Introduction

Thanks

Thank you for your purchase of our MLS lubrication pump. Please take the time to read this operation manual to take full advantage of the new lubricator.
The minimal quantity lubrication system uses a positive-displacement pump to give a continuous spray of fluid at a precise rate. The system offers flexibility while maintaining simplicity and can be operated using only compressed air.

Figure 1: MLS

Figure 2: MLS with solenoid valves

Figure 2: MLS without solenoid valves

System Introduction

The MLS gives simple, precise lubrication. Two types of pumps are available: atomizing pumps that provide an air and oil mix, and oil-only pumps. These adjustable positive-displacement pumps are proven with a track record of consistency and reliability. Their modular design allows multiple pumps to be stacked together when more than one output is required, so each system can be tailored specifically for the application. Each pump stack includes a stroke adjustment for the pump output and a pulse generator to control the cycle rate of the pump.

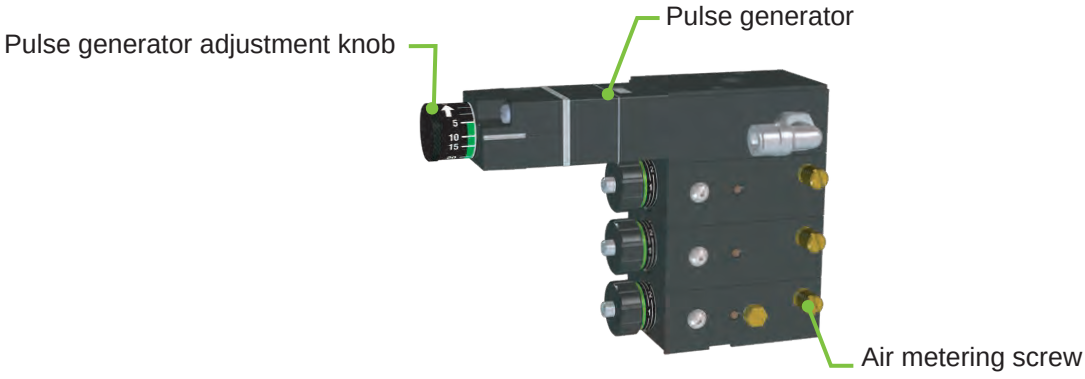


Figure 3: Pump stack

Atomizing pumps also have an air metering screw to regulate the output air flow. The combination of these adjustments gives complete control of the spray output.
Our atomizing pumps are built to provide years of service in tough, industrial environments, and each system is thoroughly tested before making its way to the market.

Introduction

Common Configurations

The modularity gives each customer the flexibility to configure a unit exactly as needed. Because of this, there are thousands of configurations. They may look different because of the an enclosure or the size of the reservoir, but regardless of the look, all MLS have the same key components which use the same simple adjustments.

Figure 4: Single pump output system with an enclosure

Figure 5: Multiple pump output system with an enclosure

Figure 6: Single pump output system without an enclosure

Figure 7: Single pump output system without an enclosure & reservoir

Systems perform best with machine tool guide oil with viscosity of 50-1000 SUS. The oil should be natural, non-toxic, renewable plant oil-based composition. It should be no petroleum products, 100% chlorine and silicone free, and produces no harmful VOC's.

Introduction

Key Components

In most cases, MLS provides an atomized oil and air mixture that is delivered to the work interface. For some applications, it can be configured with an oil-only pump, so only fluid is delivered. The oil is metered using a pneumatically actuated positive-displacement pump and the output per stroke is adjusted with the pump stroke adjustment knob.

There are many variations of pumps used in the MLS system based on the viscosity of the fluid being used, the output rate required, if it is an air atomizing or an oil-only pump, and where the pump is located in the pump stack.

On an atomizing pump, the air flow is controlled with an air-metering screw. The volume of oil supplied with each pump stroke is controlled by the pump stroke adjustment knob. The density and distance of the spray is determined by these two adjustments.

