

**QUANTUM
ABRASIVE METERING VALVES
O. M. 22565**

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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 Parts 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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WARNING

- Employers are responsible for identifying all job site hazards, educating and training all persons who will operate and maintain these products, and ensuring that all blast operators and their assistants understand the warnings and information contained in these instructions relating to safe and proper operation and maintenance of this equipment.
- Serious injury or death can result from failure to comply with all Occupational Safety and Health Administration (OSHA) regulations and all manufacturer's instructions.
- This equipment is not intended for use in any area considered hazardous per National Electric Code NFPA 70 2011, Article 500.
- Read this document and follow all instructions before using this equipment.

OSHA regulations relating to abrasive blasting are contained in the Code of Federal Regulations, Title 29 (29 CFR 1910 General Industry; 1915 Maritime; 1926 Construction). The most pertinent include: 1910.94 Ventilation, 1910.95 Occupational Noise Exposure, 1910.132 Personal Protective Equipment, 1910.133 Eye and Face Protection, 1910.134 Respiratory Protection, 1910.135 Head Protection, 1910.244 (b) Remote Controls. Consult www.osha.gov for complete information.

NOTICE TO PURCHASERS AND USERS OF OUR PRODUCTS AND THIS INFORMATIONAL MATERIAL

Clemco proudly provides products for the abrasive blast industry and is confident that industry professionals will use their knowledge and expertise for the safe and efficient use of these products.

The products described in this material, and the information relating to these products, are intended for knowledgeable, experienced users.

No representation is intended or made as to: the suitability of the products described here for any purpose or application, or to the efficiency, production rate, or useful life of these products. All estimates regarding production rates or finishes are the responsibility of the user and must be derived solely from the user's experience and expertise, not from information contained in this material.

It is possible that the products described in this material may be combined with other products by the user for purposes determined solely by the user. No representations are intended or made as to the suitability of or engineering balance of or compliance with regulations or standard practice of any such combination of products or components the user may employ.

Abrasive blast equipment is only one component of an abrasive blasting job. Other products, such as air compressors, air filters and receivers, abrasives, scaffolding, hydraulic work platforms or booms, equipment for lighting, painting, ventilating, dehumidifying, parts handling, or specialized respirators or other equipment, even if offered by Clemco, may have been manufactured or supplied by others. The information Clemco provides is intended to support the products Clemco manufactures. Users must contact each manufacturer and supplier of products used in the blast job for warnings, information, training, and instruction relating to the proper and safe use of their equipment.

GENERAL INSTRUCTIONS

This material describes some, but not all, of the major requirements for safe and productive use of blast machines, remote controls, respirator systems, and related accessories. All equipment and accessories must be installed, tested, operated and maintained only by trained, knowledgeable, experienced users.

The blast operator and all workers in the vicinity must be properly protected from all job site hazards including those hazards generated by blasting.

Work environments involving abrasive blasting present numerous hazards. Hazards relate to the blast process from many sources that include, but are not limited to, dust generated by blasting or from material present on the surface being blasted. The hazards from toxic materials may include, but are not limited to, silica, cyanide, arsenic, or other toxins in the abrasives or in the coatings, such as lead or heavy metals. Other hazards from toxins include, but are not limited to, fumes from coating application, carbon monoxide from engine exhaust, contaminated water, chemicals or asbestos. In addition, physical hazards that may be present include, but are not limited to, uneven work surfaces, poor visibility, excessive noise, and electricity. Employers must identify all job site hazards and protect workers in accordance with OSHA regulations.

Never modify Clemco equipment or components or substitute parts from other manufacturers for any Clemco components or parts. Any unauthorized modification or substitution of supplied-air respirator parts violates OSHA regulations and voids the NIOSH approval.

IMPORTANT

Contact Clemco for free booklets:

Blast Off 2 – Guide to Safe, Productive, and Efficient Abrasive Blasting, and Abrasive Blasting Safety Practices – Guide to Safe Abrasive Blasting.

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OPERATIONAL INSTRUCTIONS

OPERATOR SAFETY EQUIPMENT

WARNING

- OSHA regulation 1910.134 requires appropriate respiratory protection for blast operators and workers in the vicinity of blasting. These workers must wear properly-fitted, properly-maintained, NIOSH-approved, respiratory protection that is suitable for the job site hazards. Blast respirators are to be worn only in atmospheres not immediately dangerous to life or health from which wearers can escape without use of the respirator.
- The employer must develop and implement a written respiratory protection program with required worksite- specific procedures and elements for required respirator use. The employer must provide effective training to employees who are required to use respirators. The training must be comprehensive, understandable, and recur annually, and more often if necessary.
- NEVER use abrasives containing more than one percent crystalline silica. Fatal diseases, such as silicosis, asbestosis, lead or other poisoning, can result from inhalation of toxic dusts, which include, but are not limited to, crystalline silica, asbestos, and lead paint. Refer to NIOSH Alert 92-102; and OSHA CPL 03-00-007: “National Emphasis Program – Crystalline Silica”, in which OSHA describes policies and procedures for implementing a national emphasis program to identify and reduce or eliminate health hazards from exposure to crystalline silica. Numerous topics associated with the hazards of crystalline silica in silica blasting sand can be found on [http:// osha.gov/](http://osha.gov/). Clemco urges users of silica blasting sand to visit this website, and read and heed the information it contains.
- Always make sure the breathing air supply (respirator hose) is not connected to plant lines that supply gases that include, but are not limited to, oxygen, nitrogen, acetylene, or other non-breathable gas. Never modify or change respirator air line connections without first testing the content of the line for safe breathing air. Failure to test the line may result in death to the respirator user.

- Breathing air quality must be at least Grade D, as defined by the Compressed Gas Association specification G-7.1, per OSHA Regulation 29 CFR 1910.134. When compressed air is the breathing air source, a Clemco CPF (suitable sorbent bed filter) should be used. Respirator hose connecting the respirator to the filter must be NIOSH approved. Non- approved hose can cause illness from chemicals employed to manufacture the hose.

- All workers must always wear NIOSH-approved respirators when any dust is present. Exposure to dust can occur when handling or loading abrasive, blasting, cleaning up abrasive, or working in the vicinity of blasting. Before removing the respirator, test the air with a monitoring device to ensure it is safe to breathe.

- Clemco respirators DO NOT remove or protect against carbon monoxide or any other toxic gas. Monitoring devices must be used in conjunction with the respirator to ensure safe breathing air. Always locate compressors and ambient air pumps where contaminated air will not enter the air intake.

- Always use Clemco lenses with Clemco respirators; installing non-approved lenses voids the NIOSH approval. Respirator lenses are designed to protect the wearer from rebounding abrasive; they do not protect against flying objects, heavy high-speed materials, glare, liquids, or radiation.

INDUSTRY ORGANIZATIONS

For additional information, consult:

Occupational Safety and Health Administration (OSHA) - www.osha.gov

Compressed Gas Association (CGA) - www.cganet.com

The Society for Protective Coatings (SSPC) - www.sspc.org

National Association of Corrosion Engineers (NACE) - www.nace.org

American Society for Testing and Materials (ASTM) - www.astm.org

National Institute of Occupational Safety and Health (NIOSH) - www.niosh.gov

American National Standards Institute (ANSI) - www.ansi.org

PREFACE

BLAST MACHINES AND REMOTE CONTROLS

⚠ WARNING

OSHA regulation 1910.169 describes the necessity of pressure relief valves on compressed air equipment. Do not operate blast machines with air compressors that are not equipped with properly functioning pressure relief valves.

OSHA regulation 1910.244(b) requires the use of remote controls on blast machines.

Serious injury or death can result from many sources, among them:

- Involuntary activation of the remote controls. Never modify or substitute remote control parts; parts are not compatible among different manufacturers. Welding hose is not suitable for remote control hose. Its ID and material composition make it unsafe for remote control use.
- Exceeding the maximum working pressure. Clemco blast machines are built to ASME-code and carry a 'U' or 'UM' stamp, and National Board/serial number. Every machine is marked with its maximum working pressure. Never exceed the maximum working pressure limits of the blast machine.
- Uncontrolled blast stream. High-velocity abrasive particles will inflict serious injury. Always point the blast nozzle in the direction of the blast surface only. Keep unprotected workers out of the blast area.
- Welding on the blast machine. Never weld on the blast machine; welding voids the National Board approval and may affect the dimensional integrity of the vessel.
- Moving the blast machine. Never manually move a blast machine containing abrasive, any machine containing abrasive must be moved with appropriate mechanical lifting equipment.

