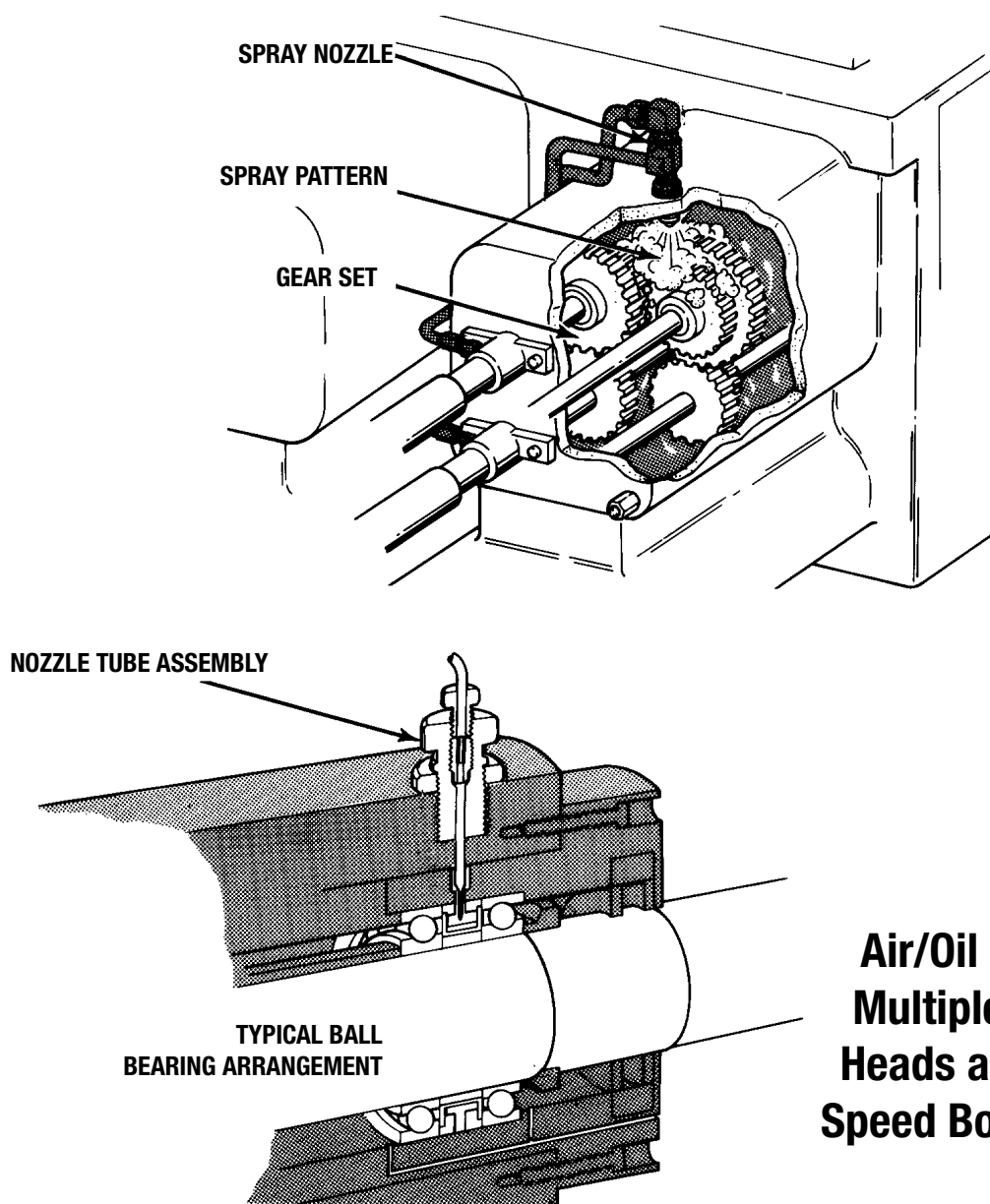


Air/Oil Lubrication System



**Air/Oil System for
Multiple Spindle
Heads and High-
Speed Box Spindles**

NEW LUBRICATION METHOD FOR HIGH SPEED BEARINGS AND GEARS

Exclusive from Graco,® Spindl-Gard® is an extremely efficient and cost-effective method for lubricating single or multiple-spindle machining heads. This method also offers significant advantages for other types of equipment which use high-speed bearings and gears.

Spindl-Gard Systems Get Back to the Important Basics

The primary function of a lubrication system for machining spindles, gearboxes and enclosed antifriction bearings is to reduce friction and heat from friction. Circulating oil wet sump systems and mist systems do indeed reduce friction. However, they also create a battery of all-too-familiar problems.

Today, Graco offers a proven new system—Spindl-Gard—that is far superior to traditional systems.

Spindl-Gard provides a precise application of a measured amount of oil to a specific bearing surface. This oil is applied at the proper frequency in the right quantity to meet the lubrication requirements, keeping bearings, gears, shafts and seals running cool. Spindl-Gard provides full protection without over- or under-lubing. Fact is, a multiple-spindle head that used to require 1.5 gallons (5.7 liters) of oil per minute can now operate more efficiently with a mere 1.2 cubic inches (20 cm³) per hour applied by Spindl-Gard.

Features/Benefits

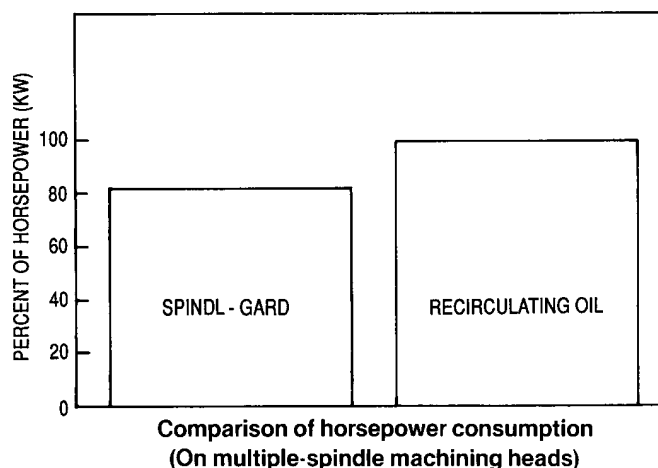
Here's how Spindl-Gard Systems improve performance and extend equipment life.

- Eliminate high oil consumption, leaking oil and contamination of coolant that are common with circulating oil wet sump systems.
- Do away with the health, safety and cleanup problems that result from mist systems.
- Save up to 17% on horsepower consumption to reduce energy costs.
- Reduce temperature rise by up to 50% compared to wet sump systems.
- Permit using higher spindle speeds within temperature limitations to produce more good parts per hour.
- Provide effective monitoring capabilities for increased protection of equipment against inadequate lubrication.
- Prevent corrosive coolant from entering and damaging head components.
- Help extend seal life and reduce shaft wear.
- Minimize thermal distortion to improve production accuracy.

All this and more, at an investment far less than the cost of a spindle rebuild.

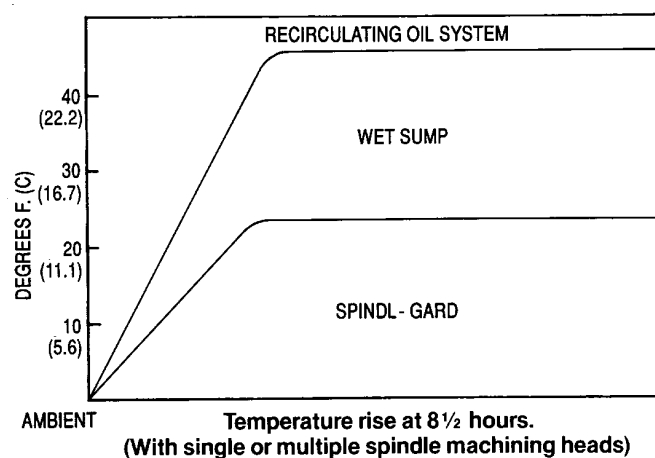
Spindl-Gard Delivers Cost-Effective Lubrication Plus, Much, Much More!

