

# SENTINEL MEDIA METERING VALVE

O. M. 20951

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## **WARNING**

**Do not proceed with these instructions until you have READ the orange cover of this MANUAL and YOU UNDERSTAND its contents. \* These WARNINGS are included for the health and safety of the operator and those in the immediate vicinity.**

**\*If you are using a Clemco Distributor Maintenance and Part Guide, refer to the orange warnings insert preceding the Index before continuing with the enclosed instructions.**

**Electronic files include a Preface containing the same important information as the orange cover.**

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## 1.0 INTRODUCTION

### 1.1 Scope

1.1.1 This manual covers installation, operation, maintenance, and replacement parts for Clemco Sentinel standard-use and fine-mesh media control valves.

1.1.2 The Sentinel valve is a blast machine component. The operator must be qualified to safely operate the blast machine and remote controls, and all other equipment used with the valve. To ensure safe blasting, all operators and personnel involved with the abrasive blasting process must read and understand the manuals, including the information included in the orange cover, for all devices used with the Sentinel valve.

1.1.3 The Clemco booklet "Abrasive Blasting Safety Practices" contains important safety information about abrasive blasting that may not be included in equipment operation manuals. Copies are available from Clemco Industries and may be requested through our website [www.clemcoindustries.com](http://www.clemcoindustries.com) or requested via email to [info@clemcoindustries.com](mailto:info@clemcoindustries.com).

### 1.2 Safety Alerts

1.2.1 Clemco uses safety alert signal words, based on ANSI Z535.4-1998, to alert the user of a potentially hazardous situation that may be encountered while operating this equipment. ANSI's definitions of the signal words are as follows:



This is the safety alert symbol. It is used to alert the user of this equipment of potential personal injury hazards.

Obey all safety messages that follow this symbol to avoid possible injury or death.

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## CAUTION

Caution used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

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## CAUTION

Caution indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

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## WARNING

Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

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## DANGER

Danger indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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### 1.3 General Description

1.3.1 The Sentinel is a normally-closed, pneumatically-operated media control valve. The valve can be used with a pressure-release system, as shown in Figures 1 and 2, to stop the abrasive flow each time the blast machine is depressurized. It can also be used with a pressure-hold system, to stop the abrasive flow while the machine remains under pressure.

If the valve is supplied as part of a Clemco remote system, it will be controlled by a Clemco Abrasive Cutoff Switch (ACS) mounted on the remote control handle. This setup enables the operator to shut off the abrasive flow, allowing air alone to exit the nozzle. This air flow is used to clear abrasive from the blast hose, or for surface blow-down. If the Sentinel valve is not used with a Clemco ACS system, an ACS switch must be installed on the Sentinel as shown in Figure 2. Use the ACS instead of the metering handle to shut off abrasive flow. The ACS is shown under accessories in Section 6.2.

1.3.2 The Sentinel comes in two models, standard-use and fine-mesh.

- Standard-use valves are for use with abrasives coarser than 50-mesh.
- Fine-mesh valves are for use with abrasives 50-mesh and finer.

The valves are identical except for the metering plate and a few related parts. To identify the valve, look at the end of the metering plate shaft. Fine-mesh valves have a U stamped on the end; the shaft on standard valves are unmarked. Conversion kits are available to convert from one to the other. See Section 6.1.

1.3.3 Valves are available with or without an inspection opening. Valves without inspection openings are usually used only where height clearance (distance from the bottom of the machine to the ground) is limited. See Figure 3 for nominal dimensions.

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Sentinel valve installed on a blast machine  
using pressure-release remote controls with ACS switch mounted on the control handle

