Operation

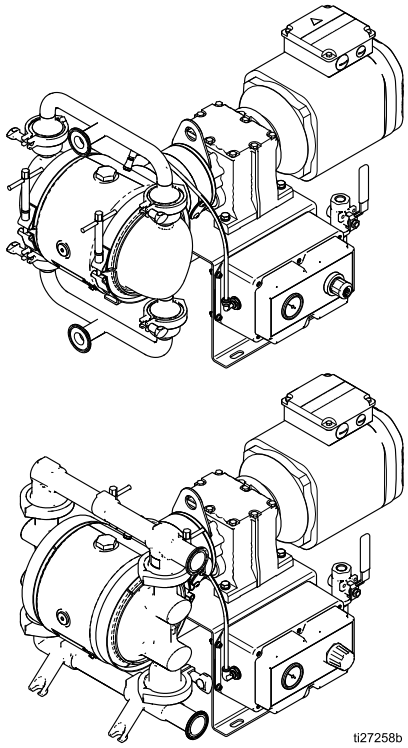
Verder VA-EH25 and VA-E2H25 Electric-Operated Diaphragm Pumps

859.0530
Rev.N
EN

For fluid transfer in indoor sanitary applications. Not approved for use in explosive atmospheres or hazardous (classified) locations. See approvals page for more information. For professional use only.

Important Safety Instructions
Read all warnings and instructions in this manual before using the equipment. **Save these instructions.**

For maximum operating pressures, see the Performance Charts on pages 23 and 24.
See pages 6 to 11 for model information, including approvals.



Contents

Related Manuals

Manual Number	Title
859.0531	Verder VA-EH25 and VA-E2H25 Electric-Operated Diaphragm Pumps, 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.

DANGER

SEVERE ELECTRIC SHOCK HAZARD

This equipment can be powered by more than 240 V. Contact with this voltage will cause death or serious injury.

- Turn off and disconnect power at main switch before disconnecting any cables and before servicing equipment.
- This equipment must be grounded. Connect only to grounded power source.
- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

WARNING

FIRE AND EXPLOSION HAZARD

Flammable fumes, such as solvent, in **work area** can ignite or explode. Solvent flowing through the equipment can cause static sparking. To help prevent fire and explosion:

- Use equipment only in well ventilated area.
- Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static sparking).
- Ground all equipment in the work area. See **Grounding** instructions.
- Keep work area free of debris, including solvent, rags and gasoline.
- Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.
- Use only grounded fluid lines.
- **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.

Static charge may build up on plastic parts during cleaning and could discharge and ignite flammable vapors. To help prevent fire and explosion:

- Clean plastic parts only in well ventilated area.
- Do not clean with a dry cloth.

⚠ WARNING

PRESSURIZED EQUIPMENT HAZARD

Fluid from the equipment, leaks, or ruptured components can splash in the eyes or on skin and cause serious injury.

- Follow the **Pressure Relief Procedure** when you stop spraying/dispensing and before cleaning, checking, or servicing equipment.
- Tighten all fluid connections before operating the equipment.
- Check lines, tubes, and couplings daily. Replace worn or damaged parts immediately.

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 Data** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Data** 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.
- 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 fluid lines and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend fluid lines or use fluid lines to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.

PRESSURIZED ALUMINUM PARTS HAZARD

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.

- Do not use 1,1,1-trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents.
- Do not use chlorine bleach.
- Many other fluids may contain chemicals that can react with aluminum. Contact your material supplier for compatibility.

⚠ WARNING

THERMAL EXPANSION HAZARD

Fluids subjected to heat in confined spaces, including lines, can create a rapid rise in pressure due to the thermal expansion. Over-pressurization can result in equipment rupture and serious injury.

- Open a valve to relieve the fluid expansion during heating.
- Replace lines proactively at regular intervals based on your operating conditions.

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.

- 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.

BURN HAZARD

Equipment surfaces and fluid that's heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.

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. This 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.

Configuration Number Matrix for VA-EH25 Food Grade Pumps

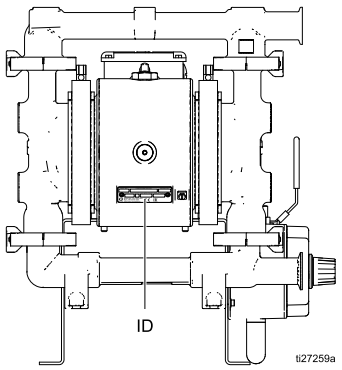
Check the identification plate (ID) for the Configuration Number of your pump. Use the following matrix to define the components of your pump.

When you receive your pump, record the 8 character part number found on the shipping box (e.g., 811.0018):

_____

Also record the configuration number on the pump ID plate to assist you when ordering replacement parts:

_____



Sample Configuration Number: VA-EH25SA-SENWSPT4ACFD21

VA-EH	25	S	A	SE	NW	SP	T4	AC	FD	21
Pump Model	Pump Size	Wetted Parts	Center Section	Seats	Balls	Diaphragms	Connections	Drive	Options	Certifications

NOTE: Some combinations are not possible. Please check with your local supplier.

Pump	Pump Size		Wetted Parts		Center Section Material		Seat Material		Ball Material	
VA-EH	25	25 mm	S	Sanitary Stainless Steel	A	Aluminum	SE	Sanitary Stainless Steel with EPDM o-rings	NW	Poly-chloro-prene Weighted
					S	Sanitary Stainless Steel	ST	Sanitary Stainless Steel with PTFE o-rings	SP	Santo-prene
									TF	PTFE

Continued on the next page

Diaphragm Material		Connections		Drive		Options		Certification	
TO	PTFE/EPDM Overmolded	**D4**	40 mm DIN 11851	**AC**	Standard AC Induction, high speed gear ratio	**FD**	Food Grade	**21**	EN 10204 type 2.1
TF	2-Piece PTFE/EPDM	**T4**	1.5 in. Tri-Clamp	**A1**	Standard AC Induction, high speed gear ratio, 120V air compressor			**31**	EN 10204 type 3.1
SP	Santoprene			**A2**	Standard AC Induction, high speed gear ratio, 240V air compressor				
				AX◆	ATEX AC Induction, high speed gear ratio				
				AF	Flameproof AC Induction, high speed gear ratio				
				BC	Standard AC Induction, low speed gear ratio				
				B1	Standard AC Induction, low speed gear ratio, 120V air compressor				
				B2	Standard AC Induction, low speed gear ratio, 240V air compressor				
				BX◆	ATEX AC Induction, low speed gear ratio				
				NG‡	None — NEMA 56 C Gearbox only				
				IG‡	None — IEC 90 B5 Flange Gearbox only				

Configuration Number Matrix for VA-E2H25 High Sanitary Pumps

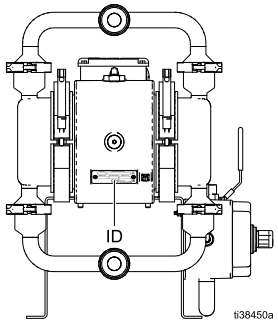
Check the identification plate (ID) for the Configuration Number of your pump. Use the following matrix to define the components of your pump.

