

# SKO FLO

Pressure Independent  
Flow Controller



**SkoFlo Valve Model SF10000NB**

**OPERATION AND MAINTENANCE INSTRUCTIONS**

***SKO FLO INDUSTRIES INC.***

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# SkoFlo Valve Model SF1000NB

## OPERATION AND MAINTENANCE INSTRUCTIONS

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## **SkoFlo Valve Model SF1000NB**

### **OPERATION AND MAINTENANCE INSTRUCTIONS**

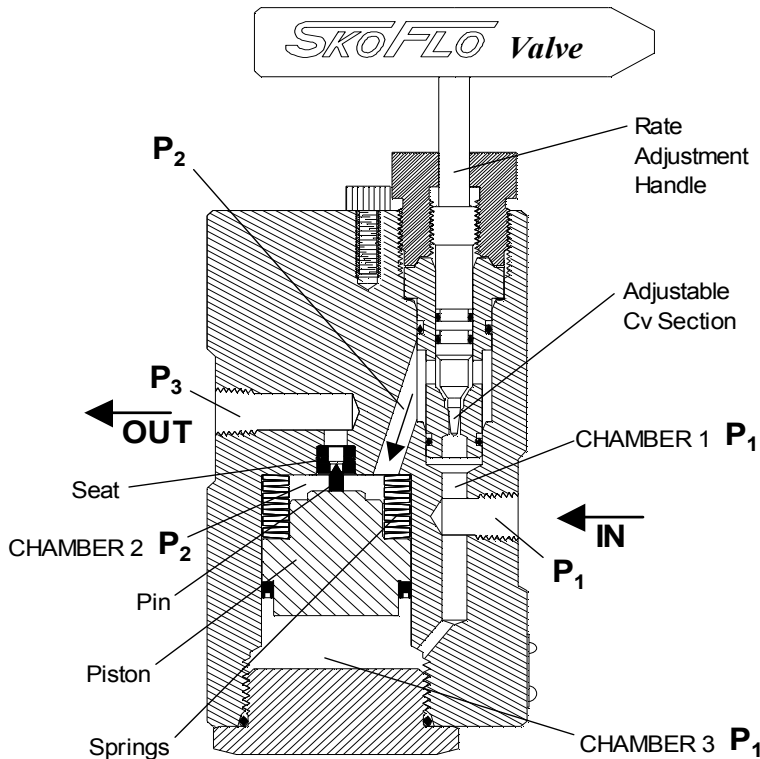
#### **INSTALLATION PROCEDURES:**

1. Install valve so that the flow is in the proper direction. The "IN" connection and the "OUT" connection are 9/16" tubing AE Medium Pressure style connections, and are marked respectively.
2. Install an inline filter in the system. Generally, this is located upstream of the pump. Clean chemical and proper filtering is very important. A 200 micron size filter is recommended.

#### **START UP PROCEDURES:**

1. Open the supply isolation valve to the flow controllerslowly.
2. Turn the rate adjustment handle until you are at the desired flow rate.
3. The flow controller is now set and further adjustments are not required.