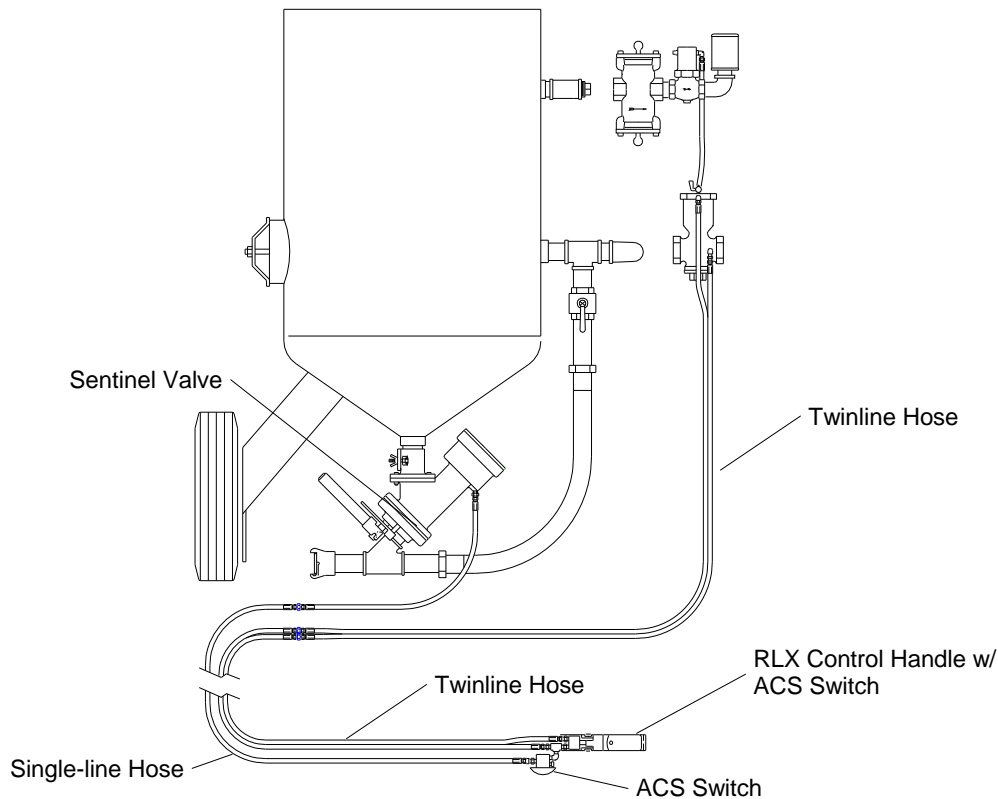


Figure 1

## 2.0 INSTALLATION

### **⚠ WARNING**

Failure to observe the following procedures before performing service on a blast machine (pressure vessel) could cause serious injury or death from the sudden release of trapped compressed air.

- Depressurize the blast machine.
- Lockout and tagout the compressed air supply.
- Bleed the air supply line to the blast machine.

**2.1** Remove abrasive from the blast machine, depressurize the machine, and disconnect the compressed air supply line.

**2.2** Remove the existing abrasive metering valve and necessary pipe fittings. NOTE: The following installation describes how to install the valve on a machine with minimal rotation clearance. It is not

necessary to disassemble the valve if it rotates freely on the bottom of the machine.

**2.3** Remove the four cap screws holding the flanged adaptor to the valve assembly.

**2.4** Use a 1-1/2" close nipple to connect the flanged adaptor to the outlet at the bottom of the blast machine. If the adaptor has an inspection plate, position the plate toward the blast hose connection. If the adaptor does not have an inspection opening, align the bolt holes fore and aft, with the wide gap toward the blast hose connection.

**2.5** Position the adaptor gasket between the flanged adaptor and valve assembly, and bolt the parts together.

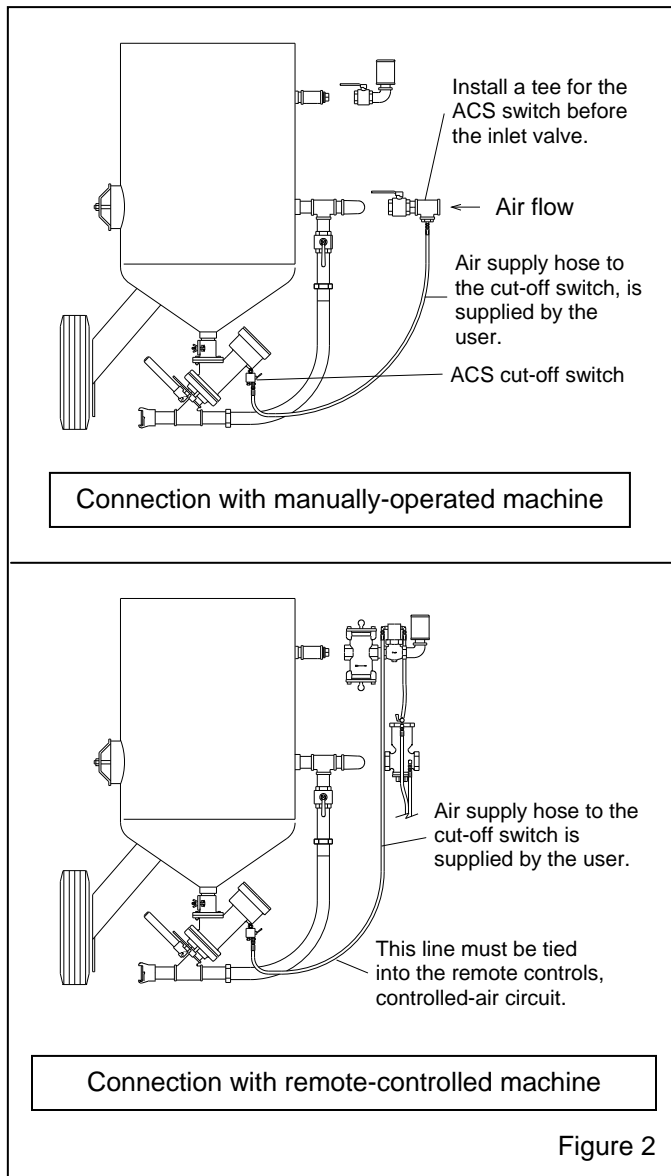
**2.6** Connect pipe fittings between the wye and existing pusher line. It may be necessary to "fit" with new nipples to align the height of the pusher line with the wye.

