# **SERV-OIL® INJECTION LUBRICATORS**

#### WHAT IS SERV-OIL?

**SERV-OIL** is the most advanced system for the precision lubrication of pneumatic equipment. It has been used for over thirty years to provide lubrication to all kinds of pneumatic equipment and various fixtures, bearings, slides, and ways. It overcomes the control problems that can be encountered with conventional mist lubricators. It also ensures proper lubrication of pneumatic components in complex circuits, and accurately delivers lubricant to points at a long distance from the lubricator.

Positive-displacement oil injectors, called Servo-Meters, are the heart of **SERV-OIL** equipment. They put predetermined, precise amounts of oil right at the points where lubrication is needed. By comparison, mist lubricators lack the precision and control of a **SERV-OIL** system. Extensive tests have shown that when a conventional mist lubricator is installed upstream of a control valve, much of the oil dispensed by the lubricator is exhausted to atmosphere through the exhaust port of the control valve. This is inefficient, and also contributes significantly to pollution of plant air.

With **SERV-OIL** equipment the amount of oil used is greatly reduced and lubrication is more effective because of the accuracy with which the oil is delivered. Briefly: **SERV-OIL** lubricates the component, not the area!



#### Servo-Meter: Key Element in SERV-OIL Equipment

- Actuated by air pulse (60 psig minimum).
- Choice of 3 output ratings: 1/2, 1 or 2 drops.
- Output adjustable in small increments.
- Positive displacement metering ensures precise oil delivery with each actuation.
- Modular assembly allows up to 10 Servo-Meters to be built into a single assembly.
- Servo-Meters easily added or removed from multiple-unit assemblies.

#### **DO YOU NEED SERV-OIL?**

If any **ONE** of the following statements describes a situation in your plant, you can reap long-term dividends by the use of **SERV-OIL** equipment.

- We repair air tools because the vanes are worn and the cylinders and rotors are scored due to insufficient lubrication.
- The appearance of fog or mist lubrication is a hazard in our plant.
- Over-lubrication costs us money because of the stringent requirements for disposing of used lubricants.
- Air cylinders in our plant become sluggish because of varnish or other contaminants.
- Torque control in our air tools is variable and doesn't meet our requirements.
- We set pressure regulators higher than the work requires just to overcome stiction in valves, cylinders, or other air components.

- If one pump fails in our lubrication system, the performance of other pumps is adversely affected.
- Sometimes lubricators are turned off, or the lubrication adjustments have been tampered with by unauthorized personnel. Such tampering removes lubrication control from the proper hands.
- We use flood coolants to lubricate taps and drills. The cost and environmental impact of this have not been considered.
- It would be to our advantage to know exactly what lubrication is being provided, and when to fill our lubricator reservoirs.

# **SERVO-METER: Key SERV-OIL Module**



AIR SIDE Minimum pressure 60 psig (4 bar) with output oil pressure ratio of 11:1. OIL or LIQUID SIDE Oil feed from a gravity reservoir or pressurized oil supply at 30 psig or less.

#### **Cutaway Drawing of SERVO-METER**

Servo-Meters are the key modules in all the **SERV-OIL** equipment. They are precision, positive-displacement liquid injectors which are actuated by an air pressure signal of at least 60 psig (4 bar). 1/8-Inch oil-filled nylon line carries the injected oil from each Servo-Meter to a point of lubrication. Servo-Meters in single-point lubricators have a flow-actuated ball in the sight indicator at one end of the Servo-Meter to give visual verification of oil delivery. Ball check valves at the ends of the nylon lines ensure that the lines and the oil sides of the Servo-Meters remain full of oil and free of air.

Servo-Meters are available in three capacities: maximum flows of 1/2 drop, 1 drop, and 2 drops. A Servo-Meter is adjustable so that the maximum amount can be reduced in increments of 1/50th of its rated capacity as shown in the following chart: (Note: 1 drop = 1/30 cc.)

Maximum	Reducing	Minimum
Output	Increments	Output
1/2 drop	1/100 drop	1/20 drop
1 drop	1/50 drop	1/10 drop
2 drops	1/25 drop	1/5 drop

With the aid of pulse counters and the controllers described on the next page, lubrication can be reduced even further by selecting the frequency of oil injection.

**SERV-OIL** equipment described on the following pages may be designed for either single Servo-Meter service or multiple (up to twenty) Servo-Meter service. Servo-Meters are made for modular assembly so that the equipment using multiple Servo-Meters can have them added or removed very simply.

**SERV-OIL** units employing multiple Servo-Meters use the same oil supply and the same air signals. An accessory block plate can be used in a stack of Servo-Meters to allow the use of two different air signals. All the Servo-Meters will continue to use the same oil supply. See **SERV-OIL** Accessories on page 223 for further details.

Although Servo-Meters are most commonly used to inject oil, they can also be used with other liquids. Before using them with other liquids, consult Master Pneumatic for advice on such applications.

# **SERVO-METER Controllers**

Servo-Meters can be set to dispense widely different amounts of oil on each actuation. In addition, every SERV-OIL unit employs a controller to regulate the frequency with which the Servo-Meter(s) in the unit are actuated. This control of both the amount and frequency of lubrication makes for the greatest efficiency and economy of use of lubricants.

Controllers range from simple pulse counters to units that create the pulses that actuate the Servo-Meters.



#### INTEGRATED CONTROLLERS

Pneumatic Pulse Counter. A multiple-point lubricator with pulse counter is shown at the left. The counter receives air pulses (usually from the output of an operating valve) and determines which of the pulses it will pass on to the Servo-Meter and so become an actuating signal. A ratcheting mechanism in the counter can be set to make an actuating signal of every pulse, every 5th pulse, or every 10th pulse.

Pneumatic Pulse Controller

Pulse counters can be paired in tandem so that lubrication frequency

can be reduced to as little as every 100th pulse.

the pulse counter and frequency generator combination is equal to the pulse counter setting (1, 5, or 10) multiplied by the frequency generator setting (1 to 30).

