GIANT PLUNGER PUMPS

Performance Under Pressure

Assembly instructions

with installation, operating and safety instructions

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1. General

1.1 Introduction

The manual contains basic instructions that must be observed during installation as well as for proper operation and for maintenance. It must be always available for use (wherever the pump is located.
It is intended for qualified personnel, operators and users who have been entrusted with the handling and operation of the pump and must be read by the designated personnel (before handling and commissioning).
In addition to these instructions, the information in the product-specific data sheet must be observed.

In these instructions, the masculine form is always used for reasons of simplified readability.
Giant Industries, Toledo, Ohio accepts no liability in the event of non-observance of the information given in these instructions.

1.2 Copyright

All copyrights to this manual and the associated documents remain with Giant Industries, Inc.

1.3 Marking of instructions in the manual and on the pump

In the documents and on the pump, the following markings are used for important notes and warnings.

Instructions which, if not observed, may cause danger to the pump and its functions.

Safety instructions which, if not observed, may cause danger to persons.

- Rotation arrow
- Marking of fluid connections
- Type plate with indication of the permissible operating data

The markings and warnings on the pump must be kept in a fully readable condition.

2. Safety

2.1 General

In addition to the safety instructions mentioned in this document, the specifications in the associated documents of the Giant Industries' pumps and, if applicable, national as well as internal regulations of the operator (e.g. accident prevention, work, operating and safety regulations, etc.) must also be observed.
Compliance with the relevant safety regulations must be ensured by the machine manufacturer or the user.

2.2 Personnel qualification and training

The personnel for handling and operation must have the appropriate qualification for this work.
The scope of responsibility, competence and supervision of the personnel must be precisely regulated by the plant operator. If the personnel do not have the necessary knowledge, they must be trained and instructed. If necessary, this may be performed by the manufacturer / supplier on behalf of the plant operator of the machine. Furthermore, the operator must ensure that the contents of the instructions are fully understood by the personnel.

2.3 Hazards due to non-compliance of the safety instructions

Non-compliance of the safety instructions may endanger persons as well as the environment and the pump and results in a loss of any claims for damages.

In detail, non-compliance can result in the following hazards, for example:

- Failure of important functions of the pump
- Failure of specified procedures of maintenance and repair
- Exposure of persons to electrical, mechanical and chemical hazards
- Endangering the environment due to leakage of hazardous substances

2.4 Safety instructions for the operator / user

- The pump must be equipped on the high pressure side with a safety valve or other hydraulic or mechanical device (e.g. rupture discs) to prevent against overpressure, which ensures that the maximum permissible operating pressure cannot be exceeded by more than 10%.
- Pressure-bearing components such as hoses, screw fittings, etc. must be designed for the maximum permissible operating pressure and selected in accordance with the thermal chemical and mechanical load.

- Do not install a shut-off valve between the pump and the safety valve or other device to prevent overpressure.

- Moving parts must be provided with a touch guard (e.g. gear cover, shaft protector, coupling guard, belt guard, plunger cover), which must not be removed when the pump is in operation. Contact to non-protected and moving parts (e.g. plunger on the underside between valve casing and crankcase; not for all pump types) must be ensured on the part of the operator.
- Leakages (e.g. at shaft seals) of hazardous pumped media (e.g. explosive, toxic, hot) must be discharged in such a way that there is no danger to persons or the environment. Legal regulations must be complied with.

- During longer-term operation or operation with hot media, the surface of the product (primarily the crankcase or, in the case of hot water operation, also the valve casing) can heat up. Protect these areas against contact. Danger of burns!

2.5 Safety instructions for assembly, maintenance and inspection

The operator must ensure that all assembly, maintenance and inspection work is performed by authorised and qualified personnel who have adequately informed themselves by studying these instructions in detail.

