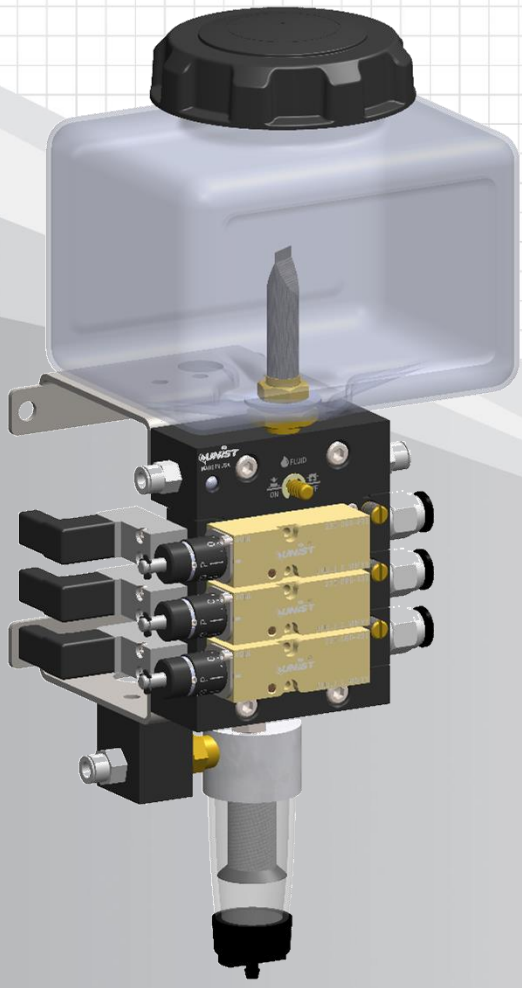
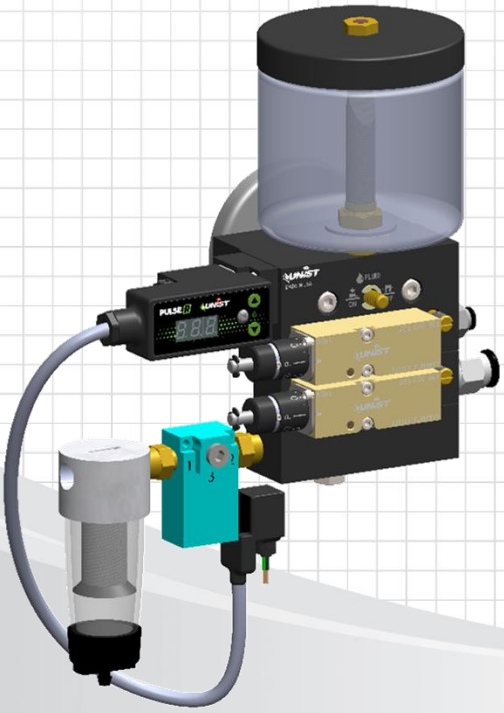
230 Micro Pump

Operation Manual





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Environmentally Friendly Lubrication

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Questions or part orders:

1-800-253-5462 (US & Canada)
1-616-949-0853 (International)

230 Micro Pump™ Operation Manual

9/26/2024 V1.8

Quick Start Guide

1. Mount

Bracket mount
(Shown with optional magnets)

OR

Direct mount
(Through holes for ¼-20 SHCS)

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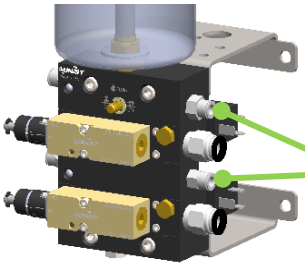
2. Air

Clean and dry air at 80-100 psi [4-7 bar]

System with an air filter

OR



System without an air filter

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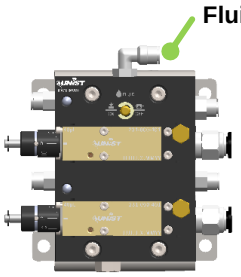
3. Fluid

Fill

OR

OR



Connect remote reservoir or pressurized fluid supply (20 psi [1.4 Bar] Max)

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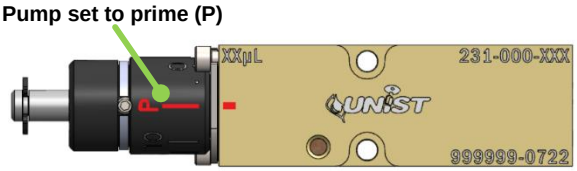
4. Prime

All pumps are self-priming! Cycle pumps at an increased cycle rate, with adjustable pumps set to ‘P’, to quickly fill lines with fluid.



Warnings

Important Operator Information

Consult this documentation in all cases where this caution symbol appears. This symbol is used to inform you of any potential HAZARD or actions that require your attention.

Use of this equipment in a manner other than that specified by Unist, Incorporated may compromise design integrity and become unsafe.

WARNING: This equipment is not intended for use in explosive environments.
ADVERTENCIA: Este equipo no está diseñado para uso en atmósferas explosivas.
AVVERTIMENTO: Questa apparecchiatura non è inteso per l'uso in ambienti esplosivi.
WARNUNG: Das Ausrüstung darf in einer explosiven Umgebung NICHT verwendet werden.
AVERTISSEMENT: Cet équipement n'est pas prévu pour une utilisation dans des environnements explosifs.

WARNING: This product can expose you to chemicals, including lead, which is known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to www.p65warnings.ca.gov.

ADVERTENCIA: Este producto puede exponerlo a productos químicos, incluido el plomo, que el estado de California sabe que causan cáncer, defectos de nacimiento u otros daños reproductivos. Para obtener más información, vaya a www.p65warnings.ca.gov.

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AVERTISSEMENT: Ce produit peut vous exposer à des produits chimiques, y compris le plomb, qui est connu par l'État de Californie pour causer le cancer, des malformations congénitales ou d'autres problèmes de reproduction. Pour plus d'informations, visitez www.p65warnings.ca.gov.

Identifying Symbols

Caution - ISO 7000-0434B

Table Of Contents

Introduction

Thank You

Thank you for your purchase of a Unist 230 Micro Pump System. This system was built on Unist's foundation and extensive knowledge of positive displacement pumps. It was designed with simplicity and modularity in mind, resulting in an easy-to-use, maintenance friendly system that delivers consistent and reliable results.

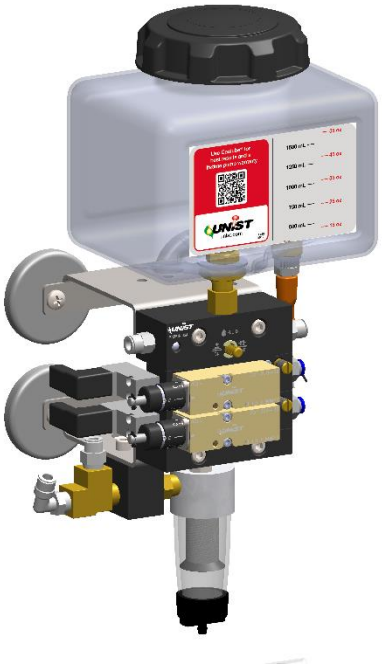


Figure 1: 230 Micro Pump System

System Introduction

The 230 Micro Pump provides simple and precise fluid dispensing. Its modular design allows for 1 to 12 fluid outputs, along with a variety of other options. Consistently supply fluid to cutting tools, wear points, assembly operations, forming and punching, and more with this system.

System Options

Fluid Output Type

Fluid outputs can either be an air and fluid mix for spraying, or a fluid only output for dispensing. For air and fluid mix outputs, the atomization air can be controlled with a metering screw or with an external air pressure regulator. Additionally, those outputs can be supplied via single line or coaxial tubing, depending on the nozzle type.

Control Type

Directly controlled pumps provide independent control for the actuation of each pump. Common pump control groups several pumps together such that they are all actuated at the same time. Remote pump control utilizes a set of user provided solenoid valves to control pumps independently.

Pump Control Method

Pumps can be intermittently cycled to provide discrete shots of fluid or atomized spray, or they can be configured with a pump timer to repeatedly cycle the pump to provide continuous fluid delivery.

Pump Volumetric Output

Pumps with a nominal volumetric output of 20, 40, and 60 µL per stroke are available. Each size can be supplied with a volumetric adjustment knob or in a fixed displacement configuration.

Fluid Supply

Fluid can be supplied from an integral fluid reservoir, remote gravity feed reservoir, pressurized fluid source (15 psi [1 Bar] maximum fluid pressure) or a pressurized reservoir (used when dispensing grease).

Pump Output Flow Sensing

Optional fluid flow sensors can be added for critical operations where feedback of pump performance is desired.

Common Configurations

The modularity of the system allows it to fit a wide variety of customer needs. While there are thousands of potential system configurations, they all feature the same key components. Below are a few examples to illustrate some more widely used configurations. Figure 2 shows a system with (2) 60µL adjustable output pumps with direct actuation, an air metering screw, 16 oz fluid reservoir and magnetic mounting brackets.

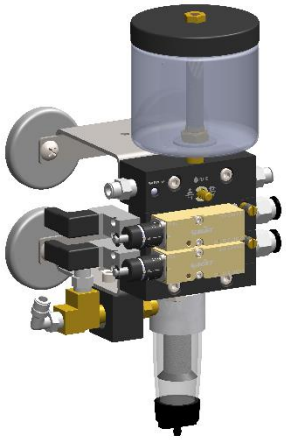


Figure 2: Pump Configuration 230-A1A1M2-2A3

Figure 3 shows a common actuation system utilizing the Pulse R electronic timer and (2) 60µL adjustable output pumps with air metering screws. The system is supplied with a 64 oz fluid reservoir and low-level switch.

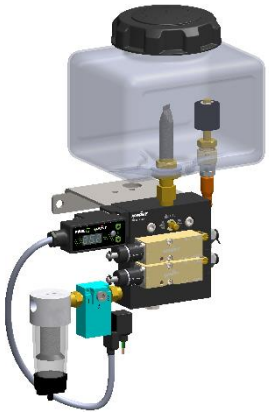


Figure 3: Pump Configuration 230-A1A1B4-2D6

A remote actuation system with (2) adjustable 60µL pumps is shown in Figure 4; it is a fluid output only system with a 64 oz fluid reservoir and low-level switch. Part numbering can be deciphered in Appendix C: System Part Numbering Scheme on page 31.

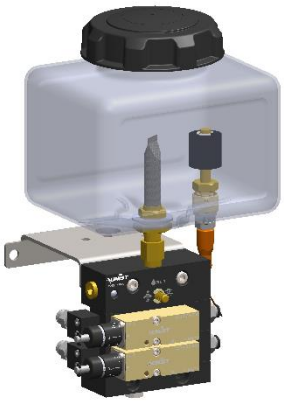


Figure 4: Pump Configuration 230-A1A1B4-2B9

Pump Identification

The differences between the three pump sizes can only be discerned by the internals of the pumps. Because of this, the pump bodies are marked with the pump size and the part number. Figure 5 shows where this information is located on the pump body for both the adjustable and fixed output pumps.

Figure 5: Pump body markings

Typical System Layout

Direct

- **A. Air Filter**
- **B. Pump Control Valve**
  One valve for every pump
- **C. Atomize Air Control Valve**
  One valve for every pump (not present on fluid only pumps)
- **D. 230 Micro Pump**
  Precise, reliable, and self-priming
  20, 40 or 60µL output options
- **E. Air Metering Screw**
  Controls nozzle air flow (not present on fluid only manifolds)
- **F. Pump Stroke Adjustment**
  Controls fluid volume per stroke
  Not present on fixed displacement pump
- **G. 64 oz Fluid Reservoir**
  Additional sizes and styles available
- **H. Mounting Bracket**
  Magnet mount option available
- **I. Outlet Port**
  Connection port for fluid outputs
- **J. Atomize Air Inlet**
  Separate for optional regulated air supply
- **K. Actuation Air Inlet**
  80 to 100 psi [5.5-7 bar] recommended
- **L. Fluid on/off Valve**
  Push in to allow fluid flow to pump stack
  Pull out to stop fluid flow to pump stack

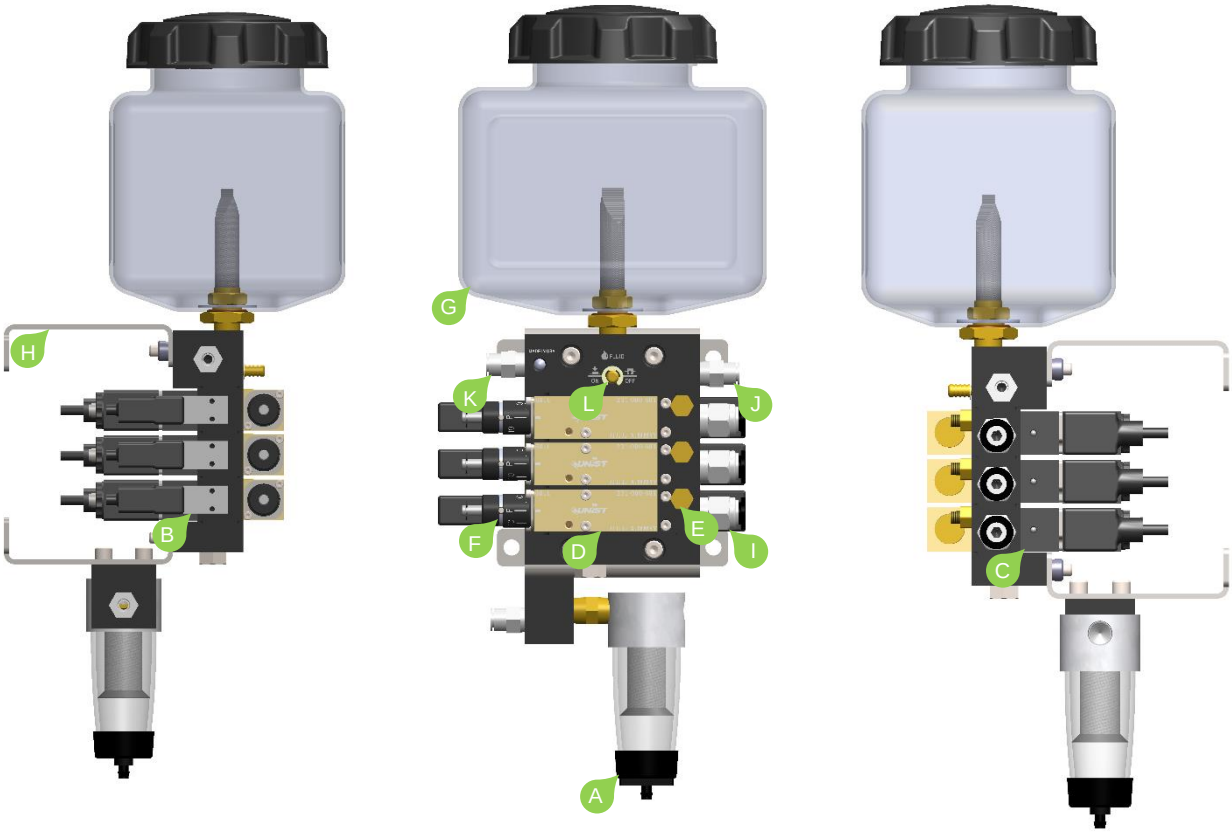


Figure 6: Direct Actuation Layout (typical)

