Vertical In-Line

Model PVF

Installation, operation, and maintenance manual

IOM #: 98827323 Rev June 2025

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English (US) Installation and operating instructions
Original installation and operating instructions

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1. General information

These instructions should be retained for maintenance and operation near the pump. Additional copies can be found at www.peerlesspump.com.

These are general instructions and may not take into account local regulations. The user should ensure such regulations are observed by all parties.

Information in this manual is believed to be reliable. In spite of all the efforts to provide sound and all necessary information, the content of this manual may appear insufficient and is not guaranteed to be compete or accurate in all instances. Contact Peerless Pump Company or Authorized Service Provider for additional information.

1.1 Limited warranty

This unit is manufactured under a quality management system standard as certified and audited by external quality assurance organizations. Genuine parts and accessories have been designed, tested, and incorporated into the products to help ensure their continued product quality and performance in use.

Damage or failure caused by misuse, abuse, or failure to follow these instructions are not covered by our warranty.

Any modification of our products or removal of original components may impair the safety or performance of these products in their use.

Standard warranty conditions can be found at www.PeerlessPump.com.

1.2 Hazard statements

The symbols and hazard statements below may appear in Peerless Pump installation and operating instructions, safety instructions and service instructions.

DANGER
Indicates a hazardous situation which, if not avoided, will result in death or serious personal injury.

WARNING
Indicates a hazardous situation which, if not avoided, will death or serious personal injury

CAUTION
Indicates a hazardous situation which, if not avoided, result in death or serious personal injury.

The hazard statements are structured in the following way:

SIGNAL WORD
Consequence of ignoring the warring.
- Action to avoid the hazard.

1.3 Notes

The symbols and notes below may appear in Peerless Pump installation and operating instructions, safety instructions and service instructions.

Observe these instructions for explosion-proof products.

A blue or gray circle with a white graphical symbol indicates that an action must be taken.

A red or gray circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.

If these instructions are not observed, it may result in malfunction or damage to the equipment.

Tips and advice that make the work easier.

1.4 Target group

These installation and operating instructions are intended for professional installers and operators of the product.
We recommend that installation be carried out by skilled persons with technical qualifications required by the specific legislation in force.

1.5 General safety warnings

DANGER
Electric shock
Death or serious personal injury
- The electrical installation must be carried out by a qualified electrician in accordance with local regulations and the manuals provided with the electrical accessories.
- Before starting any work on the product, make sure that the power supply has been switched off and that it cannot be accidentally switched on.
- Never do maintenance work on the pump when it is connected to the power supply.

WARNING
Automatic startup
Death or serious personal injury
- Before any inspection, maintenance, service or repair of the product, make sure that the motor controls are in the "OFF" position, locked and tagged.
- Pumping equipment can start up at any time. It is imperative to isolate the engine before doing any maintenance work. Switch off the main power supply, remove fuses, secure fuel lines, apply lock-outs where applicable, and affix suitable isolation warning signs to prevent inadvertent reconnection.
- Isolate the fuel supply to the engine before working on any part of the fuel supply or control system.
- Disconnect the batteries by removal of the negative terminal connector.
- Do not place tools on or near the batteries. This could result in a short circuit.
- Inspect all cables for damage or signs of failure and replace immediately if damaged.

WARNING
Hazardous and flammable fumes
Death or serious personal injury
- Never refuel the engine when it is running or is still hot from recent running.
- Avoid breathing fuel fumes when refueling the product, especially if the product is installed in an enclosed pump room. Maintain maximum ventilation to clear fumes quickly.
- Do not start the engine while fuel fumes remain evident or may be present.
- Battery gasses are hazardous and flammable. The battery area must be well ventilated to clear these gasses quickly.
- Exhaust gases are hazardous and may contain carbon monoxide and other poisonous gasses. The exhaust system must be maintained free from leaks and directed to discharge in a safe area.

WARNING
Large openings
Death or serious personal injury
- If the site is left unattended before the installation is complete, all openings must be covered to prevent entry of children, animals, stones, or any other foreign objects.
- Use unbreakable covers that cannot be removed without tools.

WARNING

Hot surface

Death or serious personal injury
- Do not allow skin contact with pump components that have heated above 108 °F (42 °C).
- Wear protective gloves when necessary to touch hot surfaces. Surfaces may remain hot after unit has been shut off.
- Ensure that drain water from stuffing box is cool before contact. The stuffing box and bearing bracket areas on the pump can become hot in the event of a malfunction or maladjustment.

WARNING

Hot or freezing surfaces

Death or serious personal injury
- Protect persons from contact with hot or freezing components or auxiliary heating supplies.
- If complete protection is not possible, limit access to maintenance staff only, with clear visual warnings to those entering the immediate area.

WARNING

Chemical hazard

Death or serious personal injury
- When the pump handles hazardous liquids, avoid exposure to the liquid. Limit personnel access and ensure that operators are properly trained. If the liquid is flammable and/or explosive, strict safety procedures must be required.
- Gland packing must not be used when pumping hazardous liquids.

WARNING

Overhead load

Death or serious personal injury
- Do not lift components by the lifting lugs or eye bolts on the motor. Unload and handle components with a sling.
- Complete pump units must be lifted by fork truck from beneath the pump's steel base.
- When manually lifting pump components, use proper lifting techniques and never bend at the waist. Keep the component close to your body with your back straight, and lift with your legs.

WARNING

Crushing of hands

Death or serious personal injury
- Do not work under a suspended object unless you have taken precautions to stop its fall in the event of sling failure. Do not place hands under a component in such a way that it could fall on your hands if it were dropped.

WARNING

Sharp and moving machine parts or blades.

Death or serious personal injury
- Ensure an approved coupling guard is in place before operating the product. Failure to observe this warning could result in injury to operating personnel.
- Wear appropriate protective safety equipment including gloves when handling parts and components.
- Read and follow all recommended guarding and safety instructions for accessories, if any.

WARNING

Rotating equipment and sharp objects

Death or serious personal injury
- Do not place fingers, hands, arms, etc. into any opening (such as the air relief valve hole).
- Do not wear loose or frayed clothing or jewelry that could catch on equipment or become trapped in the equipment.
- Do not touch the impeller or other rotating elements, if rotated, this can cause severe injury. The area between the stuffing box and bearing bracket is left open to allow for inspection and adjustment of packing. Never place your hands or fingers into this area while the equipment is in operation. Do not wear loose clothing, long hair, or jewelry around this area.

WARNING

Excessive noise

Death or serious personal injury
- If the operating noise level of the product exceeds local code or safe levels (over 85 dBA), the product must be installed in a controlled access area. Provide ear protection to persons authorized to be in this area.
- Pumps can start unexpectedly at any time. Ear protection should be carried by, or readily available to, all persons authorized to be in the pump room with these pumps. Observe health and safety regulations limiting exposure of personnel to excessive noise.

WARNING

Explosive environment

Death or serious personal injury
- Do not store lubricants or other volatile substances near the engine. Store these in a designated, suitable storage enclosure.

Partial decomposition of fluoro-elastomers (when fitted) will occur if equipment reaches temperatures above 400°F (205 °C)..

For applications involving potentially explosive atmospheres, contact Peerless Pump for more information.

Avoid rapid temperature change in the pumped liquid. Thermal shock from sudden temperature changes can damage pump components.

Pumps are not designed to accept external loads from belt-driven arrangements. A separate jackshaft with a bearing structure suitable for belt loading is required.

Do not remove or paint over any safety labels. If labels are lost or damaged, contact your Peerless Pump representative for replacement.

Do not use gland packing when pumping hazardous liquids.

Do not use the pump as a support for pipes. Do not mount expansion joints, so that their force, due to internal pressure, acts on the pump flange, without written authorization from Peerless Pump.

1.6 Material safety data sheet

Safety data sheets (SDS) are not supplied with pumps unless required. You may request them from your Peerless Pump representative.

2. Receiving the product

2.1 Unpacking the product

Do not unpack more than required to verify that the equipment is complete and undamaged unless installed immediately. Look through all packaging material that is to be discarded to ensure no parts or instructions are discarded accidentally. In some shipments, small boxes containing additional parts are bound to pump skids. Leave small parts in their shipping container until installation. While unpacking, make sure that pump unit accessories are clearly marked indicating the exact pump unit they should be used with.

2.2 Inspecting the product

The product must be inspected after transport and before installation.