- Before working on the pump, disconnect the power supply and lock it against restarting.
- Depressurise the system and close the suction and supply lines!
- Pumps pumping media that are hazardous to health must be decontaminated (before working on them). Use personal protective equipment!
- Check surface temperature, wait for product to cool down.
- Only use screw connections with suitable strength classes, observe the required tightening torques.
- Machine parts that are not properly aligned or tensioned can break and be slung away.
- Immediately, after completion of the work, all safety and protective devices must be refitted or put into operation.

Before restarting, the points mentioned in section 6. "Putting into operation" must be observed.

2.6 Unauthorised modifications and spare parts

Modifications or changes to the pump are only permitted after consultation with the manufacturer. Original spare parts and accessories authorised by the manufacturer are used for safety. The use of other parts cancels the liability for the resulting consequences.

2.7 Intended use

The operational safety of the pump supplied is only guaranteed if it is used as intended in accordance with the following sections of the instructions or the uses specified in the product-specific data sheets or the conditions agreed separately in the purchase contract.
The limit values specified in the data sheet or on the type plate (e.g. pressure, temperature and speed limits) must not be exceeded.
The pump is intended for installation in a machine or for assembly with other machines to create a complete machine.

Non-compliance with legal regulations and exceeding the limit values invalidates any warranty!

2.8 Predictable misuse

- Operation without suitable safety device
- Operation outside the specified performance range (pressure/speed/temperature)
- Operation without sufficient water supply
- Conveying of unsuitable media

3 Description

3.1 Fields of application

Giant Industries' pumps are suitable for pumping clean water or other non-aggressive or abrasive media with similar physical properties as water.
For deviating fields of application of the Giant Industries' pumps, please refer to the product-specific data sheets.
Before pumping other fluids, the suitability and resistance of the pumps in standard or special design must be checked; this includes considering the performance and temperature values.
The use of the pumps for other liquids than those specified in the product-specific data sheets, in particular flammable, explosive or toxic media, requires the written consent of the manufacturer Giant Industries, Inc., Toledo.
For other media we offer pumps in special designs.

3.2 Design and mode of action

Giant Industries' pumps are oscillating piston pumps consisting of drive and pump head.
The displacement unit consists of a crankshaft with connecting rods running in an oil bath and plunger.
Sealing in the pump head is realized by plunger sealing and partially with leakage recirculation.
All seals are held in sleeves, thus ensuring the exact centering with facilitated replacement.
The suction and pressure valves are easily accessible via plugs.

3.3 Technical data and dimensions

The technical data and dimensions of the Giant Industries' pumps can be found in the product-specific data sheets.
The maximum limit values (e.g. pressure, temperature and speed limits) specified in the data sheet or on the type plate must not be exceeded.
Up to half the nominal speed of the pump, the full operating pressure can be used; other speed and pressure combinations must be requested from the manufacturer.
Performance data are specified for intermittent operation, data for continuous operation on request.
Intermittent operation means that the pump is operated under full load for maximum of 50 % of a shift (8 hours), whereby the load change intervals should be maximum 30 minutes full load / 30 minutes idle or standstill.
Anything beyond this is considered as continuous operation.

The triplex plunger pumps have a linear characteristic directly proportional to the pump speed, which is almost independent of the pressure. The flow rate is determined solely by the pump speed.
Taking into account the pump efficiency and the losses during power transmission (e.g. by means of a flexible coupling or belt), the following formula can be used to estimate the required shaft power:

$$P\,[kW] = \frac{p\,[bar] \times Q\,[\frac{l}{min}]}{475} \qquad P\,[hp] = \frac{p\,(PSI) \times Q\,(GPM)}{1450}$$

4. Transport and Storage

- Note the center of gravity of the load, not all products are centered on the slinging options.
  Only use undamaged load lifting and slinging equipment in accordance with accident prevention regulations.
- When lifting the pump, make sure that the load lifting and slinging equipment is secure (as slipping and tipping is possible).
- If necessary, use the eyebolt on the pump as an attachment point.
- Select load suspension and slinging equipment according to the weight of the pump (see product-specific data sheet).