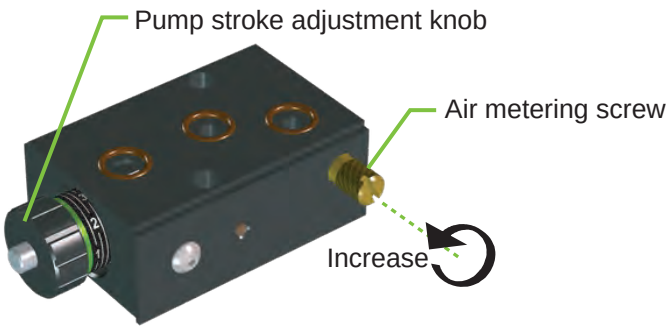


Figure 8: Air metering screw & pump stroke adjustment

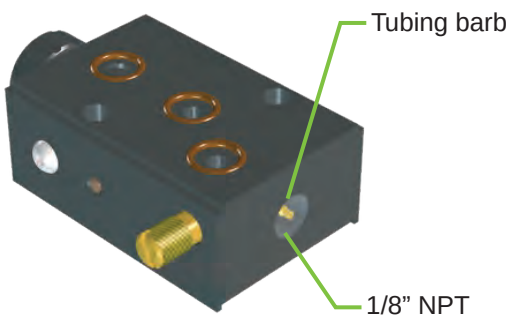


Figure 9: Outlet port

The Pulse Generator

The pulse generator is a variable pneumatic timer to give consistent control of the pump cycle rate. Because this is a pneumatic and not an electronic circuit, the exact rate of the pulses are subject to changes in air pressure and other mechanical variations. The numbers on the dial should be used as rough approximations of the pulses per minute at 80 psi. If an exact value is needed, regulated air is recommended and the frequency should be set by adjusting the knob.

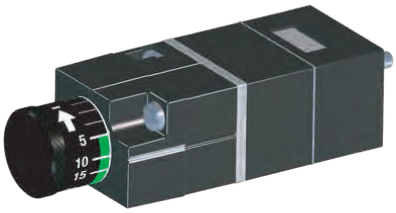


Figure 10: Pulse generator

Figure 11: Air & oil spray

Output

If system is designed to deliver an air and oil spray, keeping the fluid and air separate until the point of application to delivering consistent spray output. The “jacket of air” surrounding the fluid outlet evenly atomizes the fluid and delivers it to the target in a balanced spray pattern. In the oil-only case, the output from the pump can be connected directly to the application point.

