skoflo
Industries

Surface CIMV, Low Flow, HTV
5000 psi

SF5000HTVB

Operations and
Maintenance Manual

DOC-04072 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 SF5000HTVB is a pressure independent chemical injection and metering valve (CIMV), used in the petroleum industry to accurately control chemical injection rates. The SF5000HTVB 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 SF5000HTVB 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 SF5000HTVB 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 SF5000HTVB REQUIRES A MINIMUM DIFFERENTIAL PRESSURE ACROSS THE VALVE OF 300 PSI (20.7 BAR) TO ACHIEVE FULL RATED FLOW.

Max Working Pressure: 5,000 psi (345 bar)

Hydro-Pressure: 7,500 psi (518 bar)

Flow Ranges:

- 0.2 to 150 GPD (0.03 to 24 LPH)
- 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 SF5000HTVB 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 SF5000HTVB 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 SF5000HTVB SHALL NOT BE INSTALLED SUBSEA.

1. Mounting

The SF5000HTVB can be panel or base mounted in any orientation. See Appendix B 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.

The base plate can be rotated in 90-degree increments (180-degree increments for valves paired with an SF3 Actuator and optional PDFM) to offer various inlet/outlet configurations:

1.1 If applicable, see Section 13 for instructions on disconnecting the PDFM connecting tube. (Applies only to valves paired with an SF3 Actuator and optional PDFM.)

1.2 Loosen and remove the four M12 socket head cap screws (SHCSs) attaching the base.

1.3 Rotate the base to the desired orientation.

1.4 Replace the four fasteners and tighten in opposite pairs to 40 ft.lbf [54 Nm].

2. Hydraulic Installation

Install the SF5000HTVB so that the flow is in the proper direction. The IN (inlet) and OUT (outlet) connections are marked respectively. See Appendix B for details.

Install an inline filter upstream of the SF5000HTVB. 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.

Table 1 – Filter Specification

Flow Range	Filter Micron Size
0.2 to 0.6 GPD	25
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 SF5000HTVB 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 SF5000HTVB is not a positive shut off device, therefore, a valve on the inlet or outlet will be required to meet shut off specifications. The preferred location of the shut off valve is on the outlet of the SkoFlo valve to minimize the shock to internal parts during start up.

A check valve shall be installed immediately downstream of the SF5000HTVB (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 10 psi to enhance longevity of check valve seats.

An example of a typical chemical injection system is given in Appendix A.

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.

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

4. Adjustment and Calibration

The SF5000HTVB 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, such as the SkoFlo SF5000PDFMA, however, it must be capable of withstanding the process pressure. Another method of calibrating the SF5000HTVB 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).

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.

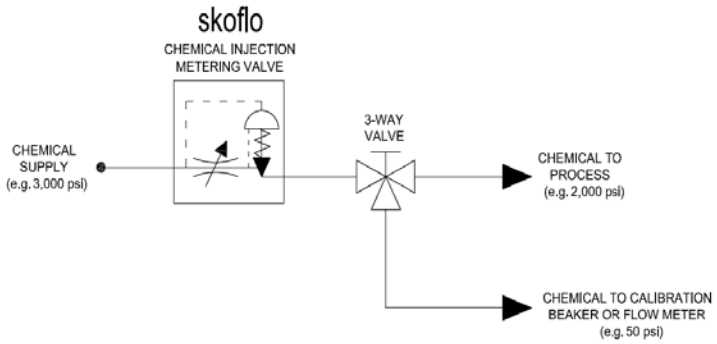


Figure 1 – Valve Calibration Schematic

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.

5. General

Spares kits available for typical maintenance items are listed in Table 2. See Tables 3, 4, and 5 for part number guides.

Table 2 – SF5000HTVB Spares Kit Part Numbers

ITEM	PART NUMBER
Complete Rebuild Kit	31655-5-XXXX-XXXX-1S-XX-XX
Seal Kit	31664-5-XXXX-1S
Stem Assembly Kit	31625-5-XXXX-XXXX-XX-XX
Piston Assembly Kit	31623
Gate Pad	30512
Washer Spring Stack	30513
O-ring Installation Tool Kit	31624

Table 3 – SF5000HTVB Rebuild Kit Number Guide

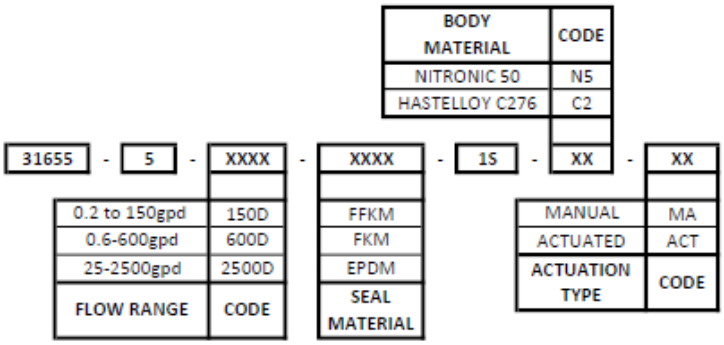


Table 4 – SF5000HTVB Seal Kit Number Guide

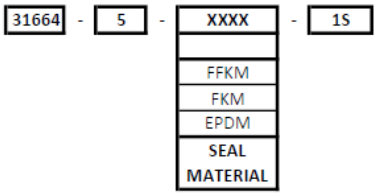


Table 5 – SF5000HTVB Stem Kit Number Guide

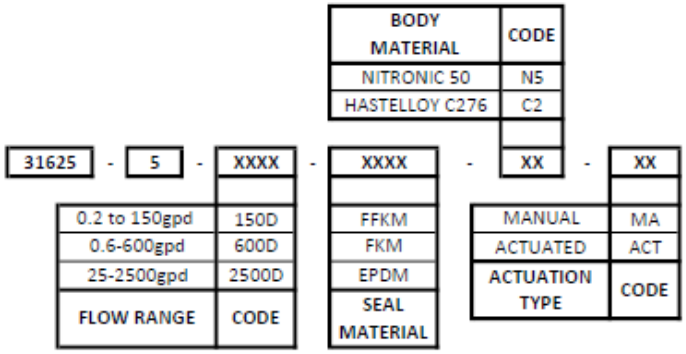


Table 6 - Maintenance Tool Requirements

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
22mm socket	1
13mm socket	1
12mm socket	1
10mm Allen socket	1
Pliers	1
2mm Allen wrench	1
5mm Allen wrench (required for SF3 Actuator)	1
Brass Rod (3.5mm Diameter)	1
Hammer (required for SF3 Actuator)	1
9/16" wrench (required for SF3 Actuator with PDFM)	2
Circlip Pliers (.035" Tip Diameter)	1
HTVB O-Ring Installation Kit (P/N: 31624)	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
Marker Pen	1

6. Disassembling the SF5000HTVB

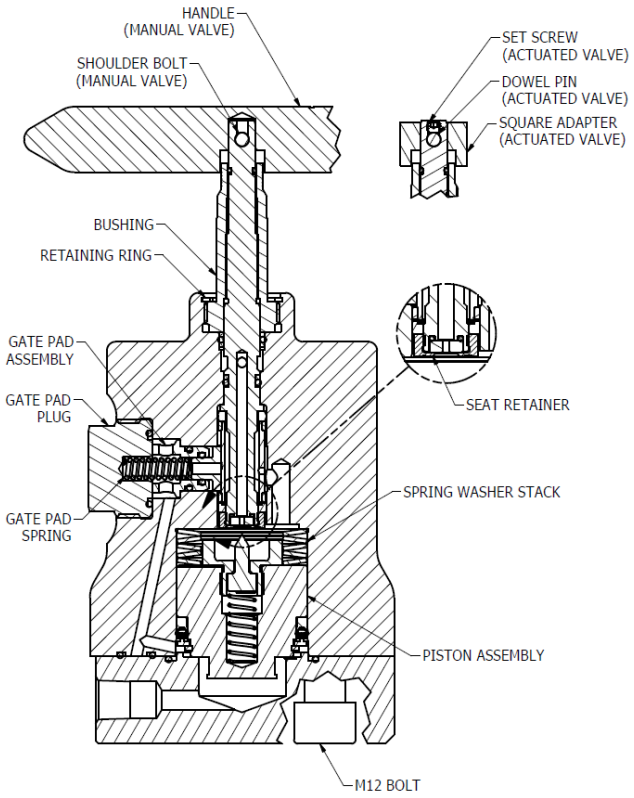


Figure 2 – SF5000HTVB Cross-Section

6.1 Remove the valve from the system. If applicable, see Section 13 for information on unpairing the valve from an SF3 Actuator.