When you receive your pump, record the 8 character part number found on the shipping box (e.g., 811.0018):

_____

Also record the configuration number on the pump ID plate to assist you when ordering replacement parts:

_____



Sample Configuration Number: VA-E2H25XS-STTFTST2AXSB21

VA-E2H	25	X	S	ST	TF	TS	T2	AX	SB	21
Pump Model	Pump Size	Wetted Parts	Center Section	Seats	Balls	Diaphragms	Connections	Drive	Options	Certifications

NOTE: Some combinations are not possible. Please check with your local supplier.

Pump	Pump Size		Wetted Parts		Center Section Material		Seat Material		Ball Material	
VA-E2H	25	25 mm	X	High Sanitary, 3-A 0.8 µm	S	Sanitary Stainless Steel	SE	Sanitary Stainless Steel with EPDM gasket seals	NW	Poly-chloro-prene Weighted
			Y	Pharmaceutical 0.5 µm			ST	Sanitary Stainless Steel with TF-EP gasket seals	SP	Santo-prene
							SB	Sanitary Stainless Steel with Buna-N gasket seals	TF	PTFE
							SV	Sanitary Stainless Steel with FKM gasket seals	BN	Buna-N

Continued on the next page

Diaphragm Material		Connections		Drive		Options		Certification	
TO	PTFE/EPDM Overmolded	**D2**	25 mm DIN 11851	**AC**	Standard AC Induction, high speed gear ratio	**SB**	Sanitary ball	**21**	EN 10204 type 2.1
SP	Santoprene	**T2**	1 in. Tri-Clamp	**A1**	Standard AC Induction, high speed gear ratio, 120V air compressor			**31**	EN 10204 type 3.1
BN	Buna-N			**A2**	Standard AC Induction, high speed gear ratio, 240V air compressor				
TS	2-piece PTFE/Santo-prene			**AX**◆	ATEX AC Induction, high speed gear ratio				
				AF	Flameproof AC Induction, high speed gear ratio				
				BC	Standard AC Induction, low speed gear ratio				
				B1	Standard AC Induction, low speed gear ratio, 120V air compressor				
				B2	Standard AC Induction, low speed gear ratio, 240V air compressor				
				BX◆	ATEX AC Induction, low speed gear ratio				
				NG‡	None — NEMA 56 C Gearbox only				
				IG‡	None — IEC 90 B5 Flange Gearbox only				

Approvals

Approvals	
All models (except AF) are approved to:	CE
*Diaphragm materials coded TO , TF, or TS combined with ball materials coded TF comply with:	EC 1935/2004
‡ Pumps with code NG or IG are approved to:	II 2 G Ex h IIB T3 Gb
◆ Aluminum and stainless steel pumps with code AX and BX are approved to:	II 2 G Ex d h IIB T3 Gb
Diaphragm materials coded TS combined with ball materials coded TF comply with:	Class VI

* EC 1935/2004 compliant pumps may be subject to individual national provisions in addition to those specified in the EC regulation. It is the users responsibility to know and follow local laws.

Overview

The product line offers electric-powered diaphragm pumps in a wide range of models. This section shows the structure of available models.

Center Section	Motor Type (Drive)	Gearbox	Compressor	Approval Options
Aluminum or Stainless Steel	AC, BC	Yes – part of motor	No†	CE
	A1, B1	Yes – part of motor	Yes – 120 V	None
	A2, B2	Yes – part of motor	Yes – 220 V	CE
	IG, NG	NEMA	No†	ATEX & CE
		IEC		
	AX, BX	IEC	No†	ATEX & CE

† Compressor Kits 859.0465 (120V) and 859.0466 (220V) are available

Key Points:

- Pumps are available with an AC gearmotor or with just a gearbox (for applications where a motor is already 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.

Installation

General Information

A Typical Installation is shown in Figure 1. It is only a guide for selecting and installing system components. Contact your Verder distributor 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 located near the reference.

Pumps with aluminum center sections may exhibit fading or signs of corrosion depending on cleaning solutions used.

Mount the Pump

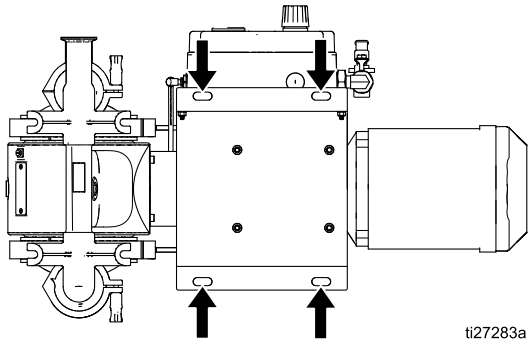
The pump may be very heavy (see Technical Data, page 30, for specific weights). If the pump must be moved, follow the Pressure Relief Procedure, page 21, and have two people lift the pump by grasping the outlet manifold securely, or use appropriate lifting equipment. Never have one person move or lift the pump.

1. Ensure that the mounting surface is level and can support the weight of the pump, lines, and accessories, as well as the stress caused during operation.
2. For all mountings, be sure the pump is secured with screws through the mounting bracket on the gear box. See Dimensions (typical only), page 26.

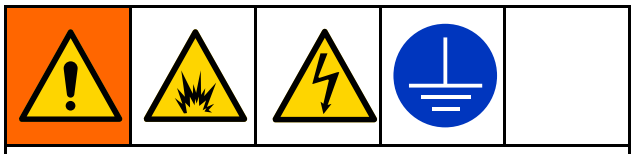
   NOTE: For ease of operation and service, mount the pump so the air valve cover, air inlet, and fluid inlet and outlet ports are easily accessible.

NOTICE

To prevent pump damage, use all four fasteners in all four mounting holes to attach the bracket to the mounting location. Do not use the feet on the inlet manifold for mounting.



Grounding

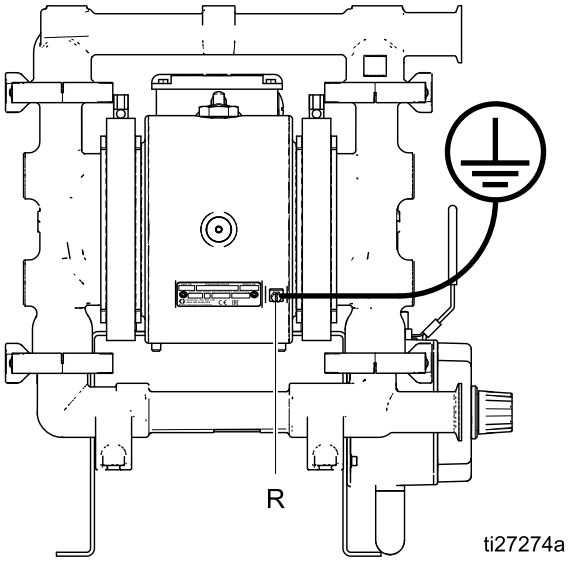


The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.

- **Always** ground the entire fluid system as described below.
- Follow your local codes and regulations.