System Layout

A. Air filte

Standard on every system with enclosure

B. Control valve

Options include solenoid valve, air pilot valve, manual valve, or foot valve

C. Positive-displacement metering pump

Precise and reliable with full stroke outputs of 0.033 mL, 0.100 mL, or 0.045 mL

D. Pneumatic pulse generator

Controls pump cycle rate

E. Air metering screw

Controls nozzle air flow

F. Pump stroke adjustment knob

Controls volume of fluid delivered per strok

G. Fluid reservoir

Additional sizes and styles available

H. Rugged steel enclosure

Removable and adjustable

I. Drain plug

Empty pump stack, reservoir, bleed trapped air

J. Outlet port

Connection port for coaxial or oil-only outputs

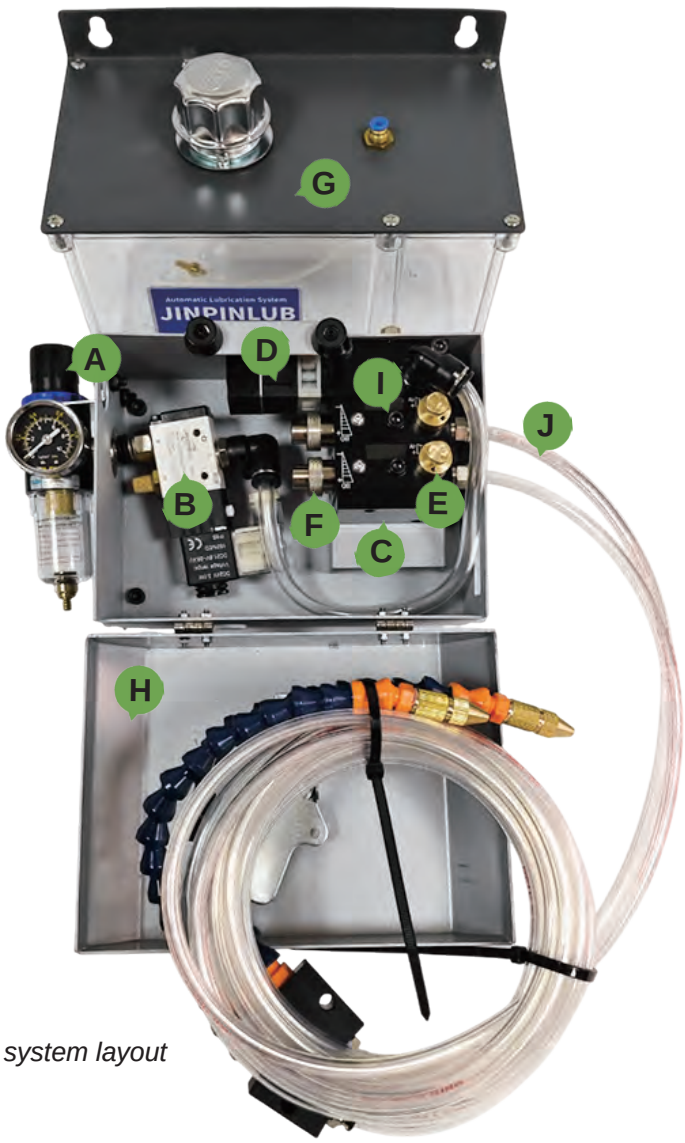


Figure 12: Typical system layout

System Specifications

Supply air pressure	Clean, dry compressed air, 4-7 bar, 708 LPM minimum
Pump viscosity	50-1000 SUS
Pump output at full stroke	0.033mL (1-drop standard) 0.100mL (3-drop standard)
Pump output rate	0-396mL/hr (1-drop standard) 0-1200mL/hr (3-drop standard)
Air flow rate	0-4 SCFM for each air and oil output, 1-2 SCFM typical
Pulse generator frequency	Recommended: 5-50 pulses/min Max: 200pulses/min(not recommended for continuous operation)
Operating temperature	0˚-50˚C
Storage temperature	-16˚–70˚C
Fluid reservoir capacity	Reservoir dependent and customizable Standard optional 0.5L, 1.0L, 2L, 4L