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

6.3 Remove the handle or square adapter

6.3.1 For Manual valves:

6.3.1.1 remove handle fastener – *2mm Allen wrench*

6.3.1.2 Remove handle.

6.3.2 For Actuated valves:

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

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

6.3.2.3 Remove the square adapter.

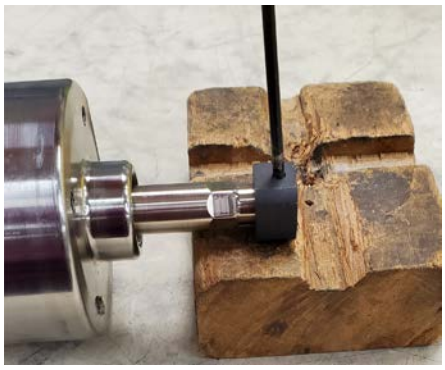


Figure 3 – Square Adapter Removal

6.4 Secure the valve in a vise with the gate pad plug facing up.

6.5 Unscrew the gate pad plug (30426) – *22mm socket*.

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

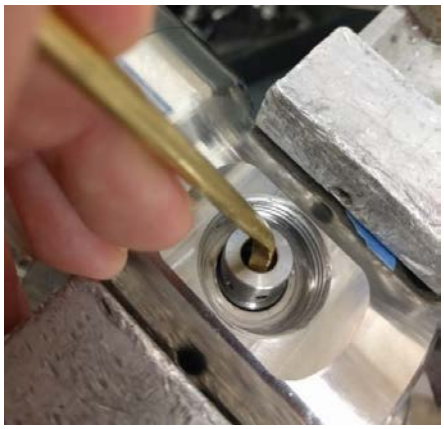


Figure 4 – Gate Pad Assembly Removal

6.7 Resecure the valve in vice with the base facing up.

6.8 Note the orientation of the Inlet and Outlet for reassembly.

6.9 Unscrew the 4x M12 bolts and remove the base – *10mm Allen socket.*

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

Figure 5 – Piston Assembly Removal

! 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.

6.11 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 6 – Stem Assembly Removal

6.12 Remove valve from vise.

6.13 Remove the retaining ring (71007136) that retains the stem bushing and discard – *Circlip pliers (.035" Tip Diameter)*.

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

6.15 Unscrew the bushing from the body – *13mm socket*.

7. Replacing the Stem Assembly Seals

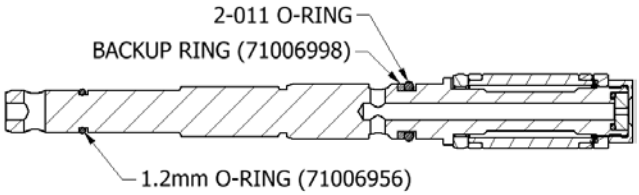


Figure 7 – Stem Assembly Seals

7.1 Screw the O-ring installation tool onto the stem as shown in Figure 8 – *PN 31479 (Actuated) or 31480 (Manual)*

Figure 8 – Stem O-Ring Tool with Seals

7.2 Apply O-ring lube to the 2-011 O-ring.

7.3 Carefully slide the 2-011 O-ring over the stem into the O-ring groove. Minimize stretching.

7.4 Carefully slide the backup ring (71006998) over the stem into the O-ring groove. Reform the backup ring into the groove as needed.

7.5 Remove O-ring installation tool.

7.6 Apply O-ring lube to the 1.2mm O-ring (71006956).

7.7 Slide the 1.2mm O-ring over the stem into the O-ring groove.

8. Replacing the Piston Cup Seal

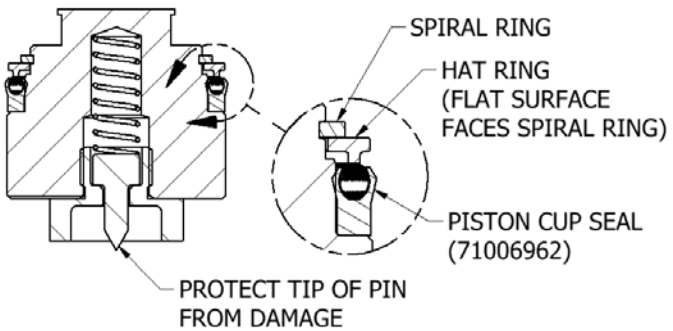


Figure 9 – Piston Assembly

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. See Figure 10.

Figure 10 – Installing Piston Seal

8.5 Orient the hat ring over so the flat side faces the spiral ring. See Figure 9 for more details.

8.6 Install the spiral ring on the piston.

9. Replacing the Gate Pad and Gate Pad Assembly Seals

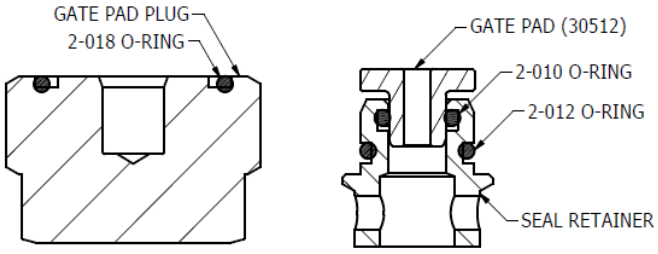


Figure 11 – Gate Pad Assembly Cross Section

9.1 Remove the two O-rings from the gate pad seal retainer and discard – *pick with bent tip.*

9.2 Install 2-010 O-ring into gate pad seal retainer. This will be easier if you do not lubricate it first.

9.3 Apply O-ring lube to the new 2-012 O-ring and install on the gate pad seal retainer.

9.4 Apply O-ring lube to the gate pad shaft.

9.5 Insert the gate pad into the seal retainer.

9.6 Look inside seal retainer to verify O-ring was not cut.

9.7 Remove the O-ring from the gate pad plug and discard.

9.8 Apply O-ring lube to the new 2-018 O-ring and install in gate pad plug.

10. Replacing Stem Seals

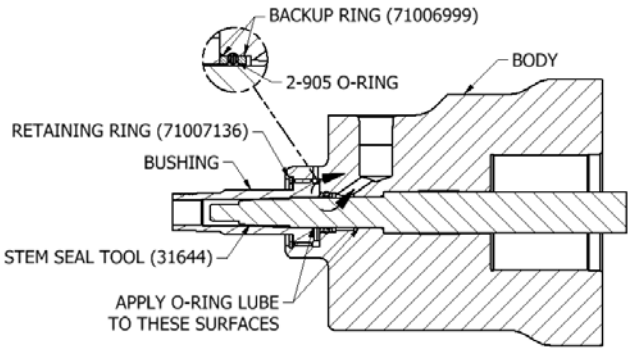


Figure 12 – Stem Seal Cross Section

10.1 Apply O-ring lube to stem seal tool. See Figure 12

10.2 Insert stem seal tool fully into body.

10.3 Apply O-ring lube to a new 2-905 O-ring.

10.4 While holding stem seal tool in place, install a new backup ring (71006999), followed by a new 2-905 O-ring and then another backup ring over the stem seal tool. See Figure 13

Figure 13 – Stem Seals

10.5 Use the O-ring press tool to push seals fully into gland. Screw in hand tight. See Figure 14 – *O-ring Press Tool (30643)*

Figure 14 – O-ring Press Tool

10.6 Remove the O-ring press tool and check that the O-ring and backup rings are correctly installed and not cut.

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

10.8 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.