**2.7** Attach the quick coupling and nipple to the wye.

**2.8 Control Hose Connections**

**2.8.1** If a Clemco remote control with ACS control handle is used, connect the "single" control line to the fitting on the upper body as shown in Figure 1. Refer to the blast machine and remote control manuals for set-up and operation of the particular equipment.

**2.8.2** If other machines or control systems are used, the valve should be ordered with the ACS. Note: the ACS switch and fittings are shown under accessories in Section 6.2. Refer to Figures 2 and 5 while making the following changes:



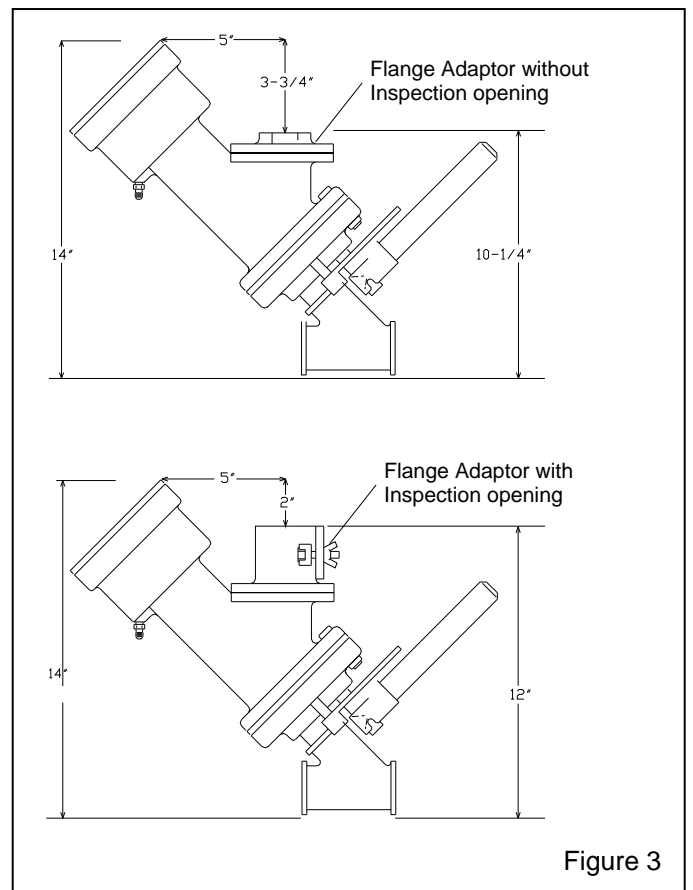
**2.8.2.1** Remove the fitting on the upper body cylinder port.

**2.8.2.2** Screw the 1/8" hex nipple provided, into the "CYL" port of the ACS switch, and attach it to the upper body.

**2.8.2.3** Install the fitting removed in the previous step, (or one that is compatible with the system used), into the "IN" port of the ACS switch.

**2.8.2.4** If the Sentinel is installed on a manually-operated blast machine, such as in an automated system, connect an air line between the "IN" port fitting and a tee installed before the machine's air-inlet valve. Refer to the top illustration in Figure 2.

**2.8.2.5** If the Sentinel is connected to a remote system, connect the air line from the "IN" port fitting to a controlled air line (one that is on the controlled side of the remote control air line, which will pressurize when the control handle is pressed). One method is to tee off the inlet or outlet valves of the remote system. Doing so closes the valve when the remote controls depressurize the blast machine, resulting in a smoother start when the machine is re-pressurized. Refer to the bottom illustration in Figure 2.



**2.8.2.6** If a pressure regulator is used, control air for the Sentinel should be sourced up-stream of the regulator. Doing so allows full line pressure to control the valve

while blasting pressure can be adjusted down to approximately 30 psi. The Sentinel valve requires control line pressure to be between 65 psi and 150 psi.

## **⚠ WARNING**

**Excessive compressed air pressure could cause a blast machine to rupture. To prevent serious injury or death, do not exceed the rated pressure of the blast machine vessel.**

### 3.0 OPERATION

**3.1** When the valve is correctly installed, it opens and closes pneumatically as control-air is applied or removed from the valves actuating piston. If the valve is used in conjunction with the remote control system, it opens when the remote controls begin the blasting process, and closes when the controls stop the blasting process. If the valve is used independently of remote controls, it opens and closes with the use of the ACS switch.