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

- **Pump:** Loosen the grounding screw (R). Insert one end of a 12-gauge (2 mm^2) or thicker ground wire behind the grounding screw and tighten the screw securely. Connect the clamp end of the ground wire to a true earth ground. To order a ground wire and clamp, order part number 819.0673.



- **Motor:** AC motors have a ground screw in the electrical box. Use it to ground the motor to the controller.
- **Air and Fluid lines:** Use only conductive lines with a maximum of 150 m (500 ft) combined line length to ensure grounding continuity. Check electrical resistance of lines. If total resistance to ground exceeds 29 megohms, replace line immediately.
- **Fluid supply container:** Follow local codes and regulations.
- **Pails for solvents and sanitizing solution used when flushing:** Follow local codes and regulations. 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.

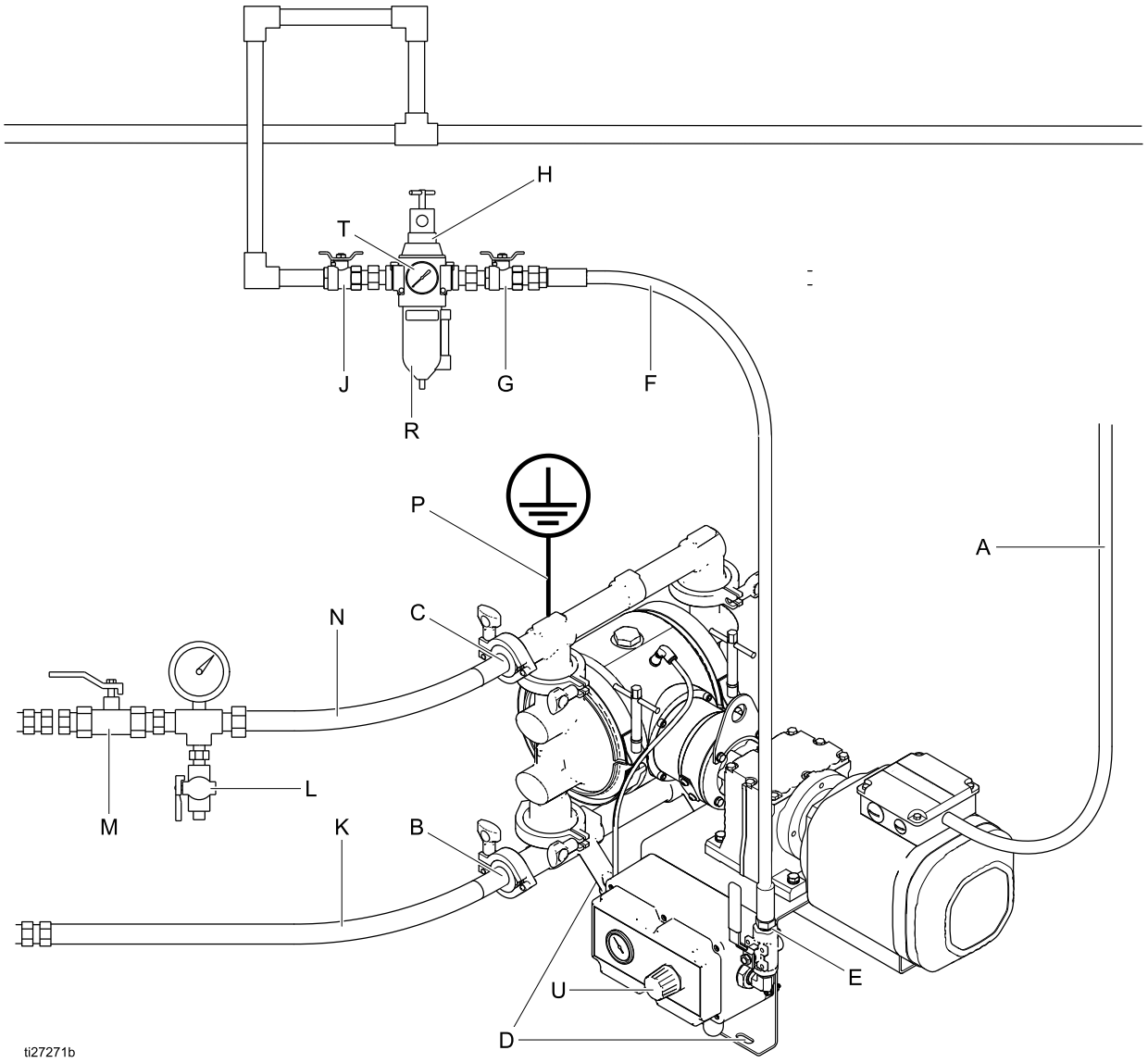


Figure 1 Typical Installation

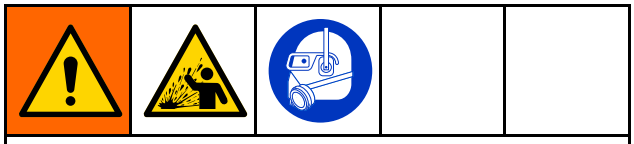
System Components

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

Accessories/Components Not Supplied

F Grounded, flexible air supply line
G Bleed-type master air valve
H Air regulator (required, not supplied)
J Master air valve (for accessories)
K Flexible fluid suction line
L Fluid drain valve (may be required for your pump installation, not supplied)
M Fluid shutoff valve (required, not supplied)
N Flexible fluid outlet line
P Ground wire and clamp (required, not supplied)
R Air line filter
T Air pressure gauge (required, not supplied)

Air Line



A bleed-type master air valve (G) is required in the system to relieve air trapped between this valve and the pump. Trapped air can cause the pump to cycle unexpectedly, which could result in serious injury, including splashing in the eyes or on the skin. See Figure 1.

Using a Verder Compressor Kit:
An air line is provided in the kit, which must be installed between the compressor and the pump air inlet.

Using Your Own Compressor:
Connect the air line from the compressor to the inlet valve on the pneumatic enclosure (28).

Using Shop Air:

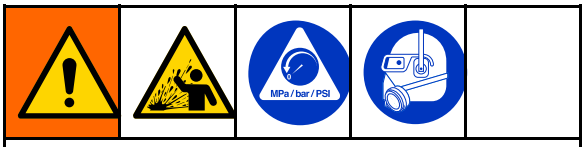
1. Install an air regulator (H) and air line filter (R). The fluid stall pressure will be the same as the setting of the air regulator. The filter removes harmful dirt and moisture from the compressed air supply.
2. Locate a bleed-type master air valve (G) close to the pump and use it to relieve trapped air. Be sure the valve is easily accessible from the pump and located downstream from the regulator.
3. Locate the other master air valve (J) upstream from all air line accessories and use it to isolate them during cleaning and repair.
4. Install a conductive, grounded, flexible air line (F) between the accessories and the 3/8 npt(f) pump air inlet.

Fluid Suction and Outlet Lines

For best sealing results, use a standard tri-clamp or DIN style sanitary gasket of a flexible material such as EPDM, Buna-N, fluoroelastomer, or silicone.

NOTE: Compliance with 3A sanitary standards requires DIN connections to use certain gaskets. See CCE Coordination Bulletin Number 2011-3.