The pump is packed and transported in cardboard boxes or wooden crates. When unpacking, check for damage.
If transport damage is visible, please immediately report it to the shipping company.
Avoid long-term storage in an environment with high humidity and at temperatures below freezing.
If not avoidable, drain the pump completely (pumped medium) to avoid frost damages.
See section 7.1. and, if applicable, information in the product-specific data sheet.

5. Installation

5.1 Pump

The pump should be freely accessible from all sides for easy maintenance. Ensure that there is enough distance between the valve housing and the interference contours so that the valves can be replaced.

The pump must be installed horizontally to ensure optimum lubrication in the drive.

The installation site must be frost-proof, dry and dust free. It should also be ventilated to avoid condensation in the pump.

If the pump is mounted freely on a vehicle, for example, it must be considered that the pumped medium in the pump can freeze due to the airstream even at temperatures above freezing point.

When connecting the motor, observe the required direction of rotation of the pump gear (see direction of rotation arrow on the drive housing or information in the product-specific data sheet).

To prevent accidents, a belt / coupling / shaft guard that complies with the applicable accident prevention regulations must be fitted to each pump.

5.2 Turn drive or drive shaft

Pumps with a one-sided drive shaft are supplied from the factory with the shaft end on the left as seen from the rear.
For installation reasons, the drive shaft can be modified to the right.
Carry out the modification in accordance with the installation instructions in the product-specific data sheet.

5.3 Mounting drive elements

The drive elements (tension bushings, belt pulleys, coupling claws) may only be mounted or dismounted using suitable tools.

To avoid damaging the bearings, do not hammer the drive elements.

If necessary, heat the coupling claws before mounting (risk of burns!).

In addition, observe the installation instructions of the motor and drive element manufacturers.

If the drive elements are operated without being mounted, the key may be thrown out.
This can lead to death or serious injury.

5.4 Suction line

Connect the suction line to the intended suction connection of the pump
(see "Dimensions" section in the pump data sheet).
Interchanging the suction and discharge connections can cause the suction line to burst!

Faultless operation of the pump is largely dependent on the suction line being laid correctly and carefully. In order to exclude so-called air pockets, the suction line to the pump must be laid continuously rising, or at least horizontally. The suction line must be absolutely tight and the cross-section must be at least as large as the pump connection. Only use bends, not elbows. Avoid suction and delivery of air or air-water mixture as well as cavitation (see also section 5.5).

Due to its design, the plunger pump generates pulsations of the medium in the suction and discharge lines. In particular, the suction pulsation must be damped to avoid resonance in the suction line and the resulting cavitation. Never use an inflexible pipe for the inlet to the pump, but an elastic (non-reinforced) hose (preferably with 1.5 to 2 times the nominal diameter of the suction connection).

If a pre-pressure pump is used, install a hose between the pre-pressure pump and the high-pressure pump.

If several pumps are used, each pump must be fed by its own suction line.

If this is not possible, a suction air vessel or suction flow stabilizer must be installed upstream of each pump.

The adjustment of the gas pressure pre-tension of the diaphragm in the stabilizer must be done on site.

To avoid operational disturbances, the installation of a filter is recommended (Mesh sizes can be found in the product-specific data sheet).

Brace heavy suction lines to reduce the load effect on the pump.

The recommended maximum flow velocities in the suction line should not exceed 3.28 ft/s (1m/s).

5.5 Suction head / Inlet pressure

Observe NPSH value (see product-specific data sheet), Risk of cavitation occurring!
NPSHA > NPSHR!
NPSHR is the minimum required overpressure above the vapour pressure of the medium. This pressure must never be undershot at the suction inlet of the pump.
For this purpose, the temperature and the vapour pressure of the medium corresponding to this temperature, the geodetic height of the installation site as well as the flow and friction resistances of the suction line must be considered. If necessary, a centrifugal pump must be installed in the suction line to increase the pressure.

The maximum supply pressure can be found in the product-specific data sheet.

Cavitation or compression of gases produces uncontrollable pressure surges and can destroy pump and system parts and endanger operating personnel!