Significant Savings In Horsepower



This graph is based on comparison of Spindl-Gard with a circulating oil wet sump system. Each system was used on an 11-spindle head. The test covered more than 2,500 hours of operation. The bottom line is that the head protected by Spindl-Gard needed 17% less horsepower. This savings of up to 17% could result in either lower energy costs or more horsepower to apply toward increased production.

Temperature Rise Reduced By Up To 50%



Because Spindl-Gard works with a considerably smaller volume of oil, there's less oil shear friction to generate heat. Also, Spindl-Gard's pressurization of the head lowers compression loading of seals, to reduce seal-to-shaft friction and heat as well as wear on seal and shaft.

Proven With Real-World Tests

A major manufacturer of drill heads and a blue-chip automotive company were involved in the testing of Spindl-Gard for almost a year. The tests revealed that temperatures in the Spindl-Gard lubricated heads were an average of 22°F (12°C) below those for the wet sump units performing the same work.

Opportunity To Increase Speeds and Use State-of-the-Art Tooling

Because Spindl-Gard reduces temperature rise and operating temperatures—as well as making more horsepower available for production—Spindl-Gard provides new latitude to increase speed and more fully utilize the capabilities of carbide or ceramic tooling. And Spindl-Gard does it without exceeding original temperature limitations.

Increase Accuracy, Get More Good Parts Per Hour

Spindl-Gard System's ability to keep heads running cooler means there will be less thermal distortion. More of equipment's designed-in potential for accuracy can be realized.

Less Chance for Coolant to Get Into Head

With the Spindl-Gard System's use of pressure in the head and outward-facing shaft seals, it's unlikely that coolant will get into the head to cause rust or other problems. Any coolant that does infiltrate is quickly eliminated by the drain.

Less Oil Needed, Less Oil Used

The most effective circulating oil wet sump system requires large volumes of oil, applying about 1.5 gallons (5.7 liters) per minute per head. Spindl-Gard uses a very small volume of oil, a mere 1.2 cu. in. (20 cm³) per hour or about 1 gallon (3.8 liters) in 200 hours of operation!

Spindl-Gard Systems Designed for Your Applications

Two different versions of Spindl-Gard are available to fit a wide range of applications. Each version is customized to provide optimum lubrication for the specific machine or equipment on which it is installed. Both types have been proven effective while avoiding the major problems common with circulating oil, mist, and grease pack lube systems.

To distinguish the two different type of Spindl-Gard systems, Graco has designated them as:

- **Spindl-Gard System 1 (SG-1)**
- **Spindl-Gard System 2 (SG-2)**

Range of Applications

Spindl-Gard System 1 can be used with horizontal and vertical machining heads which have bearings operating at surface speeds to 2,500 surface feet (762 m) per minute, or 250,000 DN. (DN - diameter of bearing (D) in millimeters multiplied by the rotational speed of the bearing RPM (N).) SG-1 may be used by itself as an independent system for a specific spindle head. However, SG-1 can also be an integral part of a Graco Trabon® oil lubricating system. It is this latter option which offers the greatest cost advantages.

Spindl-Gard System 2 differs from SG-1 in that it is designed for speeds above 2,500 surface fpm (762 mpm) (greater than 250,000 DN). The lubricant delivery method is also somewhat different, as will be explained later.

Both systems can be used to good advantage for applications other than spindle heads. Other applications include motor, turbine, and blower bearings; high-speed gear-reduction drives, conveyor chain lubrication, or anywhere stray mist must be avoided.

SYSTEM CONFIGURATIONS SPINDL-GARD SYSTEM 1 = TRUE MODULARITY

SG-1 utilizes a standard Trabon® pump package (typically, Graco's Modu-Flo® series), a Model MSP lubricant divider valve with cycle indicator switch, air pressure switch, Maxi-Monitor® controller, and various fluid line accessories. (See Figure 1.) In some cases, the machine controller will be used in lieu of the Maxi-Monitor controller. Each shot of lubricant from the pump is distributed by the divider valve to the appropriate lube point. Depending upon spindle head design, some bearings may receive lubricant directly from the divider valve while others, including gears, may receive lubricant from spray nozzles located in the gear cavity. By using the feedback features of the divider valve and air pressure switch,

it is possible to monitor lubricant delivery status to all points at all times. The SG-1 circuit shown in Figure 1 can handle up to four spray nozzles and/or terminating lube points. However, when combined with the appropriate Trabon series-progressive lube system, the number of points which can be handled by SG-1 is virtually unlimited.