1. Connect flexible, conductive fluid lines (K and N). For VA-EH pumps, the port is 38 cm (1.5 in.) sanitary Tri-Clamp flange or 40 mm DIN 11851. For VA-E2H pumps, the port is 2.5 cm (1.0 in.) sanitary flange or 25 mm DIN 11851.
2. Install a fluid drain valve (L) close to the fluid outlet. See Typical Installation.



A fluid drain valve (L) is required to relieve pressure in the fluid outlet line if it is plugged. The drain valve reduces the risk of serious injury, including splashing in the eyes or on the skin, when relieving pressure.

3. Install a fluid shutoff valve (M) in the fluid outlet line (N) downstream from the fluid drain valve (L).

NOTE: For best results, always install the pump as close as possible to the material source. See the Technical Data, page 30 for maximum suction lift (wet and dry).

NOTICE

The pump can be damaged if flexible fluid lines are not used. If hard-plumbed fluid lines are used in the system, use a short length of flexible, conductive fluid line to connect to the pump.

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 lines. Remember that fittings add friction length to the lines. Reduce the number of fittings to reduce the friction length.
   c. Increase the diameter of the suction lines.
   d. Ensure the inlet fluid pressure does not exceed 25% of the outlet working pressure.
   e. Increase the Net Positive Suction Head (NPSH). See Performance Charts, page 23.
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.

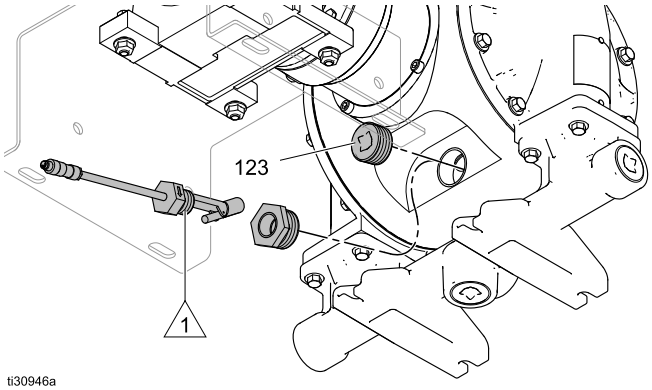
Verder recommends taking all of the above factors into account in system design. To maintain pump efficiency, supply only enough power to the pump to achieve the required flow.

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

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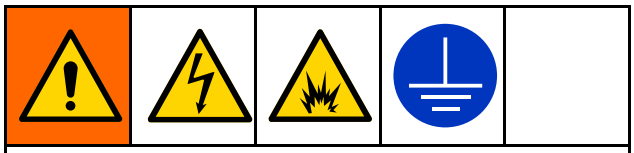
1 To ensure a watertight seal, apply Loctite® 425 Assure™ threadlocker to threads.

Electrical Connections for AC Models



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.

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. The motor must be wired to the Variable Frequency Drive (VFD)

Wire Connections at the VFD

Follow the instructions in the VFD manufacturer's manual.

NOTICE

To avoid equipment damage, do not plug the motor directly into a wall socket. The motor must be wired to a VFD.

Wire Connections at the 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.

   NOTE: For specific wiring instructions, see the instruction manual supplied with your drive.
4. Torque terminals to 2.3 N•m (20 in-lb).
5. Close the motor electrical box. Torque the screws to 2.3 N•m (20 in-lb).

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.

Leak sensor electrical ratings:	
Voltage	36 VDC/30 VAC
Current	0.5 A
Circuit	Normally-closed circuit

1. Select and purchase a cable from the following table, determined by the cable routing distance between the pump and the VFD..

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. Follow Leak Sensor, page 16, to install 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 of the cable to the detection circuit in the VFD.
   NOTE: Refer to the VFD manual for proper connection points.
6. Individually terminate the two unused leads.
7. Close the access cover.
8. Turn on power to the VFD.
9. Configure the VFD to monitor the leak sensor circuit.

Wire Connections at the ATEX Motor

For use with optional ATEX motor kit 859.0523.

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.

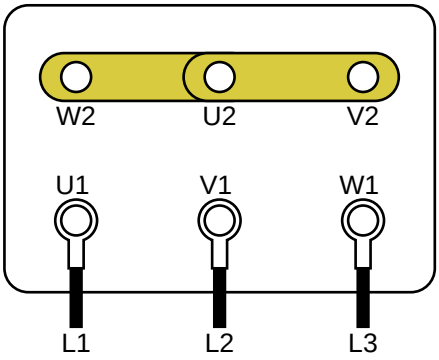


Figure 2 Connections for a 415V Wiring

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

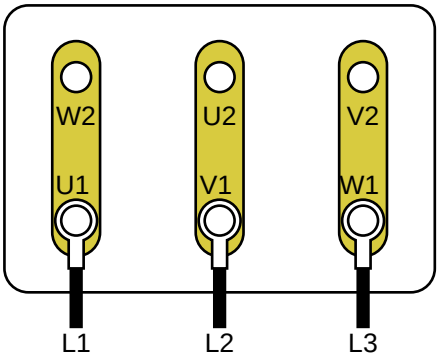


Figure 3 Connections for a 240V Wiring

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

For use with optional explosionproof motor kit 859.0522.

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.

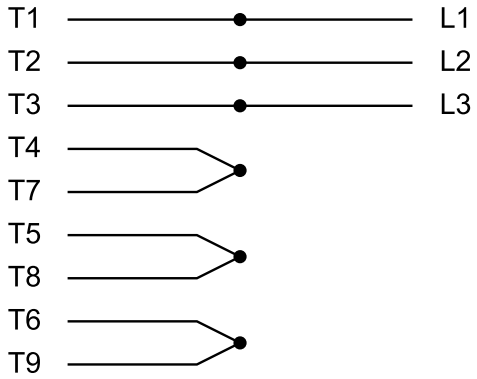


Figure 4 Connections for 460V Wiring

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

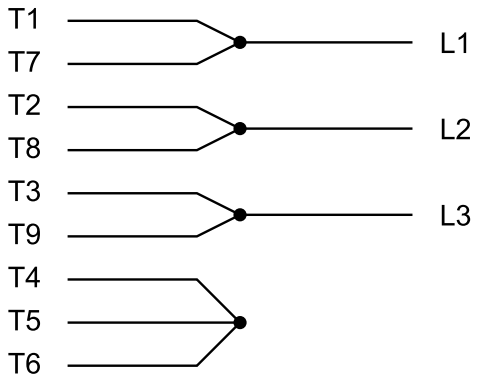
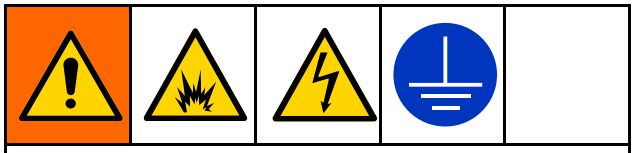


Figure 5 Connections for 230V Wiring

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

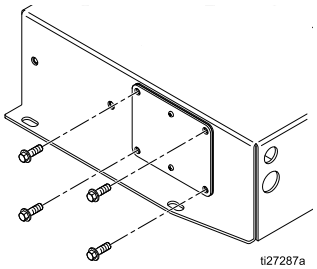


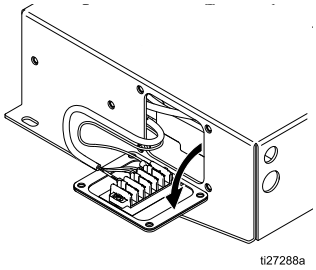
To avoid injury from fire, explosion, or electric shock, all electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

Follow these instructions to wire Compressor 859.0465 (120V) or 859.0466 (240V).

