

Python[®] Chemical Injection Pump

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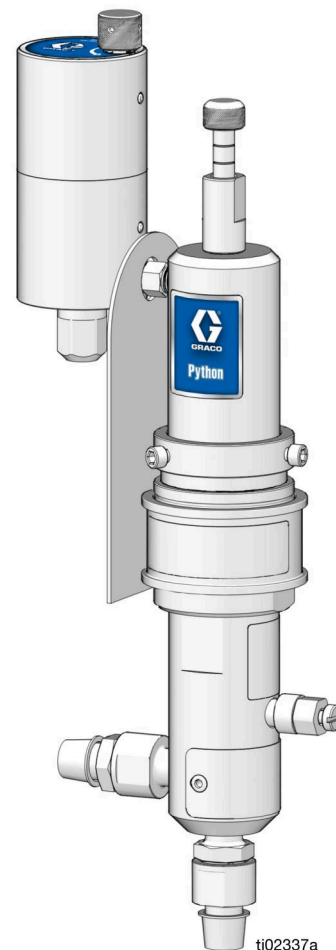
For pneumatic pumps injecting chemicals at well sites. For use with compressed air or compressed natural gas (CNG) only. CNG power source is not allowed for explosive atmospheres. Not for use with sour gas. For professional use only.

See page 3 for model information, including maximum working pressure and approvals.



Important Safety Instructions

Read all warnings and instructions in this manual before using the equipment. Be familiar with the proper control and usage of the equipment. Save these instructions.



CE  II 2 G Ex h IIC T5 Gb
-40° ≤ Ta ≤ 80° C

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Models

Part	Configuration Number	Maximum Working Pressure psi (MPa, bar)	Maximum Pneumatic Inlet Pressure psi (MPa, bar)
2A25023	PCI-125-25-XBS-0	3500 (24, 241)	200 (1.4, 14)
2A25044	PCI-125-25-XCS-0		
2A25065	PCI-125-25-XDS-0		
2A25030	PCI-175-25-XBS-0	7000 (48, 483)	
2A25051	PCI-175-25-XCS-0		
2A25072	PCI-175-25-XDS-0		
2A25024	PCI-125-38-XBS-0	1500 (10, 103)	
2A25045	PCI-125-38-XCS-0		
2A25066	PCI-125-38-XDS-0		
2A25031	PCI-175-38-XBS-0	3000 (21, 207)	
2A25052	PCI-175-38-XCS-0		
2A25073	PCI-175-38-XDS-0		
2A25025	PCI-125-50-XBS-0	875 (6.0, 60)	
2A25046	PCI-125-50-XCS-0		
2A25067	PCI-125-50-XDS-0		
2A25032	PCI-175-50-XBS-0	1750 (12, 121)	
2A25053	PCI-175-50-XCS-0		
2A25074	PCI-175-50-XDS-0		
2A25034	PCI-175-75-XBL-0	800 (5.5, 55)	
2A25055	PCI-175-75-XCL-0		
2A25076	PCI-175-75-XDL-0		

Configuration Number Matrix

Check the identification plate (ID) for the 12-digit Configuration Number of your pump. Use the following matrix to define the components of your pump.

NOTE: Not all combinations are possible.


Sample Configuration Number: PCI-125-25-XBS-0

PCI	125	25	X	B	S	0
Pneumatic Chemical Injection	Air Motor Size	Plunger Size	Plunger Material	Seal Material	Adapter Size	Qualifier

Air Motor Size		Plunger Size		Plunger Material		Seal Material		Adapter Size		Qualifier	
125	1-1/4 in.	25	1/4 in. Diameter	X	Chromex Coated 17-4 PH Stainless	B	FKMETP	S	Small	0	None
175	1-3/4 in.	38	3/8 in. Diameter			C	HNBR	L	Large		
		50	1/2 in. Diameter			D	FFKM				
		75	3/4 in. Diameter								

Safety Symbols

The following safety symbols appear throughout this manual and on warning labels. Read the table below to understand what each symbol means.

Symbol	Meaning
	Equipment Misuse Hazard
	Fire and Explosion Hazard
	Moving Parts Hazard
	Skin Injection Hazard
	Skin Injection Hazard
	Splatter Hazard
	Splash Hazard

Symbol	Meaning
	Toxic Fluid or Fumes Hazard
	Do Not Place Hands or Other Body Parts Near Fluid Outlet
	Do Not Stop Leaks with Hand, Body, Glove or Rag
	Follow Pressure Relief Procedure
	Ground Equipment
	Read Manual
	Wear Personal Protective Equipment












Safety Alert Symbol

This symbol indicates: Attention! Become Alert! Look for this symbol throughout the manual to indicate important safety messages.

General Warnings

The following warnings apply throughout this manual. Read, understand, and follow the warnings before using this equipment. Failure to follow these warnings can result in serious injury.

 WARNING	
 	FIRE AND EXPLOSION HAZARD When flammable fluids are present in the work area, such as gasoline and windshield wiper fluid, be aware that flammable fumes can ignite or explode. To help prevent fire and explosion: <ul style="list-style-type: none"> • Use equipment only in well-ventilated area. • Eliminate all ignition sources, such as cigarettes and portable electric lamps. • Ground all equipment in the work area. • Keep work area free of debris, including rags and spilled or open containers of solvent and gasoline. • Do not plug or unplug power cords or turn lights on or off when flammable fumes are present. • Use only grounded hoses. • Stop operation immediately if static sparking occurs or you feel a shock. Do not use equipment until you identify and correct the problem. • Keep a working fire extinguisher in the work area.
    	SKIN INJECTION HAZARD High-pressure fluid from dispensing device, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. Get immediate surgical treatment. <ul style="list-style-type: none"> • Do not point dispensing device at anyone or at any part of the body. • Do not put your hand over the fluid outlet. • Do not stop or deflect leaks with your hand, body, glove, or rag. • Follow the Pressure Relief Procedure when you stop dispensing and before cleaning, checking, or servicing equipment. • Tighten all fluid connections before operating the equipment. • Check hoses and couplings daily. Replace worn or damaged parts immediately.
	TOXIC FLUID OR FUMES HAZARD Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed. <ul style="list-style-type: none"> • Read Safety Data Sheets (SDSs) to know the specific hazards of the fluids you are using. • Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.

WARNING



EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Specifications** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Specifications** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request Safety Data Sheets (SDSs) from distributor or retailer.
- Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use.
- Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
- Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- Use equipment only for its intended purpose. Call your distributor for information.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend hoses or use hoses to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.



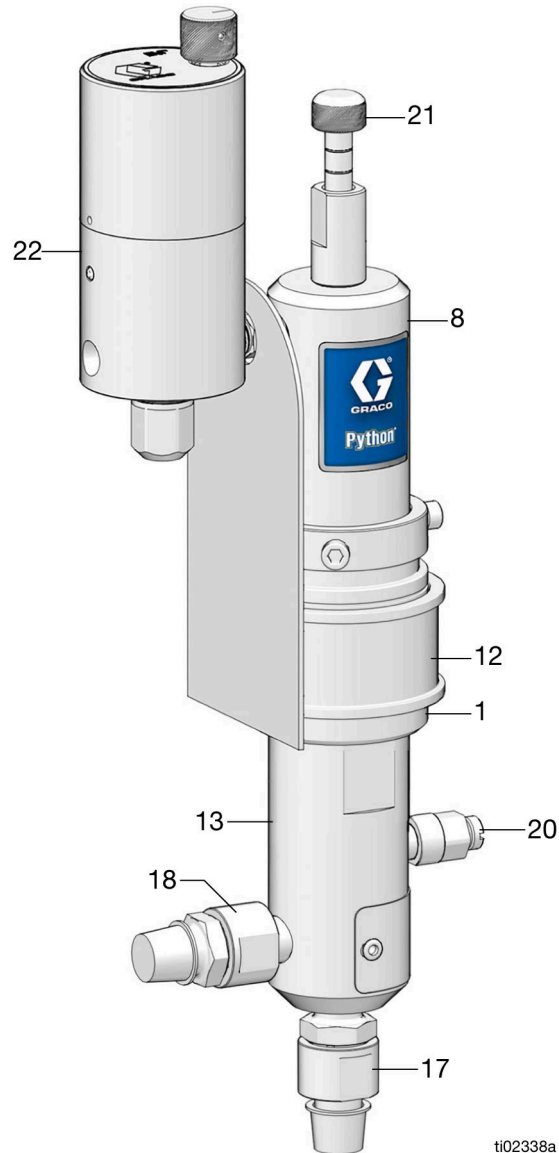
PERSONAL PROTECTIVE EQUIPMENT

Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. Protective equipment includes but is not limited to:

- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

Component Identification

The installation shown in FIG. 1 is only a guide for selecting and installing system components and accessories. Contact your Graco distributor for assistance in designing a system to meet your needs.



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FIG. 1

Key:

- 1 Air Motor Housing
- 8 Air Piston Cylinder
- 12 Dust Shield
- 13 Fluid Cylinder
- 17 Inlet Valve Check
- 18 Outlet Valve Check
- 20 Priming Bleed Valve
- 21 Pump Stroke Adjuster
- 22 Timing Valve

Typical Installation

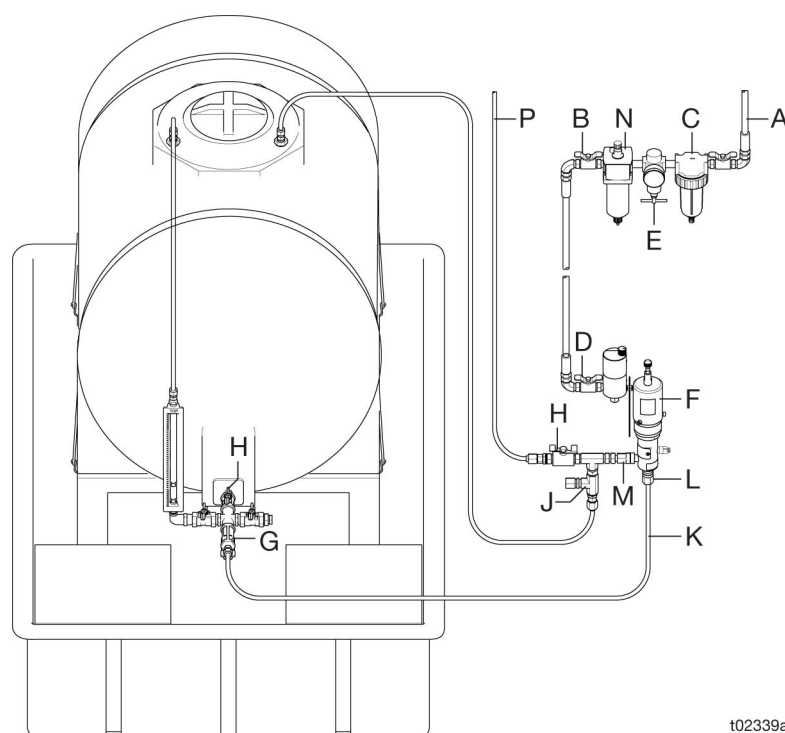


FIG. 2: Typical Installation

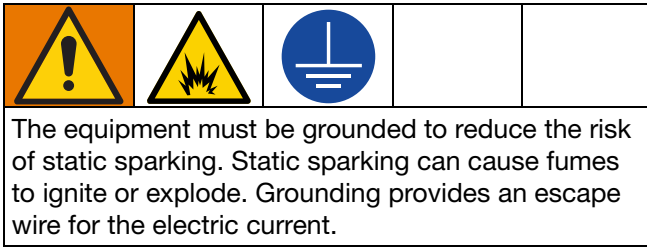
FIG. 2 is an example of an installation with a Python chemical injection pump. Your installation may differ from what is shown here. (See **Required Accessories**, page 10.) The Python pump (F) is the only component in FIG. 2 supplied by Graco. All other components are supplied by customer.

Key:

- A Main Air Supply Line
- B Air Shutoff Valve
- C Air Filter
- D Bleed-type Master Air Valve
- E Air Pressure Regulator
- F Pump
- G Manifold Assembly (includes y-strainer and fluid shutoff valve (H))
- H Fluid Shutoff Valve (inlet and outlet)
- J Fluid Pressure Relief Valve
- K Fluid Inlet Line
- L Inlet Port
- M Outlet Port
- N Air Lubricator
- P Fluid Outlet Line

Installation

Grounding



Pump: Ground through electrically conductive air and fluid lines.

Air and fluid hoses: Use only electrically conductive lines.

Air compressor: Follow manufacturer recommendations.

