE	1S

CODE	BODY MATERIAL
N5	NITRONIC 50
C2	HASTELLOY C276

ACTUATION TYPE	CODE
MANUAL	MA
ACTUATED	ACT

Table 4 – SF15000HTVB Seal Kit Number Guide

31664	-	XX	-	XXXX	-	XX

CODE	WORKING PRESSURE
15	15KSI
10	10KSI
5	5KSI

SEAL MATERIAL
FFKM
FKM
EPDM

CODE	STAGE SELECTION
2X	DUAL-INT. CUP SEAL
XH	DUAL-INT. O-RING
1S	SINGLE

Table 5 – SF15000HTVB Stem Kit Number Guide

31625	-	XX	-	XXXX	-	XXXX	-	XX	-	XX	-	XX

CODE	WORKING PRESSURE
15	15KSI
10	10KSI
5	5KSI

FLOW RANGE	CODE
0.2 to 150gpd	150D
0.6-600gpd	600D
25-2500gpd	2500D

SEAL MATERIAL
FFKM
FKM
EPDM

STAGE SELECTION	CODE
DUAL-INT. CUP SEAL	2X
DUAL-INT. O-RING	XH
SINGLE	1S

CODE	BODY MATERIAL
N5	NITRONIC 50
C2	HASTELLOY C276

ACTUATION TYPE	CODE
MANUAL	MA
ACTUATED	ACT

Table 6 - Maintenance Tool Requirements

Tools and Parts	Quantity
Vise	1
250 ft.lb [340 Nm] Torque wrench	1
50 ft.lb [68 Nm] Torque wrench	1
Socket extension	1
27mm wrench	1
27mm socket	1
25mm socket	1
17mm socket	1
12mm socket	1
10mm Allen socket	1
5mm Allen wrench	1
2mm Allen wrench	1
Pliers	1
Brass Rod (3.5mm Diameter)	1
Hammer	1
5/8" wrench	1
7/8" wrench	1
9/16" wrench (required for SF3 Actuator with PDFM)	2
HTVB Stem Seal Installation Kit (P/N: 31804)	1
Brass Pick	1
Pick or small flat head electrical screwdriver	1
Parker Super Lube (or equivalent)	1
Dynatex Anti-Seize & Lubricating Compound (or equivalent)	1
Molykote G-4700 Lithium/Moly Grease (or equivalent)	1
Loctite 222 Low Strength Threadlocker (or equivalent)	1

7. Disassembling the SF15000HTVB

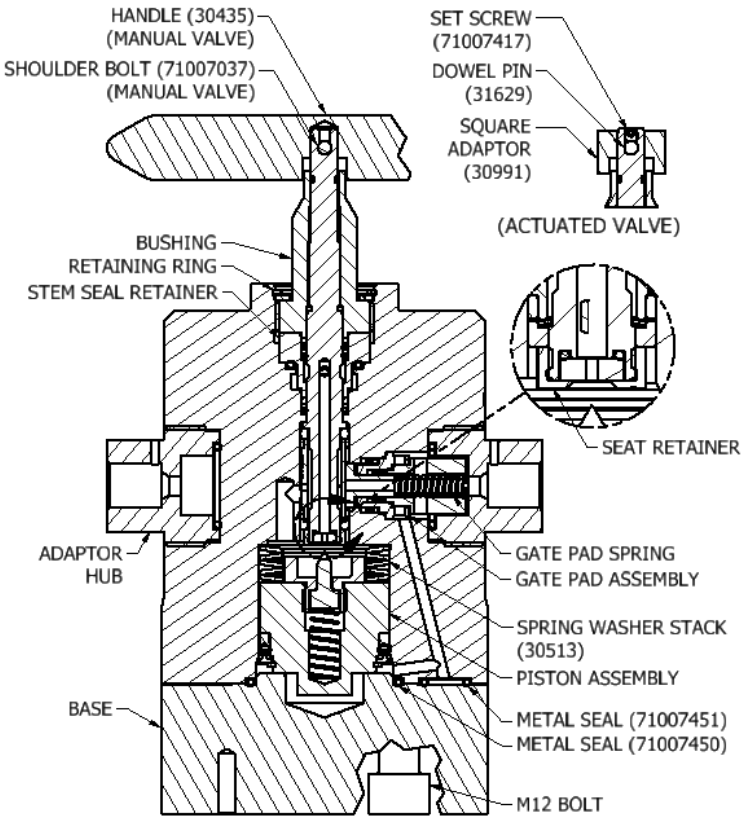


Figure 2 – SF15000HTVB Cross-Section

7.1 Remove the valve from the system.

7.2 Where applicable, see Section 13 for information on unpairing the valve from a Rotork Actuator.

7.3 Rotate the handle clockwise until you reach the bottom stop.

7.4 Remove the handle or square adapter

7.4.1 For Manual valves:

7.4.1.1 Remove handle fastener – *2mm Allen wrench*

7.4.1.2 Remove handle.

7.4.2 For Actuated valves:

7.4.2.1 Remove set screw – *2mm Allen wrench*.

7.4.2.2 Remove dowel pin. If necessary, hold the square drive in a vise and tap the dowel pin out – *3.5mm dia rod, hammer*.

7.4.2.3 Remove the square adapter.

7.5 Secure the valve in a vise with the inlet hub facing up.

7.6 Unscrew the adapter hub (31438) – *28mm socket*.

7.7 Pull out the spring retainer (31742) and spring

7.8 Remove the gate pad assembly – A brass rod can be used to aid pad assembly removal.

Figure 3 – Gate Pad Assembly Removal

7.9 Resecure the valve in vise with the base facing up.

7.10 Unscrew the 8x M12 bolts and remove the base – *10mm Allen socket.*

7.11 Remove the piston assembly and washer springs. Set the piston down pin side up to protect the tip of the pin – *pliers.*

Figure 4 – Piston Assembly Removal

7.12 Remove and discard the base cap's three metal seals – use a brass pick if necessary.

7.13 Remove the HPS seal retainer. See Figure 6 for reference.

! NOTICE

IT IS CRITICAL THAT THE GATE PAD IS REMOVED BEFORE THE STEM. FAILURE TO DO SO WILL RESULT IN DAMAGE TO THE STEM GUIDE RINGS.

7.14 Place a 12mm socket over the seat retainer (31409) and rotate counter-clockwise until you can withdraw the old stem assembly from the body – *12mm socket, socket extension*.