## PRINCIPLE OF OPERATION

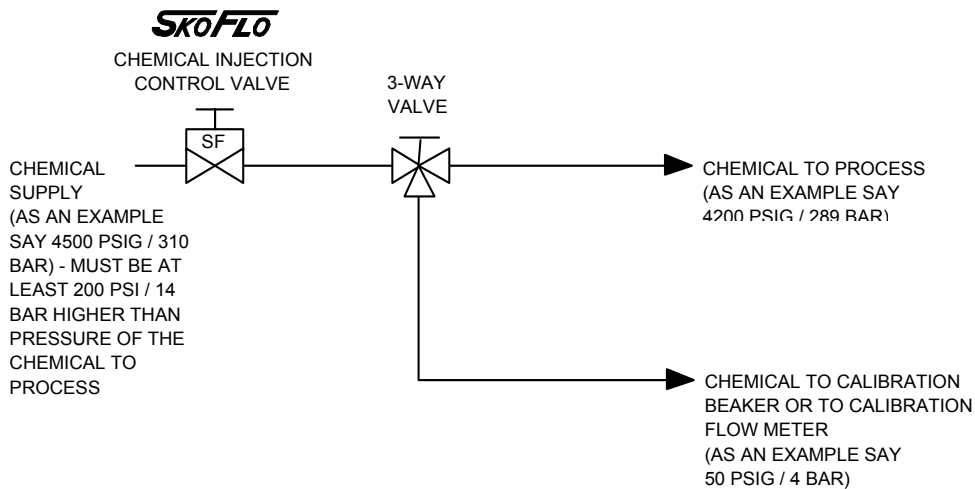


The SkoFlo valve is a pressure independent flow control valve used in the petroleum industry to accurately inject chemicals. The valve consists of a body, a base plate that is bolted to the body, and a flow rate adjustment handle.

The principle of operation of the Model SF10000NB SkoFlo valve is that it internally maintains a constant differential pressure across an adjustable Cv section, thus resulting in a constant flow through that Cv section. The piston/spring assembly utilizes system pressure to adjust the internal pin and seat Cv section, which then sets a constant differential pressure across the adjustable Cv section, thus maintaining a constant flow. Flow rate changes through the valve can only be made by adjusting the rate adjustment handle.

Fluid enters the valve inlet at pressure  $P_1$  and flows into chamber 1. It then flows through the adjustable Cv section into chamber 2 where the piston and springs are located. These springs put a force against the piston based on how much the springs are deflected. The spring force against the piston is set by the differential pressure between  $P_1$  in chamber 3 and  $P_2$  in chamber 2. This pressure balance establishes the pressure  $P_2$  in chamber 2 at a fixed differential from  $P_1$ . Flow then exits the valve at pressure  $P_3$  after passing through the seat. The flow through the seat is held back by the pin that mates with the seat. As the pressure in chamber 2 changes, either as a result of a change in  $P_1$  or a change in  $P_3$ , the pin moves in relation to the seat and controls pressure  $P_2$ . As soon as equilibrium flow through the valve is established, the flow rate will remain constant even when pressures upstream and/or downstream of the valve change.

## ADJUSTMENT AND CALIBRATION:



The SkoFlo Valve is a pressure independent flow control valve. 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 standard Multi-Point SkoFlo valve is set by manually adjusting the rate adjustment handle. When the desired flow rate is set, the valve needs no further adjustment, and the valve remains at that fixed flow rate until the rate adjustment handle is turned to a new setting.

The flow rate can be set using a flow meter in the line to the process. However, a flow meter in this line must be capable of withstanding the process pressure. This normally limits the availability of this type flow meter.

The most common method of calibrating the SkoFlo Valve is with a 3-way valve and a line to a calibration beaker or to a low pressure flow meter. Once the flow rate is set, the 3-way valve is switched to direct the chemical to the process. At higher flow rates, this method may not be feasible.

Since the SkoFlo Valve flows at the set rate independent of the pressure differential across the SkoFlo Valve, the flow rate to the process is the same as the flow rate set using the beaker or flow meter. Overall monitoring of the flows is done by taking inventory of the usage from the supply tank.

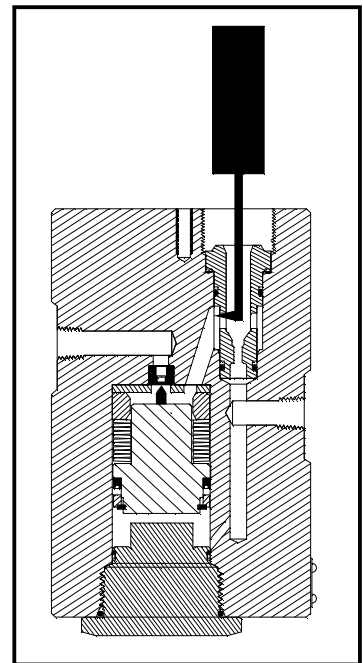
In the above example, the SkoFlo Valve is set with a differential pressure of 4450 psi / 306 bar across the valve. The flow rate set will remain the same when the chemical is routed to process and the SkoFlo Valve has a differential pressure of 300 psi / 21 bar.