#### STAND-ALONE CONTROLLERS



Series **PC100** Controller. This is a stand-alone assembly of two pulse counters, and a coalescing filter to provide clean input air. A pulsed air input (usually from the output of an operating valve) is required. This controller can be used for a number of **SERV-OIL** units instead of having a counter in each of the individual units. This provides greater economy and superior control.

Series **PC110** Controller. This is a stand-alone assembly that combines a pulse counter, a frequency generator, and a coalescing filter to provide clean input air. A steady flow of input air is required. The steady flow is converted into controlled pulses to actuate Servo-Meters.

As explained above, the settings of the pulse counter and the frequency generator can produce actuating pulses in periods as long as five minutes.

Frequency Generator. This all-pneumatic device requires a steady supply of input air, and is used most often where on-off air-input pulses are not available. From the steady air

input the generator produces output pulses to actuate Servo-Meters. This type of controller is shown at the right as an integrated part of an Automation Pac assembly.

A frequency generator's output is most accurate when producing pulses with a period of 1 to 30 seconds. The generator can be combined with a pulse counter to produce a final pulse output with periods from 1 second to 5 minutes. The actuating pulse frequency in seconds of



Pneumatic Pulse

Controller

Master Pneumatic, Inc.

## The SERV-OIL Family of Products

#### **AUTOMATION PAC -**

This is a self-contained assembly consisting of an oil reservoir, up to 20 Servo-Meters, and frequency controller. It is supplied ready for installation in a pneumatic circuit, with only ball checks, fittings, and tubing being required accessories. The Automation Pac will provide precision lubrication for valves, cylinders, fixtures, and machine tools using pneumatic components.



SINGLE-POINT INJEC-**TION LUBRICATOR for AIR TOOLS** — This unit is specifically designed to lubricate air tools. It cannot be used for other lubrication. For other single-point lubrication see the Downstream Lubricator below.

air motors, or other pneumatic equipment except air tools. See above for air tools. A small nylon

line carries oil from the

lubricator to the desired

point of lubrication. Most

commonly the nylon line

runs inside the air line.



#### SINGLE-POINT DOWNSTREAM INJECTION LUBRI-

**CATOR** — The downstream lubricator is installed in an air line going to cylinders,



#### **MULTIPLE POINT INJEC-**TION LUBRICATORS-Up to ten Servo-Meters can be

assembled to provide precision lubrication for up to ten lubrication points. All Servo-Meters use the same oil and air sources.



#### LIQUID-ONLY EJECTOR

- A Servo-Meter is terminated with a nozzle through which a precise amount of liquid can be ejected up to ten inches. Assemblies of up to 10 Servo-Meters can be used.





**COMPLETE LUBRICATION SYSTEMS** - All-in-one lubrication or coolant systems are engineered for many specialized requirements. See the descriptions of the SCORPION systems at the end of this section.

## PNEUMATIC TOOL LUBRICATION

The Best Way to Do It!

#### **CONVENTIONAL MIST LUBRICATION**



Oil pools in the low spots until air pushes it out in large slugs.

**INJECTION LUBRICATION** 



Consistant, Precision Lubrication Results in Consistent Torque and Tool Performance.

# The Importance of SERV-OIL to Air Tools

Air tools are very economical devices for tightening threaded fasteners. They are usually smaller and lighter than similar electric or hydraulic tools, and have the advantage of being able to stall without suffering motor damage. However, undertanding the mechanics of an air tool will make it clear why it requires consistent, controlled lubrication.

#### CONSTRUCTION

The most common motor design used in air tools is the rotary vane type. A typical cross section of such a motor is shown below.



The motor body is usually of cast metal. Its inside diameter and is machined and polished to a high finish. The diameter and length of the body will determine the size and capacity of the motor. The rotor's diameter is about 85% of the inside diameter of the body, and has radial slots to accomocate the four vanes. The vanes are as long as the rotor, and are linen-based, phenolic resin strips. The two end plates are made of a soft metal. They support the rotor shaft and serve as dynamic seals.

Note that the cylinder inside diameter and the rotor diameter have different center points. The difference is such that the two surfaces will be tangent where the bottom of the rotor touches the cylinder. Note also that the vanes slide in the rotor slots so that they maintain contact with the cylinder. This contact can be maintained by springs beneath each vane, or, more commonly, by air pressure.

#### **WORK CYCLE**

Referring to the diagram below we can follow a work cycle of the air motor.



Vanes divide the space between the rotor and cylinder into four chambers. Chamber 1 includes the inlet port. When pressurized air enters chamber 1 it causes the rotor to turn clockwise. When vane 2 clears the inlet port, chamber 2 is pressurized and the rotation to continues. As each chamber reaches the exhaust port its pressure is exhausted. A positive pressure differential between the chambers on the left and those on the right must be maintained in order for the rotor to rotate.

Maintaining a good seal between chambers is the function of the vanes. The most important seal points are where the vanes contact the cylinder, with the seal of the bottom vane being the most critical. It is here that the pressure differential between the inlet and exhaust sides of the motor must be maintained. If the seal points leak, the pressure differential drops, and the motor loses torque.

The wear of the seals is magnified by hit-or-miss lubrication. Without oil the vanes take a beating, and eventually crack and chip. The chips score the cylinder and rotor, and may even wedge themselves between vanes and cylinder. The air motor is approaching uselessness!

The **SERV-OIL** Single Point Lubricator is specifically designed to inject a predetermined amount of oil at the inlet of the air tool every time it cycles. Maximum performance. Extended life. Reduced maintenance. Less downtime. Improved torque control. These are all the result of **PRECISE**, **CONSISTENT LUBRICATION**.

## **SERV-OIL Single-Point** Injection Lubricators for Air Tools

## Port Sizes: 1/2, 3/4



Model Shown: A64061

#### SPECIFICATIONS

**Air Flow:** Maximum inlet pressure of 150 psig (10 bar) and a pressure drop of 3 psi (0.2 bar):  $1/2 \text{ NPTF} - 4-60 \text{ scfm} (2-28 \text{ dm}^3_{n}/\text{s})$  $3/4 \text{ NPTF} - 4-90 \text{ scfm} (2-43 \text{ dm}^3_{-}/\text{s})$ 

#### Ambient/Media Temperature:

40° to 125°F (4° to 52°C).