Fluid supply container: Follow local codes and regulations.

Required Accessories

Install the following required accessories in the order shown in FIG. 2, using adapters as necessary. See **Python Timing Valve Assembly** starting on page 36.

Air Line

- **Bleed-type master air valve (D):** Required in the system to relieve air trapped between it and the air motor when the valve is closed.
 - Be sure the valve is easily accessible from the pump and located downstream from the air regulator.
- **Pump air regulator (E):** Control pump speed and outlet pressure. Locate it close to the pump.
- **Air line filter (C):** Removes harmful dirt and moisture from compressed air supply.

- **Second bleed-type air valve (air shutoff valve) (B):** Isolates air line accessories for servicing. Locate upstream from all other air line accessories.

Fluid Line

- **Fluid filter (Y-Strainer) (included in G):** With a 60 mesh (250 micron) stainless steel element to filter particles from the fluid before it reaches the pump.
- **Fluid shutoff valve (H):** Shuts off fluid flow.
- **Pressure relief valve (J):** Overload protection.

Flush Before Using Equipment

The equipment was tested with lightweight oil, which is left in the fluid passages to protect parts. To avoid contaminating your fluid with oil, flush the equipment with a compatible solvent before using the equipment. See **Flush the Equipment**, page 15.

Mount the Pump and Connect Chemical Supply



If the application, or mounting configuration, requires installation in a manner different than depicted in FIG. 2, please contact your Graco distributor for assistance.

NOTE: A y-strainer (G) or chemical filter is required before the pump inlet. This keeps any debris from the tank from reaching the pump seals. Fluid filters are available from Graco. See **Python Timing Valve Assembly** starting on page 36.

Mount the pump (F) and connect the fluid inlet line (K).

The pump is designed to be vertically mounted directly from the 1/4 female NPT inlet port (L). The inlet port (L) is on the bottom and is designated by a flow arrow pointing into the pump. Verify the inlet plumbing is sufficiently strong to support the weight of the pump.

Connect Pneumatic Supply

1. Install the pneumatic regulator (E) and gauge to control the inlet pressure. See **Models** on page 3 for your model's maximum pneumatic pressure.

NOTE: If less than 200 psi supply pressure is used, the pump's maximum output pressure decreases proportionally. See **Minimum Gas Pressures by Fluid Plunger Size and Outlet Pressures** on page 12. Minimum Gas Pressure is found by first finding the table that corresponds to the plunger size. Next, using the column that corresponds to the air motor size, find the row equal to or slightly greater than the outlet pressure of the pump. The value is the Minimum Gas Pressure required to achieve the fluid outlet pressure.

2. Install a pneumatic line filter (C) to keep debris from affecting pump performance and to increase pump life.





NOTE: Keep the timing valve knob closed at this point to keep the pump from operating without fluid, which minimizes seal wear.

3. Attach a pneumatic line to the 1/8 in. female NPT port (116) on the timing valve. (See **Python Timing Valve Assembly**, page 36.) An 1/8 NPT fitting is preferred, though a 1/8 - 1/4 NPT adapter is included for convenience.
4. If an exhaust gas recovery is desired for the application, attach the exhaust line to the 1/8 female NPT on the side of the timing valve (22) where the exhaust gases exit the pump. The port is marked on the timing valve (22) as Exhaust. Route the exhaust line to a recovery system per local codes and regulations.

Connect Chemical Outlet

1. Connect a 1/4 NPT(F) fluid line from the outlet check valve (M) to the injection point.
2. Install a pressure relief valve (J) on the outlet side of the pump.

NOTE: A user-supplied pressure relief valve can be connected back to the tank or directly to the inlet side of the pump.

				
In the event of an injection line blockage, to reduce the risk of skin injection and damage to the pump, ensure the pressure relief valve is set at or below the maximum working pressure of the pump.				

3. Set the pressure relief valve at or below the maximum working pressure of the pump.
4. Connect a 10-32 UNF fluid outlet from the prime/bleed valve (21) to the fluid source or waste reservoir.

Minimum Gas Pressures by Fluid Plunger Size and Outlet Pressures

See **Performance Charts**, starting on page 39, for maximum flows at any given pressure.

Outlet Pressure			1/4 in. Fluid Plunger Pumps					
			Minimum Gas Pressure					
			1.25 in. Air Motor			1.75 in. Air Motor		
psi	MPa	bar	psi	MPa	bar	psi	MPa	bar
0	0	0	50	0.34	3.4	50	0.34	3.4
250	1.7	17.2	60	0.41	4.1	50	0.34	.4
500	3.4	34.5	70	0.48	4.8	50	0.34	3.4
750	5.2	51.7	80	0.55	5.5	50	0.34	3.4
1000	6.9	68.9	90	0.62	6.2	50	0.34	3.4
1250	8.6	86.2	100	0.69	6.9	51	0.35	3.5
1500	10.3	103.4	110	0.76	7.6	56	0.39	3.9
1750	12.1	120.7	120	0.83	8.3	61	0.42	4.2
2000	13.8	137.9	130	0.89	8.9	66	0.46	4.6
2250	15.5	155.1	140	0.96	9.6	71	0.49	4.9
2500	17.2	172.4	150	1.03	10.3	76	0.53	5.3
2750	19	189.6	160	1.10	11.0	81	0.56	5.6
3000	20.7	206.8	170	1.17	11.7	87	0.60	6.0
3250	22.4	224.1	180	1.24	12.4	92	0.63	6.3
3500	24.1	241.3	190	1.31	13.1	97	0.67	6.7
3750	25.9	258.6				102	0.70	7.0
4000	27.6	275.8				107	0.74	7.4
4250	29.3	293				112	0.77	7.7
4500	31	310.3				117	0.81	8.1
4750	32.8	327.5				122	0.84	8.4
5000	34.5	344.7				127	0.88	8.8
5250	36.2	362				133	0.91	9.1
5500	37.9	379.2				138	0.95	9.5
5750	39.6	396.4				143	0.98	9.8
6000	41.4	413.7				148	1.02	10.2
6250	43.1	430.9				153	1.05	10.5
6500	44.8	448.2				158	1.09	10.9
6750	46.5	465.4				163	1.12	11.2
7000	48.3	482.6				168	1.16	11.6

Outlet Pressure			3/8 in. Fluid Plunger Pumps					
			Minimum Gas Pressure					
			1.25 in. Air Motor			1.75 in. Air Motor		
psi	MPa	bar	psi	MPa	bar	psi	MPa	bar
0	0	0	50	0.34	3.4	50	0.34	3.4
150	1	10.3	63	0.44	4.4	50	0.34	3.4
300	2.1	20.7	77	0.53	5.3	50	0.34	3.4
450	3.1	31	90	0.62	6.2	46	0.32	3.2
600	4.1	41.4	104	0.72	7.2	53	0.36	3.6
750	5.2	51.7	117	0.81	8.1	60	0.41	4.1
900	6.2	62.1	131	0.90	9.0	67)	0.46	4.6
1050	7.2	72.4	144	0.99	9.9	74	0.51	5.1
1200	8.3	82.7	158	1.09	10.9	80	0.55	5.5
1350	9.3	93.1	171	1.18	11.8	87	0.60	6.0
1500	10.3	103.4	185	1.27	12.7	94	0.65	6.5
1650	11.4	113.8				101	0.70	7.0
1800	12.4	124.1				108	0.74	7.4
1950	13.4	134.4				115	0.79	7.9
2100	14.5	144.8				122	0.84	8.4
2250	15.5	155.1				129	0.89	8.9
2400	16.5	165.5				136	0.93	9.3
2550	17.6	175.8				142	0.98	9.8
2700	18.6	186.2				149	1.03	10.3
2850	19.7	196.5				156	1.08	10.8
3000	20.7	206.8				163	1.12	11.2

Outlet Pressure			1/2 in. Fluid Plunger Pumps					
			Minimum Gas Pressure					
			1.25 in. Air Motor			1.75 in. Air Motor		
psi	MPa	bar	psi	MPa	bar	psi	MPa	bar
0	0	0	50	0.34	3.4	50	0.34	3.4
100	0.7	6.9	66	0.45	4.5	50	0.34	3.4
200	1.4	13.8	82	0.56	5.6	50	0.34	3.4
300	2.1	20.7	98	0.67	6.7	50	0.34	3.4
400	2.8	27.6	114	0.78	7.8	58	0.40	4.0
500	3.4	34.5	130	0.89	8.9	66	0.46	4.6
600	4.1	41.4	146	1.00	10.0	74	0.51	5.1
700	4.8	48.3	162	1.11	11.1	83	0.57	5.7
800	5.5	55.2	178	1.23	12.3	91	0.63	6.3
900	6.2	62.1				99	0.68	6.8
1000	6.9	68.9				107	0.74	7.4
1100	7.6	75.8				115	0.79	7.9
1200	8.3	82.7				123	0.85	8.5
1300	9.0	89.6				131	0.91	9.1
1400	9.7	96.5				140	0.96	9.6
1500	10.3	103.4				148	1.02	10.2
1600	11.0	110.3				156	1.08	10.8
1700	11.7	117.2				164	1.13	11.3

Outlet Pressure			3/4 in. Fluid Plunger Pumps		
			Minimum Gas Pressure		
			1.25 in. Air Motor		
psi	MPa	bar	psi	MPa	bar
0	0	0	50	0.34	3.4
50	0.3	3.4	68	0.47	4.7
100	0.7	6.9	86	0.59	5.9
150	1.0	10.3	104	0.72	7.2
200	1.4	13.8	122	0.84	8.4
250	1.7	17.2	140	0.96	9.6
300	2.1	20.7	158	1.09	10.9
350	2.4	24.1	176	1.21	12.1
400	2.8	27.6	194	1.34	13.4

Operation

Pressure Relief Procedure



Follow the Pressure Relief Procedure whenever you see this symbol.

This equipment stays pressurized until pressure is manually relieved. To help prevent serious injury from pressurized fluid, such as skin injection, splashing fluid and moving parts, follow the Pressure Relief Procedure when you stop dispensing and before cleaning, checking, or servicing the equipment.

NOTE: Discharge fluid into an approved container or location.

1. Shut off all fluid and air lines (A, K. and P) using the shutoff valves (H).
2. Disconnect the air supply lines (A).
3. Disconnect the timing valve (22) to vent internal trapped pressure.

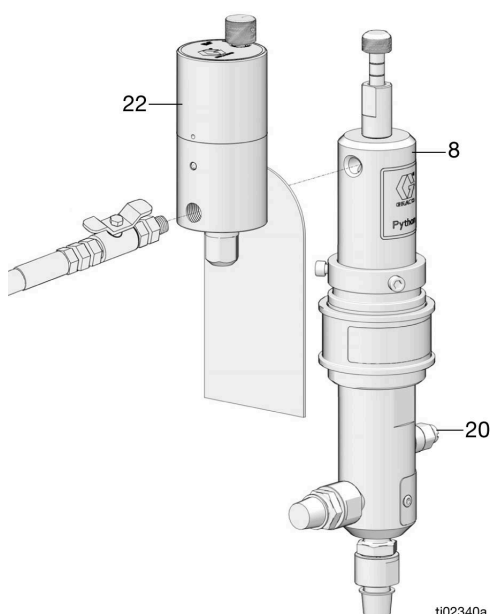


FIG. 3: Disconnect timing valve

4. Use a flathead screwdriver to turn the prime/bleed valve (2) slowly counter-clockwise to relieve pressure.
5. Slowly disconnect the fluid lines (K and P) from the check valves (L and M).
6. Reconnect the timing valve (22).

Flush the Equipment

To avoid fire and explosion, always ground equipment and waste container. To avoid static sparking and injury from splashing, always flush at the lowest possible pressure.

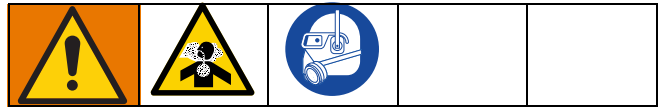
- Flush with a fluid compatible with the fluid being dispensed and the equipment wetted parts.
1. Follow the **Pressure Relief Procedure**, page 15.
 2. Connect inlet to the supply source of the flushing fluid.
 3. Connect outlet to a waste reservoir.
 4. Run the pump until the dispensed fluid is predominately flushing fluid.
 5. Follow the **Pressure Relief Procedure**, page 15.