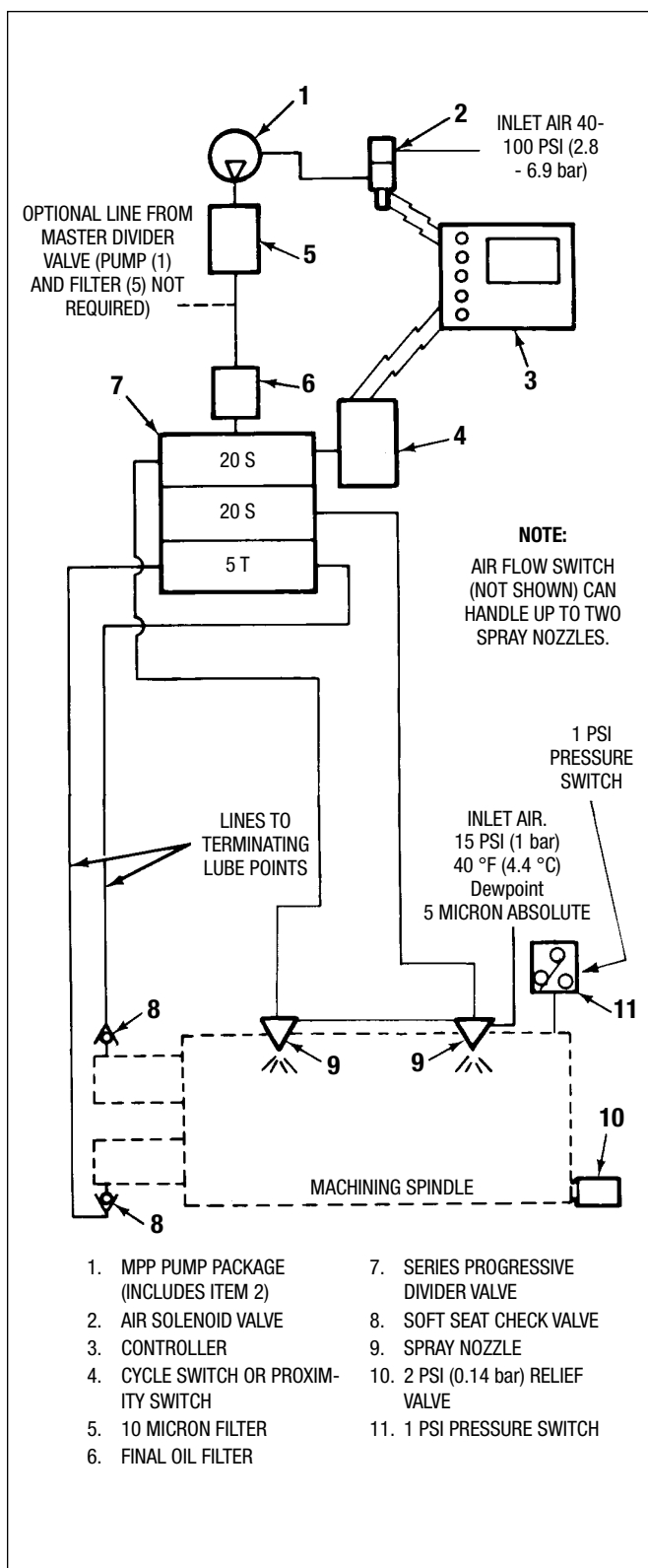


Figure 1. Spindl-Gard System 1

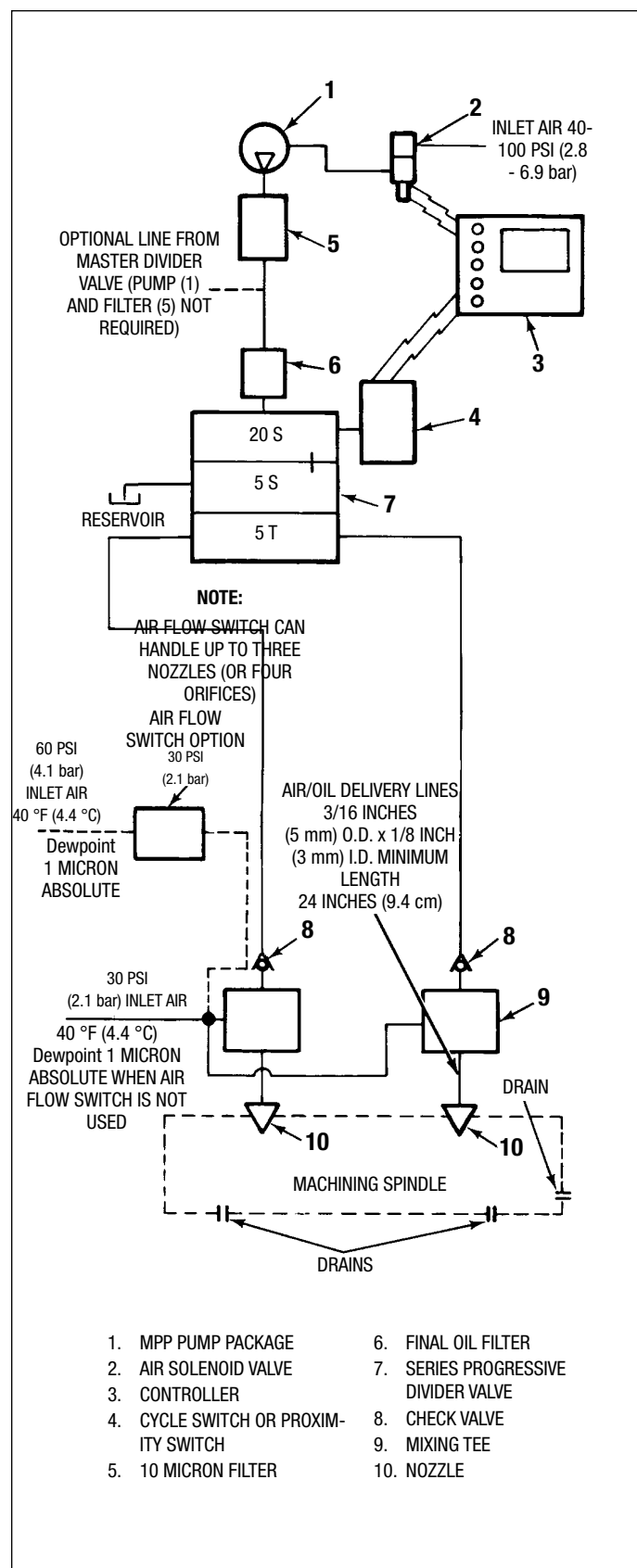


Figure 2. Spindl-Gard System 2

SPINDL-GARD SYSTEM 2 UNIQUE DELIVERY METHOD

SG-2 differs from its predecessor primarily in lube delivery method and in the components used to mix the oil and air and deliver it to the bearings. Instead of lubricating with discrete shots of air-conveyed oil spray, SG-2 applies a continuous stream of air which carries a minute quantity of oil through tubing direct to the lube point (typically a high-speed bearing). The tubing is sized to allow the air flow to distribute the oil into minute, evenly spaced droplets which are carried along the tubing wall. The result is a minute supply of oil being continuously applied to the bearing surface. Again, this system provides both air and oil line monitoring with fault warning capability.

SG-2 will give a warning if either a high or low air flow condition exists which would correspond to over or under lubrication. A similar warning system is built into the oil distribution assembly. This type of warning is essential for bearings which are turning at speeds in excess of 250,000 DN. A typical SG-2 system is illustrated in Figure 2.

Both SG-1 and SG-2 are modular in design. Components are available off-the-shelf from any Graco authorized Trabon distributor.

SYSTEM SELECTION CRITERIA

The first step in selecting any Spindl-Gard System is to calculate the "DN" factor. This factor is developed from the following equation using these parameters:

- D: Spindle bearing bore diameter in millimeters (MM)
- N: Spindle speed in revolutions per minute (rpm)
- DN: MM x rpm
- When DN is 0—250,000, Select Spindl-Gard System 1 (SG-1)
- When DN exceeds 250,000, Select SG-2
- Contact Graco to arrange a Spindl-Gard design seminar or to discuss details of your application.

SPINDL-GARD SYSTEM 1 COMPONENTS

Controller: Several means of control are available for the SG-1. Operation can be controlled by signals from user's machine control or by one of several controllers available from Graco as follows:

- **WMP III Maxi-Monitor®:** This microprocessor-based controller can be used to schedule and initiate cycles on a machine cycle or time basis as well as to relay fault conditions. For details, see Literature No. L14750.
- **Solid-State Timer:** This solid-state controller can be used to initiate pump cycles on a time basis. A built-in memory retains the cycle time for 1-1/2 hours during power failure or machine shutdown to resume from the point where it was suspended. For details, see Literature No. L14511.

- **Flexi-Monitor:** Utilizing the latest solid-state programmable control technology, the Flexi-Monitor controls complex multiple zone lubrication systems. Not only does the Flexi-Monitor control lubrication cycles, but it can monitor and report every aspect of the lubrication system; including temperature, vibration, fluid flow, pressure, and system operating status. For details, see Literature No. L14200.

Modu-Flo® Pump: For details on this compact, dependable, air- or hydraulic-powered pump and its accessories, see Literature No. L12000.

Filter: A 10-micron filter placed in the outlet line of the pump provides filtration of oil entering the system. The moving portions of the divider valves require extremely fine tolerances. A final oil filter at the divider valve inlet provides the filtration necessary before oil enters the valve.

Divider Valve: This valve meters the precise amount of oil required for each Spindl-Gard nozzle or terminating lube point. The divider valve consists of stackable sections, each of which can provide oil to one or two lube points. The sections can be arranged to provide metered oil up to sixteen lube points. A valve section can be supplied with a cycle indicator pin to provide visual indication that the divider valve is cycling. The indicator pin can also be used to actuate a cycle switch which then provides a signal to the system controller. For details on the MSP valve as well as its Cycle Indicator Pin, see Literature L10102.

Spindl-Gard Spray Nozzle: The basic nozzle can be installed in heads with walls up to 1-3/4-inches (44.4 mm) thick. It has separate 1/8-inch NPT inlet ports for air and oil. Nozzle design and system air pressure (15 psi (1 bar) at nozzle inlet) combine to provide a 60 degree conical spray pattern that has a 9-inch (22.9 cm) diameter at a 6-inch (15.2 cm) distance from the nozzle.

