

# VERDERAIR VA-E25

## Electric Diaphragm Pump

859.0510  
Rev.M  
EN

1-Inch pumps with electric drive for fluid transfer applications. For professional use only.

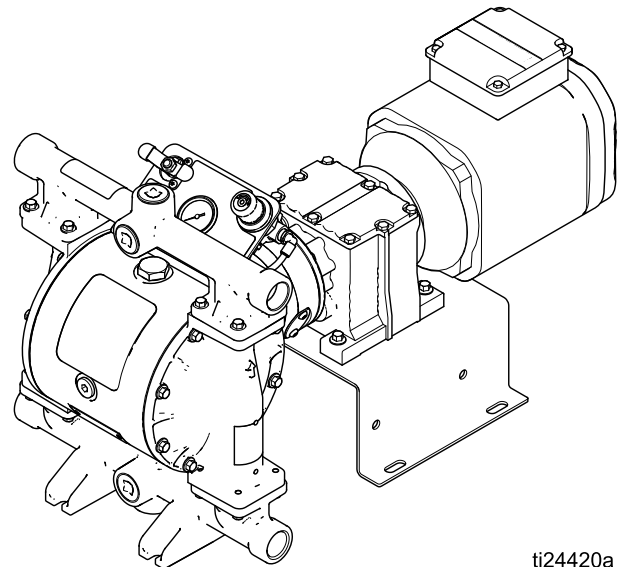


### Important Safety Instructions

Read all warnings and instructions in this manual and in your VERDERAIR VA-E25 Repair/Parts manual. **Save these instructions.**

*For maximum operating pressures, see the Performance Charts on pages 23–25.*

*See pages 6–7 for model information, including approvals.*



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## Related Manuals






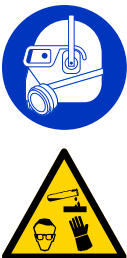
Manual Number	Title
859.0511	VA-E25 Electric Double Diaphragm Pump, Repair/Parts

# Warnings

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual or on warning labels, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

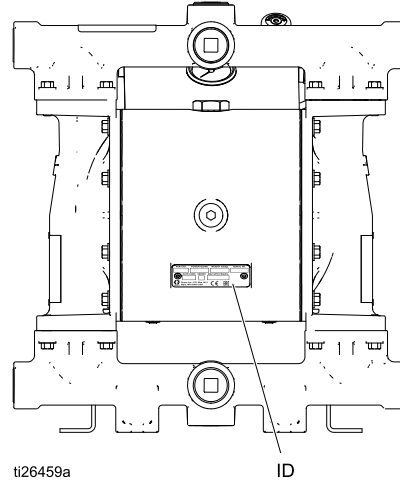
 <h1 style="margin: 0;">WARNING</h1>	
	<p><b>ELECTRIC SHOCK HAZARD</b></p> <p>This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.</p> <ul style="list-style-type: none"> <li>• Turn off and disconnect power at main switch before disconnecting any cables and before servicing or installing equipment.</li> <li>• Connect only to grounded power source.</li> <li>• All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</li> <li>• Wait five minutes for capacitor discharge before opening equipment.</li> </ul>
	<p><b>FIRE AND EXPLOSION HAZARD</b></p> <p>Flammable fumes, such as solvent and paint fumes, in <b>work area</b> can ignite or explode. Paint or solvent flowing through the equipment can cause static sparking. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> <li>• Use equipment only in well ventilated area.</li> <li>• Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static arc).</li> <li>• Ground all equipment in the work area. See <b>Grounding</b> instructions.</li> <li>• Keep work area free of debris, including solvent, rags and gasoline.</li> <li>• Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.</li> <li>• Use only grounded hoses.</li> <li>• <b>Stop operation immediately</b> if static sparking occurs or you feel a shock. Do not use equipment until you identify and correct the problem.</li> <li>• Keep a working fire extinguisher in the work area.</li> </ul>
	<p>Static charge may build up on plastic parts during cleaning and could discharge and ignite flammable vapors. To help prevent fire and explosion:</p> <ul style="list-style-type: none"> <li>• Clean plastic parts only in well ventilated area.</li> <li>• Do not clean with a dry cloth.</li> <li>• Do not operate electrostatic guns in equipment work area.</li> </ul>

 <h1 style="margin: 0;">WARNING</h1>	
 	<p><b>PRESSURIZED EQUIPMENT HAZARD</b></p> <p>Fluid from the equipment, leaks, or ruptured components can splash in the eyes or on skin and cause serious injury.</p> <ul style="list-style-type: none"> <li>• Follow the <b>Pressure Relief Procedure</b> when you stop spraying/dispensing and before cleaning, checking, or servicing equipment.</li> <li>• Tighten all fluid connections before operating the equipment.</li> <li>• Check hoses, tubes, and couplings daily. Replace worn or damaged parts immediately.</li> </ul>
 	<p><b>EQUIPMENT MISUSE HAZARD</b></p> <p>Misuse can cause death or serious injury.</p> <ul style="list-style-type: none"> <li>• Do not operate the unit when fatigued or under the influence of drugs or alcohol.</li> <li>• Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See <b>Technical Data</b> in all equipment manuals.</li> <li>• Use fluids and solvents that are compatible with equipment wetted parts. See <b>Technical Data</b> in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request Safety Data Sheet (SDS) from distributor or retailer.</li> <li>• Turn off all equipment and follow the <b>Pressure Relief Procedure</b> when equipment is not in use.</li> <li>• Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.</li> <li>• Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.</li> <li>• Make sure all equipment is rated and approved for the environment in which you are using it.</li> <li>• Use equipment only for its intended purpose. Call your distributor for information.</li> <li>• Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.</li> <li>• Do not kink or over bend hoses or use hoses to pull equipment.</li> <li>• Keep children and animals away from work area.</li> <li>• Comply with all applicable safety regulations.</li> </ul>
	<p><b>PRESSURIZED ALUMINUM PARTS HAZARD</b></p> <p>Use of fluids that are incompatible with aluminum in pressurized equipment can cause serious chemical reaction and equipment rupture. Failure to follow this warning can result in death, serious injury, or property damage.</p> <ul style="list-style-type: none"> <li>• Do not use 1,1,1-trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents.</li> <li>• Do not use chlorine bleach.</li> <li>• Many other fluids may contain chemicals that can react with aluminum. Contact your material supplier for compatibility.</li> </ul>

 <h1 style="margin: 0;">WARNING</h1>	
	<p><b>THERMAL EXPANSION HAZARD</b></p> <p>Fluids subjected to heat in confined spaces, including hoses, can create a rapid rise in pressure due to the thermal expansion. Over-pressurization can result in equipment rupture and serious injury.</p> <ul style="list-style-type: none"> <li>Open a valve to relieve the fluid expansion during heating.</li> <li>Replace hoses proactively at regular intervals based on your operating conditions.</li> </ul>
	<p><b>PLASTIC PARTS CLEANING SOLVENT HAZARD</b></p> <p>Many solvents can degrade plastic parts and cause them to fail, which could cause serious injury or property damage.</p> <ul style="list-style-type: none"> <li>Use only compatible water-based solvents to clean plastic structural or pressure-containing parts.</li> <li>See <b>Technical Data</b> in this and all other equipment instruction manuals. Read fluid and solvent manufacturer's Safety Data Sheet (SDS) and recommendations.</li> </ul>
	<p><b>TOXIC FLUID OR FUMES HAZARD</b></p> <p>Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.</p> <ul style="list-style-type: none"> <li>Read Safety Data Sheet (SDS) to know the specific hazards of the fluids you are using.</li> <li>Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.</li> </ul>
	<p><b>BURN HAZARD</b></p> <p>Equipment surfaces and fluid that's heated can become very hot during operation. To avoid severe burns:</p> <ul style="list-style-type: none"> <li>Do not touch hot fluid or equipment.</li> </ul>
	<p><b>PERSONAL PROTECTIVE EQUIPMENT</b></p> <p>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. This protective equipment includes but is not limited to:</p> <ul style="list-style-type: none"> <li>Protective eyewear, and hearing protection.</li> <li>Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.</li> </ul>

# Pump Matrix

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








Sample Configuration Number: **VA-E25 AA HY AC HY TB AC**

<b>VA-E25</b>	<b>A</b>	<b>A</b>	<b>HY</b>	<b>AC</b>	<b>HY</b>	<b>TB</b>	<b>AC</b>
Pump Model	Fluid Section Material	Drive Section Material	Check Valve Material	Check Valve Balls	Diaphragm	Connections	Options

Pump	Fluid Section Material		Drive Section Material		Check Valve Material	
<b>VA-E25</b>	<b>A</b>	Aluminum	<b>A</b>	Aluminum	<b>AC</b>	Acetal
	<b>P</b>	Polypropylene	<b>S</b>	Stainless Steel	<b>AL</b>	Aluminum
	<b>S</b>	Stainless Steel			<b>BN</b>	Buna-N
					<b>GE</b>	Geolast
					<b>HY</b>	TPE
					<b>PP</b>	Polypropylene
					<b>SP</b>	Santoprene
					<b>SS</b>	316 Stainless Steel
					<b>VT</b>	FKM Fluoroelastomer

Balls		Diaphragm		Connections		Options	
<b>AC</b>	Acetal	<b>BN</b>	Buna-N	<b>FC</b>	Center Flange DIN/ANSI	<b>AC</b>	Standard AC Induction Motor with Gearbox (2-pole)
<b>BN</b>	Buna-N	<b>GE</b>	Geolast	<b>FE</b>	End Flange DIN/ANSI	<b>AX</b>	AC Induction Motor, ATEX (2-pole)◆
<b>GE</b>	Geolast	<b>HY</b>	TPE	<b>TB</b>	Threaded BSP	<b>AF</b>	Explosionproof AC Induction Motor (2-pole)★
<b>HY</b>	TPE	<b>NO</b>	Polychloroprene Overmolded	<b>TN</b>	Threaded NPT	<b>NG</b>	NEMA 56 C Gearbox +
<b>NE</b>	Polychloroprene Standard	<b>SP</b>	Santoprene			<b>IG</b>	IEC 90 B5 Flange Gearbox +
<b>NW</b>	Polychloroprene Weighted	<b>TF</b>	PTFE/EPDM 2-Piece			<b>B1</b>	Standard AC Induction Motor with Compressor (120V, 4-pole)
<b>SP</b>	Santoprene	<b>TO</b>	PTFE/EPDM Overmolded			<b>B2</b>	Standard AC Induction Motor with Compressor (240V, 4-pole)
<b>SS</b>	316 Stainless Steel	<b>VT</b>	FKM Fluoroelastomer			<b>BC</b>	Standard AC Induction Motor with Gearbox (4-pole)
<b>TF</b>	PTFE					<b>BX</b>	AC Induction Motor, ATEX (4-pole)◆
<b>VT</b>	FKM Fluoroelastomer						

Approvals	
◆ Aluminum and stainless steel pumps with code <b>AX</b> and <b>BX</b> are certified to:	 II 2 G Ex dh IIB T3 Gb
+ Aluminum and stainless steel pumps with code <b>NG</b> or <b>IG</b> are certified to:	 II 2 G h IIB T3 Gb
★ Motors coded <b>AF</b> are certified to:	 <b>UL LISTED</b> Class1, Zone 1, AEx d IIB T3 0°C<Ta<40°C 
All Models (except <b>AF</b> ) are certified to:	

# Overview

The **VERDERAIR** VA-E25 product line offers electric-powered diaphragm pumps in a wide range of models. This section shows the basic structure of available models. Fluid section options are too numerous to include. The many manifold, seat,

ball, and diaphragm options are available on a wide variety of these models.

