



**INSTALLATION & SERVICE INSTRUCTION MANUAL**  
**W.A. KATES FLOW CONTROLLERS**  
**FC VALVE MODEL N**

**IMPORTANT**

1. W. A. Kates flow rate controllers are designed to accurately regulate flows and are precision built with exacting tolerances and finishes. To insure satisfactory performance, the regulated fluid must be clean and free of dirt and/or solids. The installation of a filter is recommended, just upstream of the controller.

<b>MODEL</b>	<b>STRAINER</b>	<b>FILTER</b>
N	100 Mesh	150 Micron

2. Equally important: When disassembling, servicing, or cleaning the controller, the internal parts must be handled with care to prevent damaging the surface finish in any way.
3. Operation of W. A. Kates flow rate controller supplied by a positive displacement pump will be satisfactory only if a pressure-relieving valve is connected between the pump and the controller to bypass excess fluid back to the fluid source, or to the intake of the pump.

**INSTALLATION**

1. W. A. Kates flow rate controllers are shipped fully assembled, ready for operation, with all parts in place. It is completely self-contained, requires no outside source of power, no straight piping runs, and is as simple to install as an ordinary angle valve.
2. Upstream and downstream shutoff valves and a bypass valve should be installed so that the controller may be opened for inspection and cleaning without requiring complete system shutdown.(See figure 2)
3. Before installing the controller, be sure to flush out the piping system to remove any foreign material such as dirt, scale, chips, etc.
4. All controllers are constructed substantially, but pipe supports should be located so that the controller is not subject to mechanical load due to piping, or to the expansion or contraction of piping.
5. The controller should be installed at a point in the pipe where it will be completely filled with fluid under all conditions of operation. The preferred axis of the controller is vertical, with the bonnet up. The inlet is at the side and the outlet connection is at the bottom. On threaded connections, apply pipe thread compound sparingly to male threads only, so that surplus will not get inside the controller.

## START UP PROCEDURE

1. The pointer on the stainless steel nameplate should be at the front, readily visible to the operator. If not, proceed as follows:
  - a. Loosen and remove the bonnet bolts.
  - b. Lift the bonnet straight up and turn until the pointer faces the front.
  - c. Make sure the body O-ring is in good condition and is in place.
  - d. Lower the bonnet slowly, at the same time turning the flow rate adjuster bar until the slot on the end of the adjuster shaft fits over the cross bar in the torque tube, and the shoulder on the lower face of the bonnet fits into the body. (Note: If the flow rate setting knob does not turn, loosen the dial lock screw. See figure 1) When properly assembled, the bonnet will seat squarely on the body all the way around. (See figure 1)
  - e. Replace and tighten the bonnet bolts.
2. By hand, turn the flow rate adjuster bar in both directions until the stop pin inside the controller prevents further rotation. If it does not turn, easily without sticking, or if it does not hit the stop pin in both directions, follow service directions below, "To Clean Controller".  
*CAUTION:* Never use a wrench or attempt to force the bar to turn.
3. Turn the flow rate adjuster bar clockwise until it hits the internal stop pin. The lowest set point (at the right hand end of the dial) should now line up with the pointer. If not, loosen the dial clamp screws about three revolutions. Making sure that the adjuster shaft does not turn, rotate the adjuster bar until the index mark on the pointer lines up with the lowest set point on the indicating scale and retighten the screws.
4. Turn the flow rate adjuster bar until the desired flow rate mark on the indicating scale lines up with the index mark on the pointer.
5. Place the controller in service by opening upstream and downstream shut off valves and closing the bypass valve around the controller. Use caution; during start-up, open valves slowly to avoid pressure surges. The controller will now regulate the flow rate at the set value. (See figure 2)

### NOTES:

- a. If there is air trapped in the top of the controller, this should be purged by the liquid after a short period.
- b. When the flowing fluid temperature is above room temperature, especially with viscous fluids, there may be a "warming up" period until the controller reaches the same temperature as the fluid. During this warming up period, the controller may be somewhat sluggish in action. If desired, this warming up period may be eliminated by the use of a heating coil or jacket.
- c. During the first few days of operation, gasketed joints should be observed and tightened if necessary.

## **SERVICE INSTRUCTIONS**

W. A. Kates flow rate controllers have only one moving element, and are designed so that there are no complex linkages, delicate bearings, or any failure-prone components. Therefore, occasional cleaning may be the only servicing the controller will require.

