



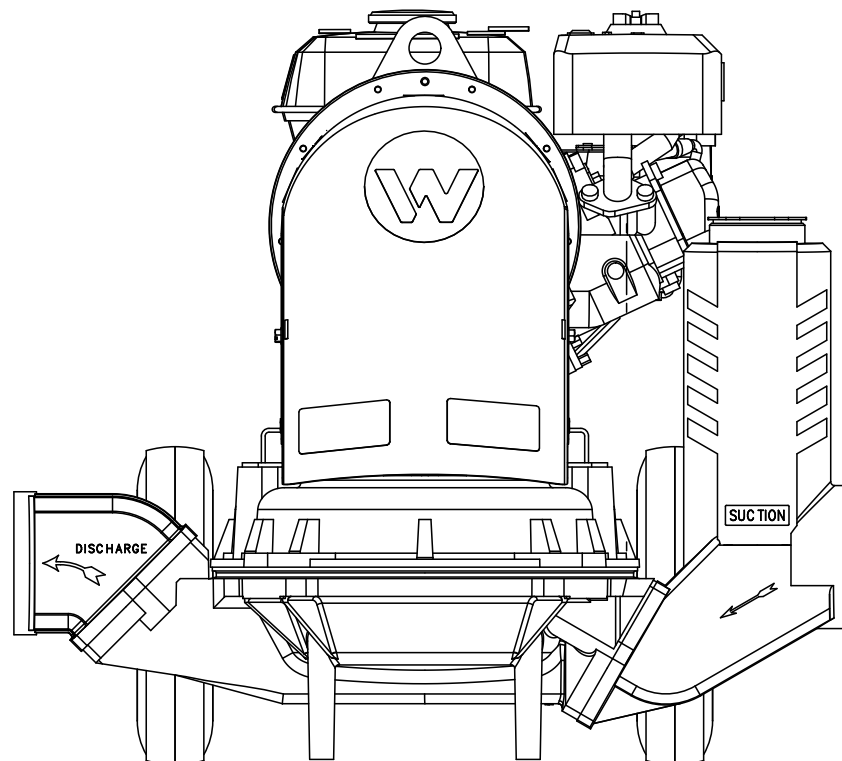
**WACKER  
NEUSON**

*all it takes!*

## Operator's Manual

### Pump

# PD12A, PD13A, PDT2A, PDT3A



**Machine Type**  
**Material Number**  
**Version**  
**Date**  
**Language**

**Diaphragm Pump**  
**5100077953**  
**01**  
**03/2024**  
**[en-US]**

## **Imprint**

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## California Proposition 65 Warning



### **⚠ WARNING**

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.



### **⚠ WARNING**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.



### **⚠ WARNING**

Cancer and Reproductive Harm  
[www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



### **⚠ WARNING**

Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. WASH HANDS AFTER HANDLING.



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# 1 Foreword

## 1.1 Machine Identification

The following machines and variants/options are described:

Machine	Item Number
PDT2A	5100075510
PDI2A(I)	5100075511
PDT3A	5100075507
PDI3A	5100075508
PDI3A(I)	5100075509

### Machine identification

A nameplate listing the model number, item number, revision, and serial number is attached to this machine. The location of the nameplate is shown below.

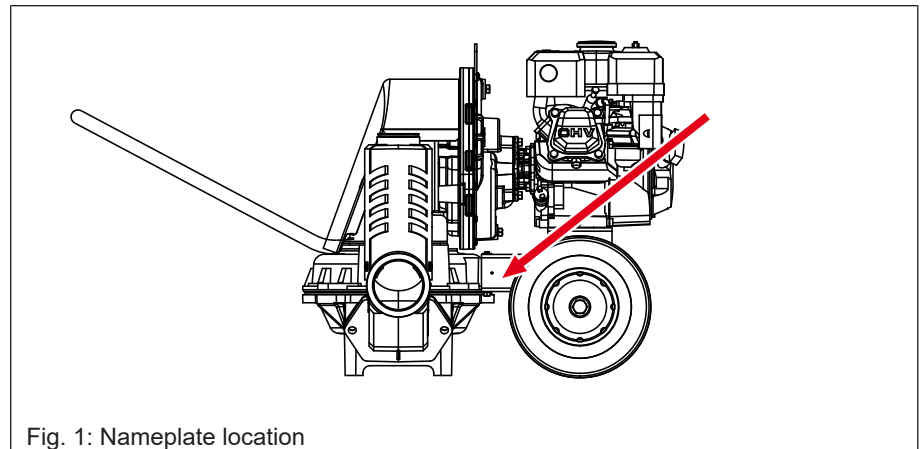


Fig. 1: Nameplate location

### Serial number (S/N)

For future reference, record the serial number in the space provided below. You will need the serial number when requesting parts or service for this machine.