Figure 5 – Stem Assembly Removal

7.15 Remove valve from vise.

7.16 Remove and discard the retaining ring (71007136) that retains the stem bushing – *flat head screwdriver*.

7.17 Resecure the valve in a vise with the stem bushing facing out.

7.18 Unscrew the bushing from the body – *17mm socket*.

7.19 Removing the stem seal retainer, cup seal and metal seal

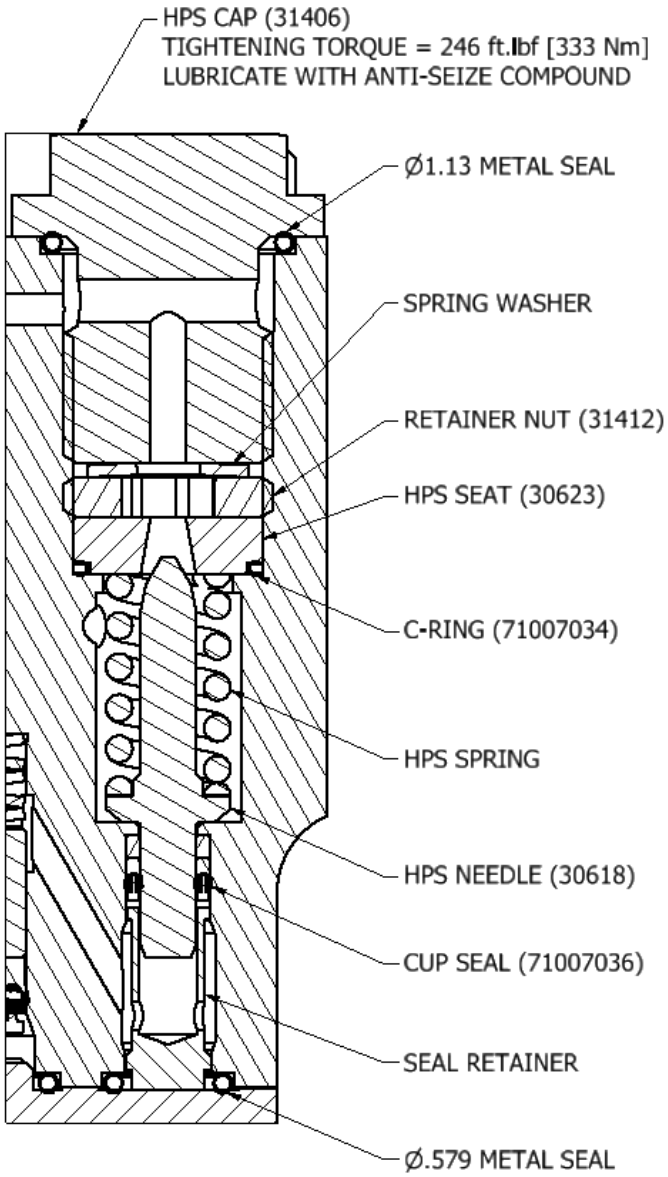


Figure 6 – HPS Cross Section

7.20 Unscrew the HPS cap (31406) – *25mm Socket.*

7.21 Remove the spring washer and unscrew the retainer nut (31412) – *10mm Allen socket*.

7.22 Working in a circular motion, remove the HPS seat (30623) from the body. See Figure 7– *Small Pick.*

7.23 Remove the valve from the vise.

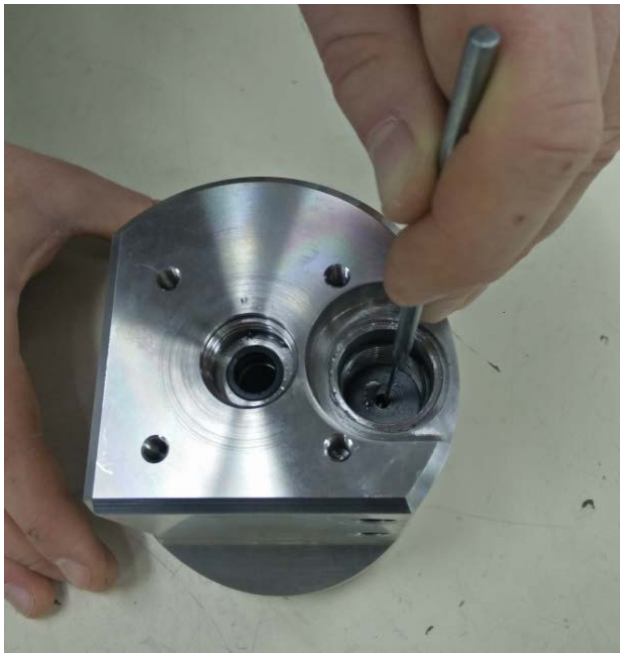


Figure 7 – Removing the HPS Seat

7.24 Upend the valve, remove the HPS spring and push on the backside of the HPS needle (30618) releasing it from the cup seal – *Brass Rod*

7.25 Drop the needle back into the body and use it to push out the old cup seal (71007036).

7.26 Remove the needle.

8. Replacing the Piston Cup Seal

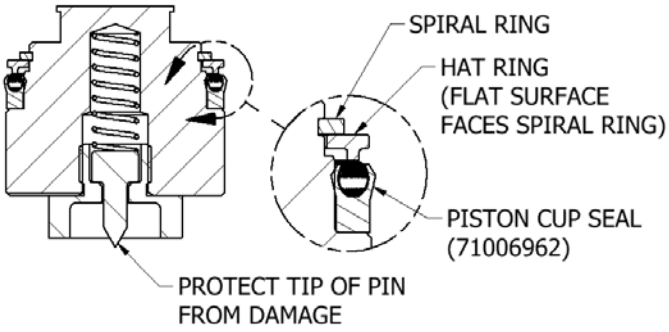


Figure 8– Piston Assembly

8.1 Remove the spiral ring from the piston assembly – *pick or small screwdriver*.

8.2 Remove the cup seal from the piston and discard.

8.3 Apply O-ring lube to the new piston cup seal (71006962)

8.4 Press the cup seal all the way on to the piston. Protect the tip of the pin from damage during cup seal installation by placing a rag between the pin and the bench. Note: the hat ring can be flipped over to aid installation, as seen in Figure 9.

Figure 9 – Installing Piston Seal

8.5 Orient the hat ring over so the flat side faces away from the cup seal. See Figure 8 for more details.

8.6 Install the spiral ring on the piston.

9. Replacing the Gate Pad and Gate Pad Assembly Seals

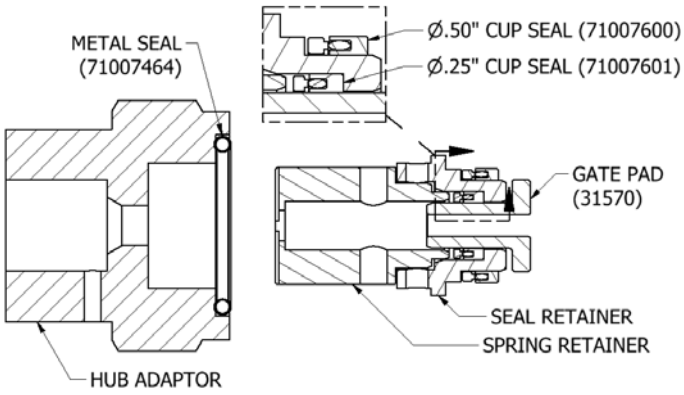


Figure 10 – Gate Pad Assembly Cross Section

9.1 Remove the two cup seals from the gate pad seal retainer and discard – brass *pick with bent tip*.

9.2 Apply O-ring lube to the new .25" cup seal and install in gate pad seal retainer. Note the seal and hat ring orientation in Figure 10.

9.3 Apply O-ring lube to the new .5" cup seal and install on the gate pad seal retainer. Note the seal and hat ring orientation in Figure 10. Place the seal retainer over the spring retainer, then apply O-ring lube to the gate pad shaft and insert it into the seal retainer.

9.4 Remove the metal seal from the hub adaptor and discard. Take care not to scratch the sealing surface – *brass pick.*

9.5 Apply O-ring lube to the new metal seal and install in adapter hub.

10. Replacing Stem Seals

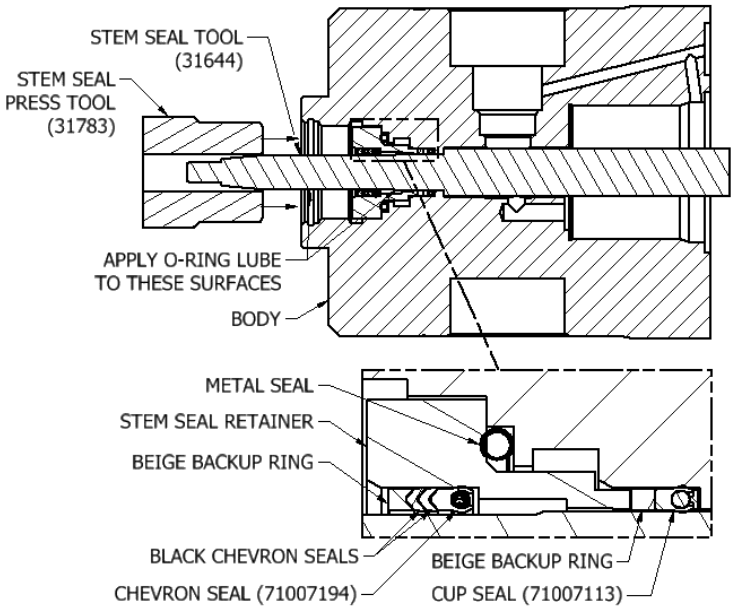


Figure 11 – Stem Seal Cross Section, Pt. 1

10.1 Apply O-ring lube to stem seal tool. See Figure 11.

10.2 Insert stem seal tool fully into body.

10.3 Apply O-ring lube to both sides of the new cup seal. (71007113)

10.4 While holding stem seal tool in place, install the new cup-seal over the stem seal tool. See Figure 11 and Figure 12 for orientation of the cup-seal.