Center Section	Motor Type	Controller	Gearbox	Compressor	Approval Options
Aluminum or Stainless Steel	AC	VFD — not included.	Yes, part of motor	Yes-120V	None
				Yes-240V	CE
				No	
			IEC	No	ATEX and CE
	NEMA	No	Explosionproof		
	None	None	NEMA	No	CE
			IEC	No	

**Key Points:**

- Pumps are available with an AC motor, or with just a gearbox (for applications where a motor already is available).
- Verder recommends the use of a motor soft starter or a VFD in the electrical circuit for all installations. See the motor manufacturer’s recommendations for proper installation when using either of these components. In all cases, make sure all products are installed in accordance with local codes and regulations.
- The standard AC motor (not ATEX or Explosionproof) is available in models without a compressor, with a 120V compressor, or with a 240V compressor.



# Installation

## General Information

The Typical Installation shown is only a guide for selecting and installing system components. Contact your Verder representative for assistance in planning a system to suit your needs. Always use Genuine Verder Parts and Accessories. Be sure all accessories are adequately sized and pressure rated to meet the system's requirements.

Reference letters in the text, for example (A), refer to the callouts in the figures.

**NOTE:** For outdoor applications, be sure to provide adequate protection from the elements.

## Tighten Fasteners

Before mounting and using the pump for the first time, check and retorque all external fasteners. Follow [Torque Instructions, page 22](#), or see the torque tag on your pump. After the first day of operation, retorque the fasteners.

## Tips to Reduce Cavitation

Cavitation in a double diaphragm pump is the formation and collapse of bubbles in the pumped liquid. Frequent or excessive cavitation can cause serious damage, including pitting and early wear of fluid chambers, balls, and seats. It may result in reduced efficiency of the pump. Cavitation damage and reduced efficiency both result in increased operating costs.

Cavitation depends on the vapor pressure of the pumped liquid, the system suction pressure, and the velocity pressure. It can be reduced by changing any of these factors.

1. Reduce vapor pressure: Decrease the temperature of the pumped liquid.
2. Increase suction pressure:
  - a. Lower the installed position of the pump relative to the liquid level in the supply.
  - b. Reduce the friction length of the suction piping. Remember that fittings add friction length to the piping. Reduce the number of fittings to reduce the friction length.
  - c. Increase the size of the suction piping.
  - d. Increase the Net Positive Suction Head Available (NPSHa). See [Performance Charts, page 23](#).

**NOTE:** Be sure the inlet fluid pressure does not exceed 25% of the outlet working pressure.

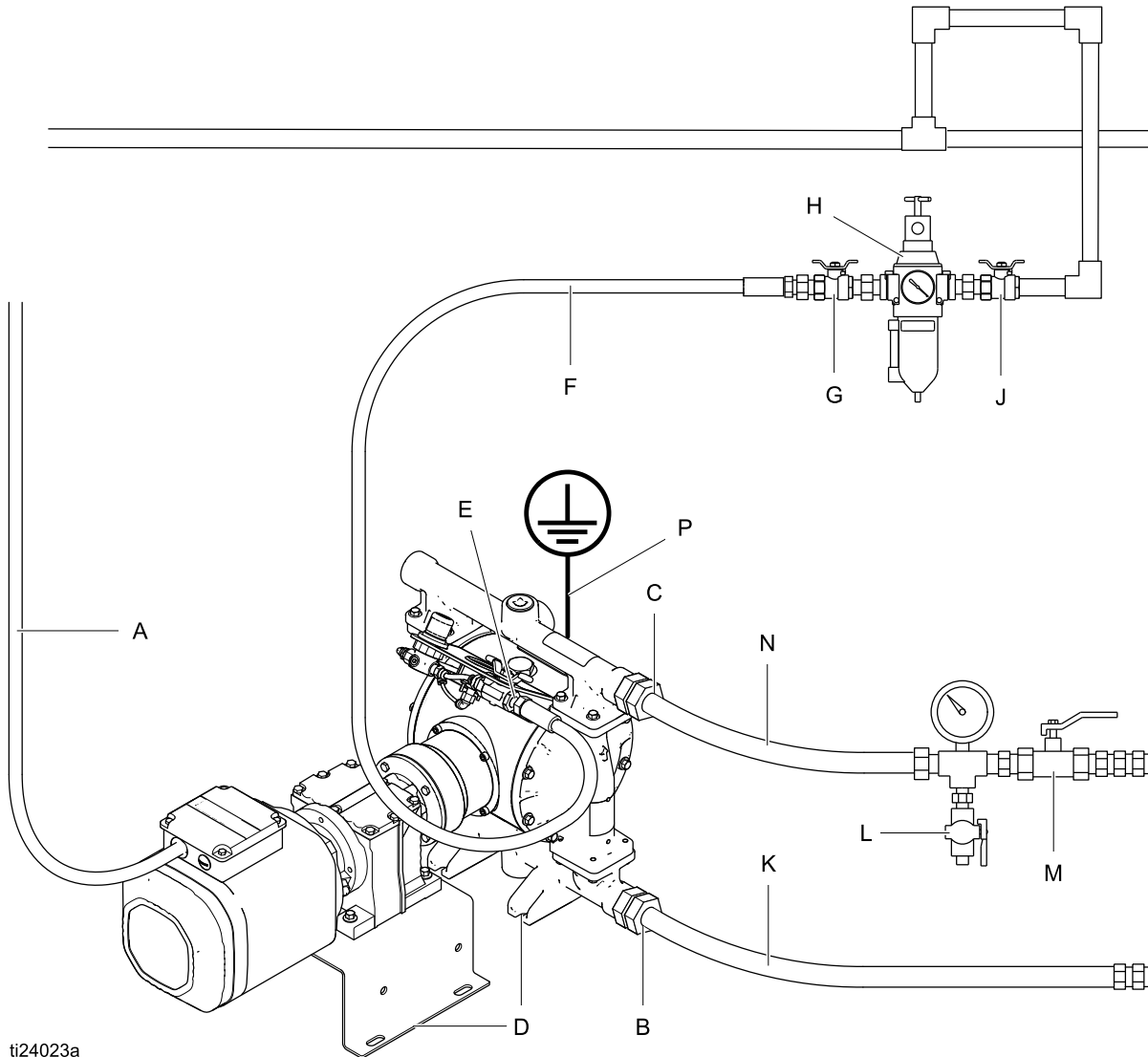
3. Reduce liquid velocity: Slow the cyclic rate of the pump.

Pumped liquid viscosity is also very important but normally is controlled by factors that are process dependent and cannot be changed to reduce cavitation. Viscous liquids are more difficult to pump and more prone to cavitation.

Take all of the above factors into account in system design. To maintain pump efficiency, supply only enough power to the pump to achieve the required flow.

Verder representatives can supply site specific suggestions to improve pump performance and reduce operating costs.

## Installation



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Figure 1 Typical Installation (AC Pump Shown)

### System Components

- A Power cord to VFD
- B Fluid inlet port
- C Fluid outlet port
- D Mounting feet
- E Air inlet port

### Accessories/Components Not Supplied

- F Grounded, flexible air supply hose
- G Bleed-type master air valve
- H Air filter/regulator assembly
- J Master air valve (for accessories)
- K Grounded, flexible fluid supply hose
- L Fluid drain valve (may be required for your pump installation)
- M Fluid shutoff valve
- N Grounded, flexible fluid outlet hose
- P Ground wire and clamp (required)

## Mount the Pump



To avoid serious injury or death from toxic fluid or fumes:

- Never move or lift a pump under pressure. If dropped, the fluid section may rupture. Always follow the [Pressure Relief Procedure, page 20](#), before moving or lifting the pump.

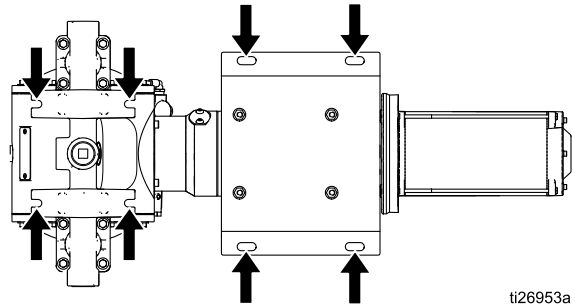
### NOTICE

The pump is heavy. To prevent damage from dropping, always use 2 people or a lift to move the pump. Do not use the manifolds to lift the pump. Use at least one strap.

1. For all mountings, be sure the pump is secured with screws through the mounting feet (D) and through the mounting bracket on the gear box. See [Dimensions \(typical only\), page 28](#).

### NOTICE





To prevent pump damage, use all eight fasteners.



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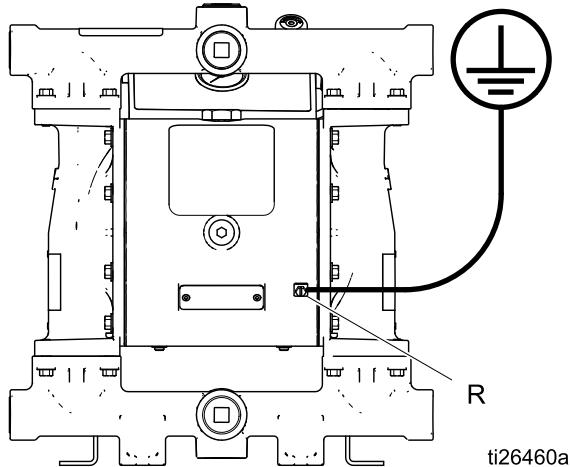
2. Make sure the surface is flat and that the pump doesn't wobble.
3. For ease of operation and service, mount the pump so fluid inlet and fluid outlet ports are easily accessible.

## Grounding

				
<p>The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.</p> <ul style="list-style-type: none"> <li>• <b>Always</b> ground the entire fluid system as described below.</li> <li>• Pumps with <b>Polypropylene</b> fluid sections are <b>not</b> conductive. <b>Never</b> use a nonconductive polypropylene pump with flammable fluids.</li> <li>• Follow your local fire codes.</li> </ul>				

Before operating the pump, ground the system as explained below.

- **Pump:** Loosen the grounding screw (R). Insert one end of a 4 mm<sup>2</sup> (12 AWG) minimum ground wire behind the ground screw and tighten the screw securely. Connect the clamp end of the grounding wire to a true earth ground. A ground wire and clamp, Part 819.0157, is available from Verder.



- **Motor:** AC motors have a ground screw in the electrical box. Use it to ground the motor to the controller.
- **Air Line and Fluid hoses:** Use only grounded hoses with a maximum of 150 m (500 ft) combined hose length to ensure grounding continuity. Check electrical resistance of hoses. If total resistance to ground exceeds 29 megohms, replace hose immediately.
- **Fluid supply container:** Follow local code.
- **Solvent pails used when flushing:** Follow local code. Use only conductive metal pails, placed on a grounded surface. Do not place the pail on a nonconductive surface, such as paper or cardboard, which interrupts grounding continuity.
- **VFD:** Ground the variable frequency drive (VFD) through a proper connection to the electrical system. Refer to the VFD manual for grounding instructions.

Check your system electrical continuity after the initial installation, and then set up a regular schedule for checking continuity to be sure proper grounding is maintained. The resistance should not exceed 1 ohm.

## Air Line

### Models that Include a Compressor:

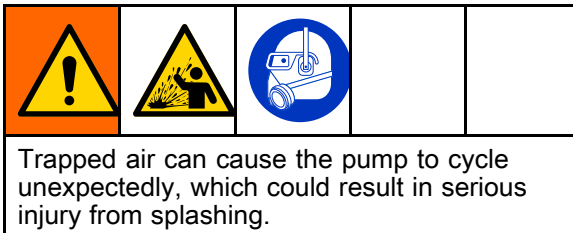
An air line is already connected from the compressor to the pump air inlet.

### Using Your Own Compressor:

Install a grounded, flexible air hose from the compressor to the 3/8 npt(f) pump air inlet.