Serial number:

## 1.2 Machine Documentation

Keep a copy of the operator's manual with the machine at all times.

From this point forward in this documentation, Wacker Neuson America Corporation will be referred to as Wacker Neuson or the manufacturer.

For spare parts information, please see your Wacker Neuson dealer, or visit the Wacker Neuson website at <http://www.wackerneuson.com/>.

When ordering parts or requesting service information, be prepared to provide the machine model number, item number, and serial number.

## 1.3 Expectations for Information in This Manual

This manual provides information and procedures to safely operate and maintain this machine. For your own safety and to reduce the risk of injury, carefully read, understand, and observe all instructions described in this manual.

The manufacturer expressly reserves the right to make technical modifications, even without notice, which improve the performance or safety standards of its machines.

The information contained in this manual is based on machines manufactured up until the time of publication. The manufacturer reserves the right to change any portion of this information without notice.

The illustrations, parts, and procedures in this manual refer to the manufacturer's factory-installed components. Your machine may vary depending on the requirements of your specific region.

## 1.4 Manufacturer's Approval

This manual contains references to approved parts, attachments, and modifications. The following definitions apply:

- Approved parts or attachments are those either manufactured or provided by the manufacturer.
- Approved modifications are those performed by an authorized service center according to written instructions published by the manufacturer.
- Unapproved parts, attachments, and modifications are those that do not meet the approved criteria.

Unapproved parts, attachments, or modifications may have the following consequences:

- Serious injury hazards to the operator and persons in the work area
- Permanent damage to the machine which will not be covered under warranty

Contact your dealer immediately if you have questions about approved or unapproved parts, attachments, or modifications.



## 2 Usage

### 2.1 Intended Use

This machine is intended to be used for general de-watering applications. This machine is intended for the pumping of clear water, or water containing solids up to the size stated within the product specifications, and up to the flow, head, and suction lift limits also stated within the product specifications.

### 2.2 Unintended Use

This machine has been designed and built strictly for the intended use described above. Using the machine for any other purpose could permanently damage the machine or seriously injure the operator or other persons in the area. Machine damage caused by misuse is not covered under warranty.

The following are some examples of misuse:

- Pumping flammable, explosive, or corrosive fluids
- Pumping hot or volatile fluids that result in pump cavitation
- Operating the pump outside of product specifications due to incorrect diameter hoses, incorrect length hoses, other inlet or outlet restrictions, or excessive suction lift or head
- Using the machine as a ladder, support, or work surface
- Operating the machine outside of factory specifications
- Operating the machine in a manner inconsistent with all warnings found on the machine and in the operator's manual

### 2.3 Residual Risks

This machine has been designed and built in accordance with the latest global safety standards. It has been carefully engineered to eliminate hazards as far as practicable and to increase operator safety through protective guards and labeling.

However, some risks may remain even after protective measures have been taken. They are called residual risks. On this machine, they may include exposure to:

- Heat, noise, exhaust, and carbon monoxide from the engine
- Fire hazards from improper refueling techniques
- Fuel and its fumes
- Personal injury from improper lifting techniques
- Projectile hazard from discharge
- Crushing hazards from a tipping or falling pump

To protect yourself and others, make sure you thoroughly read and understand the safety information presented in this manual before operating the machine.

## 3 Safety

### 3.1 Signal Words Used in This Manual

This manual contains DANGER, WARNING, CAUTION, *NOTICE*, and NOTE signal words which must be followed to reduce the possibility of personal injury, damage to the equipment, or improper service.



#### **⚠ DANGER**

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

- ▶ To avoid death or serious injury from this type of hazard, obey all safety messages that follow this signal word.



#### **⚠ WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.

- ▶ To avoid possible death or serious injury from this type of hazard, obey all safety messages that follow this signal word.



#### **⚠ CAUTION**

**CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

- ▶ To avoid possible minor or moderate injury from this type of hazard, obey all safety messages that follow this signal word.



#### **NOTICE**

**NOTICE** identifies a situation that causes damage if it is not observed.

- ▶ To avoid possible damage from this type of hazard, obey all safety messages that follow this signal word.