Order Code

MLS - □ □ □ □ □

Pump Model

Minimal lubrication system

Number of Outlet

1 = 1 outlet

2 = 2 outlets

3 = 3 outlets

4 = 4 outlets

5 = 5 outlets

6 = 6 outlets

7 = 7 outlets

8 = 8 outlets

9 = 9 outlets

10 = 10 outlets

Reservoir

00 = Without an enclosure & reservoir

05 = 0.5L reservoir & enclosure

20 = 2.0L reservoir & enclosure

40 = 4.0L reservoir & enclosure

Solenoid Valve

0 = No Solenoid valve

1 = with Solenoid valve

Spray Nozzle

1 = Soft plastic

2 = Semi hard copper

3 = Stainless steel

4 = Fan spray nozzle

Mounting Method

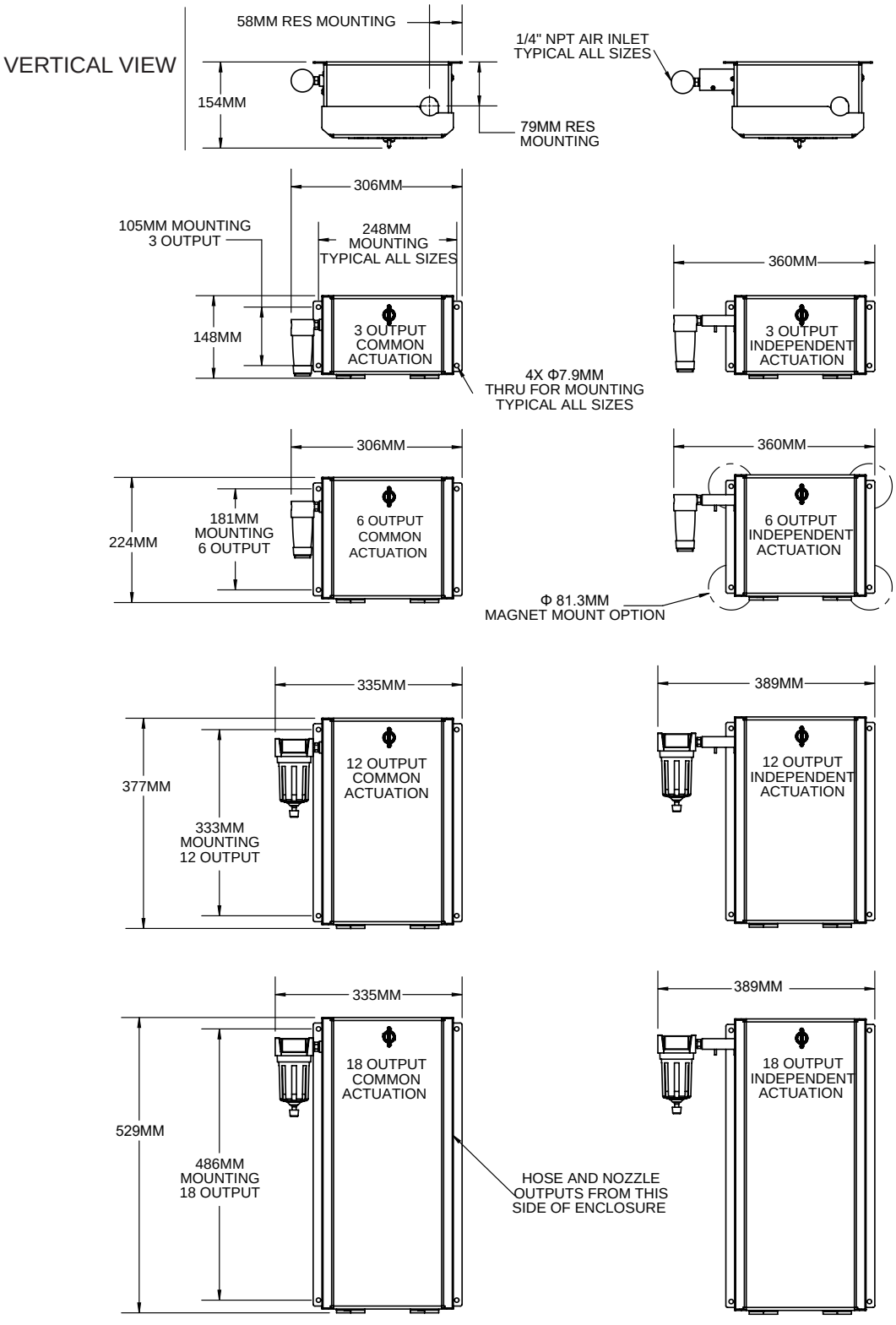
1 = Direct mount

2 = Magnet mount

System Installation

Mounting Dimensions

Systems With Enclosures



System Installation

Systems Without Enclosures

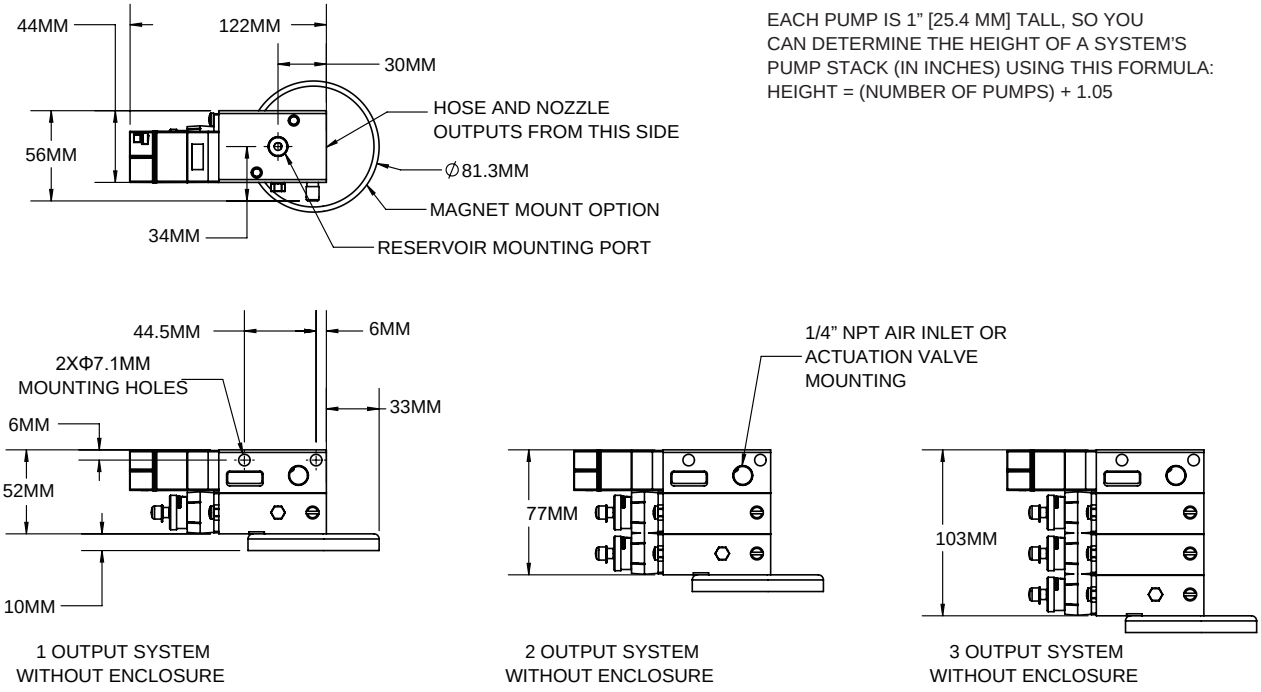