## OPERATION NOTES AND WARNINGS:

1. The SkoFlo valve has hard seats and is not designed to provide complete "bubble-tight" shut off. Separate isolation valves should be used for shutting off the flow. The SkoFlo valve will reach its minimum flow before the handle is bottomed out. **Overtightening the handle will not further reduce flow**. If flow rate does not decrease when turning the handle in, see "Trouble Shooting Improper Valve Performance".
3. The SkoFlo Valve is designed for flow in one direction only. Do not flow backwards through the SkoFlo valve. Some internal seals are designed for one direction only and could possibly become dislodged. The valve will not control flow in the reverse direction. SkoFlo Industries recommends installation of a check valve in the outlet line **within 5 feet** from the SkoFlo valve (see "Multi-Point System Sample Schematic") to avoid reverse flow of process fluids into the chemical system.

## MAINTENANCE:

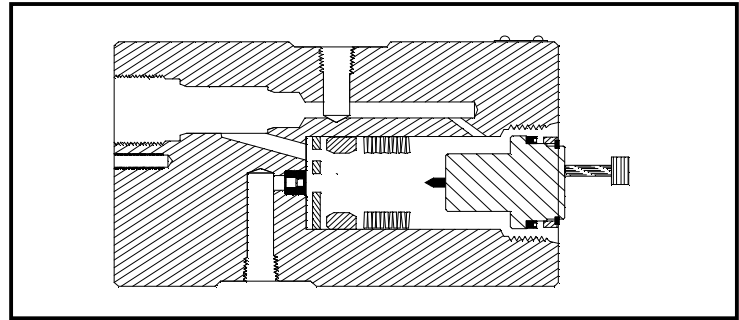
1. **Replacing Seals:** When replacing valve seals, it is recommended that the Piston Seal Installer Tool (P/N SF10000-T2) be used.
  - A. Remove SkoFlo valve from system.
  - B. Remove the adjustment handle retainer lock bolt. Unscrew the stem retainer and pull the rate adjustment handle out of the body.
  - C. Pull out the needle trim using a hooked probe or similar device. Use care to avoid damage to the internal surfaces of the SkoFlo valve. (See Figure I).



*Figure I*

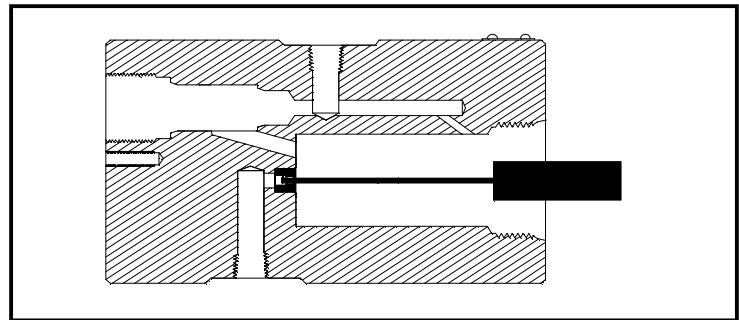
- D. Unscrew and remove the base cap.
- E. Screw a bolt into the thread on the piston (use handle retainer lock bolt or any M6 bolt) and carefully pull out the piston assembly, springs, spring washer and seat retainer plate. (See Figure II).

Figure II



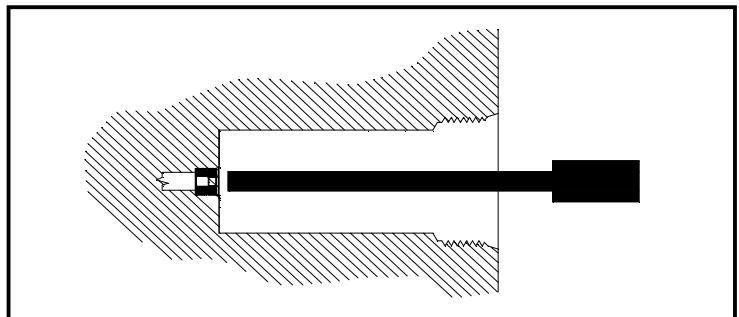
- F. If replacing the seal on the ceramic seat, use a hooked probe to carefully remove the seat. (See figure III).