Common

A. Air Filter/Air Inlet
80 to 100 psi [5.5-7 bar] recommended

B. Pulse R
One valve and device for every group

C. Atomize Air Control Valve
One valve for every group (not present on fluid only groups)

D. 230 Micro Pump
Precise, reliable, and self-priming
20, 40 or 60µL output options

E. Air Metering Screw
Controls nozzle air flow (not present on fluid only manifolds)

F. Pump Stroke Adjustment
Controls volume delivered per stroke
Not present on fixed displacement pump

G. 16 oz Fluid Reservoir
Additional sizes and styles available

H. Mounting Block
Magnet mount option shown

I. Outlet Port
Connection port for fluid outputs

J. Fluid on/off Valve
Push in to allow fluid flow to pump stack
Pull out to stop fluid flow to pump stack

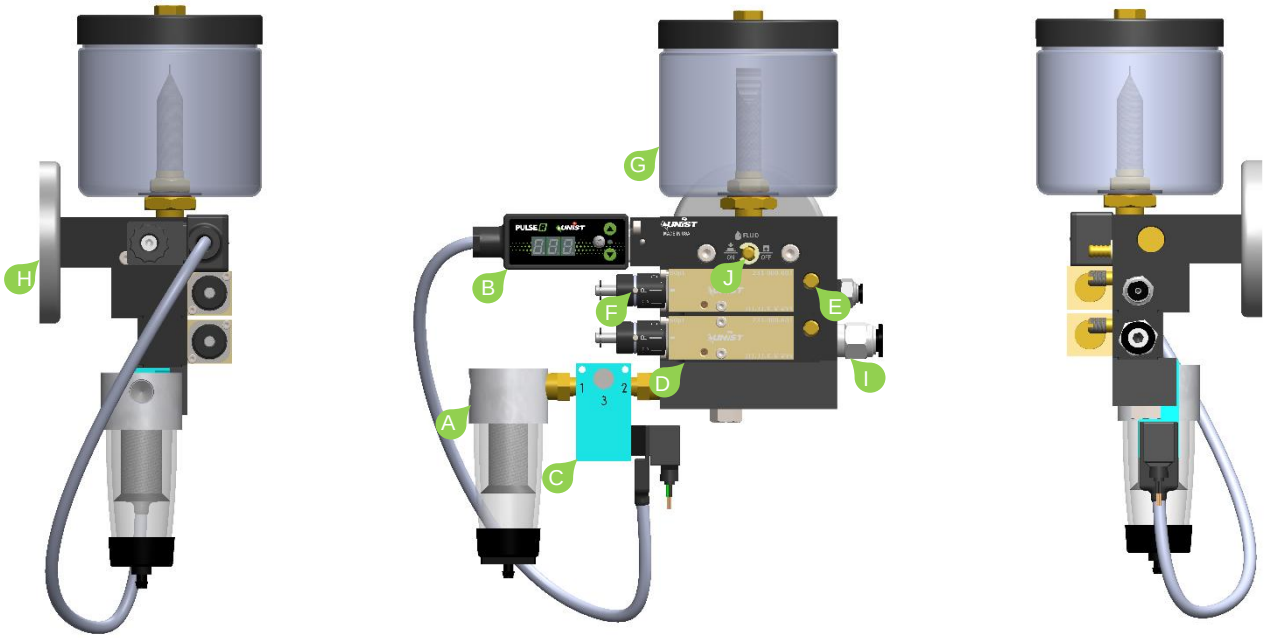


Figure 7: Common actuation layout (typical)

Remote

A. 230 Micro Pump
Precise, reliable, and self-priming
20, 40 or 60µL output options

B. Air Metering Screw
Controls nozzle air flow (not present on fluid only Manifolds)

C. Pump Stroke Adjustment
Controls volume delivered per stroke
Not present on fixed displacement pump

D. 64 oz Fluid Reservoir
Additional sizes and styles available

E. Mounting Bracket
Magnet mount option available

F. Outlet Port
Connection port for fluid outputs

G. Atomize Air Inlet
Air supplied for atomization of fluid (not present on fluid only Manifolds)

H. Actuation Air Inlet
80 to 100 psi [5.5-7 bar] air pressure recommended

I. Fluid on/off Valve
Push in to allow fluid flow to pump stack
Pull out to stop fluid flow to pump stack

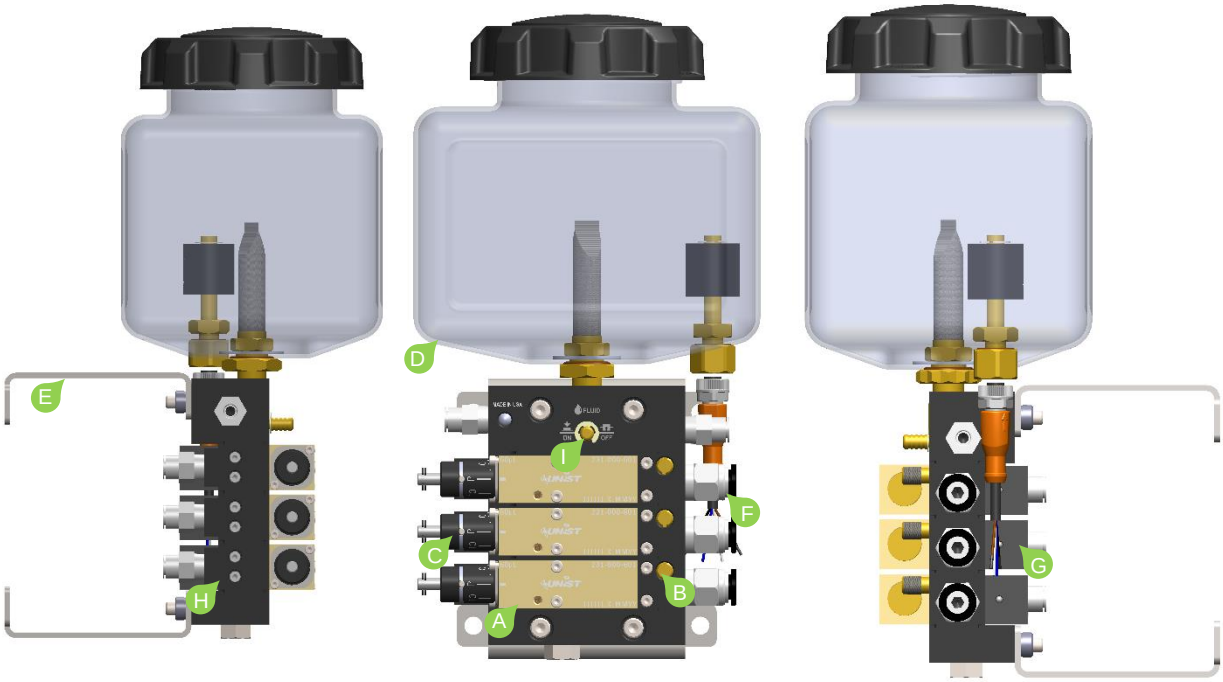


Figure 8: Remote actuation layout (typical)

Common, Grease System

A. Air Filter/Air Inlet
80 to 100 psi [5.5-7 bar] recommended

B. Pulse R
One valve and device for every group

C. 230 Micro Pump
Precise, reliable, and self-priming
20, 40 or 60µL output options

D. 16 oz Pressurized Fluid Reservoir
Additional sizes and styles available

E. Low Level Switch
Low level switch option shown

F. Mounting Block
Magnet mount option shown

G. Outlet Port
¼ in Compression fitting connection for fluid outputs

H. Reservoir manual air inlet slide valve
Slide up to pressurize reservoir
Slide down to relieve reservoir pressure

I. Reservoir Pressure Regulator
30 psi [2 bar] recommended

J. Fill Port
Standard grease zerk, use a grease gun to fill reservoir

K. Relief valve
80psi relief valve

L. Visual Level Indicator
Moves up and down with grease level

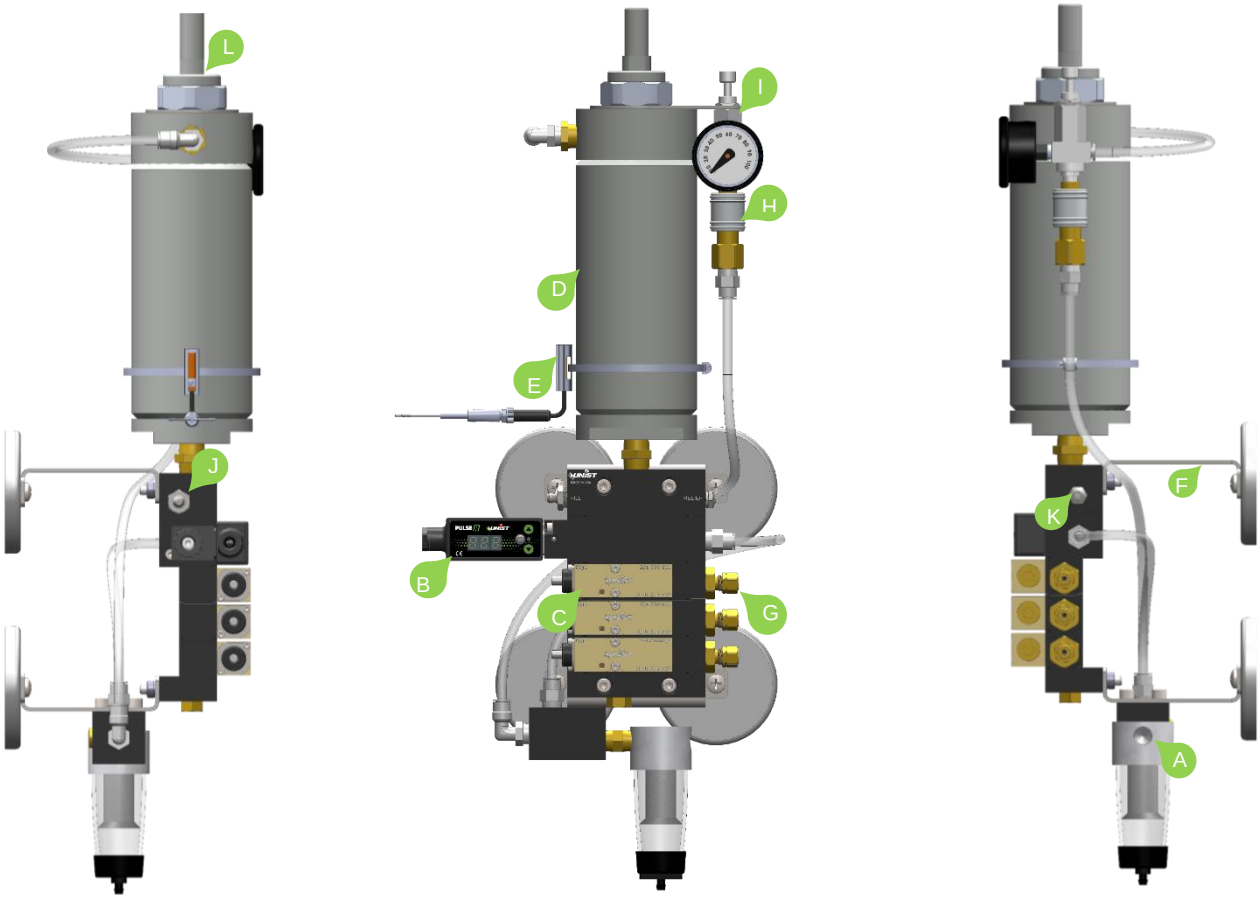


Figure 9: Common actuation, Grease system layout (typical)

Specifications

Supply Air Pressure		Clean, dry compressed air, 80-100 psi [5.5-7 bar], 25 SCFM [708 LPM] Minimum			
Supply Fluid Pressure		For systems with a pressurized fluid supply: 15 psi [1 bar] Max			
Pumps	**Fluid**	**Pump Size** (Output at Full Stroke)	20µL	40µL	60µL
		Max Cycles per Minute*	650	650	540
		Max Output Rate*	780mL/hr	1500mL/hr	1900mL/hr
	Grease (NLGI 0)	**Max Cycles per Minute****	600	500	500
		Max Output Rate**	720mL/hr	1200mL/hr	1800mL/hr
Air Flow Rate		0-4.7 SCFM [0-131 LPM] for each air and oil output. 1-2 SCFM [28-56 LPM] typical			
Fluid Viscosity		30-5000 SUS/100°F NLGI Grade 000 to NLGI Grade 3			
Flow Sensor		PNP sensor, 5-28VDC			
Pump Timer		**Pneumatic Pulse Generator**	Recommended: 5-50 pulses/minute Maximum: 200 pulses/minute (not recommended for continuous operation)		
		Pulse R™	Recommended 5-50 Cycles per minute (Modes 1 & 2 on the Pulse R™) Maximum: 250 cycles/minute		
Direct Pump Actuation On/Off Time		0.030s Minimum On time/ 0.060s Minimum Off Time **			
Operating Temperature		32°-122°F [0°-50°C]			
Storage Temperature		4°-158°F [-16°-70°C]			

**Fluid cycles per minute based on Coolube® 2210 and direct actuated pumps, reference Figure 10 on page 8 for other fluid viscosities*

***Grease cycles per minute based on NLGI 0 with the pressurized reservoir set to 30psi, reference Figure 12 on page 9 for other NLGI #'s*

****For remote valve stacks this time may increase based on length of inlet air line*

Control Valve Specifications				
System Configuration	**Unist Part #**	**Voltage**	**Power**	**Din Connector Size**
Common Actuation	304917-120	120 VAC	5.4 W	9.4 mm
	304917-24A	24 VAC	5.4 W	9.4 mm
	304917-24D	24 VDC	2.4 W	9.4 mm
	304917-12D	12 VDC	2.4 W	9.4 mm
	68-1040-18110	120 VAC	5.4 W	9.4 mm
	68-1040-18-24	24 VAC	5.7 W	9.4 mm
	68-1040-18-24VD	24 VDC	5.4 W	9.4 mm
	68-1040-18-12VD	12 VDC	1.8 W	9.4 mm
Direct Actuation	68-1043-120	120 VAC	3 W	9.4 mm
	68-1043-24D	24 VDC	2.5 W	9.4 mm
Direct Atomization	232-100-24D	24 VDC	6.5 W	11 mm
	232-100-120	120 VAC	8.5 W	11 mm
Note: Systems come supplied with DIN connector(s), reference Figure 18 on page 12 for wiring information.				