10.5 Install seal retainer over stem seal tool. See Figure 11 for retainer orientation.

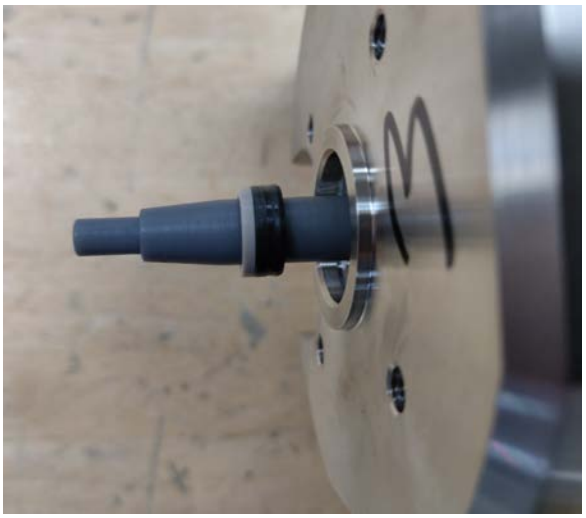


Figure 12 – Stem Cup Seal

10.6 Use the stem seal press tool to push the cup seal and seal retainer fully into body. Screw in hand tight. See Figure 13 – *Stem Seal Press Tool (31783)*

Figure 13 – Stem Seal Press Tool

10.7 Remove the stem seal press tool and seal retainer, and check that the cup seal is correctly installed and not cut.

10.8 Apply O-ring lube to metal seal and install into gland, then reinstall the stem seal retainer.

10.9 While holding stem seal tool in place, install the new chevron-seal (71007194) over the stem seal tool. See Figure 11 and Figure 14 for orientation of the chevron seal.

10.10 Use the same stem seal press tool to push the chevron seal fully into seal retainer gland. Remove tool and check for proper insertion.

10.11 Apply a small amount of low strength Loctite to the external threads of the stem bushing.

10.12 Screw the stem bushing into the body. Tighten hand tight. Note: the body must be held in a horizontal position during this step to allow the stem seal tool to move out of the way as the bushing is screwed in.

10.13 Remove the stem seal tool.

10.14 Torque bushing to 140 ft.lbf [190 Nm] – *Torque wrench, 17mm socket.*

10.15 Slide washer onto bushing and then install the retaining ring (71007701) - *flat head screwdriver.*

! WARNING

THE RETAINING RING MUST BE REINSTALLED TO PREVENT THE STEM BUSHING FROM BACKING OUT, WHICH COULD LEAD TO A HIGH-PRESSURE LEAK.

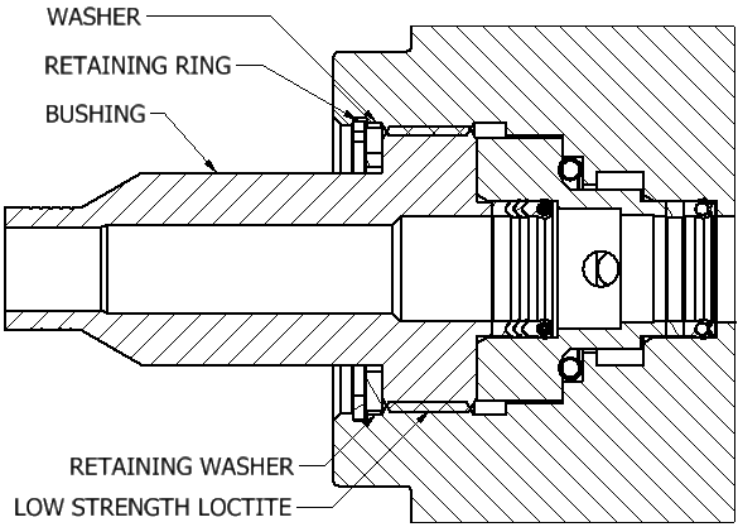


Figure 14– Stem Seal Cross Section, Pt. 2

11. Valve Reassembly

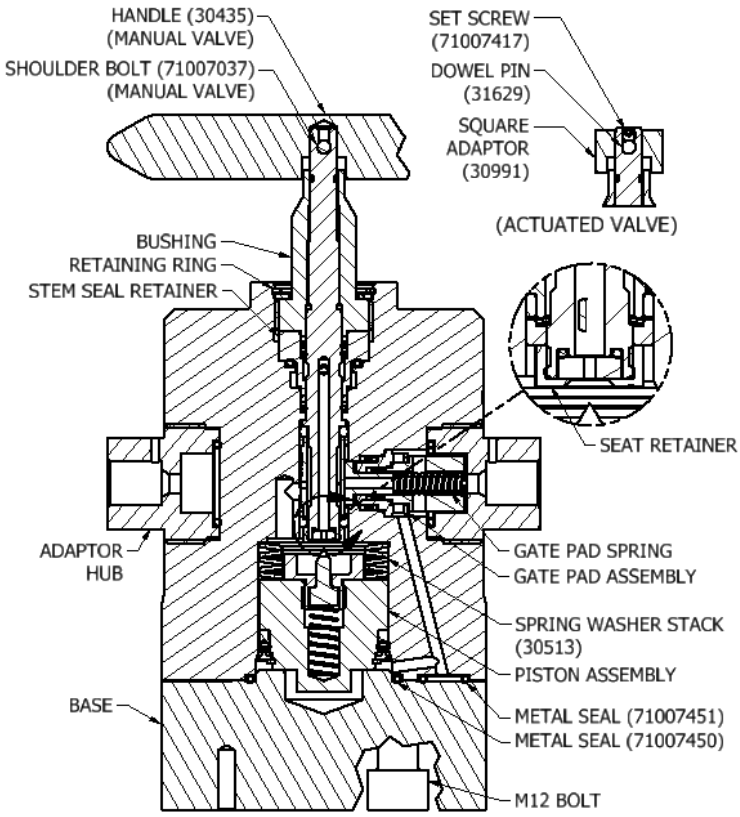


Figure 15 – SF15000HTVB Cross-Section

11.1 Apply a generous coating of lithium grease to the stem threads.

11.2 Apply O-ring lube to stem sealing surfaces. See Figure 16.

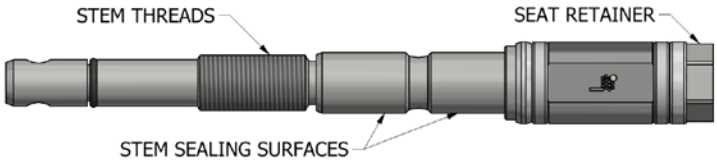


Figure 16 – Stem Sealing Surface

11.3 Align gate profile with gate pad bore. Pushing on the seat retainer, insert stem fully into the body.

11.4 Screw stem clockwise via seat retainer until you reach the top stop. Once the handle hole emerges from the bushing you can use a rod through the handle hole to finish screwing in the stem – *12mm socket, ø3.5mm rod.*

11.5 As the gate becomes visible in the gate pad bore, align the gate profile with the gate pad bore; use your thumb to keep it aligned as you screw in the stem.

11.6 Verify that the gate profile is visible in the gate pad bore and the gate guide ring is not visible. Note: ceramic gate does not have a top guide ring.

11.7 Place the valve in a bench vise stem facing down.

11.8 Stack the spring washers, alternating dish up and dish down. See Figure 17.

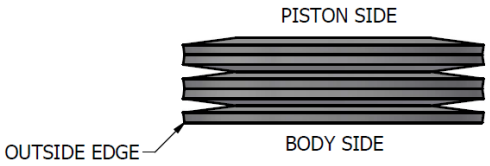


Figure 17 – Spring Stack Arrangement

11.9 Insert this stack into the valve body. The outside edge must be facing down into the body.

11.10 Apply O-ring lube to the piston cup seal.

11.11 Insert the piston subassembly into the body, pin side down. Press down on the piston with the heel of your hand until the piston contacts the springs.

11.12 Place the new HPS cup seal assembly (71007036) over a brass rod to ensure the correct arrangement and drop into the body. See Figure 18 for orientation details.

11.13 Push the cup seal assembly fully into its groove with the seal retainer (30626).

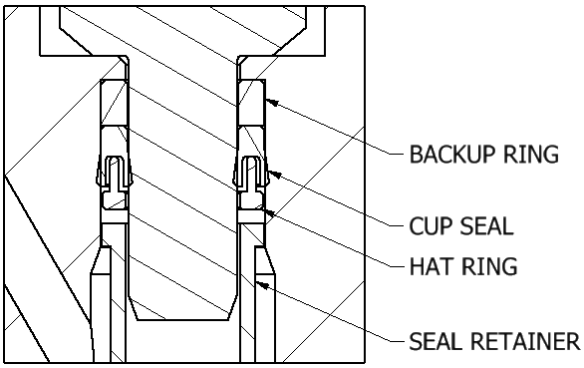


Figure 18 – HPS Seal Arrangement

11.14 Apply O-ring lube to the new metal seals and install in the metal seal glands in the bottom of the body.

11.15 Place the base onto the valve.

11.16 Apply anti-seize to the 8X M12 socket head cap screws (SHCS) and install in the base.

11.17 Gradually torque the 8 fasteners in a star pattern (in opposite pairs). It may take a couple of passes to compress the metal seal spring. – *10mm T handle hex key*

11.18 Tighten SHCS in opposite pairs. Torque to 50 ft.lbf [68 Nm]. – *10mm hex key, torque wrench*

11.19 Double check all the fasteners are torqued correctly by working clockwise through all 8. – *10mm hex key, torque wrench*

11.20 Verify that the gate profile is visible in the gate pad bore and the gate guide ring is not visible (if applicable).