HOSES, COUPLINGS, AND NOZZLE HOLDERS

- The inside diameter (ID) of air hoses, fittings, and connections should be at least four times larger than the nozzle orifice size. Blast hose ID should be three to four times the size of the nozzle orifice. Example: a #6 nozzle (3/8" diameter orifice) calls for 1-1/2" ID blast hose and 1-1/2" ID or larger compressor hose. All hose runs should be kept as short as possible and run in as straight a line as possible to reduce pressure loss.
- To install, squarely cut the end of the hose so that it fits snugly against the coupling or hose end shoulder. Always use the screws recommended by the manufacturer ensuring that they do not penetrate the inner wall. Make sure the couplings tightly fit the hose. Install cotter pins at every connection or use couplings with built-in lock-springs to prevent disengagement. Install safety cables at all connections to prevent whipping if hoses disengage or blow out.

MAINTENANCE AND REPAIR

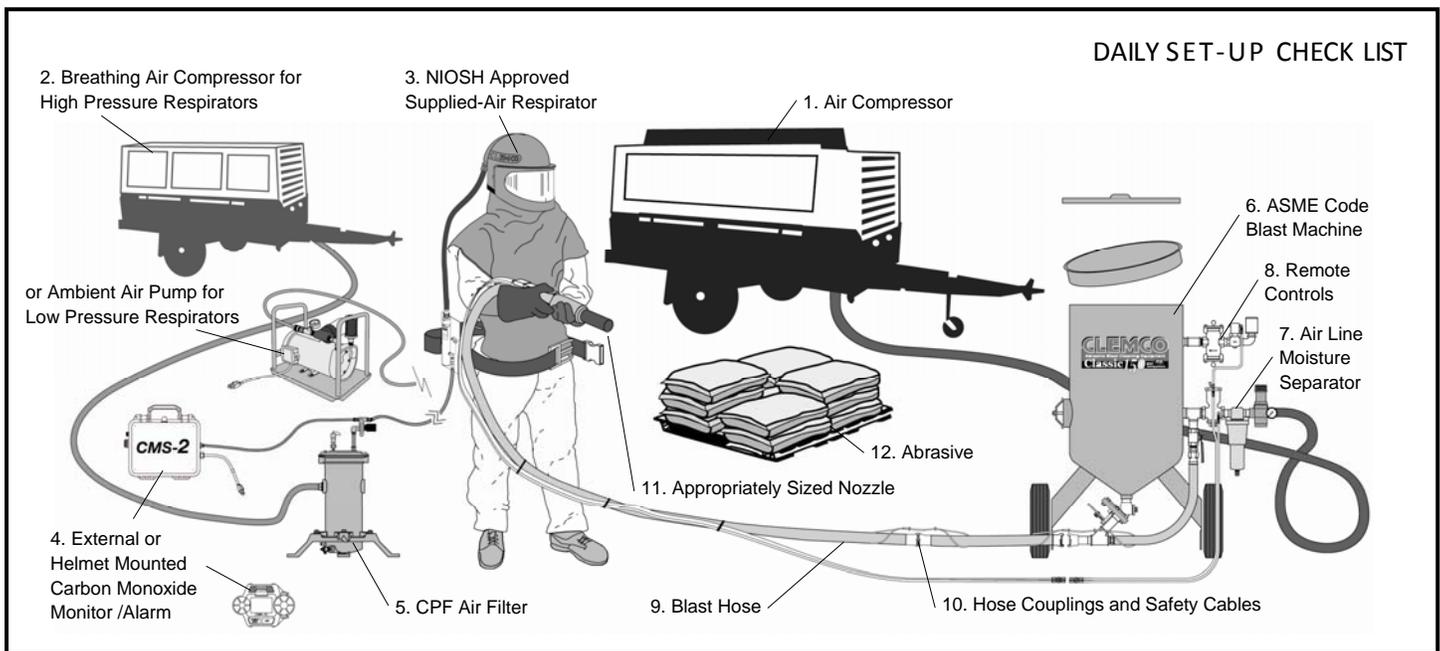
- Completely read and follow all service instructions and recommended maintenance intervals. Always shut off compressor and depressurize blast machine before performing any maintenance. At every service interval, clean all filters, screens, and alarm systems. If spring-loaded abrasive valves are used, always cage spring before disassembly.

WARRANTY

The following is in lieu of all warranties, express, implied or statutory, and in no event shall seller or its agents, successors, nominees or assignees, or either, be liable for special or consequential damage arising out of a breach of warranty. This warranty does not apply to any damage or defect resulting from negligent or improper assembly or use of any item by the buyer or its agent or from alteration or attempted repair by any person other than an authorized agent of seller. All used, repaired, modified, or altered items are purchased "as is" and with all faults. In no event shall seller be liable for consequential or incidental damages. The sole and exclusive remedy of buyer for breach of warranty by seller shall be repair or replacement of defective parts or, at seller's option, refund of purchase price, as set forth below

1. Seller makes no warranty with respect to products used other than in accordance hereunder.
 2. On products seller manufactures, seller warrants that all products are to be free from defects in workmanship and materials for a period of one year from date of shipment to buyer, but no warranty is made that the products are fit for a particular purpose.
 3. On products which seller buys and resells pursuant to this order, seller warrants that the products shall carry the then standard warranties of the manufacturers thereof, a copy of which shall be made available to the customer upon request.
 4. The use of any sample or model in connection with this order is for illustrative purposes only and is not to be construed as a warranty that the product will conform to the sample or model.
 5. Seller makes no warranty that the products are delivered free of the rightful claim of any third party by way of patent infringement or the like.
 6. This warranty is conditioned upon seller's receipt within ten (10) days after buyer's discovery of a defect, of a written notice stating in what specific material respects the product failed to meet this warranty. If such notice is timely given, seller will, at its option, either modify the product or part to correct the defect, replace the product or part with complying products or parts, or refund the amount paid for the defective product, any one of which will constitute the sole liability of the seller and a full settlement of all claims. No allowance will be made for alterations or repairs made by other than those authorized by seller without prior written consent of seller. Buyer shall afford seller prompt and reasonable opportunity to inspect the products for which any claim is made as above stated.
- Except as expressly set forth above, all warranties, express, implied or statutory, including implied warranty of merchantability, are hereby disclaimed.

PREFACE



DAILY SET-UP CHECK LIST

Make sure all blast operators are properly trained and suitably attired with a blast suit, safety boots, leather gloves, respiratory and hearing protection. Every day before start up, check all equipment components, including piping, fittings, and hoses, and valves, for leaks, tightness, and wear. Repair or replace as needed. Use the following checklist.