Pump Specification Graphs - Fluid

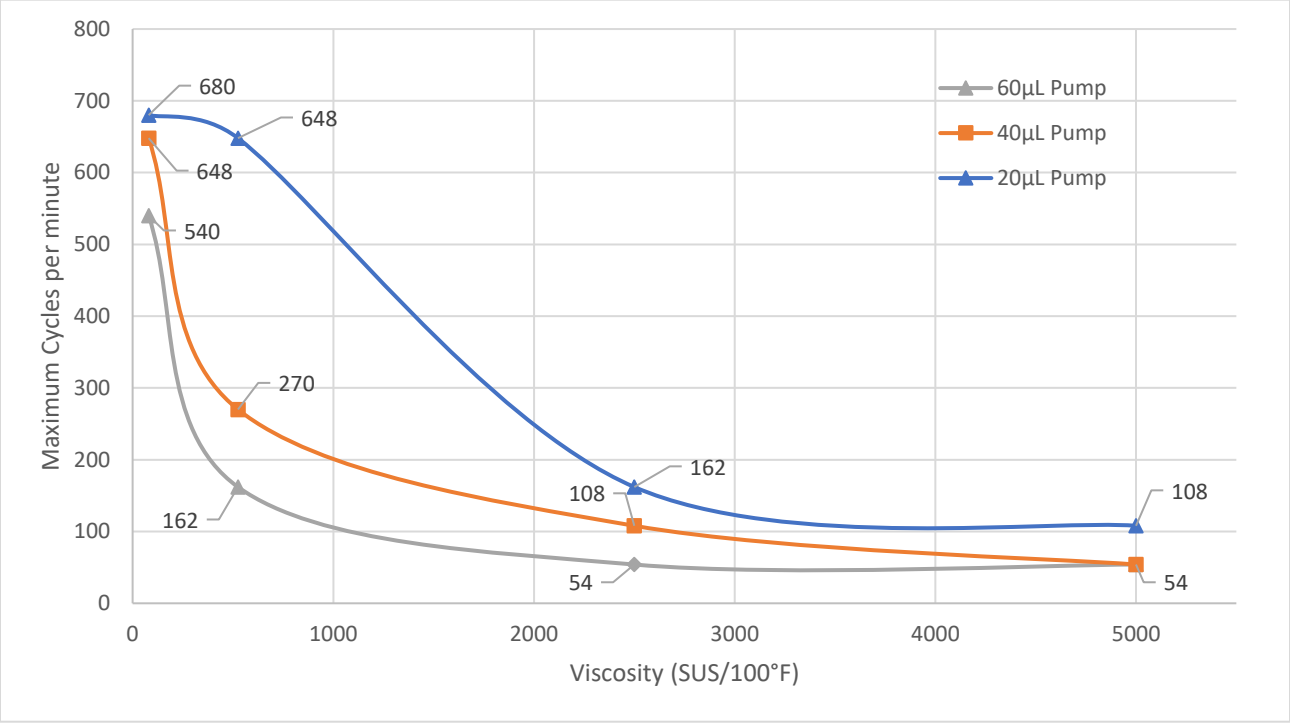


Figure 10: Maximum cycles per minute based on fluid viscosity

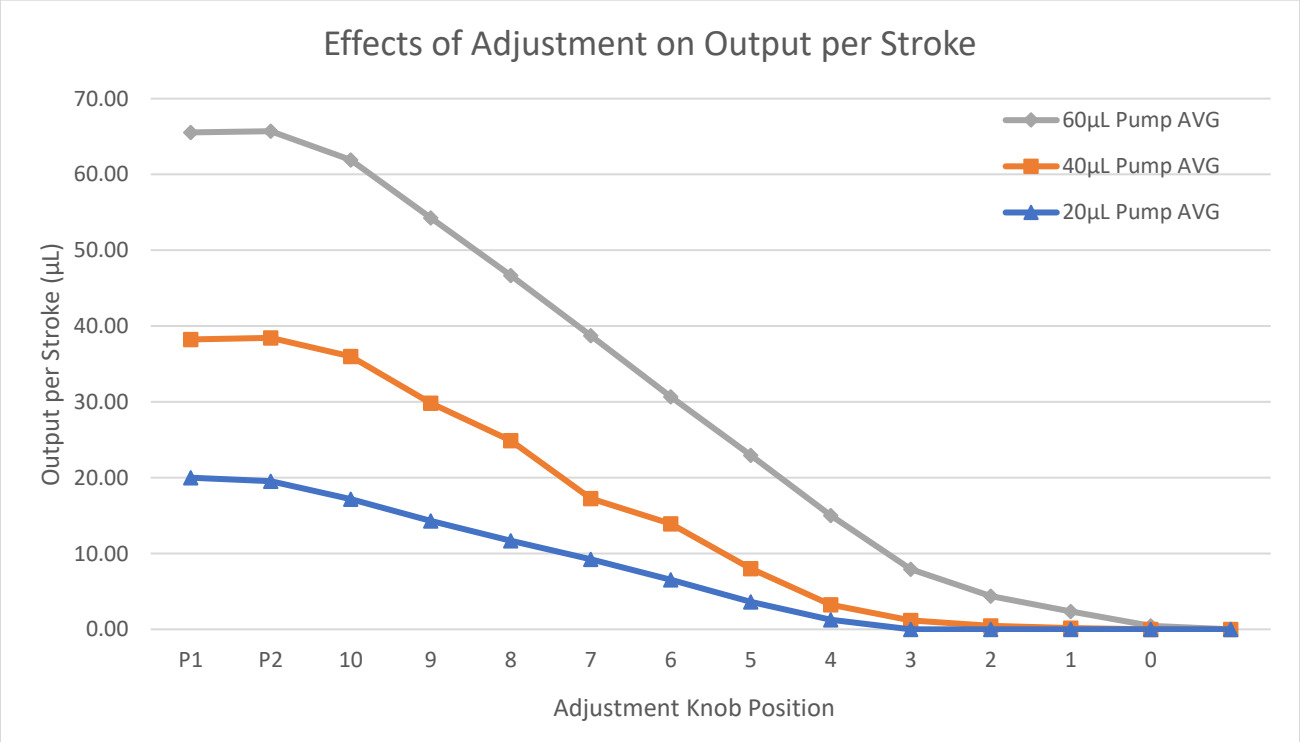


Figure 11: Effect of adjustment knob position on fluid output

Pump Specification Graphs – Grease

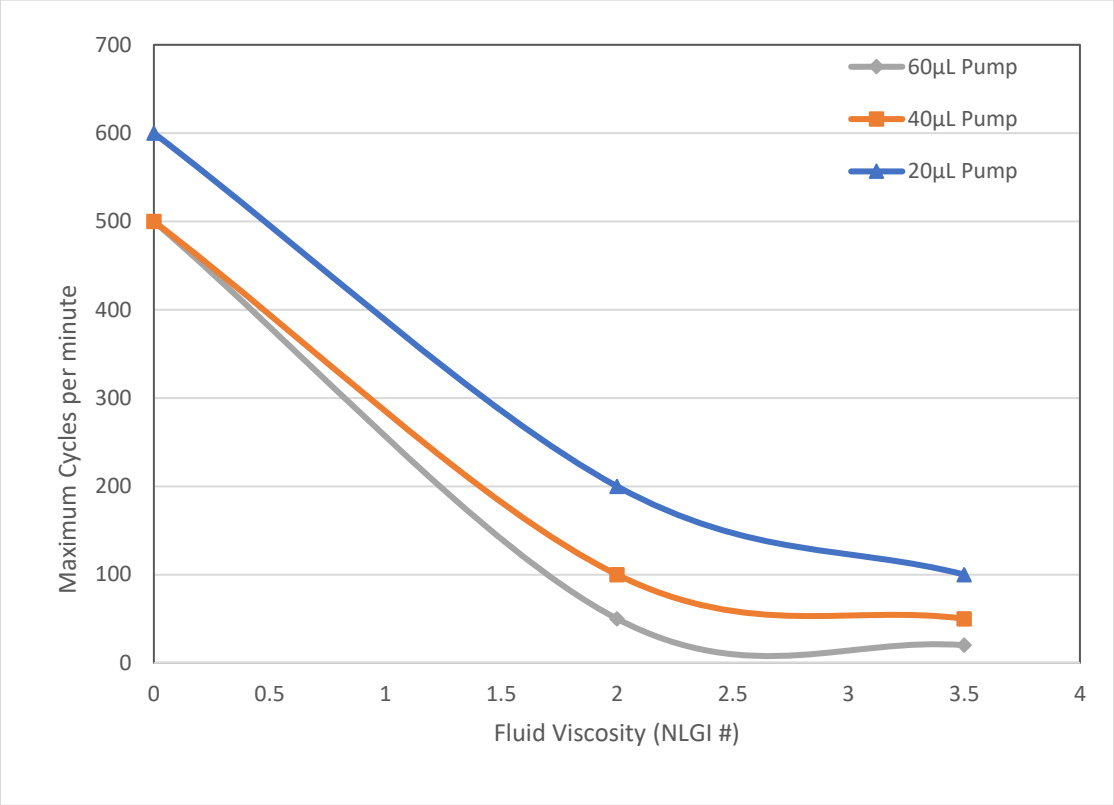


Figure 12: Maximum cycles per minute based on Grease NLGI #

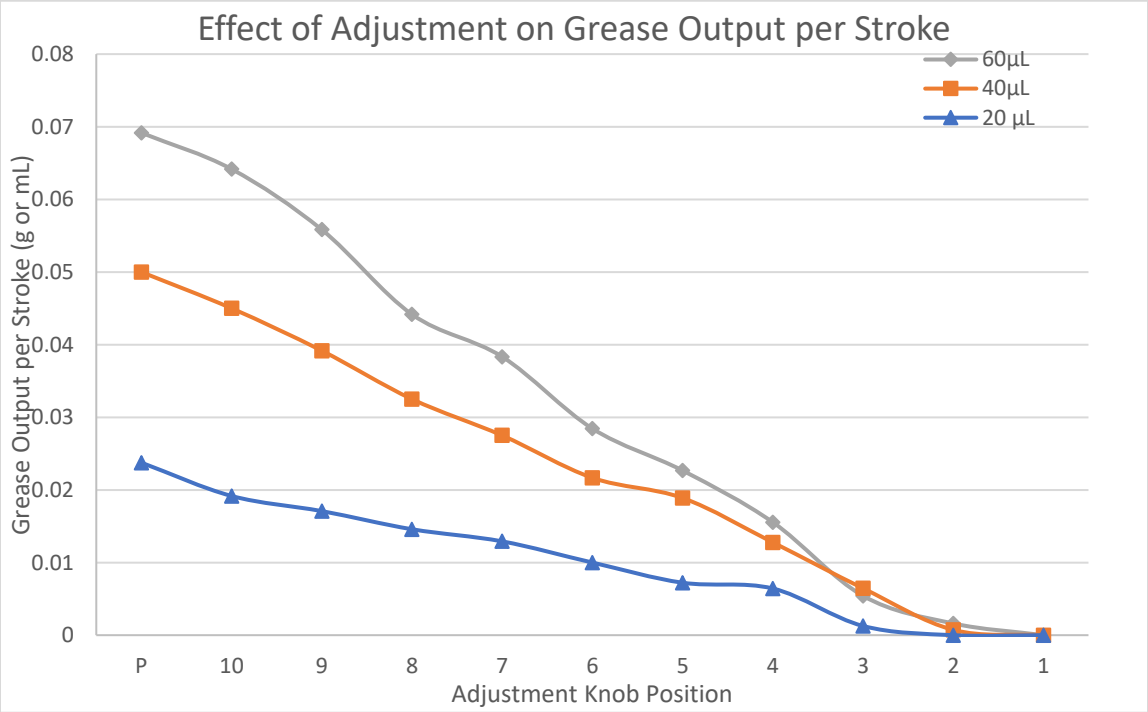


Figure 13: Effect of adjustment knob position on grease output

Fluid Flow Sensor Specifications

Flow sensors can be used to detect fluid output from the pump but have limitations in regard to the viscosity of the fluid and the amount of fluid being dispensed each stroke. The graph in Figure 14 should be used to determine the minimum adjustment knob position with respect to the viscosity. Adjustment knob positions lower than the line for the respective pump size and viscosity may cause unreliable flow sensing results. Figure 15 shows the maximum cycle rate for each pump size (at full stroke) with respect to fluid viscosity. Thinner fluids require a higher adjustment knob position (larger amount of fluid per stroke) but can run at faster cycle rates. Thicker fluids can tolerate lower adjustment knob positions but have a lower max cycle rate. See page 18 for more details.

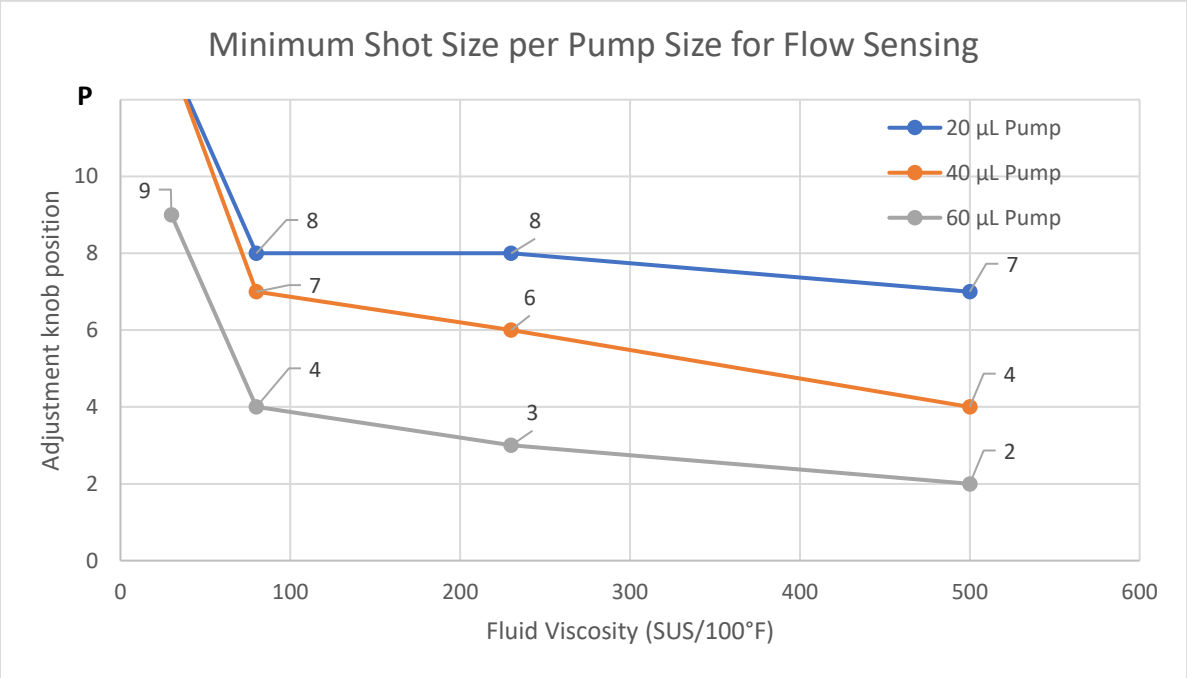


Figure 14: Using values below the lines shown may not be reliable for flow sensing with respective fluids

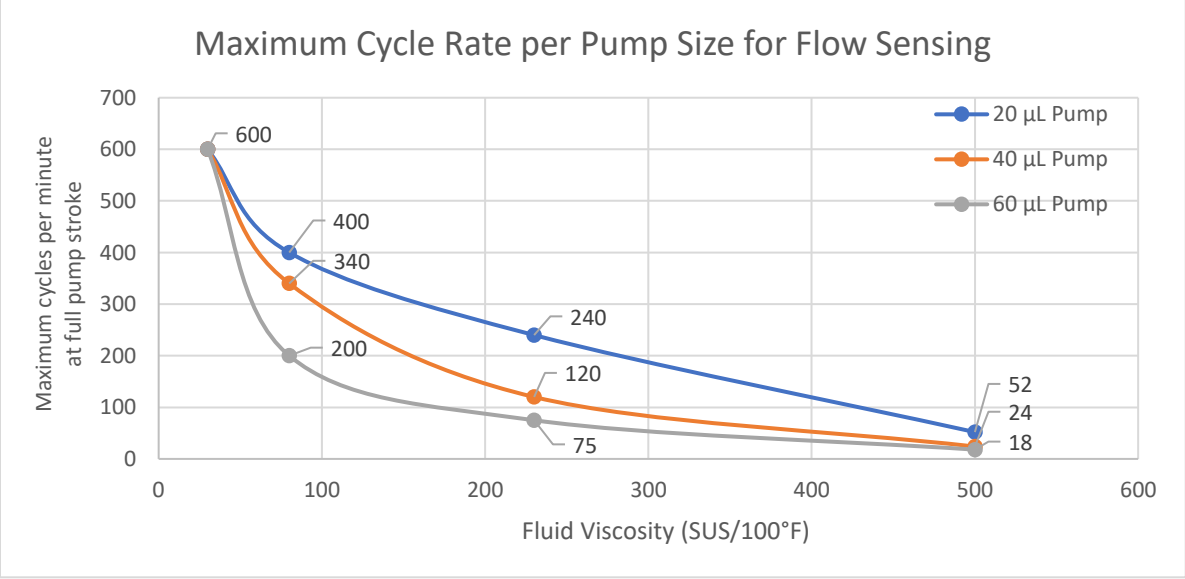


Figure 15: Cycle rates above the lines shown may not be reliable for flow sensing with respective fluids

System Installation

Mounting Dimensions

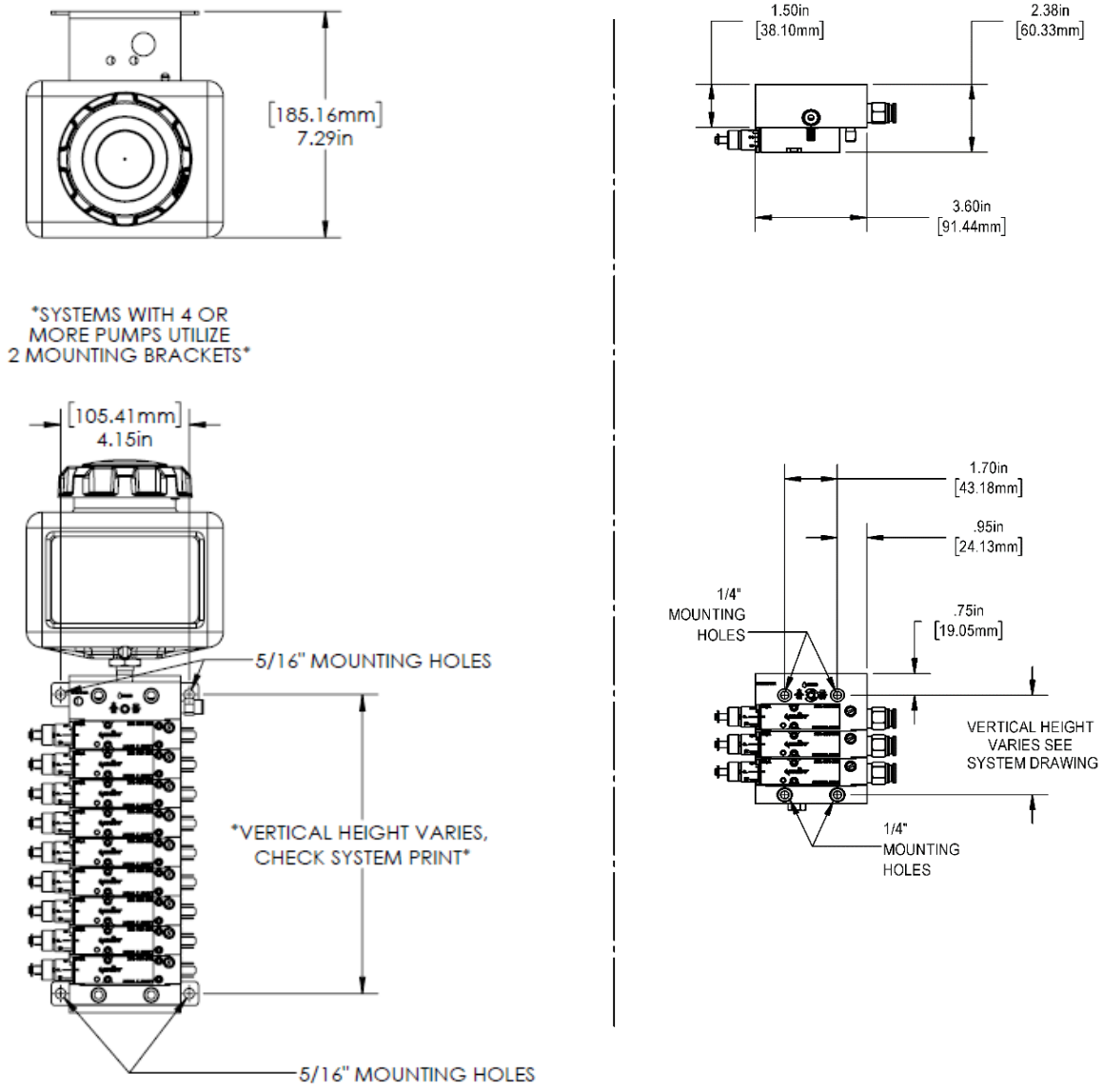


Figure 16: Mounting hole locations for a system with brackets and a system without brackets

Position & Mount System

Mount the system on or near the machine, where it is convenient to access and there are no obstructions that may pinch or kink inlet or outlet lines. Ensure the unit is level and the reservoir is up.

