MILTON ROY®

an Accudyne Industries brand

mROY®

Pneumatic Capacity Control

Instruction Manual

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PRECAUTIONS

For Pumps with PVC & 316SS Liquid Ends
WHEN USED IN SWIMMING POOLS OR SPAS/HOT TUBS (ANSI/NSF 50)

Caution on Chemical Concentration:

There is a potential for elevated chemical concentration during periods of no flow, for example, during backwash in the system. Steps, such as turning the pump off, should be taken during operation or installation to prevent this. Contact your sales representative or distributor about other external control options to help mitigate this risk.

Flow Indicating Device:

To ensure operation of the pump it is recommended that some type of flow indicating device be installed to measure water flow rates and be appropriate for the output of the pump. Contact your distributor or sales representative for further information.

Head Loss / Over Pressure Protection / Back Pressure-Anti-Siphon Valve:

- Milton Roy metering pumps are positive displacement. Head loss is not applicable to the pump.
- To ensure safe operation of the pump it is recommended that some type of safety/pressure relief valve be installed to protect the piping and other system components from failing due to excessive pressure.
- If you are pumping downhill or into low or no system pressure, a back pressure/anti-siphon device should be installed to prevent over pumping or siphoning. Contact your distributor or sales representative for further information.

Additional Operation and Installation Instructions for 316SS or PVC Liquid Ends:

- Application of this pump to swimming pool/spas only evaluated to NSF/ANSI 50.
- There is a potential for elevated chemical concentration during periods of no flow, for example, during backwash in the system. Steps, such as turning the pump off, should be taken during operation or installation to prevent this. See your sales representative or distributor about other external control options to help mitigate this risk.
- Liquid Compatibility CAUTION: Determine if the materials of construction included in the liquid handling portion of your pump are adequate for the solution (chemical) to be pumped. ALWAYS wear protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on the solution being pumped. Refer to MSDS precautions from your solution supplier. Reference a Milton Roy Material Selection Chart for aid in selecting appropriate material of construction for fluids of your specific metering pump. Contact your sales representative or distributor for further information.

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SECTION 1 - PNEUMATIC CAPACITY CONTROL

Reference the drawing for pneumatic capacity control assembly and operating principles
(pages 3 and 4) for a schematic and cross section representation of the pneumatic capacity control positioner mounted on the mRoy pump. The assembly consists of three major sections as follows:

1. The Moore Products Company, Model 73N air control valve which continuously compares the location of the piston in the pneumatic cylinder with the instrument air pressure and regulates the supply air pressure imposed on one side of the piston to obtain the required piston position.
2. The pneumatic cylinder, with a differential area piston, is the device that moves the capacity control spool of the pump in response to the metered supply pressure from the air control valve. The cylinder is made of a clear impact resistant plastic, so that the position of the piston is visible at all times for comparison against a "Percent Capacity" decal. (Read percent capacity at the black line of the O-ring contact).
3. The mounting flange, which is used to rigidly mount the assembly onto the standard production mRoy pump assembly, forms the end of the pneumatic cylinder and seals off the I.D. of the piston to establish a differential area between the two sides of the piston.

At time of installation, the instrument air pressure (Pi) and the supply air pressure (Ps) are connected to the corresponding fittings in the air control valve. The supply air (Ps) is routed internally to the pilot valve and it is also routed unrestricted, internally through the cylinder wall onto the small area (pump side) of the differential area piston. The instrument air pressure (Pi) is routed to a "dead end" cavity formed by the flexible diaphragm assembly.

As shown by the schematic, the supply pressure imposed on the small area side of the piston creates a force to move the piston until it bears against, and compresses, the range spring. The range spring in turn is supported by the flexible diaphragm assembly which bears against the stiff suppression spring. The diaphragm assembly is then a moveable element between two opposing spring forces. This movement of the diaphragm assembly is transmitted to the pilot valve which acts to either increase or decrease the metered supply air pressure (Psm) imposed on the large area side of the piston. The relationship of metered supply pressure (Psm) on one side and full supply pressure (Ps) on the other side of the differentially area piston is used to establish and maintain the required capacity control position. A fixed air bleed is incorporated in the metered supply 'pressure chamber which will maintain a small air flow across the pilot valve to provide instant response to any changes in the operating conditions.

In operation, an increase in instrument air pressure (Pi) upsets the balanced forces and moves the diaphragm assembly to the left. This lifts the pilot valve above its seat to reduce the air pressure drop across the pilot valve and increases the metered supply pressure, (Psm) on the downstream side of the pilot valve, which is imposed on the large side of the air piston. The metered supply pressure will continue to increase until sufficient force is developed to move the piston to the right which increases the pump capacity.

As the piston moves, the range spring feeds back a force proportional to the piston location so that when the range spring pressure plus the diaphragm force from the instrument air signal are again in balance with the suppression spring force, the pilot valve closes and maintains a balanced pressure condition.