- 1. PROPERLY-MAINTAINED AIR COMPRESSOR** sized to provide sufficient volume (cfm) at given pressure for nozzle and other tools. ADD 50% volume (cfm) reserve to allow for nozzle wear. Use large compressor outlet and air hose (at least 4 times the nozzle orifice diameter). For oil-lubricated compressors, the employer shall use a high- temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If only high-temperature alarms are used, the air supply shall be monitored at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm. Follow the manufacturer's checklist and maintenance instructions.
- 2. BREATHING-AIR COMPRESSOR** (or oil-less ambient air pump) capable of providing Grade D quality air, located in a dust free area. Read # 1 above.
- 3. CLEAN, PROPERLY-MAINTAINED NIOSH-APPROVED SUPPLIED-AIR RESPIRATOR** worn by blast operators, and other workers exposed to blast dust. Make sure all respirator components are in place — all lenses, inner collar, and cape. Thoroughly inspect all components for wear. The NIOSH approval (approval number is listed in the owner's manual) is for a complete assembly from point of attachment on the CPF (sorbent bed) filter to the complete respirator. Substitution of any part voids the NIOSH approval.
- 4. CARBON MONOXIDE MONITOR/ALARM** installed at the CPF filter or inside the supplied-air respirator for monitoring for the presence of deadly CO gas and warning the operator(s) when the CO level reaches an unacceptable level. When an ambient air pump is used for breathing air, a CO monitor provides a measure of safety. Read # 1 above.
- 5. BREATHING-AIR FILTER (OSHA-REQUIRED sorbent bed filter)** for removal of moisture and particulate matter in the compressed air breathing-air supply. Monitor the condition of the cartridge and replace when odor is detected or at 3 month intervals, whichever comes sooner. The breathing air filter does NOT detect or remove carbon monoxide (CO). Always install a CO monitor/alarm.
- 6. BLAST MACHINE** (bearing U or UM stamp, National Board Number, and Maximum Working Pressure) sized to hold a 30-minute abrasive supply. Examine pop-up valve for alignment. Check piping, fittings, screens, valves for tightness, leaks, and wear. Always ground the machine to eliminate hazard of static shock. Install a blast machine screen to keep out foreign objects. Use a blast machine cover if left outdoors overnight. Never exceed the maximum working pressure of the vessel.
- 7. AIR LINE FILTER** (moisture separator) installed as close as possible to the blast machine inlet and sized to match the size of the inlet piping or larger air supply line. Clean filter and drain often. Damp abrasive causes operational problems.
- 8. REMOTE CONTROLS** are required by OSHA and must be in perfect operating condition. Test and check all components to ensure all parts are present and fully functional. Use genuine replacement parts. NEVER mix parts from different manufacturers. Never use welding hose for remote control hose.
- 9. BLAST HOSE** should have an inside diameter sized to suit the blast nozzle. The ID should be three to four times the size of the nozzle orifice diameter. Blast hose should be arranged in as straight a line as possible from the blast machine to the work area, avoiding sharp bends.
- 10. COUPLINGS AND NOZZLE HOLDERS** should fit snugly on the hose and be installed with manufacturer recommended screws. Coupling lugs must snap firmly into locking position. Gasket must always be used to form a positive seal, and cotter pins must be installed. Replace gasket when wear, softness or distortion is detected. Check nozzle holder for thread wear; replace at any sign of wear. Install safety cables at all connections.
- 11. NOZZLE** orifice size should be checked and nozzle replaced when worn 1/16" from original size. (No. 5 nozzle has 5/16" orifice diameter; replace when it measures 3/8"). Threads should be inspected daily for wear and nozzle should be replaced when wear is detected. Always use a nozzle washer.
- 12. ABRASIVE** must be a material specifically manufactured for blasting. It should be properly sized for the job. Check material safety data sheet for free-silica, cyanide, arsenic, lead and other toxins and avoid use when these toxic, harmful substances are present.
- SURFACE TO BE BLASTED** should be examined for hazardous substances. Take appropriate protective measures as required by OSHA to ensure the blast operator, other workers in the vicinity, and any bystanders are properly protected.

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1.0 INTRODUCTION

1.1 Scope of manual

1.1.1 These instructions cover the installation, operation, maintenance, troubleshooting, and replacement parts for Clemco's three models of the Quantum abrasive metering valve shown below.

- Manual Quantum abrasive metering valve (MQV)
- Auto-Quantum (AQV) is the standard Auto-Quantum and is used in most applications requiring a pneumatically operated metering valve. It requires approximately 80 psi to fully open.
- Auto-Quantum-H (AQV-H) is generally used in pressure-hold applications using coarse abrasives. It closes with higher spring pressure and requires approximately 90 psi to fully open. The most noticeable internal difference is the use of a urethane wear sleeve and a plunger stamped with an "H" on the end. It is identified on the outside by an "H" stamped on the actuator body.

1.1.2 These instructions do not contain all of the important information required for safe operation of the blast machine. All blast operators and machine (pot) tenders must be trained in the safe operation of the blast machine, remote control system, and all blasting accessories. The operators and all personnel involved with the abrasive blasting process must be well informed of the hazards associated with abrasive blasting. Before using the machine, all personnel involved with the blast machine operation must read the entire blast machine manual, including the orange cover, and all accessory manuals.

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.

CAUTION

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

⚠ CAUTION

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

⚠ WARNING

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

⚠ DANGER

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

1.3 Components and Operating Principles

1.3.1 Components

1.3.1.1 The replacement valve assembly includes: the valve assembly, a 1-1/2" nipple to connect the valve to the blast machine, a 1-1/4" nipple, and 1-1/4" wye to connect the valve to the blast machine piping.

1.3.2 Operating Principles

1.3.2.1 **Manual Quantum Metering Valve (MQV):** Adjusts abrasive flow through the valve by turning the metering knob. Once the abrasive flow is set, the valve remains open at all times.

1.3.2.2 **Auto-Quantum Metering Valves (AQV):** The Auto-Quantum consists of two segments: metering segment and normally-closed actuator segment. The metering segment adjusts abrasive flow through the valve. The actuator segment opens, starting abrasive flow when control-air is applied, and closes, stopping abrasive flow when control-air is removed.

2.0 INSTALLATION

2.1 Empty the blast machine of abrasive and depressurize the machine.

2.2 Shut down the compressed air source and lockout and tagout the air supply.

⚠ WARNING

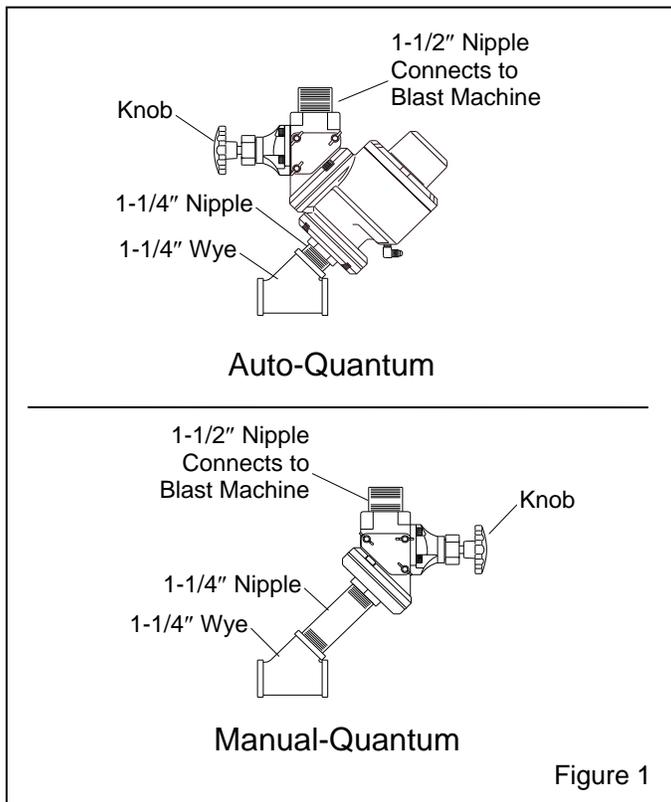
Failure to observe the following before performing any maintenance on the blast machine could cause serious injury or death from the sudden release of trapped compressed air.

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

2.3 Remove the existing metering valve from the blast machine.

NOTE: To ensure airtight seals, use pipe sealant on all male pipe threads.

2.4 Install the 1-1/4" nipple and wye to the metering valve as shown in Figure 1. NOTE: A 1-1/2" wye is available for 1-1/2" piping. Refer to Page 10, Figure 10 and Page 11, Figure 11.

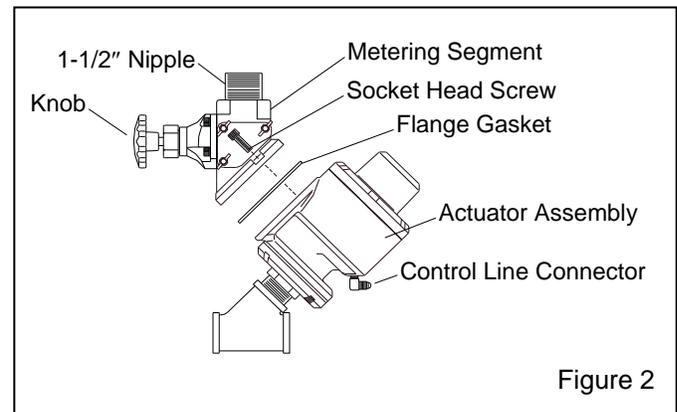


NOTE: The following describes installation of the Auto-Quantum valve on a machine with minimal rotation clearance. If the valve assembly will freely rotate beneath the blast machine, it may be installed as a unit.