Flow Valve: Zinc body.

**Operating Pressure Range:** 

60-150 psig (4.1-10.3 bar)

**Pulse Counter:** Adjustable to operate the Servo-Meter on every cycle, every 5th cycle, or every 10th cycle.

**Reservoir:** Integral, unpressurized. 10-Ounce (300-ml) capacity transparent nylon with quick-fill cap. Optional **M476R** reservoir. Integral reservoir can be eliminated if a central-fill system is employed

**Servo-Meter:** Aluminum body; acetal end caps. 1-Drop rating; optional 1/2-drop or 2-drop rating. Transparent sight indicator gives visual verification of oil delivery.

Tubing: Optional 25 feet (8 meters) of oil-filled tubing.

The single-point lubricator **(SPL)** is specifically designed to lubricate air tools. It cannot be used for general lubrication of components other than air tools. For other single-point applications see the single-point downstream lubricator or multipoint lubricators on the following pages.

An **SPL** is installed in the air supply line upstream of the air tool. When the tool is cycled the **SPL** injects a precise amount of oil at the air inlet of the tool. Both the amount of oil and the frequency of injection are adjustable.



Sub-Assemblies and Installation of SPL

The four sub-assemblies shown in the drawing above make up the **SPL**.

Flow Valve. The air supply line is connected to the inlet of the flow valve. 1/8-Inch nylon tubing is connected to the nozzle in the outlet port, and then runs inside the air line to within a short distance of the air tool. A check valve must be installed on the end of the 1/8" nylon tube.



SPL Flow Valve (continued on next page) When the air tool is at rest, no air flows in the valve. When the tool is triggered the differential pressure across the sensing disk opens a passage to the pulse counter.

Pulse Counter. When the air tool is triggered the pulse counter receives an air signal from the flow valve. A threeposition switch on the counter is set to allow the air signal to proceed to the Servo-Meter on every cycle, every 5th cycle, or every 10th cycle. This is one of the means of controlling the amount of lubrication that will be supplied to the air tool.

Servo-Meter. The Servo-Meter is an air-actuated, positivedisplacement oil pump. It injects oil with each signal from the pulse counter. These signals can be every time, every 5th time, or every 10th time the air tool is triggered. The frequency is determined by the setting of the pulse counter.

To actuate the Servo-Meter the signal received must have a pressure of at least 60 psig (4 bar). When actuated the Servo-Meter delivers a precise amount of oil to the nozzle in the outlet port of the flow valve, and is then carried by a nylon line to the air tool. A transparent sight indicator on one end of the Servo-Meter gives visual verification of oil delivery.

By means of the adjusting knob on the end of the Servo-Meter, oil delivery can be reduced in precise increments from the maximum rating down to 10% of the maximum rating. (30% for 2 drop units.)

Oil Reservoir. The integral oil reservoir is made of tough, transparent nylon, and has a capacity of 10 ounces (300

ml). It has a quick-fill cap, and since the reservoir is not pressurized it can be filled at any time. It can also be used with a central-fill system. Gravity fill is recommended, but fill pressure can be up to 30 psig (2 bar).

An SPL can be ordered without an integral reservoir, in which case a sight-dome air eliminator is available for use with a central-fill system.

#### **DIMENSIONS** inches (mm)



#### **ORDERING INFORMATION**

Change the letters in the sample model number below to specify the SPL you want.



## SERV-OIL Downstream Injection Lubricators for Equipment *except* Air Tools

## Port Sizes: 1/2, 3/4



Model Shown: D64061

#### SPECIFICATIONS

**Air Flow:** Maximum inlet pressure of 150 psig (10 bar) and a pressure drop of 3 psi (0.2 bar):  $1/2 \text{ NPTF} - 4-60 \text{ scfm} (2-28 \text{ dm}^3_{n}/\text{s})$  $3/4 \text{ NPTF} - 4-90 \text{ scfm} (2-43 \text{ dm}^3_{-}/\text{s})$ 

#### Ambient/Media Temperature:

40° to 125°F (4° to 52°C).

Flow Valve: Zinc body.

#### **Operating Pressure Range:**

60-150 psig (4.1-10.3 bar)

**Pulse Counter:** Adjustable to operate the Servo-Meter on every cycle, every 5th cycle, or every 10th cycle.

**Reservoir**: Integral, unpressurized. 10-Ounce (300-ml) capacity transparent nylon with quick-fill cap. Optional M476R reservoir. Integral reservoir can be eliminated if a central-fill system is employed

**Servo-Meter:** Aluminum body; acetal end caps. 1-Drop rating; optional 1/2-drop or 2-drop rating. Transparent sight indicator gives visual verification of oil delivery.

Tubing: Optional 25 feet (8 meters) of oil-filled tubing.

The downstream injection lubricator is specifically designed to overcome the shortcomings of the conventional mist lubricator installed upstream of a control valve. Laboratory and field tests have shown that a mist lubricator installed in the conventional manner results in much of the lubricating oil being exhausted to atmosphere through the exhaust port of the control valve.

Oil that passes through the valve tends to coalesce and cling to the wall of the air line where it simply moves back and forth with each valve cycle.

The SERV-OIL downstream injection lubricator eliminates these shortcomings. It is installed downstream of the control valve and uses a small nylon line to carry the lubricant right to the desired lubrication point. This assures dependable lubrication for cylinders, air motors, or other pneumatic equipment.

The downstream lubricator is not designed to work with air tools. For such applications see preceding pages .



## Sub-Assemblies and Installation of Downstream Lubricator

The four sub-assemblies shown in the drawing above make up the downstream lubricator.

Air Chamber. The air line supplying the cylinder (or other device to be lubricated) is connected to the inlet port of the air chamber. 1/8-Inch nylon tubing is connected to the nozzle in the outlet port, and then runs inside the air line to within a short distance of the cylinder port. A check valve must be installed at the end of the tubing.