To complete the inspection, follow the steps below:

1. Check the product for transport damage. Contact the transporter immediately in case of damage.
2. Check that the delivered products correspond to the order.
3. Check the positions and sizes of fittings.
4. Retighten various connections, as they may have become loose during transport.
5. Note the extent of damage or shortage on the freight bill and bill of lading. Failure to note damage or missing parts may result in declined warranty or replacement of parts.
6. Identify and properly store all pump components until ready for installation see 2.5 Storing and handling the product.. There may be many small parts (such as line shaft couplings or hardware) that are best left in their shipping container until installation.

2.3 Transporting the product

The pump has been prepared for shipment at the factory so as to minimize potential damage due to handling and transport.

WARNING

Crushing hazard

Death or serious personal injury

- Make sure all persons stand clear of the load and the lifting equipment while product is lifted, lowered, loaded and unloaded. Do not allow anyone to stand on, under, or near the load.

Do not subject the pump to excessive g-forces during handling or transport.

2.4 Scope of delivery

A typical shipment will include:

- one skid with the fire pump vertically mounted with the driver.
- one skid with the controller
- one (or more) skid with the accessories, when supplied
- installation and operating instructions.

Refer to the original order in case of questions about shipping, for example, special arrangements with third-party vendors for shipping and storage.

2.5 Storing and handling the product

Standard factory packaging is suitable for protection during shipment and during covered storage at a job site for a short period between installation and startup. The preservatives applied at the factory have an effective life of two to three months from the date of shipment from the factory, depending on the severity of the environment in which the equipment is exposed. For international destinations, this will vary depending on the seaworthiness of export boxing.

2.5.1 Controlled storage

Storage facilities should be maintained at an even temperature with a relative humidity lower than 50%, and little or no dust. Inspect and recoat the equipment periodically with water displacement rust inhibitor, vapor phase inhibitor, or rust preventive coating. The equipment must be inspected weekly to ensure that all preservatives are intact, and internals are protected.

2.5.2 Uncontrolled storage

For uncontrolled storage periods of three months or less, inspect the equipment weekly to ensure preservatives are intact and internal parts are protected.

Preparing the product for uncontrolled storage

- Periodically inspect and recoat the equipment with rust and vapor phase corrosion inhibitors.
- Seal all pipe threads and flanged pipe covers with tape. Place an adequate amount of desiccant near the center of the pump.
- If the pump is assembled, place and securely fasten additional desiccant in the outlet of the pump.
- Cover the equipment with black polyethylene or equivalent, with a minimum thickness of 0.006 in (0.15 mm).
- Provide a ventilation hole approximately the size of a small coin.
- Provide protection from direct exposure to the environment.
- If applicable, connect space heaters on equipment such as motors, engines or controls.

2.5.3 Short-term storage

- The pump and equipment, as shipped, have adequate protection for short-term storage for up to three months.

- If the product is not to be installed and operated immediately after receiving it, store it in a clean, dry area at a moderate ambient temperature. The unit must be protected against environmental elements such as heat, freezing and moisture.
- For packed-type pumps, the packing glands may be left on the pump shaft and securely fastened in position. All exposed machined surfaces should be thoroughly coated with a film of rust preventative material.
- For packed-type pumps, the stuffing box packing must be removed and stored in a sealed plastic bag. Seal the end of the stuffing box with rolled vapor phase inhibitor paper and seal with weatherproof tape.
- Rotate the shaft by hand periodically, at least monthly, to coat the bearing with a lubricant to retard oxidation and corrosion.
- Make sure the pump cannot roll or fall over.
- Follow the driver manufacturer's storage recommendations where applicable.

2.5.4 Long-term storage

- Long-term storage protection provided by the factory does not extend the warranty in any manner.
- The warranty is valid only if the equipment is properly handled and stored.
- In case of storage up to six months or longer, the pump must be protected against environmental elements such as heat, freezing and moisture as described in the previous sections.
- Periodically, at least monthly, manually rotate the shaft to coat the bearing with a lubricant to retard oxidation and corrosion.
- Ensure that the pump cannot roll or fall over.
- Follow the driver manufacturer's storage recommendations where applicable.
- Inspect the pump before putting it into operation. Make sure that the impeller can rotate freely. Pay special attention to the condition of the shaft seals or the packing and O-rings.

2.5.5 Accessories storage

Store accessories according to the manufacturer's instructions.

2.6 Handling the product

When storing and handling the product:

- Use properly sized and rated lifting equipment.
- Handle and lift the product according to the local regulations.
- Ensure that point loads do not occur.

DANGER
Crushing hazard
Death or serious personal injury
- Place the product on a level surface to prevent overturning..

If the product is equipped with lifting points, use the points
during handling.

2.7 Frost protection

If the pump is to be used in areas with freezing or frost potential, steps must be taken to prevent freezing and bursting of the pump and cooling systems.

3. Product introduction

3.1 Product description

Peerless Pump PVF pumps are vertical in-line fire pumps with appropriate fittings for providing water supply to fire protection systems in buildings, plants, and yards.

3.2 Intended use

The vertical in-line Model PVF is intended for use in fire protection systems. If there is any doubt as to the suitability of the product for the application intended, contact Peerless Pump.

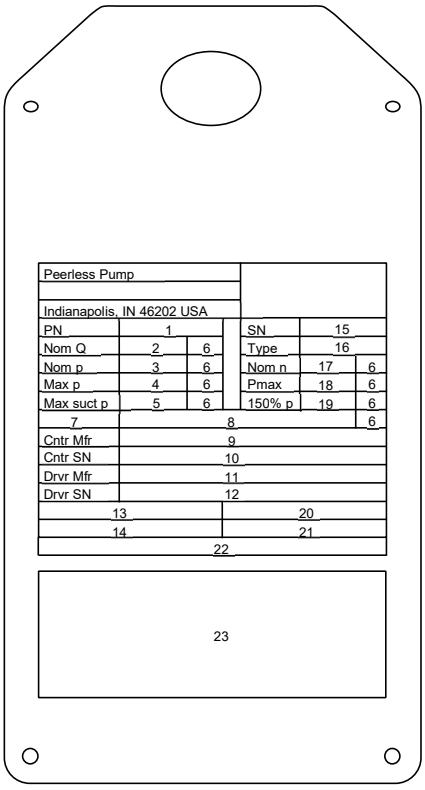
3.3 Identification

3.3.1 Nameplate

Each pump has a nameplate with the pump's serial number. You will find an example of the pump nameplate in the figure below. Reference the serial number when contacting Peerless Pump with questions or a service request.

A nameplate can also be found on the driver, if supplied. When requesting information about the driver, both the driver serial number and the pump serial number will be required.

If the pump has a flange nameplate, it will include the pump's equipment order number and pump model.



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Pos.	Description	Pos.	Description
1	Product number	13	Description
2	Nominal flow	14	Description
3	Nominal pressure	15	Serial number

4	Max. pressure	16	Pump type/model
5	Maximum inlet pressure	17	Tested speed
6	Unit of measure	18	Maximum power
7	Number of stages	19	150% maximum power
8	Impeller diameter	20	Country of origin
9	Controller manufacturer	21	Production code
10	Controller serial number	22	Packaging location
11	Driver manufacturer	23	Marks of approval
12	Driver serial number		

3.3.2 Type key

This type key is applicable to the configurator in Peerless Express.

Example: 8PVF16G-1-A-1/7-P-A-B-R-C

Example	8	PVF	16	G	-1	-A	-1	/7	-P	-C	-WE	-75	-C
Position	1	2	3	4	5	6	7	8	9	10	11	12	13

Position	Designation	Code	Example
1	Outlet (inlet) flange [inch]	8	8 inches
2	Pump type	PVF	Vertical in-line fire pump
3	Maximum impeller diameter [inches]	16	16 inches
4	Impeller design	[ ]	Not Relevant
		A	
		B	
		G	
		…..	
5	Inlet and Outlet flange rating	-1	125 lb. inlet; 125 lb. outlet
		-3	125 lb. inlet; 250 lb. outlet
		-X	Special
6	Approval	-UF	UL listed and FM approved
		-UC	UL Canada listed
		-UL	UL listed
		-FM	FM approved
7	Casing material	-1	Cast Iron ((ASTM 48 CL 35A or 40A)
		-2	Ductile iron (ASTM A536 60-40-18)
		-X	Special
8	Impeller material	/7	Silicon brass or bronze (ASTM B584)
		/8	Aluminum Bronze (ASTM B148)
		/9	Nickel-aluminum-bronze (ASTM B148)
		/X	Special
9	Sealing	-P	Packing
		-X	Special
10	Mounting option	-C	Pump with driver
		-L	Pump with driver + Base + Controller
		-X	Special
11	Driver	-US	Nidec (US Motors)
		-WE	WEG

Position	Designation	Code	Example
		-BA	Baldor
		-ZZ	Special
12	Motor Size	-xx	Motor hp
		-N	No panel
		-F	Firetol
		-T	Tornatech
13	Control type	-E	Metron
		-C	Eaton
		-M	Master
		-Z	Special

3.3.3 Approvals

The approval for your specific product is indicated on the nameplate as described in the type key.