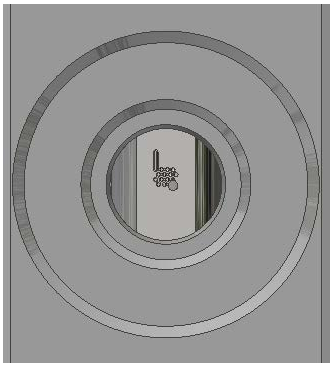


Figure 19 – Gate View Through Gate Pad Hole

11.21 Secure the body in a bench vise with gate pad bore facing up.

11.22 Insert gate pad subassembly into gate pad bore, gate pad first.

11.23 Insert gate pad coil spring and spring retainer

11.24 Apply O-ring lube to the adaptor hub metal seal and install in the hub's gland.

11.25 Coat adapter hub threads with anti-seize.

11.26 Install adapter hub and torque to 210 ft.lbf [283 Nm]. – *27mm hex, Torque Wrench*

11.27 Apply O-ring lube to the HPS needle (30618) shaft.

11.28 Drop the HPS needle into the body and carefully press into cup seal. See Figure 6.

11.29 Drop the HPS spring over the needle.

11.30 Replace the metal seal (71007034) on the HPS seat. Use a drop of O-ring lube to hold the seal in place during assembly.

Figure 20 – HPS Seat and C-Ring

11.31 Drop the seat into the body and work into position – *Brass Rod.*

Figure 21– Installing HPS Seat

11.32 Screw in the retaining nut (31412) and torque to 30 ft.lbf [40 Nm] – *10mm Allen key, torque wrench.*

11.33 Drop the washer spring (71007029) on top of the retaining nut, dish side facing down.

11.34 Coat HPS cap (31406) with anti-seize.

11.35 Screw in the HPS cap and torque to 250 ft.lbf [333 Nm] – *25mm socket, torque wrench*

12. Handle Installation

12.1 Manual Valve

12.1.1 Place handle on stem and align the holes.

12.1.2 Insert shoulder bolt and tighten, be careful not to shear the hex – *2mm hex key.*

12.2 Actuated Valve

12.2.1 Place square drive adapter on stem, aligning holes.

12.2.2 Insert dowel pin into hole

12.2.3 Center dowel pin in square drive – *ø3.5mm rod.*

12.2.4 Insert SHSS into end of stem and tighten – *2mm hex key.*

13. Disconnecting Valve from Rotork Actuator

13.1 Unscrew the 4X M6 bolts attaching the actuator bracket to the Rotork Actuator.

13.2 Pull/Disconnect the actuator from the valve,

13.3 Unscrew the 4X M6 bolts attaching the actuator bracket to the valve.

13.4 Remove the bracket from the valve.

14. Reconnecting Valve to Rotork Actuator

14.1 Apply a thin layer of anti-seize to the valve square.

14.2 Apply anti-seize to 8X M6 bolts.

14.3 Orient the valve and actuator bracket as they were prior to disassembly.

14.4 Insert 4X M6 SHCS in the bracket holes.

14.5 Tighten fasteners in opposite pairs – *5mm hex key.*

14.6 With the SF15000HTVB and actuator bracket oriented as they were prior to disassembly, align the square drive with the actuator drive shaft. Rotate valve as necessary.

14.7 Insert and tighten 4X M6 SHCS in the actuator-facing bracket holes. – *5mm hex key.*

14.8 After reconnecting the valve to the Rotork actuator, the actuator must be recalibrated. See the Rotork Actuator user guide (DOC-03828) for more details.

FREQUENTLY ASKED QUESTIONS

Table 7 – Frequently Asked Questions

ALL CIMVs	
Question	**Answer**
CIMV Shutoff Ability	SkoFlo CIMVs are not shut off devices. Separate isolation valves should be used for shutting off the flow.
Protection Against Reverse Flow	A check valve shall be installed immediately downstream of the valve (within 6 inches) to prevent seal damage.
Minimum Differential Pressure to Operate	See CIMV specification sheet that was supplied with the CIMV to determine minimum required pressure drop.
Excessive Pressure Drop	For flows above 100 US gallons per day (15.8 LPH), pressure drops across the CIMV should not exceed 3,000 psi (207bar) for extended periods to avoid cavitation, which could lead to erosion of the throttling components. As a general rule, the outlet pressure must be greater than or equal to the pressure drop to avoid cavitation.
Fluid Cavitation	Fluid cavitation occurs primarily when CIMV pressures (and secondarily fluid viscosity and velocity) cause a drop below the fluid vapor pressure. When the SkoFlo CIMV enters its cavitation region, energy release from vapor compression at the pin/seat interface may cause premature wear.
Chemical Filming	Historically, chemical filming has not been experienced in SkoFlo HTD/HTV models. Chemical filming is dependent on chemical composition selection by the user. Injected chemicals would need to have an affinity to ceramic to film. Currently, there are no known chemicals that have this affinity.
Blowout Proof Stem	The stem design is blowout proof.