Cycle Switch: The cycle switch is a limit switch which is actuated by the movement of the indicator pin. If a blockage occurs in a lube line, the divider valve will not cycle and the cycle switch will not be actuated. If the switch is not actuated within a set time period, the controller provides a warning signal. The cycle switch is supplied with a moisture-resistant enclosure and 6 feet (1.83m) of cable.

Proximity Switch: The proximity switch is a proximity-type sensor which senses the movement of the divider valve piston during cycling. The proximity switch provides a signal that is used to monitor the system in the same manner as the cycle switch. The proximity switch is supplied with a mini style Brad Harrison 3-pin or 5-pin connection that is connected to the controller with a moisture proof cable assembly.

SPINDL-GARD SYSTEM 2 COMPONENTS

The SG-2 uses the same Modu-Flo, pump package, filters, divider valve, cycle switch and check valves that are used in Spindl-Gard System 1. Air requirements are 30 psi (2.1 bar) when no air switch is used or 60 psi (4.1 bar) with air flow switch. In either case, supplied air must have a 40 °F (4.4 °C) dewpoint and be filtered to 1 micron absolute. Components unique to SG-2 are listed below.

Spindl-Gard Air Flow Switch: This small, simple pneumatic device warns of any blockage or breaks in the air line supplying the Spindl-Gard System. Normally-open and normally-closed contacts on two limit switches can be connected to the controller to provide immediate fault feedback. Spindl-Gard air flow switch is preset at the factory, but may be adjusted if necessary.

Mixing Tee: The mixing tee receives metered oil from the divider valve and air from the air flow switch at two separate inlet ports. One common outlet port provides the air/oil mix into a delivery line which connects to the nozzle tube. Up to nine mixing tees may be coupled for ease of mounting and plumbing if more than one point is to be lubricated.

Spindl-Gard Nozzle: Several options are available for the nozzle. Two options consist of a tube and adapter assembly and the third a restrictor assembly. The restrictor assembly consists of a fitting with 9/16-18 UNF-2A threads which thread into the machining spindle wall. A 0.030 inch (0.76 mm) orifice pressed in the fitting provides an oil outlet at the restrictor end. The tube and adapter assemblies consist of a cut-to-length tube which is inserted into an adapter. The adapter has a 9/16-18UNF-2A thread which threads directly into the machining spindle wall. The tube is cut to a length to allow it to be held in the adapter with its end inserted in the bearing housing. One tube has a single outlet on the side while the second has two side outlets located 180 degrees from each other. Figure 3 shows examples of the nozzle applications. An easy to remove and replace adapter that is held in place with two 1/4-20 x 1/2" screws is also available and permits removal without alignment or depth.

Low-Pressure Soft-Seat Check Valve: This valve, installed at the bearing point, prevents oil drainage of the oil lines and prevents air from entering the oil line. Oil drainage or air entrapment could result in improper oil application at the lube point.

Relief Valve: Installed at the lowest point of the machining spindle, this valve serves three important purposes. It maintains a positive internal head pressure to prevent coolant and other contaminants from entering the head. It prevents build-up of excessive pressure which could interfere with proper oil dispersion. And, it keeps the sump dry by providing a simple means to drain off oil that would otherwise collect.

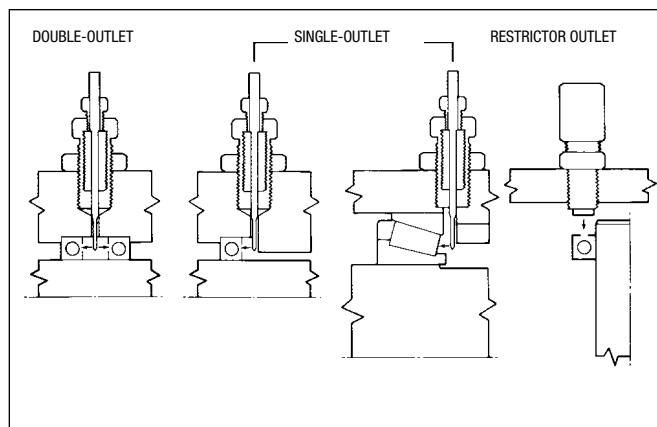


Figure 3. Nozzle Application

SYSTEM SPECIFICATIONS

SG-1 System

Spray Nozzle Air Pressure	15 psi (1 bar)
Air Volume Per Nozzle	0.6 scfm (17 sclm)
Relief Valve Pressure	@ lowest point in gearbox, 2 psi (0.14 bar)

SG-2 System

Mixing Tee Air Pressure	30 psi (2.1 bar)
Air Volume Per Nozzle	0.6 scfm (17 sclm)
Air Drain Hole Size	1/8 in (3.2 mm), per bearing
Air Flow Switch	
Inlet Pressure	60 psi (4.1 bar)
Outlet Pressure	30 psi (2.1 bar)
Air Filtration	5 micron absolute, 40°F (4.4°C) dewpoint

MSP Diver Valves

Max Pressure	3500 psi (24.13 MPa)
Weight	
3-Section Assembly	5.9 lbs (2.7 kg)
4-Section Assembly	7.3 lbs (3.3 kg)
5-Section Assembly	8.7 lbs (4.0 kg)
6-Section Assembly	10.2 lbs (4.6 kg)
7-Section Assembly	11.6 lbs (5.6 kg)
8-Section Assembly	13.0 lbs (5.9 kg)
Max Operating Temperature	
Buna-N O-Rings	200°F (93°C)
Viton O-Rings	350°F (163°C)
Typical Flow Rate	@ 60 cycles/min, 38 in ³ /min (623 cm ³ /min)

COMPONENT SPECIFICATIONS	
SG-1 Spray Nozzle Assemblies (Figure 6)	
Headwall: 1-3/4 in (44.4 mm) thick	
Nozzle Threads	1-12 in UNF
Air Inlet Threads	1/8-27 in NPSF
Lube Inlet Threads	1/8-27 in NPSF
SG-2 End Outlet Nozzle (Figure 9)	
Nozzle Threads	1/8 in NPT
Air-Oil Inlet	3/16 in tube
SG-2 Tube Adaptor (Figure 8)	
Adapter Thread	9/16-18 in UNF, 2A
Inlet	3/16 in tube
SG-2 Nozzle Adapter w/Mounting Bracket (Figure 12)	
Air-Oil Inlet	3/16 in tube
Air Flow Switch (Figure 17)	
Air Inlet Threads	1/8-27 in NPSF
Air Outlet Threads	1/8-27 in NPSF
Low-Pressure Setting	High-Flow Fault, 23 psi (1.6 bar)
High-Pressure Setting	Low-Flow Fault, 37 psi (2.6 bar)
Check Valve (Figure 13)	
Inlet Threads	1/8 in NPSF
Outlet Threads	1/8 in NPTF
Cracking Pressure	35 psi (2.4 bar)
Max Backpressure	100 psi (6.9 bar)
Relief Valve (Figure 15)	
Relief Pressure Setting	2 psi (0.14 bar)
Inlet Threads	3/8-18 in NPSF
Outlet Threads	3/8-18 in NPTF
Air-Oil Mixing Tee (Figure 14)	
Air/Lube Inlet Threads	1/8-27 in NPSF
Air/Lube Outlet Threads	3/16 in (5 mm) tube
Pump Outlet Filter (Not Shown)	
Micron Rating	10 Micron
Inlet Threads	1/4 in NPTF
Outlet Threads	1/4 in NPTM
Divider Valve Inlet Filter (Figure 16)	
Micron Rating (Nominal)	90 Micron
Inlet Threads	1/4 in NPTF
Outlet Threads	1/4 in NPTM
Proximity Switch (Figure 10)	
120/240 VAC	2 amp
24 VDC	50 mA
Cycle Switch (Figure 11)	
NEMA Compliances	1, 3, 3R, 4, 12, 13 and 6P
120/240 VAC	5 amp
28 VDC	3 amp