**3.2 Abrasive Metering:** Abrasive will not flow through the valve unless it is open (see Paragraph 3.1) Abrasive flow is adjusted at the metering handle. The valve is closed when the handle is fully right. To adjust, close the valve and slowly move the handle to the left to increase flow. Use as little abrasive as possible while maintaining the best cleaning rate. Generally, with the correct mixture, abrasive can be seen as light discoloration as it exits the nozzle. The valve is fully open when the handle is fully left.

### 3.3 Operation of the Abrasive Cut-Off Switch.

**3.3.1** The ACS switch is "OFF" (no abrasive) when the toggle is pointing forward toward the nozzle ("EXH" port) or down if installed on the Sentinel valve as shown in Figure 2. Abrasive flow is "ON" when the toggle is pointing backward away from the nozzle ("CYL" port) (up if it is as shown in Figure 2).

**3.3.2** By moving the switch to the "OFF" position, the air supply to the Sentinel valve is shut-off and vented through the exhaust port. The Sentinel then closes and abrasive flow stops. This allows the operator to have air alone coming from the nozzle, which can be used to clear the blast hose before shut-down, and to blow abrasive off the blasted surface. The switch can be opened or closed any time, but will not activate the metering valve unless the control handle is pressed.

NOTE: The ACS performs dual functions: Use it to clear abrasive from the blast hose and to blow off abrasive from the blasted surface at the blasting area. Small amounts of abrasive may exit the nozzle with the air. Residual abrasive may remain on the surface, and have to be removed outside the blast area prior to painting.

### 4.0 MAINTENANCE

## **⚠ WARNING**

**Failure to observe the following procedures before performing any maintenance on a blast machine could cause serious injury from the sudden release of trapped compressed air.**

- **Depressurize the blast machine.**
- **Lockout and tagout the compressed air supply.**
- **Bleed the air supply line to the blast machine.**

NOTE: The easiest way to service the valve is to remove it from the blast machine. The easiest way to remove the valve is to remove the four bolts holding the flanged adaptor to the valve assembly and disconnecting the pusher line. The valve and lower piping can then be removed as an assembly. The flanged adaptor remains on the machine, but it should be inspected and replaced if worn.

### 4.1 Removing Upper Body Assembly (shut-off section).

**4.1.1** Remove nuts and cap screws holding the upper body onto the flanged adaptor.

**4.1.2** Attach an air line to the fitting on the cylinder port on the upper body assembly, and pressurize the line to retract the shut-off piston. NOTE: If air is not available, use care when removing the bolts per Section 4.1.3.

**4.1.3** Remove the control handle, gauge unit studs, and the four bolts holding the upper body assembly to the lower assembly. (Note: If the piston was not retracted per Section 4.1.2., loosen the nuts in sequence. Once the nuts are loose, the lower body will be forced away from the upper body by approximately 1/2".)

**4.1.4** Remove the upper body assembly. NOTE: The seat, seat plate, and seat plate gaskets will be loose; do not misplace them.

**4.1.5** Depressurize the air line to the upper body cylinder port.

## 4.2 Inspection of Upper Body Assembly

**4.2.1** Remove the six cylinder cap screws and then remove the cap and cap gasket.

**4.2.2** Using a 9/16" socket (with impact wrench if available), remove the cap screw from inside the cylinder. The cap screw holds the piston cup to the shut-off piston, and compresses the piston against the spring. As the screw is removed, the spring will decompress, forcing the shut-off piston out of the body assembly.

**4.2.3** Remove the shut-off piston and spring.

**4.2.4** Remove the wear sleeve.

**4.2.5** Remove both u-seals from inside the wear sleeve.

**4.2.6** Remove the piston cup by inserting a long 3/8" socket extension, screw driver or similar object through the cup hole and pry upward.

**4.2.7** Remove the o-rings from the upper body, one is in the piston stem guide hole, the other is in the wear sleeve cavity.

**4.2.8** Inspect all items, including the seat, seat plate and seat plate gaskets. Replace any worn or damaged parts.

## 4.3 Inspection of Lower Body Assembly.

**4.3.1** Inspect the lower body assembly for wear or damage. If service is required, use the following instructions to disassemble.

**4.3.2** Lay the valve assembly on a flat service, and push down on the handle to remove the handle pin, handle, and spring.

**4.3.3** Push the metering plate and stem assembly through the body.

**4.3.4** Remove the shaft gasket from the metering plate stem.

**4.3.5** Remove the packing gland from the body, by prying up on the flange or pushing from the bottom.

**4.3.6** Remove the o-rings from the lower body and packing gland.

**4.3.7** Inspect all parts. Replace any that are worn or damaged.

## 4.4 Reassembly of Upper Body

**4.4.1** Place new o-rings into the groove in the piston stem guide hole and wear sleeve cavity. The o-rings must be completely seated into the grooves.

**4.4.2** Lubricate the edge of the piston cup, inside of the cylinder cavity, and o-rings with lightweight oil or light silicone grease.