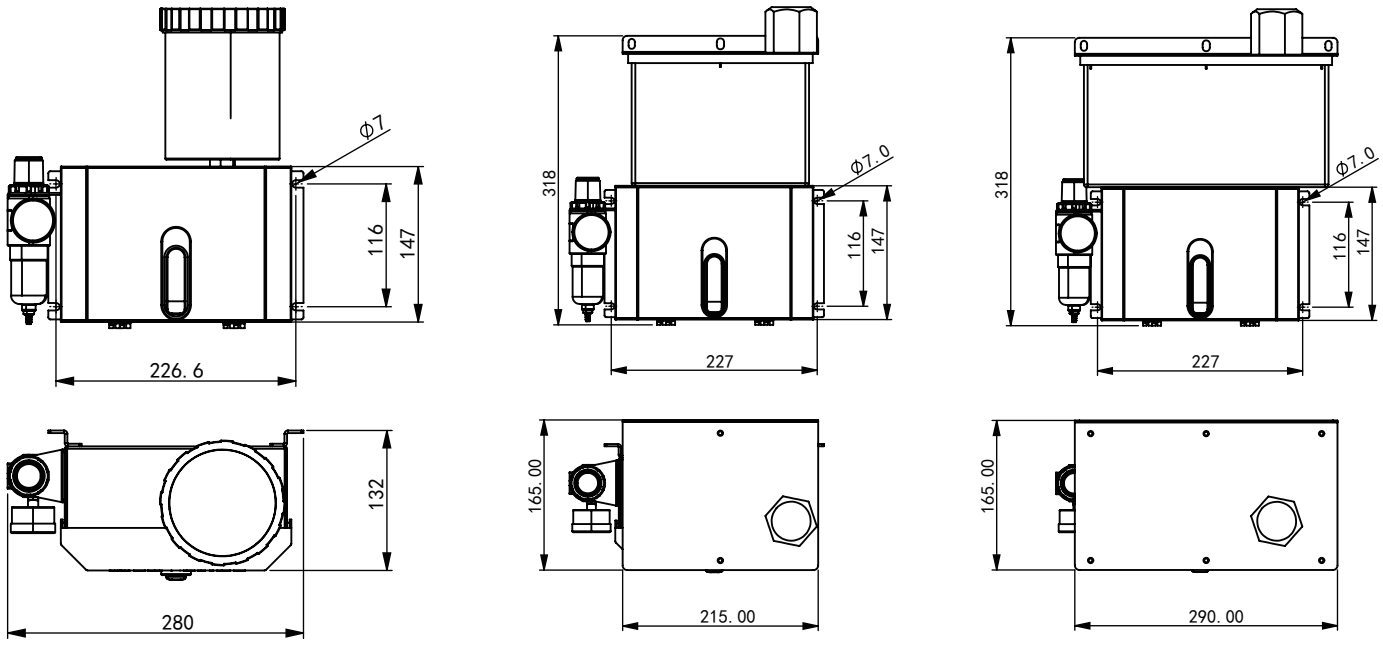


Figure 13: Systems without enclosures

Reservoirs



0.5 L 2.0 L 4.0 L

Reservoir dependent and customizable.

Standard optional 0.5 L, 2.0 L, 4.0 L

System Installation

Installation

Mount the system in close proximity to the machine, where it is convenient to access and where there are no obstructions that may pinch or kink output or air feed lines. The unit may be mounted directly to the machine, or with optional magnets, and must be mounted so the reservoir is up and the unit is level.

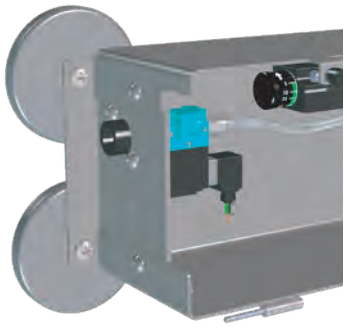


Figure 15: Magnet mount

Attention: The system must be securely mounted to a suitable mounting surface for safe operation. Use appropriate fasteners in all four mounting positions. Failure to do so could lead to unsafe operation and personal injury.