### Using Shop Air:

1. Install an air filter/regulator assembly (H). The fluid stall pressure will be the same as the setting of the air regulator. The filter removes harmful dirt and moisture from the compressed air supply.
2. Locate a bleed-type master air valve (G) close to the pump and use it to relieve trapped air. Be sure the valve is easily accessible from the pump and located downstream from the regulator.



3. Locate another master air valve (J) upstream from all air line accessories and use it to isolate them during cleaning and repair.
4. Install a grounded, flexible air hose (F) between the accessories and the 3/8 npt(f) pump air inlet.

## Fluid Supply Line

1. Connect a grounded, flexible fluid hose (K) to the fluid inlet port. The port on pumps with aluminum or stainless steel fluid sections is 1 in npt(f) or 1 in. bspt. On pumps with polypropylene fluid sections, the port is a 1 in. raised face ANSI/DIN flange.
2. If the inlet fluid pressure to the pump is more than 25% of the outlet working pressure, the ball check valves will not close fast enough, resulting in inefficient pump operation. Excessive inlet fluid pressure also will shorten diaphragm life. Approximately 0.2–0.3 bar (0.02–0.03 MPa, 3–5 psi) inlet fluid pressure should be adequate for most materials.
3. For maximum suction lift (wet and dry), see [Technical Data, page 37](#). For best results, always install the pump as close as possible to the material source. Minimize suction requirements to maximize pump performance.

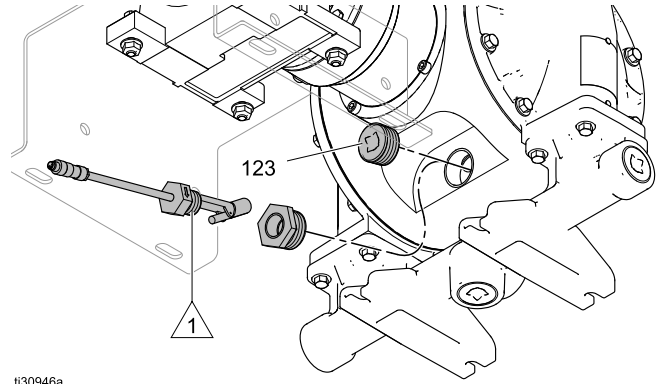
## Fluid Outlet Line

1. Connect a grounded, flexible fluid hose (N) to the fluid outlet port. The port on pumps with aluminum or stainless steel fluid sections is 1 in npt(f) or 1 in. bspt. On pumps with polypropylene fluid sections, the port is a 1 in. raised face ANSI/DIN flange.
2. Install a fluid drain valve (L) near the fluid outlet.
3. Install a shutoff valve (M) in the fluid outlet line.

## Installation

### Leak Sensor

The optional leak sensor (Kit 859.0508) is highly recommended to avoid operating the pump with a ruptured diaphragm. To install the leak sensor, remove plug 123. Install the bushing and leak sensor. **NOTE:** The arrow on the leak sensor must point down.



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**1** To ensure a watertight seal, apply Loctite® 425 Assure™ threadlocker to threads.

### Leak Sensor Wiring (AC Models)

Follow these instructions to wire the optional Leak Sensor Kit 859.0508 to a VFD.

**NOTE:** The leak sensor is designed to operate as a normally-closed circuit.





1. Select and purchase a cable from the following table.

Part Number	Cable Length
859.0517	3.0 m (9.8 ft)
859.0518	.7.5 m (24.6 ft)
859.0519	16 m (52.5 ft)

2. After installing the leak sensor, connect the selected cable to the installed leak sensor.

3. Turn off power to the VFD.
4. Open the access cover on the VFD.
5. Attach the blue and black leads to the detection circuit in the VFD.  
**NOTE:** Refer to the VFD manual for proper connection points.
6. Individually terminate the two remaining leads.
7. Close the access cover.
8. Turn on power to the VFD.
9. Configure the VFD to monitor the leak sensor circuit.

# Electrical Connections (AC Models)

				
<p>To avoid injury from fire, explosion, or electric shock, all electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</p>				

Always check the motor manufacturer's manual for the proper technical and installation information.

Follow the instructions in the motor manufacturer's manual. When using a Verder inverter duty-rated motor, use of a properly-sized VFD or a motor soft-starter is recommended. In all cases, wire size, fuse size, and other electrical devices must comply with all local codes and regulations.

## Wire Connections at the Variable Frequency Drive (VFD)

Follow the instructions in the VFD manufacturer's manual.

<b>NOTICE</b>
<p>To avoid equipment damage, do not plug the motor directly into a wall socket.</p>

## Wire Connections at the Standard Motor

Install the wiring at the motor as follows:

1. Open the motor's electrical box.
2. Install wiring system with proper liquid-tight connections in one of the ports at the side of the motor box.
3. Connect the green ground wire to the ground screw.

4. **For 460V Wiring:** The motor comes wired for 460V. If this is the voltage you want, the existing wiring can remain as it is. Connect power wires L1 to U1, L2 to V1 and L3 to W1, as shown.

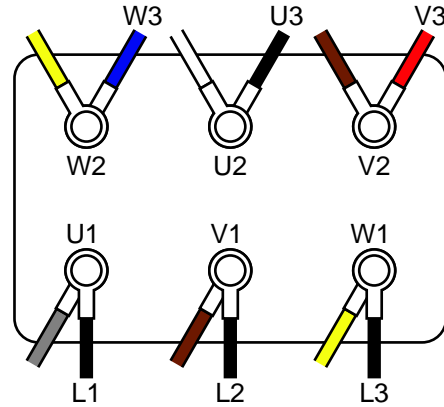


Figure 2 Connections for 460V Wiring

5. **For 230V Wiring:** Move the black wire (U3), the red wire (V3) and the blue wire (W3) as shown. Bridge W2, U2, and V2. Then connect power wires L1 to U1, L2 to V1 and L3 to W1.

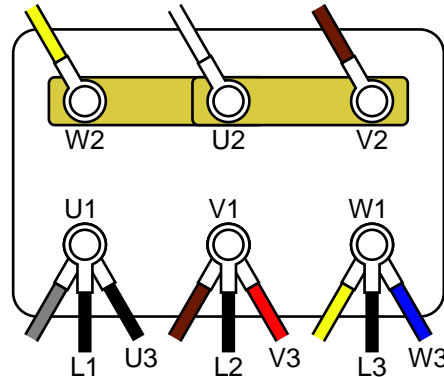


Figure 3 Connections for 230V Wiring

6. Torque terminals to 2.3 N•m (20 in-lb).
7. Close the motor electrical box. Torque the screws to 2.3 N•m (20 in-lb).

## Wire Connections at the ATEX Motor

Install the wiring at the motor as follows:

1. Open the motor's electrical box.
2. Install wiring system with proper connections to the motor electrical box.
3. Connect the green ground wire to the ground screw.
4. **For 415V Wiring:** Bridge as shown, then connect wire L1 to U1, L2 to V1, and L3 to W1.

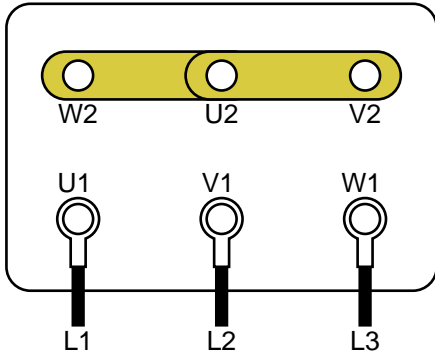


Figure 4 Connections for a 415V Wiring

5. **For 240V Wiring:** Connect wire L1 to U1, L2 to V1, and L3 to W1. Bridge as shown.

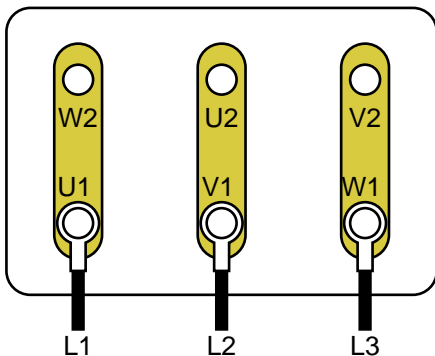


Figure 5 Connections for a 240V Wiring

6. Torque terminals to 2.3 N•m (20 in-lb).
7. Close the motor electrical box. Torque the screws to 2.3 N•m (20 in-lb).

## Wire Connections at the Explosionproof Motor

Install the wiring at the motor as follows:

1. Open the motor's electrical box.
2. Install wiring system with proper connections to the motor electrical box.
3. Connect the green ground wire to the ground screw.
4. **For 460V Wiring:** Connect wire L1 to T1, L2 to T2, and L3 to T3, and bridge the other wires, as shown.

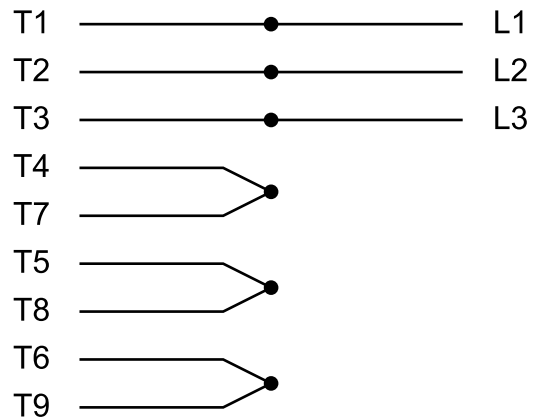


Figure 6 Connections for 460V Wiring

5. **For 230V Wiring:** Bridge the wires as shown. Then, connect L1 to T1/T7, L2 to T2/T8, and L3 to T3/T9.

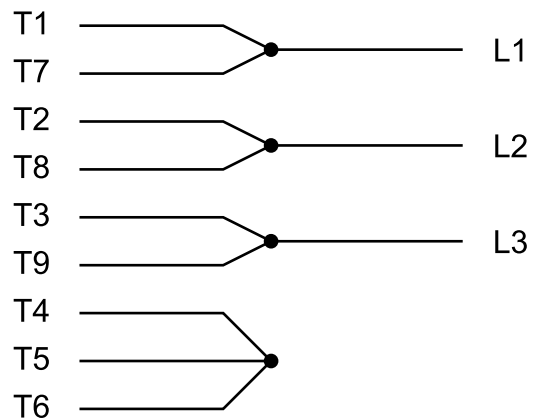


Figure 7 Connections for 230V Wiring

6. **Option:** Connect thermostat wires P1 and P2 to external overload detection. Thermostat is NC (normally closed).
7. Close the motor electrical box. Torque the screws to 2.3 N•m (20 in-lb).



# Compressor Wiring

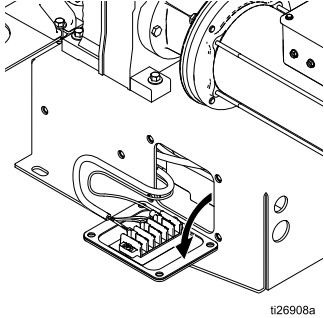
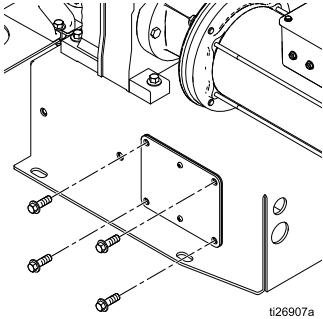
<p>To avoid injury from fire, explosion, or electric shock, all electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</p>			

Follow these instructions to wire Verder Compressor 859.0502 (120V) or 859.0501 (240V).

See [Wiring Tips, page 18](#), for additional information on wire routing.