Figure III



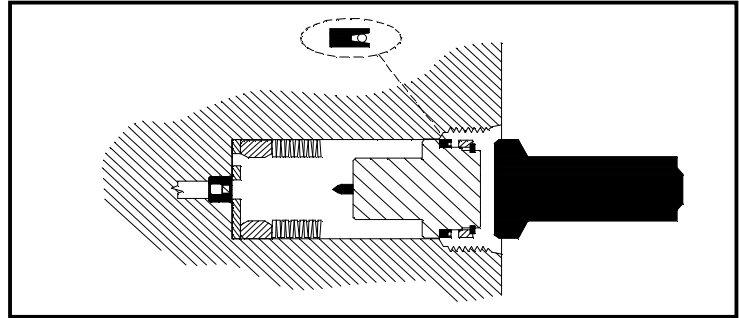
- G. Lubricate new seat seal with Parker Super Lube or equivalent. Slide seal onto seat. Insert the seat into the body by slowly pushing with any tool which will not chip the ceramic seat. Orient seat with largest hole side into the body.

Figure IV



- H. Lubricate piston seal with Parker Super Lube or equivalent. Slide seal onto piston (orient seal correctly). Place piston seal retainer onto the piston and install spiral ring.
- I. Place the seat retainer plate (flat side toward seat) and the spring spacer washer (double chamfer side toward seat) into body along.
- J. Place the piston spring stack into the body. Orient washer and spring stack as shown in attached drawing "Assembly Section / Parts List". Carefully slide the piston assembly into the valve body. Using the Piston Seal Installer Tool, push seal and piston assembly into body to clear base plate (See Figure V).

*Figure V*

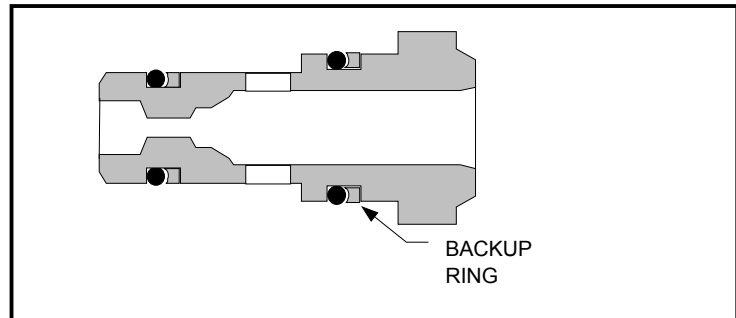


- K. Lubricate base o-rings with Parker Super Lube or equivalent. Place base locking o-ring onto the base cap. Place sealing o-ring and back up ring into o-ring groove of base. The back up ring installs on the thread side of the groove.
- L. Be certain that the back up ring is snug into the groove in the base cap. Carefully screw base cap into body, particularly near the bottom of the threads where the o-ring and back up ring pass into the bore - if the back up ring extends out from the groove, it can be damaged. Torque to maximum 30 foot-pounds (4 kg-m). Be careful not to overtighten.



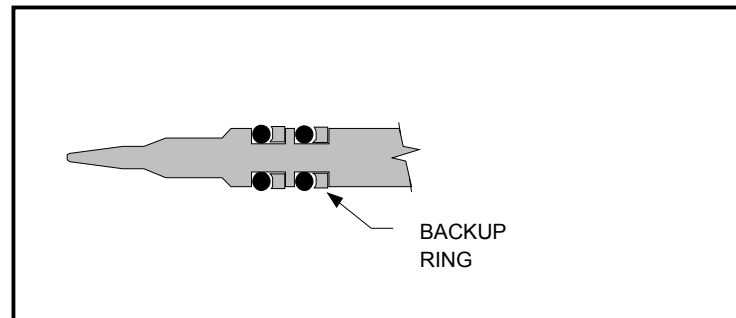
- M. Install o-rings and backup rings on the needle trim. Locate the backup rings as shown in Figure VI.