10.9 Remove the stem seal tool.

10.10 Torque bushing to 20 ft.lbf [27 Nm] – *Torque wrench, 13mm socket.*

10.11 Install the retaining ring (71007136) – *Circlip Pliers*

! WARNING

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

11. Valve Reassembly

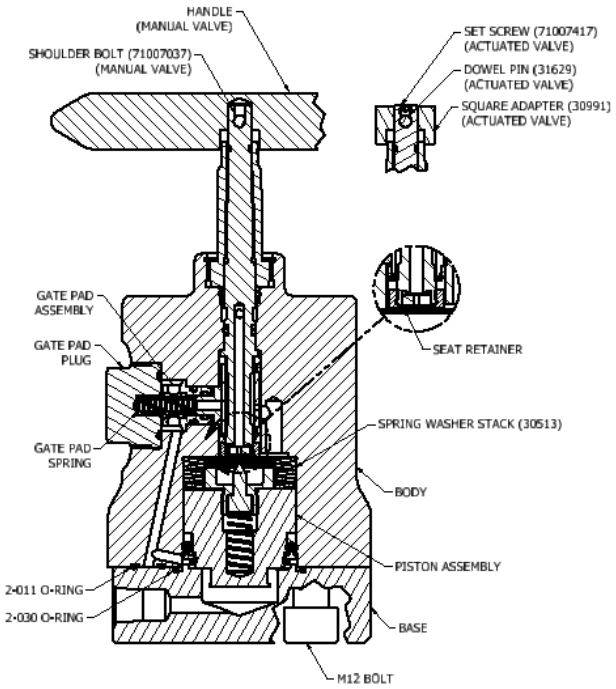


Figure 15 – SF5000HTVB Cross-Section

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

11.2 Apply O-ring lube to stem sealing surface. 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 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.

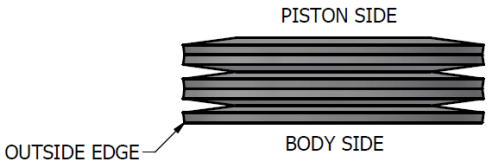


Figure 17 – Spring Stack Arrangement

11.9 Insert this stack into the valve body. The outside edge must be facing down into the body. See Figure 13.

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 Remove the O-rings from the valve base and bottom of body and discard.

11.13 Apply O-ring lube to the new 2-011 O-ring and install in the O-ring gland in the bottom of the body.

11.14 Apply O-ring lube to the new 2-030 O-ring and install in the valve base.

11.15 Place the base onto the valve. Orient the Inlet and Outlet as they were prior to disassembly.

11.16 Apply anti-seize to the 4X M12 socket head cap screws (SHCS) and install in the base.

11.17 Tighten SHCS in opposite pairs. Torque to 40 ft.lbf. – *10mm hex key, torque wrench*

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

Figure 18 – Gate View Through Gate Pad Hole

11.19 Secure the body in a bench vice with gate pad bore facing up.

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

11.21 Insert gate pad coil spring.

11.22 Coat gate pad plug threads with anti-seize.

11.23 Install gate pad plug and torque to 70 ft.lbf. – *23mm hex, 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– *ø3.5mm rod, hammer.*

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

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

13. Disconnecting Valve From the SF3 Actuator

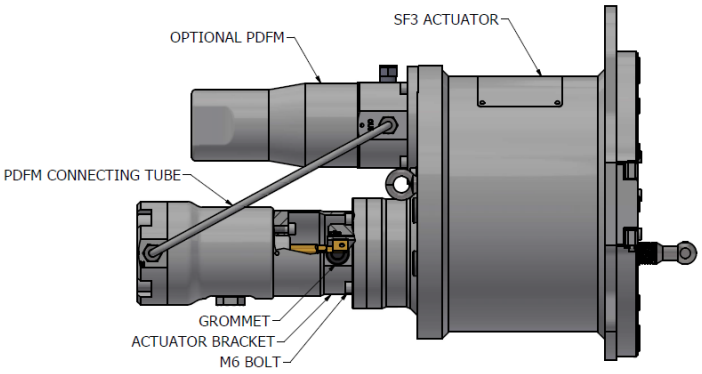


Figure 19 – SF5000HTVB with SF3 Actuator

13.1 If unit does not have a PDFM skip to step 13.5

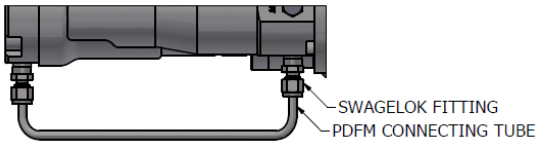


Figure 20 – PDFM Connecting Tube

13.2 Mark each fitting as shown in Figure 19 – *Marker pen*

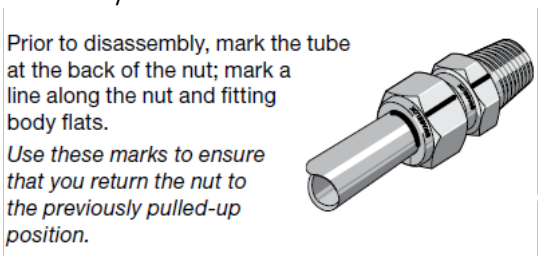


Figure 21 – Marking Swagelok Fittings

13.3 Holding the fitting in the body or PDFM tightly, unscrew the nut from each fitting – *2x 9/16" wrench.*

13.4 Pull the tube out straight out from the fittings.

13.5 Note the orientation of the actuator bracket grommet to the SF3 Actuator and valve for reference when reassembling.

13.6 Unscrew the 4X M6 bolts attaching the actuator bracket to the SF3 Actuator.

13.7 Pull Disconnect the valve from the actuator.

13.8 Unscrew the 4X M6 bolts attaching the actuator bracket to the SF5000HTVB.

13.9 Remove the bracket from the valve.

14. Reconnecting the SF5000HTVB to the SF3 Actuator

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

14.2 Remove the grommet from the actuator bracket.

14.3 Apply anti-seize to 8X M6 bolts.

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

14.5 Insert 4X M6 SHCS in the bracket holes.

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

14.7 With the SF5000HTVB and actuator bracket oriented as they were prior to disassembly, align the square drive with the actuator drive shaft. Rotate valve as necessary. Note: the square drive can be viewed through the grommet hole.

14.8 Slide the square drive into the drive shaft.

14.9 Realign the fastener holes.

14.10 Insert 4X M6 SHCS into the bracket.

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

14.12 Install the grommet in actuator bracket.

14.13 Reinsert the PDFM connecting tube to the fittings in the valve and PDFM. Note: the shorter end of the tube goes to the valve.

14.14 Tighten the nuts slightly past their previously marked position. See Figure 22 for details – *2x 9/16" wrench.*

! WARNING

⚠ THE SWAGELOK FITTINGS MUST BE TIGHTENED ACCORDING TO SWAGELOK STANDARDS – UNDERTIGHTENING COULD LEAD TO A HIGH-PRESSURE LEAK, AND OVERTIGHTENING COULD DAMAGE THE FITTING.