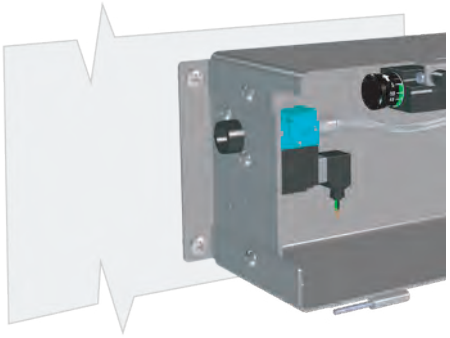


Figure 16: Direct mount

Attention: Always use two people while securing the system to its mounting surface. Failure to do so could cause personal injury.

Connect Control Valve

The pneumatic circuit on MLS can be controlled with a solenoid valve, a manual slide valve, 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 is needed, the solenoid is wired to a separate switch.

System Installation

Position & Install Nozzles

Keep the nozzle as close as possible to the cutting edge, ideally within 50 mm. The longer the distance that the nozzle needs to spray, the more airflow is needed to carry aerosol and the higher the likelihood of an unwanted mist being generated.

There is a dead zone in fluid coverage when a tool that is perpendicular to the cut. This is because the tool itself blocks the fluid and is generally 180 degrees from the nozzle. Cutting should not be done in this dead zone. If working with a machine that has a fixed position nozzle and may cut in multiple directions, such as a mill, more than one nozzle is recommended to eliminate the dead zone.

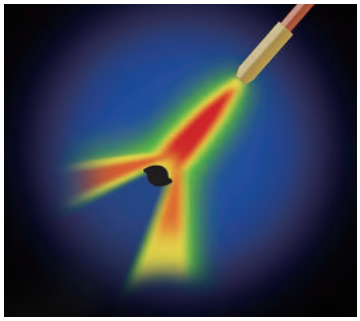


Figure 17: Dead zone with single nozzle output

When face or end milling, the best nozzle location is 135 degrees from the cut in the direction of rotation. 45 degrees does not work as well because chips and turbulence block the fluid from getting to the tool. 135 degrees lubricates the tool before use and minimizes both tool wear and oil use.

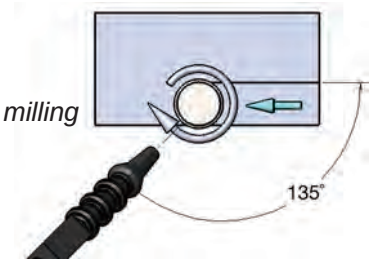


Figure 18: Optimum position of external nozzle for end milling

On the vertical plane, the nozzle should be placed so all the tools to be used are adequately covered by the output spray. For longer tools this means the angle from the vertical is less than the 60-70 degrees shown.

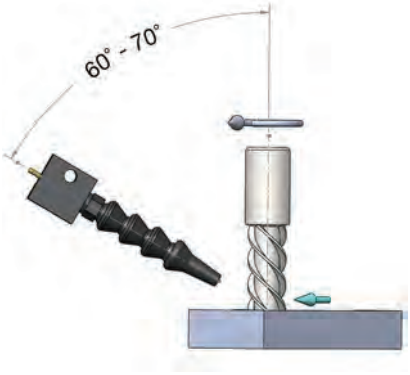


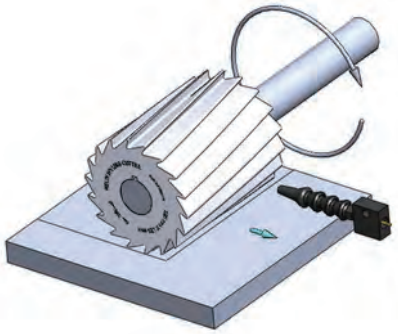
Figure 19: Vertical position of external nozzle

System Installation

Position & Install Nozzles

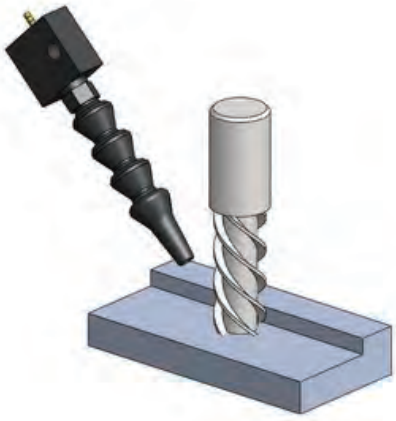
In peripheral milling, or when the tool is parallel to the work piece, the dead zone starts closer to 100 degrees from the nozzle. The nozzle should be placed close to horizontal spraying the tool before it enters the cut to fluid delivery. It is placed before entering the cut, not on the back side, so no chips or turbulence interrupts the aerosol flow.