*Figure VI*



- N. Place the trim locking o-ring into the body bore. O-ring should rest on the internal shoulder.
- O. Push needle trim into the body.
- P. Install o-rings and backup rings on the needle stem. Locate the backup rings as shown in Figure VII.

*Figure VII*



- Q. Install adjustment handle assembly into the body. Torque the stem retainer to 10 - 30 foot-pounds. Orient a flat on the stem retainer in line with the threaded hole for the retainer lock bolt.

R. Install the retainer lock bolt into the body. Torque the retainer lock bolt to 10 foot-pounds. Tighten the stem retainer until snug against lock bolt.

2. **Replacing Needle Stem Assembly:**

A. Disassemble and reassemble the SkoFlo valve using new seals as described in the "Replace Seals" section above.

3. **Replacing Piston / Pin Assembly:**

A. Disassemble and reassemble the SkoFlo valve using new seals and piston assembly as described in the "Replace Seals" section above.

B. When installing pin holder into piston, hold piston in a manner where the surface finish will not be damaged. Torque pin holder to 100 inch-pounds (1.15 kg-m).

**TROUBLE SHOOTING IMPROPER VALVE PERFORMANCE:**

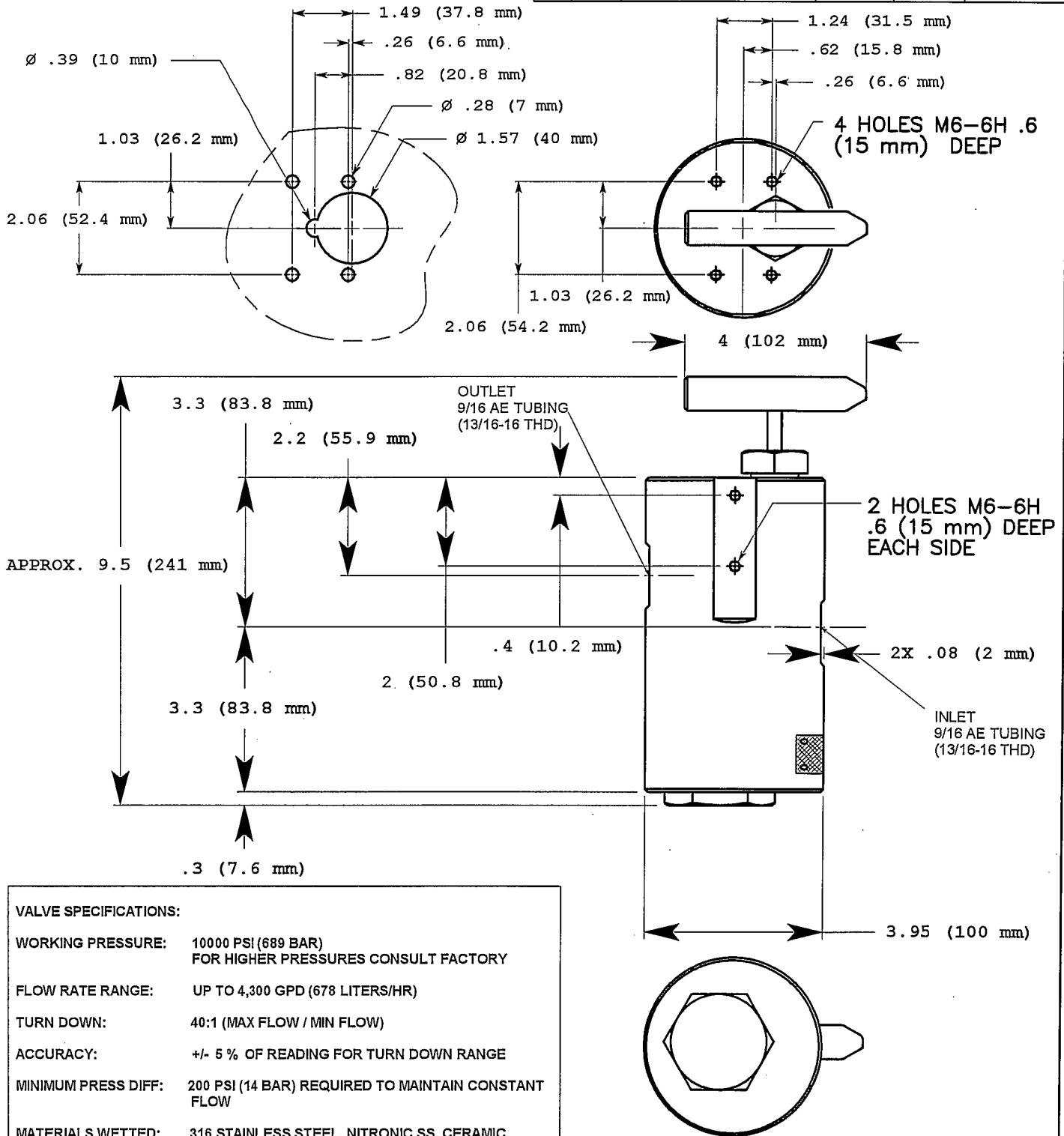
<u>SYMPTOM</u>	<u>CAUSE</u>	<u>REMEDY</u>
1. No Flow	Upstream filter is plugged.	Clean or replace filter element.
	Supply valve is shut off.	Open valve <u>slowly</u> .
	Discharge line is shut off.	Open valve.