Prime the Pump



1. Verify all connections and fluid lines are tight.
2. In order to prime the pump, turn the prime valve (20) counter-clockwise.
3. Turn the timing valve knob (122) located on the timing valve (22) counter-clockwise slowly. This will turn the pneumatic supply on to the pump and begin cycling.
4. Keep the pump cycle rate less than 1 cycle every 3 seconds. The pump is primed when discharge from the prime valve (20) has transitioned from air, to bubbly liquid chemical, to pure liquid chemical.
5. Close the prime valve (20) tightly and verify that fluid has stopped draining from the port.

Calibrate Chemical Dosage



1. Begin the process by setting the timing valve (22) to an estimated setting of the flow rate. See **Baseline Chemical Dosage Settings**, page 18, for tables of cycles per minute (CPM), and corresponding gallons per day (GPD) and liters per day (LPD).

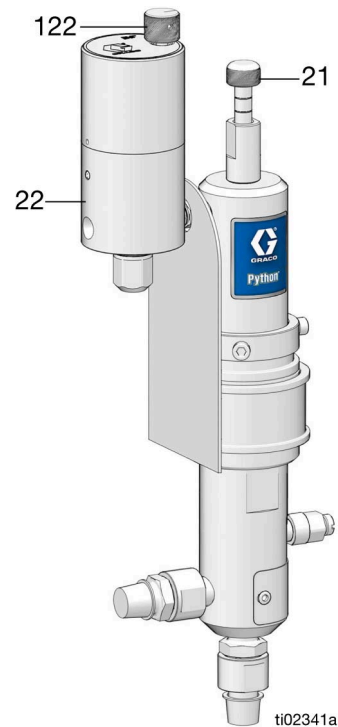
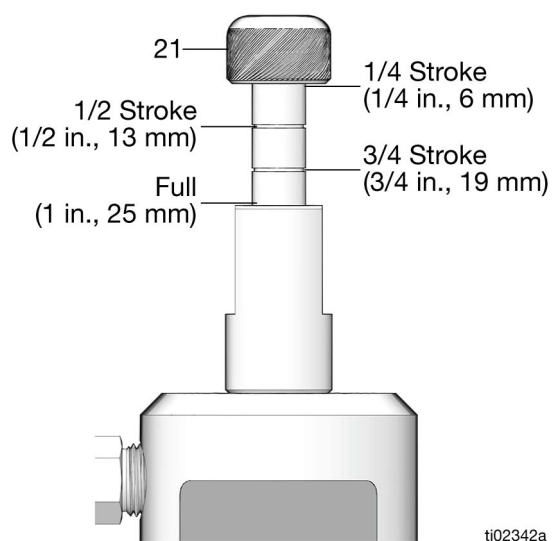


FIG. 4 Calibrate Chemical Dosage

2. Follow the instructions provided with your calibration gauge in conjunction with the **Baseline Chemical Dosage Settings** on page 18.
3. Adjust the timing valve (22) accordingly after the test is performed. Turning the knob (122) counter-clockwise will increase the pump flow rate, while turning the knob clockwise will decrease the flow.
4. Repeat the test procedure to verify your changes. Repeat as necessary until the desired flow rate is achieved.

Stroke Adjustment

This pump has infinite stroke adjustment between full and 1/4 stroke, and has four marked stroke adjustment positions.



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FIG. 5 Stroke adjustment settings

- To increase the stroke length, turn the stroke adjustment knob (21) counter-clockwise.
- To decrease the stroke length, turn the stroke adjustment knob (21) clockwise.

Baseline Chemical Dosage Settings

See **Stroke Adjustment**, page 17, for stroke adjust settings. See **Performance Charts**, starting on page 39, for maximum flows at any given pressure.

CPM	1/4 in. Fluid Plunger Pumps				3/8 in. Fluid Plunger Pumps			
	GPD (LPD)				GPD (LPD)			
	Full Stroke	3/4 Stroke	1/2 Stroke	1/4 Stroke	Full Stroke	3/4 Stroke	1/2 Stroke	1/4 Stroke
5	1.4 (5.3)	1.1 (4.0)	0.7 (2.7)	0.4 (1.3)	3.2 (12.2)	2.4 (9.2)	1.6 (6.1)	0.8 (3.1)
10	2.8 (10.7)	2.1 (8.0)	1.4 (5.3)	0.7 (2.7)	6.5 (24.5)	4.9 (18.4)	3.2 (12.2)	1.6 (6.1)
15	4.2 (16.0)	3.2 (12.0)	2.1 (8.0)	1.1 (4.0)	9.7 (36.7)	7.3 (27.6)	4.9 (18.4)	2.4 (9.2)
20	5.6 (21.3)	4.2 (16.0)	2.8 (10.7)	1.4 (5.3)	12.9 (49.0)	9.7 (36.7)	6.5 (24.5)	3.2 (12.2)
25	7.0 (26.6)	5.3 (20.0)	3.5 (13.3)	1.8 (6.7)	16.2 (61.2)	12.1 (45.9)	8.1 (30.6)	4.0 (15.3)
30	8.4 (32.0)	6.3 (24.0)	4.2 (16.0)	2.1 (8.0)	19.4 (73.5)	14.6 (55.1)	9.7 (36.7)	4.9 (18.4)
35	9.9 (37.3)	7.4 (28.0)	4.9 (18.6)	2.5 (9.3)	22.7 (85.7)	17.0 (64.3)	11.3 (42.9)	5.7 (21.4)
40	11.3 (42.6)	8.4 (32.0)	5.6 (21.3)	2.8 (10.7)	25.9 (98.0)	19.4 (73.5)	12.9 (49.0)	6.5 (24.5)
45	12.7 (48.0)	9.5 (36.0)	6.3 (24.0)	3.2 (12.0)	29.1 (110.2)	21.8 (82.7)	14.6 (55.1)	7.3 (27.6)
50	14.1 (53.3)	10.6 (40.0)	7.0 (26.6)	3.5 (13.3)	32.4 (122.5)	24.3 (91.9)	16.2 (61.2)	8.1 (30.6)
55	15.5 (58.6)	11.6 (44.0)	7.7 (29.3)	3.9 (14.7)	35.6 (134.7)	26.7 (101.1)	17.8 (67.4)	8.9 (33.7)
60	16.9 (63.9)	12.7 (48.0)	8.4 (32.0)	4.2 (16.0)	38.8 (147.0)	29.1 (110.2)	19.4 (73.5)	9.7 (36.7)

CPM	1/2 in. Fluid Plunger Pumps				3/4 in. Fluid Plunger Pumps			
	GPD (LPD)				GPD (LPD)			
	Full Stroke	3/4 Stroke	1/2 Stroke	1/4 Stroke	Full Stroke	3/4 Stroke	1/2 Stroke	1/4 Stroke
5	4.9 (18.5)	3.7 (13.9)	2.4 (9.3)	1.2 (4.6)	11.7 (44.3)	8.8 (33.2)	5.9 (22.2)	2.9 (11.1)
10	9.8 (37.1)	7.3 (27.8)	4.9 (18.5)	2.4 (9.3)	23.4 (88.6)	17.6 (66.5)	11.7 (44.3)	5.9 (22.2)
15	14.7 (55.6)	11.0 (41.7)	7.3 (27.8)	3.7 (13.9)	35.1 (132.9)	26.3 (99.7)	17.6 (66.5)	8.8 (33.2)
20	19.6 (74.1)	14.7 (55.6)	9.8 (37.1)	4.9 (18.5)	46.8 (177.2)	35.1 (132.9)	23.4 (88.6)	11.7 (44.3)
25	24.5 (92.7)	18.4 (69.5)	12.2 (46.3)	6.1 (23.2)	58.5 (221.5)	43.9 (166.1)	29.3 (110.8)	14.6 (55.4)
30	29.4 (111.2)	22.0 (83.4)	14.7 (55.6)	7.3 (27.8)	70.2 (265.8)	52.7 (199.4)	35.1 (132.9)	17.6 (66.5)
35	34.3 (129.7)	25.7 (97.3)	17.1 (64.9)	8.6 (32.4)	81.9 (310.1)	61.4 (232.6)	41.0 (155.1)	20.5 (77.5)
40	39.2 (148.3)	29.4 (111.2)	19.6 (74.1)	9.8 (37.1)	93.6 (354.4)	70.2 (265.8)	46.8 (177.2)	23.4 (88.6)
45	44.1 (166.8)	33.0 (125.1)	22.0 (83.4)	11.0 (41.7)	105.3 (398.8)	79.0 (299.1)	52.7 (199.4)	26.3 (99.7)
50	49.0 (185.3)	36.7 (139.0)	24.5 (92.7)	12.2 (46.3)	117.0 (443.1)	87.8 (332.3)	58.5 (221.5)	29.3 (110.8)
55	53.9 (203.9)	40.4 (152.9)	26.9 (101.9)	13.5 (51.0)	128.7 (487.4)	96.6 (365.5)	64.4 (243.7)	32.2 (121.8)
60	58.8 (222.4)	44.1 (166.8)	29.4 (111.2)	14.7 (55.6)	140.5 (531.7)	105.3 (398.8)	70.2 (265.8)	35.1 (132.9)

Maintenance

Preventive Maintenance Schedule

The operating conditions of your particular pump determine how often maintenance is required. Establish a preventive maintenance schedule by recording when and what kind of maintenance is needed, and then determine a regular schedule for checking your pump.

Tighten Threaded Connections

Check that all threaded connections are tight at routine intervals.

Tighten Packings

The packings included in your pump have the ability to be adjusted to stop leaks that develop when the seals are worn. If a leak develops in the pump's fluid section, tighten the packing nut clockwise by 1/16th of a turn, or lower, until the leak is eliminated. The life of the packing can be affected by over-tightening the packings. If the packing nut needs to be tightened repeatedly after short intervals, replace the packing.

Storage

If the pump is going to be stored for long periods, it is recommended that the pump be flushed with a light-weight oil or rust prohibiter to protect pump components. Store the pump with protective fluid inside whenever possible.

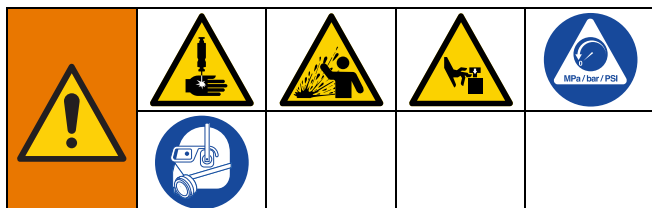
Recycling and Disposal

End of Product Life

At the end of the product's useful life, dismantle and recycle it in a responsible manner.

- Perform the **Pressure Relief Procedure**, page 15.
- Drain and dispose of fluids according to applicable regulations. Refer to the material manufacturer's Safety Data Sheet.
- Deliver remaining product to a recycling facility.

Troubleshooting



Follow **Pressure Relief Procedure**, page 15, before checking or repairing the equipment.

NOTE: Check all possible problems and causes before disassembling the equipment.

Problem	Cause	Solution
Pump runs but the chemical discharges at the incorrect rate.	The inlet check is clogged.	Clear the clog from the check valve.
	The inlet check o-ring is damaged.	Evaluate the o-ring chemical compatibility and replace, as required.
	There is a packing leak.	Ensure that the suction lines are right, and prime the pump.
	Inadequate chemical supply.	Make sure that the chemical tank is filled.
	Calibration is incorrect.	Make sure that the calibration gauge is functioning properly and has good venting.
Pump does not stroke.	Pneumatic supply is inadequate.	If pressure is too low, increase the pneumatic supply pressure.
		If volume is too low, ensure that the pneumatic supply volume is adequate to operate the pump.
	The gas supply is dirty.	Install a filter.
		Replace the filter element.
	Internal lubrication is inadequate.	Ensure that the pneumatic supply gas is clean and dry with a working filter. Then lubricate the air motor internals.
		Add an oiler is the pneumatic supply gas contains solvents that are washing out the factory grease. Oiler Part No. 237212.
	The fluid back pressure is too high.	Verify that the pump is sized to back pressure. Check inlet gas.
	The timing valve is not cycling.	Clean the timing valve
		Rebuild the timing valve.
	The packings are too tight	Loosen or replace the packing.

Problem	Cause	Solution
Chemical is leaking from the packing.	Worn packing	Tighten the packing nut. If the leak persists, replace the packing. NOTE: The packing nut is set from the factory and does not require tightening when initially installed.
		Chemical compatibility: Consult the Graco ONG Chemical Compatibility Guide† to ensure that the seal used is designed for the chemicals pumped.
		Temperature: Consult the Graco ONG Chemical Compatibility Guide† to ensure that the seal used is designed for use in the recommended temperature range.
		Plunger coating: Inspect the plunger for signs of coating failure from chemical or abrasive attack. Replace plunger as needed.