NOTE: Use only copper wire with an insulation rating of 75°C (167°F) or higher.

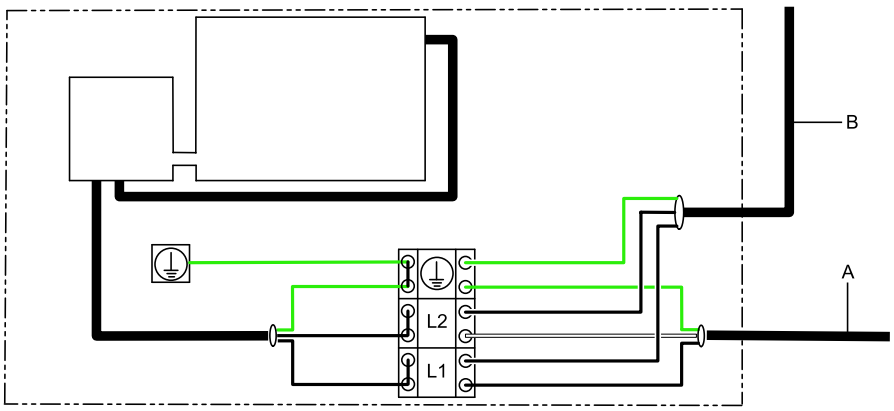
1. Remove the cover from the compressor's electrical box.





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 ⏚. Torque terminals to 2.3 N•m (20 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 2.3 N•m (20 in-lb).



KEY
A To power supply
B To controller

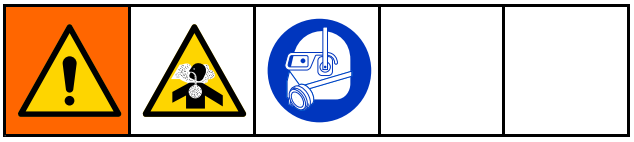
Figure 6 Wire Connections at the Compressor

Operation

Initial Configuration (AC with VFD)

Configure the VFD according to the motor nameplate information.

Sanitize the Pump Before First Use



NOTE: The pump was built and tested using a food grade lubricant.

Properly sanitize the pump before first use. The user must determine whether to disassemble and clean individual parts or simply flush the pump with a sanitizing solution.

To simply flush the pump with a sanitizing solution, follow the steps under Start and Adjust the Pump, page 20 and Flushing and Storage, page 22. To disassemble and clean individual parts, refer to the appropriate Repair manual.

NOTE: Do not expose compressor box to washdown spray.

Transfer Mode vs. Low Pulsation Mode

When the air pressure is at least 0.7 bar (0.07 MPa,10 psi) 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. Use the air regulator (U) to 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. Confirm that the pump is properly grounded. See Grounding, page 13.
2. Check and tighten all pump clamps and fluid connections before operating the equipment. Replace worn or damaged parts as necessary.
3. Connect a flexible fluid suction line (K) from the fluid to be pumped to the pump fluid inlet port (B).
4. Connect the flexible fluid outlet line (N) to the pump fluid outlet port (C) and route the line to the end container.
5. Close the fluid drain valve (L).
6. Turn the air regulator (H, U) knob to the lowest air pressure setting and open the bleed-type master air valve (G).
7. If the fluid outlet line (N) has a dispensing device, hold it open while continuing with the following step.
8. **VFD:** Set the desired frequency and press the start (run) button on the VFD.
9. To prime the pump, slowly increase air pressure with the air regulator (H, U) until the pump starts to cycle. Do not exceed the maximum operating air pressure as listed in the Technical Data, page 30. Allow the pump to cycle slowly until all air is pushed out of the fluid lines and fluid exits the outlet line (N).

NOTE: If the fluid inlet 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. Inlet fluid pressure higher than 25% of the outlet working pressure will also shorten diaphragm life. Approximately 0.21-0.34 bar (0.02-0.03 MPA, 3-5 psi) fluid inlet pressure should be adequate for most materials.

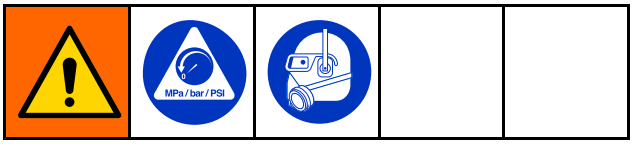
Pressure Relief Procedure

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 splashing fluid, follow the Pressure Relief Procedure when you stop dispensing and before cleaning, checking, or servicing the equipment.

1. Turn off the pump and disconnect power to the system.
2. Close the master air valve (J) to shut off the air to the pump.
3. Open the fluid drain valve (L) to relieve fluid pressure. Have a container ready to catch the drainage.
4. Close the pump air inlet valve (E) on the pneumatic enclosure.

Pump Shutdown



At the end of the work shift, follow the Pressure Relief Procedure, page 21.

Flush the pump if necessary. See Flushing and Storage, page 22.

Maintenance

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.

Lubrication

The pump is lubricated at the factory. It is designed to require no further lubrication for the life of the bearings.

Tighten Connections

Before each use, check and tighten all pump clamps and fluid connections before operating the equipment. Replace worn or damaged parts as necessary.

Flushing and Storage

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 before fluid can dry or freeze 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 sanitizing solution that is compatible with the fluid being dispensed and the equipment wetted parts.
- Flushing schedule will vary based on particular uses.
- Always cycle the pump during the entire flushing process.

Always perform the Pressure Relief Procedure, page 21 and flush the pump before storing it for any length of time.

1. Insert the suction tube into sanitizing solution.
2. Open air regulator (H) to supply low pressure air to the pump.
3. **VFD:** Set the desired frequency and press the start (run) button on the VFD.
4. Run the pump for enough time to thoroughly clean the pump and lines.
5. Close the air regulator (H).
6. Turn off the pump and perform the Pressure Relief Procedure, page 21.

NOTICE

Store the pump at 0°C (32°F) or higher. Exposure to extreme low temperatures may result in damage to plastic parts.

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.