ORDERING INFORMATION

Description	Part No.	Old Part No.
SG-1 Spray Nozzle Assemblies	—	484-094-030
SG-2 End Outlet Nozzle	562994	435-702-275
SG-2 Tube Adapter	563127	484-090-075
SG-2 Nozzle Adapter w/Mounting Bracket	—	484-090-193
Air Flow Switch	564348	484-095-095
Check Valve	563048	463-001-535
Relief Valve	564337	463-300-156
Air-Oil Mixing Tee	563129	484-095-050
Pump Outlet Filter	—	527-100-230
Divider Valve Inlet Filter	563094	473-000-265
Proximity Switch	—	527-003-250
	—	527-004-110
Cycle Switch	563273	510-599-200
1 PSI Pressure Switch		
18 in Leads	558888	492-140-597
4-Pin Brad Harrison	—	492-140-615

OTHER SYSTEM COMPONENTS AND APPLICATION LITERATURE

For information on other system components and application techniques, refer to the Graco literature listed in the following table. This literature is available from your local Graco Distributor.

SPECIFICATIONS

Lit L10102	Divider Valve
Lit L12000	Modu-Flo Pumps
Lit L14750	Maxi-Monitor Controller (WMP III)
Lit L14200	Flexi-Monitor
Lit L20201	Designing a Series-Flo Feeder System
Lit L20115	Calculating Lube Requirements
Lit L30101	Locating Blockage in Series-Flo Systems
Lit L30103	How to Remove Air From a Trabon System

SG-1 OPERATION

Figure 4 is to be used only as a guide to understand the general relationship of Spindl-Gard System components and how the Spindl-Gard System functions.

The pump (1), and controller (3) are mounted on a stationary part of the machine. An external air supply is required to operate the pump (40 to 100 psi (2.8 - 6.9 bar)) and to provide a supply of clean, dry air (approx. 40 °F (4.4 °C) dewpoint, 5 micron absolute filtration, at 15 psi (1 bar)).

The divider valve (7) with cycle switch or proximity switch (4) is located on the movable machining spindle. Flexible lines bring the oil to the divider valve inlet and the air to the inlet port of the spray nozzle (9).

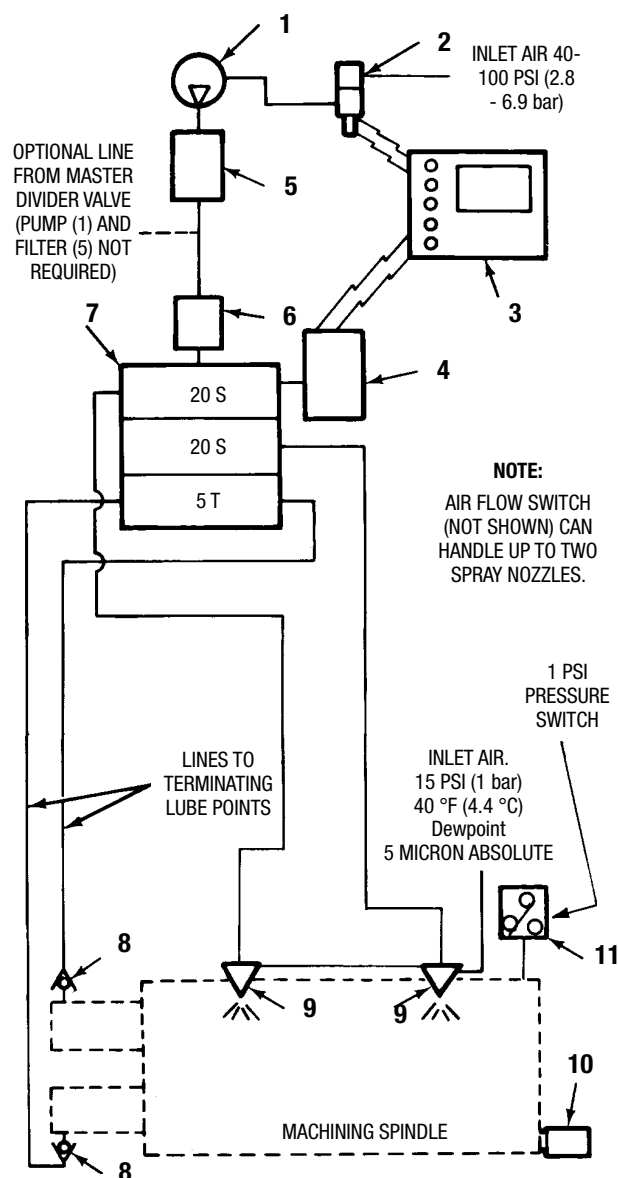
Oil destined for the spray nozzle is precisely metered in the top segment of the divider valve. Second and/or third segments in the valve which will cycle in sequence may be used to deliver oil directly to the terminating lube point, tool holder, etc. The cycling of the divider valve is monitored by the controller through an electrical signal generated by either the cycle switch or proximity switch. A pump failure, power failure, loss of lubricant, plugged or crushed feedline, or broken supply line would prevent cycle switch or proximity switch from producing the required signal to the controller, which would register a fault condition.

The force of the air coming into the spray nozzle (9) assembly at 15 psi (1 bar) picks up and carries minute particles of oil through the nozzle apertures in a 60 degree conical spray pattern to lubricate the components inside the machining head.

A relief valve (10) inserted at the lowest point of the machining spindle maintains positive air pressure at 2 psi (0.14 bar) to exclude coolant and other contaminants. It also provides a simple means to drain off any collected oil from the sump.

Soft-Seat Check Valves (8) should be installed in any lines coming out of the divider valve that will be delivering oil directly to terminating lube points. These checks prevent oil drainage from, or air entrance into, the oil lines.

The 1 psi pressure switch (11) may be installed anywhere on the gear cavity to monitor positive head pressure.



- | | |
|---------------------------------------|-------------------------------------|
| 1. MPP PUMP PACKAGE (INCLUDES ITEM 2) | 7. SERIES PROGRESSIVE DIVIDER VALVE |
| 2. AIR SOLENOID VALVE | 8. SOFT SEAT CHECK VALVE |
| 3. CONTROLLER | 9. SPRAY NOZZLE |
| 4. CYCLE SWITCH OR PROXIMITY SWITCH | 10. 2 PSI (0.14 bar) RELIEF VALVE |
| 5. 10 MICRON FILTER | 11. 1 PSI PRESSURE SWITCH |
| 6. FINAL OIL FILTER | |

Figure 4. SG-1 Operation

SG-2 OPERATION

Figure 5 is to be used only as a guide to understand the general relationship of SG-2 System components and how the system functions.

The pump (1) and controller (3) are mounted on the stationary part of the machine. An external air supply is required to operate the pump (40 to 100 psi (2.8 - 6.9 bar)) and to provide a supply of clean, dry air (approx. 40 °F (4.4 °C) dewpoint, 1 micron absolute filtration at 60 psi (4.1 bar)) to the air flow switch. The air flow switch provides air at 30 psi (2.1 bar) to the mixing tee (9) where air will pick up oil for delivery through the mixing tees to the nozzle assembly (10).