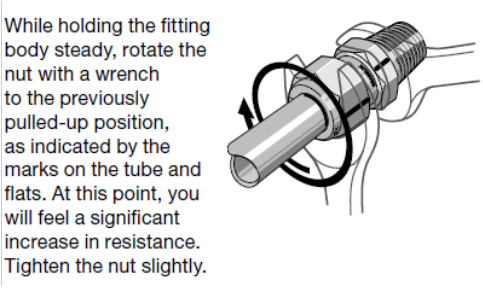


Figure 22 – Retightening Swagelok Fittings

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

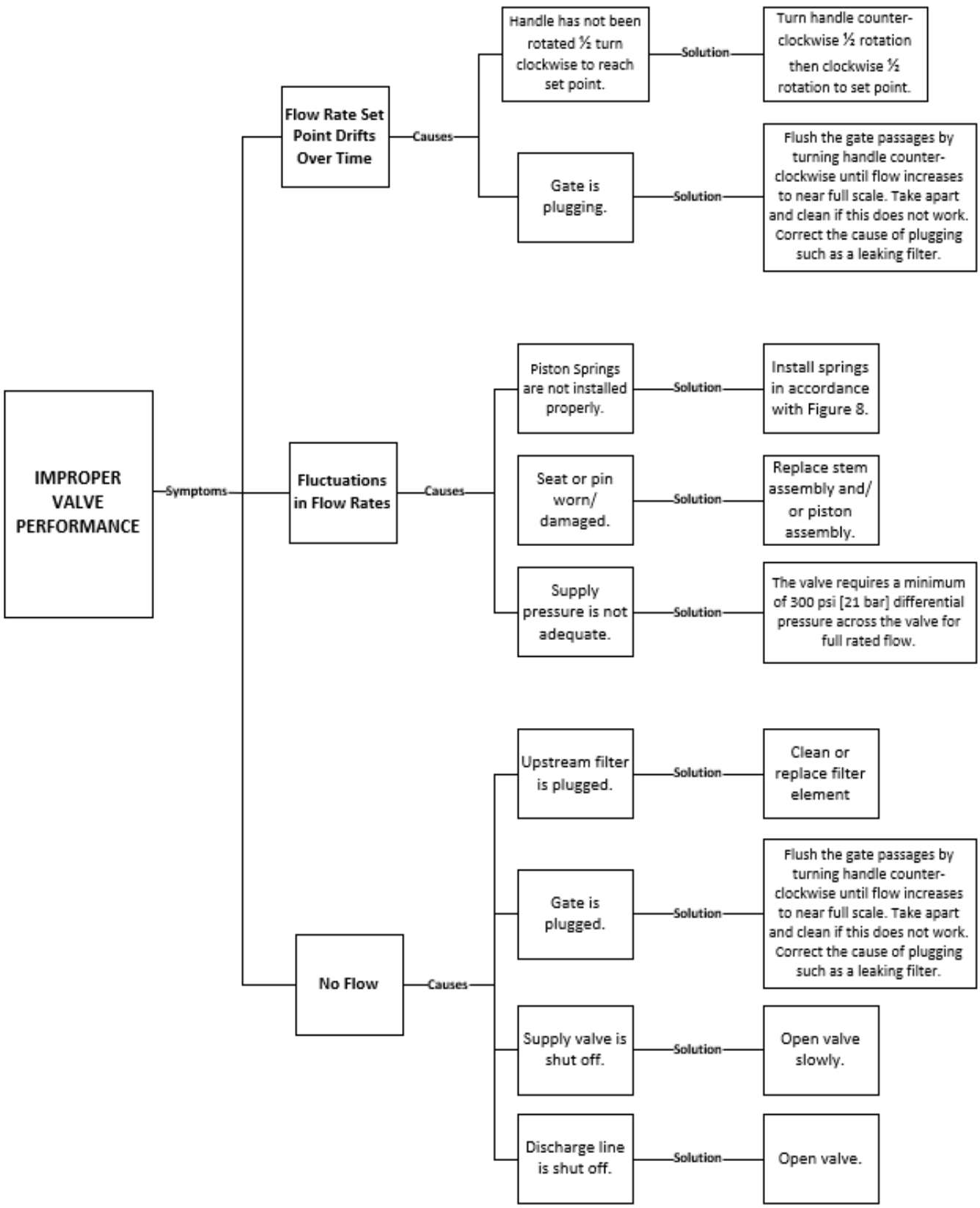
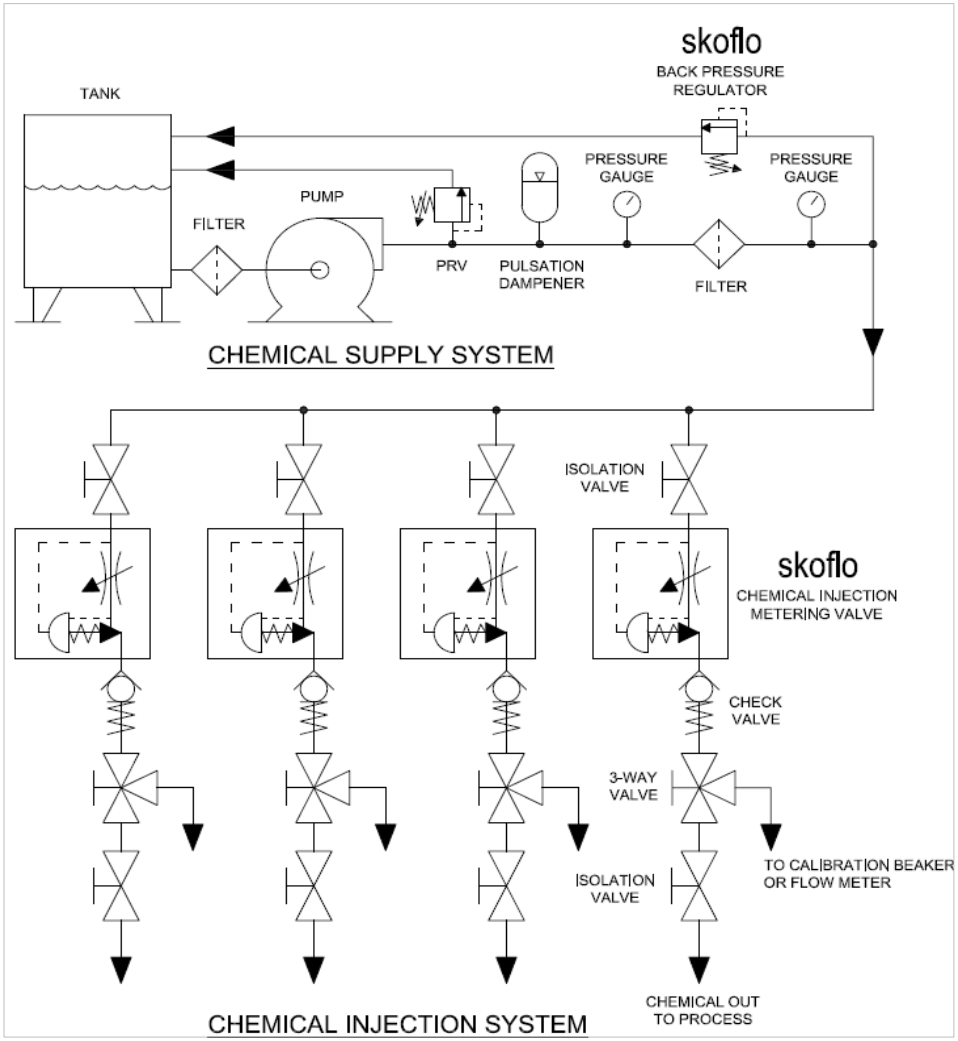


Figure 23 – Troubleshooting

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 – SF5000HTVB GA AND BOM DRAWINGS

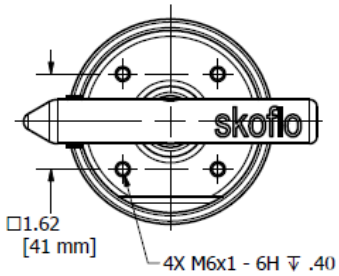
SF5000HTVB-MA

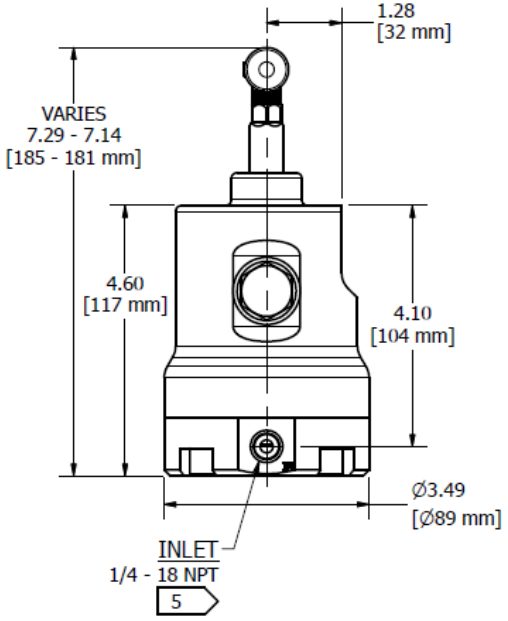
REVISION HISTORY							
ECN #	REV	DESCRIPTION	DATE	DRAWN	ENG1	ENG2	OTHER
	A	INITIAL RELEASE	12/7/21	WF	JM	CA	