*CAUTION:* Make sure that the controller is relieved of pressure before attempting to service or clean.

### **TO CLEAN CONTROLLER:**

1. The controller operates by downward flowing fluid and is self-cleaning for most liquids. Down-flow design also allows drainage on shutdown of many systems if discharge shutoff valve is closed after the inlet shutoff valve.
2. It is not necessary to remove the controller from the line to clean. If installation includes proper shutoff and bypass valves, operate these and take the controller off stream or control. (See figure 2)
3. Arrange a clean area where the internal parts can be placed and kept free of dirt.  
*CAUTION:* In all cleaning operations, be very careful not to scratch, nick, or mark any surfaces or edges.
4. Remove the bonnet bolts, lift bonnet assembly straight up, remove body O-ring, and place both in the clean area.
5. Lift out the torque tube and place in the clean area.
6. Lift out the entire internal assembly consisting of the spring adjustment nut, spring cap, spring, retaining pin, valve rod, valve rod nut, impeller cylinder, valve sleeve, and impeller, and place all in the clean area.
7. Stand the internal assembly on a flat surface that will not damage the bottom of the valve sleeve. Push the spring cap down by hand, hold it, and remove the retaining pin from the valve rod. Note the position of the top of the spring adjustment nut with respect to the top of the valve rod, and remove. Release pressure slowly and lift off spring cap and spring, then place in the clean area.
8. Remove the valve rod nut and take apart the internal assembly and place in the clean area.
9. Remove the valve tube lock screws and lift out the valve tube and place in the clean area.
10. Do NOT remove the orifice plate unless it is damaged or unless the orifice plate O-ring and lower body O-ring must be replaced. If the orifice plate must be removed, remove the flange bolts and lift off the upper section of the controller body (after first disconnecting inlet piping). Remove both existing O-rings by prying them out using a blunt-ended hook, being careful not to scratch either groove. Install new O-rings; replace the orifice plate and the body's upper section, making sure that the upper body section seats squarely on the lower body section. Install and tighten the flange bolts.

11. Thoroughly clean all parts that have been removed from the controller by immersing them in a suitable solvent. Clean and flush inside of the flow controller body and the valve tube with the solvent then drain. All surfaces, especially the metering orifice, the valve tube and integral valve ports, must be completely clean. Any dirt, sediment, coating or gummy residue must be completely removed. Wipe all parts and surfaces dry with a clean, lint-free cloth.
12. Replace the valve tube, being sure that it seats squarely in the body counterbore, and install and tighten the valve tube lock screws.
13. Put together the internal assembly, (valve rod, impeller cylinder, valve sleeve, and impeller) and replace and tighten the valve rod nut.
14. Stand the internal assembly on a flat surface that will not damage the bottom of the valve sleeve. Insert the spring and spring cap then press down so the spring adjustment nut can be threaded on the valve rod. Make sure that the top of the spring adjustment nut is in the same position with respect to the top of the valve rod as before, and insert the retaining pin into the valve rod. Slowly release.
15. Lower the internal assembly into the body, carefully guiding the valve sleeve down over the valve tube so as to not damage either part, and being sure that the flange at the upper end of the impeller cylinder seats squarely on the orifice plate (not on the vertical stop pin). Make sure that the impeller and the valve sleeve will move freely up and down as the spring is compressed and relaxed.
16. Replace the torque tube so that the driving lugs at the lower end fit into the slots in the top of the impeller cylinder. After installation, turn the torque tube and be sure that the impeller cylinder will turn in both directions until hitting the vertical stop pin.
17. Replace the bonnet, bonnet O-ring, and bonnet bolts and tighten to 23 ft-lbs.
18. Place the controller in service as specified under steps 1 – 5 in “Start Up Procedure”.

TO REPLACE ADJUSTER SHAFT PACKING:

1. The only packing required is between the adjuster and the bonnet. This consists of a PTFE thrust washer and an O-ring of standard size, of a material that is suitable for use with the fluid flowing through the controller.
2. To replace the thrust washer and O-ring, take the controller off stream or control. (see fig. 2) Remove the bonnet then remove the roll pin in the adjuster bar and lift off the adjuster bar assembly. The adjuster shaft can now be removed by pulling it through the bonnet from the inside.
3. Remove the existing O-ring by prying it out of the groove in the shaft using a blunt-ended hook. (With a PTFE O-ring, first immerse the adjuster shaft in warm water to slightly soften the O-ring.  
*CAUTION:* Be careful not to scratch the groove or the shaft.
4. Remove the existing thrust washer and replace with a new thrust washer. Run the washer down the shaft until it rests on the shoulder.