4. Installing the product

4.1 Factory support

For Engineered to Order (ETO) products, Peerless Pump recommends that you invite a Peerless Pump service engineer to supervise the installation and startup. This is to ensure a proper installation.

Peerless Pump recommends that you review the instructions provided with the pump.

4.2 Location

Install the product in a location that meets the following requirements:

4.2.1 Minimum space

Always allow sufficient accessibility space for maintenance and inspection. Provide a clearance of 24 inches (610 mm) with ample head room for use of overhead lifting equipment strong enough to lift the product.

4.2.2 Seismic analysis

When the pump is located in a seismically active area or in certain critical installations, ensure that the pumps, supports, and accessories are earthquake-resistant. The design specifications for earthquake resistance vary depending on the geographical area and the class of the equipment. The class of the equipment depends on defining how critical is the survival of the equipment, the characteristics of the structure's response to accelerations, and the foundation supporting the pump.

If a seismic analysis is required, please refer to the governing bodies recommended for grouting and foundation requirements.

The customer must supply complete specifications for earthquake resistance requirements including seismic criteria, acceleration, magnitudes, frequency spectrum, location and direction relative to the pump and qualification procedure.

4.3 Mechanical installation

For an FM approved system, support PVF vertical in-line single stage pumps by a base. Otherwise, the pumps are designed to be supported by the pipes in the system with the motor above the pump.

4.3.1 Recommendation for pump foundation

All rotating equipment generates vibrations when turning at high speeds. Proper installation and anchorage of the pumps and installation accessories are critical to limit vibrations and achieve reliable installation. To ensure acceptable vibration levels in the field, all parts of the system must be sufficiently stiff and firmly anchored to minimize vibrations:

This applies for pumps above 13 hp (10 kW).

- The foundation and concrete should be of adequate strength to support the weight of the pump including accessories, the weight of the liquid passing through the pump, and the forces generated by the pump.
- The mass of the concrete foundation should be a minimum of three to five times the mass of the supported equipment and should have sufficient rigidity to withstand the axial, transverse, and torsional loadings generated by these machines.
- The foundation should be 6 in (15.2 cm) wider than the base plate for pumps up to 469 hp (350 kW) and 10 in (25.4 cm) wider for larger pumps.
- The concrete used in the foundation should have a minimum tensile strength of 362 lb_f/in^2 (250 N/cm^2).
- Always use a non-shrink epoxy grout to fasten the pump base plate to the foundation.

4.3.2 Pump foundation

For typical installations, suitable overhead lifting equipment of adequate capacity to lift the driver, the entire pump or the heaviest subassembly of the pump must be available at the job site when installing or removing the pump.

Adequate headroom must be provided to accommodate the pump to be handled plus the rigging.

Install the pump permanently on a firm, raised concrete foundation of sufficient size to dampen any vibration and prevent any deflection or shaft misalignment. The foundation may float on springs or be a raised part of the floor.

Proceed like this:

1. Pour the foundation without interruption to 0.75- 1.5 in (20-40 mm) below the final pump level. Leave the top of the foundation rough. Then clean and wet it down.
2. Scour and groove the top surface of the foundation before the concrete sets to provide a suitable bonding surface for the grout.
3. Place anchor bolts in pipe sleeves for positioning allowance. Anchor bolt diameter should be smaller than the baseplate hole diameter but not more than one bolt size smaller.
4. Allow enough bolt length for grout, base flange, nuts, and washers.
5. Allow the foundation to cure several days before proceeding to install the pump.

4.2.1 Foundation, grout, and anchor bolt installation

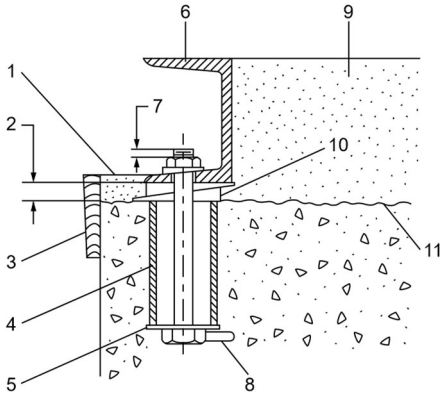

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Fig. Foundation, grout, and anchor bolt installation

Position	Description
1	Finished grouting
2	0.75-1.25 in (19-32 mm) allowance for grout
3	Formwork
4	Pipe sleeve
5	Washer
6	Base plate
7	0.2-0.4 in (5-10 mm)
8	Lug
9	Grout
10	Wedges or shims left in place
11	Top of foundation

4.3.3 Positioning the pump

When the raised concrete foundation has been poured and allowed to set, proceed as follows:

WARNING
Overhead load
Death or serious personal injury
- Never attempt to lift the entire pump by means of eyebolts screwed into the driver mounting holes. This attachment point may not be strong enough to carry the weight of the entire unit.

Adequate space above the installation site must be provided to accommodate rigging and the longest section of the pump to be handled.

1. Lower the base plate over the anchor bolts and rest it on loose adjustment wedges or shims placed near each anchor bolt and at intervals not exceeding 24 in (610 mm) along each side.
2. Orient the pump so that the inlet and outlet are in the desired direction and the holes in the base align with the foundation bolts.
3. Continue to lower the pump until the bolts begin to enter the holes in the base.
4. Place the shims or wedges so that they raise the bottom of the base plate 0.75-1.25 in (19-32 mm) above the foundation, allowing clearance for grout.
5. Level the pump shaft and/or flanges using a level, adjusting the wedges or shims, as required.

If the pump is equipped with jacking screws, use them to lift the pump and adjust the wedges or shims.

6. Make sure that the pipes can be aligned to the pump flanges without placing any strain on either flange.
7. After pump alignment has been established, put nuts on the anchor bolts and tighten them just enough to keep the base plate from moving.
8. Construct a formwork around the concrete foundation and pour grout inside the base plate. The grout will compensate for the uneven foundation, distribute the weight of the pump, and prevent shifting.

Use an approved, non-shrinking grout.

9. Allow for the grout to cure fully before proceeding with torquing the anchor bolts and the pipe connections.
10. After the grout has thoroughly hardened, check the anchor bolts and tighten them if necessary.

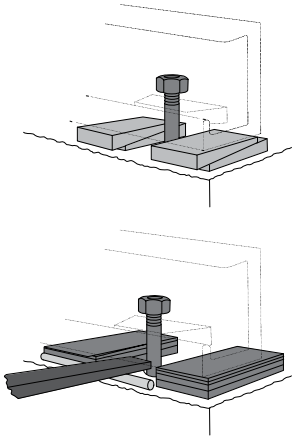

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Fig. Raising the base plate with wedges or shims

4.3.4 Grout material

The grout material that supports the base plate must be carefully selected as it is a critical element of the pump support structure. The product warranty is void if this instruction is not followed.

If the grout cracks or fails, the structure will be compromised. When the alignment is correct, tighten the foundation bolts evenly but not too firmly. Then grout the unit to the foundation. We do not recommend to grout any leveling pieces, shims or wedges in place because this introduces discontinuities and stress concentrations that may cause the grout to crack. Do not fully tighten foundation bolts until the grout cures (usually 48 to 72 hours). Remove jacking screws after the grout cures and fill the holes with an appropriate sealing material.

Do not distort the base plate by overtightening the foundation bolts.

4.3.5 Floor mounting

For an FM approved system, support PVF vertical in-line single stage pumps by a base. Otherwise, the pumps are designed to be

supported by the pipes in the system with the motor above the pump.

4.4 Mechanical installation

4.4.1 Pipes and connections

Peerless Pump recommends following industry standards such as NFPA 20 and Hydraulic Institute for piping installation and connections.

4.4.1.1 Inlet pipe

The inlet pipe must be installed in a manner that minimizes pressure loss and permits sufficient liquid flow into the pump during starting and operation.

At no point must the diameter of the inlet pipe be smaller than that of the pump inlet port.

Observe the following precautions when installing the inlet pipe:

- Run the inlet pipe as direct as possible, and ideally, make sure the length is at least ten times the pipe diameter. A short inlet pipe can be the same diameter as the inlet port. A long inlet pipe must be one or two sizes larger than the inlet port, depending on the length, and with a reducer between the pipe and the inlet port.
- Avoid any high points, such as pipe loops, as this may create air pockets and throttle the system or cause erratic pumping.
- Use an eccentric reducer, with the tapered side down for suction lift or taper side up for flooded suction from above
- If possible, run a horizontal inlet line along an even gradient. Peerless Pump recommends a gradual upward slope to the pump operating in suction lift conditions, and a gradual downward slope operating in positive inlet pressure conditions.
- Install a gate valve in the inlet line to isolate the pump during shutdown and maintenance, and to facilitate pump removal. Where two or more pumps are connected to the same inlet pipe, install two gate valves to be able to isolate each pump from the pipe.