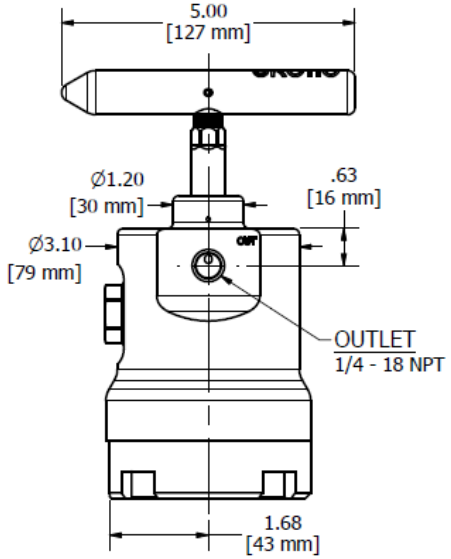
CONFIGURATION NUMBER GUIDE

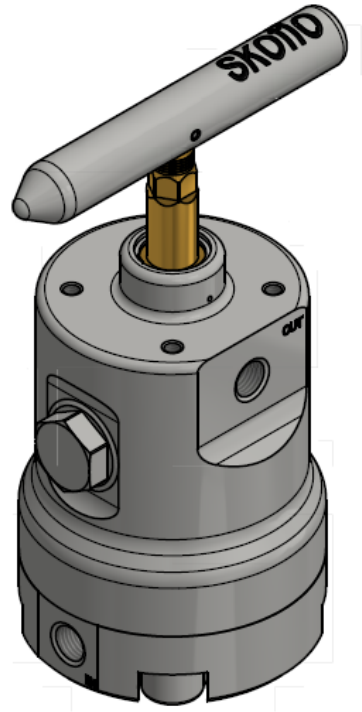
SF5000HTVB	-	XXXX	-	XXXX	-	XX	-	XX	-	XX
0.6-600gpd		600D		FFKM		A4-70		A4		MA MANUAL
25-2500gpd		2500D		FKM		SUPER DUPLEX		SD		RV ROTORK VALVE ONLY
FLOW RANGE		FLOW CODE		EPDM		FASTENER MATERIAL		FASTENER CODE		SV SF3 VALVE ONLY
				SEAL MATERIAL						ACTUATION CODE / ACTUATION TYPE

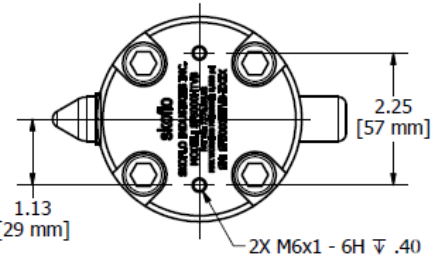
MATERIAL CODE	BODY MATERIAL
N5	NITRONIC 50
C2	HASTELLOY C276











NOTES:
1) NOMINAL WEIGHT = 11.3 lb [5.1 kg]
2) RATED WORKING PRESSURE = 5,000 psi [345 bar]
3) FLOW RATE RANGES:
   a) 0.6 - 600 gpd
   b) 25 - 2,500 gpd
4) MANUAL CONFIGURATION SHOWN

5 ORIENTATION CAN BE ADJUSTED IN 90° INCREMENTS

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED	DRAWN	W.FORTINER	12/6/2021
DRAWING PER ANSI Y14.5M-2009	ENG1	J.MOORE	12/7/2021
	ENG2	C.ARNOLD	12/7/2021
FRACTIONS ± 1/16 X ± .03 .XX ± .010 .XXX ± .005 .XXXX ±.0005 ANGULAR ±3°	OTHER		
UNLESS SPECIFIED DEBURR & BREAK EDGES: .015/.005 Ra SURFACE: 63 FILLETS: R.025/.008 SPOT FACE: 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		

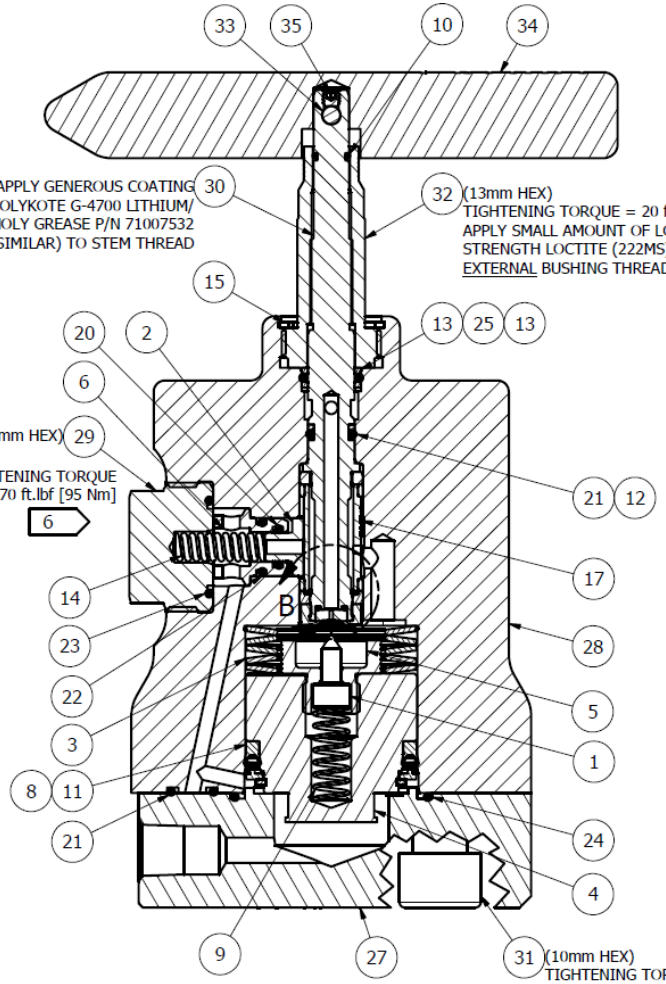
skoflo — SKOFLO INDUSTRIES, INC. WOODINVILLE, WA

VALVE ASSEMBLY, SURFACE, SF5000HTVB

DWG NO SF5000HTVB-MA REV A

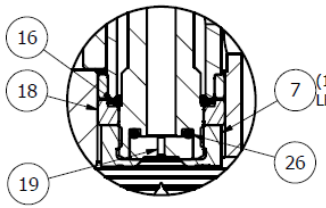
SIZE B SCALE NONE SHEET 1 OF 2

SF5000HTVB-MA



SECTION VIEW

(SF5000HTVB-XXXX-XXXX-XX-XX-MA SHOWN)



DETAIL B

TABLE 1: FLOW RATE RANGE SELECTION			
ITEM	0.6-600gpd	25-2500gpd	DESCRIPTION
17	31511 ALT 31295	31547	ASSY, GATE, HTV
18	30828	30826	GUIDE RING, STEM, BOTTOM, SURFACE HTV
19	31344	30516	SEAT, PILL STYLE

TABLE 2: O-RING COMPOUND SELECTION				
ITEM	FFKM	FKM	EPDM	DESCRIPTION
20	71006901	71006807	71001738	SL, O-RING, 2-010
21	71001744	71006921	71006952	SL, O-RING, 2-011
22	71001747	71007553	71007554	SL, O-RING, 2-012
23	71001769	71006961	71001766	SL, O-RING, 2-018
24	71005574	71006926	71005377	SL, O-RING, 2-030
25	71006915	71006918	71006917	SL, O-RING, 2-905
26	71006953	71006922	71006954	SL, O-RING, M5 X 1