**NOTE:** Use only copper wire with an insulation rating of 75°C or higher.

1. Remove the cover from the compressor's electrical box.

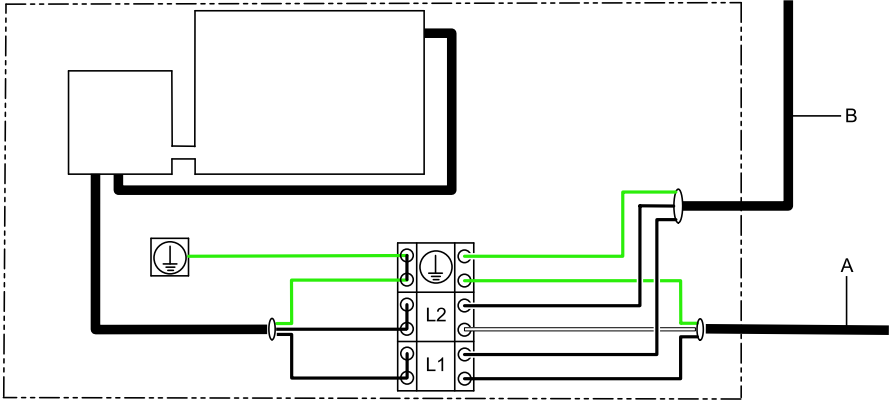


2. Install wiring system with proper connections (i.e. conduit/fittings, power cable/cable grip) to the compressor electrical box.
3. Connect line power (120VAC or 240 VAC, depending on your compressor) to L1 and L2/N.

Connect supply ground to . Wire according to local code. Torque terminals to 1.2 N•m (10 in-lb).

4. When powering the VFD on the same circuit as the compressor, connect branch wiring to L1, L2/N and Ground, then connect to the VFD.
5. Reinstall the cover of the electrical box. Torque screws to 6.8 N•m (60 in-lb).

Figure 8



**KEY**

- A To power supply
- B To controller

## **Wiring Tips**

- Use a grounded or shielded metal conduit for power cabling.
- Use the shortest possible cables or wires for incoming power.
- Use the shortest possible cables or wires between the controller and the motor.
- Route low-voltage cables away from high-power cables or wires or other known electromagnetic interference EMI sources. If cables must cross, cross at a 90° angle.

# Operation

## Tighten Fasteners

Before mounting and using the pump for the first time, check and retorque all external fasteners. Follow [Torque Instructions, page 22](#), or see the torque tag on your pump. After the first day of operation, retorque the fasteners.

## Initial Configuration (AC with VFD)

Configure the VFD according to the motor nameplate information.

## Flush the Pump Before First Use

The pump was tested in water. If water could contaminate the fluid you are pumping, flush the pump thoroughly with a compatible solvent. See [Flushing and Storage, page 21](#).

## Transfer Mode Vs. Low Pulsation Mode

When the air pressure is at least 0.7 bar higher than the desired outlet pressure, the pump is in Transfer Mode and no pulsation damping is occurring. To reduce outlet pulsation, start by setting the air pressure *equal* to the desired outlet fluid pressure. Continue to adjust the air pressure relative to the outlet fluid pressure. Lower relative air pressures produce more pulsation damping. Higher relative air pressures produce better pump efficiency.

**NOTE:** Low pulsation mode may invalidate the system k-factor. See the Low Pulsation chart in [Performance Charts, page 23](#).

## Start and Adjust the Pump

1. Be sure the fluid system is properly grounded. See [Grounding, page 12](#).
2. Check fittings to be sure they are tight. Use a compatible liquid thread sealant on male threads. Tighten fluid inlet and fluid outlet fittings securely.
3. Place the fluid supply hose in fluid to be pumped.

**NOTE:** If fluid inlet pressure to the pump is more than 25% of outlet working pressure, the ball check valves will not close fast enough, resulting in inefficient pump operation.

### NOTICE

Excessive fluid inlet pressure can reduce diaphragm life.

4. Place the end of the fluid hose into an appropriate container.
5. Close the fluid drain valve.
6. Turn the air regulator knob to match the desired fluid stall pressure. Open all bleed-type master air valves.
7. If the fluid hose has a dispensing device, hold it open. Be sure all fluid shutoff valves are open.
8. Set the desired frequency on the VFD.
9. Press the start (run) button on the VFD.
10. If you are flushing, run the pump long enough to thoroughly clean the pump and hoses.

## Pressure Relief Procedure



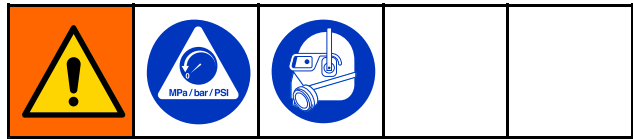
Follow the Pressure Relief Procedure whenever you see this symbol.



This equipment stays pressurized until pressure is relieved manually. To help prevent serious injury from pressurized fluid, such as splashing in the eyes or on skin, follow the Pressure Relief Procedure when you stop pumping and before you clean, check, or service the equipment.





1. Remove power from the system.
2. Open the dispensing valve, if used.
3. Open the fluid drain valve (L) to relieve fluid pressure. Have a container ready to catch the drainage.
4. Close the pump air valve.
5. **Units with a compressor:** Cycle the valve to bleed any remaining air.

## Pump Shutdown



At the end of the work shift and before you check, adjust, clean, or repair the system, follow the [Pressure Relief Procedure, page 20](#).

## Maintenance

				
<p>To avoid injury from fire, explosion, or electric shock, all electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.</p>				

### Maintenance Schedule

Establish a preventive maintenance schedule based on the pump's service history. Scheduled maintenance is especially important to prevent spills or leakage due to diaphragm failure.

### Tighten Threaded Connections

Before each use, check all hoses for wear or damage and replace as necessary. Check to be sure all threaded connections are tight and leak-free. Check mounting bolts. Check fasteners. Tighten or retorque as necessary. Although pump use varies, a general guideline is to retorque fasteners every two months. See [Torque Instructions, page 22](#).

## Flushing and Storage

				
<p>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.</p>				

- Flush before first use.
- Flush before fluid can dry in the equipment, at the end of the day, before storing, and before repairing equipment.
- Flush at the lowest pressure possible. Check connectors for leaks and tighten as necessary.
- Flush with a fluid that is compatible with the fluid being dispensed and the equipment wetted parts.
- Always flush the pump and relieve the pressure before storing it for any length of time.

### **NOTICE**

Flush the pump often enough to prevent the fluid you are pumping from drying or freezing in the pump and damaging it. Store the pump at 0°C (32°F) or higher. Exposure to extreme low temperatures may result in damage to plastic parts.

# Torque Instructions

If fluid cover or manifold fasteners have been loosened, it is important to torque them using the following procedure to improve sealing.

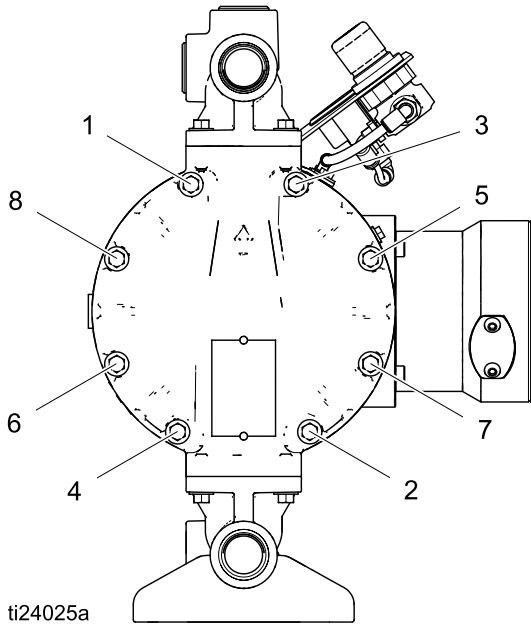
**NOTE:** Fluid cover and manifold fasteners have a thread-locking adhesive patch applied to the threads. If this patch is excessively worn, the fasteners may loosen during operation. Replace screws with new ones or apply medium-strength (blue) Loctite or equivalent to the threads.

**NOTE:** Always completely torque fluid covers before torquing manifolds.

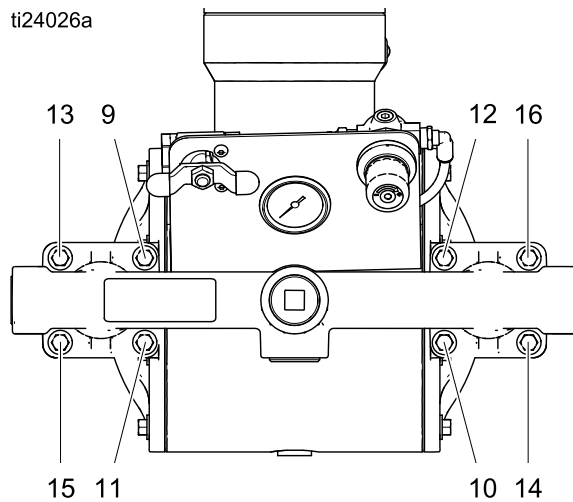
1. Start all fluid cover screws a few turns. Then, turn down each screw just until head contacts cover.
2. Turn each screw by 1/2 turn or less working in a crisscross pattern in the order shown to specified torque.
3. Repeat for manifolds.

**Fluid cover and manifold fasteners:** 10.2 N·m (90 in-lb)

## Fluid Cover Screws



## Inlet and Outlet Manifold Screws



# Performance Charts

**Test Conditions:** The pump was tested in water with the inlet submerged. The air pressure was set 0.7 bar (10 psi) higher than the outlet pressure.

**How to Use the Charts**

1. Choose a flow rate and outlet pressure that falls below the Power Limit Curve. Conditions outside of the curve will decrease the life of the pump.

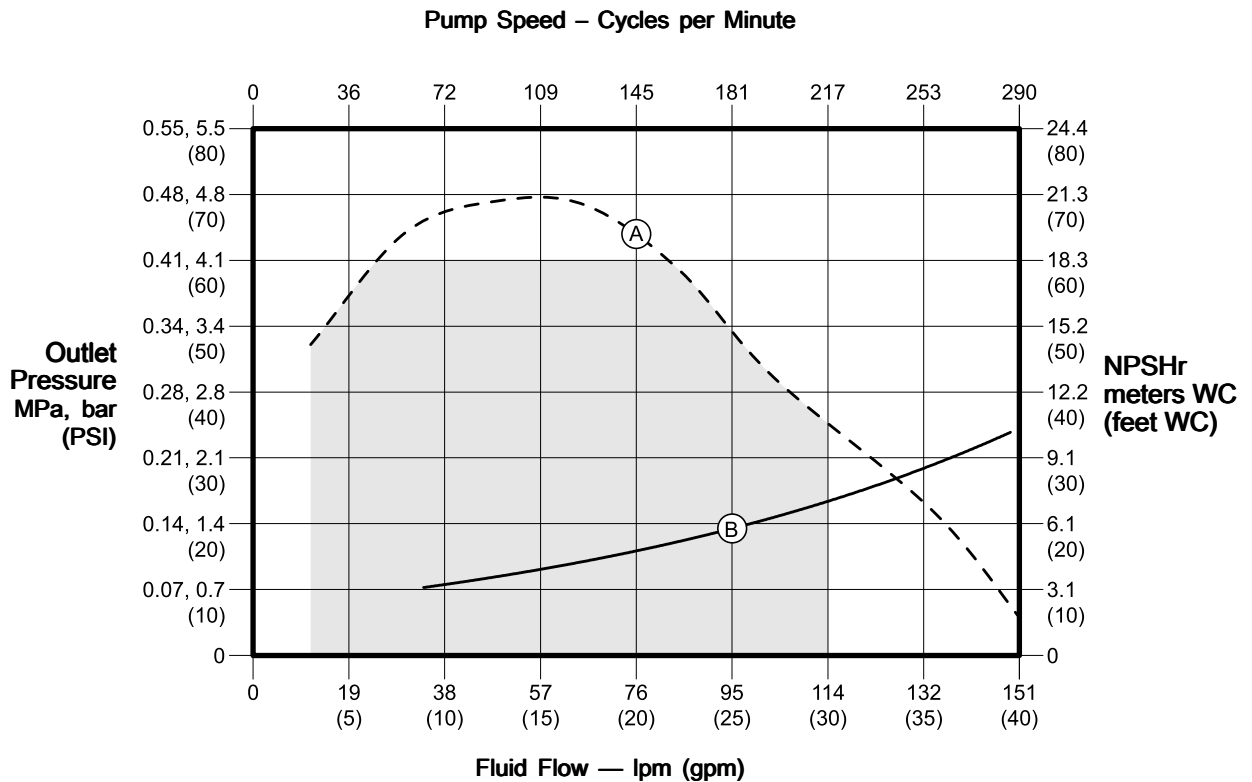
2. Set the VFD frequency corresponding to the desired flow rate. Flow rates will increase with outlet pressure lower than 0.7 bar (10 psi) and with high inlet head pressure.
3. To prevent inlet cavitation erosion, the *Net Positive Suction Head Available (NPSHa)* of your system should be above the *Net Positive Suction Head Required (NPSHr)* line shown on the chart.