5. Slide a new O-ring down the adjuster shaft until it fits properly in the groove. (With a PTFE O-ring, first immerse it in warm water to soften it slightly.)
6. Carefully push the adjuster shaft through the bonnet from the inside until the thrust washer is held tightly between the shoulder on the shaft and the shoulder on the bonnet. Keeping the stem in this position, replace the adjuster bar assembly and the roll pin.
7. Replace the bonnet and put the controller in service by following steps 1 – 5 as listed under “Start Up Procedure”.

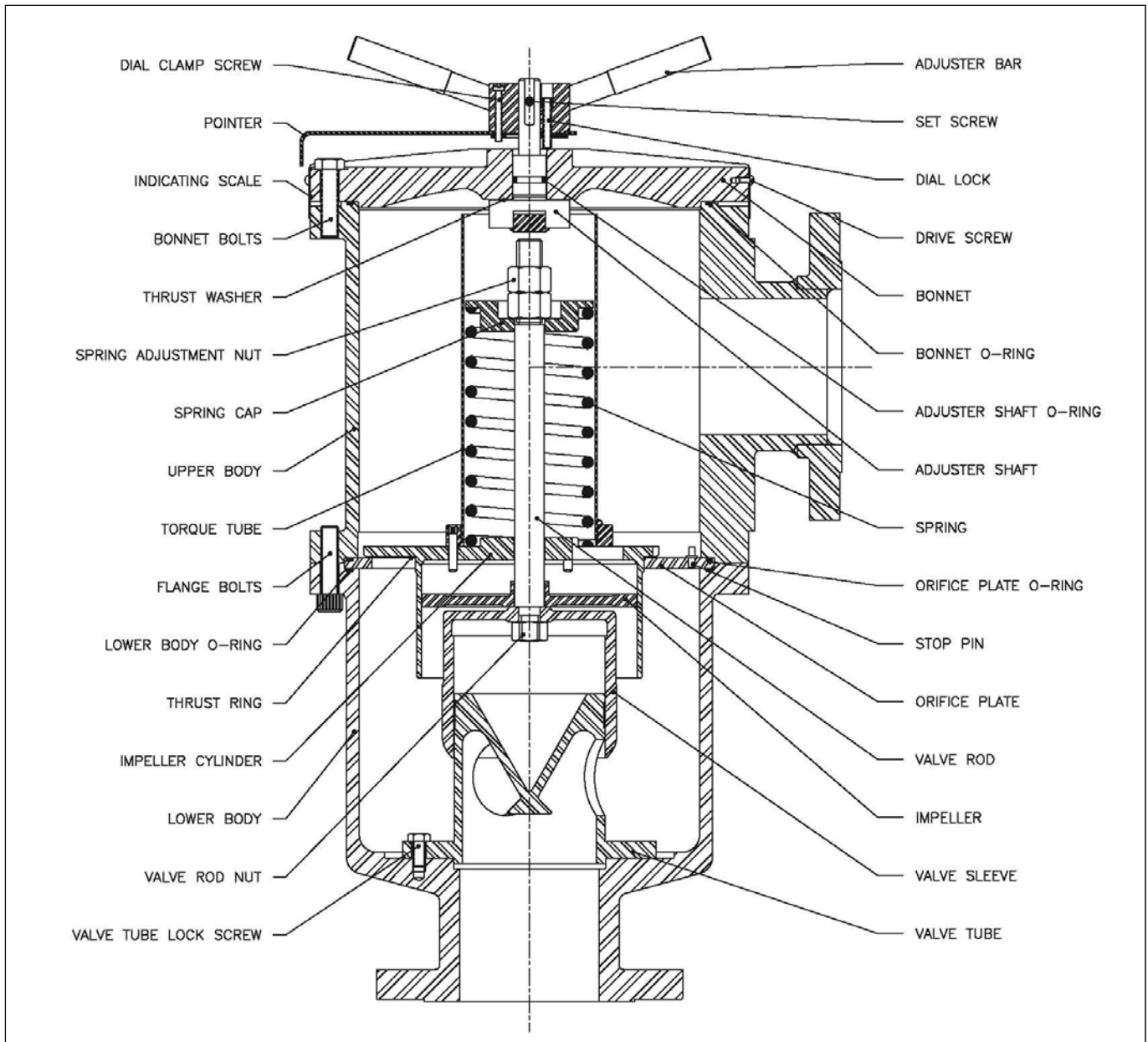


Figure 1

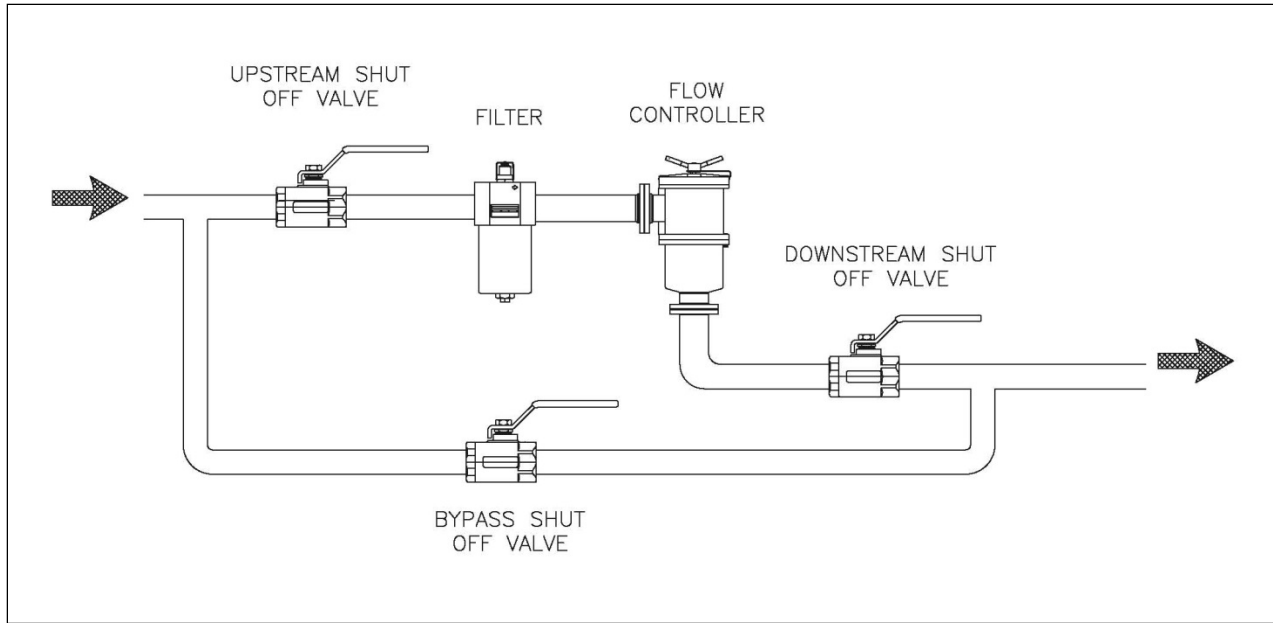


Figure 2

**LIMITED PRODUCT WARRANTY**

Custom Valve Concepts guarantees every product manufactured to be inspected and free from defects in workmanship or material when shipped from its factory. No warranty of corrosion resistance of any parts or assembly is expressed or implied.

This guarantee is valid for one year from the date of shipment from its plant. Within that time, Custom Valve Concepts will replace free of charge any product returned with shipping charges prepaid, found to have been defective at the time of shipment.

This warranty does not apply to; a) damage resulting from misuse or improper handling; or b) damage resulting from continued use after defect is apparent; or c) any other damage, loss or liability; or d) any product that has been changed or modified or altered in any way after it leaves the factory; or e) damage resulting from inadequate filtration or particle contamination; or f) damage resulting from corrosion due to improperly specified materials (i.e.; corrosion resistance).

The liability of Custom Valve Concepts shall be limited to the replacement, F.O.B. our factory, of any product found to have been defective at the time of shipment with duplicate or similar product of equal performance rating, but such liability shall in no event exceed the contract price for said product.

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 President/Owner  
 Custom Valve Concepts