TABLE 3: PRESSURE CONTAINING MATERIAL SELECTION				
ITEM	NITRONIC 50	HASTELLOY C276	DESCRIPTION	
27	31598	31599	BASE, 5KSI, SURFACE, HTV	
28	31345	31482	BODY, 5KSI, HTVB, SURFACE	
29	30426	31518	PLUG, GATE PAD, SURFACE HTV	
30	31309	31519	MANUAL	STEM, SURFACE HTV
	31346	N/A	ACTUATED	

TABLE 4: ITEM 31, FASTENER SELECTION		
	FASTENER MATERIAL	
BODY MATERIAL	A4-70	SUPER DUPLEX
NITRONIC 50	71006909	71007210
HASTELLOY	71007575	N/A

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL	PRESSURE CONTAINING
1	1	30471	PIN, CERAMIC, .165	ZIRCONIA 3Y-TZP	NO
2	1	30512	PAD, GATE, SURFACE HTV	ZIRCONIA	NO
3	1	30513	SPRING, WASHER, STACK 5	INCONEL 718	NO
4	1	30954	PISTON, STOP VERSION, HTV	NITRONIC 50 HS	NO
5	1	30955	PIN HOLDER, WITH STOP, HTV	NITRONIC 50 HS	NO
6	1	31297	RETAINER, SEAL, GATE PAD, HTV	NITRONIC 50	NO
7	1	31409	RETAINER, SEAT, SURFACE HTV	NITRONIC 50	NO
8	1	71006125	SLRG, WST-118	ALLOY X-750	NO
9	1	71006907	SPRING, COIL, Ø.258 X 1.02, PISTON	ELGILOY	NO
10	1	71006956	SL, O-RING, 1.2mm CS X 6mm ID	EPDM	NO
11	1	71006962	SL, CUP, PISTON, HTD	SEE DWG 71006962	NO
12	1	71006998	SL, BU RING, .304 ID X .053W X .050T	PTFE	NO
13	2	71006999	SL, BU RING, .410 ID X .054W X .050T	PTFE	NO
14	1	71007048	SPRING, COIL, Ø.250 X 1.00, GATE PAD	ELGILOY	NO
15	1	71007136	SLRG, INTERNAL, Ø.875, FHL-94-HAS	HASTELLOY C-276	NO
16	1	71007516	SLRG, EXTERNAL, .375, WSM-37	ALLOY X-750	NO
17	1	SEE TABLE 1	ASSY, GATE, HTV	ASSY	NO
18	1	SEE TABLE 1	GUIDE RING, STEM, BOTTOM, SURFACE HTV	PTFE	NO
19	1	SEE TABLE 1	SEAT, PILL STYLE	ALUMINA	NO
20	1	SEE TABLE 2	SL, O-RING, 2-010	SEE TABLE 2	NO
21	2	SEE TABLE 2	SL, O-RING, 2-011	SEE TABLE 2	YES
22	1	SEE TABLE 2	SL, O RING, 2-012	SEE TABLE 2	NO
23	1	SEE TABLE 2	SL, O-RING, 2-018	SEE TABLE 2	YES
24	1	SEE TABLE 2	SL, O-RING, 2-030	SEE TABLE 2	YES
25	1	SEE TABLE 2	SL, O-RING, 2-905	SEE TABLE 2	YES
26	1	SEE TABLE 2	SL, O-RING, M5 X 1	SEE TABLE 2	NO
27	1	SEE TABLE 3	BASE, SERIALIZED, 5KSI, SURFACE HTV	NITRONIC 50	XXX
28	1	SEE TABLE 3	BODY, 5KSI, HTVB, SURFACE	NITRONIC 50 HS	YES
29	1	SEE TABLE 3	PLUG, GATE PAD, SURFACE HTV	NITRONIC 50 HS	YES
30	1	SEE TABLE 3	STEM, SURFACE HTV	NITRONIC 50 HS	YES
31	4	SEE TABLE 4	SHCS, M12 X 1.75 X 30MM	SEE TABLE 4	YES
32	1	SEE TABLE 5	BUSHING, STEM, SURFACE HTV	SEE DWG	NO
33	1	SEE TABLE 5	FASTENER, HANDLE	18-8 SS	NO
34	1	SEE TABLE 5	HANDLE, SURFACE HTV	316 SS	NO
35	1	SEE TABLE 5	SHSS, M4x0.7x3LG, FLAT TIP	18-8 SS	NO

TABLE 5: ACTUATION SELECTION				
ITEM	MANUAL	RV	SV	DESCRIPTION
32	31420	31334		BUSHING, STEM, SURFACE HTV
33	71007037	31629		FASTENER, HANDLE
34	30435	30944	30991	HANDLE, SURFACE HTV
35	N/A	71007417		SHSS, M4x.07x3LG, FLAT TIP

NOTES CONTINUED:

6) COAT THREAD WITH DYNATEX ANTI-SEIZE LUBRICATING COMPOUND (OR SIMILAR)
7) LUBRICATE ALL SEALS WITH PARKER SLUBE 884-4 (OR SIMILAR)
8) SEE O&M OR SF5000HTVB-MA-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: .015/.005 Ra SURF. DUAL: 63 FILLETS: R.028/.008 DRILL POINT: 110-150