†Find the Graco ONG Chemical Compatibility Guide at www.graco.com.

Repair

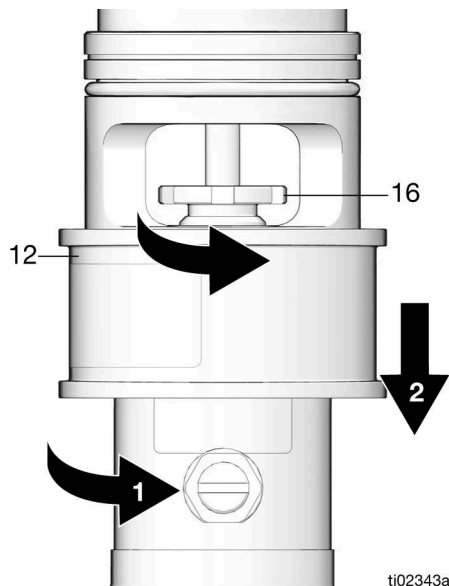


Before servicing or repairing the pump, verify that pressure is relieved according to the **Pressure Relief Procedure**, page 15, and that all fluid and pneumatic lines are properly shut off, or sealed with compatible valves and disconnected.

Pump

Disconnect Pump

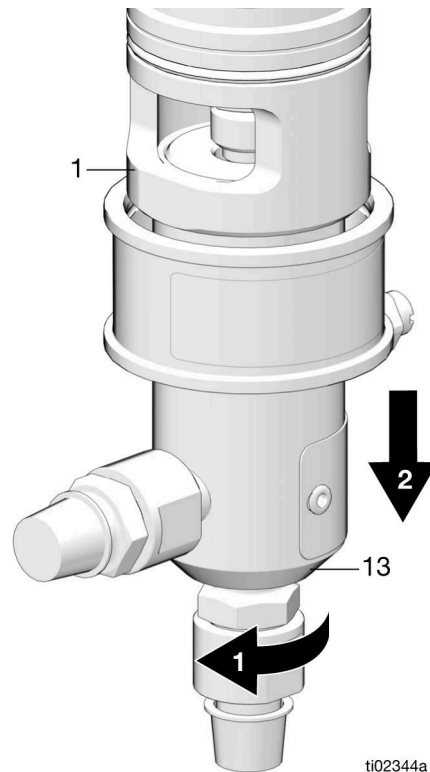
1. Follow the **Pressure Relief Procedure**, page 15.
2. Expose the packing nut (16) by rotating the dust shield (12) while pulling downward.



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FIG. 6 Expose and loosen packing nut

3. Loosen, but do not remove, the packing nut (16).
4. Remove the fluid cylinder (13) from the middle section. See FIG. 7 .
5. Carefully slide the fluid cylinder (13) away from the air motor housing (1), taking great care to keep the fluid plunger (5) from contacting any metal surfaces. The fluid plunger (5) will stay attached to the air motor during repair. See FIG. 7 and FIG. 8.



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FIG. 7 Remove fluid cylinder

Pump Repair

1. Remove packing nut (16) from fluid cylinder (13).
2. Carefully remove bearings (14) and packing (15) from the fluid cylinder (13).

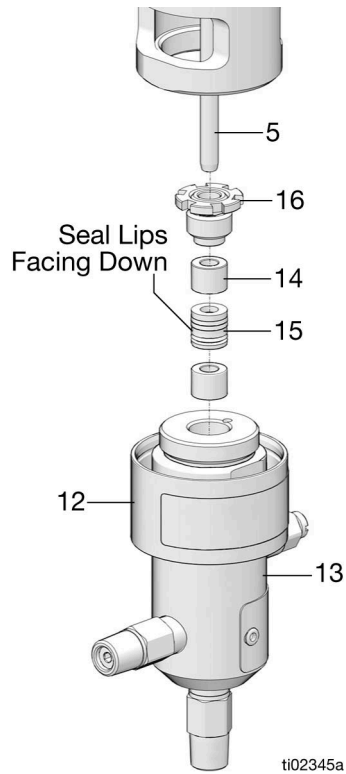


FIG. 8 Remove parts from fluid cylinder

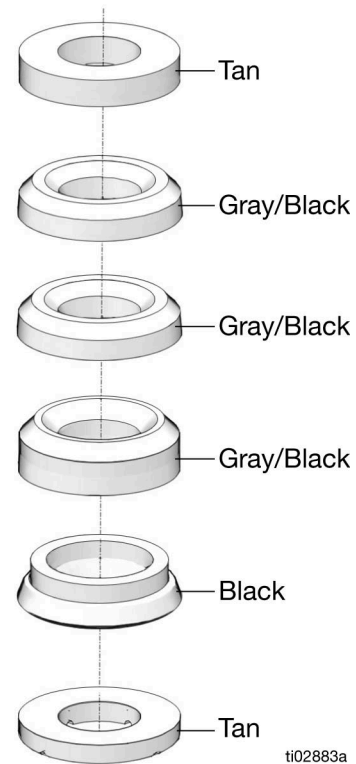


FIG. 9 Packing (15) detailed view

4. Reinsert the packing nut (16), packing (15), and bearings (14) into the fluid cylinder (13). Tighten hand tight and back off $\frac{1}{2}$ of a turn to prevent damage to packing (15) during reassembly.

Reconnect Fluid Cylinder

1. Carefully guide the fluid plunger (5) into the packing nut (16) and through the packing (15) as the threads on the fluid cylinder (13) are brought closer to the air motor housing (1).

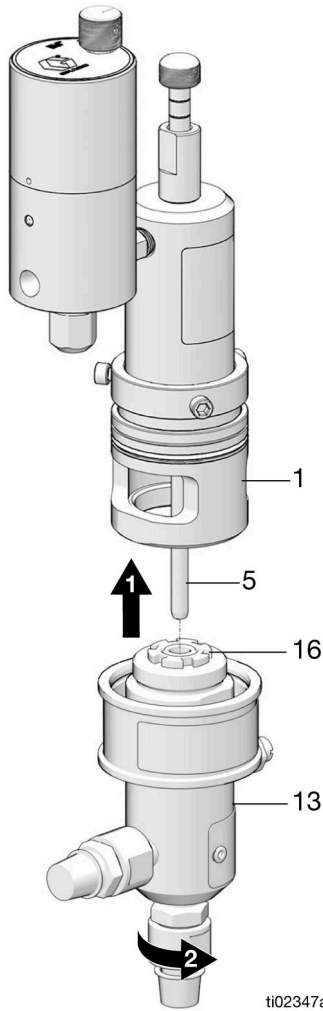


FIG. 10 Reconnect fluid cylinder

2. Tighten fluid cylinder (13) to 30 ft-lbs (40 N•m).
3. Tighten the packing nut (16) to a torque of 15 in-lbs (1.7 N•m), then loosen and tighten again it to a final torque of 5 in-lbs (0.6 N•m).

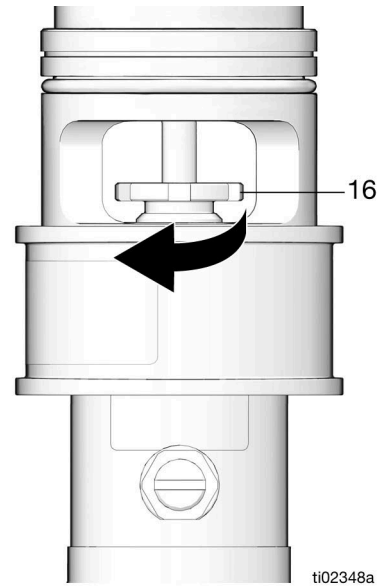


FIG. 11 Tighten packing nut

NOTE: If a torque wrench is not present in the field, an alternative method is to tighten the packing nut (16) finger tight through the window, then use a small punch or hex wrench to further tighten by approximately 10 degrees.

NOTE: If the packing nut (16) is over-tightened, the pump may not complete a full stroke and seal life will be compromised.

Remove Air Piston and Fluid Plunger Assembly

1. Follow the **Pressure Relief Procedure**, page 15.
2. Expose the packing nut (16) by rotating the dust shield (12) while pulling downward.

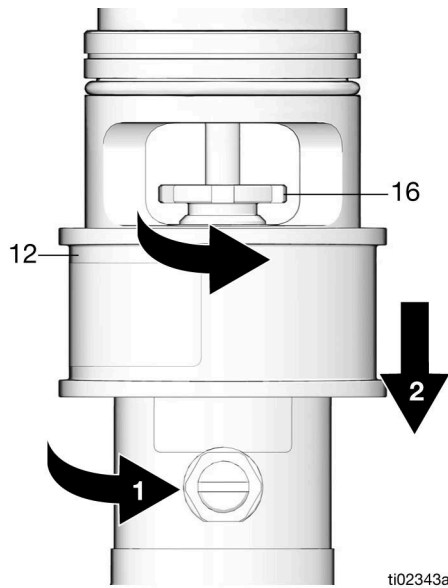


FIG. 12 Expose and loosen packing nut

3. Loosen, but do not remove, the packing nut (16).
4. Remove the air piston cylinder (8) from the air motor housing (1) by loosening the three set screws (10) so they are almost completely removed.

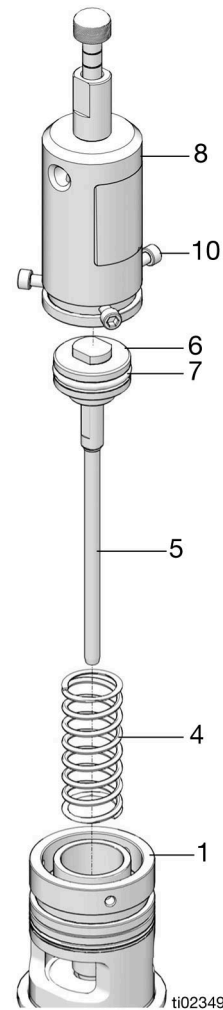


FIG. 13 Remove air piston cylinder and components

5. Carefully slide the air piston cylinder (8) away from the air motor housing (1), taking great care to keep the fluid plunger (5) from contacting any metal surfaces. The fluid plunger (5) may come out with the air cylinder (8) during removal and can stay connected to the air piston (6) during repair.
6. Remove the pump piston (6) and plunger (5) assembly from the air cylinder (8).
7. Inspect the air piston seal, fluid plunger surfaces, and return spring (4), and replace as necessary. See **Replace Air Motor Seal** on page 28.

Replace Air Motor Seal

1. Remove the air piston o-ring (7) with a plastic pick from the air piston (6), taking great care not to scratch any of the groove surfaces on the piston.

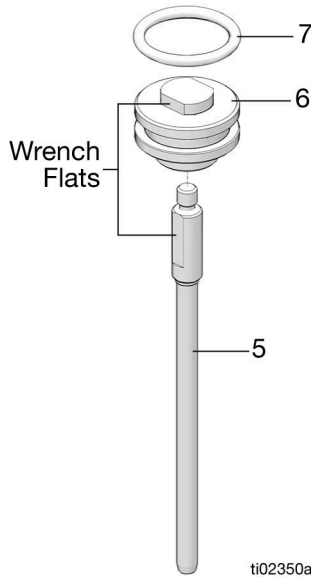


FIG. 14 Air piston and fluid plunger

2. Clean any debris or buildup from the piston (6) and plunger (5) assembly, as well as the air piston cylinder (8) and return spring (4).
3. Apply a liberal amount of assembly grease to the new air piston o-ring (7), and slide it over the piston (6) and into the groove.

Fluid Plunger Replacement

1. Use the wrench flats (FIG. 14) located on the piston (6) and plunger (5) to loosen and remove the plunger from the piston.
2. Clean the dried thread locker from the internal threads of the piston (6) as much as possible.
3. Apply a thin bead of high strength thread locker to the external threads of the new plunger (5).
4. Install the new plunger and tighten to 75 in-lbs (8.5 N•m).
5. Allow thread locker to dry for 60 minutes before operating the pump.

Air Piston, Fluid Plunger, and Upper Cylinder Reassembly

1. Ensure that all parts are cleaned before reassembly.
2. Apply a thin coat of grease to the inside of the air piston cylinder (8) and piston o-ring (7), and insert the piston (6) and plunger (5) assembly.