**4.4.3** Insert the piston cup into the cylinder. Do not allow the rubber lip of the cup to curl. Use a dull edge to work the lip into the opening. Once the cup is inserted, push it to the bottom of the cylinder.

**4.4.4** Place the spring into the upper valve body.

**4.4.5** Insert the shut-off piston, stem first through the guide hole until it bottoms against the spring.

**4.4.6** Put new u-seals in the wear sleeve as shown in Figure 4. The seal closest to the flange goes in first, with the seal expansion ring facing the flange. The second u-seal is placed next to the first with the ring also facing the flange.

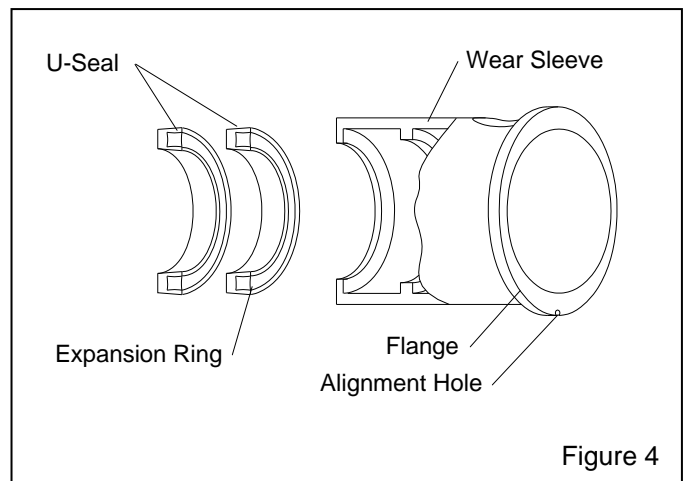


Figure 4

**4.4.7** Place the wear sleeve in the body. Align the hole in the sleeves flange with the pin in the body. Make sure the opening in the wear sleeve lines up with the opening in the body.

**4.4.8** Working from the piston side, place the flat washer and rubber-backed washer on the piston cup cap screw (rubber on rubber washer against the piston cup). Push the screw through the hole in the cup and screw it into the shut-off piston shaft. As the cap screw is

tightened, it will compress the spring and draw the shut-off piston and shaft into place. An impact wrench works best for tightening the piston screw. If a hand wrench is used, it may be necessary to grip the shut-off piston with pliers as the screw is tightened.

**4.4.9** Recheck the alignment of the wear sleeve pin hole. When the hole is aligned, lay a large socket or similar object on the wear sleeve, and tap it until the sleeve is fully seated into the body.

#### **4.5 Reassembly of Lower Body**

**4.5.1** Place new o-rings in the lower body and packing gland. Lubricate both o-rings.

**4.5.2** Push the packing gland into the lower body until it bottoms-out on the flange.

**4.5.3** Place a new shaft gasket over the metering plate stem, and push the stem through the packing gland. Hold the gland in place as the shaft is pushed through.

**4.5.4** Put the spring and handle on the stem, position the handle so it points away from the metering plate.

**4.5.5** Push on the handle and tap around the top to compress the spring until the handle clears the hole on the stem.

**4.5.6** Push the handle pin through the stem to lock the handle in place.

**4.5.7** Make sure the handle and metering plate are at 180 degrees.

#### **4.6 Reassembly of Upper and Lower Valve Assemblies.**

**4.6.1** Apply air to the upper body cylinder to retract the shut-off piston. Set the cylinder end of the upper body on a flat surface. The seat plate flange should be facing up.

**4.6.2** Place the rubber seat (the beveled side must face the shut-off piston) into the wear sleeve recess.

**4.6.3** Set a seat plate gasket on the upper body seat plate flange.

**4.6.4** Place the seat plate on top of the gasket. The two sealing ridges must face toward the rubber seat.

**4.6.5** Set another plate gasket on the seat plate.

**4.6.6** Put the lower body assembly in place and bolt the upper and lower body assemblies together using the four bolts (do not put the studs in at this time). Hand-tighten all nuts before tightening them in sequence to uniformly compress the bodies together.

**4.6.7** Depressurize and remove the cylinder air line.

**4.6.8** Remove the handle, and install the studs and gauge unit assembly. When the gauge unit is in place and studs are tightened, re-install the handle.

**4.6.9** Bolt the cylinder cap and gasket in place.

**4.6.10** Bolt the flanged adaptor and flange gasket onto the body assembly.

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## **5.0 TROUBLESHOOTING**

### **5.1 No abrasive flow**

**5.1.1** Metering valve closed. Closed is when the metering handle is fully right.

**5.1.2** ACS switch is closed. Switch is closed when the toggle is pointed toward the "EXH" port.

**5.1.3** Leak or blockage in the air hose or fittings between the control unit and the Sentinel valve.

**5.1.4** Machine empty.

**5.1.5** Abrasive or foreign material jamming the valve's shut-off piston, wear sleeve, spring, or piston cup. Check seals and o-rings.