Figure 20: Optimum position of external nozzle for peripheral n



The nozzle should be placed so that it is spraying the tool/work piece interface. In some cases this may mean the nozzle is attached to the bed or the work piece holder. In other cases it can be connected to the spindle arm.

Figure 21: Nozzle positioning



Nozzles

Flexible Plastic

Plastic nozzles are easy to aim to where the spray is needed, and there is no work-hardening on the nozzle if it is repeatedly bent into different shapes. The downside of this style nozzle is if there are things that can hit the nozzle, such as metal chips in cutting operations or an operator cleaning the machine, the nozzle is easily moved out of position. The spray output will have a conical shape with an included angle of approximately 15-20 degrees, depending on the amount of air introduced.

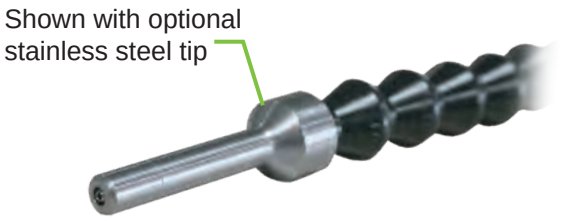


Figure 21: Dead zone with single nozzle output

Semi-Rigid Copper

Semi-rigid copper nozzles are our most popular nozzle. They offer a nice balance of flexibility and rigidity. They are easily bent and molded to shape, and they hold that shape well when hit or impacted with moderate force. Repeated bending can cause work-hardening, and eventually the nozzle body will crack. The spray output will have a conical shape with an included angle of approximately 15-20 degrees, depending on the amount of air introduced.

Figure 22: Semi-rigid copper nozzle

Stainless Steel

Stainless steel nozzles offer very good rigidity; they are not easily bent into, or out of shape. This makes them the preferred choice when the nozzle will be put in one position, and the force expected to be exerted on the nozzle is more than a copper nozzle can withstand without deforming. The spray output will have a conical shape with an included angle of approximately 15-20 degrees, depending on the amount of air introduced.

Figure 23: Stainless steel nozzle

Nozzles

Fan Spray

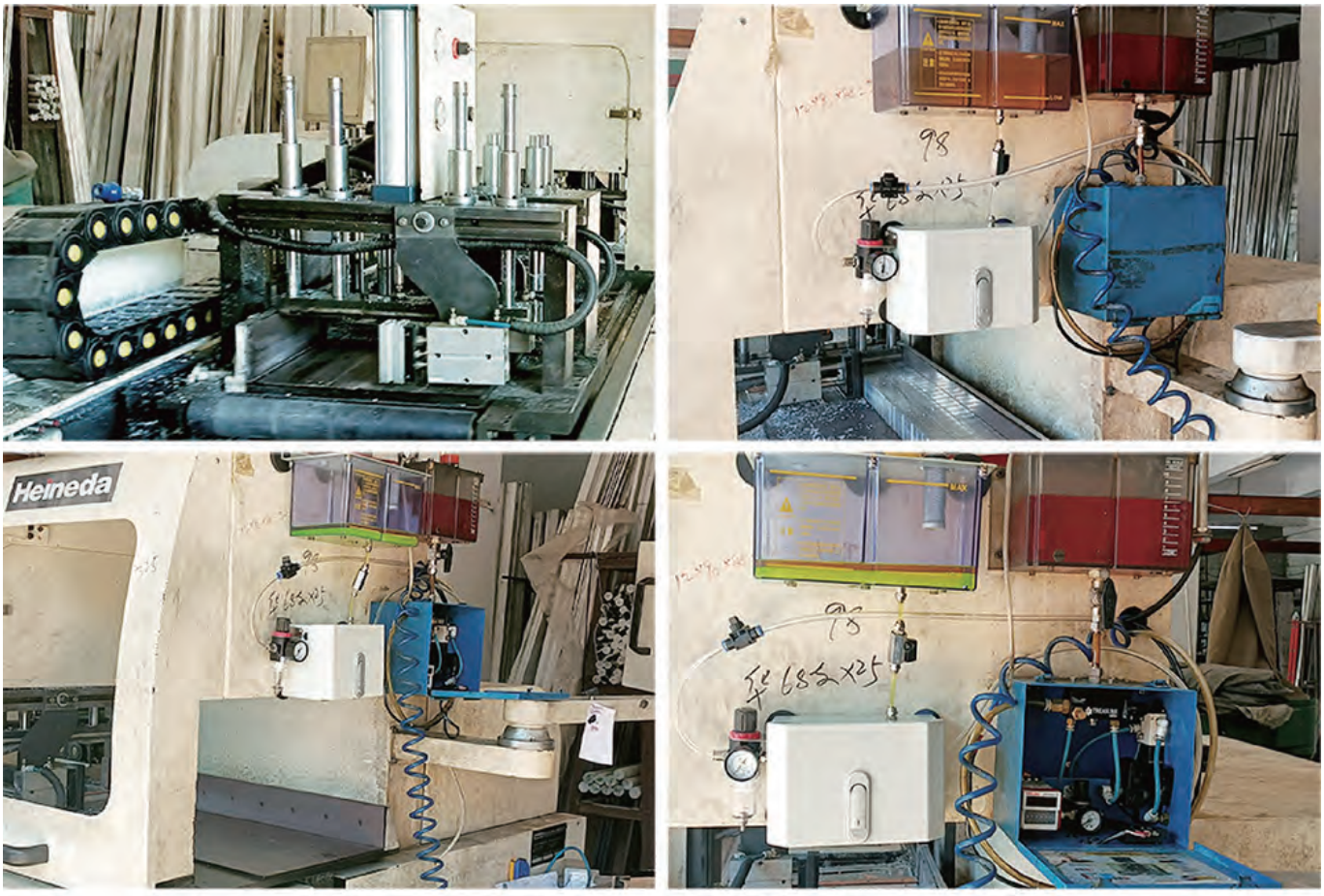
Fan spray nozzles are useful when an elliptical spray pattern fits the application better than a conical pattern. An example of this would be coating an item coming down a conveyer line. The chart below gives approximations of the spray area coverage.