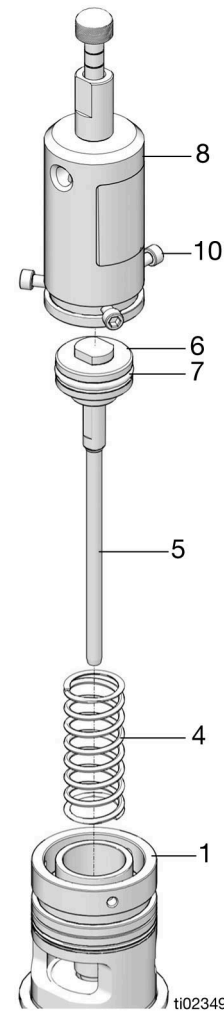


FIG. 15 Reassemble air piston

3. Apply a light coat of assembly grease to the end of the plunger (5), making certain the tip is fully coated.
4. Place the return spring (4) inside the piston stop (2).
5. Reconnect the air piston cylinder (8) to the air motor housing (1). Carefully guide the fluid plunger (5) into the packing nut (16) and through the packing as the air piston cylinder is brought closer to the air motor housing. Light pressure is required to keep the air piston cylinder in place. Ensure the cylinder (8) is

pushed down to the hard stop so that the set screws (10) engage the groove.

6. Reinstall and tighten the three set screws (10) to hold the air piston cylinder (8) in place.
7. Tighten the packing nut (16) to a torque of 15 in-lbs (1.7 N•m), then loosen and tighten again it to a final torque of 5 in-lbs (0.6 N•m).

NOTE: If a torque wrench is not present in the field, an alternative method is to tighten the nut finger tight through the window, then use a small punch or hex wrench to further tighten by approximately 10 degrees.

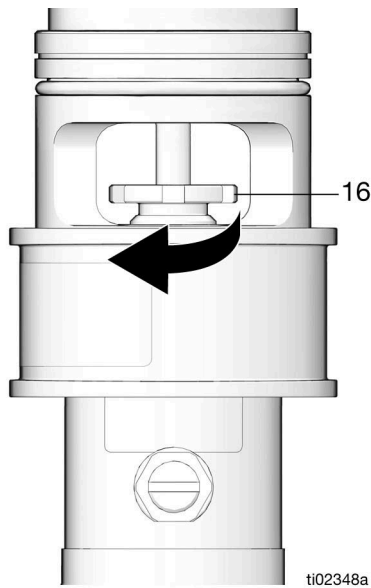


FIG. 16 Tighten packing nut

NOTE: If the packing nut (16) is over-tightened, the pump may not complete a full stroke and seal life will be compromised.

Timing Valve



Timing Valve Repair

1. Follow the **Pressure Relief Procedure**, page 15.
2. Remove the spring retainer (112) from the bottom of the timing valve. Inspect the sealing o-ring (114) and replace as necessary.

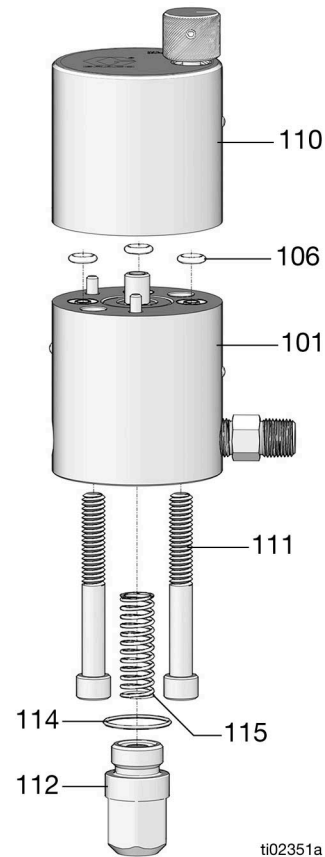


FIG. 17 Separate upper and lower housings

3. Remove the spool return spring (115), inspect and replace if necessary.
4. Remove the two screws (111) to separate the two halves of the timing valve (101 and 110). Inspect the three face seal o-rings (106) and replace as necessary.

5. Pull the spool (103) out of the lower housing (101). Inspect and replace as necessary.

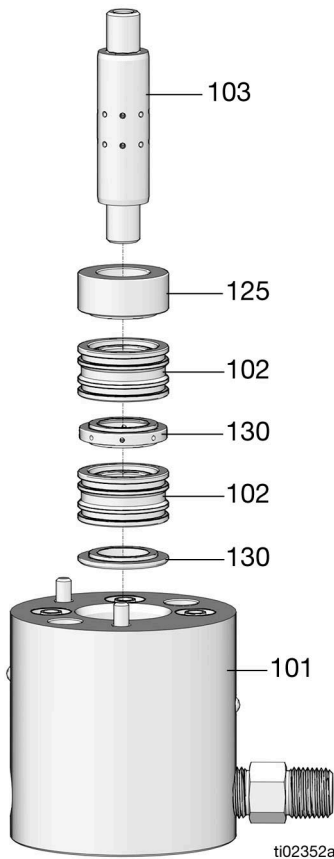


FIG. 18 Remove timing valve spool

6. Remove all of the seal cartridge components by hooking the radial ports with a plastic pick. Take care not to scratch or damage any of the metal or plastic parts. Sealing can be compromised.
7. The stack of seal cartridge components includes four sets of seals (105) and o-rings (124). Inspect and replace these as necessary. The repair parts

from Graco come as a piston assembly with the seals factory installed.

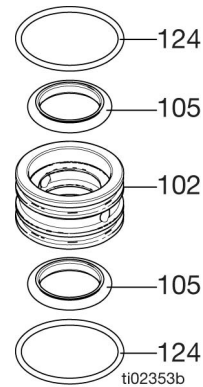


FIG. 19 Seal cartridge

8. Remove the drive piston (107) from the upper housing (110) with a needle-nose pliers.

NOTE: Keep the seal (108) and piston (107) together.

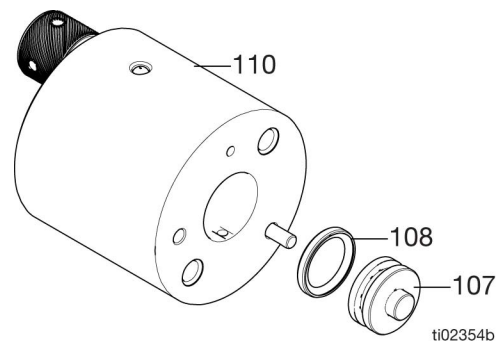


FIG. 20 Remove timing valve piston

9. Inspect the seal (108) and piston (107), and replace if necessary. The repair parts from Graco come as a piston assembly with the seals factory installed.

10. Remove the control knob (122) by loosening the two hex set screws (123) with a 1/16 in. hex key wrench.

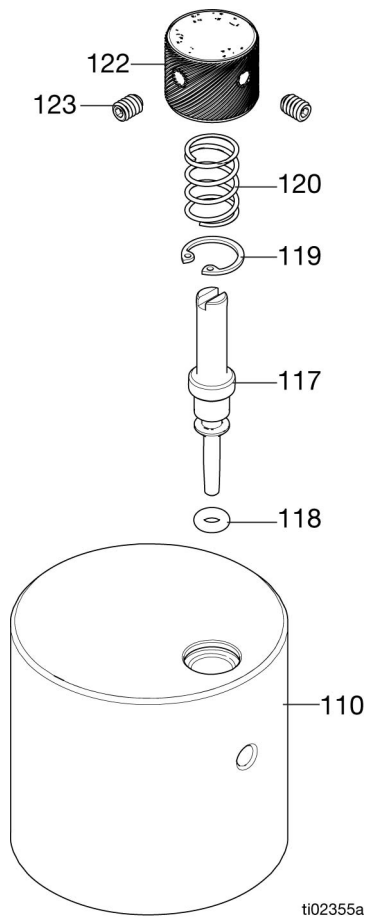


FIG. 21 Remove timing valve knob assembly

11. Remove the knob control spring (120) and the retaining ring (119).

12. Remove the needle valve (117) by unscrewing it from the housing (110). Inspect the sealing o-ring (118) and replace as necessary.
13. Clean and inspect all parts before reassembly.
14. Apply a thin coat of grease to the o-ring (118) and reinstall the needle valve (117). Tighten needle finger tight.
15. Install the retaining ring (119) and knob control spring (120).
16. Place the timing valve knob (122) over the needle valve (117), with the zero lined up with the marker on the label (121). Tighten the hex set screws (123).

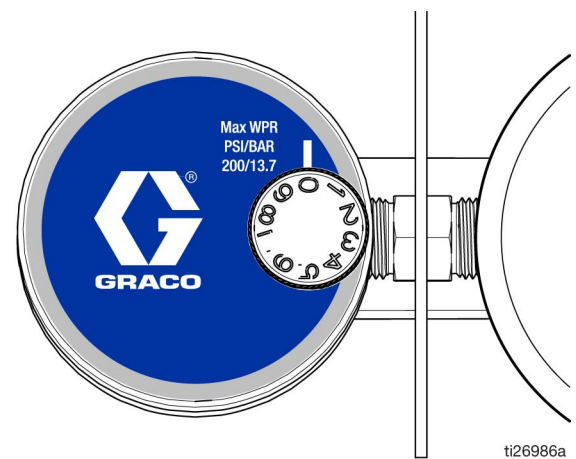


FIG. 22 Align timing valve knob with label

17. Reinstall the drive piston (107) in the bottom of the upper housing (110).

NOTE: Do not apply grease to the dynamic seals (105 and 108). They are designed to operate without grease.

18. Reinstall the seal cartridges (see FIG. 19 for the order of the seals (105) and o-rings (124) into the lower housing (101). Apply a thin coat of grease on the housing lead-in (130) to ease installation and ensure that the seals are not damaged.

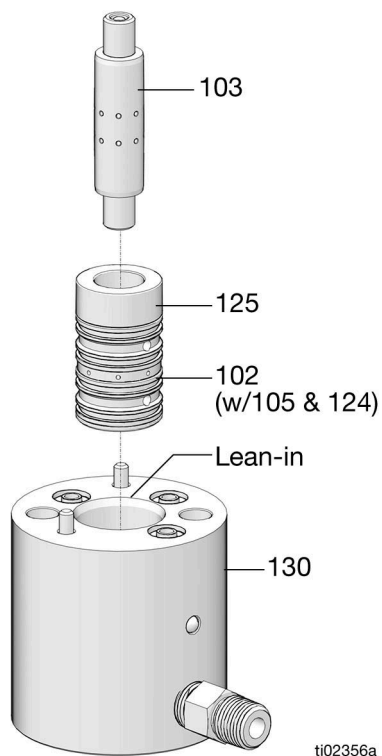


FIG. 23 Reinstall seal cartridges and spool

19. Reinstall the spool (103) carefully through the seal cartridge components.

20. Connect the upper and lower housings by lining up the dowel pins (113) in lower housing (101) with the receiving holes in the upper housing (110). Tighten the screws (111).

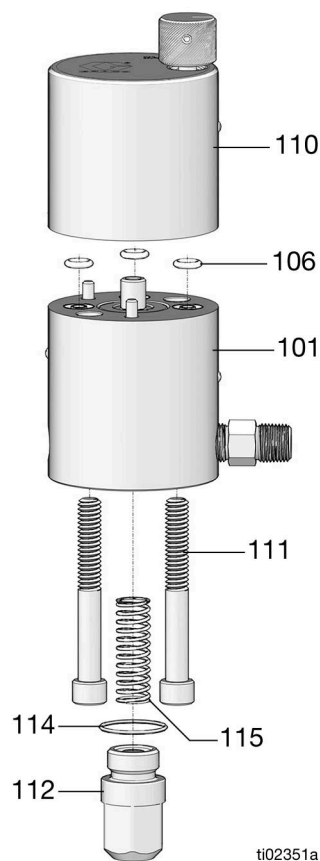


FIG. 24 Reconnect upper and lower housings

21. Insert the spring (115) in the bottom of the lower housing (101) and reinstall the spring retainer (112).

Final Reassembly

1. After all inspections and repairs are completed, reconnect all fluid lines.
2. Reconnect the timing valve (22) onto the pump assembly.