**5.1.6** Cap screw securing piston cup is loose or broken.

**5.1.7** Relief hole in cylinder cap is plugged.

**5.1.8** Leaks around seat plate gaskets, or flanged adaptor gasket.

**5.1.9** Obstruction in media valve. Clear as follows:

**5.1.9.1** Fully open the media control valve, (Fully open is when the metering handle is fully left). While blasting, close the choke valve to force out small obstructions or wet abrasive.

**⚠ WARNING**

**To avoid serious injury or death, depressurize the blast machine, lockout and tagout the compressed air supply before continuing.**

5.1.9.2 For larger obstructions, shut the machine down to examine the abrasive valve. Remove the inspection plate from the flanged adaptor and clear obstruction.

**⚠ WARNING**

**Do not stick fingers into the piston area of the inspection opening. The piston is under spring pressure, and could suddenly close when the obstruction is cleared.**

**5.2 Abrasive flow does not stop when ACS switch is turned off.**

5.2.1 Control air is not exhausting from the switch. Check the exhaust muffler for blockage and check the control handle per the control handle manual.

5.2.2 Worn valve seat.

5.2.3 Worn shut-off piston.

5.2.4 Obstruction on the valve seat. See Section 5.1.9.

**5.3 Metering handle will not move.**

5.3.1 Damp or hardened abrasive packed around metering plate. Disassemble valve to clean.

**5.4 Air leaks through relief hole in cylinder cap.**

5.4.1 Worn piston cup.

**5.5 Air leaks through relief hole in valve body (spring chamber).**

5.5.1 Worn u-seals in wear sleeve, or worn o-ring between the valve body and wear sleeve.

**5.6 Abrasive flow decreases shortly after blasting starts.**

5.6.1 Insufficient air supply causing control pressure to drop, in turn closing the valve. Check for undersized air supply hose, and the CFM of compressor against the cfm consumption of the nozzle.

5.6.2 Abrasive bridging in the blast machine. This is usually caused by using very fine abrasive, or by moist air. See Section 4.1.

**6.0 ACCESSORIES and REPLACEMENT PARTS**

**6.1 Conversion Kits**

Converts fine-mesh valve to standard-use .....	22848
Converts standard-use valve to fine-mesh .....	22849

**6.2 Accessories for Use with Non-Clemco Remote Control Applications, Figure 5**

Item	Description .....	Stock No.
1.	Adaptor, straight 1/8" NPT .....	01940
	1/4" NPT .....	02494
2.	Adaptor, elbow 1/8" NPT .....	02827
	1/4" NPT .....	02513
3.	Connector, 1/8" brass .....	01962
4.	Breather muffler, 1/8" .....	07657
5.	Valve, 3-way, ACS switch .....	07658
6.	Hose, 3/16" coupled 3-foot length .....	02498
	5-foot length .....	03083

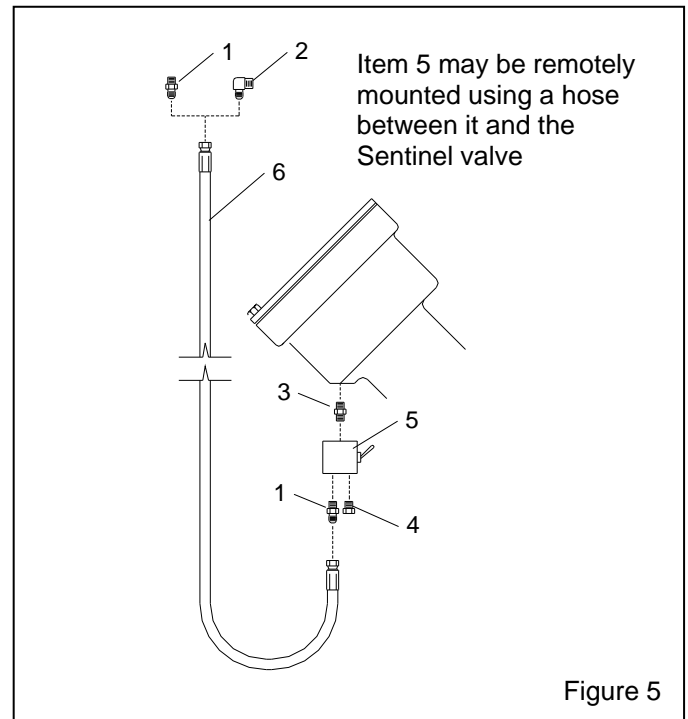


Figure 5



**6.3 Replacement Valves**

- (-) Sentinel valve with attached ACS, standard-use for abrasives coarser than 50-mesh, with inspection plate .....20508  
without inspection opening .....20509
- (-) Sentinel valve, w/o attached ACS, standard-use for abrasives coarser than 50-mesh, with inspection plate .....20608  
without inspection opening .....20609
- (-) Sentinel valve w/o attached ACS, fine-mesh for abrasives 50-mesh and finer with inspection plate .....21439