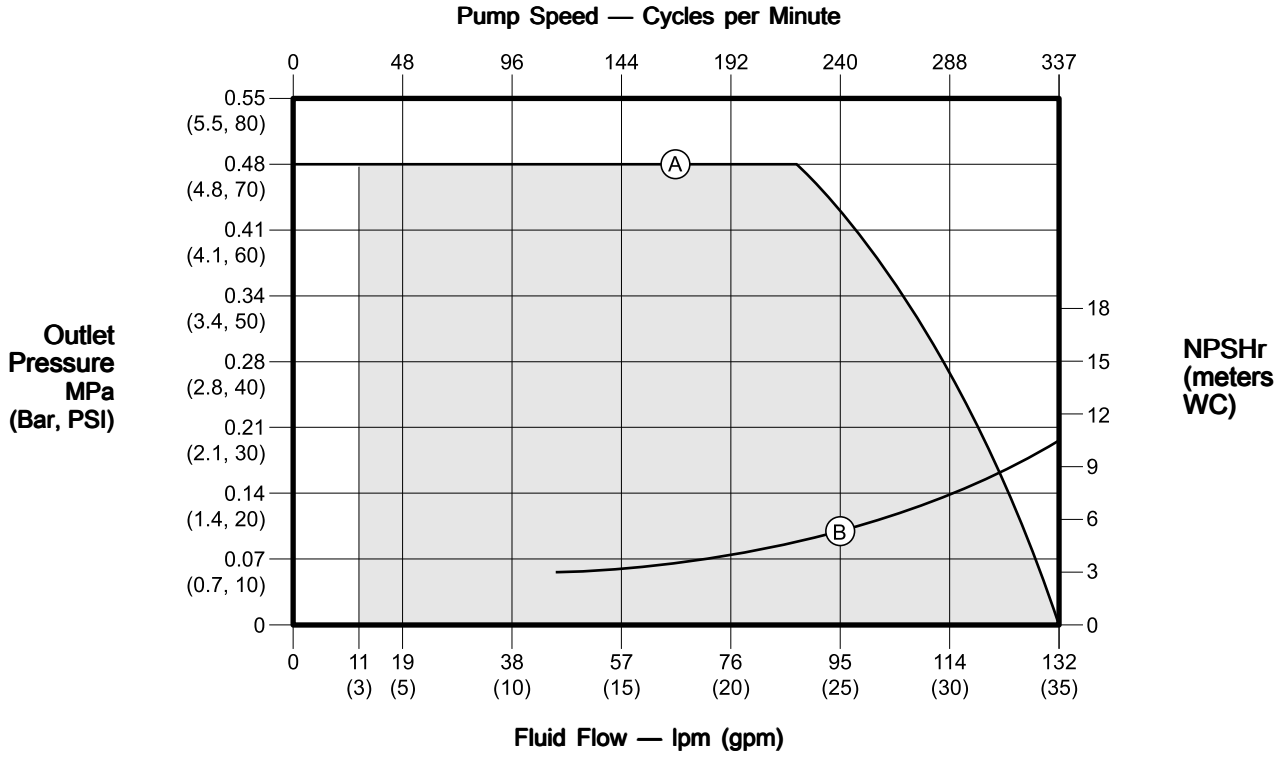
Motor Type (Drive) AC, A1, A2, or AX

KEY

A Power Limit Curve

B Net Positive Suction Head Required

The shaded area is recommended for continuous duty.

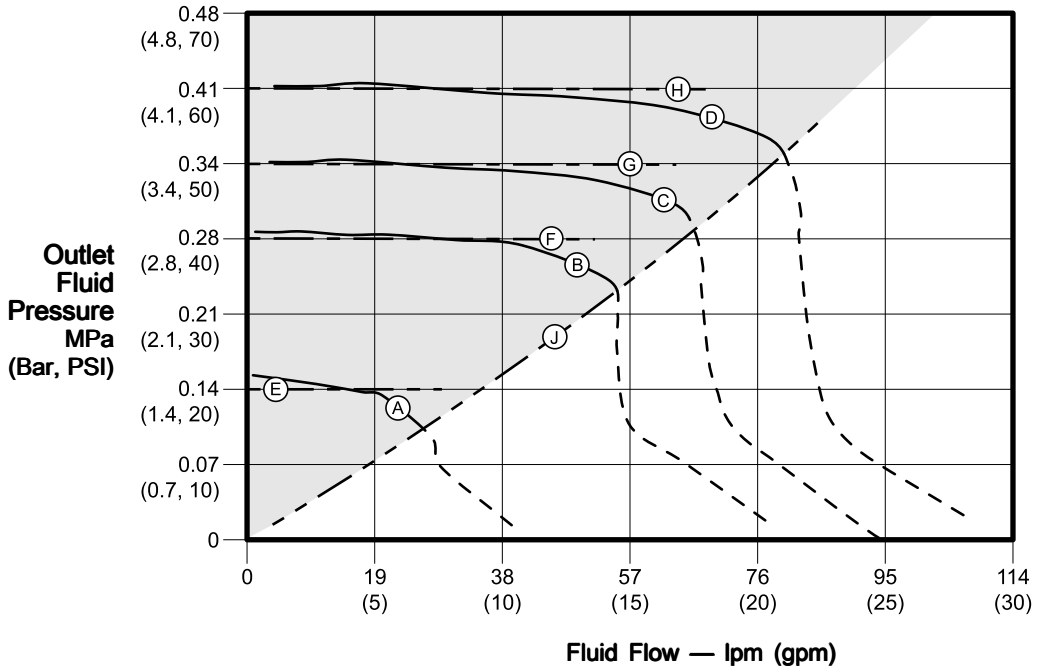


Low-Pulsation Mode

Four 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** 73 cycles per minute
- **B** 145 cycles per minute
- **C** 181 cycles per minute
- **D** 217 cycles per minute
- **E** 1.4 bar (20 psi) air pressure
- **F** 2.8 bar (40 psi) air pressure
- **G** 3.4 bar (50 psi) air pressure
- **H** 4.1 bar (60 psi) air pressure
- **J** Transition line (Low Pulsation Mode is shaded.)



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 you pump. To calculate the NPSHa of your system, use the following equation:

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

Where:

Ha 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 m at sea level.

Hz 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.

Hf is the total of the friction losses in the suction piping.

Hvp is the absolute vapor pressure of the liquid at the pumping temperature.

Dimensions (typical only)