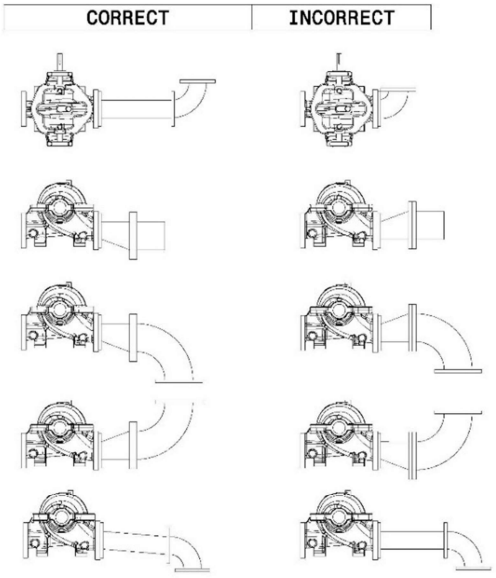

Fig. Pipe arrangements

Always install isolation valves in positions that prevent air pockets.

Do not use globe valves, particularly when NPSH is a critical operating factor.

- During pumping operation, the valves on the inlet line must always be fully open.
- Install properly sized pressure gauges in the tapped holes on the pump inlet and outlet flanges or pipes

Pressure gauges will enable the operator to monitor the pump performance and determine whether the pump conforms to the parameters of the performance curve.

If cavitation, vapor binding, or other unstable operating situations occur, the pressure gauges will indicate with wide fluctuation in the inlet and outlet pressures.

4.4.1.2 Vibration dampers

To prevent the transmission of vibrations to foundations and surrounding structures, isolate the pump and foundation from connected structures by means of vibration dampers. The selection of the correct vibration damper requires the following data:

- forces transmitted through the damper
- motor speed(s)
- required dampening in %.

The selection of a vibration damper differs from installation to installation. In certain cases, a wrong damper may increase the vibration level. Peerless Pump recommends that the vibration dampers be sized by the supplier. If you install the pump on a foundation with vibration dampers, always fit expansion joints on the pump flanges.

Install expansion joints on the pump flanges to prevent the pump from "hanging" in the flanges.

4.4.1.3 Outlet pipe

- A short outlet pipe can be the same diameter as the pump outlet port. A long outlet pipe must be one or two sizes larger than the outlet port, depending on the length.
- It is best to use long horizontal outlet pipes.
- Install a non-return (check) valve to protect the pump from backflow and excessive backpressure. The check valve should be installed between the isolation valve and pump.

Pump backspin and hydraulic shock can cause severe damage to the pump and driver.

- Install a gate valve near the outlet port to be able to isolate the pump during shutdown and maintenance, and to facilitate pump removal.
- Any high points in the outlet pipe may entrap air or gas and thus reduce pump operation.

Operating pumps against a closed valve will cause an increase in pressure and heat generation in liquid.

If an increaser is used on the outlet pipe to increase the pipe size then it should be placed between the non-return valve and the pump. If expansion joints are used then they should be placed between the pipe support or anchor and the non-return valve.

4.4.1.4 Piping

The inlet and outlet pipes must be of sufficient size and free of internal foreign material.

Considerations for inlet pipes to achieve optimal performance are:

- When operating under inlet pressure, pipe may be equal to, but never less than, the inlet nozzle size.
- Failure of the inlet pipe to deliver the liquid to the pump in this condition can lead to noisy operation, swirling of liquid around the suspended pump assembly, premature bearing failure and cavitation damage to the impeller and inlet portions of the casing.

Contact Peerless Pump for further information.

4.4.1.5 Inlet valves and manifolds

Install isolation valves on the inlet and outlet pipes so that the pump can be isolated for maintenance.

4.4.1.6 Outlet valves

Install a non-return (check) valve and an isolation valve in the outlet pipe. The non-return valve protects the pump from backflow and excessive backpressure.

Pump backspin and hydraulic shock can cause severe damage to the pump and motor. To prevent this type of damage, install at least one non-return valve in the outlet pipe, not more than 25 ft (7.5 m) after the outlet flange.

If increasers are used on the outlet side of the pump to increase the size of piping, place them between the non-return valve and the pump.

If expansion joints are used, place them between the pipe anchor and the non-return valve.

4.4.1.7 Nozzle load

The pipes should be aligned with the pump nozzles to minimize pump nozzle loads. Refer to ANSI/HI 9.6.2 for assessment of applied nozzle loads.

4.4.2 Impeller clearance

Impeller clearance achieved by mounting on the motor shaft, no adjustment is necessary.

4.4.3 Alignment

Misalignment of the pump and driver can cause product failure.

Reliable and efficient operation requires accurate alignment of the pump and driver. PVF pumps have a pilot (rabbit) fit alignment between the motor and pump. Ensure that these surfaces are free of nicks or debris should the motor be removed for any reason.

If the product does not stay in alignment after installation, possible causes of misalignment are:

- setting, seasoning or springing of the foundation.
- excessive force on the pipes distorting or shifting the machine.
- settling of the building.
- shifting of pump or driver on the base plate or foundation.

Misalignment may be the cause of:

- noisy pump operation
- vibration
- premature bearing failure

4.5 Electrical connection

All electrical connections must be carried out by a qualified electrician in accordance with local regulations.

DANGER

Electric shock

Death or serious personal injury

- Switch off the power supply before you start any work on the product.
- Make sure that the power supply cannot be switched on accidentally.

Locate the electrical conduit and boxes to avoid obstruction of the pump.

Check speed versus torque requirements during the starting phase of a pump against the speed versus torque curve of the driving motor.

To accelerate the pump up to rated speed, the driver should be capable of supplying more torque at each speed than required by the pump. In general, this condition is easily attainable with standard induction or synchronous motors, except under certain conditions when a motor with high pull-in torque may be required, such as high specific speed pumps over 5000 US units (100 metric units) or reduced voltage startup.

To achieve a smooth start for the pumping equipment, consider connecting autotransformers to the starting panel or using solid-state starters. These provide a gradual increase in voltage up to rated voltage ensuring even acceleration.

4.6 Control, monitoring, and alarm equipment

Check control and alarm systems for correct installation and function according to the manufacturer's instructions.

Check all alarm point settings.

All control and alarm systems should be checked for correct installation and functioning in accordance with the manufacturer's instructions.

4.6.1 Stopping the unit/reverse runaway speed

A sudden power and/or discharge valve failure during pump operation against a static head will result in a flow reversal, and the

pump will operate as a hydraulic turbine in a direction opposite to that of a normal pump operation.

If the driver offers little resistance while running backward, the rotational speed may approach the pump specific speed. This condition is called runaway speed and causes mechanical problems. Contact Peerless Pump for aid in preventing this condition.

5. Preparing the pump for startup

5.1 Lubricating the pump

Before attempting to start the pump, check the following items:

- lubrication of the pump fitting at bearing(s) and/or packing, if applicable
- lubrication of the driver
- oil-cooling connections for the driver, if applicable

Good practice includes the following:

- Keep lubricant clean and use a dust-tight cover on the storage container.
- Clean the pump lubricant fittings before re-lubricating with grease.
- Start and run the pump for a short time to eject any excess grease. Stop the pump to reinstall grease purge pipe plug, if applicable and wipe off any ejected grease.
- Use the proper amount of lubricant. Too much lubricant results in churning, unnecessary power consumption, rapid heating to a high temperature and inadequate lubrication.

Normal bearing temperatures vary with the seasons and environment and may range from 0 to 250 °F (-18 to 121 °C). A continuous rise from the established, normal operating temperature indicates trouble and probable failure of the bearing. Shut down the pump immediately.

5.1.1 **Recommended products**

Follow the driver manufacture's recommendations for lubrication.

5.2 Checking rotation

WARNING

Electric shock

Death or serious personal injury

- Switch off the power supply before you start any work on the product.

Three-phase motor shaft rotation can be reversed by switching any two of the three power leads.

Do not attempt to switch any leads in a single-phase motor to change the direction of rotation. The rotation of most single-phase motors is determined by internal wiring and cannot be changed easily.