## 4-Pole AC Pump with 1.5 kW VFD (BC, B1, B2)

**KEY**

- A** Power Limit Curve
- B** Net Positive Suction Head Required

The shaded area is recommended for continuous duty.



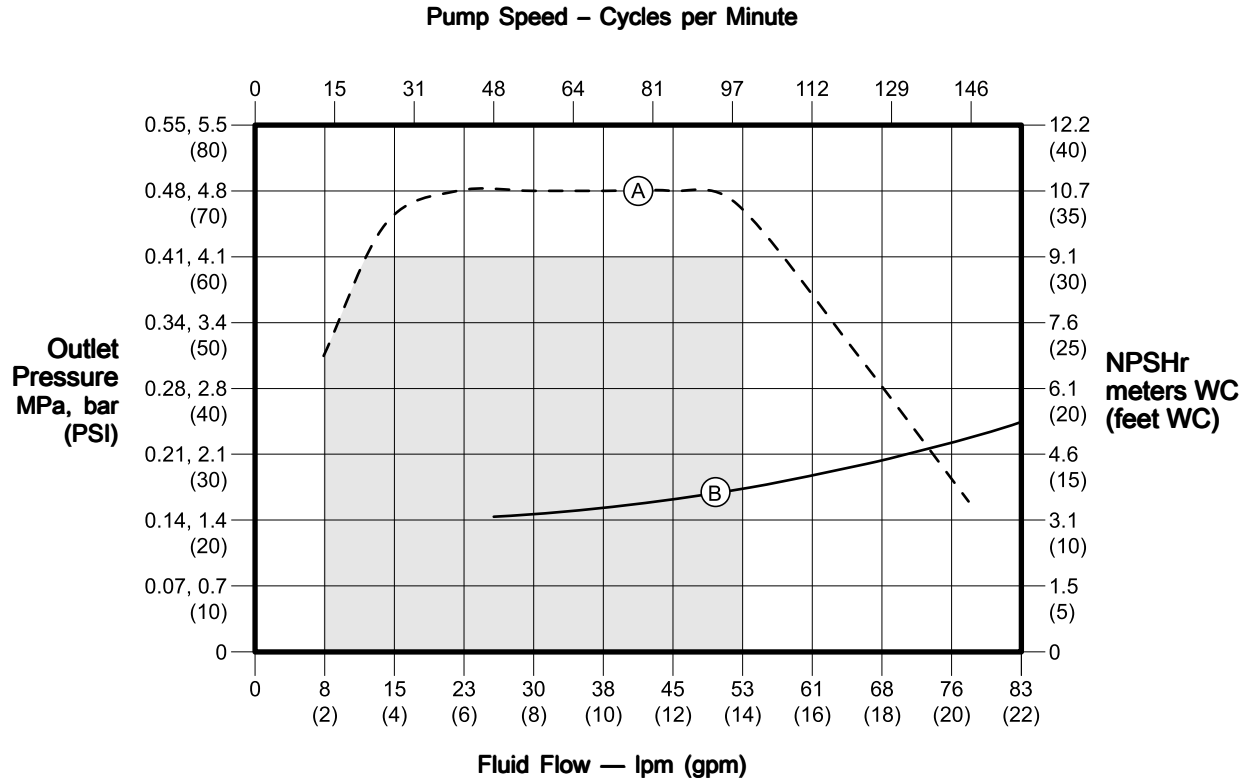
### 4-Pole AC Pump with 1.5 kW VFD (BX, NG, IG)

**KEY**

**A** Power Limit Curve

**B** Net Positive Suction Head Required

The shaded area is recommended for continuous duty.





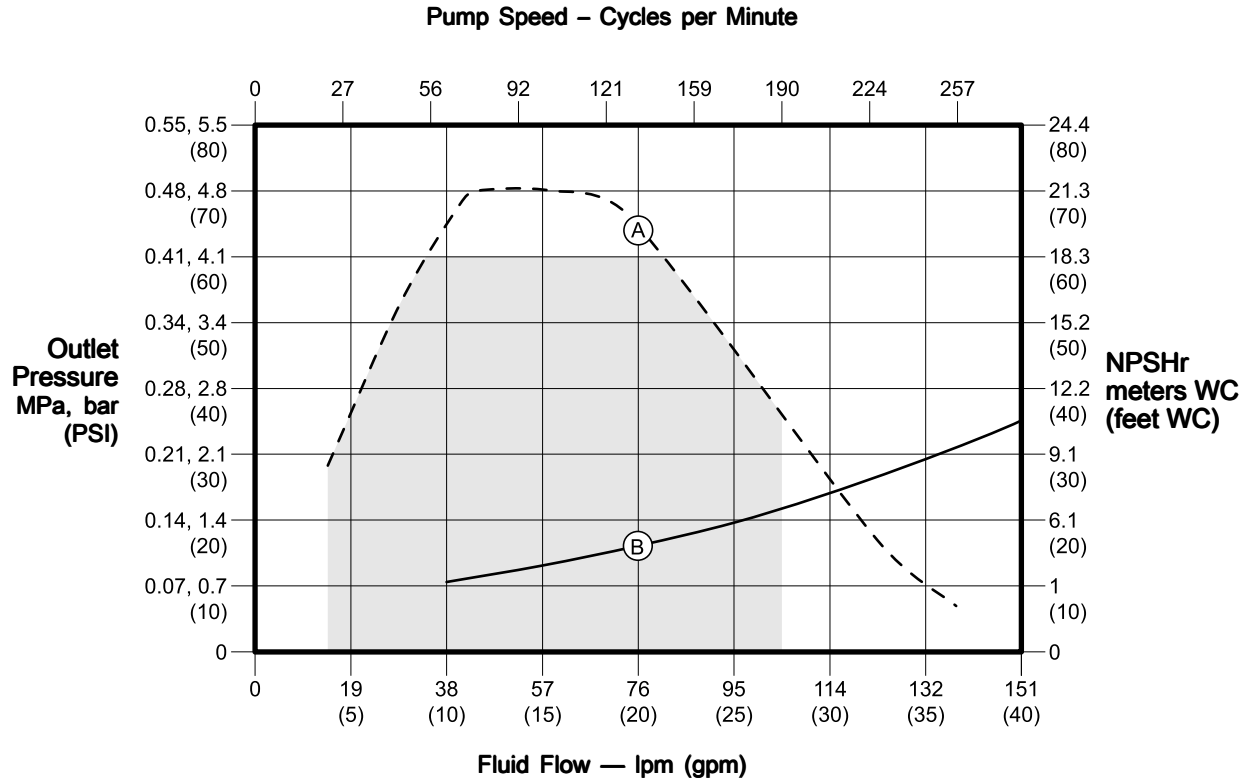
## 2-Pole AC Pump with 1.5 kW VFD (AC, AX, AF, NG, IG)

**KEY**

**A** Power Limit Curve

**B** Net Positive Suction Head Required

The shaded area is recommended for continuous duty.



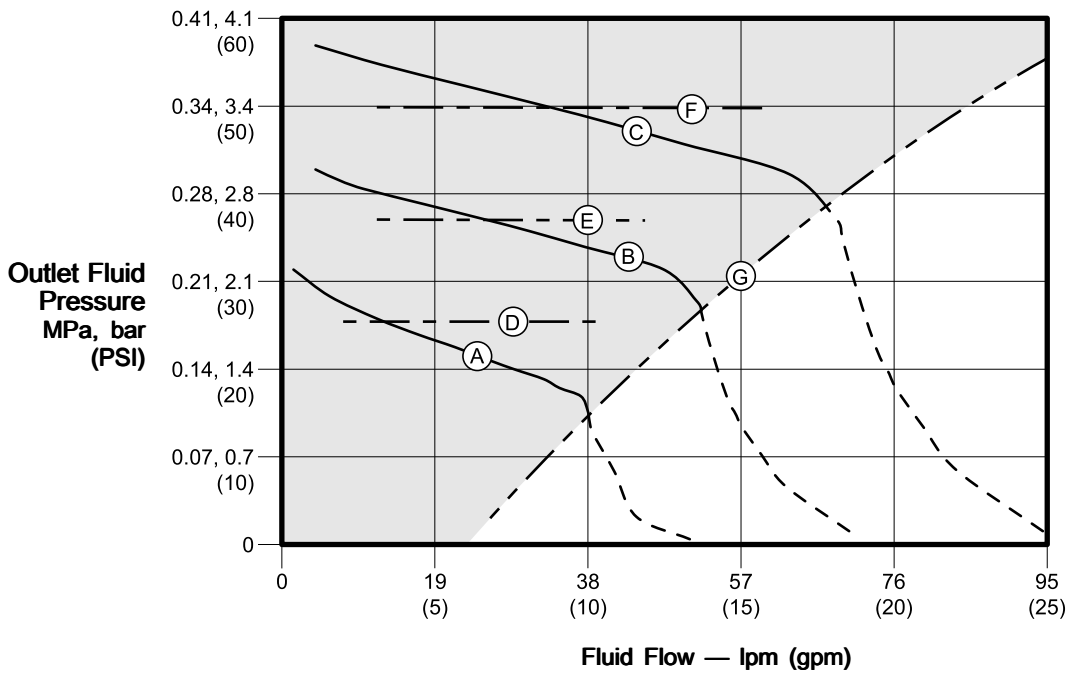
### Low-Pulsation Mode

Two typical running conditions are shown in the curves. The curves show the relationship between outlet pressure and outlet flow during Low Pulsation Mode (above the transition line) and Transfer Mode (below the transition line). Adjust the pump speed and air pressure to achieve the desired result.

**KEY**

- A** 80 cycles per minute
- B** 115 cycles per minute
- C** 150 cycles per minute
- D** 1.7 bar (25 psi) air pressure
- E** 2.5 bar (37 psi) air pressure
- F** 3.5 bar (50 psi) air pressure
- G** Transition line (Low Pulsation Mode is shaded.)

### Frequency



## How to Calculate Your System's Net Positive Suction Head – Available (NPSHa)

For a given flow rate, there must be a minimum fluid head pressure supplied to the pump to prevent cavitation. This minimum head is shown on the Performance Curve, labeled as NPSHr. The units are meters WC (Water Column) absolute. The NPSHa

of your system must be greater than the NPSHr to prevent cavitation and therefore increase efficiency and the life of your pump. To calculate the NPSHa of your system, use the following equation:

$$\text{NPSHa} = H_a \pm H_z - H_f - H_{vp}$$

### Where:

**H<sub>a</sub>** is the absolute pressure on the surface of the liquid in the supply tank. Typically, this is atmospheric pressure for a vented supply tank, e.g. 10.4 meters at sea level.