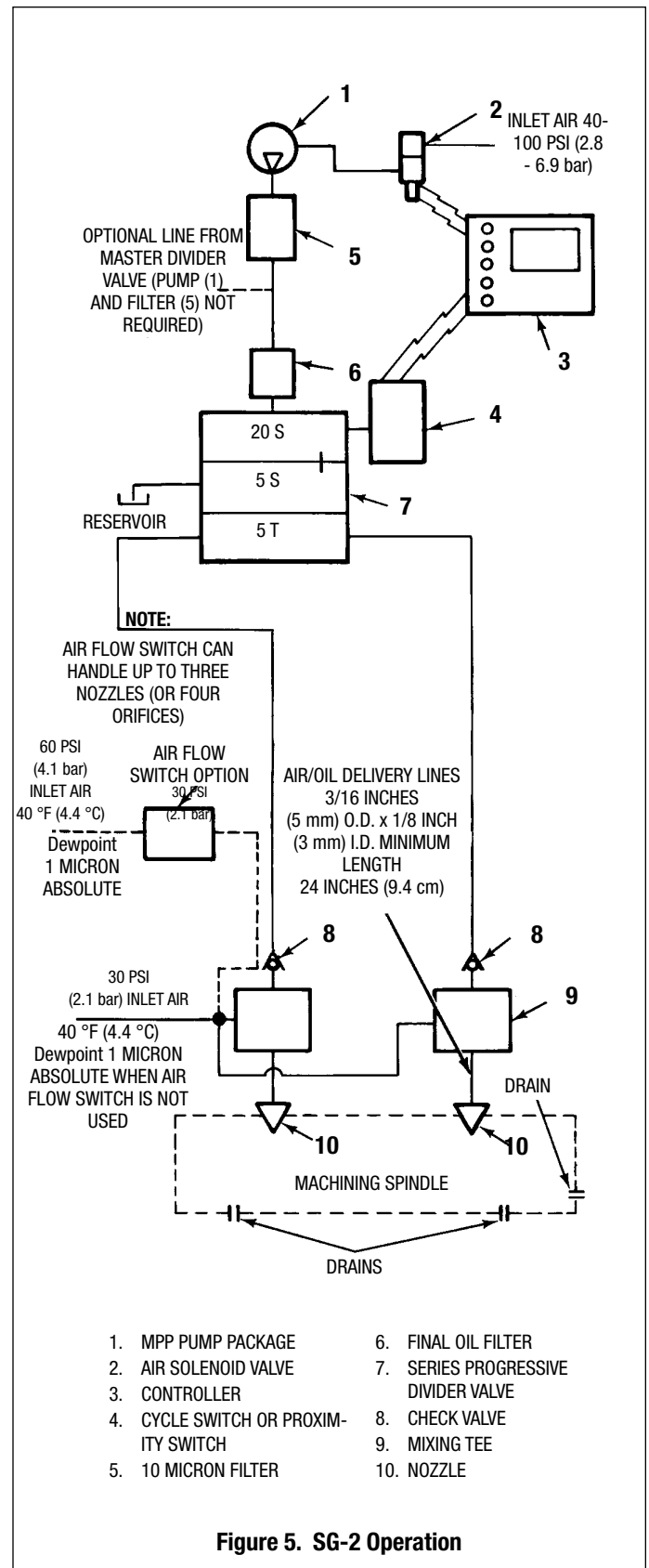
The divider valve (7), cycle switch (4), and mixing tee (9) are mounted on the moveable or stationary spindle head. Flexible lines bring the oil from the pump to the divider valve inlet, and air from the air flow switch to an inlet on the mixing tees (9).

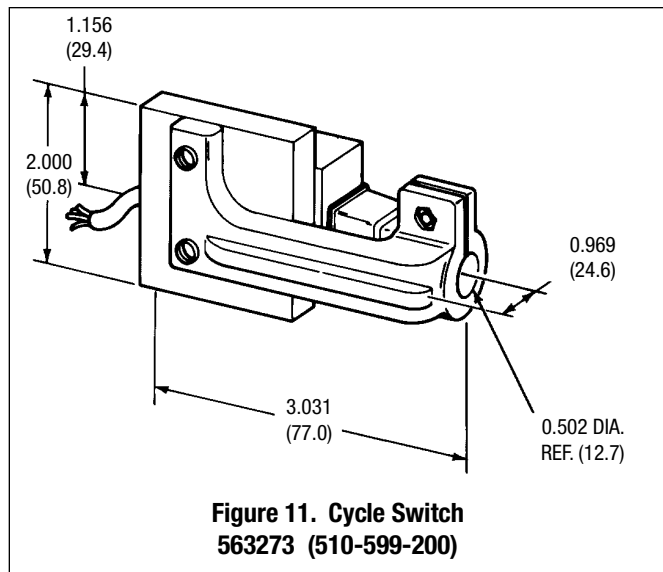
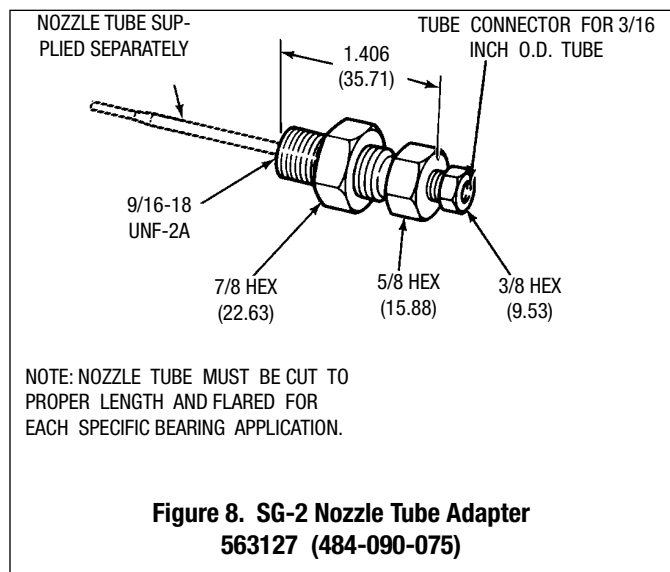
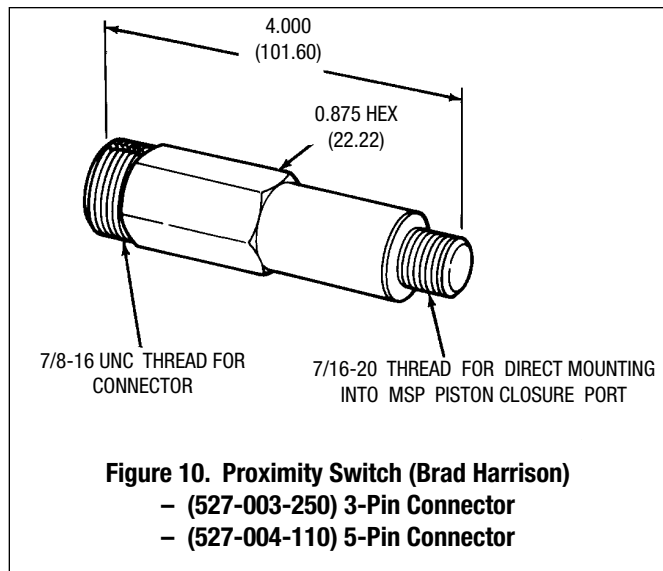
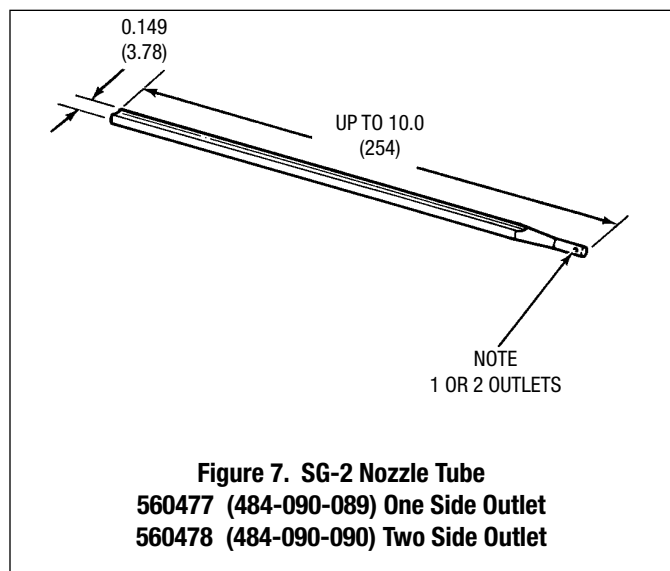
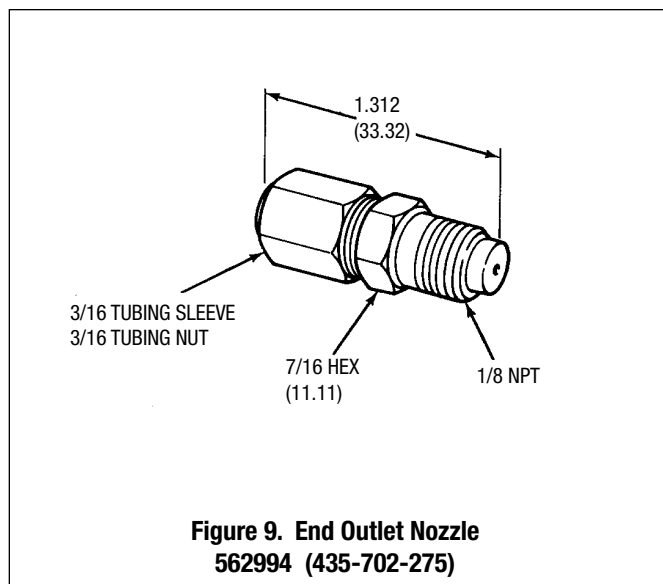
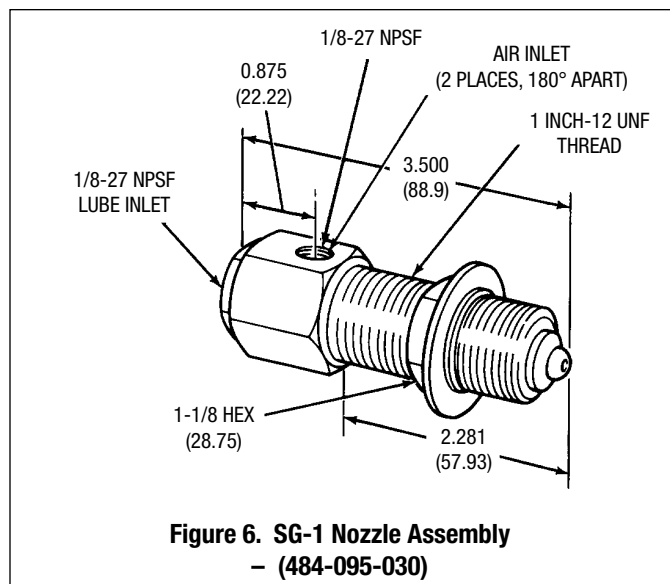
Oil entering the divider valve is precisely metered and ported to the mixing tees. Air from the air flow switch is also ported to the air-oil mixing tees. The air and oil combine in the mixing tee and are delivered through tubing to the nozzle assembly (10).