1. Disconnect the power supply.
2. Lockout-Tagout the power supply.
3. Rotate the motor shaft by hand in both directions.
   Verify that the motor spins without binding.
4. Momentarily energize the motor. Verify that the motor spins in the direction indicated on the pump volute.

5.3 Guards

WARNING

Moving machine parts or blades

Death or serious personal injury

- Guards must not be removed while the pump is operational. Ensure an approved coupling guard is in place before operating the pump

Install guarding before operating the pump.

5.4 Flushing the system

Before the pump is installed, we recommend that you clean the system to remove debris, for example, stubs of welding rod, welding slag, and loose scale. Protect the pump and other sensitive parts with startup strainers.

5.5 System decontamination

After the system has been flushed to remove debris, determine if the system needs to be decontaminated. If the system needs to be decontaminated, it must be done before priming and filling the pump.

5.6 Priming

The pump should not be run unless it is completely filled with liquid, as there is danger of damaging some of the pump components.

If the system has suction pressure, follow these steps:

1. Bleed all air from the pump casing and suction pipe by the opening of the automatic relief valve.
2. Rotate the shaft a few times, if possible, to evacuate any air trapped inside the impeller passages.

5.7 Stuffing box

5.7.1 Packed Stuffing Box

The stuffing box gland must be loose when the pump is first put into operation.

Tightly pressed packing will result in burnt packing and scoring of the shaft or shaft sleeve.

The stuffing box should slowly leak fluid, 40-60 drops per minute, as a minimum during operation. When the leak can no longer be controlled by adjusting the stuffing box gland, add one additional ring of packing and ensure the gland is loose. When the leak can no longer be controlled, all packing rings must be replaced.

- The stuffing box is packed at the factory.
- Each ring is cut to the proper length.

The end of the rings must come together and not overlap.

- The rings are placed in the stuffing box so that the joints of the packing rings are staggered.
- The stuffing box is furnished with a lantern ring.

After the stuffing box housing and stuffing box gland reach approximately the same temperature as the pump parts, the running-in of the stuffing box gland has been completed. If the stuffing box leaks too much, tighten it slightly and evenly while the pump is running. To ensure continuous lubrication, a few drops should always drip from the stuffing box to protect the packing or shaft sleeve against damage. See *5.7.1.1 Recommended packing* for recommendations for leakage rate. If the pump is to be left idle for a long period of time, we recommend that you replace the packing before starting the pump.

5.7.1.1 Recommended packing

Recommended stuffing box packing arrangements for use with water:

Inlet pressure range	Packing shaft/ sleeve	Leakage rate
1.0 - 300 psi (0.07 - 20.7 bar)	PTFE braided graphite synthetic lattice	40 - 60 drops/minute

5.7.1.2 Recommended repacking procedure

Recommended stuffing box packing arrangements for use with water:

1. Shut down pump.

Warning

Disconnect power to the pump driver before starting any repairs.

2. Clear a large area adjacent to the pump as a storage space for pump parts as they are dismantled.
3. Remove the gland nuts from the gland bolts (17B)
4. Remove the gland (12) The packing gland halves are separable.
5. Remove the packing rings (13) and lantern ring (29) with the packing remover tool.
6. Clean the stuffing box bore and shaft sleeve (71 and 14).

Make sure to clean around the full circumference of the shaft.

It is recommended that the Scotch-Brite pad (Peerless Pump Part No. 93230612) be used with a nylon pry bar (Peerless Pump Part No. 93232098) to easily reach into the stuffing box and shaft sleeve.

7. Check flush lines for obstructions and remove any foreign bodies.
8. Install the first three packing rings one at a time into stuffing box.

CAUTION

Make sure that the cut angled ends of the packing align together to make a square surface. Improper installation could lead to a thick packing and impact installation of other packing rings.

Stagger the cut ends by at least 90 degrees from prior ring of packing when installing. This should be done for all rings of packing

9. Install lantern ring into stuffing box.
10. Install final two rings of packing into stuffing box.

CAUTION

Make sure that the cut angled ends of the packing align together to make a square surface. Improper installation could lead to a thick packing and impact installation of other packing rings.

Stagger the cut ends by at least 90 degrees from prior ring of packing when installing. This should be done for all rings of packing

11. Place the gland in the stuffing box. Place the nuts on the gland studs and tighten to compress packing.

WARNING

Over tightening the gland nuts could cause premature packing failure.

WARNING

Installing a gland that is cocked could cause premature packing failure.

12. Reconnect power and energize the pump system placing it into stand by mode.
13. Allow water to flow thru the pump like a weekly / monthly test.
14. Allow packing to wear in by allowing significant leakage during the first hour of operation before reducing to 40-60 drops per minute for improved packing life
15. Adjust packing gland so that the drip rate of the packing should be approximately 40 - 60 drips per minute. This process could take several minutes.

5.8 Starting up the product

5.8.1 Starting the pump

1. Open the inlet valve completely and close the outlet valve completely.
2. Switch the power supply on.
3. Start the pump.
4. Immediately make a visual check of the pump and inlet pipe.
5. Allow the pump to ramp up to full speed.

6. Slowly open the outlet valve until the operational flow is achieved.
7. Check the outlet pipe for leaks.
8. Open the isolating valves for the pressure gauges.
9. Record the pressure readings.
10. Verify that the pump performance is within the tolerance of the pump performance curve.

5.8.1.1 Air in the system

Entrained air reduces pump total head and flow rate.

Use an eccentric reducer on the inlet pipe.

Return lines into tanks should terminate a minimum of two pipe diameters below the low liquid level.

5.8.1.2 Checking the driver lubrication

Before running the driver:

1. Follow the driver manufacturer instructions for lubrication requirements.
2. Ensure that the grease-lubricated bearings in the driver have been properly greased with the grade of grease recommended by the driver manufacturer.

5.8.1.3 Driver settings

Refer to the manufacturer's instructions.

5.8.1.4 Pump performance

Initial field test data becomes a valuable baseline for future troubleshooting and maintenance. It may not be possible to match the factory performance due to differences in system resistance.

Once the pump is operating, verify the following:

1. The pipe connections are tight, and no leaks are present.
2. Measure the following attributes:
   a. operating speed
   b. flow rate
   c. inlet and outlet pressure
   d. motor power input, P1.

5.9 Taking the product out of operation

1. Always close the outlet gate valve before stopping the pump. Close the valve slowly to prevent hydraulic shock.
2. Switch off and lock off the power supply to the motor.
3. For overnight or temporary shutdown periods under nonfreezing conditions, the pump may remain filled with liquid. Make sure that the pump is fully primed before restarting.
4. For long shutdown periods or to isolate the pump for maintenance, close the inlet and outlet gate valves. If no inlet gate valve is used and the pump has positive inlet pressure, drain all liquid from the inlet line to stop the liquid flow into the pump inlet.
5. If applicable, uninstall water flush lines.
6. Remove the plugs in the pump drain and vent holes, as required, and drain all liquid from the housing.
7. In case of freezing conditions during long shutdown periods, drain the pump completely and remove the packing, if applicable. Blow out all liquid passages and pockets with compressed air. Freezing of the pumped liquid can also be prevented by filling the pump with an antifreeze solution.
8. Rotate the shaft by hand monthly to coat the bearings with lubricant and impede oxidation and corrosion.
9. Follow the motor manufacturer's storage recommendations where applicable.

6. Servicing the product

6.1 Maintenance

WARNING
Electric shock
Death or serious personal injury
- Switch off the power supply before you start any work
on the product.

WARNING
Overhead load
Death or serious personal injury
- Do not attempt to lift the system or pump by the lifting lugs or eyes of the driver or pump.
- No point loads must occur.
- Do not work under a suspended system or pump.

6.2 Maintenance schedule

To ensure satisfactory operation of the pumping equipment, frequent inspection and periodic maintenance are required.

An inspection and maintenance log should be kept, and the inspector must report any problems immediately. A suggested guide for preventative maintenance for normal applications is given below. Unusual applications with abnormal heat, moisture, dust, etc., may require more frequent inspection and service.

Item	Action	Frequency
Packing	Inspect for excessive leakage	First 150 hours of operation, then every 2000 hours of operation or quarterly
	Adjust gland and replace packing	As necessary
Vibration	Check for change in vibration	Annually
Motor Bearings	Lubricate (grease)	See manufacturer's recommendation
Fasteners	Check for loose fasteners	Annually

6.2.2 Recommended spare parts

The list of recommended spare parts will depend on factors such as:

- supplier lead times,
- if the pump is used for normal or severe duty operation, and if a backup pump is available for use.

A suggested list of spare parts for intermittent or no-critical operation:

- packing (13)
- shaft sleeve (14)
- sleeve O-ring (14B)
- casing wear ring (7)
- adapter ring, if supplied (7A)
- casing gasket (73A)
- packing gland
- studs and nuts.