<u>SYMPTOM</u>	<u>CAUSE</u>	<u>REMEDY</u>
2. Fluctuations in flow rates	Internal passage in valve body between inlet and piston chamber is plugged.	Dismantle the valve and clean up the passage.
	Piston Springs are not installed properly.	Install springs in accordance with drawing SF-0627
	Seat or pin worn or damaged.	Replace seat or piston assembly.
	Supply pressure is not adequate.	The flow controller requires a minimum of 200 psi (14 bar) differential pressure across the valve for proper operation. (Valves designed for special high flows may require a higher differential pressure).

Please call the factory in Woodinville, Washington USA at phone number 425-485-7816 if you have any questions.  
E-Mail: [butchs@skoflo.com](mailto:butchs@skoflo.com)

### HOLE PATTERN FOR PANEL MOUNT

LTR	ECN	DESCRIPTION	DRAWN	DATE	APPROVED
D		REV APPROVAL	JT	07/06/06	



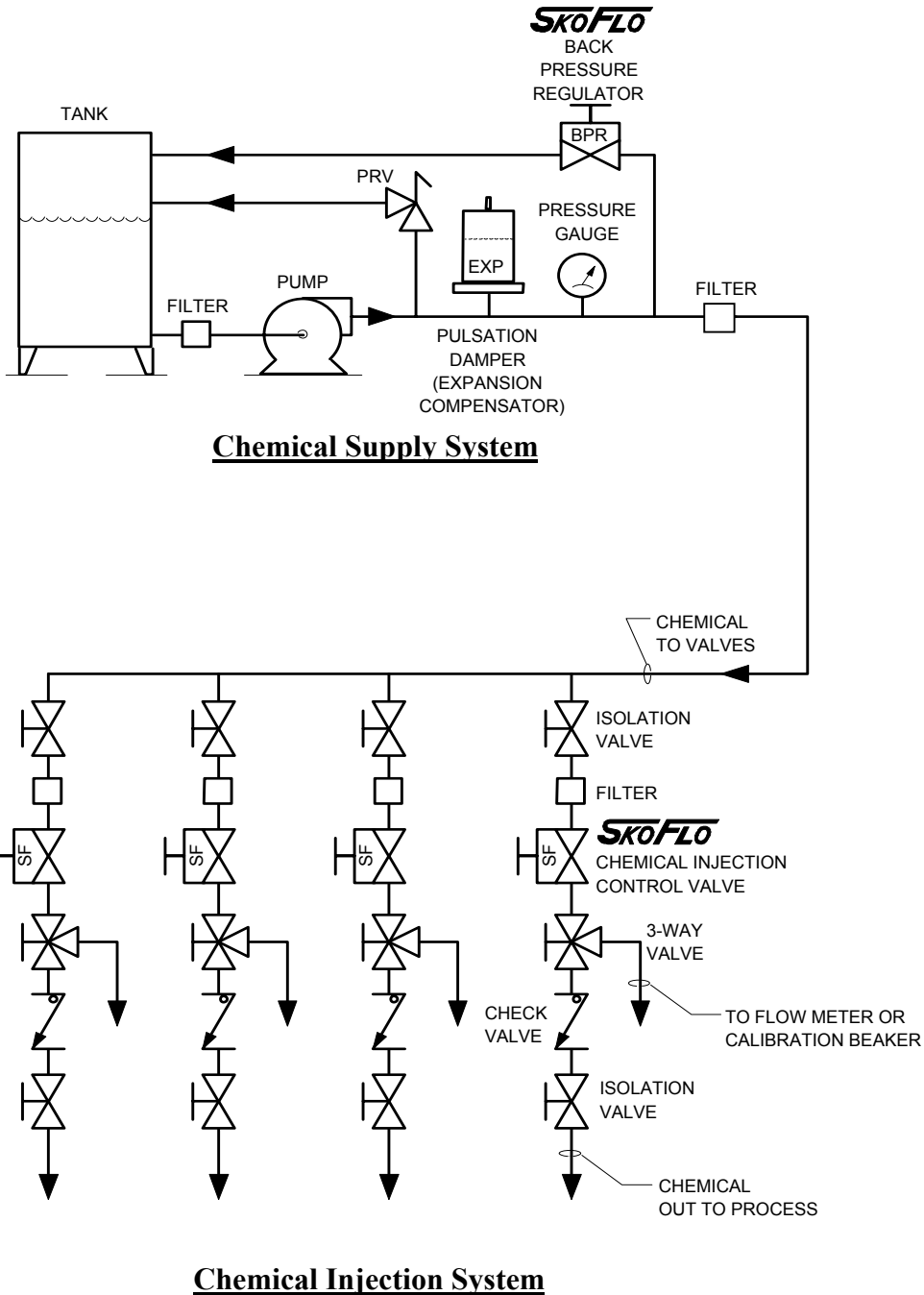
**VALVE SPECIFICATIONS:**

- WORKING PRESSURE:** 10000 PSI (689 BAR)  