Air Chamber of Downstream Lubricator

Pulse Counter. When the control valve is actuated the pulse counter receives an air signal from the air chamber. A three-position switch on the counter is set to allow the air signal to proceed to the Servo-Meter on every cycle, every 5th cycle, or every 10th cycle. This is one of the means of controlling the amount of lubrication that will be dispensed by the Servo-Meter.

Servo-Meter. The Servo-Meter is an air-actuated, positivedisplacement oil pump. It injects oil with each signal from the pulse counter. These signals can be every time, every 5th time, or every 10th time the control valve is actuated. The frequency is determined by the setting of the pulse counter.

To actuate the Servo-Meter the signal received must have a pressure of at least 60 psig (4 bar). When actuated the Servo-Meter delivers a precise amount of oil to the nozzle in the outlet port of the flow valve, and thus on to the lubrication point. A transparent sight indicator on one end of the Servo-Meter gives visual verification of oil delivery.

By means of the adjusting knob on the end of the Servo-Meter, oil delivery can be reduced in precise increments from of the maximum rating down to 10% of the maximum rating. (30% for 2 drop units)

Oil Reservoir. The integral oil reservoir is made of tough, transparent nylon, and has a capacity of 10 ounces (300 ml). It has a quick-fill cap, and since the reservoir is not

pressurized it can be filled at any time. It can also be used with a central-fill system. Gravity fill is recommended, but fill pressure can be up to 30 psig (2 bar).

A downstream lubricator can be ordered without an integral reservoir, in which case a sight-dome air eliminator is available for use with a central-fill system.

#### **DIMENSIONS** inches (mm)



#### **ORDERING INFORMATION**

Change the letters in the sample model number below to specify the downstream lubricator you want.



## PNEUMATIC CYLINDER LUBRICATION

**Extend Cylinder Life and Decrease Downtime** 



#### **CONVENTIONAL MIST LUBRICATION**

oil, and a check valve maintains a

solid oil column.

# Cylinder Lubrication: Mist vs. SERV-OIL

A test was conducted for a major automotive plant to compare the effectiveness of mist type and SERV-OIL injection type lubricators. The test used special dual lip piston weld cylinders, and was conducted over a period of three and a half months. Cylinders were run for approximately 14 hours at a time. Both types of lubricators were adjusted to dispense the equivalent of one-tenth drop of oil for each 10 cylinder cycles.

Triple-filtered air was used in this test, and when the cylinders were disassembled at the end of the test no visible foreign particles were found in the cylinders. Filtration was at the 0.3- $\mu$ m level, and this is much finer than is found in most air cylinder operations where only 40- $\mu$ m filtration is common.

At the end of each daily test run, an air flow meter was attached to each cylinder to measure rod end leakage while the cylinders were still warm. The findings are displayed in the graph below.



Effect of Lubrication

If the cylinders had been of conventional construction, and had air filtration been at the more common plant level (40- $\mu$ m), cylinder wear could be expected to be much greater than that recorded in this test.

With the use of **SERV-OIL** injection lubrication, it is guaranteed that lubricant is reaching the cylinder at the rod end. Oil is carried from the **SERV-OIL** injector to the lubrication point by 1/8-inch nylon tubing inside the air line. The rod, therefore, is well lubricated and as a result, due to the piston's extended resting period (usually directly under the retract air supply port), the piston also receives a beneficial delivery of lubricant.

The longer and more tortuous the air pathway from control valve to cylinder, the less effective the mist lubricator becomes. Oil tends to coalesce on the air line walls and puddle in low points. Much of the oil can also be blown into the atmosphere from the valve's exhaust port, so that it serves no purpose in lubricating the cylinder, but does create a health hazard.

Wear in the cylinder during this test is exemplified by the O-ring wear shown in the graph below.



The cylinder leakage graph above displays the results at intervals up to 2 million cycles, the cycle count for the entire test. Air bypass around the piston can be seen to be significantly greater with mist type lubrication. This bypass is a failure that directly affects the force and speed of a cylinder. With **SERV-OIL** lubrication bypass loss is small, and essentially constant after establishing a low initial loss level.

As shown in this graph, an initial O-ring thickness of 0.139 inch was reduced by little more than 10% after two million cycles using **SERV-OIL** lubrication. With mist lubrication, the O-ring wear was nearly twice as great.

\* See page 289 for Cylinder Lubrication Rate chart.

## **FILTER & REGULATOR with SPL and HOSE ASSEMBLIES**





**SERV-OIL** single point lubricators **(SPLs)** have been used for decades to provide economical, precision lubrication to pneumatic devices. They lubricate just the points needing lubrication, not the hose or pipe supplying air to the device

The illustrations above are but a small sample of the available **FRL** combinations using single point lubricators . All those shown are for lubricating **AIR TOOLS** only. The injection lubricators used here are not designed for bi-directional flow, and so are **NOT** to be used with air cylinders or air motors. Where bi-directional flow is involved the downstream **SPLs** on pages 206-207 would be used.

In the above assemblies the lubricators can be fitted with integral oil reservoirs (assemblies A-D), or can be supplied from external reservoirs (assemblies E-H).

A variety of coaxial fittings and hose assemblies are available. Coaxial fittings allow the air and oil supplies to be connected simultaneously. Both quick connect/disconnect versions and **NPT** pipe models are offered. Some assemblies (A-D and H) include a 90-degree coaxial elbow for use where the lubricator is installed overhead.

The coaxial hose assemblies are available with the internal oil capillary tube, including check valve, installed in either straight or coiled blue urethane hose. The standard hose lengths are 12-, 25-, and 50-feet. Note that the coiled assemblies have a working length less than the overall length. Working lengths are shown with the Ordering Information on page 211, 213 and 215. Other hose lengths can be made to the user's exact specifications. Consult the Master Pneumatic Sales Department.

Coiled hose assemblies are typically used in applications where the **SPL** is overhead and the amount of hose on the floor needs to be minimized.