2.5 Remove the four socket head screws holding the metering segment to the actuator, and remove the actuator assembly as shown in Figure 2.

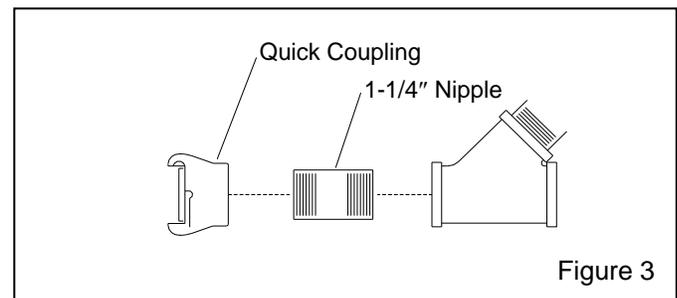
2.6 Use the 1-1/2" x close, schedule 80 pipe nipple to connect the metering segment to the outlet at the bottom of the blast machine. Position the metering knob as shown in the illustrations.

2.7 Make sure the flange gasket is in place, and bolt the actuator to the metering segment.



2.8 Some vertical and horizontal piping realignment may be required to reinstall the pusher line.

2.8 Install a coupling and nipple to the wye as shown in Figure 3.



2.10 On AQV valves only, connect the control line to the elbow on the bottom of the actuator assembly, shown in Figure 2.

3.0 ADJUST ABRASIVE FLOW, Figure 4

3.1 Adjust abrasive flow by turning the knob on the metering valve located at the bottom of the blast machine. Use the metering knob to adjust abrasive flow.

3.2 The hole in the knob is a rotation reference enabling the operator to monitor its rotation and count turns as the knob is rotated. The reference hole helps return the setting to its original position, should temporary adjustments be required.

3.3 The valve is closed when the knob has been turned fully clockwise. Begin with the knob set 1-1/2 turns from fully closed. To increase abrasive flow, the machine tender turns the knob no more than 1/4 turn counterclockwise while the operator is blasting. Allow 10 to 15 seconds for the flow to stabilize before readjusting. Continue making adjustments as described until the ideal flow is attained.

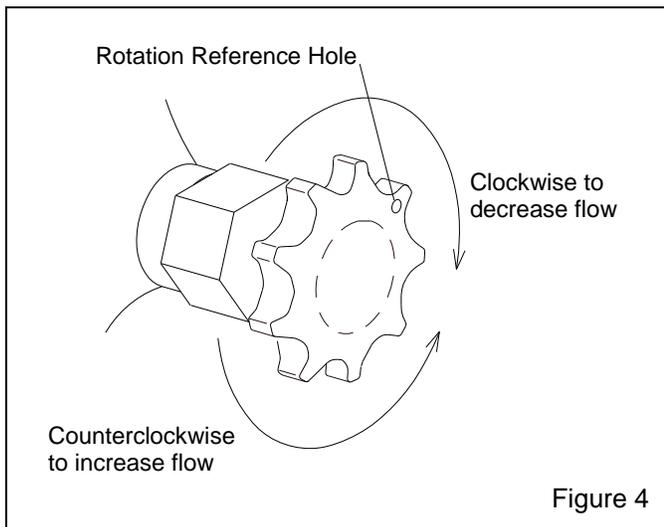


Figure 4

3.4 Optimum abrasive flow depends on the type and size of abrasive and blasting pressure, and is best determined by experience. Use as little abrasive as possible while maintaining the maximum cleaning rate. The air/abrasive mixture should be mainly air. As a rule, the stream of abrasive coming out of the nozzle should barely discolor the air when seen against a contrasting background.

4.0 MAINTENANCE

⚠ WARNING

Failure to observe the following before performing any maintenance on the blast machine could cause serious injury or death from the sudden release of compressed air.

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

NOTE: Service kits are available for the Quantum metering assembly and actuator segments. Keeping kit(s) on-hand will eliminate unnecessary downtime. Replace all seals provided in the kit whenever the valve is opened.

If immediate service is required and a service kit is not readily available, take extreme care not to misplace or damage o-rings, gaskets, or other seals. Thoroughly clean all reusable parts.

4.1 Metering Assembly, Ref. Figure 5

Refer to Section 4.2 for servicing the Auto Quantum actuator segment.

4.1.1 Empty the machine of abrasive. Turn off the compressed air supply. Lockout and tagout the air supply, and bleed the air supply line to the blast machine.

4.1.2 Remove the inspection plate wing nuts and inspection plate.

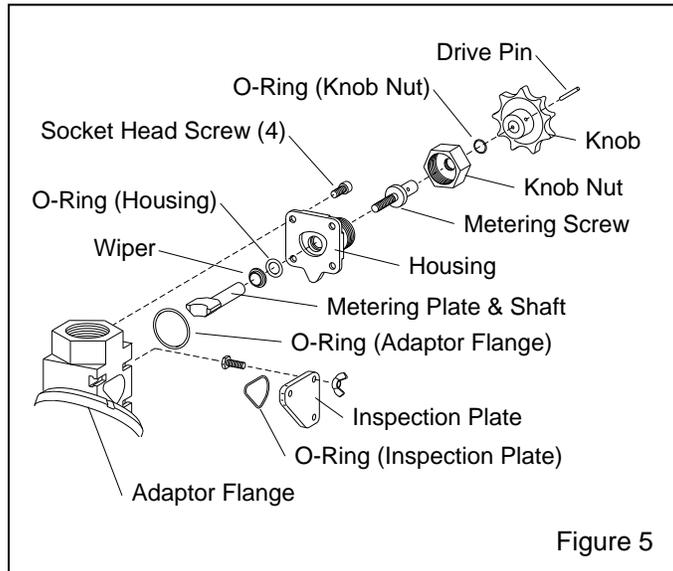
4.1.3 Remove the four socket head screws securing the metering housing, and remove the housing assembly.

4.1.4 The adaptor flange and actuator do not need to be removed from the blast machine to service the metering assembly. Thoroughly inspect the adaptor flange for wear, and replace it if worn.

4.1.5 Turn the metering shaft clockwise to remove the shaft from the metering screw.

4.1.6 Loosen the knob nut, and pull the knob assembly from the housing.

4.1.7 Use a drive pin and hammer to force the roll pin from the knob, and remove the knob.



4.1.8 Remove the metering screw by pushing it out the front of the knob nut.

4.1.9 Inspect the metering screw for damage and any signs of abrasive ingress or metal filings.

4.1.10 Clean the metering screw threads, and test the condition of the threads by installing the screw into the metering plate shaft. Replace the metering screw if there is any resistance, binding or metal filings.

4.1.11 Remove the o-ring from the knob nut, and remove the o-ring and wiper from the housing.

4.1.12 Thoroughly clean and inspect all parts that are to be reused. Replace all worn parts.

4.1.13 Place a new o-ring in the knob nut.

4.1.14 Place a new o-ring and wiper seal in the housing. A generous amount of silicone-based lubricant eases installation. The small side of the wiper seal faces away from the o-ring.

4.1.15 Insert the metering plate shaft through the housing bore, and wipe off any lubricant on the metering plate side of the bore.

4.1.16 Reassemble the metering screw, nut, knob, and drive pin. Note: applying a small amount of silicone-based lubricant on the unthreaded end of the metering shaft eases insertion through the nut o-ring.

4.1.17 Apply a molybdenum disulfide or graphite-based anti-seize lubricant to the metering shaft and metering screw threads, and thread the shaft onto the screw.

4.1.18 Place a new o-ring in the groove on the face of the adaptor flange.

4.1.19 Insert the metering plate (flat side up) through the adaptor flange opening. Be careful not to displace the o-ring.

4.1.20 Secure the metering housing finger-tight before tightening all screws.

4.1.21 Place a new o-ring on the inspection plate, and securely attach the plate.

4.1.22 Once service of the metering assembly is complete, test the machine and piping for air leaks before returning to service.

4.2 Actuator Segment

Refer to Section 4.1 for servicing the manual valve, and the metering assembly of the auto valve.