**H<sub>z</sub>** is the vertical distance in meters between the surface of the liquid in the supply tank and the centerline of the pump inlet. Value should be positive if the level is higher than the pump and negative if the level is lower than the pump. Always be sure to use the lowest level the liquid can reach in the tank.

**H<sub>f</sub>** is the total of the friction losses in the suction piping.

**H<sub>vp</sub>** is the absolute vapor pressure of the liquid at the pumping temperature.

Dimensions (typical only)

# Dimensions (typical only)

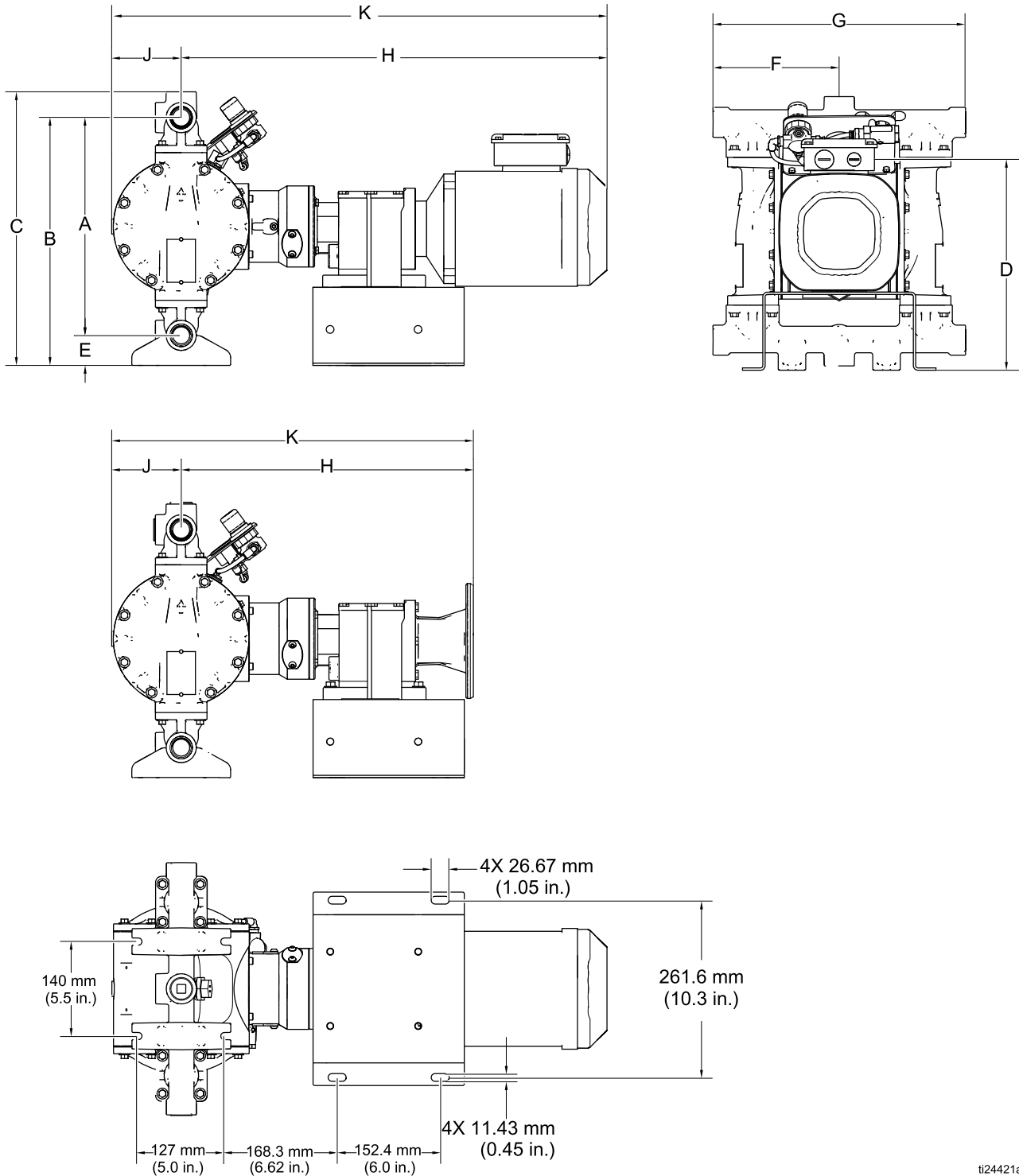


Figure 9 Pumps with Aluminum Fluid Sections, without Compressor

ti24421a

Dimensions (typical only)

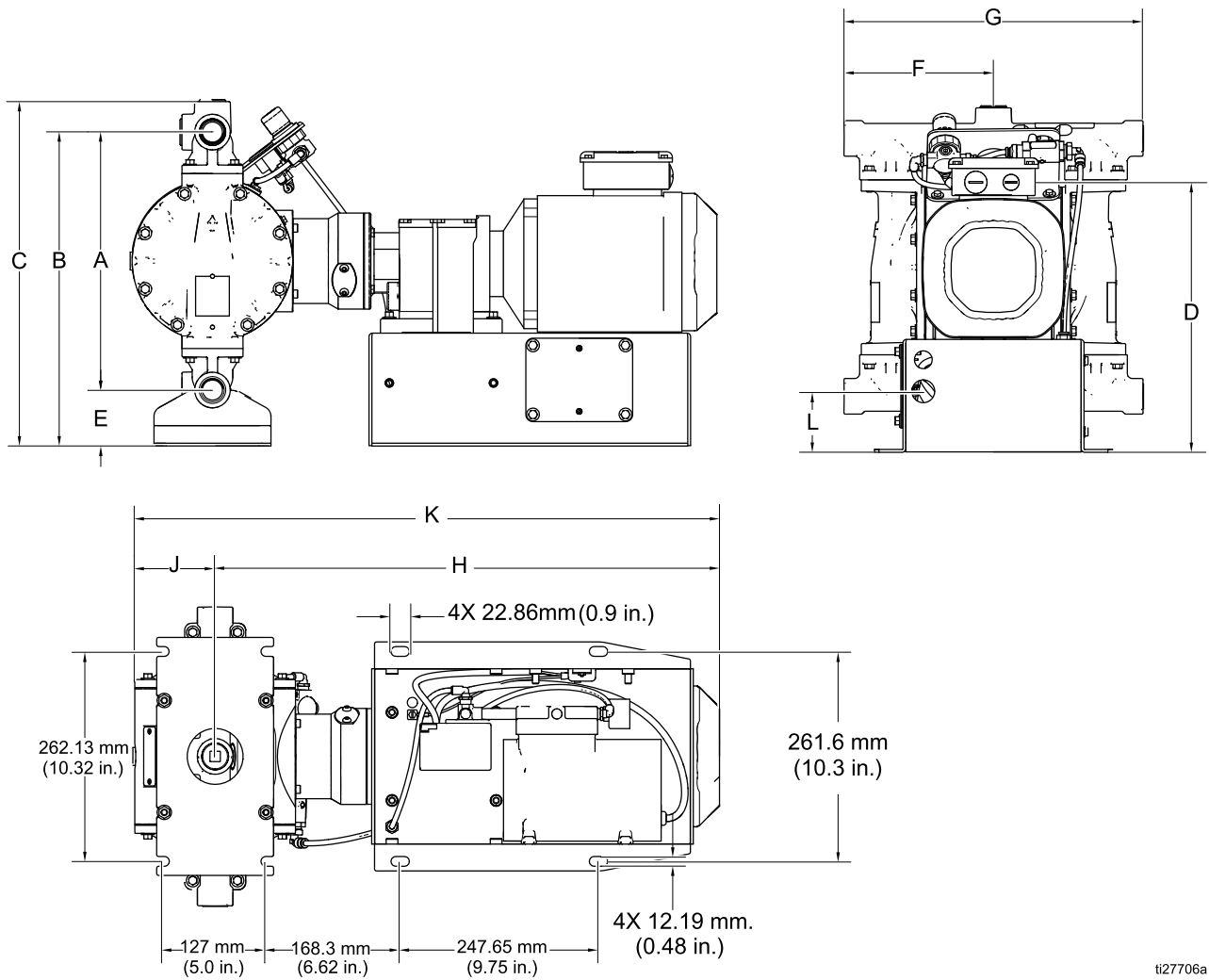


Figure 10 Pumps with Aluminum Fluid Sections, with Compressor

ti27706a

Dimensions (typical only)

Table 1 Dimensions for Pumps with Aluminum Fluid Sections

Ref.	Gearbox Only (NG and IG)		Gearbox and Motor (BC, AX, and AF)		Gearbox, Motor, and Compressor (B1 and B2)	
	in	cm	in	cm	in	cm
A	12.7	32.2	12.7	32.2	12.7	32.2
B	14.4	36.7	14.4	36.7	15.4	39.1
C	15.9	40.5	15.9	40.5	16.9	42.9
D			BC 12.3	BC 31.1	13.1	33.4
			AX 11.6	AX 29.4		
			AF 12.4	AF 31.5		
E	1.8	4.5	1.8	4.5	2.8	7.1
F	7.3	18.6	7.3	18.6	7.3	18.6
G	14.7	37.3	14.7	37.3	14.7	37.3
H	NG 17.0	NG 43.2	BC 24.8	BC 63.0	24.8	63.0
	IG 17.0	IG 43.2	AX 30.4	AX 77.1		
			AF 29.9	AF 75.9		
J	3.9	10.0	3.9	10.0	3.9	10.0
K	NG 21.0	NG 53.5	BC 28.8	BC 73.2	28.8	73.2
	IG 21.0	IG 53.5	AX 34.4	AX 87.4		
			AF 33.9	AF 86.1		
L	3.0	7.6	3.0	7.6	3.0	7.6

Dimensions (typical only)