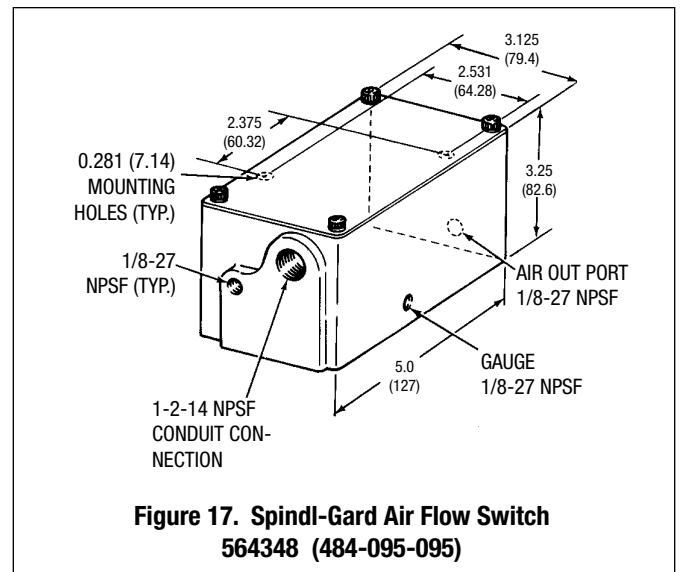
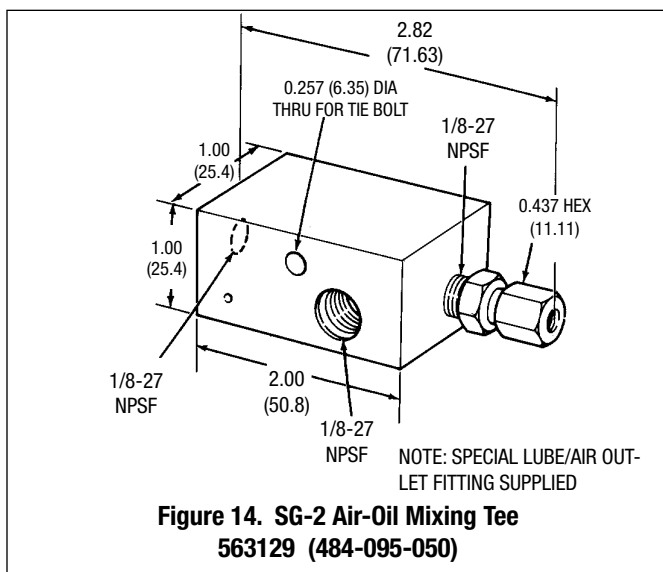
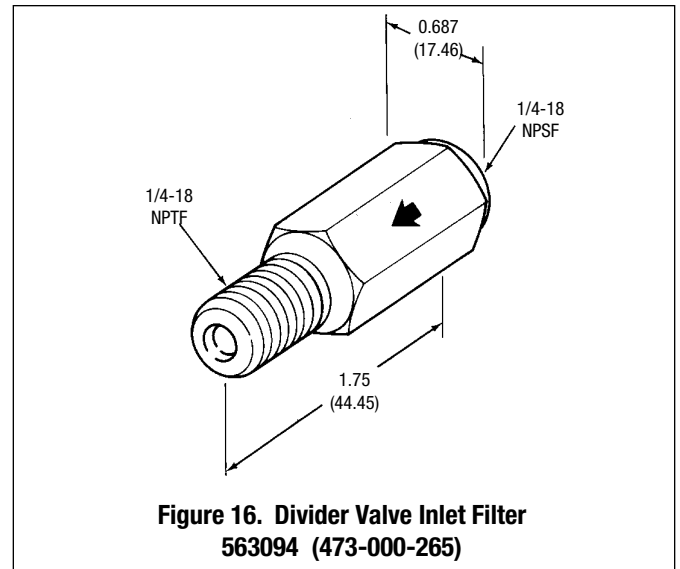
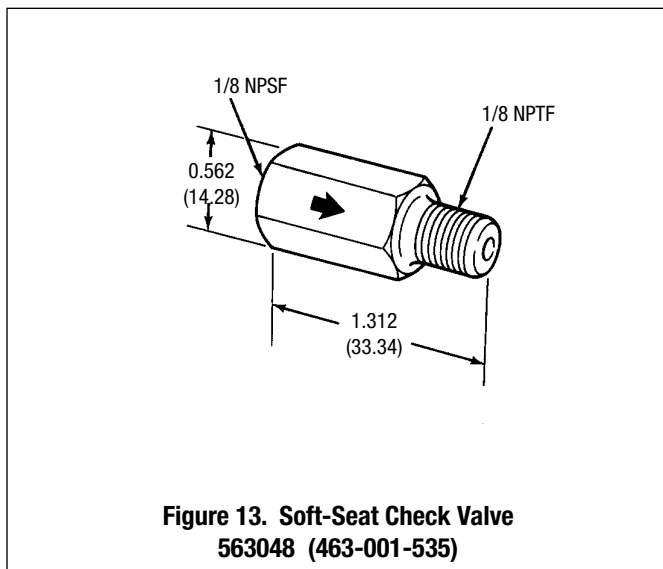
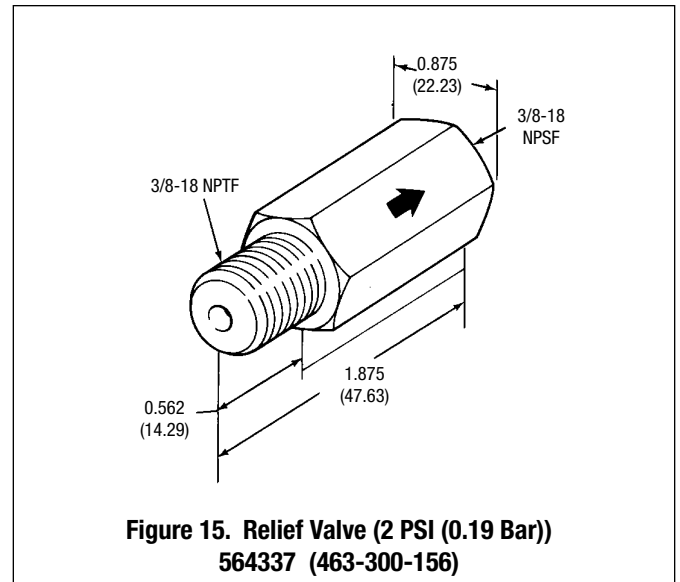
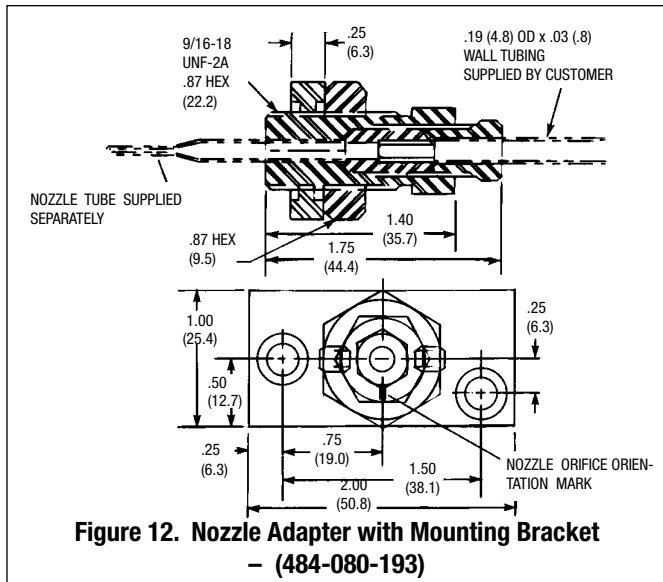
When oil enters the tubing, it is deposited on the inner surface, forming a laminar sublayer of the turbulent air stream. The dynamic forces of the air moving through the center of the tube move the oil to the opening of the nozzle assembly. The oil is deposited in very small amounts directly, and continuously, on the rotating bearing surface.