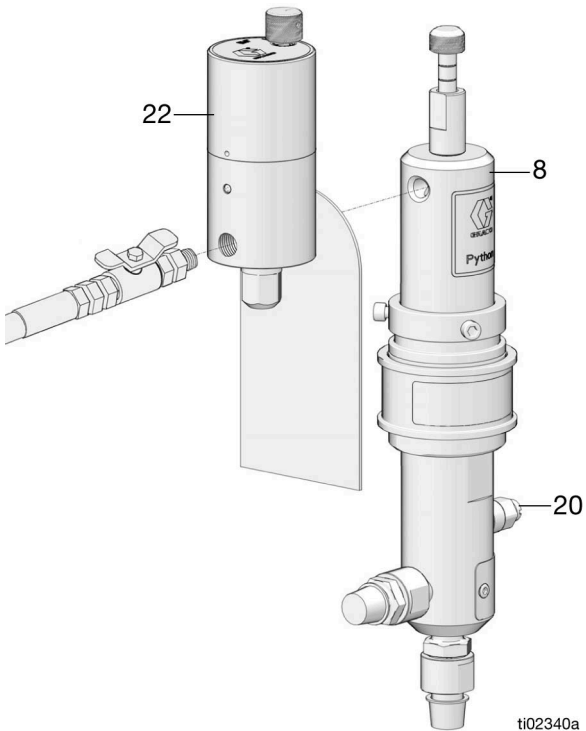
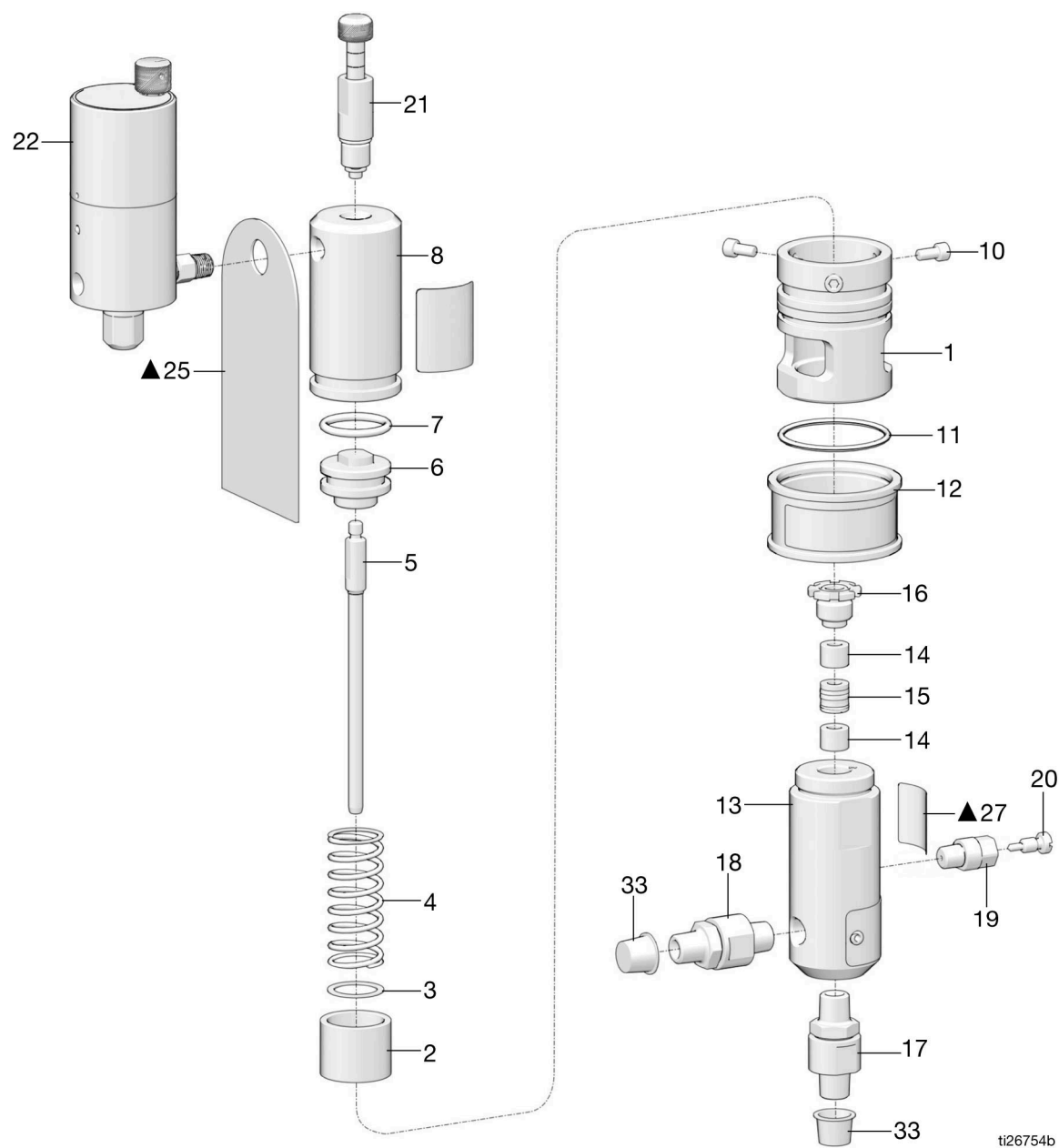


FIG. 25 Reconnect timing valve

3. Reconnect all pneumatic lines.
4. **Prime the Pump**, on page 16.
5. **Calibrate Chemical Dosage**, on page 16, to test for proper pump operation. The calibration test will ensure the desired pump stroke is achieved, as well as, verify proper operation of the check valves.
6. Compare results from calibration test with previous notes or the recommended pump settings in **Stroke Adjustment**, on page 17.

Parts

Python Pneumatic Pump



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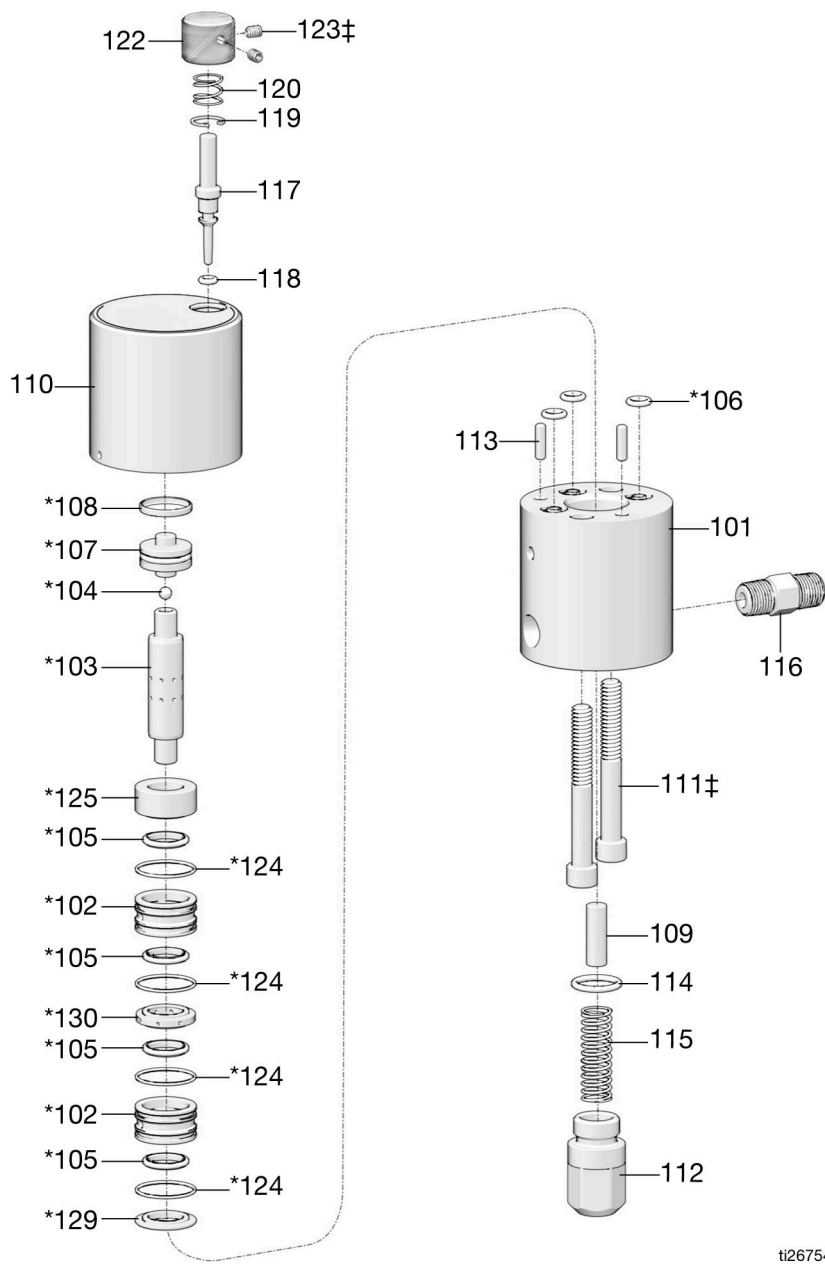
Python Pneumatic Pump Parts List

Ref.	Part	Description	Qty.
1		Air motor housing, for 1/2 in. and smaller fluid plungers	1
		Air motor housing, for 3/4 in. and larger fluid plungers	1
2		Air piston stop, for 1.25 in. air piston	1
		Air piston stop, for 1.75 in. air pistons	1
3		Fluid plunger wiper, included with fluid plunger spring (ref. 4)	1
4	B32168	Fluid plunger spring	1
5	See Table 1, pg 38	Fluid plunger	1
6		Air piston, 1.25 in.	1
		Air piston, 1.75 in.	1
7	B32034	O-ring packing, 1.25 in., included with air piston (ref. 6)	1
	B32035	O-ring packing, 1.75 in., included with air piston (ref. 6)	1
8		Air piston cylinder, 1.25 in.	1
		Air piston cylinder, 1.75 in.	1
10		Set screw, included with air motor housing (ref. 1)	3
11		O-ring packing	1
12		Dust shield	1
13		Fluid cylinder	1
14	See Table 2, pg 38	Plunger bearings, included with packing (ref. 15)	2
15	See Table 2, pg 38	Packing	1
16		Packing nut	1
17	See Table 3, pg 38	Inlet valve check	1
18		Outlet valve check	1
19	B32191	Priming bleed valve housing, standard pressure (1/4 in., 3/8 in., 1/2 in., and 3/4 in. plungers)	1

Ref.	Part	Description	Qty.
20		Priming bleed valve; included with priming bleed valve housing (ref. 19)	1
21		Pump stroke adjuster	1
22	B32069	Spool timing valve, see pg 37	1
25▲	17G319	Warning label, hanging	1
27▲	2006480	Warning label, adhesive	1
33		Cap plug	2

▲ Replacement Danger and Warning labels, tags, and cards are available at no cost.

Python Timing Valve Assembly



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Timing Valve Assembly (B32069) Parts List

Ref.	Part	Description	Qty.
101		Lower Housing	1
102*		Seal Cartridge	2
103*		Spool	1
104*		Ball, 316 stainless steel; included with lower and upper housing (ref. 101 & 110)	1
105*		Seal, Spool	4
106*		O-ring; included with lower housing (ref. 101)	3
107*		Piston	1
108*		Seal, Piston	1
109		Pin; included with spring retainer (ref. 112)	1
110		Upper Housing	1
111		Screw, 316 SST, 1/4-20	2
112		Spring Retainer	1
113		Dowel Pin; included with lower housing (ref. 101)	2
114		O-ring; included with spring retainer (ref. 112)	1
115	B32197	Spool Return Spring	1
116		Nipple Fitting, 1/8 NPT; included with lower housing (ref. 101)	1
117	B32199	Timing Valve Needle	1
118		O-ring; included with timing valve needle (ref. 117)	1

Ref.	Part	Description	Qty.
119		Internal Ring, Stainless Steel; included with timing valve needle (ref. 117)	1
120		Knob Spring; included with timing valve needle (ref. 117)	1
122		Needle Knob; included with timing valve needle (ref. 117)	1
123		Set Screw; included with timing valve needle (ref. 117)	2
124*		O-ring	4
125*		Seal Cartridge Retainer	1
126		Grease Lubricant (not shown)	
127		Pipe Sealant (not shown)	
129*		Bottom Seal Retainer	1
130*		Cartridge Spacer	1

* Parts included in Kit B32153 (purchase separately).