VA-EH25, without compressor

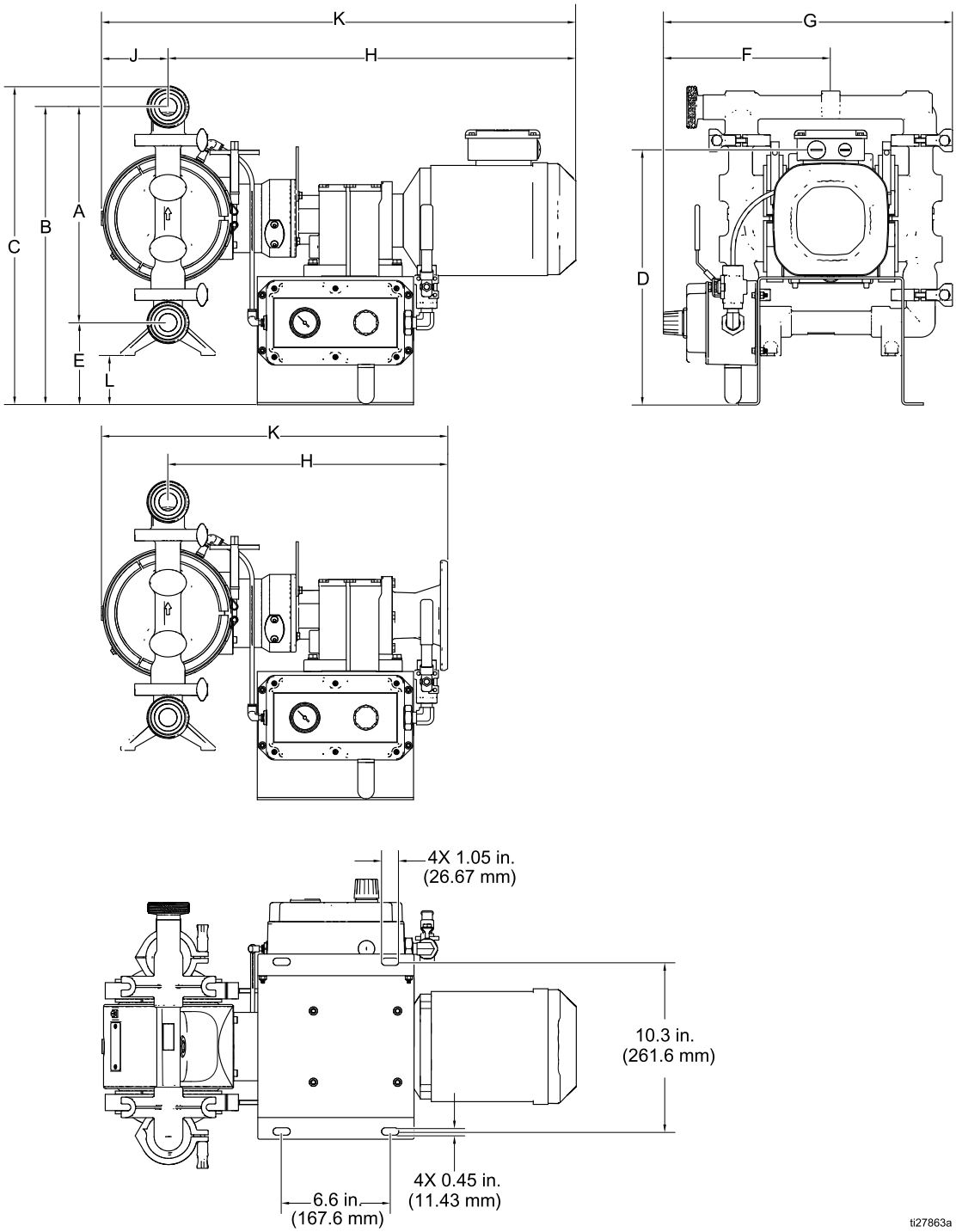


Figure 7 Sanitary Stainless Steel pump models without compressor shown

VA-E2H25, without compressor

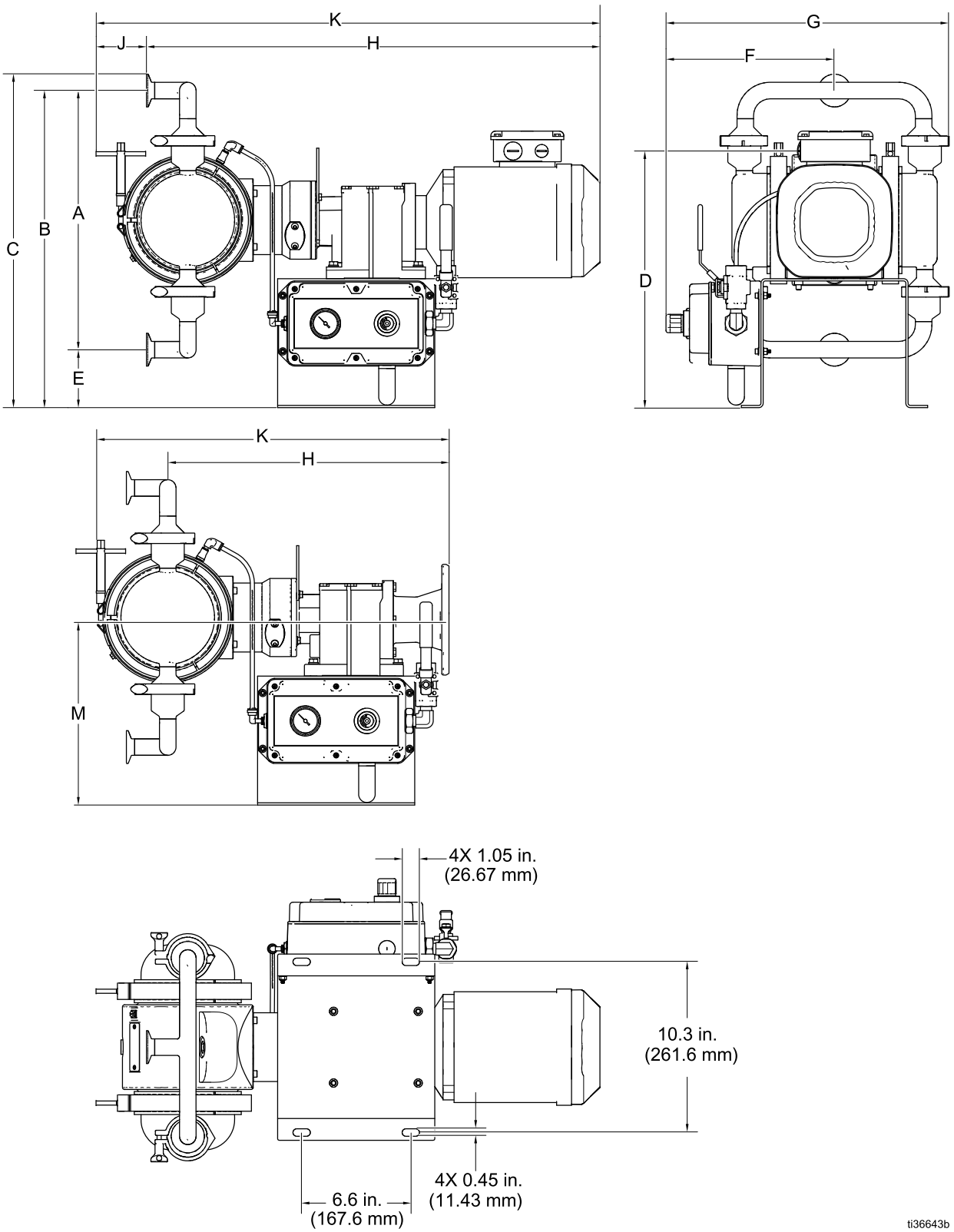
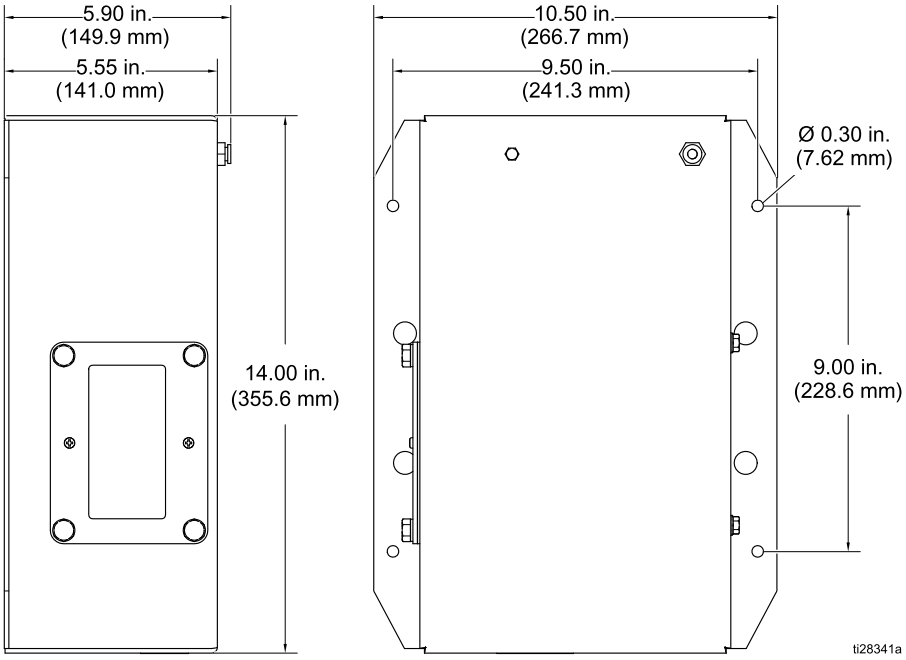