TROUBLESHOOTING

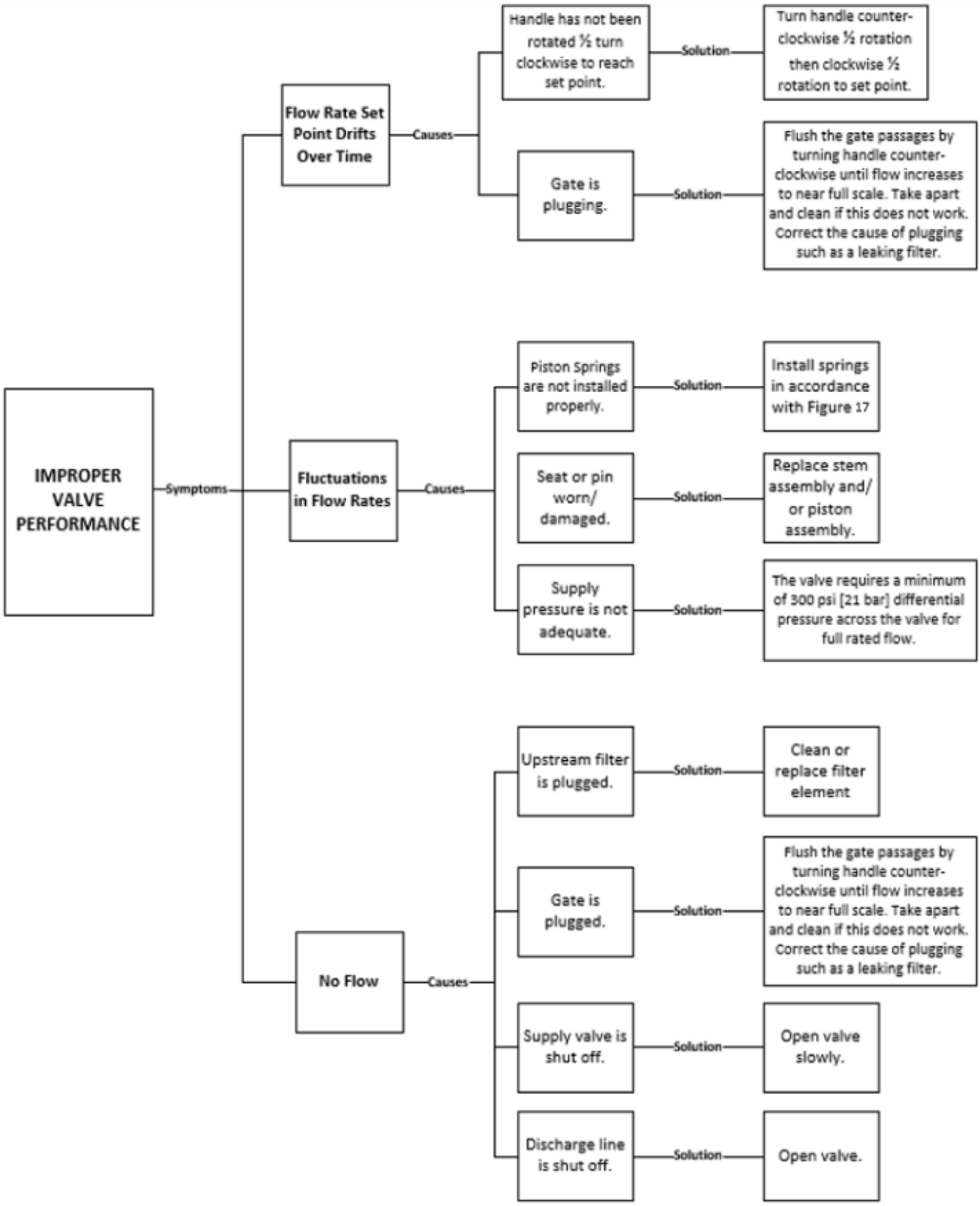
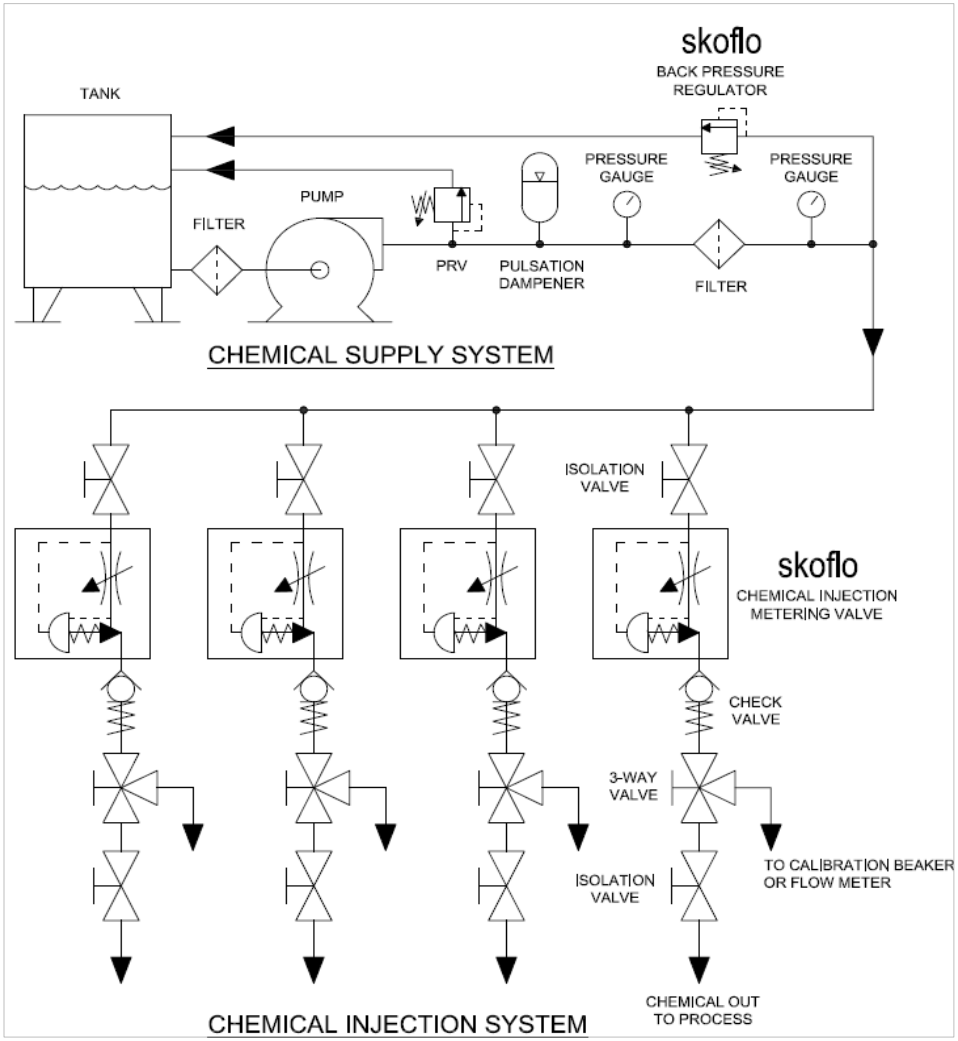


Figure 22– Troubleshooting

APPENDIX A – A TYPICAL CHEMICAL INJECTION SYSTEM



NOTES

Any number of injection points can be served by a single pump and header system. The only limitation is the flow capability of the pump.

Check valve shall be installed within 6 inches of the SkoFlo CIMV.

APPENDIX B – SF15000HTVB GA AND BOM DRAWINGS

SF15000HTVB-2S-MA

REVISION HISTORY							
ECN #	REV	DESCRIPTION	DATE	DRAWN	ENG1	ENG2	OTHER
	1	INITIAL RELEASE	9/7/22	WF	JM		
	2	BUSHING TORQUE NOW 142 FT.LBF, WAS 128; A4-80 WAS A4-70 IN CONFIG GUIDE AND TABLE 6; ITEM 39: UPDATE DESC TO "GATE, HTV" IN PARTS LIST AND TABLE 3; ITEM 51: CHANGE MATERIAL TO "SEE DWG"	9/29/22	WF	JM		

CONFIGURATION NUMBER GUIDE 2

SF15000HTVB	-	XXXX	-	XXXX	-	XX	-	XX	-	XX	-	XX	-	XX
FLOW RANGE		FLOW CODE		SEAL MATERIAL		SPRING CODE		MATERIAL CODE		FASTENER CODE		HUB CODE		ACTUATION CODE

FLOW RANGE	FLOW CODE
0.6-600gpd	600D
25-2500gpd	2500D

SEAL MATERIAL
FFKM
FKM
EPDM

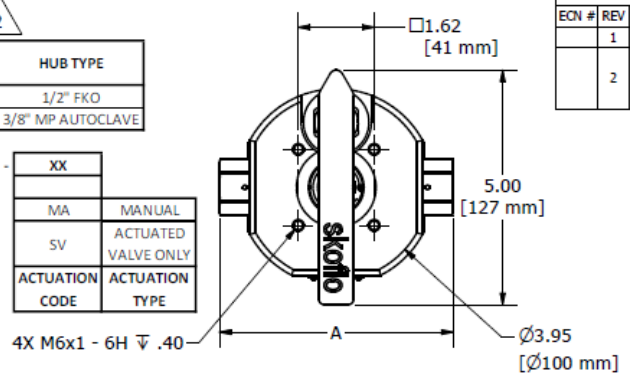
SPRING	SPRING CODE
LIGHT	2L
HEAVY	2H

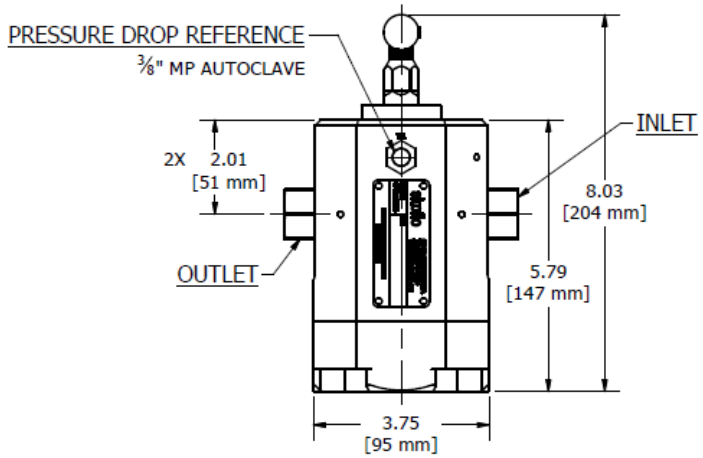
MATERIAL CODE	BODY MATERIAL
N5	NITRONIC 50 HS

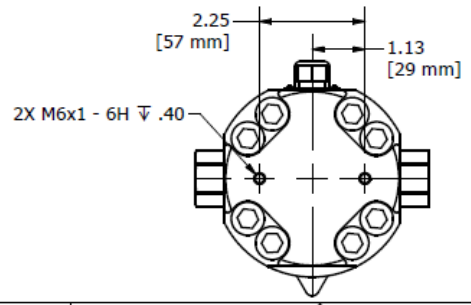
FASTENER MATERIAL	FASTENER CODE
A4-80	A4

HUB CODE	HUB TYPE
FK	1/2" FKO
AE	3/8" MP AUTOCLAVE

ACTUATION CODE	ACTUATION TYPE
MA	MANUAL
SV	ACTUATED VALVE ONLY







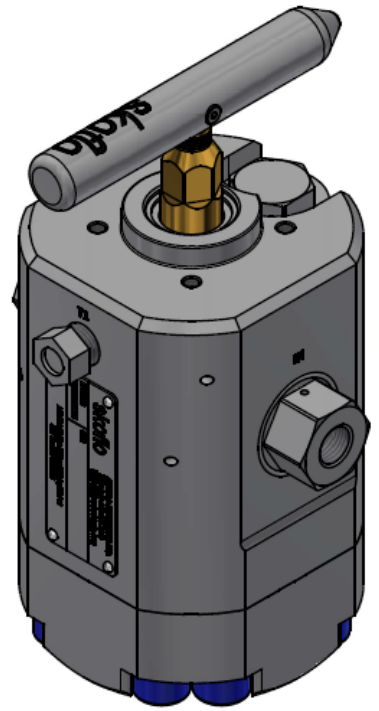


TABLE 1: HUB LENGTH		
HUB TYPE	'A' (in.)	'A' (mm)
AE	4.99	127
FK	10.23	260

NOTES:
1) NOMINAL WEIGHT = 20.0 lb [9.1 kg]
2) RATED WORKING PRESSURE = 15,000 psi [1,034 bar]
3) FLOW RATE RANGES:
   a) 0.6 - 600 gpd
   b) 25 - 2,500 gpd
4) MANUAL CONFIGURATION SHOWN