Kits and Accessories

Python Pneumatic Pump

Table 1: Fluid Plungers (ref. 5)

Ref	Part Numbers by Fluid Plunger Size Diameter				Qty.
	1/4 in.	3/8 in.	1/2 in.	3/4 in.	
Chromex-Coated Fluid Plungers					
5	B32141	B32142	B32143	B32145	1

Table 2: Packing Stacks (ref. 15), including Plunger Bearings (ref. 14)

Ref	Part Numbers by Fluid Plunger Size Diameter				Qty.
	1/4 in.	3/8 in.	1/2 in.	3/4 in.	
FKMETP					
15	2B32437	2B32438	2B32439	2B32441	1
HNBR					
15	2B32444	2B32445	2B32446	2B32448	1
FFKM					
15	2B32451	2B32452	2B32453	2B32455	1

Table 3: Check Valve Kit (ref. 17 and 18)

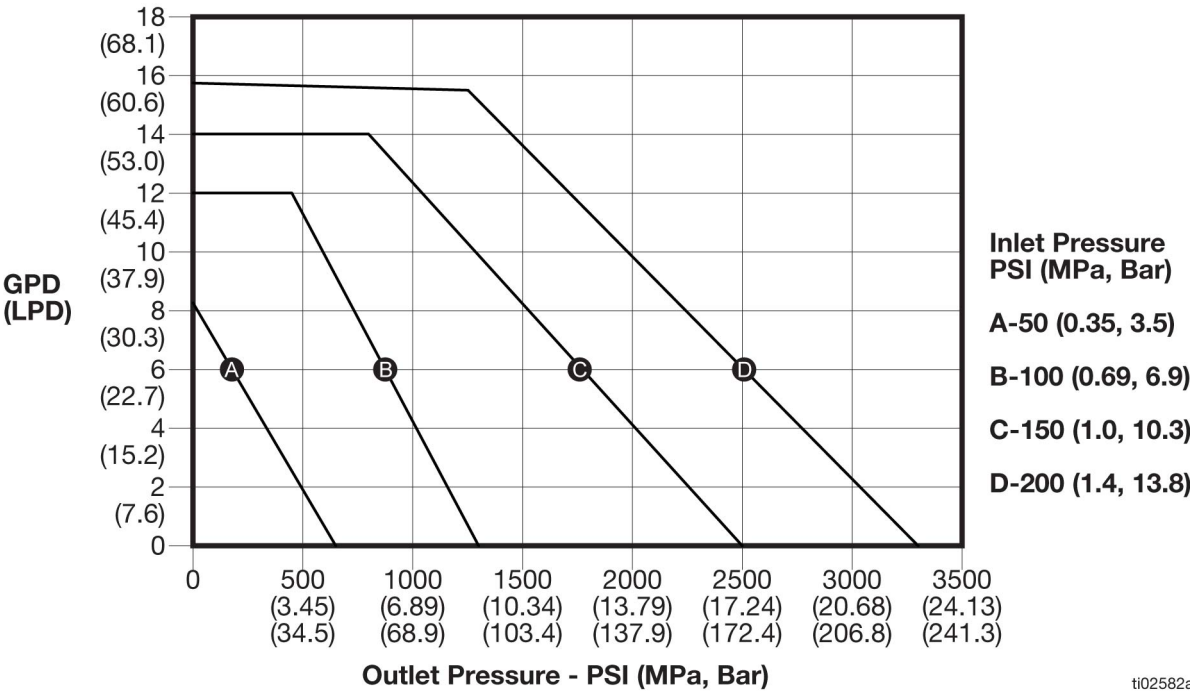
Part Numbers	
FKMETP	B33300
HNBR	B33301
FFKM	B33302

Bleed Kit Part No. B32191

Performance Charts

1 1/4 in. Air Motors (PCI-125)

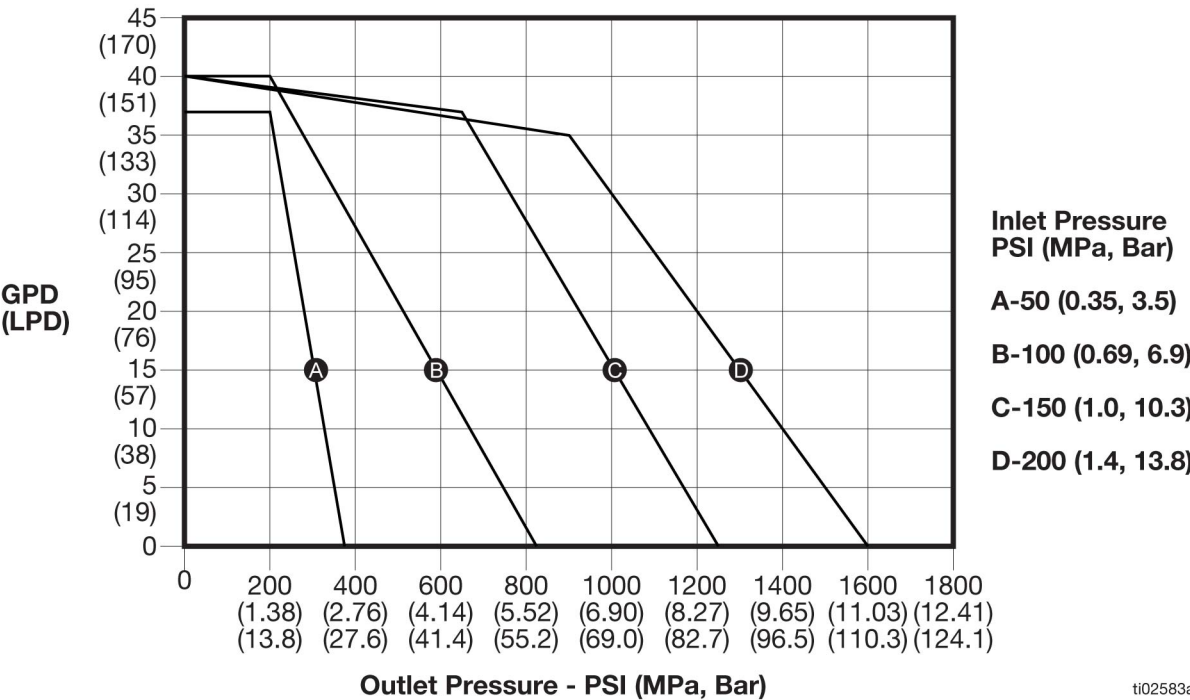
1/4 in. Plunger (PCI-125-25)



ti02582a

FIG. 26

3/8 in. Plunger (PCI-125-38)



ti02583a

FIG. 27

1/2 in. Plunger (PCI-125-50)

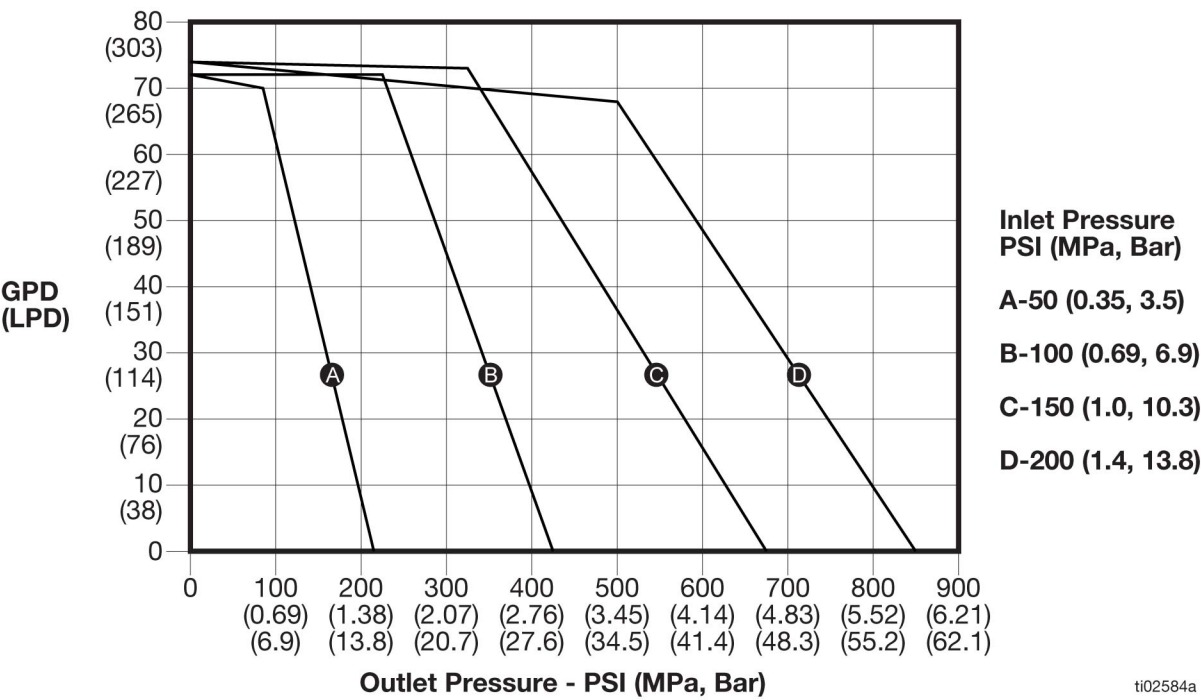


FIG. 28

1 3/4 in. Air Motors (PCI-175)

1/4 in. Plunger (PCI-175-25)

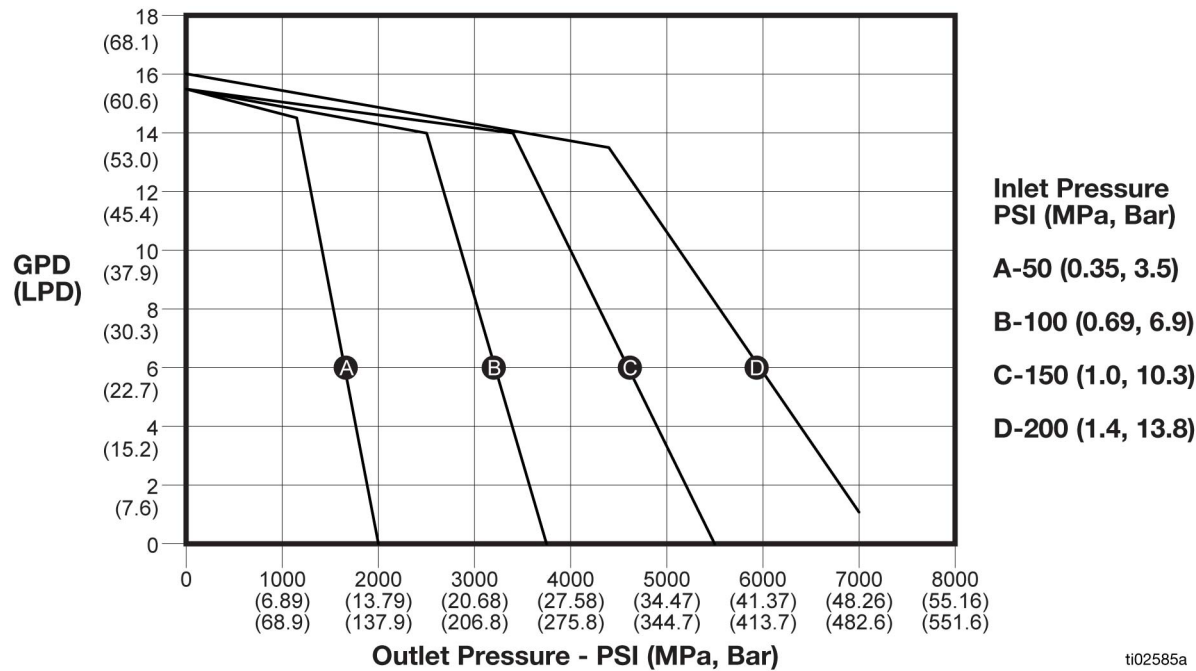


FIG. 29

3/8 in. Plunger (PCI-175-38)