**6.4 Service Kits**

- (-) Service kit, upper segment, Figure 6 .....22388

- (-) Service kit, lower segment, Figure 7 .....22389

**22388 UPPER-SEGMENT SERVICE KIT**

Item	Qty.	Description
1.	1	Washer, rubber backed
2.	1	O-ring, piston shaft bore, 3/4" ID nom.
3.	1	Gasket, cylinder cap
4.	2	U-seal
5.	1	O-ring, inspection plate 1-3/4" OD nom.
6.	1	Gasket, flanged adaptor
7.	1	Roll pin, 1/16" x 1/2"
8.	1	O-ring, Main body, 2-1/4" nom.
9.	2	Gasket, seat plate
10.	1	Cap screw, 3/8-NC x 2"
11.	1	Washer, 5/16" flat

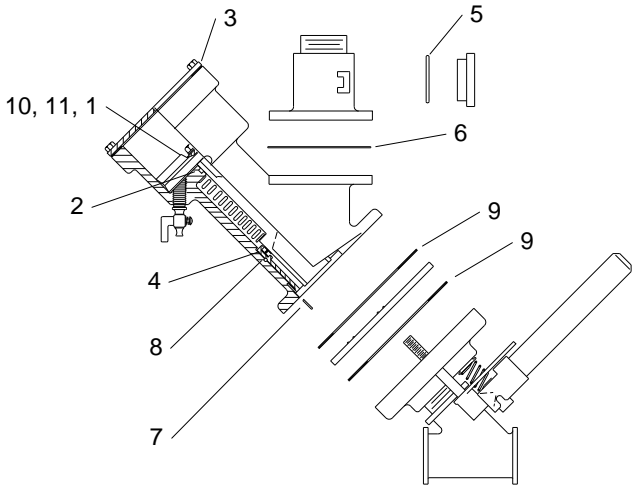


Figure 6

**22389 LOWER-SEGMENT SERVICE KIT**

Item	Qty.	Description
1.	1	Seat, rubber
2.	2	Gasket, seat plate
3.	1	O-ring, gland, 5/8" ID nom.
4.	2	Gasket, shaft (One is for standard-use [coarse media] has a 1-3/8" nominal OD) (One is for a urethane plate [fine-mesh] has a 1" nominal OD)
5.	1	O-ring, lower body 1" ID
6.	1	O-ring, Inspection plate, 1-3/4" OD nom.

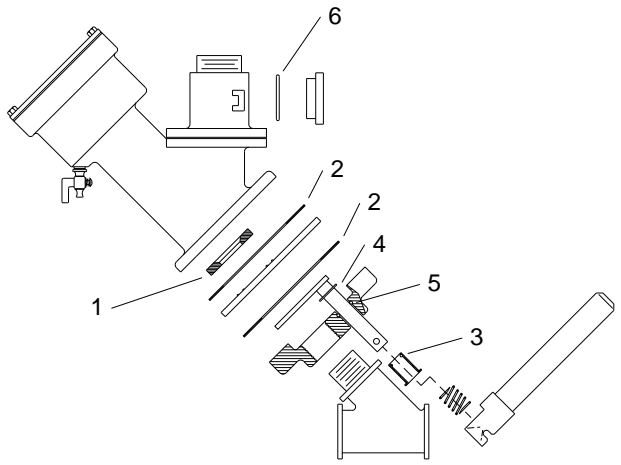


Figure 7

6.5 Sentinel Replacement Parts, Figure 8

Item	Description.....	Stock No.
1.	Cylinder cap .....	20512
2.	Cap screw, 3/8-NC x 1-1/2" .....	03267
3.	Adaptor, 1/8" NPT .....	01940
4.	Piston cup .....	20515
5.	Piston, shut-off .....	20494
6.	Spring, 2" OD x 4-1/2" .....	20600
7.	Upper body .....	20514
8.	Cap screw, 5/16-NC x 3/4" .....	03151
9.	Wear sleeve .....	20495
10.	Seat plate .....	20497
11.	Metering plate and stem Standard-use, coarser than 50-mesh ....	20499
	Fine-mesh, Urethane, 50-mesh & finer .	21438
12.	Packing gland .....	21021
13.	Spring, 5/8" ID x 1-11/16" .....	01982
14.	Close nipple, 1-1/2" schedule 80.....	01791
15.	Inspection plate .....	02440
16.	Cap screw, 5/16-NC x 1-1/4" .....	19509
17.	Cap screw, 1/2-NC x 2-1/2" .....	03457