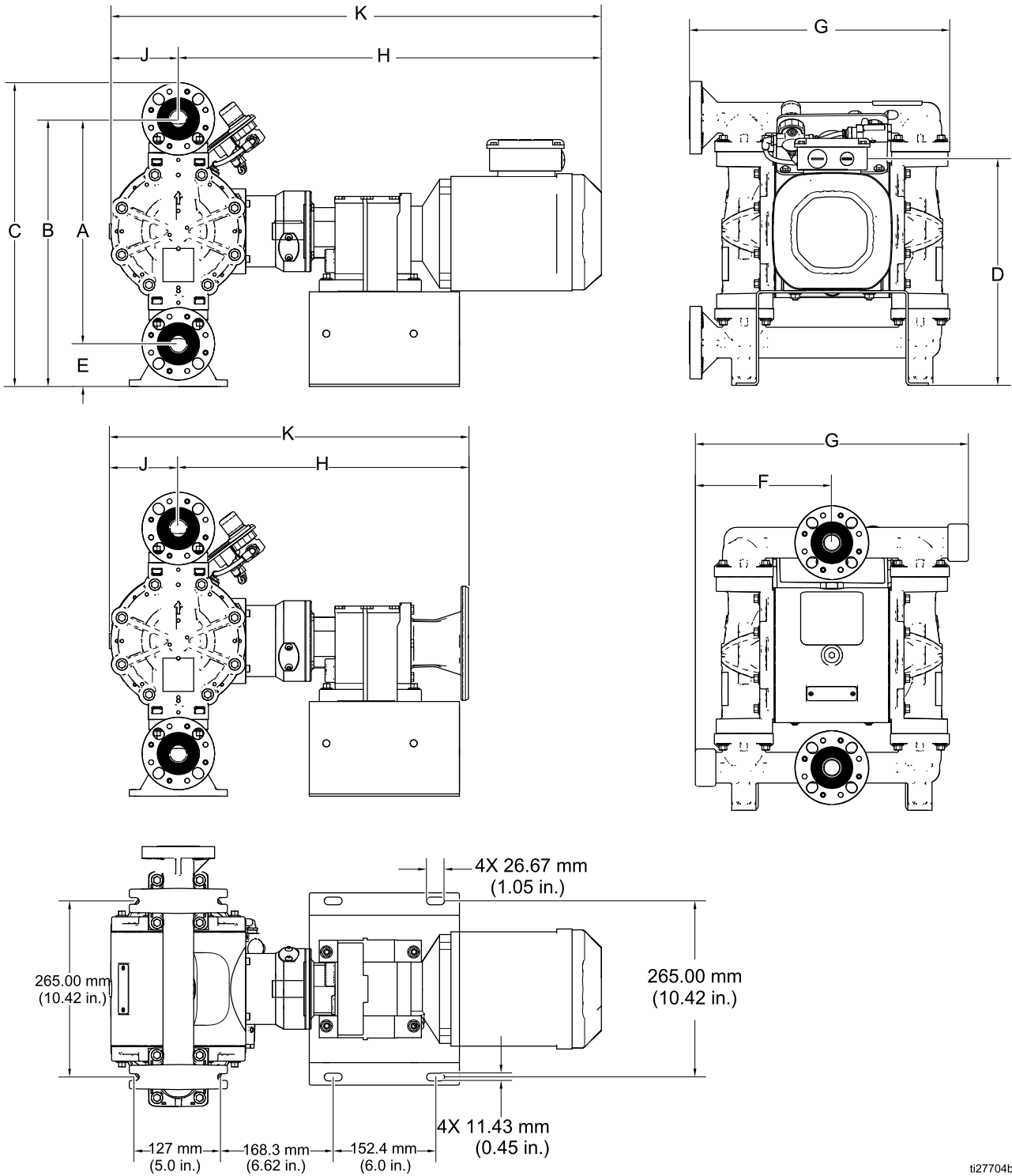
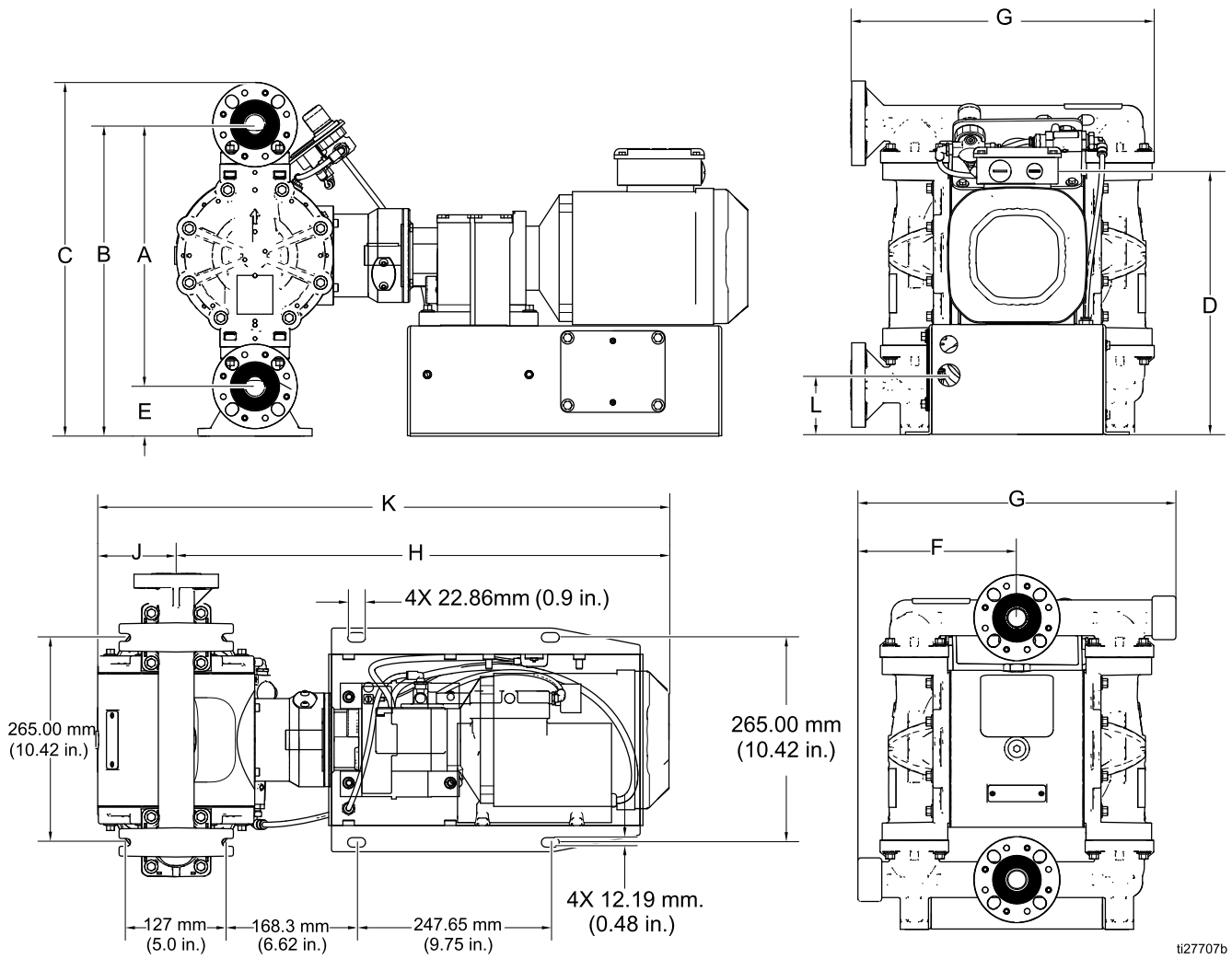


Figure 11 Pumps with Polypropylene Fluid Sections, without Compressor

ti27704b

Dimensions (typical only)



t27707b

Figure 12 Pumps with Polypropylene with Compressor



Table 2 Dimensions for Pumps with Polypropylene Fluid Sections

Ref.	Gearbox Only (NG and IG)		Gearbox and Motor (BC, AX, and AF)		Gearbox, Motor, and Compressor (B1 and B2)	
	in	cm	in	cm	in	cm
A	12.1	30.8	12.1	30.8	12.1	30.8
B	15.1	38.4	15.1	38.4	15.1	38.4
C	17.8	45.2	17.8	45.2	17.8	45.2
D			BC 13.3	BC 33.7	13.3	33.7
			AX 14.1	AX 35.7		
			AF 12.4	AF 31.5		
E	1.9	4.9	1.9	4.9	1.9	4.9
F, Center Flange	8.3	21.1	8.3	21.1	8.3	21.1
F, End Flange						
G, Center Flange	16.7	42.4	16.7	42.4	16.7	42.4
G, End Flange	15.1	38.4	15.1	38.4	15.1	38.4
H	NG 17.0	NG 43.2	BC 24.8	BC 63.0	24.8	63.0
	IG 17.0	IG 43.2	AX 30.4	AX 77.1		
			AF 29.9	AF 75.9		
J	3.9	10.0	3.9	10.0	3.9	10.0
K	NG 21.0	NG 53.5	BC 28.8	BC 73.2	28.8	73.2
	IG 21.0	IG 53.5	AX 34.4	AX 87.4		
			AF 33.9	AF 86.1		
L	3.0	7.6	3.0	7.6	3.0	7.6

Dimensions (typical only)

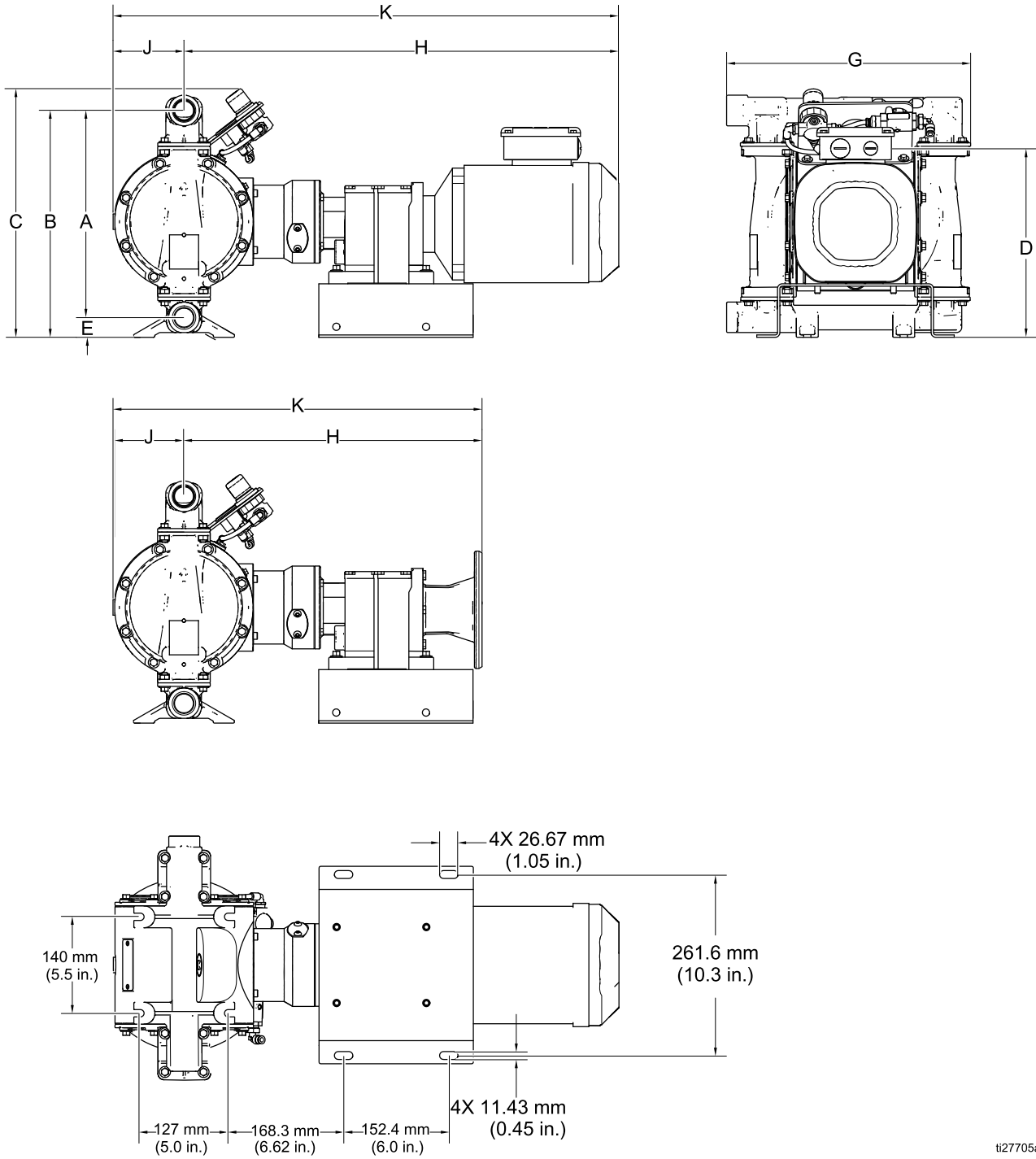


Figure 13 Pumps with Stainless Steel Fluid Sections, without Compressor

ti27705a

Dimensions (typical only)