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED	DRAWN W.FORTINER 4/8/2021	skoflo	SKOFLO INDUSTRIES, INC. WOODINVILLE, WA
DRAWING PER ANSI Y14.5M-2009	ENG1	VALVE ASSEMBLY, SURFACE, SF15000HTVB, INTERNAL CUP SEALS, MANUAL	
FRACTIONS ± 1/16 X ± .03 .XX ± .010 .XXX ± .005 .XXXX ± .0005 ANGULAR ±3°	UNLESS SPECIFIED DEBURR & BREAK EDGES .015/.005 Ra SURF DUAL: 63 FILLETS: R.025/.008 DRILL POINT: 110-120°	ENG2 / OTHER	DWG NO SF15000HTVB-2S-MA REV 2
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SF15000HTVB-2S-MA

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL	PRESSURE CONTAINING
1	1	30471	PIN, CERAMIC, .165	ZIRCONIA 3Y-TZP	NO
2	1	30513	SPRING, WASHER, STACK 5	INCONEL 718	NO
3	1	30618	NEEDLE, LF, HPS, 20°	CARBIDE BC-6N	NO
4	1	30623	SEAT, Ø.250, HPS	CARBIDE BC-6N	NO
5	1	30954	PISTON, STOP VERSION, HTV	NITRONIC 50 HS	NO
6	1	30955	PIN HOLDER, WITH STOP, HTV	NITRONIC 50 HS	NO
7	1	31262	RETAINER, SEAL, HPS/ HTV, METAL SL	NITRONIC 50 HS	NO
8	1	31409	RETAINER, SEAT, SURFACE HTV	NITRONIC 50	NO
9	1	31412	NUT, RETAINER, SEAT, HPS	NITRONIC 50	NO
10	1	31538	NAMEPLATE, SF15000HTVB	316 SS	NO
11	1	31570	PAD, GATE, CUP SEAL, HTV/LF	ZIRCONIA 3Y-TZP	NO
12	1	31731	RETAINER, SEAL, STEM, SURFACE HTV	NITRONIC 50 HS	NO
13	1	31742	RETAINER, SPRING, SF15000HTVB	NITRONIC 50 HS	NO
14	1	31743	WASHER, RETAINER, BUSHING	316 SS	NO
15	1	31790	RETAINER, SEAL, GATE PAD, SF15000HTVB	NITRONIC 50 HS	NO
16	4	71002116	U-DRIVE SCREW, RH, #2X1/4	302 SS	NO
17	1	71003288	NUT, PLUG, 3/8 AUTOCLAVE	316 SS	YES
18	1	71006125	SLRG, WST-118	ALLOY X-750	NO
19	1	71006907	SPRING, COIL, Ø.258 X 1.02, PISTON	ELGILOY	NO
20	1	71006956	SL, O-RING, 1.2mm CS X 6mm ID	EPDM	NO
21	1	71006962	SL, CUP, PISTON, HTD	SEE DWG 71006962	NO
22	1	71007029	SPRING, WASHER, Ø.845 X Ø.280 X .05	INCONEL 718	NO
23	1	71007034	SL, C-RING, EXTERNAL PRESSURE, ECE-000711-05-14-8-SPC	INCONEL 718	NO
24	1	71007036	SL, CUP, CANT SPRING, Ø.250 ID, FC1N1229	SEE DWG 71007036	NO
25	1	71007048	SPRING, COIL, Ø.250 X 1.00, GATE PAD	ELGILOY	NO
26	1	71007113	SL, CUP, .408 ID, FS032029-2	ALLOY X-750	YES
27	1	71007183	SL, METAL, SILVER COAT, Ø0.868	SEE DWG 71007249	YES
28	1	71007194	SL, CUP W. VRING, .533 OD	SEE DWG 71007194	YES
29	1	71007450	SL, METAL, SILVER COAT, Ø1.790	SEE DWG 71007249	YES
30	2	71007451	SL, METAL, SILVER COAT, Ø.579	SEE DWG 71007249	YES
31	1	71007452	SL, METAL, SILVER COAT, Ø1.130	SEE DWG 71007249	YES
32	2	71007464	SL, METAL, SILVER COAT, Ø.984	SEE DWG 71007249	YES
33	1	71007516	SLRG, EXTERNAL, .375, WSM-37	ALLOY X-750	NO
34	1	71007552	PLUG, 3/8 AE	INCONEL 625	YES
35	1	71007600	SL, CUP, Ø.500 ID, W/ HAT RING	SEE DWG 71007600	NO
36	1	71007601	SL, CUP, Ø.250, W/ HAT RING	SEE DWG 71007601	NO
37	1	71007701	SLRG, INTERNAL, Ø1.125, FHE-0112-S16	316 SS	NO
38	1	SEE TABLE 2	SL, O-RING, M5 X 1	SEE TABLE 2	NO
39	1	SEE TABLE 3	GATE, HTV	SEE DWG	NO
40	1	SEE TABLE 3	GUIDE RING, STEM, SURFACE HTV	PTFE	NO
41	1	SEE TABLE 3	SEAT, HTV, SURFACE	ALUMINA	NO
42	1	SEE TABLE 4	SPRING, 2ND STAGE	ELGILOY	NO
43	1	SEE TABLE 5	BASE, 15KSI, SURFACE HTV	SEE TABLE 5	YES
44	1	SEE TABLE 5	BODY, 15KSI, SURFACE HTV	SEE TABLE 5	YES
45	1	SEE TABLE 5	CAP, HPS, HTV, METAL SL, COATED	NITRONIC 50 HS	YES
46	1	SEE TABLE 5	STEM, HTV, SURFACE	SEE TABLE 5	YES
47	8	SEE TABLE 6	SHCS, M12 X 1.75 X 40, XYLAN COATED	SEE TABLE 6	YES
48	2	SEE TABLE 7	HUB, ADAPTER, COATED	NITRONIC 50 HS	YES
49	1	SEE TABLE 8	BUSHING, STEM, MANUAL, SURFACE HTV	TOUGHMET 3	NO
50	1	SEE TABLE 8	FASTENER, HANDLE	SEE DWG	NO
51	1	SEE TABLE 8	HANDLE, SURFACE HTV	SEE DWG	NO
52	1	SEE TABLE 8	SHSS, M4x0.7x3LG, FLAT TIP	18-8 SS	NO

2

2

TABLE 2: O-RING COMPOUND SELECTION

ITEM	FFKM	FKM	EPDM	DESCRIPTION
38	71006953	71006922	71006954	SL, O-RING, M5 X 1

TABLE 3: FLOW RATE RANGE SELECTION

ITEM	0.6-600gpd	25-2500gpd	DESCRIPTION
39	31511 ALT 31295	31547	GATE, HTV
40	30828	30826	GUIDE RING, STEM, SURFACE HTV
41	31344	30516	SEAT, PILL STYLE

2

TABLE 4: SPRING SELECTION

ITEM	LIGHT (L)	HEAVY (H)
42	71007251	71007028

TABLE 5: PRESSURE CONTAINING MATERIAL SELECTION

ITEM	NITRONIC 50 HS		DESCRIPTION
43	31729		BASE, 15KSI, SURFACE, HTV
44	31730		BODY, 15KSI, SURFACE, HTV
45	31406		CAP, HPS, HTV, METAL SL, COATED
46	31747	MANUAL	STEM, SURFACE HTV
	31728	ACTUATED	

TABLE 6: FASTENER SELECTION

ITEM	A4-80
47	71007412

2

TABLE 7: ADAPTER SELECTION

MATERIAL	NITRONIC 50 HS		DESCRIPTION
ITEM	3/8"MP AE	1/2" FKO	
48	31438	31741	HUB

TABLE 8: ACTUATION SELECTION

ITEM	MANUAL	ACTUATED	DESCRIPTION
49	31750	31739	BUSHING, STEM, COATED, SURFACE HTV
50	71007037	31629	FASTENER, HANDLE
51	30435	30991	HANDLE, SURFACE HTV
52	N/A	71007417	SHSS, M4x.07x3LG, FLAT TIP