A decrease in instrument air pressure moves the diaphragm assembly to the right which seats the head of the pilot valve and lifts the pilot valve stem off the exhaust seat. This vents the pressure (Psm) on the large side of the piston at atmosphere (Pa), then the supply pressure on the small side of the piston will move the piston to the left to decrease the pump capacity. Again the range spring feeds back to the positioner the location of the air piston until the forces are again in the balanced condition.

SECTION 2 - DISASSEMBLY AND ASSEMBLY PROCEDURE

2.1 DISASSEMBLY

1. Disconnect the supply and instrument air pressure lines.
2. Remove the six ¼ -20 NC nuts from the air control valve hold-down studs.
3. Mark the alignment between the air control valve, gasket, cylinder and mounting flange to facilitate reassembly.
4. Remove positioner by sliding off hold-down studs.
5. Remove spring adapter plate and spring from bore of cylinder.
6. Slide plastic cylinder off mounting studs to expose piston.
7. Hold piston O.D. and remove mounting screw in center of piston.
8. Remove the mounting screw in the flange and the screw in the barrel of the flange. Now slide the flange off the pump capacity control boss.
9. Use a thin screwdriver or similar tool to remove “E” ring which retains the piston adapter onto the pump capacity control spool.

This completes the disassembly.

2.2 ASSEMBLY

For assembly follow the disassembly procedure in reverse order (descending step numbers from 9 to 1) making certain that the O-rings are lubricated with pump oil or ring lubricant before assembly of the retaining part. Make certain that parts are aligned in the same way as the original assembly. Make certain the gasket between the Moore positioner and the cylinder body is positioned so that the small hole in the gasket, adjacent to the stud hole, is aligned with the corresponding hole through the plastic cylinder.

2.3 CALIBRATION AFTER ASSEMBLY

To calibrate the pneumatic capacity control after reassembly, apply an instrument air signal corresponding to 100% capacity setting. Remove the cover on the top of the valve positioner and use a screwdriver to turn the zero adjust until the piston seal line corresponds to the 100% graduation on the % capacity decal. Turn the adjusting screw counter clockwise to move the piston away from the pump.

SECTION 3 - GENERAL PERFORMANCE

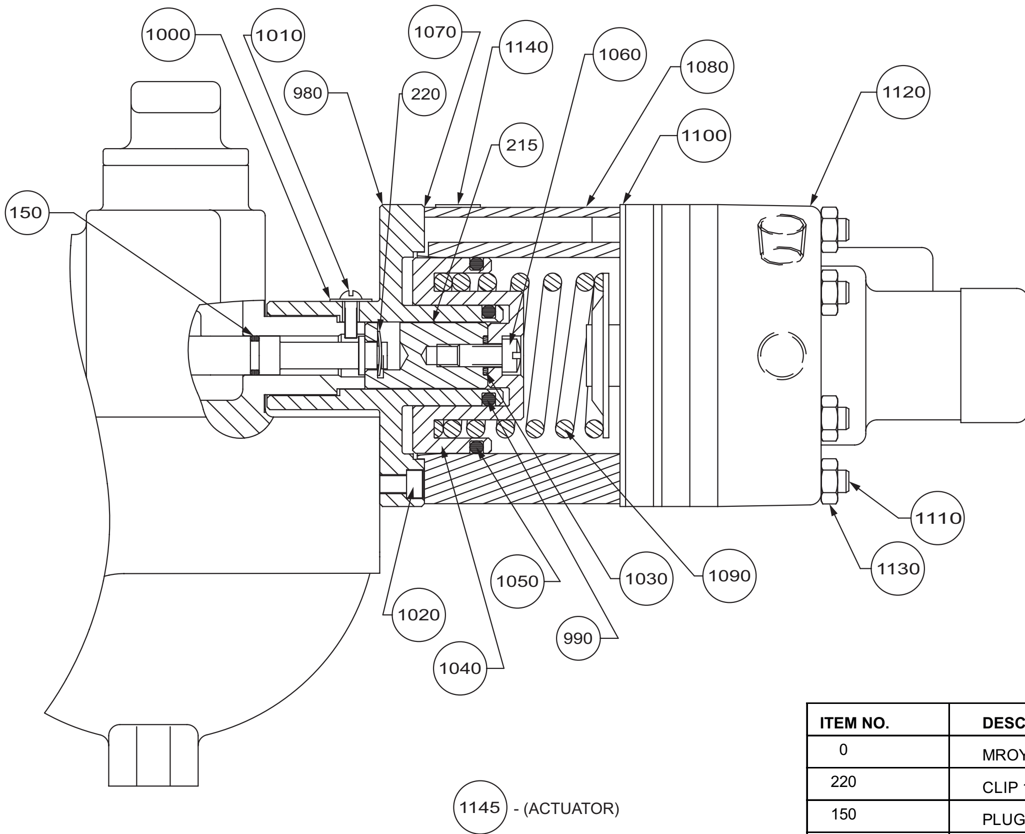
The pneumatic capacity control assembly will provide accurate incremental adjustment in both directions as a linear function of the applied instrument air pressure. There is no tendency for the capacity control to “drift” off setting over long periods of time because

1. There is no significant force acting on the pump capacity control adjustment spool.
2. The friction from, the sealing rings act to hold the spool in position until the pneumatic capacity control applies sufficient force to overcome this friction.