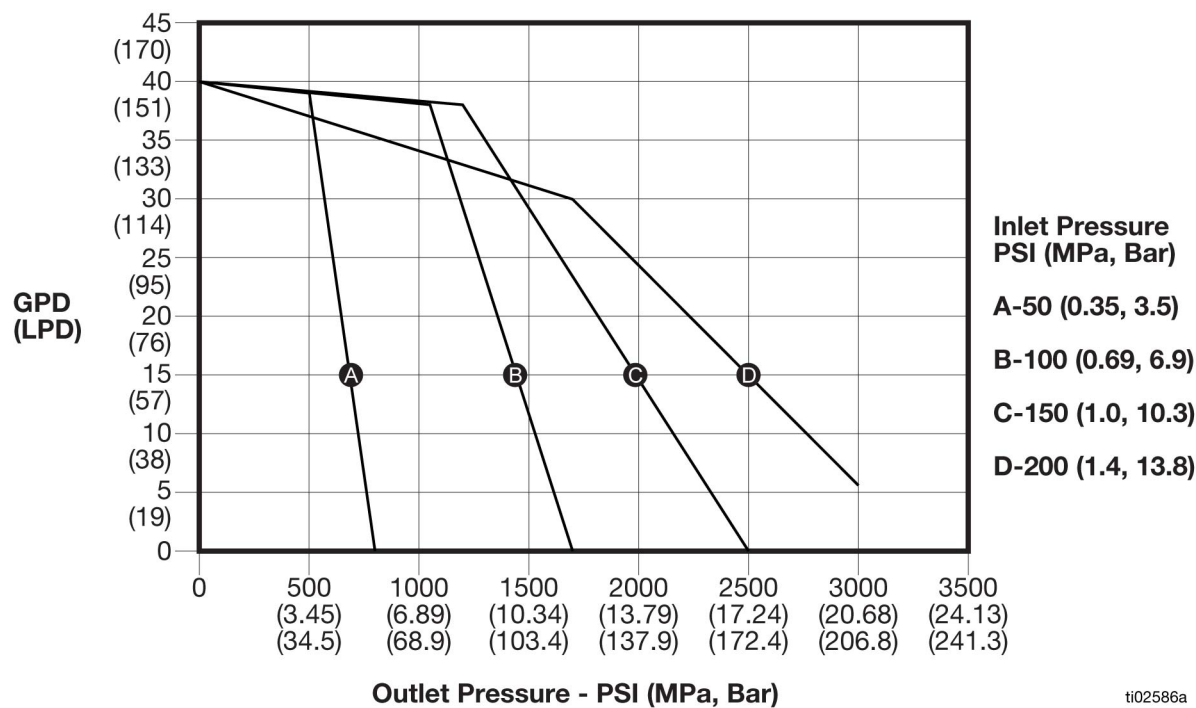


FIG. 30

1/2 in. Plunger (PCI-175-50)

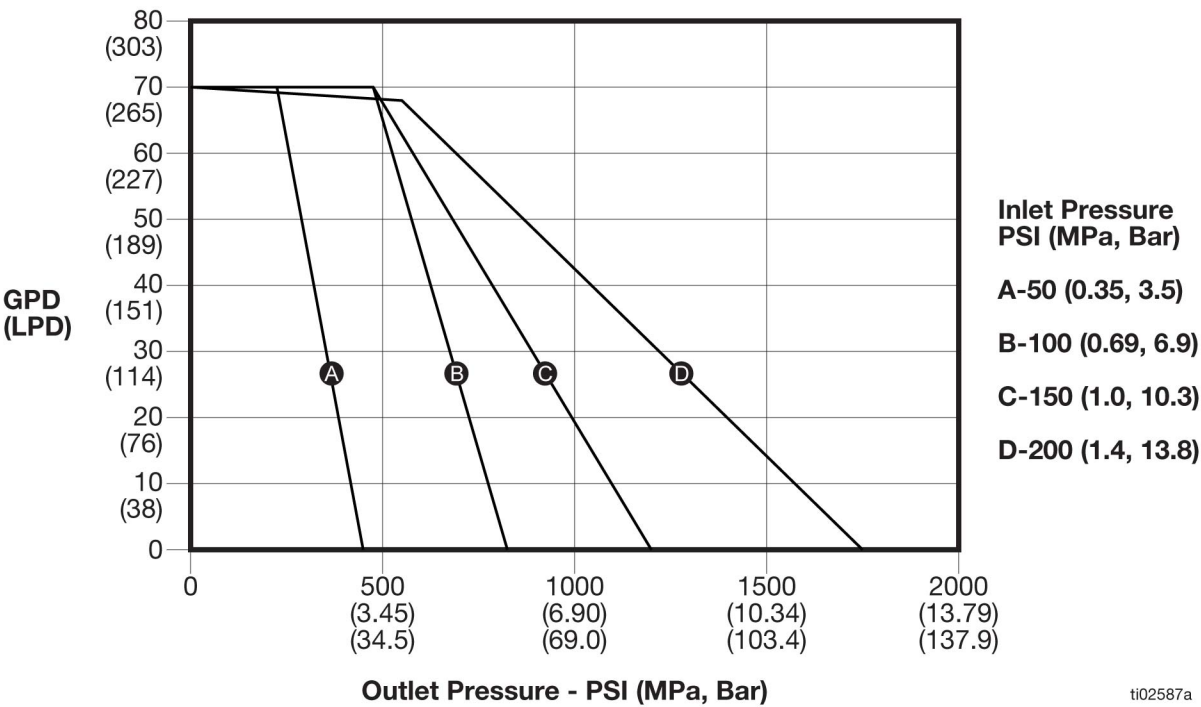


FIG. 31

3/4 in. Plunger (PCI-175-75)

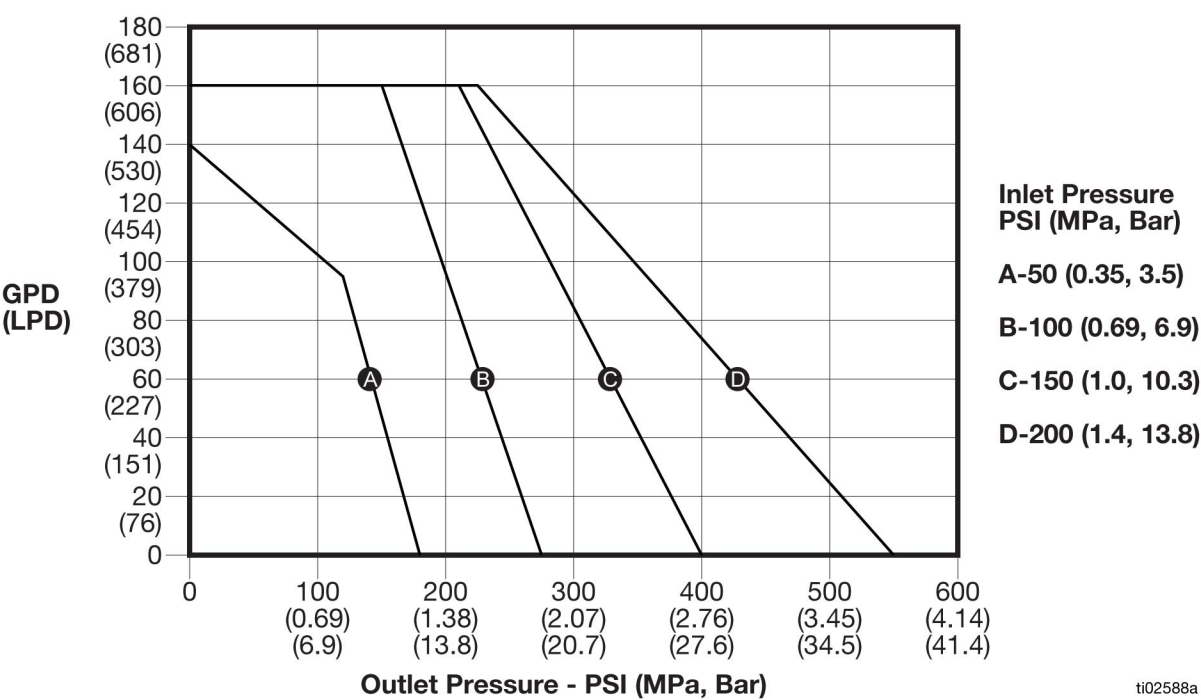


FIG. 32

Dimensions

Python Pump Dimensions

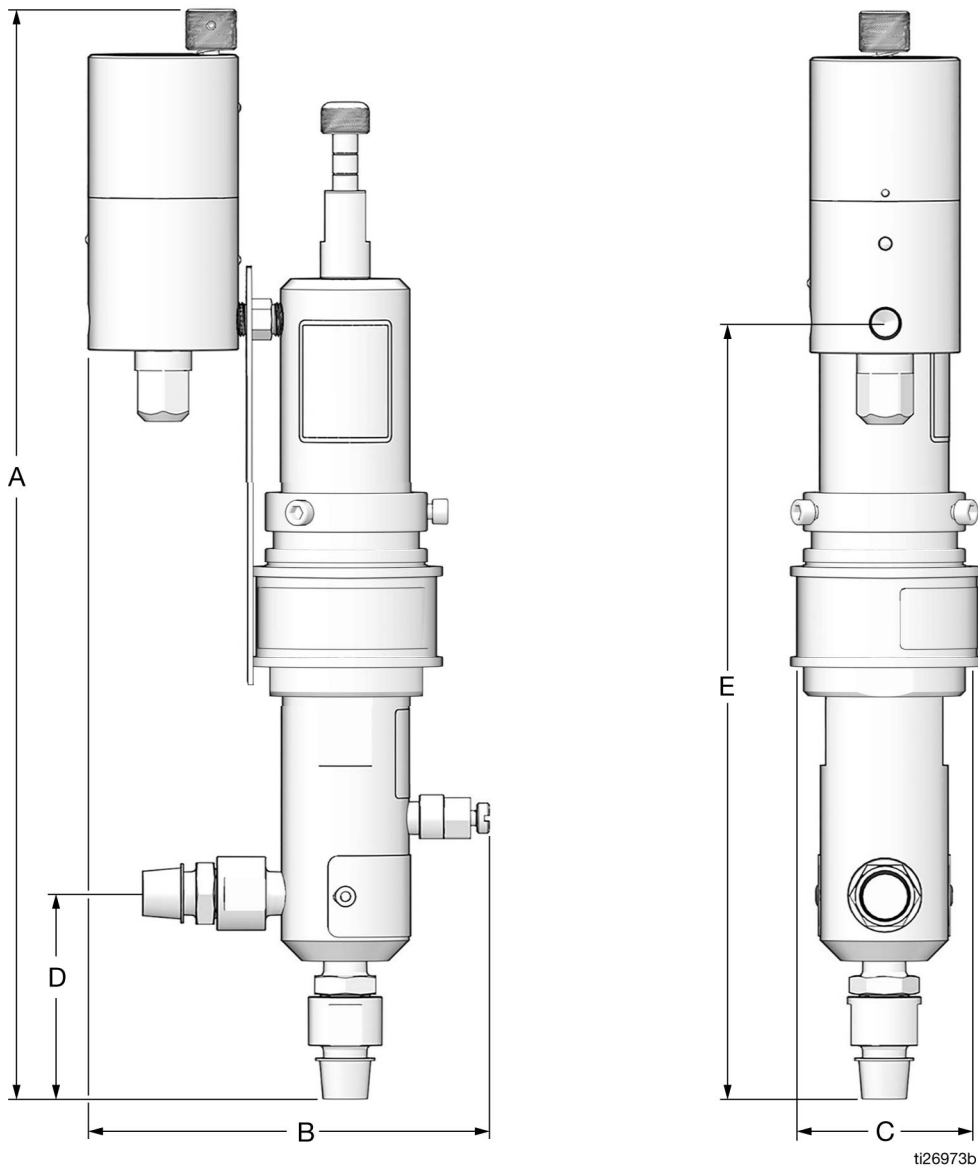


FIG. 33 Python Pump Dimensions


A	B	C	D	E
13.26 in. (33.7 cm)	5.3 in. (13.5 cm)	2.34 in. (5.9 cm)	2.3 in. (5.8 cm)	9.125 in. (23.2 cm)

Technical Specifications

Equipment Name		
	US	Metric
Maximum air inlet pressure	See Models , page 3	
Maximum fluid working pressure	See Models , page 3	
Maximum cycle rate	60 cpm	
Environmental temperature range	-40°–176°F	-40°–80°C
Noise (dBa)		
Maximum sound pressure	< 70 bBa with included muffler installed	
Inlet/Outlet Sizes		
Fluid inlet size	1/4 NPT(f) (1/4 NPT(m) adapter included)	
Fluid outlet size	1/4 NPT(f)	
Prime/bleed size	10 - 32 UNF	
Pneumatic inlet size	1/8 NPT(f) (1/4 NPT(f) adapter included)	
Pneumatic outlet size (exhaust recovery)	1/8 NPT(f)	
Materials of Construction		
Pump/Check Valve Seal Material	See Configuration Number Matrix , page 4 for seal material. All other packing materials are PEEK and PTFE, unless otherwise noted.	
Wetted materials on all models	See Configuration Number Matrix , page 4 for plunger material. All other packing materials are 316 stainless steel, unless otherwise noted.	
Weight		
All models	8 - 11 lb.	3.6 - 4.9 kg

California Proposition 65

CALIFORNIA RESIDENTS

 **WARNING:** Cancer and reproductive harm – www.P65warnings.ca.gov.

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Original instructions. This manual contains English. MM 3A9524

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Revision A, August 2024