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED

DRAWING PER ANSI Y14.5M-2009

FRACTIONS ± 1/16
X ± .03
.XX ± .010
.XXX ± .005
.XXXX ± .0005
ANGULAR ±3°

UNLESS SPECIFIED DEBURR & BREAK EDGES .015/.005
Ra SURFACE QUAL: 63
FILLETS: R.025/.008
DRILL POINT: 110-120°

DRAWN W.FORTINER 4/8/2021
ENG1
ENG2
OTHER

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skoflo

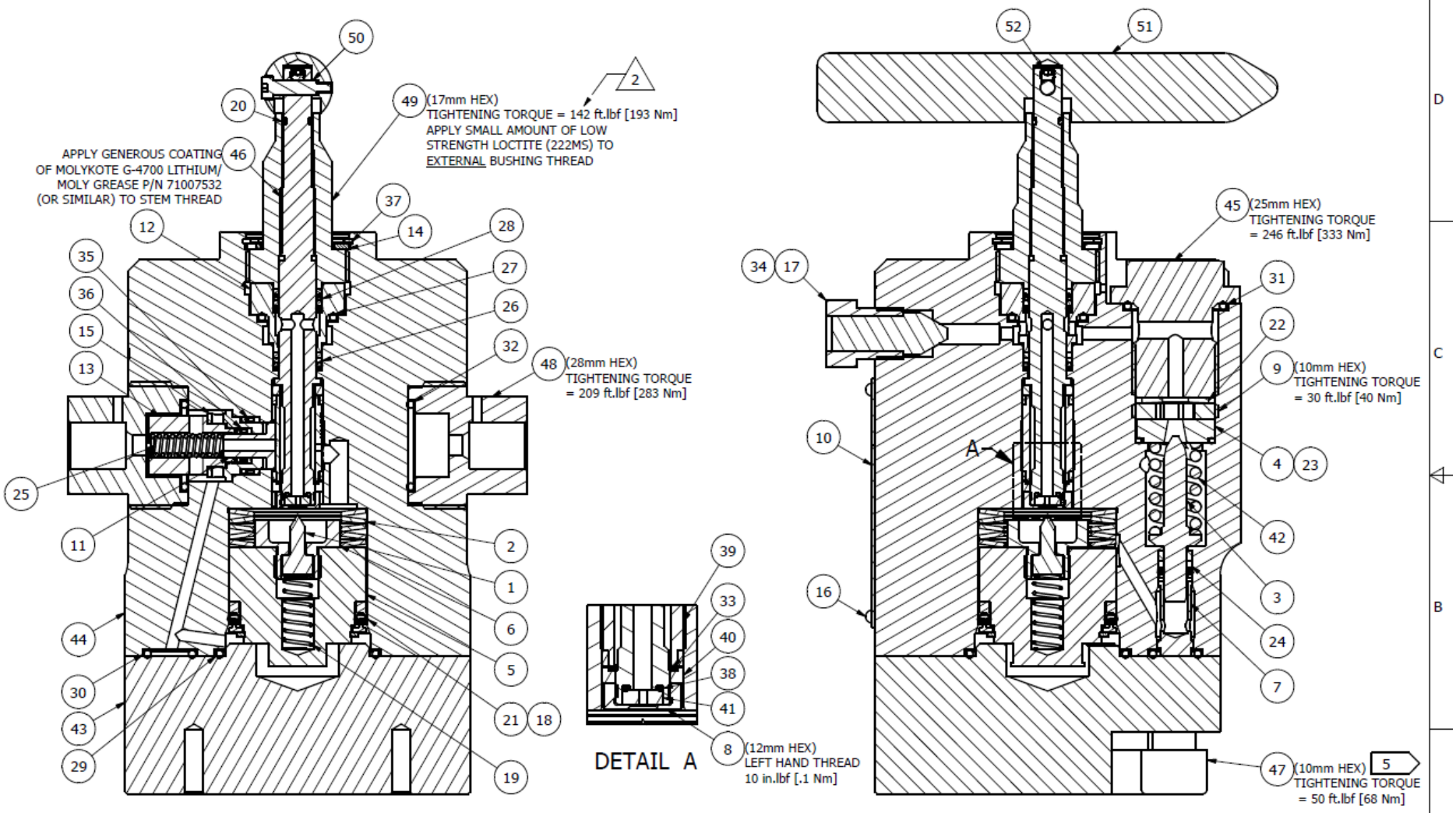
SKOFLO INDUSTRIES, INC.
WOODINVILLE, WA

VALVE ASSEMBLY, SURFACE, SF15000HTVB, INTERNAL CUP SEALS, MANUAL

DWG NO SF15000HTVB-2S-MA REV 2

SIZE B SCALE NONE SHEET 2 OF 3

SF15000HTVB-2S-MA



(SF15000HTVB-XXXX-XXXX-2X-XX-X-AE-MA SHOWN)

NOTES CONTINUED:

5 COAT THREAD WITH DYNATEX ANTI-SEIZE LUBRICATING COMPOUND (OR SIMILAR)

6) LUBRICATE ALL SEALS WITH PARKER SLUBE 884-4 (OR SIMILAR)

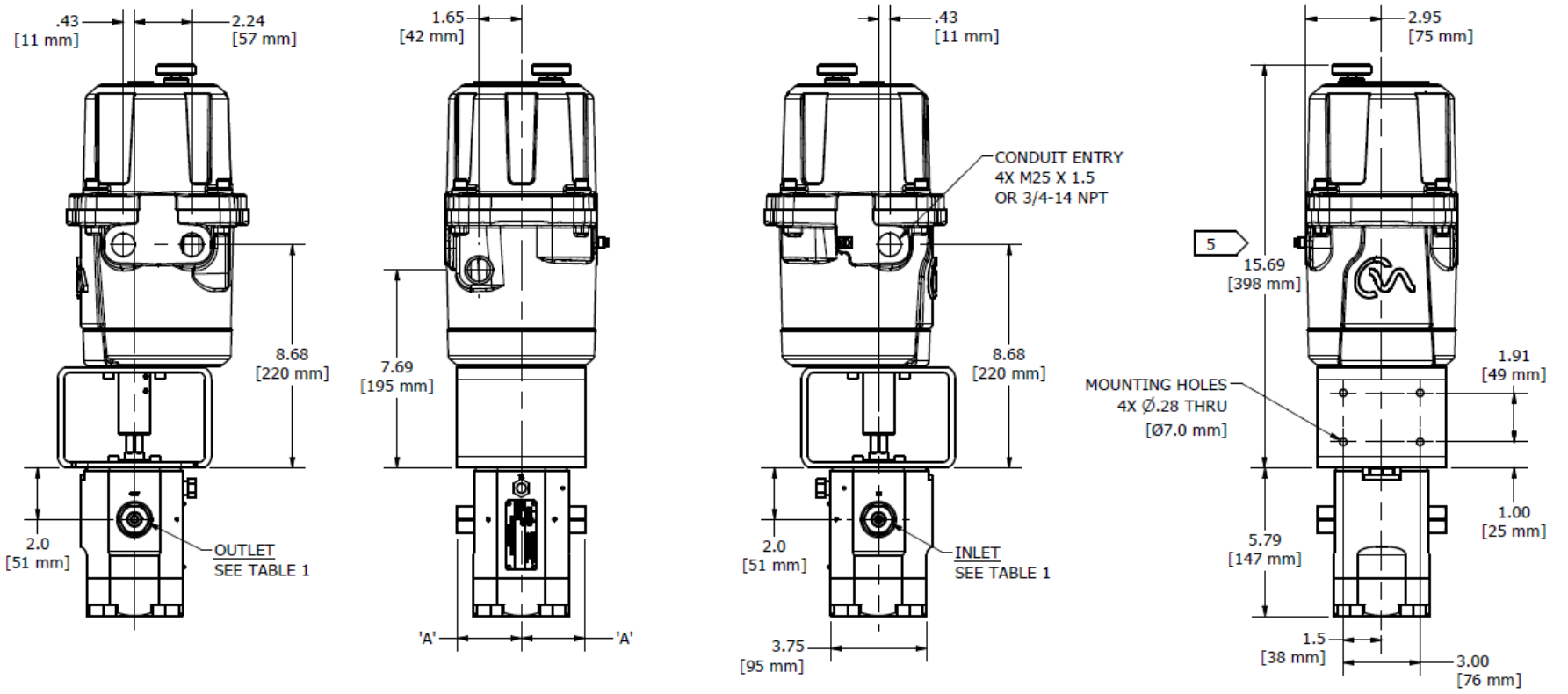
7) SEE O&M OR HTVB-SK FOR SPARES KITS PART LISTS