NOTE: A rubber piston-cup and bushing replaces the machined aluminum piston and u-seal. The aluminum piston is no longer available; replacing it with the rubber piston-cup and bushing is recommended when service is required on the actuator.

4.2.1 Empty all abrasive from the machine per instructions supplied with the blast machine. NOTE: If the metering assembly does not require service, abrasive flow may be shut off by closing the metering valve.

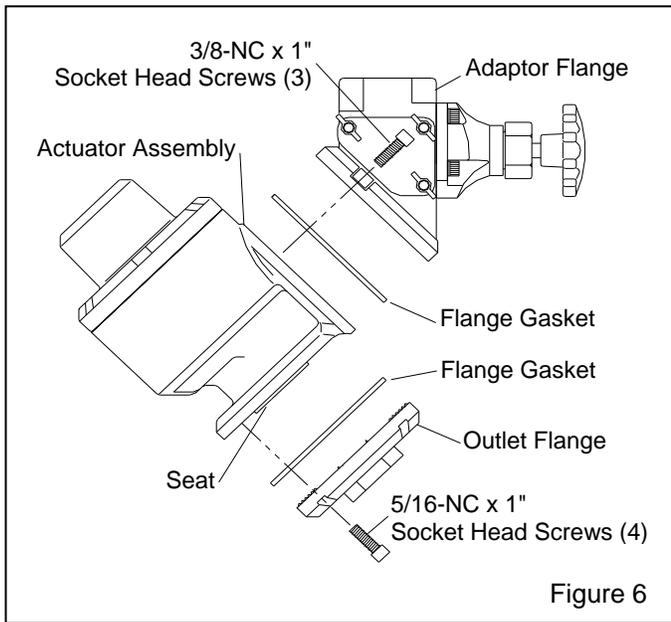
4.2.2 Turn off the compressed air supply. Lockout and tagout the air supply, and bleed the air supply line to the blast machine.

4.2.3 Refer to Figure 6 and remove the screws securing the adaptor flange and the outlet flange to the actuator assembly, and then remove the actuator assembly.

4.2.4 Refer to Figure 7 and unscrew the six socket head screws, and remove the cylinder cover and spring. Spring compression is relieved when the cover is approximately 9/16" from the actuator valve body.

4.2.5 Remove the felt disc from inside the cylinder cap.

4.2.6 Use a hammer handle or similar object to push the bottom of the plunger, forcing the plunger/piston assembly out the top of the valve body cylinder.



NOTE: If servicing an AQV-H actuator, which is identified by an "H" stamped in the side of the actuator body and at the end of the plunger, proceed to Section 4.3.

4.2.7 Pry the urethane seat from the bottom of the actuator valve body.

4.2.8 Remove the wear sleeve and roll pin from the body. A puller may be needed to remove the wear sleeve.

4.2.9 It is not necessary to separate the plunger from the piston unless either part is scored or worn. To separate the parts, hold the plunger in a vise with the vise jaws covered with copper or similar protection (if the plunger is damaged it does not matter if the vise jaws mar the plunger). Using a wrench placed on the flats of the piston stop, unscrew the stop. **NOTE: if the piston is aluminum, replace it with the rubber piston-cup and bushing. The bushing flange must be placed as shown in Figure 7, on the top side of the piston-cup, facing toward the piston stop.**

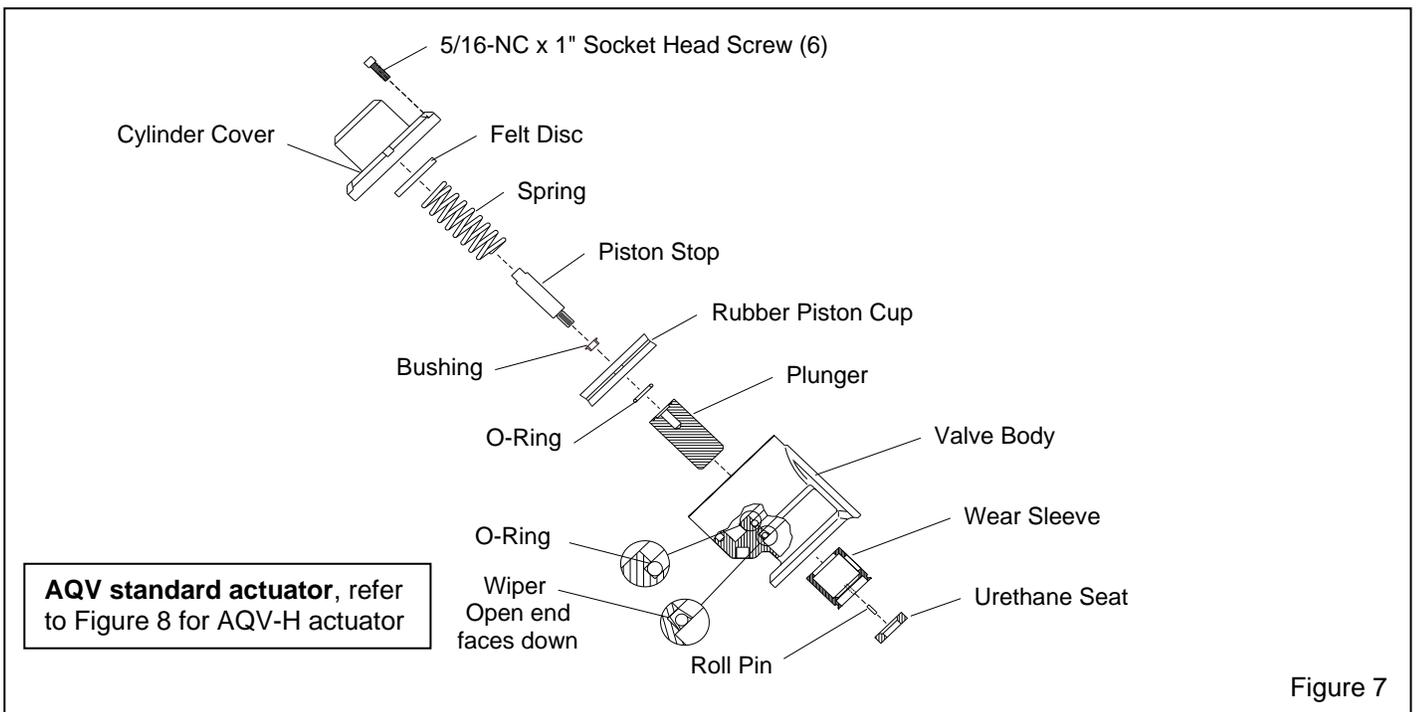
4.2.10 Remove the wiper and o-ring from the actuator valve body.

4.2.11 Inspect the urethane seat. Replace if worn or damaged.

4.2.12 Inspect the abrasive path in the actuator valve body, adaptor flange and outlet flange for wear. Replace if worn.

4.2.13 Clean all items and inspect for wear. Replace worn or damaged parts.

4.2.14 If the plunger and piston were separated as noted in Section 4.2.9, apply removable thread sealant to the threads on the piston stop and reassemble the parts using a new o-ring. **Make sure the bushing is installed in the piston as shown in Figure 7.**



4.2.15 Replace the wiper and o-ring in the actuator body; the o-ring side of the wiper must face toward the bottom of the body as shown in Figure 7.

4.2.16 Lubricate the o-ring and wiper in the actuator body with a silicone-based lubricant.

4.2.17 Install the plunger and piston assembly into the body. Make sure the bottom side of the piston cup does not fold back during assembly. Tucking in the lip of the cup, while applying pressure to the piston, eases assembly.

4.2.18 Place the roll pin and wear sleeve in the actuator body. The wear sleeve is correctly positioned when the alignment slot in the sleeve fits the roll pin in the body.

4.2.19 Place the urethane seat into the wear sleeve, with the beveled side toward the sleeve.

4.2.20 Assemble the actuator assembly onto the adaptor flange and outlet flange. Note: The adaptor flange is secured with three screws, and the outlet flange is secured with four screws. The gaskets are the same for both parts. Align the gaskets so the mounting holes match the pattern in the flange. First hand-tighten the outlet

flange screws to the actuator valve body. Hand-tighten the adaptor flange screws before tightening all screws.