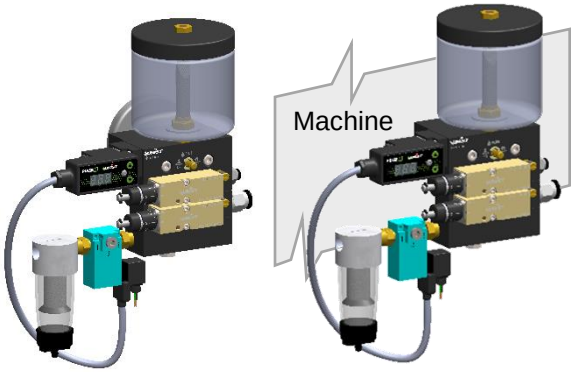


Figure 17: Magnet mount and direct mount option

Connect Control Valve

The pneumatic circuit on the 230 Micro Pump System can be controlled with a solenoid valve, multiple direct manifold mount valves or an air pilot valve. If the system is to be turned on whenever the machine is operated, the solenoid valve is wired to the operation circuit on the machine. If independent operation has been supplied, the direct mount solenoid valves must be wired into the machine controls. Details regarding valve wiring can be found in Figure 18 and valve electrical requirements can be found under Specifications on page 6.

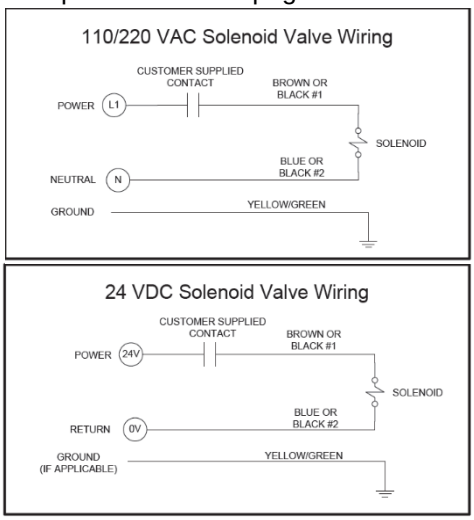


Figure 18: Valve Wiring

Connect Low level Switch (if applicable)

A low-level switch indicates that fluid needs to be added to the reservoir. If your system has a low-level switch, it can be connected to an input on the machine, an external annunciator, or other device that indicates the fluid level is low.

Fluid Reservoir Level Switch

The wiring for a level switch located in the fluid reservoir is shown below.

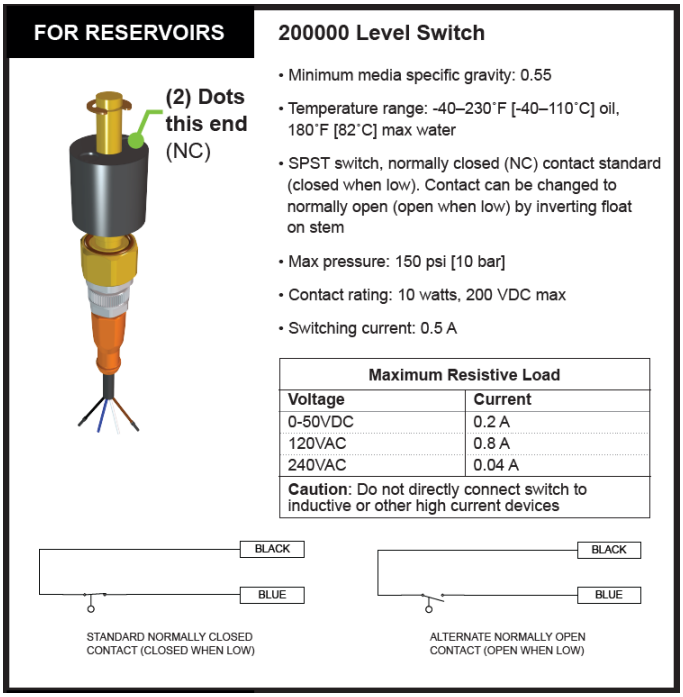


Figure 19: Low level switch information

Normally Open or Normally Closed for Low Level Switch

The float is installed at the factory so that the switch is open when the reservoir is full and closes when the fluid level is low. This works well for turning on alarms and lights. However, if broken wire detection is desired in the circuit logic, this can be changed by inverting the float stem, so the switch is closed when the reservoir is full and open when it is low.

Pressurized Reservoir Level Switch

Level switches located on the outside of the pressurized reservoir will have an M8 connection. The M8 cordset wiring is shown below.

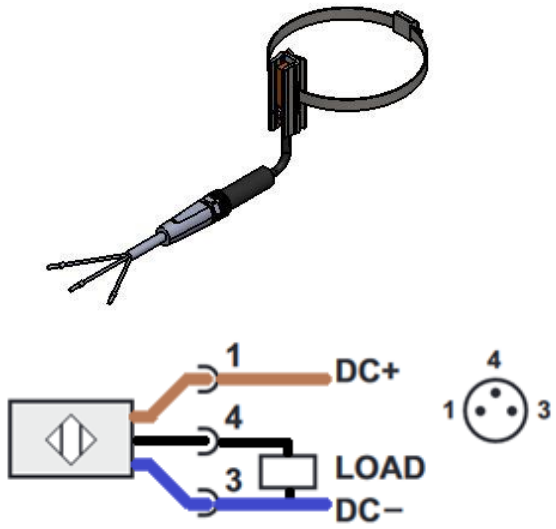


Figure 20: Low Level Switch Wiring

The low level switch point can be adjusted by loosening the cylinder clamp and sliding it up or down on the reservoir. The sensor is normally closed PNP with a 10-30 VDC operating voltage. When the reservoir is empty the switch is open, An LED on the switch will also illuminate when the reservoir is empty.

Air supply

Attach an air supply line to the 1/4” NPT inlet on the air filter. Depending on system configuration, the air inlet filter may be mounted underneath the pump stack as shown in Figure 22.

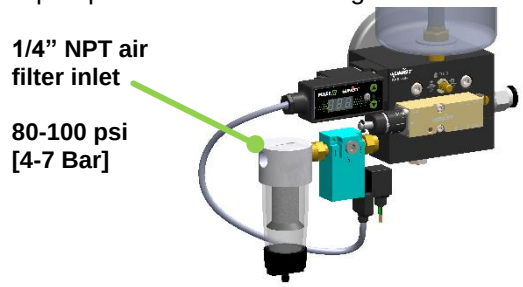


Figure 21: Air supply to filter

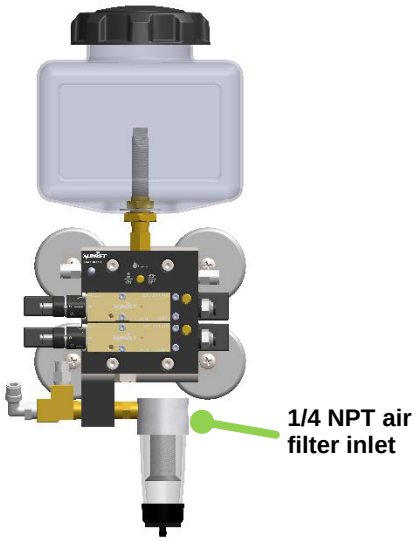


Figure 22: Air supply to filter in an alternate configuration

Attention: *Use caution when connecting the system to a compressed air source. Only qualified individuals should make this connection. Failure to do so safely could cause damage to property and personal*

Fluid

For a system with a gravity feed reservoir, remove the cap, fill the reservoir with fluid, and replace the cap.

Figure 23: Filling reservoir

If the system is fed pressurized fluid from an external source and is equipped with an air trap, attach the fluid source, set the supply pressure to 5-15 psi [0.34-0.69 bar], and depress the air vent cap until the trap is 75% full. Do this periodically to maintain 10-75% full to prevent air entering the pump stack.

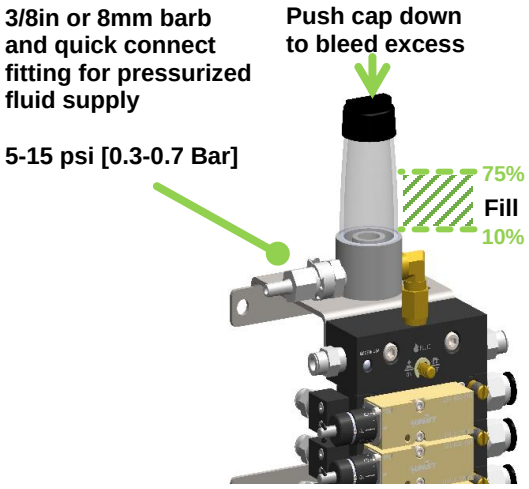


Figure 24: Bleeding air trap

Attention: *Use caution while connecting to a pressurized fluid source. Fluid leaks cause hazardous slippery conditions. Only qualified individuals should attempt to make this connection.*

To fill a system with a pressurized reservoir first turn off pressure to the reservoir by sliding the manual air inlet slide valve down. As shown below there is a grease zerk located on the pump stack to fill the reservoir. As the reservoir is filled the level indicator will rise. There is a relief valve opposite the grease zerk. When the reservoir is full grease will flow out of this relief valve. Once full the air to the pressurized reservoir can be turned back on by sliding the valve up. The recommended pressure setting on the reservoir is 30psi. The reservoir pressure should never exceed 70psi.

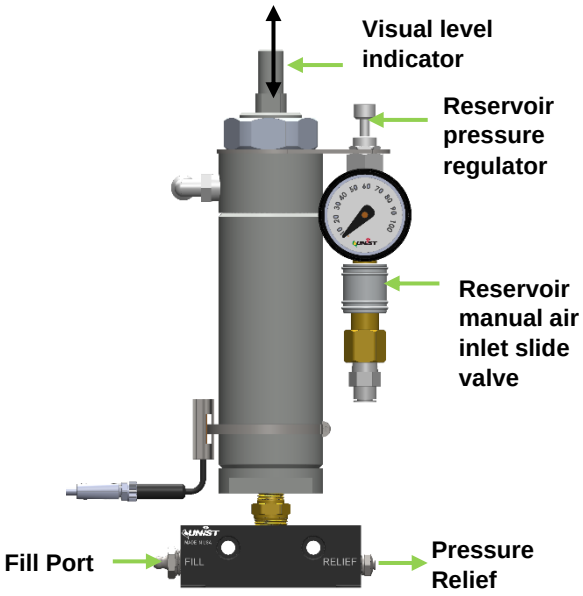


Figure 25: Pressurized Reservoir Filling

Fluid Output Nozzle

Mount and position the fluid output nozzles and route the tubing back to the pump stack. Keep the nozzle as close as possible to the point of application. Connect the fluid tubing to the pump outputs as required.

Connecting Coaxial Outputs

The 230 Series system uses coaxial quick connects for all nozzles with coaxial tubing. Fluid passes through the inner tubing, with air in the outer. With the push-to-connect fitting threaded onto the manifold at the fluid outlet, simply push the quick connect splicer into the fitting until it is firmly seated. You should be able to feel a distinct click when the 3/8in tubing has been captured by the tube fitting. A light coat of grease (Molykote 55 or equivalent recommended) should be applied to the O-ring at the tip of the splicer and a slight twisting motion should be used while inserting to avoid damage upon insertion.

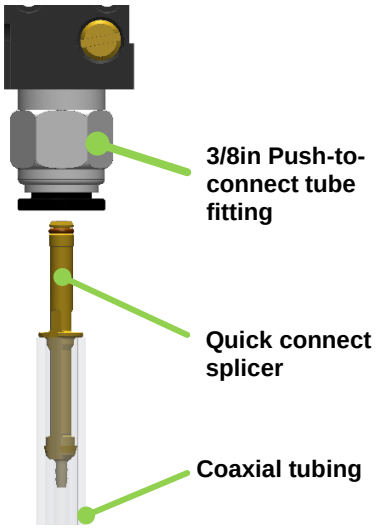


Figure 26: Inserting coaxial tubing with quick connect splicer

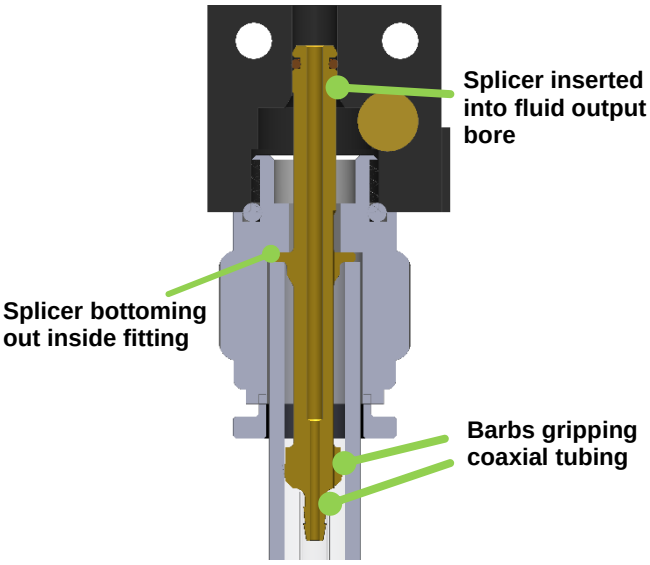


Figure 27: Cross section view of quick connect splicer properly inserted

When properly inserted, only about 0.20in [5.1mm] of the quick connect should be visible outside of the fitting. If more of the splicer body can be seen, then there is a risk of fluid leaking into the atomize air of the co-ax tubing.

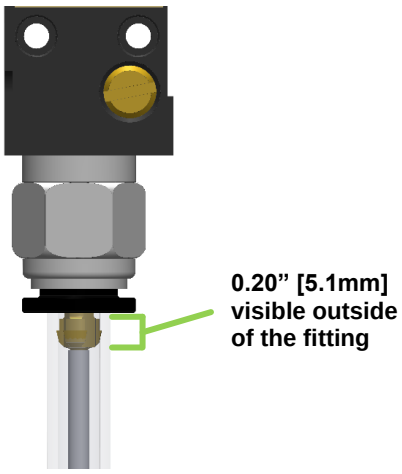


Figure 28: 0.20" of quick connect splicer is visible outside of the fitting

Connecting Compression Outputs

230 Series systems dispensing grease will use compression fittings for fluid only outputs. It is up to the user to run the tubing from the pump output to the grease application point. For optimal performance, use rigid tubing and minimize tubing length. This will result in a quicker, more discrete output. Longer runs and flexible tubing, such as nylon, will lead to a slower, oozing, and less discrete output. When using flexible nylon tubing, use the provided support sleeve for a secure fit. The support sleeve is not needed if using ¼ inch rigid tubing like copper or steel.

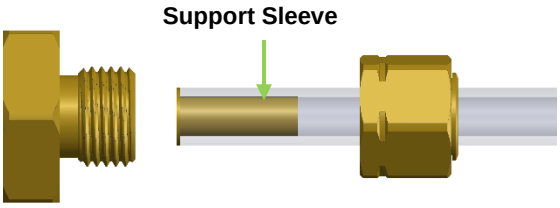


Figure 29: Compression Fitting with Support Sleeve

Flow Sensing (If Applicable)

The flow sensor option monitors the output of each pump to ensure that it is pumping fluid each time it strokes. If the system is ordered from the factory with the flow sensing option, the flow sensors will be calibrated properly for use with Coolube® fluid. Fluids of different viscosities may need slight adjustment of the flow sensor to ensure proper operation.

To calibrate the flow sensors, ensure they are properly connected and powered per the wiring diagram in Figure 30, then follow the procedure below referring to Figure 31 & Figure 32.

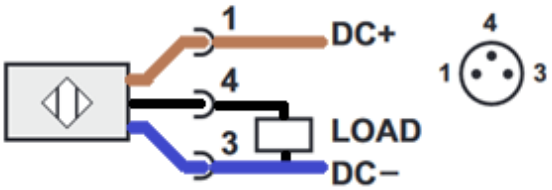


Figure 30: Flow Sensor Wiring Diagram

Locate the flow sensor on the bottom of each micro pump. Begin the calibration process by loosening the flow sensor set screw and sliding the flow sensor all the way towards the manifold. Using a non-ferrous material tool, (brass, aluminum, plastic, etc.) slowly move the flow sensor towards the pump until the red LED on the sensor illuminates.