The SG-2 System is designed to operate in conjunction with the divider valve's cycle indicator pin and cycle switch accessories. By using the cycle switch in conjunction with a controller, a fault warning signal can be generated when a lube line is blocked. The air flow switch adds fault warning when the air line or lines are blocked or broken. A sensing device in the switch notes any change in the air flow rate and provides a fault signal to the controller.

When line monitoring is not desired, the air flow switch is not used and an air supply line (30 psi (2.1 bar)) comes directly into the mixing tee. Air and oil are mixed in the tee and delivered to the nozzle via a single line from the tee's outlet port. When multiple tees are used to form a manifold, plugs are removed from all but the last tee and a single air input line is used. Each tee in the manifold, however, requires an oil line from a segment in the divider valve, and delivers oil to its specific nozzle-tube via a single line from its outlet port.

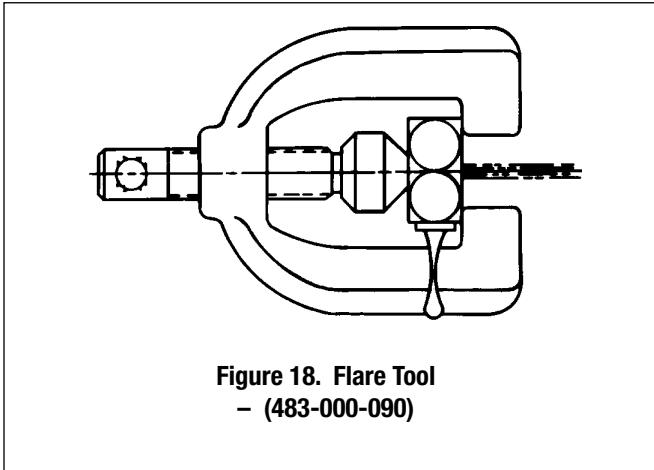






ACCESSORY

Flare Tool: 45° SAE 0.149-inch (3.8 mm) OD Tubing Flare with special tube clamp for precise nozzle tube flaring.



SPINDL-GARD SYSTEM ORDERING INFORMATION

Description	Part No.	Old Part No.
SG-1 Spray Nozzle Assembly	563128	484-095-030
SG-2 End Outlet Nozzle Assembly	562994	435-702-275
SG-2 Nozzle Tubes (must be used w/ adapter)		
One Side Outlet	560477	484-090-089
Two Side Outlet (180°)	560478	484-090-090
SG-2 Nozzle Tube Adapter	563127	484-090-075
Adapter w/ Mtg. Bracket	–	484-090-193
Air-Oil Mixing Tee	563129	484-095-050
Mixing Tee Tie Rods		
Two	Disc.	415-700-274
Three	–	415-700-275
Four	–	415-700-276
Five	–	415-700-277
Six	557733	527-001-840
Seven	557734	527-001-850
Eight	557735	527-001-860
Nine	557736	527-001-870
Relief Valve, 2 psi (0.14 bar)	564337	463-300-156
Soft-Seat Check Valve		
Female-Threads Feeder-End & Male-Threads Bearing End	–	563-001-535
Filter Assemblies		
Filter (90 micron Nominal)	–	472-000-265
Filter (10 micron)	–	527-100-230
Proximity Switch (Brad Harrison)		
3-Pin	–	527-003-250
5-Pin	–	527-004-110
Cable for Proximity Switch		
3-Pin, 6 ft (1.8 m)	558021	570-999-080
3-Pin, 12 ft (3.6 m)	558022	570-999-090
5-Pin, 6 ft (1.8 m)	558023	570-999-160
5-Pin, 12 ft (3.6 m)	558034	570-999-170
Cycle Switch	563273	510-599-200
1 psi Pressure Switch		
18 in Leads	558888	492-140-597
4-Pin Brad Harrison	–	492-140-615

Always specify key Spindl-Gard components by the proper part number, shown below, when ordering

All written and visual data contained in this document are based on the latest product information available at the time of publication. Graco reserves the right to make changes at any time without notice.

Contact us today!

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