DRAWN W.FORTINER 12/6/2021
ENG1 J.MOORE 12/7/2021
ENG2 C.ARNOLD 12/7/2021
OTHER

skoflo SKOFLO INDUSTRIES, INC. WOODINVILLE, WA

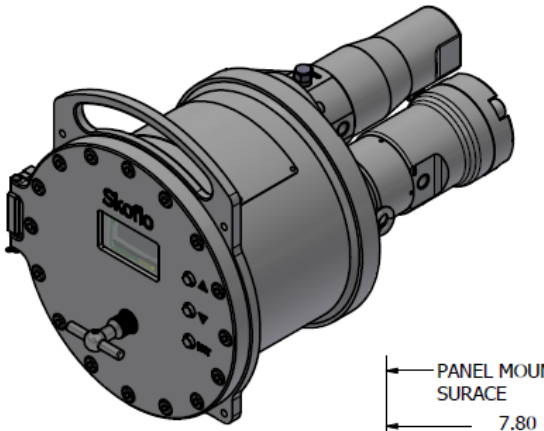
VALVE ASSEMBLY, SURFACE, SF5000HTVB

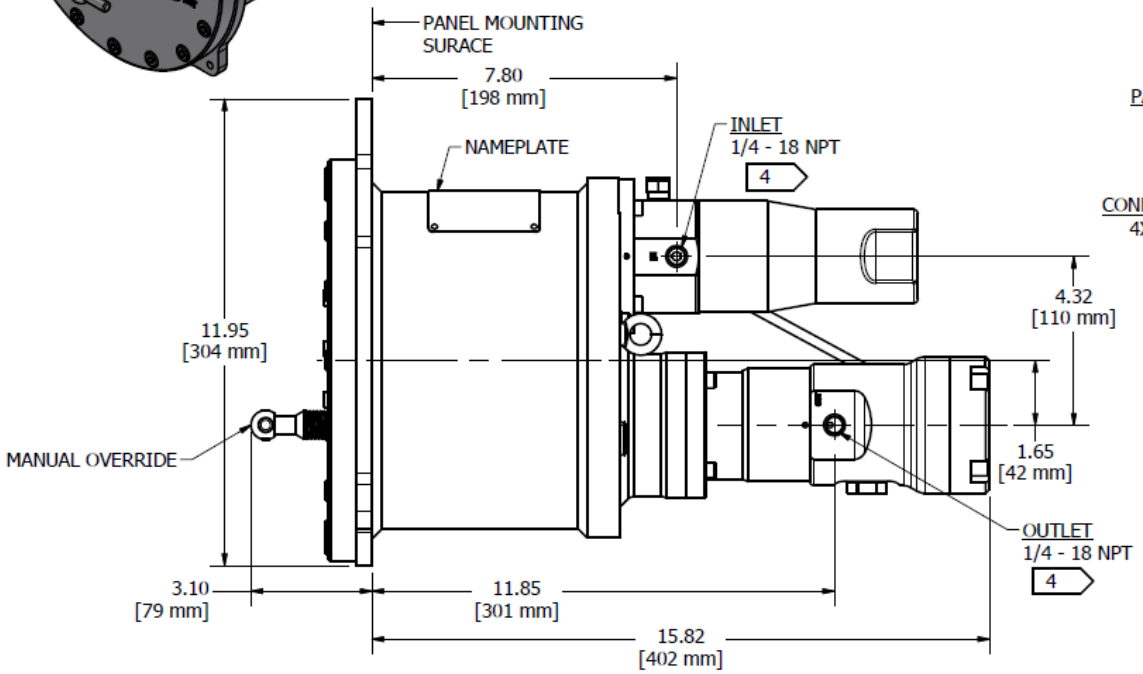
DWG NO SF5000HTVB-MA REV A

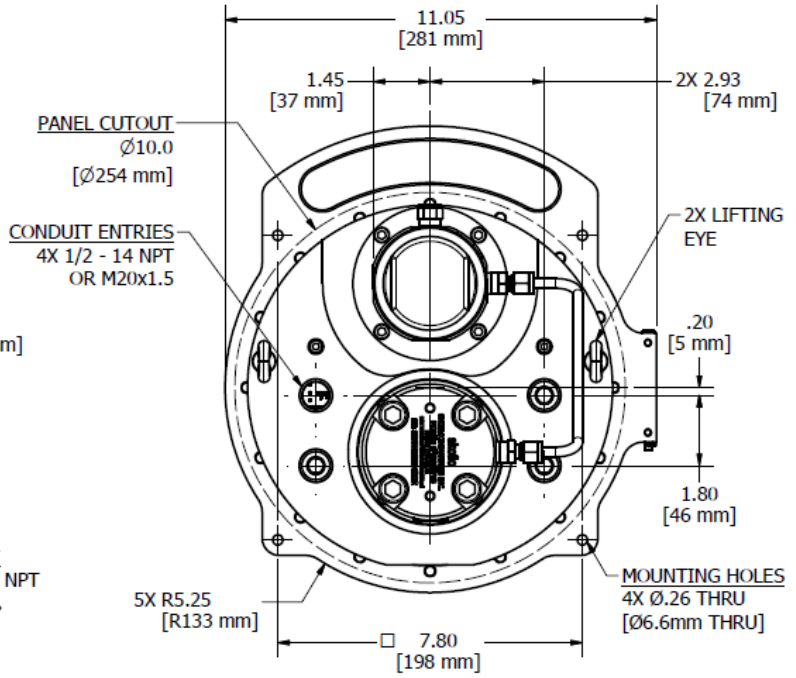
SIZE B SCALE NONE SHEET 2 OF 2

SF5000HTVB-SF3

REVISION HISTORY							
ECN #	REV	DESCRIPTION	DATE	DRAWN	ENG1	ENG2	OTHER
	A	INITIAL RELEASE	12/8/21	WF	CA	JM	







NOTES:
1) NOMINAL WEIGHT = 89 lbs [40 kg]
2) RATED WORKING PRESSURE = 5,000 psi [345 bar]
3) FLOW RATE RANGES:
   a) 0.6 - 600 gpd
   b) 25 - 1,200 gpd
4 ORIENTATION CAN BE ADJUSTED IN 90° INCREMENTS

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED	DRAWN	W.FORTINER	12/3/2021
DRAWING PER ANSI Y14.5M-2009	ENG1	C.ARNOLD	12/7/2021
	ENG2	J.MOORE	12/8/2021
	OTHER		

SKOFLO INDUSTRIES, INC. WOODINVILLE, WA

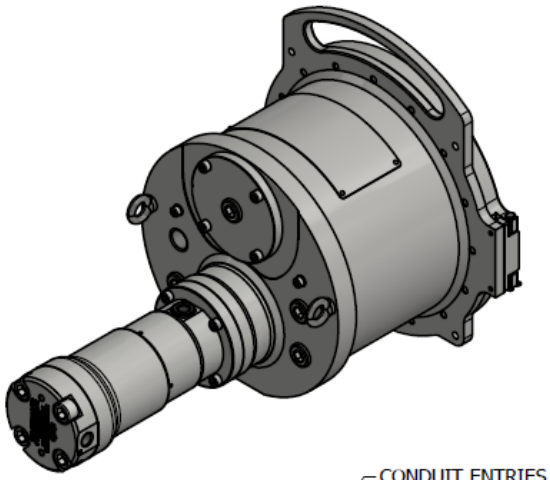
VALVE ASSEMBLY, SURFACE, SF5000HTVB, SF3 ACTUATOR