18.	Nut, 1/2-NC hex head .....	03511
19.	Metering handle, heavy duty .....	20498
20.	Pin, valve handle .....	20246
21.	Close nipple, 1-1/4" .....	01717
22.	Wye, 1-1/4" standard .....	01818
23.	Set screw, 1/4-NC SQ. HD. ....	03080
24.	Lower body .....	20511
25.	Flanged adaptor w/ inspection opening ...	20513
26.	Nut, 3/8-NC hex head .....	03311
27.	Nut, 5/16-NC wing .....	03213
28.	Flanged adaptor w/o inspection opening .	20522
29.	Hitch pin.....	20245
30.	Petcock.....	01993
31.	Gauge unit .....	02433
32.	Stud, gauge unit .....	02436
33.	Spacer, handle bolt .....	02431
34.	Cap screw, 1/4-NC x 1" .....	03053
35.	Nut, 1/4-NC wing .....	03113
36.	Washer, 1/4 flat .....	03116
37.	Connector, 1/8" brass .....	01962
38.	Valve, 3-way ACS switch.....	07658
39.	Breather, muffler 1/8" .....	07657

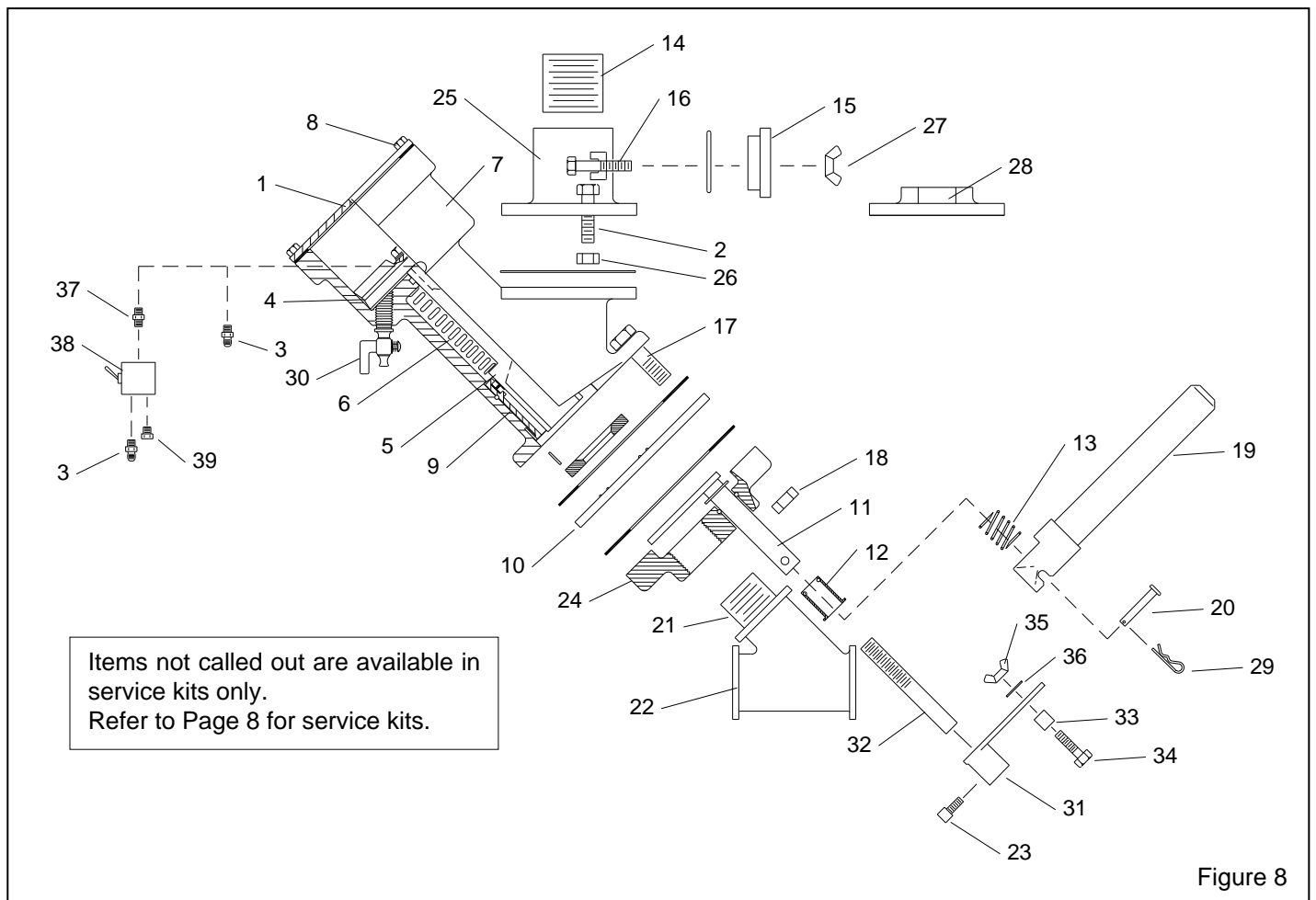


Figure 8