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED	DRAWN W.FORTINER 4/8/2021	SKOFLO INDUSTRIES, INC. WOODINVILLE, WA
DRAWING PER ANSI Y14.5M-2009	ENG1 / ENG2 / OTHER	VALVE ASSEMBLY, SURFACE, SF15000HTVB, INTERNAL CUP SEALS, MANUAL
FRACTIONS ± 1/64 X ± .03 XX ± .010 XXX ± .005 XXXX ± .0005 ANGULAR ±3°	UNLESS SPECIFIED: DEBURR & BREAK EDGES .015/.005 Ra SURF QUAL: 63 FILLETS: R.025/.008 DRILL POINT: 110-120°	THIS DOCUMENT CONTAINS INFORMATION WHICH IS PROPRIETARY TO SKOFLO INDUSTRIES INC. THE INFORMATION CONTAINED HEREIN SHALL NOT BE DISCLOSED, DUPLICATED, USED IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN TO EVALUATE THIS DOCUMENT	DWG NO SF15000HTVB-2S-MA REV 2
		SIZE B SCALE NONE SHEET 3 OF 3

SF15000HTVB-2S-AT

TABLE 1: HUB LENGTH	
HUB TYPE	DIM 'A'
3/8" MP AE	2.50 [63.5mm]
1/2" FKO TUBE STUB	4.87 [124mm]

REVISION HISTORY							
ECN #	REV	DESCRIPTION	DATE	DRAWN	ENG1	ENG2	OTHER
	1	INITIAL RELEASE	9/7/22	WF	JM		
	2	SHT 2: ADD LOCTITE APPLICATION NOTES	9/29/22	WF	JM		



NOTES:
1) NOMINAL WEIGHT = 50 lbs [23 kg]
2) RATED WORKING PRESSURE = 15,000 psi [1,034 bar]
3) FLOW RATE RANGES:
   a) 0.6 - 600 gpd
   b) 25 - 2,500 gpd
4) VALVE ORIENTATION CAN BE ADJUSTED IN 90° INCREMENTS
5) ALLOW ADDITIONAL 5.6 [150 mm] FOR COVER REMOVAL
6) 3/8" MP AE CONFIGURATION SHOWN

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED
DRAWING PER ANSI Y14.5M-2009
FRACTIONS ± 1/16
X ± .03
.XX ± .010
.XXX ± .005
.XXXX ±.0005
ANGULAR ±3°
UNLESS SPECIFIED: DEBURR & BREAK EDGES: .015/.005 Ra SURF FINISH: 63 FILLETS: R.025/.005 DRILL POINT: 110-120°
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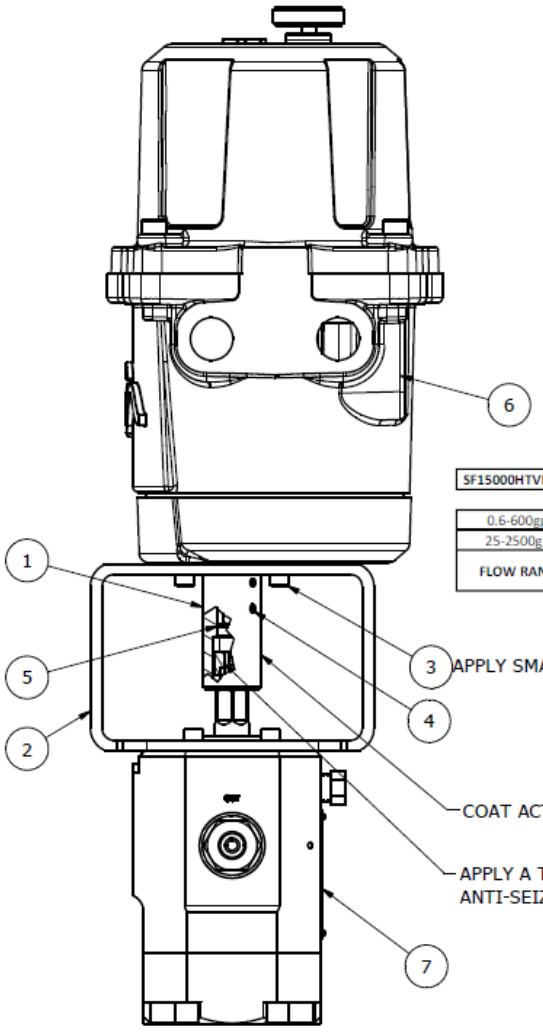
DRAWN J.MOORE 2/11/2022
ENG1
ENG2
OTHER

SKOFLO INDUSTRIES, INC.
WOODINVILLE, WA

VALVE ASSEMBLY, SURFACE, SF15000HTVB, INTERNAL CUP SEALS, ROTORK ACTUATED ENVELOPE DRAWING

DWG NO SF15000HTVB-2S-AT REV 2
SIZE B SCALE NONE SHEET 1 OF 2

SF15000HTVB-2S-AT



PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL	PRESSURE CONTAINING
1	1	31647	COUPLING, ACTUATOR, ROTORK	NITRONIC 50 HS	NO
2	1	31782	BRACKET, ACTUATOR, 15KSI, HTV	316L SS	NO
3	8	71007246	SHCS, M6X1 X 12LG	316 SS	NO
4	2	71007620	SHSS, M4x0.7x5LG	316 SS	NO
5	1	71007777	SLRG, HHM-16-S02	302 SS	NO
6	1	SEE DWG 71007126	Actuator, Rotary, CMR-200	ASSEMBLY	NO
7	1	SEE DWG SF15000HTVB-2S-MA	VALVE ASSEMBLY, SURFACE, SF15000HTVB, INTERNAL CUP SEALS, ACTUATED	SEE DWG SF15000HTVB-2S-MA	YES

CONFIGURATION NUMBER GUIDE

SF15000HTVB	-	XXXX	-	XXXX	-	XX	-	XX	-	XX	-	XX	-	AT	-	XX	-	X	-	X	-	00	-	XX
		0.6-600gpd	600D	FFKM		2L	LIGHT	3/8 MP AE	AE	120 VAC	120	M25 X 1.5	M			AX	ATEX
		25-2500gpd	2500D	FKM		2H	HEAVY	FKO TUBE STUB	FK	208 VAC	208	3/4 - 1/4 NPT	N			EX	IECEx
		FLOW RANGE	FLOW CODE	EPDM		SPRING CODE	SPRING	HUB TYPE	HUB CODE	230 VAC	230	CONDUIT ENTRY SIZE	CONDUIT CODE			NA	FM
				SEAL MATERIAL						24 VDC	DC					GO	GOST
										VOLTAGE	VOLTAGE CODE					HAZLOC CODE	HAZLOC CERTIFICATION

BODY MATERIAL	MATERIAL CODE
NITRONIC 50	NS

FASTENER CODE	FASTENER MATERIAL
A4	A4-70
SD	SUPER DUPLEX

PROTOCOL CODE	COM. PROTOCOL
4	4-20mA
F	FIELD BUS
H	HART

3 APPLY SMALL AMOUNT OF HIGH STRENGTH LOCTITE (271) TO THREAD △2

COAT ACTUATOR DRIVE SHAFT WITH LOCTITE 648 OR SIMILAR △2

APPLY A THIN LAYER OF
ANTI-SEIZE TO VALVE SQUARE

NOTES CONTINUED:
6) COAT ALL THREADS WITH DYNATEX ANTI-SEIZE & LUBRICATING COMPOUND (OR SIMILAR) UNLESS OTHERWISE STATED
7) SEE O&M OR HTVB-SK FOR SPARES KITS PART LISTS

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED
DRAWING PER ANSI Y14.5M-2009
FRACTIONS ± 1/16
X ± .03
XX ± .010
XXX ± .005
XXXX ± .0005
ANGULAR ±3°
UNLESS SPECIFIED
DEBURR & BREAK EDGES: .005/.005
Ra SURFACE VALUE: 63
FILLETS: R.025/.008
DRILL POINT: 110-120°
DRAWN J.MOORE 2/11/2022
ENG1
ENG2
OTHER
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SKOFLO INDUSTRIES, INC.
WOODINVILLE, WA

VALVE ASSEMBLY, SURFACE, SF15000HTVB, INTERNAL CUP SEALS, ROTORK ACTUATED
BOM DRAWING

DWG NO SF15000HTVB-2S-AT REV 2
SIZE B SCALE NONE SHEET 2 OF 2

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