4.2.21 Install the felt disc, spring, and cylinder cover, and tighten the screws to secure.

4.2.22 Connect the control line to the fitting or port on the actuator assembly, and test the operation before putting the valve in service.

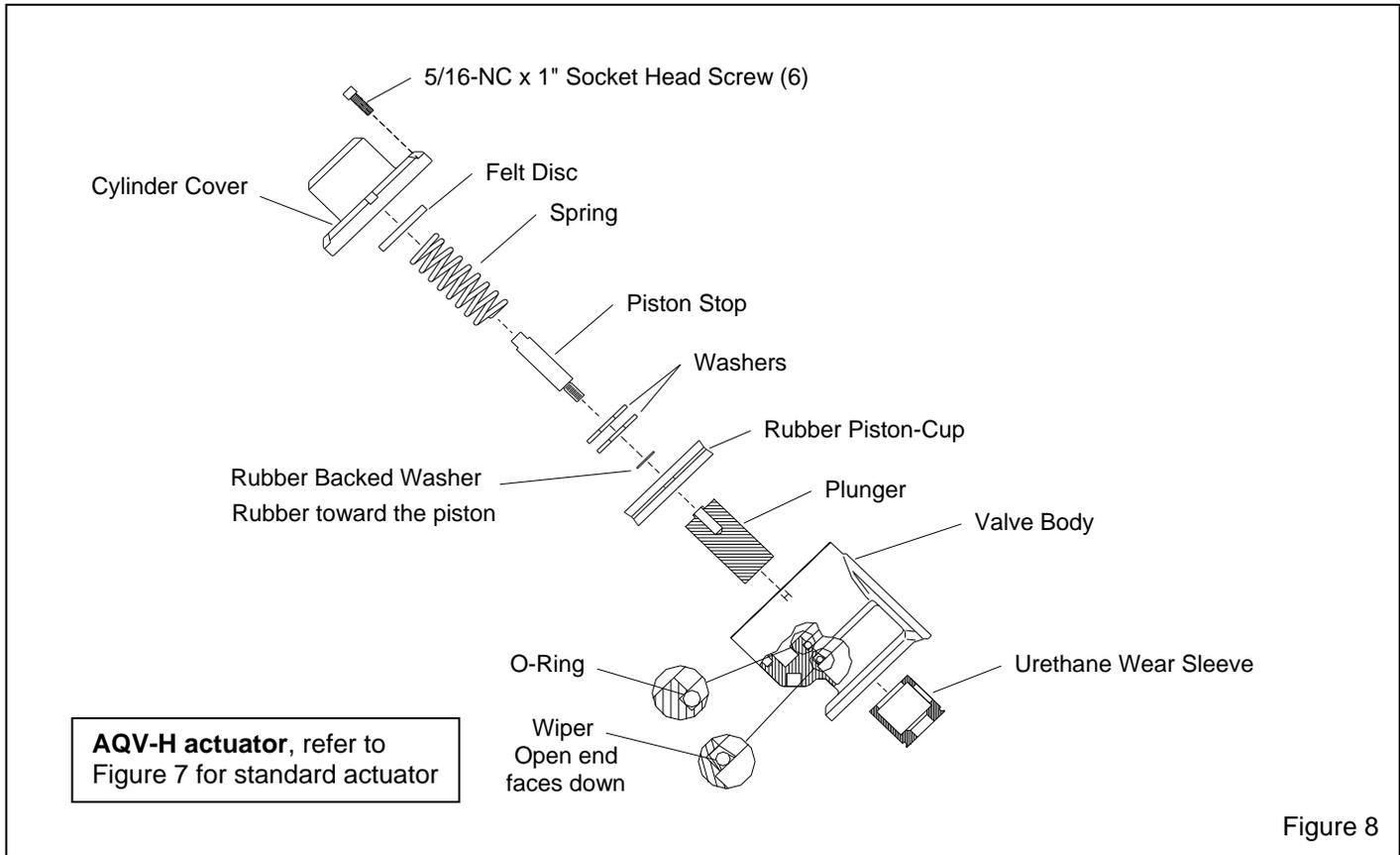
4.3 Service for AQV-H Actuator Only, Refer to Figure 8

Continued from paragraph 4.2.6

4.3.1 Pry the urethane wear sleeve from the bottom of the actuator valve body.

4.3.2 It is not necessary to separate the plunger from the piston unless either part is scored or worn. To separate the parts, hold the plunger in a vise with the vise jaws covered with copper or similar protection (if the plunger is damaged it does not matter if the vise jaws mar the plunger). Using a wrench placed on the flats of the piston stop, unscrew the stop.

4.3.3 Remove the wiper and o-ring from the valve body.



4.3.4 Inspect the abrasive path in the actuator valve body, adaptor flange and outlet flange for wear. Replace if worn.

4.3.5 Clean all items and inspect for wear. Replace worn or damaged parts.

4.3.6 If the plunger and piston were separated as noted in Section 4.3.2, apply removable thread sealant to the threads on the piston stop, and reassemble the piston assembly using a new o-ring from the service kit. NOTE: Make sure the two flat washers and rubber backed washer are installed as shown in Figure 8.

4.3.7 Replace the wiper and o-ring in the actuator body; the open side of the wiper must face toward the bottom of the body as shown in Figure 8.

4.3.8 Lubricate the o-ring and wiper in the actuator body, with a silicone-based lubricant.

4.3.9 Install the plunger-piston assembly into the body. Make sure the bottom side of the piston cup does not fold back during assembly. Tucking in the lip of the cup, while applying pressure to the piston, eases assembly.

4.3.10 Place the urethane wear sleeve in the actuator body. Align the hole in the wear sleeve with the opening in the body.

4.3.11 Assemble the actuator assembly onto the adaptor flange and outlet flange. Note: The adaptor flange is secured with three screws, and the outlet flange is secured with four screws. The gaskets are the same for both parts. Align the gaskets so the mounting holes match the pattern in the flange. First hand-tighten the outlet flange screws to the actuator valve body. Hand-tighten the adaptor flange screws before tightening all screws.

4.3.12 Install the felt disc, spring, and cylinder cover, and tighten the screws to secure.

4.3.13 Connect the control line to the fitting or port on the actuator assembly, and test the operation before putting the valve in service.

5.0 TROUBLESHOOTING

5.1 No Abrasive Flow

5.1.1 Metering valve closed. Adjust abrasive flow per Section 3.0.

5.1.2 Optional 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 Quantum valve.

5.1.4 Machine empty.

5.1.5 Obstruction in media valve. Clear as follows:

5.1.5.1 Fully open the media control valve, (It is fully open when the metering knob is turned fully counterclockwise). While blasting, close the choke valve to force out small obstructions or wet abrasive.

⚠ WARNING

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

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

5.1.6 Relief hole in cylinder cap is plugged.

5.1.7 Air leak through relief hole in cylinder cap. Check for leak. A leak at the vent indicates a worn or damaged piston cup. Service the actuator per Section 4.2.

5.1.8 Abrasive bridging in the blast machine. Refer to Section 5.6.

5.2 Abrasive Flow Does Not Stop When Optional ACS Switch is Turned to 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 owner's manual.

5.2.2 Worn urethane seat. Service the actuator per Section 4.2.

5.2.3 Worn plunger. Service the actuator per Section 4.2.

5.2.4 Obstruction on the valve seat. Service the actuator per Section 4.2.

5.3 Turning Metering Knob Does Not Change Abrasive Flow

5.3.1 Inspect metering segment per Section 4.1.

5.4 Air Leaks Through Relief Hole in Cylinder Cap

5.4.1 Worn piston cup. Service the actuator per Section 4.2.

5.5 Abrasive Flow Decreases Shortly After Blasting Starts

5.5.1 Insufficient air supply causes 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.

5.5.2 Abrasive bridging in the blast machine. This is usually caused by using very fine abrasive, or by moist air. Refer to Section 5.6.

5.6 Media Bridging

5.6.1 Frequent bridging or blockage in the blast machine and metering valve can be caused by damp abrasive. Blast media becomes damp by blasting parts that are slightly oily (when using recycled abrasive), from moisture in the compressed air line, or from absorption.