6.2.3 Consumables

The following items are normally used in the maintenance of pumping equipment:

- lubricant (grease or oil)
- cleaning materials
- touch-up paint or coating
- hand tools
- measuring equipment (feeler gauges, dial indicator, etc.).

Some items may vary depending on the type of unit.

6.2.4 Tightening torques

Proper tightening of fasteners is very important. The torque values depend on the size and grade of the fasteners used. The values in the table below apply to non-lubricated parts.

Fastener size	Torque [lb-ft (Nm)]	Torque [lb-ft (Nm)]
	Medium carbon steel SAE J429 Grade 5 105-120,000 psi Tensile	Medium carbon alloy steel SAE J429 Grade 8 150,000 psi Tensile
3/8-16	31 (42)	44 (60)
7/16	49 (66)	70 (95)
1/2-13	75 (102)	107 (145)
5/8-11	150 (203)	212 (287)
3/4-10	266 (361)	376 (510)
7/8-9	429 (582)	606 (822)
1-8	644 (873)	909 (1232)

When assembling a pump, cross-tighten the screws in order to avoid misalignment, binding and leakage.

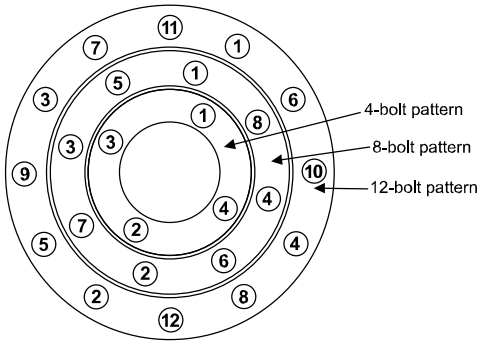

Fig. Tightening pattern for 4-, 8-, or 12-bolt flange

The shown torque value is for clean lubricated threads and gasket joints.

6.3 Dismantling the pump

WARNING
Electric shock
Death or serious personal injury
- Switch off the power supply before you start any work on the product.

WARNING
Flammable material
Death or serious personal injury
- Contact Peerless Pump for help related to removal of impellers.
- Occasionally, the impeller has either been shrunk-fit onto the pump shaft or has become difficult to remove due to corrosion.
- If heat is applied to remove the impeller, it must be applied cautiously. Before applying heat, ensure that any residual hazardous liquid trapped between the impeller and shaft has been drained and thoroughly cleaned.

Peerless Pump does not recommend reusing gaskets, O-rings, packing rings, or ball bearings.

Before dismantling the pump, obtain a set of spare parts.

1. Shut down the pump.
2. Disconnect the power supply.
3. Close isolation valves, both suction and discharge sides.
4. Clear a space adjacent to the pump for storing components.
5. Remove plug from bottom of casing and drain casing.

6. The casing (1) need not be disconnected from inlet and outlet pipes for pump disassembly. If the removal of the casing is desired, disconnect inlet and outlet pipes.
7. Remove the water seal piping (127).
8. Remove cap screws holding the adapter (71) to casing (1). Before removing rotating assembly, scribe assembly marks on casing, motor, and adapter flanges so that the unit can be reassembled in the same orientation. Remove complete rotating assembly by lifting motor from casing.

Use supplied set screw to aid in separating the adapter from the casing. After the adapter has been removed, remember to unscrew the set screw for later reassembly.

9. Insert a rod of suitable diameter and material into a passage of impeller (2) and hold while loosening impeller lockscrew (26). Remove screw and impeller washer (24A).
10. Slide impeller from end of motor shaft (6) and remove impeller key (32). If it is necessary to pry the impeller off, use a gear or wheel puller so that force is exerted on the motor shaft and not the motor bearings. Pry evenly on opposite sides of impeller where bending or denting of impeller shrouds will not occur.
11. Loosen the gland nuts (17B) and pull gland (17) out slightly to relax packing (13).
12. Remove screws and slide adapter (71) over the motor shaft. Use care not to scratch shaft sleeve (14).
13. Remove adapter ring (7A) if supplied from adapter only if damaged or worn to excess (refer to Repair).
14. Remove gland (17), packing (13) and lantern ring (29), if furnished, from the adapter.
15. Slide shaft sleeve (14). O-ring from the motor shaft.
16. Remove casing ring (7) from casing only if damaged or worn to excess (refer to Repair).
17. Clean all parts:
    a. Clean metal parts with a solvent
    b. Scrape gasket and lubricant from flanges.

Use a bristle brush.

Replace or recondition worn or defective parts if the following is observed:

a. O-rings have cracks, nicks, or tears.
b. Packing rings are excessively compressed, fraying or shredding, or embedded with particles (dirt or metal).
c. Check the entire shaft length for eccentricity with a dial indicator. Runout must not exceed 0.003 in (0.08 mm)ch.
d. Check that threads are clean and sharp.
e. Verify that the motor shaft shoulders are square and free from nicks.
f. Examine passages for cracks, dents, gouges, or embedded material.

6.3.1 Accessories

Please see the manuals supplied with the accessories.

6.4 Wear ring

Wear rings decrease the clearance between the impeller and volute to reduce the quantity of liquid leaking from the high-pressure zone, outlet, and the low-pressure zone, inlet. The rings are designed to use the pumped liquid for lubrication and to be replaced when worn to maintain optimal pump performance and service.

As the rings wear, the clearance between the impeller and the volute increases as does the amount of liquid leaking from the high-pressure to the low-pressure zone. The rate of wear depends on the characteristics of the pumped liquid. The pump will typically have a volute wear ring and can also have an impeller wear ring.

Badly worn wear rings will result in severe degradation of pump performance: head and flow rate, especially on small pumps. Examination of wear patterns can provide valuable information to diagnose pump performance or maintenance issues and determining the source of a problem.

6.5 Replacing the wear ring

Standard pumps are not supplied with impeller wear rings, and they can be installed in the field. The wear surface of the impeller is an integral part of the impeller. Impellers with worn surfaces that cannot be fitted with wear rings must be replaced.

Use the following steps to determine if the wear rings must be replaced:

1. Measure the outer diameter (OD) of the impeller wear surface or wear ring (8) and the inner diameter (ID) of the casing wear ring (7) or when supplied adapter wear ring (7a).
2. Compute the diametrical clearance and compare them with the allowed diametrical clearance.
3. If the measured clearance is out of tolerance, proceed as follows:

Ensure the ID of the casing or adapter ring is concentric with the wear ring OD, and the surface is smooth.

a. Replace the casing wear ring and impeller wear ring if the measured clearance is two times the maximum allowed clearance.

Machining the impeller wear surface may be necessary to install or replace the impeller wear rings. Ensure that the impeller OD is not reduced and is concentric with the bore of the impeller. Bronze impeller rings are shrink-fitted onto the hub according to ANSI B4.1 [FN-4]. Hardened impeller rings are installed according to ANSI B4.1 [FN-1].

b. Replace the casing or adapter wear ring if the measured clearance is out of tolerance.

6.6 Diametrical clearance

Clearances are for the standard bronze or cast iron fitted pumps. For materials with a tendency to gall such as stainless steel, increase clearances by 0.01 in (0.25 mm).

Pump size	Diametrical clearance [in (mm)]
Typical	0.015 to 0.019 (0.381 to 0.48)

6.7 Repairing the product

Visually inspect parts for damage that affects serviceability or sealing. Pay special attention to mating parts with relative motion, for example, the wear rings.

Inspection

Perform a detailed inspection as follows:

- Check O-rings and gaskets for cracks, nicks, or tears.
- Check packing rings for excessive compression, fraying or shredding, embedded particles (dirt or metal). Replace them if they are defective in any way.
- Examine motor shaft for nicks or cuts. Check runout on shaft.
- Examine the casing for cracks, dents, gouges or embedded material.

Repairs

Make needed repairs in the following manner:

- Replace casing ring (7) if the inner diameter (ID) is grooved, scored or eccentric.
- Replace impeller if wear surface is grooved, scored or eccentric.
- Replace adapter ring (7A) if wear surface is grooved, scored or eccentric.
- Replace worn shaft sleeve.
- Replace motors having excessive run-out (eccentricity).

6.8 Assembling the pump

Take care not to damage any components and avoid contamination (dirt, debris, moisture, etc.) of the unit.

Peerless Pump does not recommend reusing gaskets, O-rings, packing rings, or ball bearings.

See section "*6.2.4 Tightening torques*" for torque values.