Next, move the sensor very slowly towards the manifold until the red LED goes out. Tighten down the flow sensor set screw. Cycle the pump and physically inspect the output to make sure it is pumping fluid. Observe the flow sensor while it is pumping fluid to ensure that the red LED flashes with each pump stroke.

With the flow sensor properly calibrated, the signal can then be monitored by a PLC or any other input device compatible with a 5-28VDC input. The signal should be monitored to ensure it goes high within 50ms of the pump stroke. There is typically a 20ms delay between the pump stroke and the signal going high. This can be used to alert an operator of fluid not dispensing despite the pump actuating.

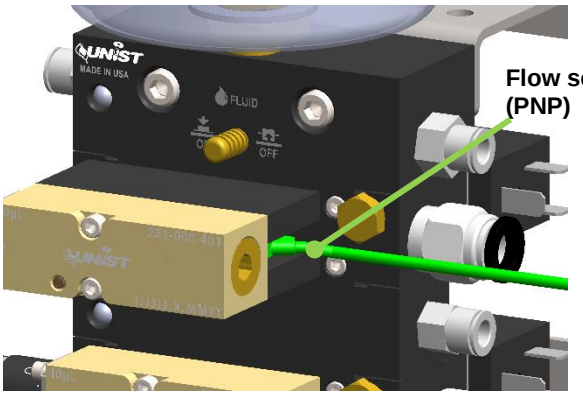


Figure 31: Location of Flow Sensor, shown in green

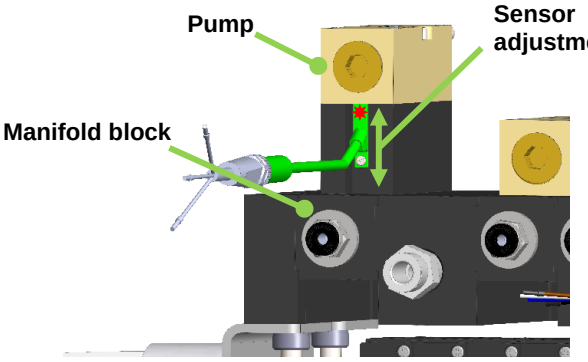


Figure 32: Flow sensor location detail, showing set screw and red LED

Start Up

Turning the System On & Off

The 230 Micro Pump System is turned on or off using a manual slide valve, a solenoid valve, or an air pilot valve. If the unit is equipped with a manual slide valve, it is turned on and off by sliding the valve to the desired position. Moving the slide valve barrel toward the air filter will turn air flow to the system on. Moving the slide valve barrel away from the air filter will turn air flow to the system off.

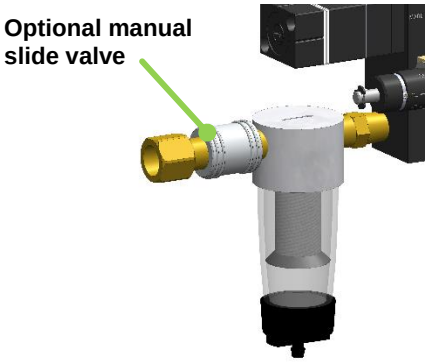


Figure 33: Manual slide valve

Solenoid control will turn the unit on when the correct electrical voltage is applied. In a common actuation system, there is one valve for each group of pumps. In a direct actuation system, each pump will have its own actuation valve and air atomize valve (if applicable). Pumps set up with remote actuation will need valves to supply actuation atomization air these can be grouped or indepdant.

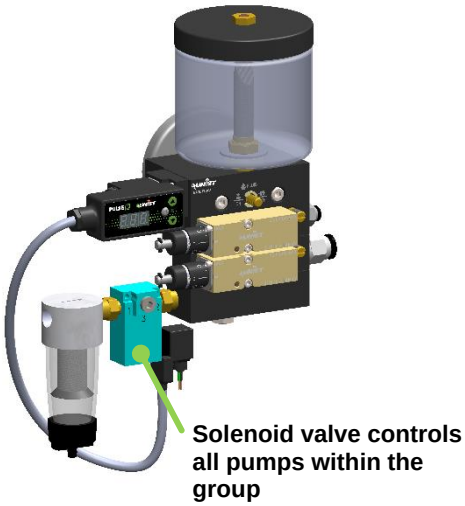


Figure 34: Common actuation

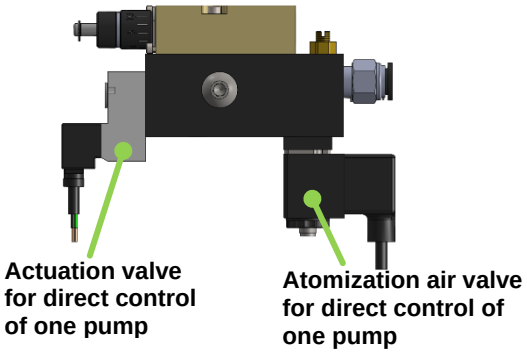


Figure 35: Direct actuation and atomization

If electrical control is not an option, an air pilot valve can be used to turn the unit on when the air signal is received.

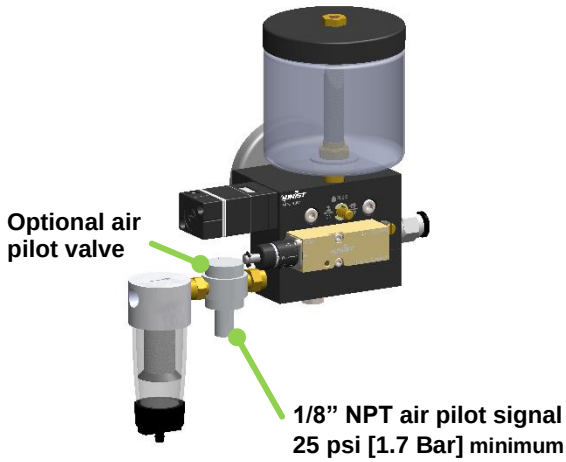


Figure 36: Pneumatic air pilot valve

Turning on the Pressurized Reservoir (If applicable)

A grease system will have a pressurized reservoir. Air to the reservoir is turned on by sliding the manual air inlet slide valve to the up position. Above the valve is a regulator to set the reservoir pressure. The recommended setting is 30psi however this can be increased to achieve higher cycle rates. This pressure should not exceed 70psi.

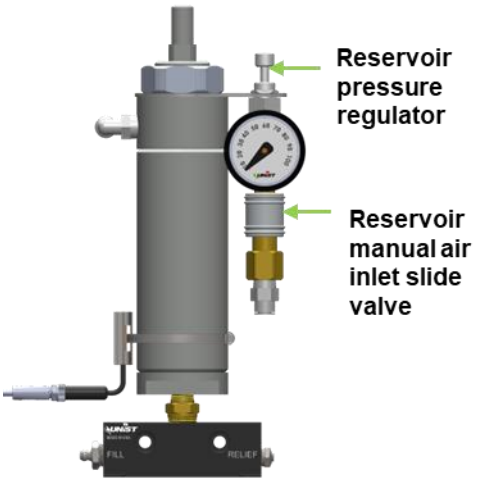


Figure 37: Turning on the Pressurized Reservoir

Prime pumps

230 micro pumps are self-priming at full stroke, which means they can draw fluid into the fluid inlet even if there is air present in the line. If there is an issue with a pump not priming fast enough, increase the cycle rate momentarily. It can take a longer time to prime large pump stacks or long fluid inlet lines as the pumps only displace 20-60µL per stroke. Ensure there are no air bubbles in the fluid outlet line before starting operation.

Attention: *Ensure all people are clear from the area of the system output nozzles when operating the outputs manually. Failure to do so could result in personal injury.*

Setting Desired Output

It is suggested that the pump be left at full stroke and fluid output be adjusted by increasing or decreasing the pump cycle rate. However, in cases where very low output is needed and a stable spray pattern cannot be maintained when adjusting the pump timer alone, the pump stroke length can be decreased, and the pump cycle rate increased.

Pump Stroke

The pump is only self-priming at full stroke. This is shown with a “P” on the adjustment knob that lines up with a mark on the pump body. Rotating the knob towards the “0” mark will decrease the output, eventually shutting the pump off.

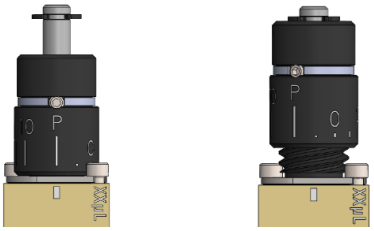


Figure 38: Pump adjustment knob in prime position (left) and in the off position (right)

Stroke Frequency

Stroke frequency is the best way to adjust the amount of fluid being applied. If less fluid is desired, decrease the cycle rate but ensure there is still a continuous spray with no pulsing. If more fluid is desired, increase the cycle rate. Depending on the system set up, the max cycle rate can be up to 650 cycles per minute.

Pulse R

Press the up or down arrow to increase or decrease the cycle rate or number of shots. Cycles per minute or number of shots is displayed on the screen depending on mode of operation. Reference Appendix G: Pulse R Operating Modes and Fault Indication for more information.

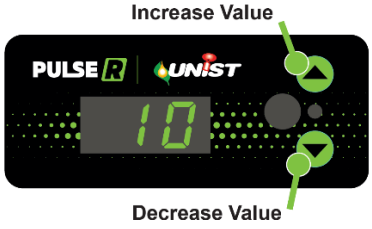


Figure 39: Pulse R electronic timer

Pulse generators with adjustment knob

Turn the knob clockwise or counterclockwise to decrease or increase the frequency. The number on the dial will line up with the alignment

notch on the mounting block for a rough approximation of cycles per minute.

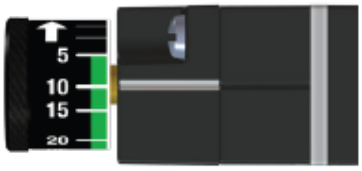


Figure 40: Pulse generator adjustment knob

Air Setting

On atomizing pumps, the air metering screw will adjust how fine a spray is generated. Too little air will result in a pulsating and spitting spray. Too much air will create a fog of very fine mist.

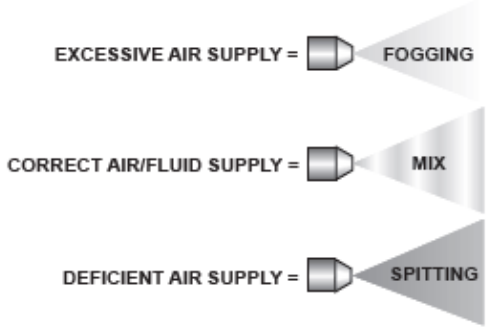


Figure 41: Adjusting airflow

Adjust the air metering screw to the desired degree of atomization for the application. The recommended initial setting for the air metering screw is found by rotating the air metering screw clockwise until it is fully seated, then backing it off 3/4 of a turn (270 degrees). Use the minimum amount of air necessary to deliver the fluid to the point of application. Excess air flow will cause undesirable fogging!

Figure 42: Use metering screw to adjust airflow

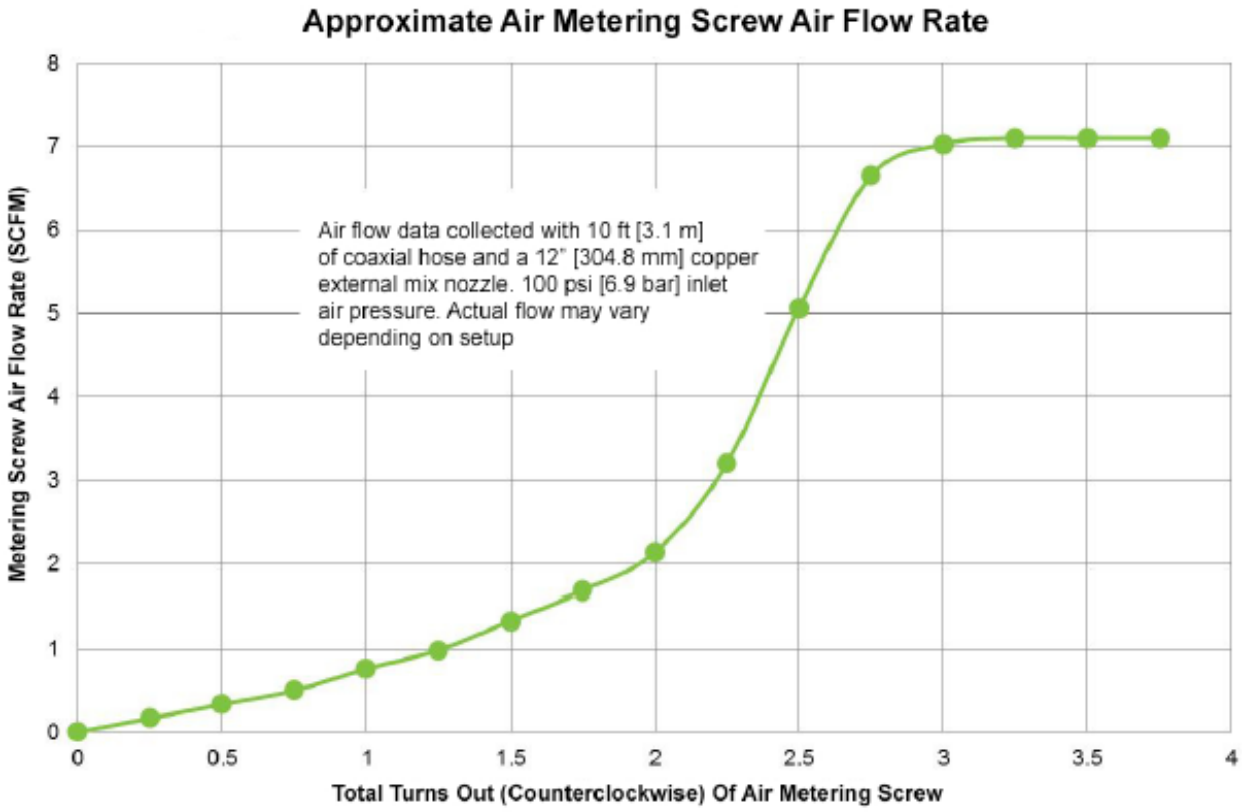


Figure 43: Approximate air metering screw airflow rate

Troubleshooting

Pump is not cycling

- Confirm the pump timer is not set to 0.
- Confirm that the inlet air pressure is between 80-100 psi [4-7 bar].
- Confirm that actuation of the controlling manual valve, solenoid valve, or air pilot valve allows air to flow into the system.
- If using a pneumatic pulse generator inspect the inlet screen for debris and clean if necessary. (See Figure 44)

No fluid output from cycling pump

- Confirm pump is cycling by observing the air piston move in and out of the pump.
- Ensure the adjustment knob is not set to 0.
- Confirm that the fluid reservoir is not empty.
- Confirm the fluid valve is in the on position (pushed in)
- If the system has a pressurized reservoir confirm that the manual air inlet slide valve is in the up position.
- Confirm the pump is primed by cycling the pump with the adjustment knob turned to “P” and a full reservoir. Once the fluid outlet line does not have air bubbles in it, the pump is primed.
- Perform a pump rebuild. Reference Appendix E: Pump Rebuild Instructions on page 35.

Fluid flows continuously out of a nozzle without pumps cycling

- If using pressurized supply, ensure fluid pressure is set below 15psi.
- Perform a pump rebuild to replace outlet check valve seal and spring. Reference Appendix E: Pump Rebuild Instructions on page 35.

Air bubbling upward into fluid reservoir when system is operating

- Perform a pump rebuild to replace outlet check valve seal and spring. See rebuild instructions in Appendix E: Pump Rebuild Instructions on page 35.

Fluid is flowing in the pump outlet

- Inspect outlet check seal for debris or a worn seal. Replace seal or rebuild pump.
- Perform a pump rebuild to replace the metering pin seals.

Fluid is leaking from the plug on the pump body

- Remove the pump body from the manifold, then remove the bottom plug of the pump to inspect the crush seal o-ring for any cuts or wear. Replace the o-ring if defective. Reference Appendix E: Pump Rebuild Instructions on page 35.

The pump is running, but the outlet is not dispensing fluid adequately or consistently (reduced fluid output)

- Check for a kink or break in the line.
- Confirm that the fluid reservoir is not empty.
- Confirm that the inlet air pressure is between 60-100 psi [4-7 bar].
- Confirm that the pump stroke adjustment knob is set appropriately (not at 0).
- Confirm the pump timer is set appropriately.
- Confirm the tubing is seated on both the quick connect splicer and the nozzle splicer.
- If the system has a pressurized reservoir confirm that the manual air inlet slide valve is in the up position and the reservoir is adequately pressurized (30-70psi).
- Confirm cycle rate has not exceeded the max cycle rate for the given fluid viscosity, see Figure 10 and Figure 12.
- Perform a pump rebuild. Appendix E: Pump Rebuild Instructions on page 35.