5.6.2 To avoid contaminating recyclable media by the workpiece, all parts should be clean and dry. If parts are oily or greasy, degrease and dry them prior to blasting.

5.6.3 Moist compressed air: Moisture in the air supply may be due to a faulty compressor that overheats, or pumps oil or moisture into the air line; an air line that is too long permitting moisture to condense on the inside; and from high humidity. Drain filters and receiver tank regularly. If the problem persists, a dryer or aftercooler may be required in the air supply line.

5.6.4 Absorption: Some media tends to absorb moisture from the air, especially fine-mesh media in high humidity areas. Empty media from the blast machine at the end of the work day, and store media in an area protected from damp environment.

5.6.5 Condensation: When working in conditions of extreme temperature change or humidity, condensation may develop inside the machine. Condensation dampens abrasive and causes flow problems. Empty the machine of all abrasive, when shutting down for the day. This will eliminate trouble from moist abrasive the next time the machine is started.

REPLACEMENT PARTS

6.1 Replacement Metering Valves

Item	Description	Stock No.
(-)	MQV Manual Quantum metering valve with 1-1/4" wye	22845
(-)	AQV Auto-Quantum, metering valve with fittings and 1-1/4" wye	24447
(-)	AQV Auto-Quantum, metering valve with fittings and 1-1/2" wye	25281
(-)	AQV-H, Auto Quantum metering valve coarse mesh with fittings and 1-1/4" wye ...	27525

6.2 Manual Quantum Abrasive Metering Valve
Figure 9

Item	Description	Stock No.
*	Service kit, metering assembly (Fig. 9a).....	22854
1.	Adaptor flange	21314
2.	Screw, 3/8-NC x 1" socket head	22655
3.	Flange, threaded outlet.....	22621
4.	Cover, cleanout	22620
5.	Screw, 1/4-NC x 3/4" hex head cap.....	03052
6.	Nut, 1/4-NC wing	03113
7.	Housing, knob	22761
8.	Nut, knob housing	22762
9.	Metering plate and shaft	22763
10.	Metering screw	22764
11.	Knob, adjustment	22766
12.	Screw, 5/16-NC x 3/4" socket head	22767
13.	Wye, 1-1/4"	01818
14.	Nipple, 1-1/2" x 2" heavy wall	01840
15.	Nipple, 1-1/4" x 5-1/2"	01874

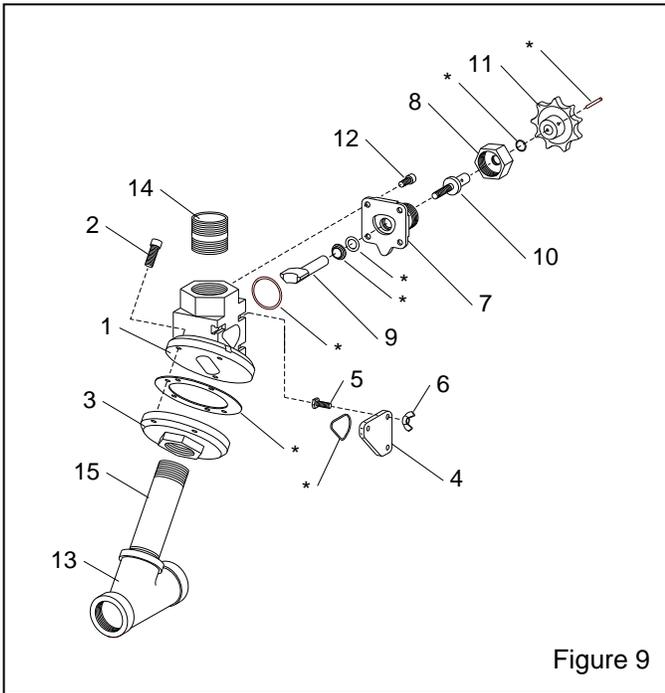


Figure 9

22854 SERVICE KIT
QUANTUM METERING ASSEMBLY

Item	Qty	Description
1.	1	Flange gasket
2.	1	Wiper seal
3.	1	O-ring, 3/4" OD nominal
4.	1	O-ring, 5/8" OD nominal
5.	2	O-ring 1-1/2" ID nominal
6.	1	Roll Pin

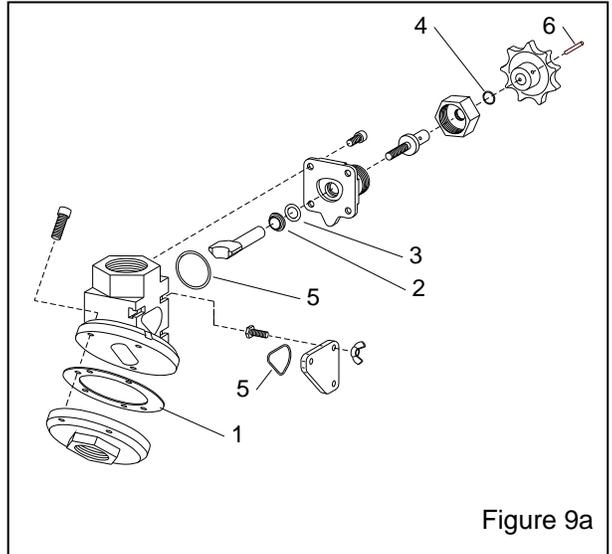
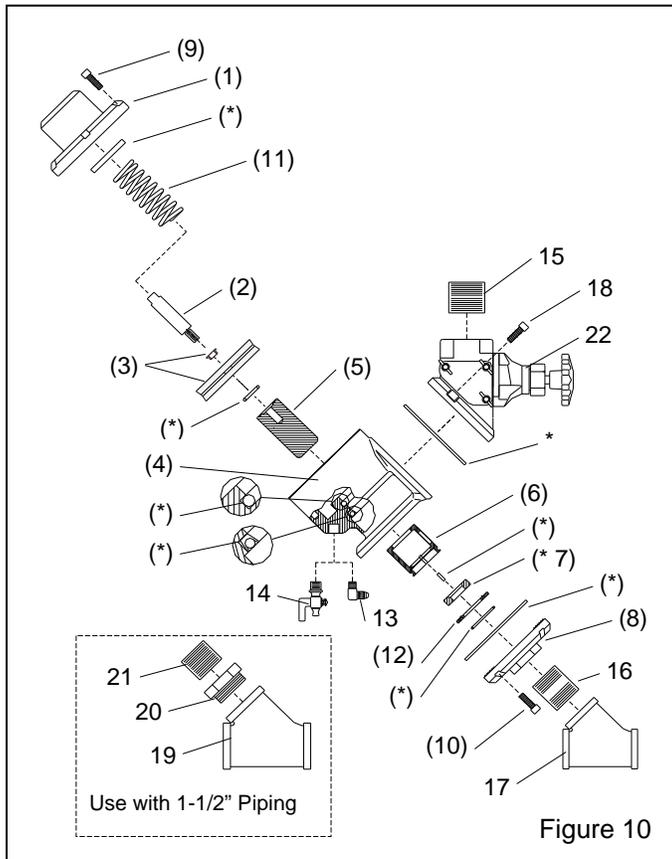


Figure 9a

6.3 AQV Auto Quantum Actuator, Figure 10
Refer to 6.4 for AQV-H Actuator

Item	Description	Stock No.
(-)	Conversion kit, AQV to AQV-H Converts Standard Actuator to AQV-H actuator	27621
(-)	Actuator assembly, AQV (Items w/()	22775
*	Service kit, Quant. actuator, See Fig. 10a.....	24446
1.	Cover, cylinder	21317
2.	Stop, piston	21323
3.	Piston cup w/bushing.....	21329
4.	Valve body, actuator	21349
5.	Plunger, grit valve	21326
6.	Wear sleeve, grit valve	21342
7.	Seat, urethane	21344
8.	Flange, threaded outlet w/retaining ridge.....	21319
9.	Screw, 5/16-NC x 1-3/4" socket head	21321
10.	Screw, 5/16-NC x 1" socket head	21318
11.	Spring	20600
12.	Retaining ring (for replacement parts only) Not required with current Item 8.....	22429
13.	Adaptor, 1/4" NPT elbow	02513
14.	Petcock, 1/4" NPT	01993
15.	Nipple, 1-1/2" x close, schedule 80	01791
16.	Nipple, 1-1/4" x 2"	01718
17.	Wye, 1-1/4" NPT.....	01818
18.	Screw, 3/8-NC x 1" socket head.....	22655