## **HOSE ASSEMBLIES**



## **FILTER & REGULATOR ASSEMBLY WITH SPL and HOSE**



#### FRL (with SPL) ORDERING INFORMATION

Change the letters in the sample model number below to specify the FRL assembly you want.



## LOW FLOW SPL HOSE ASSEMBLIES



**SERV-OIL** single point lubricators **(SPLs)** have been used for decades to provide economical, precision lubrication to pneumatic devices. They lubricate just the points needing lubrication, not the hose or pipe supplying air to the device.

The low flow **FR-SPL** assembly has been designed to offer a more economical, lower flow **FR-SPL** assembly at the same time supplying the accuracy and reliability that customers have come

to rely on with our standard **FR-SPL** assemblies.

The illustrations above are but a small sampling of the available **FR-SPL** combinations using single point lubricators . All those shown are for lubricating **AIRTOOLS** requiring low flow operation only. The injection lubricators used here are not designed for bi-directional flow, and are **NOT** to be used with air cylinders or air motors. Where bi-directional flow is involved the downstream **SPLs** on pages 206-207 would be used.

In the above assemblies the lubricators can be fitted with external oil reservoirs (assemblies A-D) or without the external oil reservoir for applications using central fill oil delivery systems.

The low flow **FR-SPL** assemblies are supplied with a 1/4"NPT inlet port. The outlet port is 1/2"NPT. The downstream hose fitting is supplied with a 1/4"NPT male swivel. Depending on the installation, these **FR-SPL** low flow assemblies can be ordered in a straight inline design or a 90 degree version allowing these assemblies to be mounted overhead in a workstation.

The coaxial hose assemblies are available with the internal oil capillary tube, including check valve, installed in either straight or coiled blue urethane hose. The standard hose lengths are 12- or 25-feet. Note that the coiled assemblies have a working length less than the overall length. Other hose lengths can be made to the user's exact specifications. Consult the Master Pneumatic Sales Department.

Coiled hose assemblies are typically used in applications where the **SPL** is overhead and hose on the floor needs to be eliminated, or at least minimized. A 90 Degree **FR-SPL** design is recommended to revent the hose from crimping during operations when the design is called out to be mounted overhead.

#### **INJECTION LUBRICATION vs. MIST LUBRICATION**

- Increased tool life 2-1/2 3x
- ◆ Reduce tool repair cost by 50 90%
- Provide consistant lubrication for consistant torque
- Use less oil AND minimize oil discharge in tool exhaust

## **HOSE ASSEMBLIES**



#### **HOSE DIAMETER:**

5/16 ID (1/2 upstream connection only)

#### UPSTREAM CONNECTION:

1/2-NPT male (non-coax – upstream barb on capillary tube installed in hose)

#### DOWNSTREAM CONNECTION:

1/4 male swivel (used with 3/8 ID or 5/16 ID hose)

#### HOSE TYPE

Coiled (standard 18" upstream
straight tail, 36" downstream
straight tail)C
For other tail lengths, consult factory
StraightS



#### LOW FLOW AIR TOOL LUBRICATION SYSTEM ORDERING INFORMATION

Change the letters in the sample model number below to specify the assembly you want.

## HB-0 A 0 A 4 A 2 <u>A-C12</u>

FILTER AN	D
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FILTER/REGULATOR OPTIONS
FD50-2B
F50-2C
BFD50-2D
BF50-2E
CFDR55M-2NGF
CFDR55M-2G
CFR55M-2NGH
CFR55M-2 J
CFDR56M-2NGK
CFDR56M-2L
CFR56M-2NGM
CFR56M-2N
BCFDR55M-2NGP
BCFDR55M-2Q
BCFR55M-2NGR
BCFR55M-2S
BCFDR56M-2NGT
BCFDR56M-2U
BCFR56M-2NGV
BCFR56M-2 W

#### **REGULATOR** •

None	0
R55M-2	1
R55M-2G	2
R56M-2	3
R56M-2G	4

	HOSE ASSE	MBLIES		
No hose assemb	ly			. B-A00
Assembly Number	Hose Type	Lenç Overall	gth ft (m) Working	Cod
URETHANE HO	SE			
Includes 1/4 ma	le swivel downs	tream co	nnection:	
H-0A0A5C-C12	5/16 ID coiled	12 (3.7)	9 (2.7)	C-C12
H-0A0A5C-C25	5/16 ID coiled	25 (7.6)	18 (5.5)	C-C2
H-0A0A5C-S12	5/16 ID straight	12 (3.7)	12 (3.7)	C-S12
H-UAUA5C-S25	5/16 ID straight	25 (7.6)	25 (7.6)	C-S28
REINFORCED U	RETHANE HOSI	Ε		
Includes 1/4 ma	le swivel downst	tream co	nnection:	
H-0A1A5C-C12	5/16 ID coiled	12 (3.7)	9 (2.7)	F-C1
H-0A1A5C-C25	5/16 ID coiled	25 (7.6)	18 (5.5)	F-C2
H-0A1A5C-S12	5/16 ID straight	12 (3.7)	12 (3.7)	F-S12
H-UATA5C-525	5/16 ID straight	25 (7.6)	25 (7.6)	F-52
<b>† LUBRICATOR</b>	(See pp 204, 20	6)		
(1/2" port size a	nd 1/2" drop onl	y)		
PA60045	-			
PA60045, M476F	R reservoir	•••••		<u>[</u>
PA60045, M4/6	R reservoir, 1/4" d	rain cock		t
PA60045, 1/4" di	rain cock			I
$PA60045, 90^{\circ} as$	sembly M476P r			)
PA60045, 90 as	ible counter			ا۱
PA60045BB, M4	76R reservoir. doi	uble coun	ter	
PA60045BB, M4	76R reservoir, 1/4	" drain co	ock,	
double counte	er		,	V
PA60045BB, 1/4	" drain cock, dou	ble count	er	
PA60045BB, 90°	assembly, double	e counter.		····· `
PA60045, 90° as	sembly, M476R r€	eservoir,		

double counter ...... Z

**† NOTE:** "P" prefix on lubricator part number indicates that it is supplied without capillary tubing. Instead a probe adapter will be supplied within this assembly.