Pulse generator not operating

Remove pulse generator and check air inlet screen for particulate matter. If none found, replace generator. See illustration below for details on the position of the air inlet screen.

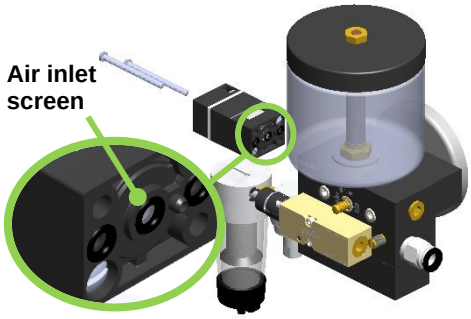


Figure 44: Air inlet screen

Outer channel of Coaxial tubing has fluid in it

In some instances, the fluid can accumulate in the outer tubing. This is usually caused when too little atomizing air flow is used and/or the fluid line is lower than the nozzle coupler block. The problem can be alleviated by:

- Increasing the atomizing air flow.
- Raising the fluid line so the fluid flows down into, and eventually out of, the nozzle.
- Mounting the nozzle coupler block at an angle so fluid flows down into, and eventually out of, the nozzle. See Figure 45 for an example of proper nozzle coupler block mounting.
- Ensure quick disconnect splicer is fully inserted into fluid outlet. See page 16.
- Ensure capillary tubing is installed on internal barb.
- Remove quick connect splicer from tube fitting and inspect the o-ring on the tip of the splicer for any cuts or wear. Replace the o-ring if defective.

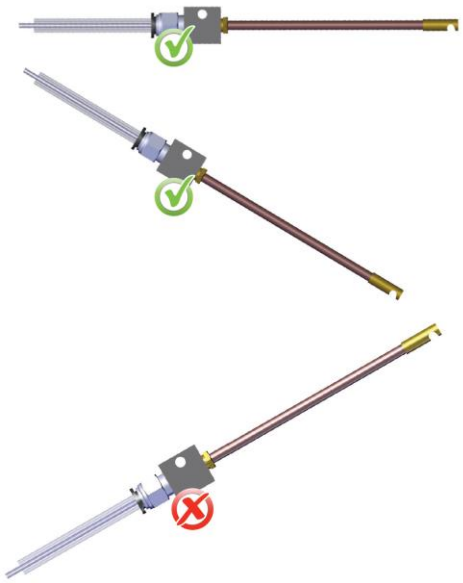


Figure 45: Proper nozzle positioning

Fluid is coming out the Pressure relief valve

If the fluid pressure exceeds 80psi it will exhaust out of the pressure relief valve

If this is happening and the reservoir is not being filled:

- Check the reservoir pressure setting. Recommended pressure is 30psi. For thicker fluids, pressure could be set as high as 70psi.
- Replace pressure relief valve

If this is happening while the reservoir is being filled:

- Verify that the reservoir pressure is off
- If the level indicator is up the reservoir may be full
- If the level indicator has not moved there may be a clog. Remove the pressurized reservoir. Push down on the level indicator or turn on reservoir pressure (start at zero and slowly increase pressure) until grease comes out. Re-install the reservoir on the pump stack.

Maintenance

Routine inspection and maintenance of the 230 Micro Pumps is critical to ensure that the overall process continues to run smoothly. Check for proper operation and output of the pump(s) every 6 months or 2.5 million cycles. Pumps that do not stroke smoothly or fail to put out the proper amount of fluid should be rebuilt or replaced. Instructions for common maintenance items are shown below.

Replacing a Pump

1. Pull out the fluid on/off valve to the off position to prevent fluid from draining out when the pump is removed.
    a. In the case of a pressurized reservoir, instead of a fluid on/off valve turn off the reservoir pressure valve.
2. Remove the two bolts on the front of the pump using a 7/64 hex wrench.
3. Replace with a new pump and tighten bolts to 6 in-lbs torque.
4. Push the on/off valve to allow fluid back into the pump stack.
5. Fully prime the pump and line before running the equipment. To prime the pump, cycle it with the adjustment knob turned to “P” and a full reservoir. Once the fluid outlet line does not have air bubbles in it, the pump is primed.

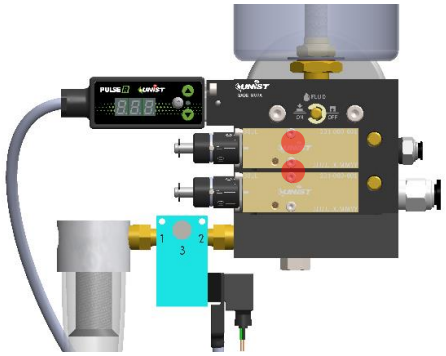


Figure 46: Removing a pump

Rebuilding a Pump

Pumps can be rebuilt, but to minimize downtime Unist recommends having a spare pump on hand so that the system does not have to be down while the pump gets rebuilt. To rebuild a pump, see the instructions in Appendix E: Pump Rebuild Instructions on page 35

Spool Valve Replacement (Fluid On/Off).

If fluid is leaking from the fluid on/off valve, it can be replaced per the instructions below.

1. Drain all fluid from the reservoir.
2. Remove the spool valve by inserting a flathead screwdriver into the back of the valve port and into the slot of the spool valve shaft. Hold the knob and loosen the assembly until it comes apart.
3. Push the spool valve shaft through the back of the top block. Be careful not to scratch the internal bore when pushing it out.
4. Check the internal bore for a lose O-ring and remove it if found. There should be three O-rings total (2 on the spool valve shaft, 1 loose).
5. Replace the seals or spool valve assembly.
6. Make sure the O-rings are greased when reinstalling (Molykote 55 or equivalent recommended).
7. Insert the valve shaft from the back of the top block. Use a screwdriver and slight twisting motion to push in until the threaded end is sticking out.
8. Place the loose -007 O-ring over the threads and onto the shaft.
9. Place a small drop of thread locker onto the thread. Over application of the thread locker can cause it to squeeze out into the valve bore, seizing the valve in place. Tighten the spool valve assembly together until it bottoms out. Do not over tighten!
10. Refill the reservoir with fluid. Ensure the spool valve is pushed into the block so that fluid can flow to the pumps.

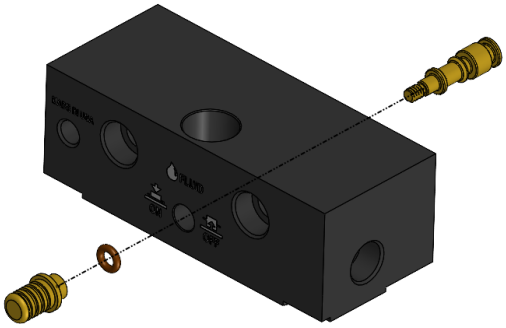


Figure 47: Replacing spool valve.

Air Filters

All air filters will need to be checked periodically to ensure there is no buildup of dirt, debris, or water. If there is water in the air filter trap, turn off the air, hold a cup below the barb and press up on the black cap to relieve the water. If the filter is visibly dirty, deenergize the incoming air, unscrew the clear housing and clean the filter.

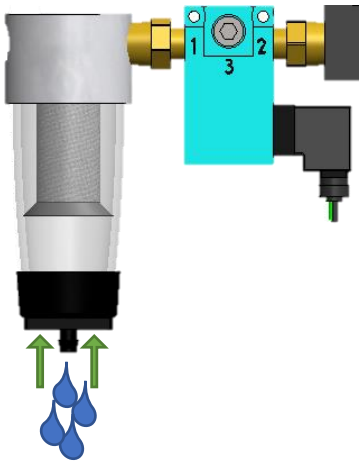


Figure 48: Purging water from the air filter trap

Reservoir

There is a strainer on the inside of all reservoirs. When refilling the reservoir make sure to clean out any dirt or debris that may be present.

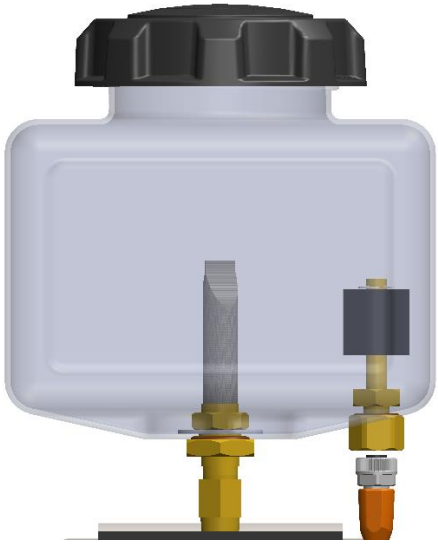


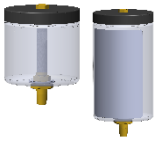
Figure 49: Cleaning reservoir

Appendix A: System Spare Parts

Adjustable Output Micro Pump
231-000-201 (20µL)
231-000-401 (40µL)
231-000-601 (60µL)

Fixed Output Micro Pump
231-000-211 (20µL)
231-000-411 (40µL)
231-000-611 (60µL)

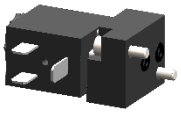
Pump Rebuild Kit
231-000-XXXR – *Replace XXX with the last 3 digits on the pump body, shown in Figure 5.*



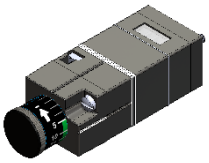
Reservoir, HDPE
69-459-PE (16 oz)
69-460 (32 oz)

Reservoir, 64oz., with Low Level, HDPE
301313

Pulse R Device with Wafer
305326-A1 (18mm)
305326-C1 (9.4mm)

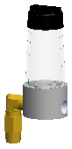


Manifold Mount Valve
23-410-XXX



Pneumatic Pulse Generator
301930

Pump Flow Sensor Assembly
233-010-1 (replacement)
233-000-1 (upgrade)

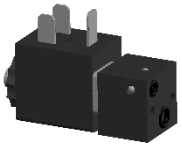


Air Trap
6139

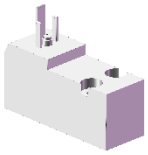
Spool Valve Replacement
304915-VR (Viton)

Air Filter 1/4” NPT
69-459

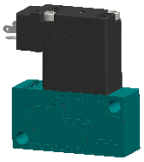
Systems with 6+ pumps
F60-2



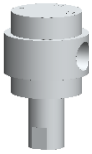
Atomize Air Valve
232-100-24D
232-100-120



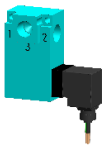
Direct Actuation Solenoid Valve
68-1043-24VD



Stackable Solenoid Valve
See Specifications Pg. 13



Air Pilot Valve 1/8” NPT
68-1030-18



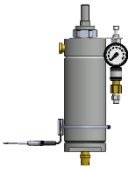
Air Inlet Solenoid Valve
See Specifications Pg. 13

Quick Connect Splicer
304902-V (Viton)
304902-VE (Viton ETP)

Universal Push-to-Connect Tube Fitting (3/8, 5/32, 1/8 UNI)
PTC-1S-U02-38
PTC-1S-U0C-532
PTC-1S-U0C-18

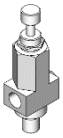
Pressurized Reservoir Low Level Switch
304924

Pressurized Reservoir Low Level Upgrade
304930-2 (5oz Reservoir)
304930-3 (16oz Reservoir)

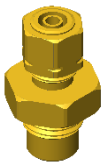


Pressurized Reservoir Assembly
5oz with LL: **304935-A**
5oz without LL: **304935-B**
16oz with LL: **304935-C**
16oz without LL: **304935-D**