19.	Wye, 1-1/2" NPT.....	01819
20.	Bushing, 1-1/2 NPT x 1-1/4 NPT	01805
21.	Nipple, 1-1/4 x close HD.....	01854
22.	Metering assembly, Quantum	24587

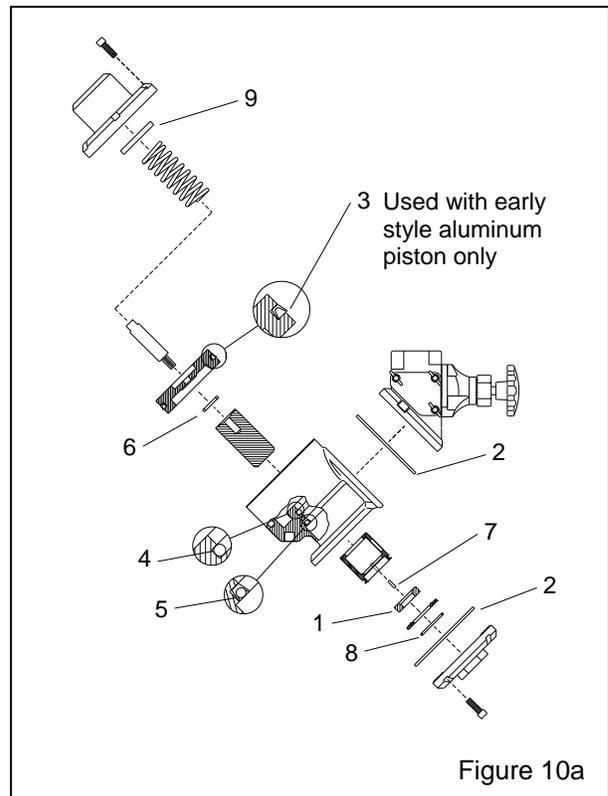
Refer to Section 6.2 for replacement parts

24446 SERVICE KIT
QUANTUM ACTUATOR ASSEMBLY

Item	Qty	Description
1.	1	Seat, urethane
2.	2	Flange gasket
3.	1	U-seal, 3-1/2" ID (used only w/ alum piston)
4.	1	O-ring, 1-1/2" ID x 3/16" nom.
5.	1	Wiper, plunger
6.	1	O-ring, 31/64" ID
7.	1	Roll pin, 1/8" x 1/2"
8.	1	O-ring, 1-1/2" ID x 3/32" nom.
9.	1	Felt disc
10.	1	Washer, rubber backed
11.	2	Washer, 3/4 flat

NOTE: Item 8 is not required with current 21319 outlet flange with integrated retaining ridge. Used only with earlier style 22077 flange, requiring a separate 22429 Retaining Ring.

Items 10 and 11 used with AQV-H actuator only.



6.4 AQV-H Auto Quantum Actuator, Figure 11
 Refer to 6.3 for standard AQV actuator

Item	Description	Stock No.
(-)	Actuator assembly, AQV-H (Items w/(-).....	27620
*	Service kit, Quant. actuator, See Fig. 11a....	24446
1.	Cover, cylinder	21317
2.	Stop, piston	21323
3.	Piston cup	20515
4.	Valve body, actuator	21349
5.	Plunger, AQV-H	27523
6.	Wear sleeve, urethane, AQV-H	27521
7.	Flange, threaded outlet w/retaining ridge	21319
8.	Screw, 5/16-NC x 1-3/4" socket head	21321
9.	Screw, 5/16-NC x 1" socket head	21318
10.	Spring, AQV-H	27524
11.	Adaptor, 1/4" NPT elbow	02513
12.	Petcock, 1/4" NPT	01993
13.	Screw, 3/8-NC x 1" socket head.....	22655
14.	Nipple, 1-1/2" x close, schedule 80	01791
15.	Nipple, 1-1/4" x 2"	01718
16.	Wye, 1-1/4" NPT.....	01818
17.	Wye, 1-1/2" NPT.....	01819
18.	Bushing, 1-1/2 NPT x 1-1/4 NPT	01805
19.	Nipple, 1-1/4 x close HD.....	01854
20.	Metering assembly, Quantum	24587

Refer to Section 6.2 for replacement parts

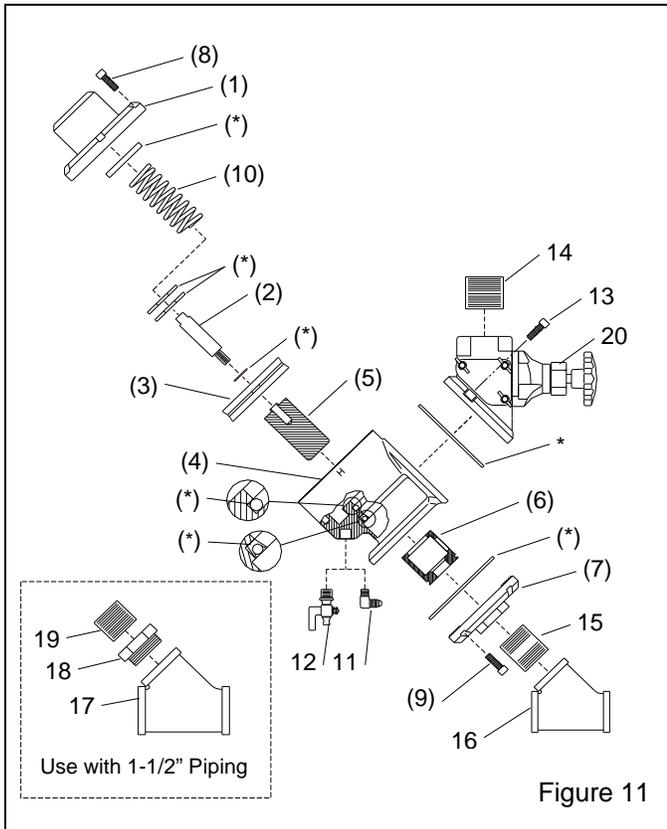


Figure 11

24446 SERVICE KIT
QUANTUM ACTUATOR ASSEMBLY

Item	Qty	Description
1.	1	Seat, urethane
2.	2	Flange gasket
3.	1	U-seal, 3-1/2" ID (used only w/ alum piston)
4.	1	O-ring, 1-1/2" ID x 3/16" nom.
5.	1	Wiper, plunger
6.	1	O-ring, 31/64" ID
7.	1	Roll pin, 1/8" x 1/2"
8.	1	O-ring, 1-1/2" ID x 3/32" nom.
9.	1	Felt disc
10.	1	Washer, rubber backed
11.	2	Washer, 3/4 flat

NOTE: Items 1, 6, 7, and 8 used with standard AQV actuator only.

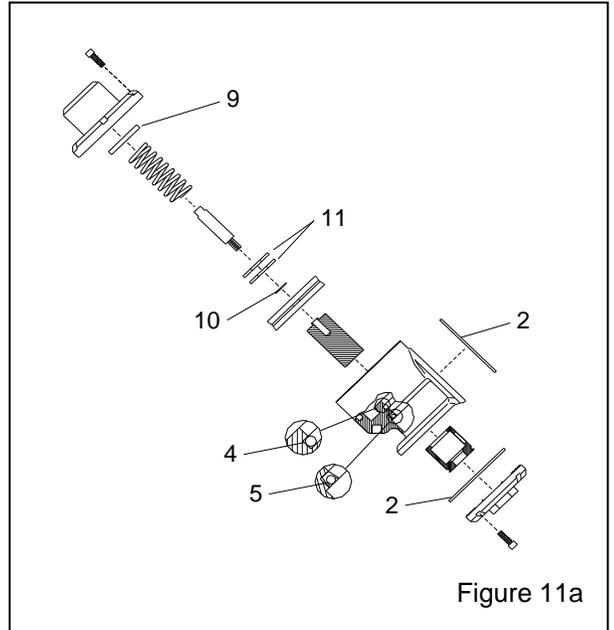


Figure 11a