#### TYPICAL MPL APPLICATION With 2-Drop Servo-Meters and Integral Oil Reservoir

Diagram A at the right shows a simple circuit using three 2-drop Servo-Meters and an integral oil reservoir. The actuating signal for the Servo-Meters is taken from the downstream side of the operating valve. Each actuation of the valve causes the Servo-Meters to inject oil at three different specific lubrication points. The Servo-Meters can be set to inject as little as 1/5th drop or as much as 2 drops per cycle. No controller is required in this application.



#### TYPICAL MPL APPLICATION With 1-Drop Servo-Meters, a Pulse Counter, and Remote Oil Reservoir



Diagram B at the left shows a circuit using three onedrop Servo-Meters, a pulse counter, and a remote one-quart oil reservoir. The actuating signal for the Servo-Meters is taken from the downstream side of the operating valve. The Servo-Meters can deliver from 1/10th drop to one drop of oil to each of the three different lubrication points. The pulse counter can be set to reduce lubrication by allowing only every 5th or 10th air pulse from the operating valve to actuate the Servo-Meters. For even greater reduction of the lubricating frequency, two pulse counters acting in tandem can be used.

Note the use of a sight dome to vent air from the system.

An additional Typical Application using a stand-alone frequency generator is shown on the following page.

#### TYPICAL MPL APPLICATION With 1/2-Drop Servo-Meters, a Frequency Controller, and Remote Oil Reservoir

In diagram C at the right the **MPL** has 1/2-drop Servo-Meters which can supply from 1/20th drop to 1/2 drop of oil at each actuation. A 10-gallon metal oil reservoir is used. This reservoir could actually supply a number of similar **MPL** lubricating systems. Oil is introduced at the bottom of the assembly, and a sight dome is used to prevent airlock of the Servo-Meters.

A stand-alone frequency controller determines how often the Servo-Meters will inject oil. This can be as often as every second or as infrequent as every five minutes. Air for the controller is from a constant, no-pulse source which the controller will use to create the actuating pulses for the Servo-Meters. The air signal can be introduced at either the top or the bottom of the assembly.





#### MPL ASSEMBLY KITS

Servo-Meter Kit (see footnotes)	70001##4B-@
Mounting/Assembly Kit	KA474-10
## – Specify rating: 1/2 drop05 1 drop10 2 drops20	@ – Specify options. See OPTIONS under Ordering Information on following pages.

#### **ASSEMBLY OF MPL SYSTEMS**

- 1. Oil reservoir
- 2. Sight dome for venting air manually and to give visual confirmaton of oil in Servo-Meters. Part **482R**.
- 3. Mounting clamp.
- 4. Servo-Meter.
- 5. Prefilled 1/8" nylon oil delivery line. Part **A00942M**.
- 6. Block plate. Block plate with seals and hardware is kit number **K474-07T**. See page 287.
- 7. Tube connector. Part 00142W
- 8. Ball check valve. One required for inlet to tee before air valves. See page 287 for types and sizes.
- 9. Mounting plate.
- 10. Pneumatic pulse counter.
- 11. Mounting clamp.
- 12. Tube connector. Part **00184W.**
- 13. Tube connector. Part 001124W.
- 14. Oil supply line; 3/8" nylon tubing. Part **009126-M**. Larger size can be used.
- Air signal line; 1/4" nylon tubing. Must be from on-off source, usually downstream of operating valve. Part 00984M. Note: When using a pulse counter, the air signal must first go to the counter, then to the Servo-Meters.
- 16. 476-40 Ball valve



**MPL Mounting Kit** 

## **SERVO-METERS** Add-on injectors / replacement kits



Model: 70001104B (Bolts and washers not shown)



Model: 70G01104A (Bolts and washers not shown)



Model: 70E01104B (Bolts and washers not shown)



Model: 70001104A (Bolts and washers not shown)







456-140

Fittings above are shown attached to housings that have the M5 x 0.8-6h tapped hole on side on unit.







Standard end cap Solid end cap

### SERVO-METER KITS FOR SERV-OIL MULTIPLE-POINT INJECTION LUBRICATORS.

#### Series 710 and 720 70 0 01 10 4 B - A W EXTRA PORTING and MICRO DIAL OPTIONS Standard Servo-Meter no options ......0 M5 x 0.8H tapped air hole on breather end of ..... D

- housing **456-138** brass plug and **SOLID** washers. M5 x 0.8H tapped air hole on breather end of ..... E
- housing **456-139** 90 degree fitting and **SOLID** washers.
- M5 x 0.8H tapped air hole on breather end of ..... F housing **456-140** Straight fitting and **SOLID** washers.

```
Micro Dial ...... G
M5 x 0.8H tapped air hole on breather end of ..... H
```

housing **456-139** 90 degree fitting and **SOLID** washers. Micro Dial.

#### SERVO-METER RATING

Half drop	05
Full drop	10
Two drops	20
	_
SERVU-METER HOUSING MATERIAL	_
Brass housing	.В
Brass housing	.В А