FOR HIGHER PRESSURES CONSULT FACTORY
- FLOW RATE RANGE:** UP TO 4,300 GPD (678 LITERS/HR)
- TURN DOWN:** 40:1 (MAX FLOW / MIN FLOW)
- ACCURACY:** +/- 5% OF READING FOR TURN DOWN RANGE
- MINIMUM PRESS DIFF:** 200 PSI (14 BAR) REQUIRED TO MAINTAIN CONSTANT FLOW
- MATERIALS WETTED:** 316 STAINLESS STEEL, NITRONIC SS, CERAMIC
- SEAL MATERIALS:** VITON, KALREZ, EPR, TEFLON  
CONSULT FACTORY FOR OTHER SEAL MATERIALS

UNLESS OTHERWISE SPECIFIED	SIGNATURES	DATE
DIM. ARE IN INCHES	DRAWN FJG	11-5-01
2 PL. DEC. ±.01	CHECKED	
3 PL. DEC. ±.005	ENGRG	
ANGLES ±1°	ISSUED	
FRACTIONS ± 1/64		

	FLOW CONTROL INDUSTRIES INC. WOODINVILLE, WA	
	SkoFlo Valve Model SF10000NB GENERAL ARRANGEMENT	
SIZE B	REV: D	DWG NO. 20626
SCALE NONE	SHEET 1 OF 1	

# Multi-Point System Sample Schematic



**Notes:**

1. 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.
2. Check valve must be installed within 5 feet from the SkoFlo valve.