5.6 Discharge line

When dimensioning the connection components, observe the maximum operating pressure of the system.
Connect the discharge line to the intended discharge connection of the pump
(see the "Dimensions" section on the pump data sheet).
Interchanging the suction and discharge connections can cause the suction line to burst!
To decouple the pressure line from mechanical vibrations of the pump and to reduce pressure surges, the connection should be made with a flexible high-pressure hose.

Before putting the system into operation, bleed any pressure in the pump and, if necessary, the cooling system and the system parts on the discharge side of the pressure. Although the pumps run with low pulsation, it must be checked. Depending on the design of the system, a pressure accumulator might be needed. This essentially depends on the design of the unit and the overall operating conditions.

Brace heavy discharge lines to reduce the load effect on the pump.
With regard to further safety instructions, **see point 2.4** of these assembly instructions.

6. Putting into Operation

6.1 Pump - Fill up oil

The pump may or may not be delivered with gear oil. The pumps supplied with oil are fitted with a plug to prevent the oil from leaking out, which must be replaced with the dipstick with ventilation hole before commissioning

For oil quality and filling quantity, see the product-specific data sheet. Especially when operating the pump on vehicles (inclined positions possible) and / or low speeds as well as low ambient temperatures, observe separate lubrication specifications according to the product-specific data sheet.

6.2 Pump - hydraulic connection

Check that the water inlet on the suction side is free of malfunctions (e.g. shut-off valve open, filter not clogged, suction lines not compressed).

6.3 Pump / Plant

- Ensure that all pressure-bearing components are suitable for the maximum operating pressure and are properly mounted. (Check the safety valve).
- Open all gate valves and other shut-off devices.
- Before commissioning, check the motor-pump alignment, both for direct coupling and for V-belt drive; correct (if necessary).
- Start the drive motor briefly to check the direction of rotation. Observe the prescribed direction of rotation of the pump, which is indicated by arrows on the drive housing and described in the pump data sheet.
- All protective devices should be mounted and activated.
- Open water inlet / start primary pressure pump.

7. Operation

7.1 Pump

If it is not possible to install the pump and adjacent system parts (in particular the pressure regulating or safety valve) in a frost-proof room, the pump as well as, if available, the cooling system and system parts must be carefully drained after operation has ended.
The second, unused pressure connection and, if available, the plug at the bottom of the suction channel can be used for draining. For this purpose, the pump can run "dry" for approx. 1-2 minutes.
For further information, please refer to the product-specific data sheet.
If the pump is mounted freely on a vehicle, for example, it must be noted that the pumped medium in the pump can freeze due to the airstream (even if temperature is above freezing point).

During longer-term operation or operation with hot media, the surfaces of the product (primarily the crankcase or, in the case of hot water operation, also the valve casing) can heat up. Protect these areas against contact. Danger of burns!

8. Maintenance and Servicing

Before working on the pump, disconnect the power supply and lock it against restarting.
Depressurize the system and close the suction and supply lines!

Pumps pumping media that are hazardous to health must be decontaminated before working on them. Use personal protective equipment!

During longer-term operation or operation with hot media, the surfaces of the product (primarily the crankcase or, in the case of hot water operation, also the valve casing) can heat up. Before working on the pump, the surfaces of the pump must cool down to room temperature.
Danger of burns!

8.1 Oil Filling

Refer to the product-specific data sheet for filling quantity, oil quality and change intervals.
Observe the safety data sheet (e.g. regarding waste disposal) of the oil!
When operating in humid environments or with high temperature fluctuations, **condensation** can form in the crankcase (frothy oil, milky discoloration).
Immediately, change the oil.

8.2 Pump Head / Valve Casing

Before dismantling, secure the pump head / valve casing against falling down (e.g. by placing squared timbers underneath or fixing with a pulley).

8.3 Suction and Discharge Valves

The surfaces of the valve seat and valve plate wear out due to the valve frequency and the nature of the medium. Worn valves manifest themselves in irregular flow and pressure behaviour of the pump and should then be replaced.
See the installation instructions in the product-specific data sheet.