Pressurized Reservoir
5oz: **304929**
16oz: **304928**

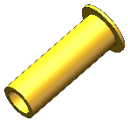


Reservoir Pressure Regulator
301533

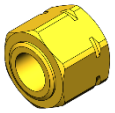


Fluid only ¼” compression fitting
304922

80psi Pressure Relieef valve
304925

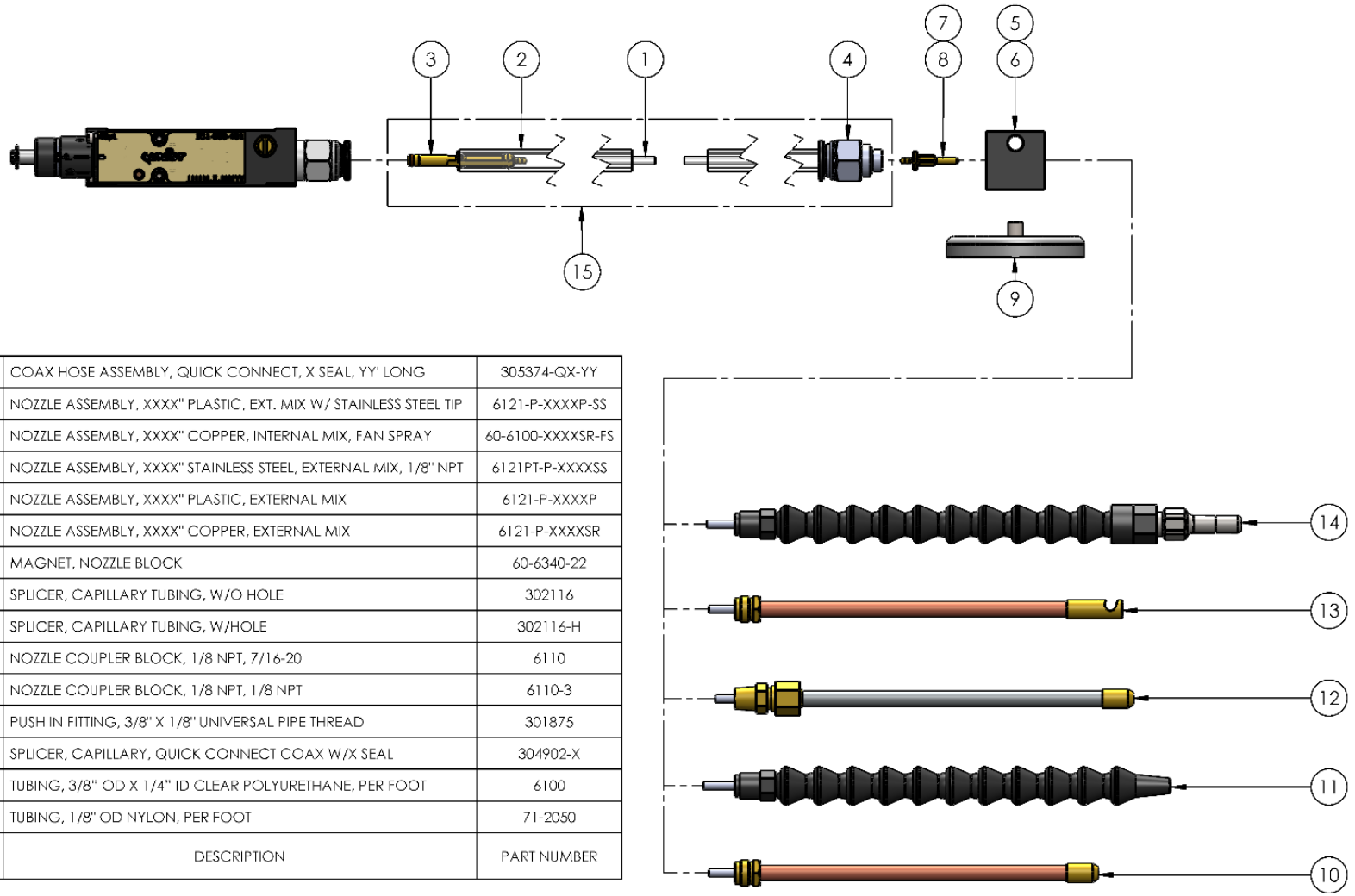


¼” Tube Support Sleeve
305633



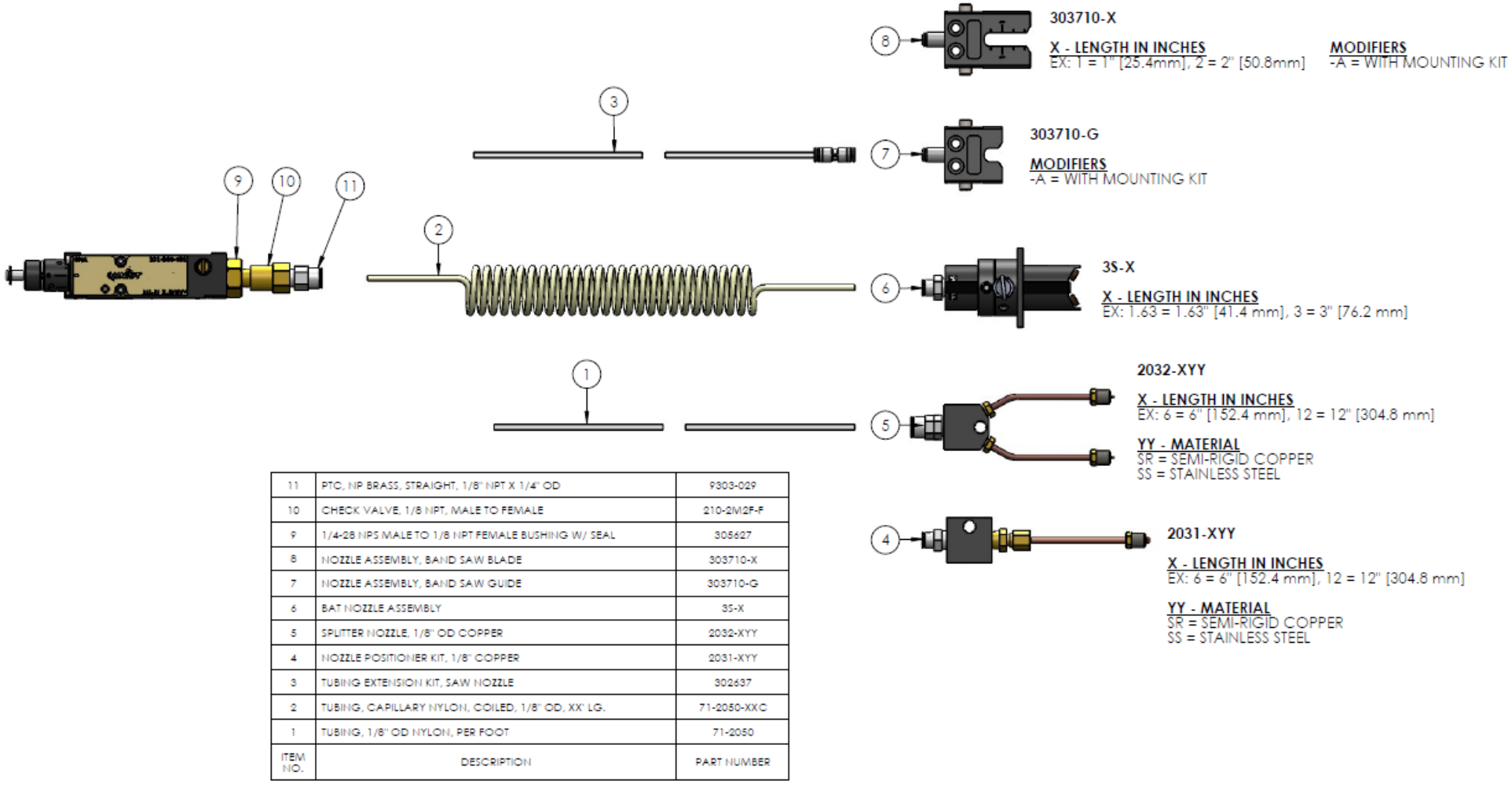
¼” Compression nut
305605

Appendix B: Nozzle Spare Parts



ITEM NO.	DESCRIPTION	PART NUMBER
15	COAX HOSE ASSEMBLY, QUICK CONNECT, X SEAL, YY' LONG	305374-QX-YY
14	NOZZLE ASSEMBLY, XXXX" PLASTIC, EXT. MIX W/ STAINLESS STEEL TIP	6121-P-XXXXP-SS
13	NOZZLE ASSEMBLY, XXXX" COPPER, INTERNAL MIX, FAN SPRAY	60-6100-XXXXSR-FS
12	NOZZLE ASSEMBLY, XXXX" STAINLESS STEEL, EXTERNAL MIX, 1/8" NPT	6121PT-P-XXXXSS
11	NOZZLE ASSEMBLY, XXXX" PLASTIC, EXTERNAL MIX	6121-P-XXXXP
10	NOZZLE ASSEMBLY, XXXX" COPPER, EXTERNAL MIX	6121-P-XXXXSR
9	MAGNET, NOZZLE BLOCK	60-6340-22
8	SPLICER, CAPILLARY TUBING, W/O HOLE	302116
7	SPLICER, CAPILLARY TUBING, W/HOLE	302116-H
6	NOZZLE COUPLER BLOCK, 1/8 NPT, 7/16-20	6110
5	NOZZLE COUPLER BLOCK, 1/8 NPT, 1/8 NPT	6110-3
4	PUSH IN FITTING, 3/8" X 1/8" UNIVERSAL PIPE THREAD	301875
3	SPLICER, CAPILLARY, QUICK CONNECT COAX W/X SEAL	304902-X
2	TUBING, 3/8" OD X 1/4" ID CLEAR POLYURETHANE, PER FOOT	6100
1	TUBING, 1/8" OD NYLON, PER FOOT	71-2050

Figure 50 Coax nozzle spare parts



ITEM NO.	DESCRIPTION	PART NUMBER
11	PTC, NP BRASS, STRAIGHT, 1/8" NPT X 1/4" OD	9303-029
10	CHECK VALVE, 1/8 NPT, MALE TO FEMALE	210-2M2F-F
9	1/4-28 NPS MALE TO 1/8 NPT FEMALE BUSHING W/ SEAL	305627
8	NOZZLE ASSEMBLY, BAND SAW BLADE	303710-X
7	NOZZLE ASSEMBLY, BAND SAW GUIDE	303710-G
6	BAT NOZZLE ASSEMBLY	3S-X
5	SPLITTER NOZZLE, 1/8" OD COPPER	2032-XYY
4	NOZZLE POSITIONER KIT, 1/8" COPPER	2031-XYY
3	TUBING EXTENSION KIT, SAW NOZZLE	302637
2	TUBING, CAPILLARY NYLON, COILED, 1/8" OD, XX' LG.	71-2050-XXC
1	TUBING, 1/8" OD NYLON, PER FOOT	71-2050

Figure 51 Single line nozzle spare parts

Appendix C: System Part Numbering Scheme

230-ABCDEF-GHIJK

Global Options | Pump Group

Global Options

These options will be true for the whole system and will not change for each pump group.

A	Fittings
X	No Fittings
A	Standard Fittings Air Inlet = 1/4 tube OD Outlet = 1/8 Tube OD Coaxial = 3/8in
B	Metric Fittings Air Inlet = 8mm OD Outlet = 4mm OD Coaxial = 3/8in

B	Seal Type
1	Viton
2	Viton ETP

C	Pump Adjustment
A	Adjustable
F	Fixed

D	Valve Voltage
1	24VDC
2	24VAC
3	120VAC
4	12VDC
5	Air Pilot
X	No Valves

E	Mounting
M	Magnet
B	Bracket/Block Only
X	None

F	Reservoir
1	Elbow Fitting Standard = 3/8in OD Metric = 8mm OD
2	16oz
3	32oz
4	64oz with Low Level
5	Air Trap with Fitting Standard = 3/8in OD Metric = 8mm OD
X	No Reservoir

G230-ABCDEF-GHIJK

Indicates a Grease System

Global Options

Pump Group

Global Options

A grease system will follow the numbering scheme on this page rather than the scheme on the previous page. These options will be true for the whole system and will not change for each pump group.

A	Fittings
X	No Fittings
A	Standard Fittings Air Inlet = 1/4 tube OD Outlet = 1/8 Tube OD Coaxial = 3/8in Fluid Only = ¼in Compression
B	Metric Fittings Air Inlet = 8mm OD Outlet = 4mm OD Coaxial = 3/8in Fluid Only = ¼in Compression

B	Seal Type
1	Viton
2	Viton ETP

C	Pump Adjustment
A	Adjustable
F	Fixed

D	Valve Voltage
1	24VDC
2	24VAC
3	120VAC
4	12VDC
5	Air Pilot
X	No Valves

E	Mounting
M	Magnet
B	Bracket/Block Only

F	Reservoir
A	5oz Pressurized Reservoir with Low Level
B	5oz Pressurized Reservoir
C	16oz Pressurized Reservoir with Low Level
D	16oz Pressurized Reservoir
X	No Reservoir

Pump Group

General Rules

- Systems can have 12 pumps maximum and maximum number of 6 groups.
    - Example: One group of 12 pumps or 6 groups of 2 pumps is acceptable.
    - 4 groups of 4 pumps will not be accepted since it would be more than 12 pumps.
- When using common actuated pumps, the group may not contain more than 6 pumps.
- All groups in a grease system must have the same actuation type. A Grease system with direct actuation can only have 1 group.
- Option K will continue for each pump in the group.
    - Example: if option GH is 3 then there will be 3 option K's at the end
- If all pumps in the group are the same output style just one digit will be sufficient.
- A "-" will be used to separate pump groups.

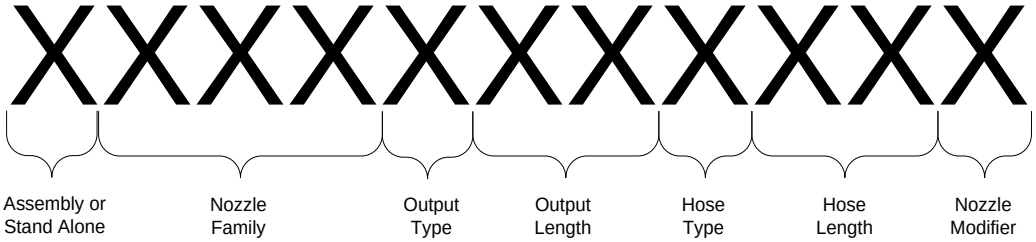
GH	Number of Pumps
1-12	Number of pumps in group

I	Actuation Type
A	Direct
B	Remote
C	Common, DIN
D	Common, Pulse R (Mode 1)
E	Common, Pulse R (Mode 2)
F	Common, Pulse R (Mode 3)
G	Common, Pulse R (Mode 4)
H	Common, PG
J	Common, Or Element Serv-O-Spray
K	Direct with flow sensing (M8, PNP)
L	Remote with flow sensing (M8, PNP)
M	Common with flow sensing, DIN (M8, PNP)
N	Common with flow sensing, OR Element Serv-O-Spray (M8, PNP)

J	Metering Screw
	This digit is truncated if using standard or fluid only
F	Full Flow
J	Jam Nut

K	Output Style
1	20µL, Air, Co-Ax Line
2	40µL, Air, Co-Ax Line
3	60µL, Air, Co-Ax Line
4	20µL, Air, Single Line
5	40µL, Air, Single Line
6	60µL, Air, Single Line
7	20µL, Air, Fluid Only
8	40µL, Air, Fluid Only
9	60µL, Air, Fluid Only

Appendix D: Nozzle Part Numbering Scheme



1st Character: Assembly or Stand Alone

Designator	Description
A	Assembly - Mated w/ system
S	Stand Alone - No system. Outputs only.

2nd, 3rd & 4th Character: Nozzle Family

Designator	Description
501	Continuous Spray
601	Intermittent Shot Spray

5th Character: Output Type

Designator	Description
A	1/4" - Flexible Plastic
B	1/4" - Semi-Rigid Copper
C	1/4" - Stainless Steel
D	1/4" - Flexible Steel
E	3 - outlet BAT[1]
K	Guide Lube Point 1/8 NPT - Ftg[1]
L	Guide Lube Point 1/4 NPT - Ftg[1]
M	1/8" OD Copper Nozzle
N	Splitter[2]
P	1/4" – Copper Fan Spray
R	Band Saw Blade Nozzle[1]
S	Band Saw Guide Nozzle[1]
T	¼" Flexible Plastic w/ SS Tip
U	¼" Copper, Radial Spray
V	1/8" OD Drilled Thru 1/8NPT
W	3/8" OD x 1/4NPT

[1]Nozzle Modifier does not apply
[2]Articulated Arm does not apply
[3]Single line atomized systems must ship stand alone

6th and 7th Character: Output Length (6" increments standard. Special lengths additional cost)

Designator	Description
06-36	Length (in inches)[1]
XX	Predefined Length Nozzle

[1]on 1.63" BAT use 01. BAT limited to 01, 03 & 07.
Splitters limited to 06,12,18
Use 00 for guide lube.
Band Saw Blade use 01, 02 or 03

8th Character: Hose Type

Designator	Description	Not to be used with system type
A	Polyurethane Co-Axial Hose	
B	Braided Stainless Steel Co-Axial Hose	230
C	1/8" Coiled Tubing (10' long minimum)	200, Assembled[3]
D	1/8" Straight Tubing	200, Assembled[3]
E	3/8" OD Straight Tubing	200

9th and 10th Characters: Hose Length (5ft increments standard. Per ft lengths available)

Designator	Description
05-50	Length (in feet)

11th Character: Nozzle Modifier

Designator	Description
A	Standard (Magnet Only)
B	Articulated Arm Only
C	Magnet and Articulated Arm
X	No Magnet, No Articulated Arm

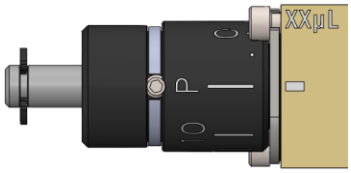
Appendix E: Pump Rebuild Instructions

Tools Needed:

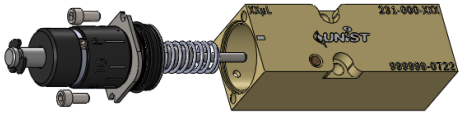
- 1/4” hex key
- 1/8” hex key
- 5/32” hex key
- 7/64” hex key
- A clean surface

Note: Reference the itemized drawing on the next page during the rebuild process.

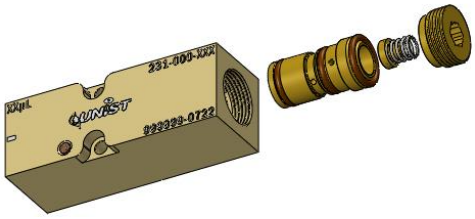
1. If necessary, remove the pump from the pump stack using a 7/64” hex key.
2. Record the current pump position and then adjust the pump to the prime position.



3. Remove the two bolts (item 16) that hold the adjustment knob to the pump body using an 5/32” hex key.
4. Remove adjustment knob (item 15), metering pin (item 14), and spring (item 13). Set on a clean surface.



5. Use the 1/4” hex key to remove the brass plug (item 12) from the fluid side (bottom) of the pump.
6. Remove the check seal, spring, pump inserts and all seals (items 2-11). Depending how long the pump has been in service and what fluids have been ran through the pump this can be accomplished by either banging the bottom of the pump body on a hard smooth surface or pushing on the inserts from the opposite side to force the parts out.