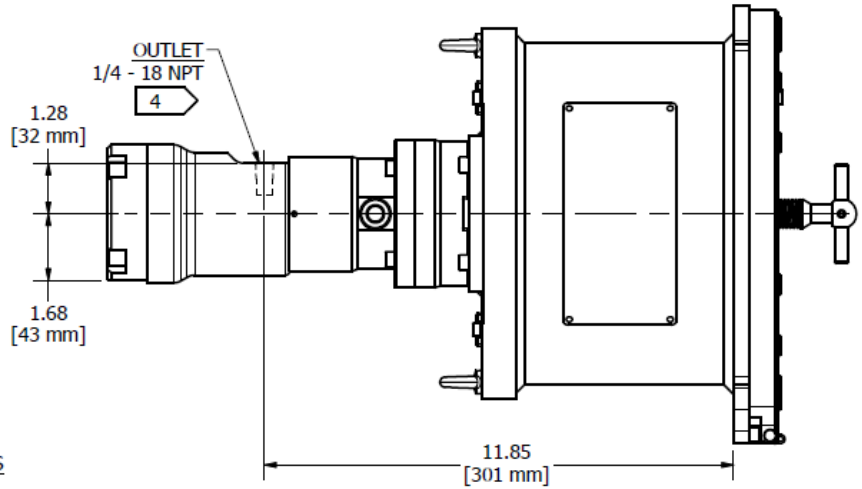
ENVELOPE DRAWING W. PDFM

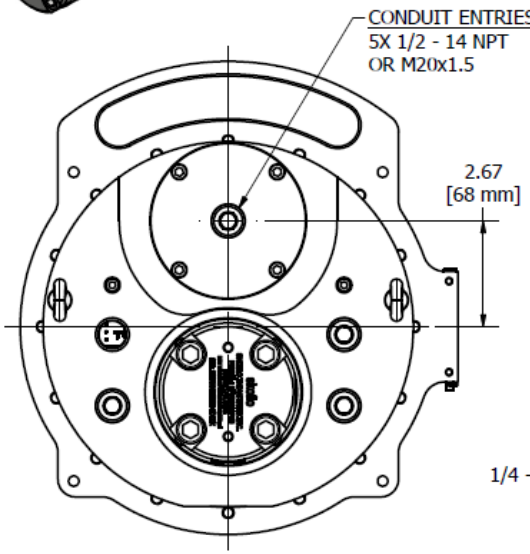
DWG NO SF5000HTVB-SF3 REV A

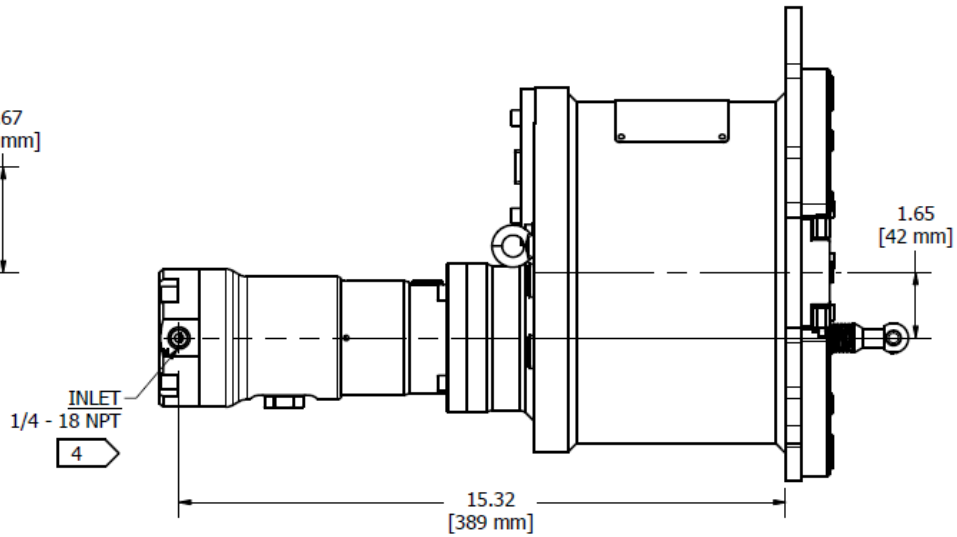
SIZE B SCALE NONE SHEET 1 OF 3

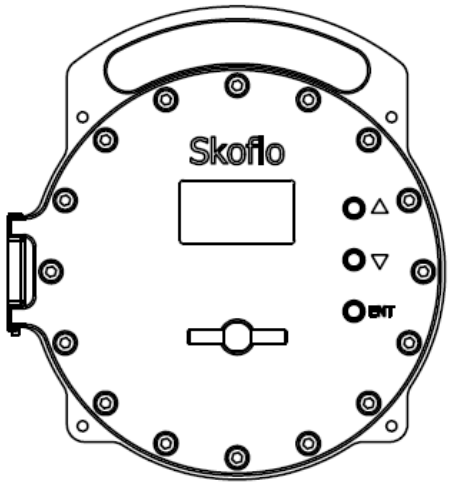
SF5000HTVB-SF3











NOTES CONTINUED:
5) NOMINAL WEIGHT = 78 lbs [34 kg]
6) FLOW RATE RANGES:
   a) 0.6 - 600 gpd
   b) 25 - 2,500 gpd
7) SEE SHEET 1 FOR MOUNTING DETAILS

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED	DRAWN W.FORTINER 12/3/2021	skoflo	SKOFLO INDUSTRIES, INC. WOODINVILLE, WA
DRAWING PER ANSI Y14.5M-2009	ENG1 C.ARNOLD 12/7/2021	VALVE ASSEMBLY, SURFACE, SF5000HTVB, SF3 ACTUATOR	
FRACTIONS ± 1/16 X ± .03 .XX ± .010 .XXX ± .005 .XXXX ± .0005 ANGULAR ±3°	ENG2 J.MOORE 12/8/2021	ENVELOPE DRAWING W/O PDFM	
UNLESS SPECIFIED DEBURR & BREAK EDGES .015/.005 Ra SURF. QUAL: 63 FILLETS: R.025/.008	OTHER	DWG NO SF5000HTVB-SF3	REV A
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SF5000HTVB-SF3

TABLE 1: PART QTY		
ITEM	PDFM	NO PDFM
1	1	0
3	2	0

PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL	PRESSURE CONTAINING
1	SEE TABLE 1	31296	TUBE, BENT, 1/4" OD, SF5000HTV-SF3	316 SS	YES
2	1	31583	BRACKET, ACTUATOR, SF5000HTV	316 SS	NO
3	SEE TABLE 1	71005017	FITTING, ADAPTER, 1/4 Tube X 1/4" NPT	316 SS	YES
4	8	71007102	SHCS, M6X1 - 20	316 SS	NO
5	1	71007615	GROMMET, SNAP-IN, 15.5MM	TPE RUBBER	NO
8 6	1	SEE DWG 31256	ASSY, ACTUATOR, SURFACE (31256-XX-X-X-S5-XX-XX)	SEE DWG 31256	YES
7	1	SEE DWG SF5000HTVB-MA	SUBASSEMBLY, SF5000HTVB, ACTUATED (SF5000HTVB-XXXX-XXXX-XX-XX-SV)	SEE DWG SF5000HTVB-MA	YES

CONFIGURATION NUMBER GUIDE

SF5000HTVB - XXXX - XXXX - XX - XX - SF3 - XX - X - X - XX

FLOW RANGE	FLOW CODE
0.6-600gpd	600D
25-1200gpd*	2500D

SEAL MATERIAL
FFKM
FKM
EPDM

FASTENER MATERIAL	FASTENER CODE
A4-70	A4
SUPER DUPLEX	SD

MATERIAL CODE	BODY MATERIAL
N5	NITRONIC 50
C2	HASTELLOY C276

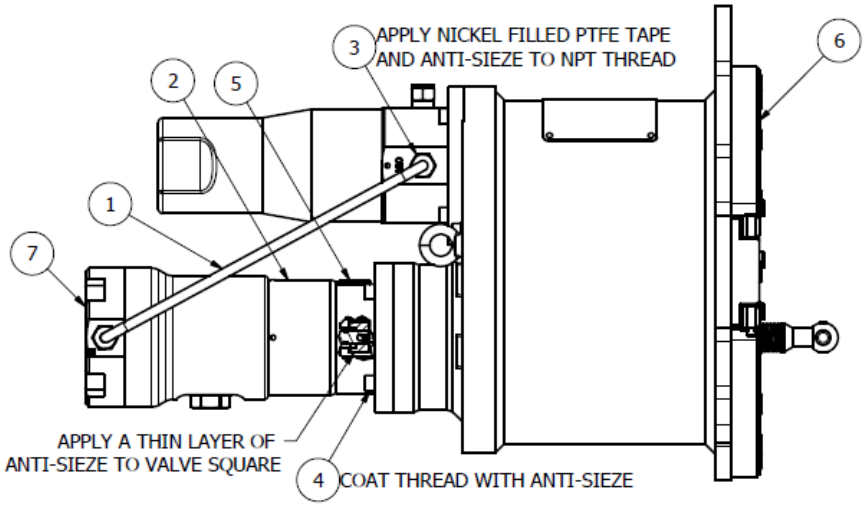
VOLTAGE CODE	VOLTAGE
AC	120-240 VAC
DC	24 VDC

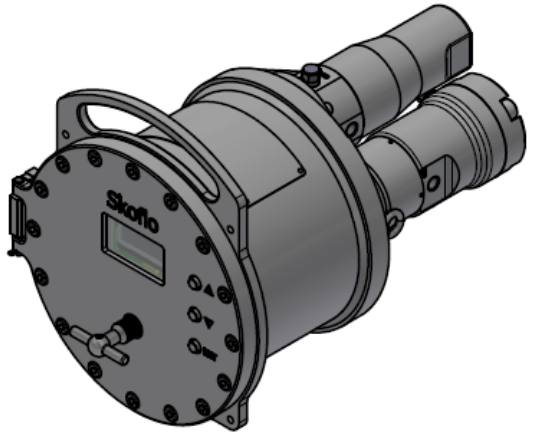
PROTOCOL CODE	COM. PROTOCOL
M	MODBUS
H	HART

CONDUIT CODE	CONDUIT SIZE
M	M20
N	1/2in NPT

PDFM CODE	PDFM TYPE
00	NO PDFM
PD	PDFM

* WHEN NO PDFM IS SELECTED, MAX FLOW IS 2,500 gpd





NOTES CONTINUED:

8 ACTUATOR CONFIGURATION MUST INCLUDE 5:1 GEAR RATIO OPTION AND 5,000 PSI PDFM (WHERE APPLICABLE)

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 QUAL: 63 FILLETS: R.025/.008 DRILL POINT: 110-120°

DRAWN W.FORTINER 12/3/2021
ENG1 C.ARNOLD 12/7/2021
ENG2 J.MOORE 12/8/2021
OTHER

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skoflo SKOFLO INDUSTRIES, INC. WOODINVILLE, WA

VALVE ASSEMBLY, SURFACE, SF5000HTVB, SF3 ACTUATOR

BOM DRAWING

DWG NO SF5000HTVB-SF3 REV A

SIZE B SCALE NONE SHEET 3 OF 3

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