#### PORT TYPE

NPTF	Leave Blank
BSPP	W

#### 

Oil end seals (Buna N standard) ....Leave Blank

## **SERVO-METERS**

## Add-on injectors / replacement kits

#### SERVO-METER KITS FOR SERV-OIL ELECTRONICALLY CONTROLLED MULTIPLE-POINT INJECTION LUBRICATORS.

Series 7A0	70 <u>0</u>	01	<u>10</u> 4	<b>B</b> -	Ŵ	
EXTRA PORTING and M OPTIONS Standard Servo-Meter no Micro Dial	<b>AICRO DIAL</b>	0 G			PORT TYPE NPTF BSPP	Remove '-' W
SERVO-METER RATING Half drop Full drop Two drops SERVO-METER HOUSI	6					
Brass housing Aluminum housing Nickle plated housing	B A N					
	SERVO-M	IETER	KITS F	OR AU	TOMATION PACS	
Series 730	70 Q	01	<u>10</u> 4	<b>B</b> -	A W	
EXTRA PORTING and POPTIONS Standard Servo-Meter not M5 x 0.8H tapped air hol housing 456-138 brass washers. M5 x 0.8H tapped air hol housing 456-139 90 de washers. M5 x 0.8H tapped air hol housing 456-140 Straig washers. Micro Dial M5 x 0.8H tapped air hol housing 456-139 90 de washers. Micro Dial.	MICRO DIAL	0 f D f E <b>ID</b> f F G f H <b>ID</b>			PÖRT TYPE         NPTF         BSPP         OPTIONS (More than one option chosen. Add in alphabetical ord None (remove dash)         Servo-meter shutoff         Non-shutoff         Oil end seals (EPR)         Oil end seals (Neoprene)         Oil end seals (Viton)         Oil end seals (Buna N standard	Leave Blank W n can be er) Leave Blank A Leave Blank E N V )Leave Blank
SERVO-METER RATING Half drop Full drop Two drops SERVO-METER HOUSI Brass housing Aluminum housing Nickle plated housing	G					

#### SERVO-METERS Add-on injectors / replacement kits SERVO-METER KITS FOR LIQUID DISPENSERS Series 740 and 770 70 0 01 10 4 B - A L V W PORT TYPE EXTRA PORTING and MICRO DIAL NPTF ..... Leave Blank **OPTIONS** Standard Servo-Meter no options ......0 BSPP ..... W M5 x 0.8H tapped air hole on breather end of ..... D **OPTIONS** housing 456-138 brass plug and SOLID Oil end seals (EPR) ..... Leave Blank washers. (Add E using other M5 x 0.8H tapped air hole on breather end of ..... E **OPTION**) housing 456-139 90 degree fitting and SOLID Oil end seals (Viton) ......V washers. M5 x 0.8H tapped air hole on breather end of ..... F **OPTIONS** (More than one option can be housing 456-140 Straight fitting and SOLID chosen. Add in alphabetical order) washers. None (remove dash) ..... Leave Blank Micro Dial ..... G Servo-meter shutoff ..... A M5 x 0.8H tapped air hole on breather end of ..... H Non-shutoff ..... Leave Blank housing 456-139 90 degree fitting and SOLID Oil end seals (EPR) ..... E washers. Micro Dial. SERVO-METER RATING Full drop ...... 10 Two drops ...... 20 SERVO-METER HOUSING MATERIAL Brass housing......B Aluminum housing ...... A Nickle plated housing ..... N SERVO-METER KITS FOR JETMASTER LIQUID DISPENSERS Series **750** and **760** 70 0 01 10 5 B - E S V EXTRA PORTING and MICRO DIAL **OPTIONS OPTIONS** Oil end seals (EPR) ..... Leave Blank Standard Servo-Meter no options ...... 0 (Add E using other **OPTION**) M5 x 0.8H tapped air hole on breather end of ..... D Oil end seals (Viton) .....V housing 456-138 brass plug and SOLID washers. OPTIONS (More than one option can be M5 x 0.8H tapped air hole on breather end of ..... E chosen. Add in alphabetical order) housing 456-139 90 degree fitting and SOLID None (remove dash) ..... Leave Blank washers. Servo-meter shutoff ...... A M5 x 0.8H tapped air hole on breather end of ..... F Non-shutoff ..... Leave Blank housing 456-140 Straight fitting and SOLID Oil end seals (EPR) ..... E washers. Micro Dial ..... G SERVO-METER HOUSING MATERIAL M5 x 0.8H tapped air hole on breather end of ..... H Brass housing......B housing 456-139 90 degree fitting and SOLID Aluminum housing ...... A washers. Micro Dial. Nickle plated housing .....N SERVO-METER RATING Half drop ...... 05 Full drop ...... 10

Two drops ...... 20

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## Series 710, 720

## SERV-OIL Multiple-Point Injection Lubricators



Up to 10 Servo-Meters can be assembled to make up a multiple point lubricator (MPL). Assembled MPLs can be ordered, or they can be assembled by the user employing the Servo-Meter and Assembly/Mounting Kits shown on the facing page. Master Pneumatic recommends that you order factory-assembled MPLs. The cost is economical, your installation time is greatly reduced, and you are assured of reliable performance because both the components and the assemblies have been factory-tested.

The frequency of oil injection can be controlled by using one of the pulse counters or frequency controllers detailed on page 200.

Series 710 factory assemblies employ two mounting holes. When a very rigid mounting is needed, order Series 720 which employs heavy-duty mounting plates with four mounting holes.

Model Shown: 71003104B

#### SPECIFICATIONS

#### Ambient/Media Temperature:

40° to 125°F (4° to 52°C).

**Controller:** See page 200 for the various types of controllers available.

Operating Pressure: 60-150 psig (4.1-10.3 bar).

**Reservoir:** See page 222 for the various types of reservoirs available.

**Servo-Meter:** Brass body; optional Aluminum and Nickel plated housings; acetal end caps. 1-Drop rating; optional 1/2-drop or 2-drop rating. Minimum operating air pressure: 60 psig (4 bar).

<b>DIMENSIONS</b> inches (mm)				
Α	в†	С	D	E †
3.9 (99)	2.5 (64)	1.8 (46)	4.1 (104)	4.3 (109)

+ Add 0.9 (23) for each additional Servo-Meter.



А

С

#### **ORDERING INFORMATION**

Change the letters in the sample model number below to specify the MPL you want.



## Series 7A0

## Electronically Controlled SERV-OIL Multiple-Point Lubricators



The electronically controlled multiple-point lubricator has a 3-way solenoid-controlled valve to produce the actuating signals for the Servo-Meters (up to four may be used.). This allows lubrication control to be interfaced with other system electronics, so that the frequency of oil injection is under precise control.

**Servo-Meters.** Up to four can be included in the assembly with ratings of 1/2, 1, or 2 drops. Each Servo-Meter output is adjustable down to just 10 percent of its rating. Because of their modular construction Servo-Meters can be easily added or removed from the assembly.