Reassemble pump in the following manner:

1. Install shaft sleeve o-ring (130) and shaft sleeve (14) on the motor shaft while aligning sleeve slot with key slot on shaft. Make sure shaft sleeve bottoms on shaft shoulder.
2. Place adapter (71) on flat surface.
3. Install adapter ring (7A) if supplied and removed from adapter.
4. Clean the stuffing box bore in the adapter.

Make sure to clean around the full circumference of the bore.

It is recommended that the Scotch-Brite pad (Peerless Pump Part No. 93230612) be used with a nylon pry bar (Peerless Pump Part No. 93232098) to easily reach into the stuffing box and shaft sleeve.

5. Install packing in the following order, install 3 packing rings (13), the lantern ring (29), if furnished, and 2 packing rings in the adapter cavity. When lantern ring is not furnished, install 6 packing rings.

Check that the packing rings are of proper cross-section and length.

Stagger the joint of each ring at least 90° to 180° apart adjacent rings.

Be sure each ring is square with the shaft. The rings should butt tightly, but not overlap at the joints.

6. Slide adapter (71) over the motor shaft. Use care not to scratch shaft sleeve (14). Using screws attach adapter to motor.
7. Install the packing gland (17) and set the gland nuts nuts (17B) finger tight.

The stuffing box gland must not be too tight during startup in order to let sufficient liquid lubricate the shaft and the packing.

8. Rotate shaft by hand to check that it turns freely.

If motor shaft does not turn freely, loosen packing.

9. Install impeller key (32) in shaft keyway. Make sure that key enters slot in shaft sleeve. Align impeller (2) with key and install on shaft. Tap impeller hub lightly with plastic hammer to seat against shaft sleeve.
10. Install impeller washer (24A) and impeller lockscrew (26). Restrain impeller with rod inserted in one passage and securely tighten screw. Rotate shaft by hand to check for free movement.
11. Install casing ring (7) into casing (1) only if removed.
12. Replace all drain plugs if removed during disassembly.
13. Position casing gasket (73A) on adapter making sure that holes are aligned. Carefully lower complete pump rotating assembly into casing (1), keeping the impeller properly aligned to prevent binding and possible damage. If present, ensure the assembly marks align so existing orientation is maintained.
14. Install screws securing the adapter (71) to casing (1). Tighten uniformly in a star pattern. The cap screws are SAE Grade 5 and must be tightened to the following minimum torque values for dry threads (see 6.2.4 Tightening torques).

Lightly coat both sides of casing gasket (73A) with a nonhardening sealing compound, such as grease and graphite.

15. Install the water seal piping (127) between casing (1) and adapter (71).

The pipe supplying sealing liquid should be fitted tightly so that no air enters. If the pumped liquid is dirty or gritty, clean sealing liquid should be piped to the stuffing box in order to prevent damage to the packing and shaft sleeves.

Clear sealing liquid is also required if the stuffing box materials are not completely compatible with the pumped liquid. The sealing liquid should be at a pressure sufficient to ensure a flow of clean liquid into the pump, but not so high as to require excessive tightening of the packing.

16. If the pump was removed from inlet and outlet pipes, install pump into pipe following recommendations on installation section 4. Installing the product.
17. See section 5.8.1.2 for lubricating the motor.
18. Reconnect motor wiring and follow instructions 4.5 Electrical Connection.

Materials of construction, specifications, dimensions, design features, and application information, where shown in this instruction manual, are subject to change and/or modification without notice by Peerless Pump at their option.

7.0 Fault finding the product

Fault	Cause	Remedy
The outlet pressure is too low.	The speed of rotation is too low.	Reestablish the correct speed and direction of rotation.
	The system pressure is lower than anticipated.	Check the system curve.
	There is air or gas in the pumped liquid.	Remove the air from the pumped liquid.
	The wear rings are worn.	Replace the wear rings.
	The impeller is damaged.	Replace the impeller.
	The impeller diameter is too small.	Check specified diameter.
	The direction of rotation is wrong.	Check rotation, consult electrician to change rotation.
	The pump has lost its prime.	Re-prime the pump.
	There is insufficient NPSH.	Restore required NPSH.
	Passages are restricted.	Clean the impeller and casing passages.
	Joints are leaking.	• Tighten the joints • Check and replace packing or seals (if supplied). • Replace the gaskets or o-rings.
Excessive leakage at stuffing box	Joints or the stuffing box are leaking.	• Tighten the joints or the stuffing box gland. • Check and replace packing or seals (if supplied). • Replace the gaskets or o-rings.
	Leaking around shaft sleeve.	• Tighten nuts to packing gland. If necessary, add an additional ring of packing. • Replace packing and lantern ring • Check casing gasket at stuffing box area for worn or missing pieces. Replace as needed. • Check o-rings on shaft sleeve, replace as needed. • Check for plugged lantern ring ports. Clean or replace.
The inlet pressure is insufficient.	The inlet line is drawing air.	Tighten the joints.
	The suction lift is too high, or there is insufficient NPSH.	Reduce the suction lift or restore the required NPSH.
	Air or gas is trapped in the pumped liquid.	Remove the trapped air or gas from liquid.
	The strainer is clogged.	Clean the strainer.

Fault	Cause	Remedy
The noise level has increased.	Poor alignment of the pump. The inlet and outlet pipe clamps are loose.	• Reestablish proper alignment of the pump and the motor. • Support the inlet and outlet pipes. • Make sure the vibration dampers, flexible pipes, and conduit connectors are installed correctly.
	The foundation is cracked.	Repair the foundation.
	The ball bearings are worn.	Replace the worn bearings and renew the lubrication.
	The motor is unbalanced	• Disconnect the motor and operate it alone. • Clean out the pump, if necessary
	Hydraulic resonance.	• Alter the resonant pipes. • Insert a pulsation damper on the pump or the pipes. • Insert a flow straightener.
Insufficient flow.	The pump is not primed.	Prime the pump.
	The system pressure exceeds the shut-off pressure.	• Increase the liquid level on the inlet side. • Open the isolating valve in the inlet pipe.
	The speed of rotation is too low.	Reestablish the correct speed of rotation.
	The suction lift is too high, or there is insufficient NPSH.	Reduce the suction lift or restore the required NPSH.
	The casing or the impeller is clogged.	Clean the casing and the impeller passages.
	Wrong direction of rotation.	Reestablish the correct direction of rotation.
	The joints are leaking.	Tighten the joints.
	The shaft or coupling are broken.	Repair or replace damaged parts.
	The inlet valve is closed.	Slowly open the inlet valve to fully open position.
	Worn or damaged hydraulic parts.	Repair or replace the worn parts.
	Excessive clearance between the wear surfaces.	Repair or replace the wear rings.
The pump loses its prime after starting.	Joints or the stuffing box are leaking.	• Tighten the joints or the stuffing box gland. • Check and replace packing or seals (if supplied). • Replace the gaskets or o-rings.
	The suction lift is too high, or there is insufficient NPSH.	Reduce the suction lift or restore the required NPSH.
Excessive power is required.	The pump is operating beyond its recommended performance range.	Set the duty point in accordance with the recommended performance range.
	The specific gravity or viscosity of the pumped liquid is too high.	If less flow is sufficient, reduce the flow on the outlet side, or fit the pump with a more powerful motor.

Fault	Cause	Remedy
	The shaft is bent.	Replace the shaft and inspect bearings for replacement.
	The packing is too tight.	Loosen packing gland and packing. If necessary, replace packing and lantern ring.
	The impeller clearance is too small causing rubbing or worn wear surfaces.	Adjust the impeller clearance, if possible, or replace the wear ring.
	There is an electrical or mechanical defect in the motor.	Contact your local service center for diagnostics.
	The pump is restricted in its rotation.	Remove any obstacles or replace any worn parts.
	Incorrect lubrication of the motor.	Reestablish correct lubrication of the motor.