With 40 psi supply air pressure, the pneumatic capacity control cylinder will develop up to 40 pounds force in the direction to increase the capacity setting and up to 110 pounds force in the opposite direction. Then with 100 psi air pressure applied, these forces are increased to 100 pounds and 275 pounds respectively. There is no noticeable change in control position when the supply air pressure is varied within the specified pressure range. However, the nominal force required to overcome the seal ring friction on the control spool is in the range of 17-30 pounds, so the pneumatic capacity control should have no difficulty providing rapid, accurate adjustment of the pump capacity when the minimum specified control air pressure is applied.

It should be noted that the instrument air pressure is applied to a closed chamber in the positioner valve so that the regulator or instrument system establishing the air signal must incorporate a venting air bleed to insure accurate air signal response.

Supply Pressure	Regulated 40-100 psi.
CDA (Instrument) Pressure Range	3-15 psi standard, other pressure ranges available on special order.
Pump Capacity Variation over Instrument Pressure Range	0-100% rated capacity.
Minimum Pressure Change Required to Reset Capacity	0.20 psi or 0.13% of full range pressure.
Linearity of Actuator Movement	Within 5% of maximum capacity (maximum difference in output between calibration curve and most favorable straight line drawn through curve).
Repeatable Accuracy of Actuator Position	Within 1% of full stroke. (Maximum difference between two positions of output for the same value of input always approached from one direction)
Supply Air Consumption (Balanced Condition)	0.2 - 0.4 SCFM
Instrument Air Consumption	0 SCFM
Failure to Supply Pressure (Ps)	Moves to 100% position.
Failure of Instrument Air (PI)	Moves to 0% position.



ITEM NO.	DESCRIPTION
0	MROY PCC INSTRUCTION MANUAL
220	CLIP 1/4 E-RING EXTERNAL
150	PLUG 1 NPT LVLSL HEXS 18-8SS
150	PLUG 1/2 NPT LVLSL HEXS 18-8SS
215	ADAPTER
980	MOUNT FLANGE MROY A PNEU.
990	O-RING .921 X .139 BUNA N
1000	INT TOOTH LOCK WASHER #6 Z PL
1010	RD HD SCR #6-32NCX7/16 Z PLT
1020	5/16-18 SLOTTED SHOULDER SCREW
1030	O-RING#2-011 70 DURO URETHANE
1040	PISTON
1050	O-RING 2-226 BUNA N
1060	FIL HD SCR 1/4-20X1/2 ZPL
1070	GASKET, PNEUMATIC CYLINDER
1080	PNEUMATIC CYLINDER POLYCARBONA
1090	SPRING, ACT SH -P/N 6240-23
1100	GASKET PNEUMATIC POSITIONER
1110	STUD
1120	MOORE POSTIONER MODEL 73N12F
1140	PNEUMATIC % CAPACITY DECAL RA
1130	1/4-20 HEX NUT SS

Figure 1. Assembly Pneumatic Capacity Control (102197100015)

1 atmosphere	Equals	1.0333 kilograms/square centimeter
		101.33 kilopascals
		1.0135 bars
1 Btu/hour	Equals	0.2928 Watts
Degrees Fahrenheit	Equals	1.8° Celsius + 32
1 Engler degree	Equals	7.45 square millimeters/second
1 foot	Equals	30.48 centimeters
		12 inches
1 Ford cup #4	Equals	3.76 square millimeters/second
1 gallon (U.S.)	Equals	0.1337 cubic feet
		0.8333 Imperial gallons
		3.785 liters
		4 quarts
1 gallon/hour (U.S.)	Equals	0.003785 cubic meters/hour
		0.002228 cubic feet/minute
1 horsepower	Equals	745.7 Watts
1 inch	Equals	2.540 centimeters
1 inch of mercury	Equals	0.03442 kilograms/square centimeter
		3376.5 Pascals
		0.4897 pounds/square inch
1 pint (liquid)	Equals	0.4732 liters
		16 ounces
1 pound/square inch	Equals	0.06804 atmospheres
		0.06897 bars
		0.07029 kilograms/square centimeter
		6894.8 Pascals
1 Redwood Admiralty	Equals	2.340 square millimeters/second
1 Redwood Standard	Equals	0.237 square millimeters/second
1 Saybolt Furol	Equals	2.16 square millimeters/second
1 Saybolt Second Universal	Equals	0.216 square millimeters/second

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