Figure 8 HI-CLEAN 2.0 Pumps without Compressor
(AX and motorless models shown)

Dimensions for VA-EH25 Pumps, typical only						
	Gearbox Only		Gearbox and Motor		Gearbox, Motor, and Compressor	
	NG and IG		AC, AX, AF, BC and BX		AX, AF, BC and BX	
Ref.	in.	cm	in.	cm	in.	cm
A	13.1	33.3	13.1	33.3	13.1	33.3
B	18.1	46.0	18.1	46.0	15.9	40.3
C	19.1	48.5	19.1	48.5	16.9	42.8
D	N/A	N/A	15.5	39.4	13.3	33.7
E	5.0	12.7	5.0	12.7	2.8	7.0
F	10.2	25.9	10.2	25.9	10.2	25.9
G	17.6	44.7	17.6	44.7	17.6	44.7
H	17.0	43.2	24.9	63.2	24.9	63.2
J	4.0	10.2	4.0	10.2	4.0	10.2
K	21.0	53.3	28.9	73.4	28.9	73.4
L	3.0	7.6	3.0	7.6	0.8	1.9

Dimensions for VA-E2H25 Pumps, typical only						
	Gearbox Only		Gearbox and Motor		Gearbox, Motor, and Compressor	
	NG and IG		AC, AX, AF, BC and BX		AX, AF, BC and BX	
Ref.	in.	cm	in.	cm	in.	cm
A	15.7	39.9	15.7	39.9	15.7	39.9
B	19.2	48.8	19.2	48.8	17.0	43.1
C	20.2	51.3	20.2	51.3	18.0	45.6
D	N/A	N/A	15.5	39.4	13.3	33.7
E	3.5	8.9	3.5	8.9	1.3	3.2
F	10.2	25.9	10.2	25.9	10.2	25.9
G	17.1	43.4	17.1	43.4	17.1	43.4
H	17.0	43.18	27.4	69.6	27.4	69.6
J	1.5	3.8	1.5	3.8	1.5	3.8
K	21.32	54.15	28.9	73.4	28.9	73.4
M	11.34	28.8	N/A	N/A	N/A	N/A

Compressor Dimensions



Technical Data

Verder VA-EH25 and VA-E2H25 Electric-Operated Double Diaphragm Pump		
	US	**Metric**
Maximum fluid working pressure	70 psi	4.8 bar, 0.48 MPa
Air pressure operating range	20 to 80 psi	1.4 to 5.5 bar, 0.14 to 0.55 MPa
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		
VA-EH25	1/8 in.	3.2 mm
VA-E2H25	0.42 in.	10.7 mm
Ambient air temperature range for operation and storage. **NOTE:** Exposure to extreme low temperatures may result in damage to plastic parts.	32°F–104°F	0°C–40°C
Fluid displacement per cycle	0.10 gallons	0.38 liters
Maximum free-flow delivery	35 gpm	132.5 lpm
Maximum pump speed	280 cpm	
Fluid Inlet and Outlet Size		
VA-EH25	1.5 in. sanitary flange or 40 mm DIN 11851	
VA-E2H25	1.0 in. sanitary flange or 25 mm DIN 11851	
Electric Motor		
	AC, A1, A2, AF, and AX	**BC, B1, B2, and BX**
Power	1.5 kW	1.5 kW
Pump Shaft Speed at 50 Hz	158 rpm	81 rpm
Speed	3420 rpm (60 Hz) or 2850 rpm (50 Hz)	1750 rpm (60 Hz) or 1450 rpm (50 Hz)
Gear Ratio	18.08	18.08
Voltage	3–phase 240V / 3–Phase 415V	3–phase 230V / 3–Phase 460V
Motorless Gearbox		
NEMA (NG)		
Mounting Flange	NEMA 56 C	
Gear Ratio	18.08	
IEC (IG)		
Mounting Flange	IEC 90	
Gear Ratio	18.08	
Noise Data		
Sound Power (measured per ISO-9614–2)		
at 4.8 bar fluid pressure and 50 cpm	71 dBa	
at 2.76 bar fluid pressure and 280 cpm (full flow)	94 dBa	
Sound Pressure [tested 1 m (3.28 ft) from equipment]		
at 4.8 bar fluid pressure and 50 cpm	61 dBa	
at 2.76 bar fluid pressure and 280 cpm (full flow)	84 dBa	

Weights (typical only)

Pump Material		Motor/Gearbox					
		AC/AX		NEMA NG		IEC IG	
Fluid Section	Center Section	lb	kg	lb	kg	lb	kg
VA-EH	Aluminum	136	62	99	45	104	47
	Stainless Steel	166	75	129	58	134	61
VA-E2H	Stainless Steel	157	80	--	--	145	66

Weight		
Compressor	28 lb	13 kg
Wetted Parts		
Wetted parts include stainless steel, plus material(s) chosen for seat, ball, and diaphragm options		
Non-wetted parts		
Aluminum, coated carbon steel, bronze		
Stainless Steel, aluminum, coated carbon steel, bronze		

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	
	Fahrenheit	Celsius
Buna-N (BN)	10° to 180°F	-12° to 82°C
Polychloroprene check balls (NW)	40° to 200°F	4° to 90°C
PTFE overmolded diaphragm (TO)	40° to 180°F	4° to 82°C
PTFE check balls or two-piece PTFE/EPDM diaphragm (TF)	40° to 220°F	4° to 104°C
PTFE/Santoprene® diaphragm (TS)	40° to 180°F	4° to 82°C
Santoprene® check balls or Santoprene diaphragm (SP)	-40° to 180°F	-40° to 82°C

Notes

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.

Revision N, November 2020

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