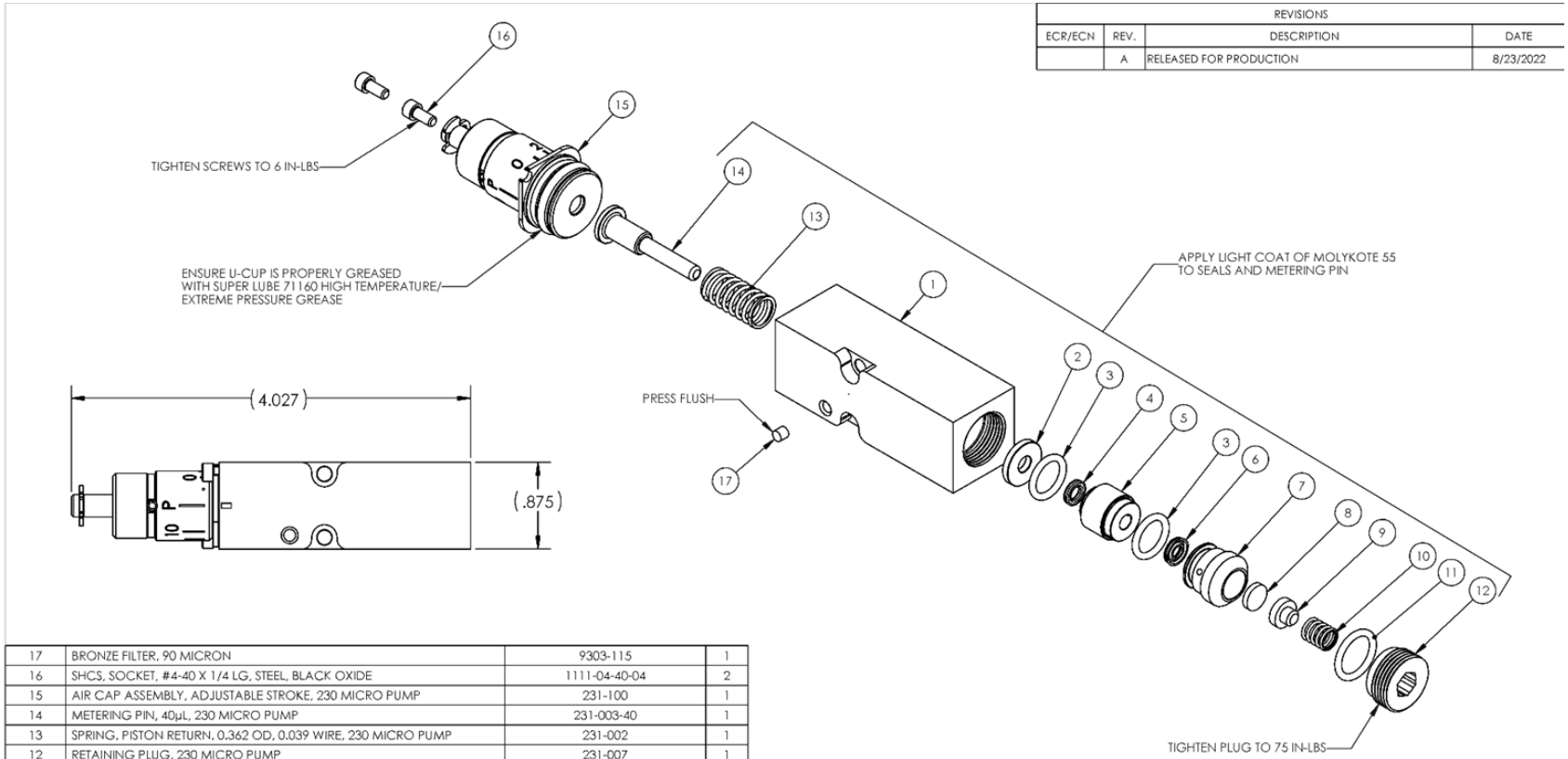


7. Discard all old seals. Clean any debris from the inside of the pump block to ensure contaminants do not interfere with pump performance upon re-assembly.
8. Drop the brass washer (item 2) into the fluid side of the pump body. Ensure it sits flat on the internal shelf
9. Ensure there is a light coat of grease on the -012 O-ring (item 3) and drop it on top of the washer. Ensure it sits flat on the washer.
10. The smaller seal (item 4) should be in the counter bore of the fluid inlet insert (item 5). Ensure this is assembled and lightly greased.
11. Insert the fluid inlet insert (item 5) into the pump body with the small seal (item 4) facing the washer
12. Ensure the -012 O-ring (item 3) and smaller seal (item 6) are installed on the fluid displacement chamber (item 7) and they are lightly greased. If using a 40 or 60 µL pump this seal will be a U-cup, ensure the U-cup lips are facing into the bore
13. Ensure the outlet check valve is assembled with the seal (item 8) and the brass housing (item 9). Install this assembled with the seal facing the inside of the pump.
14. Install the outlet check valve spring (item 10) around the nub on the outlet check valve housing (item 9)
15. Ensure the -013 O-ring (item 11) is lightly greased and install on the chamfer of the displacement chamber (item 7)
16. Install and tighten the brass plug (item 12) to 75 in-lbs [8.5 Nm]

If replacing the air piston, refer to Appendix F on page 37 before moving to the next step.

17. Flip the pump over and install the metering pin return spring (item 13) and metering pin (item 14). Ensure the metering pin has a light coat of grease around the smaller diameter shaft.
18. Install adjustment knob (item 15) making sure the P is lined up with the mark on the pump body
19. Tighten screws (item 16) to 6 in-lbs using 1/8” hex key.

REVISIONS			
ECR/ECN	REV.	DESCRIPTION	DATE
	A	RELEASED FOR PRODUCTION	8/23/2022



ITEM NO.	DESCRIPTION	PART NUMBER	QTY.
17	BRONZE FILTER, 90 MICRON	9303-115	1
16	SHCS, SOCKET, #4-40 X 1/4 LG, STEEL, BLACK OXIDE	1111-04-40-04	2
15	AIR CAP ASSEMBLY, ADJUSTABLE STROKE, 230 MICRO PUMP	231-100	1
14	METERING PIN, 40µL, 230 MICRO PUMP	231-003-40	1
13	SPRING, PISTON RETURN, 0.362 OD, 0.039 WIRE, 230 MICRO PUMP	231-002	1
12	RETAINING PLUG, 230 MICRO PUMP	231-007	1
11	O-RING, ID .438, CS .070, VITON, BROWN	OR-013V75BN	1
10	SPRING, CHECK VALVE, METERING PUMP	9303-108	1
9	BODY, CHECK VALVE, INJECTOR PUMP	9303-107	1
8	CHECK SEAL, CHECK VALVE, VITON, INJECTOR PUMP	9303-112	1
7	PUMP INSERT, DISPLACEMENT CHAMBER, 40µL, 230 MICRO PUMP	231-006-40	1
6	U-CUP, STRAIGHT, 1/16 C/S X 5/32 ID X 9/32 OD, 75 DURO, BLACK, VITON	U4-0156-0281-062-V75BN	1
5	PUMP INSERT, FLUID INLET, 40µL, 230 MICRO PUMP	231-005-40	1
4	X-RING, OD .281, CS .063, VITON, 75 DUROMETER, BLACK	XR-007V75BK	1
3	O-RING, ID .364, CS .070, VITON	2-012-V884-75	2
2	RETAINING WASHER, 40µL, 230 MICRO PUMP	231-004-40	1
1	PUMP BODY, 230 MICRO PUMP	231-001	1

DATE:	05/13/2020
DRAWN BY:	JF
STATUS:	RELEASED
ITEM TYPE:	ASM
DWG SIZE:	ANSI B (11X17)

UNIST

TITLE: PUMP ASSEMBLY, 40µL, VITON, ADJUSTABLE OUTPUT, 230 MICRO PUMP

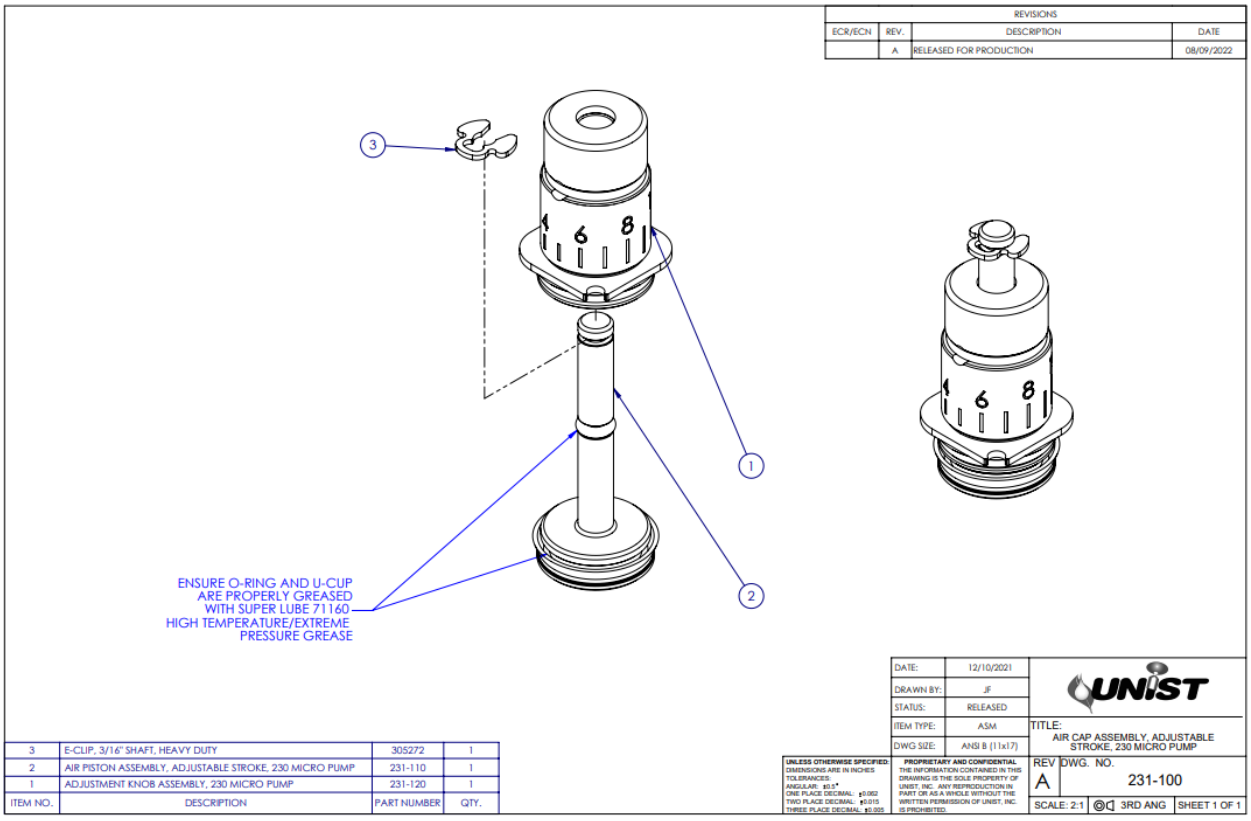
REV A | DWG. NO. 231-000-401

SCALE: 1:1 | 3RD ANG | SHEET 1 OF 2

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES
ANGULAR: ±0.5°
ONE PLACE DECIMAL: ±0.06
TWO PLACE DECIMAL: ±0.015
THREE PLACE DECIMAL: ±0.005
NPT THREADS: ±1 TURN OF L1 GAUGE

Appendix F: Replacing the Air Piston

1. Remove E-clip (item 3).
2. Remove the air piston (item 2) from the adjustment knob (item 1).
3. Clean the internal bore of the adjustment knob and discard the old air piston and any debris.
4. Ensure seals are lightly greased on new air piston and use a twisting motion to install it into the adjustment knob.
5. Re-install the e-clip. This can be achieved by pressing the e-clip into the groove using a hard surface.



Appendix G: Pulse R Operating Modes and Fault Indication

Changing Operation Modes

The Pulse R™ is configured for the desired operating mode at the factory and should only be changed if directed to do so by a Unist representative.

To change modes, press and hold both the UP and DOWN buttons while turning on power to the Pulse R™. Continue holding buttons for 2 seconds until the mode number with a period before it is displayed.

Figure 52: Mode selection (mode 1 displayed)

Use the UP and DOWN buttons to select the desired mode. To confirm selection, press and hold the UP and DOWN buttons for 2 seconds. After 2 seconds, the display will show the set point for the selected mode.

When changing to modes 3 or 4, the system will display the shot delivery rate (in cycles per minute) after pressing and holding the up/down buttons for 2 seconds. The user can then change the shot delivery rate by pressing the up or down buttons. Pressing and holding the up/down buttons for 2 seconds will then save the mode and the desired cycle rate.

Operation Mode Details

Mode 1 - Repeat cycle on power up

When powered on, the Pulse R™ output cycles at the rate displayed (indicated in cycles per minute) until power is removed or turned off. The rate can be adjusted from 1 to 250. The duty cycle (on/off time of each cycle) is automatically set by the Pulse R™.

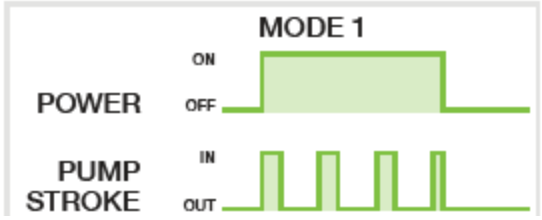


Figure 53: Mode 1 timing diagram

Mode 2 – Repeat cycle on input signal

When powered on and the input trigger signal is high, the Pulse R™ output cycles at the rate displayed (indicated in cycles per minute) until the input is removed. The rate can be adjusted from 1 to 250. The duty cycle is automatically set by the Pulse R™.

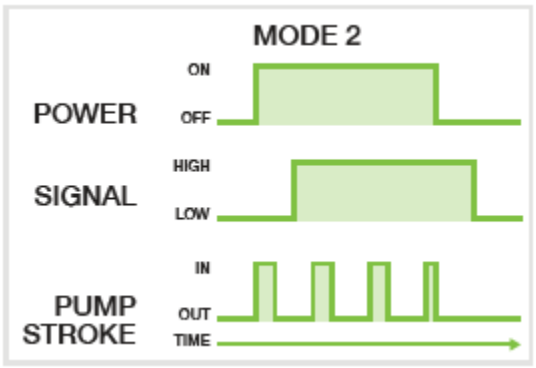


Figure 54: Mode 2 timing diagram

Mode 3 – Deliver shots on power up

When powered on, the Pulse R™ output rapidly cycles to deliver the selected number of shots. Once power is turned off, repeat function. In mode 3 the first digit on the display will be flashing “S”. The value can be adjusted from 1 to 99. The rate of these shots is determined when selecting the mode. See the Changing Operation Modes for more details.

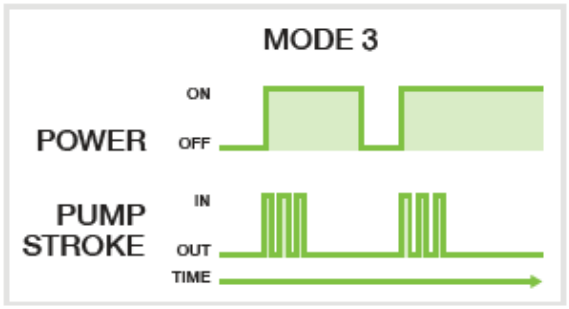


Figure 55: Mode 3 timing diagram

Mode 4 – Deliver shots on input signal
When powered on and an input signal is received, the Pulse R™ output rapidly cycles to deliver the selected number of shots. In mode 4 the first digit on the display will be flashing “S”. The value can be adjusted from 1 to 99. The rate of these shots is determined when selecting the mode. See the Changing Operation Modes for more details.

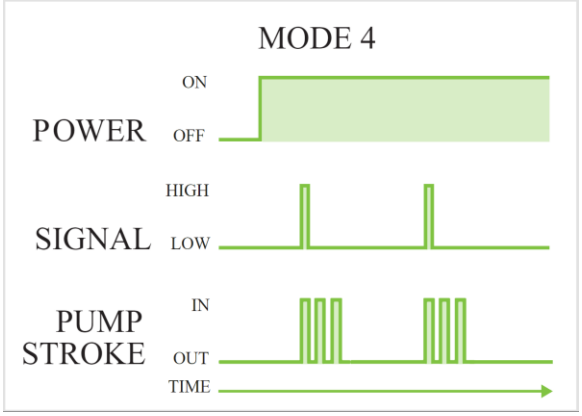


Figure 56: Mode 4 timing diagram

Locking the Display

To prevent accidental changes to settings, the display can be locked by pressing and holding the up and down button buttons at the same time for 3 seconds. The display will show LOC for 1 second, and then show the set point for the mode. Anytime a user interacts with the up or down button, the system will display LOC for 1 second.

Figure 57: Locking Keypad

To unlock, press and hold the up and down buttons for 3 seconds. The display will show ULC for 1 second and then show the set point for the mode.

Figure 58: Unlocking keypad

Fault Indication

A red light between the buttons indicates that a fault condition is or was present. This will be accompanied with a FXX fault code.

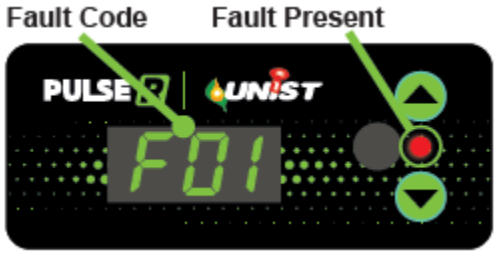


Figure 59: Fault Indication

The system will attempt to operate normally regardless of the fault state. Faults can be cleared when the fault state is no longer active and the user has pressed the up or down button.

F01 = Output Circuit Error

An F01 error indicates one of three possibilities:

1. An open circuit is detected. Check to ensure that the Pulse R™ is appropriately connected to valve.
2. A short circuit is detected. Check for any shorts in the system on the output side of the Pulse R™.
3. A valve that is not 24VDC is connected to the Pulse R™.

F02 = Major System Fault

An F02 error indicates that the system has detected an issue within the memory or processor that cannot be resolved. Contact Unist for a replacement system.

F03 = Incoming Voltage out of range

An F03 error indicates that the incoming voltage is outside of the allowable range. The incoming power must be 24VDC +/

Revision History

Rev.	Description	Date
V1.0	Initial Release	11/1/2022
V1.1	Updated Figure 15; Added Revision Table	12/15/2022
V1.3	Updated flow sensing data (page 10)	1/20/2023
V1.4	Added nozzle part numbering scheme and nozzle spare parts to the appendix	2/13/2023
V1.5	Updated spare part numbers, removed LIT number	7/19/2023
V1.6	Updated spare part numbers, Updated pulse R mode 4	2/19/2024
V1.7	Added 230 Grease system information	3/11/2024
V1.8	Updated Pump Group Rules	9/26/2024

Notes

Notes

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