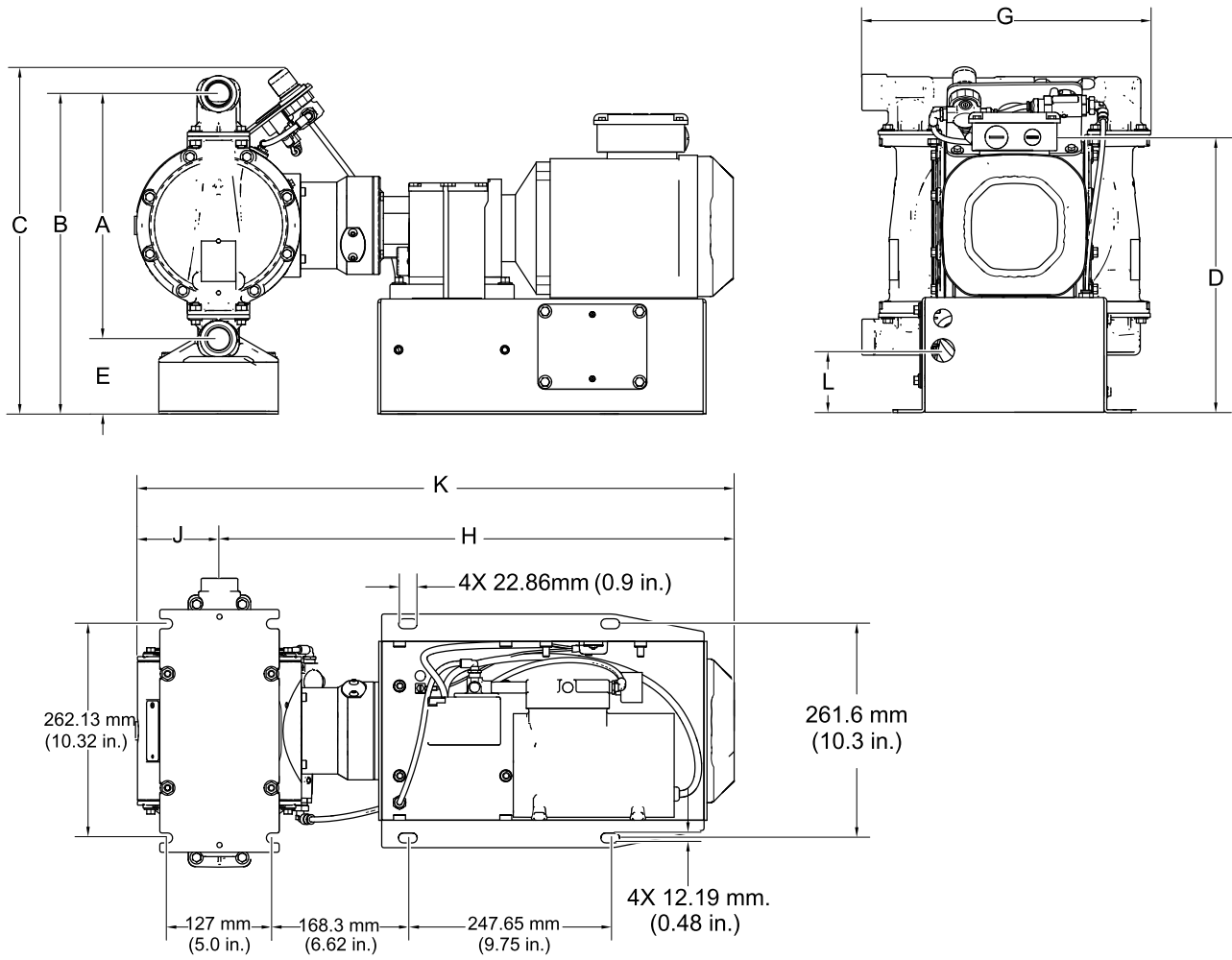


Figure 14 Pumps with Stainless Steel Fluid Sections,  
with Compressor

Dimensions (typical only)

Table 3 Dimensions for Pumps with Stainless Steel Fluid Sections

Ref.	Gearbox Only (NG and IG)		Gearbox and Motor (BC, AX, and AF)		Gearbox, Motor, and Compressor (B1 and B2)	
	in	cm	in	cm	in	cm
A	11.8	30.0	11.8	30.0	11.8	30.0
B	12.9	32.8	12.9	32.8	15.4	39.1
C	13.7	34.8	13.7	34.8	16.5	41.9
D			BC 9.9	BC 25.0	10.6	27.0
			AX 11.6	AX 29.4		
			AF 12.4	AF 31.5		
E	1.1	2.8	1.1	2.8	3.6	9.1
F						
G	13.6	34.5	13.6	34.5	13.6	34.5
H	NG 17.0	NG 43.2	BC 24.8	BC 63.0	24.8	63.0
	IG 17.0	IG 43.2	AX 30.4	AX 77.1		
			AF 29.9	AF 75.9		
J	3.9	10.0	3.9	10.0	3.9	10.0
K	NG 21.0	NG 53.5	BC 28.8;	BC 73.2	28.8	73.2
	IG 21.0	IG 53.5	AX 34.4	AX 87.4		
			AF 33.9	AF 86.1		
L	3.0	7.6	3.0	7.6	3.0	7.6

# Technical Data

	US	Metric
<b>VERDERAIR VA-E25 Electric Double Diaphragm Pump</b>		
Maximum fluid working pressure	70 psi	0.48 MPa, 4.8 bar
Maximum incoming air pressure	150 psi	1.03 MPa, 10.3 bar
Center section air charge range	20 to 80 psi	0.14–0.55 MPa, 1.4–5.5 bar
Maximum air consumption	<0.2 scfh	<0.006 cubic meters/hour
Air inlet size	3/8 in. npt(f)	
Maximum suction lift (reduced if balls don't seat well due to damaged balls or seats, lightweight balls, or extreme speed of cycling)	Wet: 29 ft Dry: 16 ft	Wet: 8.8 m Dry: 4.9 m
Maximum size pumpable solids	1/8 in.	3.2 mm
Ambient air temperature range for operation and storage. <b>NOTE:</b> Exposure to extreme low temperatures may result in damage to plastic parts.	32° F–104° F	0° C–40° C
Fluid displacement per cycle	0.14 gallons	0.53 liters
Maximum free-flow delivery	39 gpm	148 lpm
Maximum pump speed	280 cpm	
<b>Fluid Inlet and Outlet Size</b>		
Aluminum or Stainless Steel	1 in npt(f) or 1 in bspt	
Polypropylene	1 in. ANSI/DIN Raised Face Flange	
<b>Electric Motor</b>		
AC, Standard CE (BC, B1, B2)		
Power	2 HP	1.5 kW
Speed	1800 rpm (60 Hz) or 1500 rpm (50 Hz)	
Gear Ratio	8.16	
Voltage	3-phase 230V / 3-Phase 460V	
AC, ATEX (AX)		
Power	2 HP	1.5 kW
Speed	3420 rpm (60 Hz) or 2850 rpm (50 Hz)	
Gear Ratio	18.08	
Voltage	3-phase 240V / 3-Phase 415V	

Technical Data

	US	Metric
AC, Explosionproof (AF)		
Power	2 Hp	1.5 kW
Speed	3450 rpm (60 Hz) or 2875 rpm (50 Hz)	
Gear Ratio	18.08	
Voltage	3-phase 230V / 3-Phase 460V	
<b>Noise Data</b>		
Sound Power (measured per ISO-9614-2)		
at 70 psi fluid pressure and 50 cpm	71 dBa	
at 30 psi fluid pressure and 280 cpm (full flow)	94 dBa	
Sound Pressure [tested 3.28 ft (1 m) from equipment]		
at 70 psi fluid pressure and 50 cpm	61 dBa	
at 30 psi fluid pressure and 280 cpm (full flow)	84 dBa	
<b>Wetted Parts</b>		
Wetted parts include material(s) chosen for seat, ball, and diaphragm options, <b>plus the fluid section's material of construction: Aluminum, Polypropylene, or Stainless Steel</b>		
Non-wetted parts		
Aluminum	aluminum, coated carbon steel, bronze	
Polypropylene	stainless steel, polypropylene, coated carbon steel, bronze	
Stainless Steel	stainless steel, aluminum, coated carbon steel, bronze	

**Weights (typical only)**

Pump Material		Motor/Gearbox									
Fluid Section	Center Section	AC Induction (BC)		ATEX (AX)		Flameproof (AF)		NEMA (NG)		IEC (IG)	
		lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
Aluminum	Aluminum	106	48.1	144	65.3	109.5	49.7	69.5	31.5	74	33.6
Polypropylene	Aluminum	103.5	46.9	141.5	64.2	106.5	48.3	67	30.4	71.5	32.4
Polypropylene	Stainless Steel	135	61.2	173	78.5	138.5	62.8	98.5	44.7	103	46.7
Stainless Steel	Aluminum	121.5	55.1	159.5	72.3	125	55.5	85	38.6	89.5	40.6
Stainless Steel	Stainless Steel	153	69.4	191	86.6	156.5	71.0	116.5	52.8	121	54.9

Component	U.S.	Metric
Compressor	28 lb	13 kg

## Fluid Temperature Range

**NOTICE**

Temperature limits are based on mechanical stress only. Certain chemicals will further limit the fluid temperature range. Stay within the temperature range of the most-restricted wetted component. Operating at a fluid temperature that is too high or too low for the components of your pump may cause equipment damage.

Diaphragm/Ball/Seat Material	Fluid Temperature Range			
	Aluminum or Stainless Steel Pumps		Polypropylene Pumps	
	Fahrenheit	Celsius	Fahrenheit	Celsius
Acetal (AC)	10° to 180°F	-12° to 82°C	32° to 150°F	0° to 66°C
Buna-N (BN)	10° to 180°F	-12° to 82°C	32° to 150°F	0° to 66°C
FKM Fluoroelastomer (VT)*	-40° to 275°F	-40° to 135°C	32° to 150°F	0° to 66°C
Geolast® (GE)	-40° to 150°F	-40° to 66°C	32° to 150°F	0° to 66°C
Polychloroprene overmolded diaphragm (NO) or Polychloroprene check balls (NE or NW)	0° to 180°F	-18° to 82°C	32° to 150°F	0° to 66°C
Polypropylene (PP)	32° to 150°F	0° to 66°C	32° to 150°F	0° to 66°C
PTFE overmolded diaphragm (TO)	40° to 180°F	4° to 82°C	40° to 150°F	4° to 66°C
PTFE check balls or two-piece PTFE/EPDM diaphragm (TF)	40° to 220°F	4° to 104°C	40° to 150°F	4° to 66°C
Santoprene® check balls (SP)	-40° to 180°F	-40° to 82°C	32° to 150°F	0° to 66°C
TPE (HY)	-20° to 150°F	-29° to 66°C	32° to 150°F	0° to 66°C

\* The maximum temperature listed is based on the ATEX standard for T4 temperature classification. If you are operating in a non-explosive environment, FKM fluoroelastomer's maximum fluid temperature in aluminum or stainless steel pumps is 320°F (160°C).

# Notes

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# Customer Services/Guarantee

## CUSTOMER SERVICES

If you require spare parts, please contact your local distributor, providing the following details:

- Pump Model
- Type
- Serial Number, and
- Date of First Order.

## GUARANTEE

All VERDER pumps are warranted to the original user against defects in workmanship or materials under normal use (rental use excluded) for two years after purchase date. This warranty does not cover failure of parts or components due to normal wear, damage or failure which in the judgement of VERDER arises from misuse.

Parts determined by VERDER to be defective in material or workmanship will be repaired or replaced.

## LIMITATION OF LIABILITY

To the extent allowable under applicable law, VERDER's liability for consequential damages is expressly disclaimed. VERDER's liability in all events is limited and shall not exceed the purchase price.

## WARRANTY DISCLAIMER

VERDER has made an effort to illustrate and describe the products in the enclosed brochure accurately; however, such illustrations and descriptions are for the sole purpose of identification and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustration or descriptions.

## PRODUCT SUITABILITY

Many regions, states and localities have codes and regulations governing the sale, construction, installation and/or use of products for certain purposes, which may vary from those in neighboring areas. While VERDER attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchasing and using a product, please review the product application as well as the national and local codes and regulations, and be sure that product, installation, and use complies with them.

Original instructions. This manual contains English.

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