**Pneumatic Valve**. A solenoid-actuated, 3-way valve provides the air pressure to actuate the Servo-Meters. Inlet pressure must be at least 60 psig (4 bar). Available solenoid voltage options are 24-, 110-, or 220-volts AC and 12-, 24-, or 110-volts DC.

**Oil Supply.** Oil can be supplied from a central reservoir, or an optional integral reservoir. Integral reservoirs are available in 10-ounce (part M476R), one-quart (part M570-6R), or two-quart (M570-12R) capacities.

**Air Filter.** A general-purpose Sentry filter can be included in the assembly, but is not required if external air filtration is adequate, i.e., has at least 40-µm filtration.

#### SPECIFICATIONS

Ambient/Media Temperature:

40° to 125°F (4° to 52°C).

Operating Pressure: 60-150 psig (4.1-10.3 bar).

**Pneumatic Valve**: Solenoid actuated 3-way. Electrical: 24-, 120-, 220-volts 50/60 Hz; 12-, 24-, 110-volts DC.

**Servo-Meter:** Brass body; optional Aluminum and Nickel plated housings; acetal end caps. 1-Drop rating; optional 1/2-drop or 2-drop rating. Minimum operating air pressure: 60 psig (4 bar). Transparent sight indicator gives visual verification of oil delivery.

#### **IMPORTANT SERIES 7A0 BENEFITS**

Modular design provides Servo-Meters, solenoid valve, and air filter in a complete package with easy add-on capability.

There is no need to purchase additional valves or other components. Simply pipe up an air supply and plug in the **MPL** package.

You have full control by coordinating with your own computer programming. This eliminates costly feast-or-famine lubrication.

# Electronically Controlled SERV-OIL Mulltiple-Point-Lubrcation, 7A0 Series

#### **EASY ORDERING FOR SERIES 7A0**

Model Number	Servo-Meters	Inlet Port
7A00#054B-11XY	1/2 drop	1/8 NPTF
7A00#054B-21XY	1/2 drop	1/4 NPTF
7A00#104B-11XY	1 drop	1/8 NPTF
7A00#104B-21XY	1 drop	1/4 NPTF
7A00#204B-11XY	2 drops	1/8 NPTF
7A00#204B-21XY	2 drops	1/4 NPTF

# - Insert quantity of Servo-Meters (1 to 4).

X – Insert voltage number (see Ordering Information below).

Y – Insert filter number (see Ordering Information below).



**DIMENSIONS** inches (mm)

†Add 0.9 (23) for each additional Servo-Meter

#### **ORDERING INFORMATION**

Change the letters in the sample model number below to specify the MPL you want.



## **SERV-OIL** Automation Pacs

## Series 730

Model Shown: 73010104B-CC



Automation Pac with Double-Counter Controller For Use with Pulse Air Inlet Source

<image>

Automation Pac with Frequency Controller For Use with Constant Air Inlet Source

A **SERV-OIL** Automation Pac is a self-contained assembly of oil reservoir, up to 20 Servo-Meters, and a controller. It is supplied ready for installation in a pneumatic circuit, with only ball checks, fittings, and tubing being required. The Automation Pac will provide precision lubrication for up to 20 points on valves, cylinders, fixtures, automation equipment, and machine tools using pneumatic components.

**Oil Reservoir.** The Automation Pac oil reservoir is made of cast aluminum, and has a capacity of 1/2 gallon (1.9 liters). It has a built-in oil strainer, a transparent sight tube, a quick-fill cap, and a screw-on lid.

If the Automation Pac is located where the oil level cannot easily be determined visually, electrical oil-level switches are available. There are both high-level and low-level switches. They can be connected to a remote electrical control for automatic filling of the reservoir.

**Controllers:** (See page 200.) Double pulse counters, with or without a frequency generator, can be used to control the frequency of oil injection. These can be integrated into the assembly, or be in the form of stand-alone controllers. A stand-alone controller can be employed to control the injection frequency of several Automation Pacs.

In either case actuation pulses from the system control valve initiate the oil injection function. The controller then is set so the actual oil injection could be every cycle, or every 5, 10, 25, 50, or 100 cycles of the control valve.

Both types of controller are supplied with a 0.3- $\mu$ m coalescing filter for clean, long-life operation. The coalescing filter should be preceded by 5- $\mu$ m filtration to prolong the life of the coalescing element.

#### SPECIFICATIONS

Ambient/Media Temperature:

40° to 175°F (4° to 79°C).

**Reservoir:** Aluminum; 0.5 gallon (1.9 liters) capacity. **Seals:** Nitrile.

**Servo-Meter:** Brass body; optional Aluminum and Nickle Plated brass; acetal end caps.

**Servo-Meter Operating Pressure:** 60-150 psig (4.1-10.3 bar).



#### **DIMENSIONS** inches (mm)

				Weight
Α	В	С†	D	lb (kg)
5.1 (130)	7.6 (193)	1.8 (46)	5.1 (130)	6.6 (3.0)

† Dimension for single Servo-Meter. For each additional Servo-Meter add 0.9 (23).

#### **ORDERING INFORMATION**

Change the letters in the sample model number below to specify the Automation Pac you want.



## Serv-Oil PNEUMATIC INJECTION LUBRICATION CHART



First identify where the bore and stroke intersect on the lower chart. With the appropriate letter use the cycles of the cylinder per minute and draw a line to intersect the A, B, C or D line on the upper chart. Draw a line vertically from there to the appropriate setting of the counter and Servo-Meter.

Example: Cylinder with 4" bore and 5" stroke falls into the "B" segment of the selection chart. If the operating rate of the cylinders is 15 per minute, the counter setting should be at 10 and the injector (Servo-Meter) knob turned counter - clockwise 25 clicks.

To increase Servo-Meter output, turn volume control knob clockwise. **NOTE:** This chart is a tool for establishing a baseline only. Specific applications may require more or less fluid output.

MASTER PNEUMATIC - DETROIT, INC. SERV-OIL ACTUATOR SELECTION CHART.

# MULTIPLE POINT LUBRICATOR'S (MPL's) with M476 RESERVOIR





71001104B-C with M476R reservoir



71002104A with M476R reservoir