Figure 24: Fan spray nozzle

Spray Dimensions

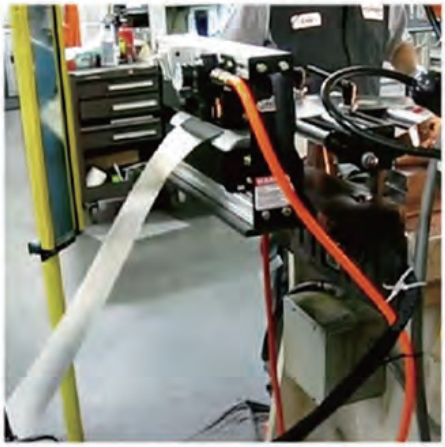
A	Min	Width	Max	+ / –
1.00" [25.4 mm]	1.60" [40.6 mm]	2.40" [60.9 mm]	3.20" [81.3 mm]	0.80" [20.3 mm]
2.00" [50.8 mm]	2.90" [73.7 mm]	3.80" [96.5 mm]	4.70" [119.4 mm]	0.90" [22.9 mm]
3.00" [76.2 mm]	4.10" [104.1 mm]	5.20" [132.1 mm]	6.30" [160.0 mm]	1.10" [27.9 mm]
4.00" [101.6 mm]	5.30" [134.6 mm]	6.60" [167.6 mm]	7.90" [200.7 mm]	1.30" [33.0 mm]
5.00" [127 mm]	6.50" [165.1 mm]	8.00" [203.2 mm]	9.50" [241.3 mm]	1.50" [38.1 mm]
6.00" [152.4 mm]	7.70" [195.6 mm]	9.40" [238.8 mm]	11.10" [281.9 mm]	1.70" [43.2 mm]

Application

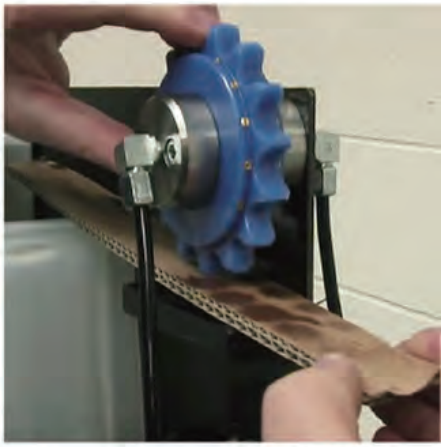


MQL on aluminum blanking machine

On CNC



On printing equipment



On gears and racks

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