8. Parts list and sectional drawings

8.1 **PVF with integral stuffing box**

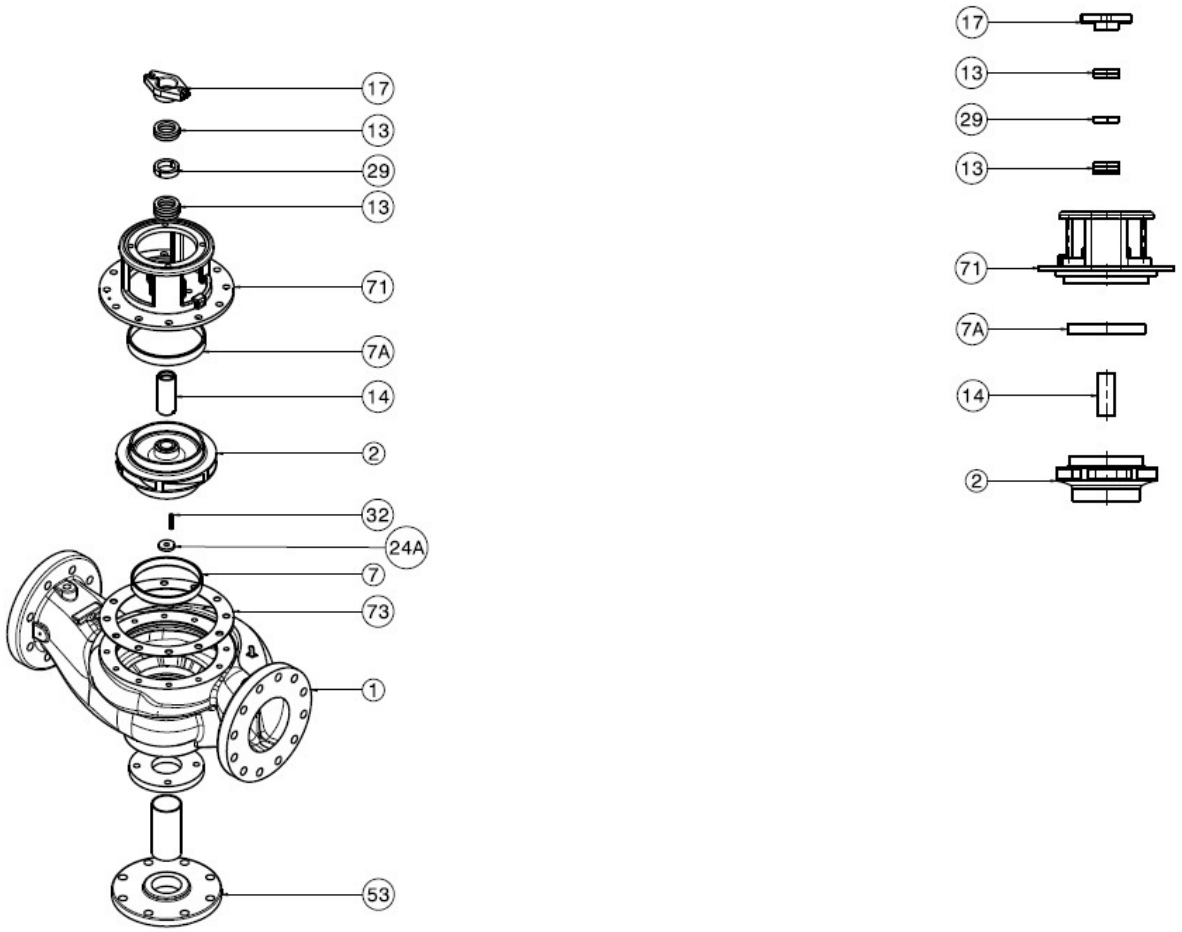

Fig.PVF with integral stuffing box packing sealed sectional drawing

Item No.	Description	Item No.	Description
1	Casing	27	Ring, stuffing-box cover
2	Impeller	29	Ring, lantern
5	Diffuser	32	Key, impeller
6	Shaft	40	Deflector
7	Ring, casing	53	Base
7A	Ring, Adapter (if supplied)	65	Seal, mechanical, stationary element
13	Packing	71	Adapter
14	Sleeve, shaft	73	Gasket
17	Gland	80	Seal, mechanical, rotating element
17B	Nut, gland studs	119	O-ring
24A	Washer, impeller screw	127	Water seal piping
26	Screw, impeller		

8.2 PVF with removable stuffing box

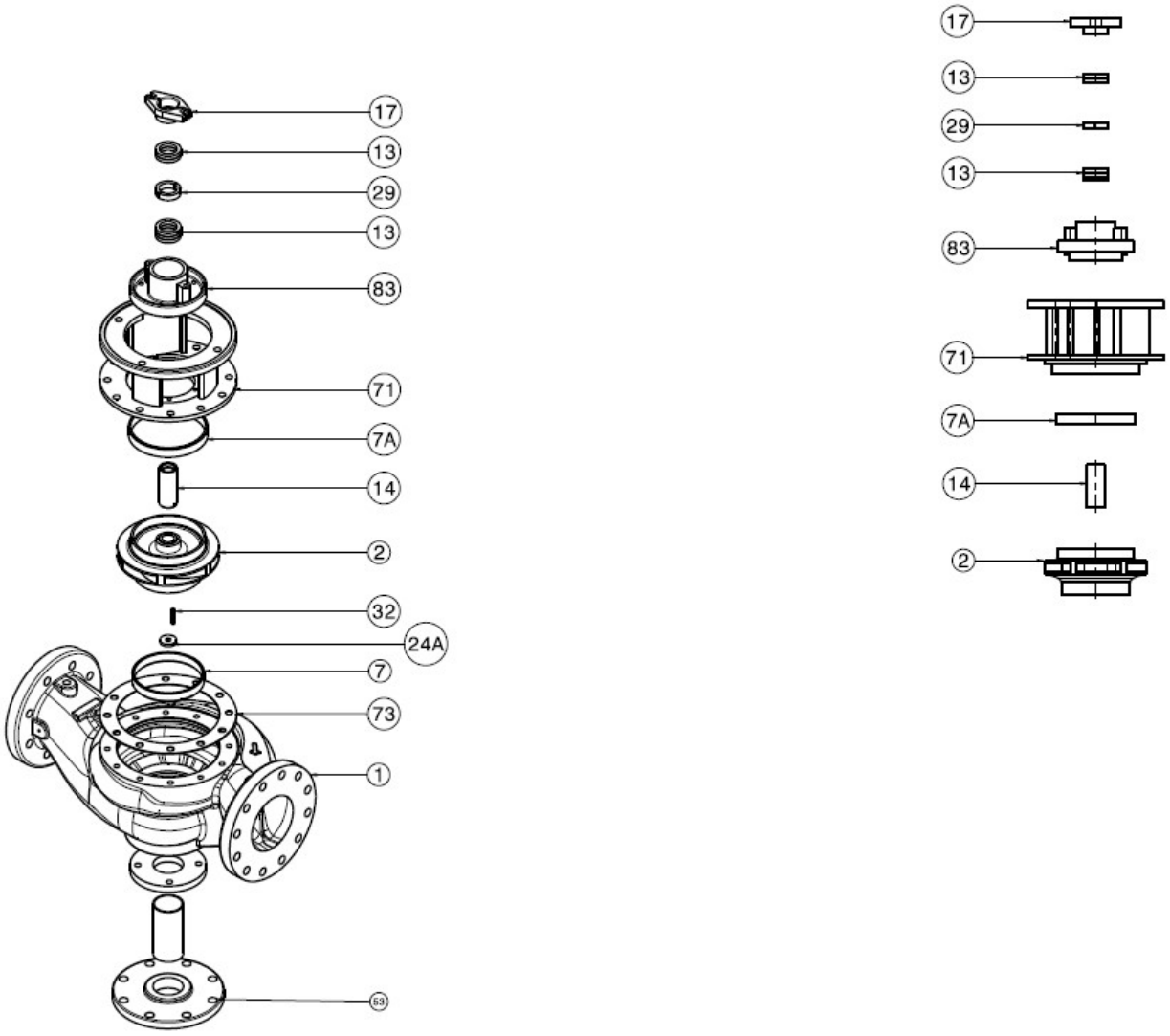

Fig.PVF with removable stuffing box packing sealed sectional drawing

Item No.	Description	Item No.	Description
1	Casing	27	Ring, stuffing-box cover
2	Impeller	29	Ring, lantern
5	Diffuser	32	Key, impeller
6	Shaft	40	Deflector
7	Ring, casing	53	Base
7A	Ring, Adapter (if supplied)	65	Seal, mechanical, stationary element
13	Packing	71	Adapter
14	Sleeve, shaft	73	Gasket
17	Gland	80	Seal, mechanical, rotating element
17B	Nut, gland studs	83	Stuffing box
24A	Washer, impeller screw	119	O-ring
26	Screw, impeller	127	Water seal piping

9. Technical data

Ambient temperature:

Consult Peerless Pump for requirements.

Liquid temperature:

Consult Peerless Pump for requirements.

Electrical data:

The supply voltage and frequency are marked on the pump nameplate.

10. Disposing of the product

This product, or parts of it, must be disposed of in an environmentally sound way.

1. Use the public or private waste collection service.
2. If this is not possible, contact Peerless Pump or service workshop.

Product: Vertical inline, single stage - Model PVF

Type: Installation, operation, and maintenance manual

IOM #: 98827323 Rev June 2025

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