8.4 Seals

The seal life is strongly dependent on the operating conditions such as medium temperature, medium condition, pump speed and pressure.
It is recommended to check the pump regularly for leakage. A few drops of leakage per minute are permissible (if this does not cause the gear oil to mix with water), e.g., by carrying steam into the drive. In the event of greater leakage, which can also lead to a drop in pressure, the seals must be replaced in a reasonable amount of time.
When the pump is not in use, the seals can dry out, become brittle or harden, so that leakage can occur during commissioning. In the former case, however, this almost completely disappears as soon as the seals have absorbed moisture and swelling of the seals has occurred. Otherwise, the seals must be replaced.

For repairs, see the installation instructions in the product-specific data sheet.

8.5 Drive

For repairs, see the installation instructions in the product-specific data sheet.

8.6 Return delivery for repair

Before returning the pump, request the form "Declaration of condition of a returned component" from Giant (page 11).
Enclose the completed form with the pump to be returned.

9. Out of Operation

Before working on the pump, disconnect the power supply and lock it against restarting. Depressurise the system and close the suction and supply lines!

Pumps pumping media that are hazardous to health must be decontaminated before working on them. Use of personal protective equipment!

Drain pump according to section 7.1.
For storage, see instructions in section 4.

10. Dismantling / Disposal

Before working on the pump, disconnect the power supply and lock it against restarting. Depressurise the system and close the suction and supply lines!

Drain the pump according to section 7.1 a). Make sure that pumps that pump media that are hazardous to health are decontaminated before working on them.
Drain oil, empty residual media in the pump and dispose of properly.
Remove plastic parts / seals, dismantle metal components and dispose of them separately in a proper manner.

11. Malfunctions / Remedy

Before analysing the fault, please first check the operating conditions to be observed in accordance with the product-specific data sheet (e.g. maximum pressure, speed, inlet conditions, condition of the pumped medium).

Before working on the pump, disconnect the power supply and lock it against restarting. Depressurise the system and close the suction and supply lines!

Set the pump out of operation if the following signs occur:

- unusual noise or odor emission
- Increased surface temperature, vibrations or power consumption
- leaking medium or operating liquid
- releasing safety devices (e.g. safety valve)

These signs can cause malfunctions that can result in death, serious physical injuries or material damage.

Further information on troubleshooting can be found in the product-specific data sheet.

Malfunction		**Cause**		**Remedy**
1	Pressure or flow rate decreases or is not reached and / or Leakage (pumped medium) between crankcase and valve casing	a)	Insufficient inlet at the suction connection	Increase suction height (NPSHa > NPSHr) Reduce the flow resistance in the suction line. Clean suction filter if necessary Increase flow pressure Check the position of the shut-off valve
		b)	Plunger seals (V-sleeves) worn or defective	Check the surface of the plunger Replace seals If the pumped medium is contaminated, install a suction filter if necessary
		c)	Ceramic plunger damaged (e.g. due to thermal or mechanical stress, cavitation, overload)	Replace ceramic plunger
2	Leakage (pumped medium) at the valve plugs	a)	Seal on valve plug leaking	Check sealing surfaces and O-ring for damage Replace O-rings or damaged parts if necessary
		b)	Valve casing expanded due to overpressure or frost action	Replace valve casing and plug
3	Pressure decreases, pump becomes noisy	a)	Discharge or suction valve leaking or jammed	Clean valves, install suction filter if necessary. Check sealing surfaces on the valves, replace valves if necessary
		b)	Gas bubble formation (cavitation)	Increase suction height (NPSHa > NPSHr) Reduce flow resistance in the suction line (e.g. by increasing the inlet cross-section). Clean the suction filter if necessary Reduce water temperature Increase the inlet pressure, install a pre-pressure pump if necessary

Malfunction		Cause		Remedy
4	Pressure is irregular, pulsations in the suction line / discharge line	a)	Pump sucks air	Check suction line and connections for leaks or water supply
		b)	Valves worn	Check sealing surfaces on the valves, replace valves if necessary If the pumped medium is contaminated, install a suction filter if necessary.
		c)	O-rings on the valves or in the valve adaptors defective	Check sealing surfaces for damage (e.g. due to corrosion). Replace O-rings or damaged parts.
		d)	Valve spring broken	Replace valve spring
5	Oil leakage between crankcase and valve casing	a)	Oil seal on crankcase worn or defective	Check the seal and surface of the plunger Replace oil seals
		b)	Plunger surface damaged (scoring)	Replace plunger
6	Oil leakage at the crankshaft	a)	Radial shaft seal ring leaking or crankshaft sealing surface damaged	Check seal and crankshaft surface If necessary, replace the seal or crankshaft
		b)	Bearing cover seal leaking (O-ring squeezed or damaged)	Check sealing surfaces for damage Replace the bearing cover sealing ring and, if necessary, the bearing cover or crankcase
7	Dirty, milky foamed oil	a)	Oil mixed with water or pumped medium	Change oil immediately Determine and eliminate the cause (e.g. condensation, leaks in the water unit)
8	Noise increase without pressure decrease	a)	Bearings defective or worn	Dismantle gearbox, check all parts for wear or damage, replace parts if necessary. Check oil level. If the service life is too short, check whether there is an overload or the oil change intervals were too long. Use only specified oils.

In the case of non-assignable faults, please contact the technical support.

GIANT

Occupational Health and Safety	Issue Date:
Risk Assessment / Stress Assessment	Repair Used Components

Declaration of condition of a returned component (pump/unloader unit)
This risk assessment must be transmitted to the recipient before the actual shipment of the components(s)!

Recipient:
Giant Industries
900 N Westwood Ave
Toledo, OH 43607

Phone: 419-531-4600
Fax: 419-531-6836
E-mail: sales@giantpumps.com

Customer / Shipper / Operator:

Contact person / company / department:
Name:
Phone:
Fax:
E-mail:

Component	Type	Serial Number	Year of Manufacture

Due to legal regulations (Occupational Health and Safety Act, Hazardous Substances/Biological Substances Ordinance, etc.), it is necessary, among other things, to carry out a risk assessment when handling working and hazardous substances.
For this purpose, it is necessary to determine the identity of the medium conveyed in the component.
Please complete the following information and return it to the above address. If available, please include or send us the corresponding safety data sheet. Until delivery, the goods travel at the risk of the sender! The sender is liable for material damage and personal injury caused by non-observance of the legal regulations or due to untrue or omitted information in the risk assessment.

If the components are heavily soiled or not rinsed, the component(s) will be returned to the sender at the sender's expense. We reserve the right to reject the component(s)!

Pumped medium (trade name, product number, mixture designation, ingredients):

☐ no hazardous substance according to the regulation on hazardous substance

☐ no biological substance according to the regulation on biological substances

Classification of the pumped medium (if hazardous/bio-substance according to regulation on hazardous substance / regulation on biological substances or CLP/SDS regulation):

☐ explosive
☐ extremely flammable
☐ easily flammable
☐ oxidizing
☐ corrosive
☐ highly toxic
☐ toxic
☐ irritant
☐ harmful to health
☐ carcinogenic mutagenic, toxic for reproduction
☐ dangerous to the environment
☐ H-/R- phrases
☐ P-/S- phrases

Recommended personal protective equipment or protective measures (e.g. fire / explosive protection):

□ Chemical protection gloves
□ Protective goggles
□ Face protection
☐ Other protective measures
☐ Safety data sheet enclosed or transmitted

The component/components must be rinsed and cleaned before shipping! The gear oil must be drained. So that no oil or other liquids can escape during transport.

☐ Rinsing and cleaning performed. Used rinsing / cleaning substance:

Remarks / error description:

☐ water / medium leakage
☐ gearbox oil leakage
☐ no pressure / pressure pulsation
☐ medium in the gear oil
☐ crankshaft
☐ plunger / pump head

Confirmation customer / shipper / operator:

Date Name Signature

Verification Recipient:

Date Name Signature