**Note:** A Note contains additional information important to a procedure.

### 3.2 Safety Guidelines for Operating the Machine

#### **Operator and service training, knowledge, and qualifications**

Before operating, maintaining, or servicing the machine:

- Familiarize yourself with the location and proper use of all controls and safety devices.
- Know the rules for the jobsite.
- Contact Wacker Neuson for additional training if necessary.

When operating this machine:

- Do not allow improperly trained people to operate the machine.
- People operating the machine must be familiar with the potential risks and hazards associated with it.
- Follow legal and other mandatory regulations relevant to accident prevention and environmental protection. These may include handling hazardous substances, issuing and/or wearing PPE, or obeying traffic regulations.

The machine must not be accessed or operated by:

- Children
- People impaired by alcohol, drugs, or prescription drugs

### **Application area**

Be aware of the application area.

- Keep unauthorized personnel, children, and pets away from the machine.
- Remain aware of changing positions and the movement of other equipment and personnel in the application area/job site.
- Identify whether special hazards exist in the application area, such as toxic gases or unstable ground conditions, and take appropriate action to eliminate the special hazards before using the machine.
- Do not operate the machine in areas that contain flammable objects, fuels, or products that produce flammable vapors.
- Keep the area around the muffler free of debris such as leaves, paper, cartons, etc. A hot muffler could ignite the debris and start a fire.

### **Safety devices, controls, and attachments**

Only operate the machine when:

- All safety devices and guards are in place and in working order.
- All controls operate correctly.
- The machine is set up correctly according to the instructions in the operator's manual.
- The machine is clean.
- The machine's labels are legible.

To ensure safe operation of the machine:

- Do not operate the machine if any safety devices or guards are missing or inoperative.
- Do not modify or defeat the safety devices.
- Only use accessories or attachments that are approved by the manufacturer.

### **Safe operating practices**

When operating this machine:

- Ensure that the machine is on a firm, level surface and that it will not tip, roll, slide, or fall while operating.
- Do not pump volatile, flammable, or low-flash-point fluids.
- Do not change hoses while the engine is running.
- Do not attempt to move the machine while the engine is running.

### Personal protective equipment (PPE)

Wear the following PPE while operating, servicing, or maintaining this machine:

- Close-fitting work clothes that do not hinder movement
- Safety glasses with side shields
- Hearing protection
- Safety-toed footwear

In addition, before servicing or maintaining the machine:

- Tie back long hair.
- Remove all jewelry (including rings).

### Operation

- Remain aware of the machine's moving parts. Keep hands, feet, and loose clothing away from the machine's moving parts.
- Do not consume the operating fluids used in this machine. Depending on your machine model, these operating fluids may include water, wetting agents, fuel (gasoline, diesel, kerosene, propane, or natural gas), oil, coolant, hydraulic fluid, heat transfer fluid (propylene glycol with additives), battery acid, or grease.

### After use

- Stop the engine when the machine is not being operated.
- Close the fuel valve on engines equipped with one when the machine is not being operated.
- Ensure that the machine will not tip over, roll, slide, or fall when not being operated.
- Store the machine properly when it is not being used. The machine should be stored in a clean location out of the reach of children.

## 3.3 Safety Guidelines for Using Internal Combustion Engines



### **WARNING**

#### Personal injury hazard

Failure to follow the warnings and safety standards during operation and fueling could result in severe injury or death.

- ▶ Read and follow the warning instructions in the engine owner's manual and the safety guidelines below.

**Running the engine**

- Keep the area around the exhaust pipe free of flammable materials.
- Check the fuel lines and the fuel tank for leaks and cracks before starting the engine. Do not run the machine if fuel leaks are present or the fuel lines are loose.
- Do not smoke while operating the machine.
- Do not run the engine near sparks or open flames.
- Do not touch the engine or muffler while the engine is running or immediately after it has been turned off.
- Do not operate a machine when its fuel cap is loose or missing.
- Do not start the engine if fuel has spilled or a fuel odor is present. Move the machine away from the spill and wipe the machine dry before starting.
- Do not use the machine in areas with a risk of explosion or fire.

**Refueling safety**

- Clean up any spilled fuel immediately.
- Refill the fuel tank in a well-ventilated area.
- Replace the fuel tank cap after refueling.
- Use suitable tools for refueling (for example, a fuel hose or funnel).
- Do not smoke.
- Do not refuel a hot or running engine.
- Do not refuel the engine near sparks or open flames.

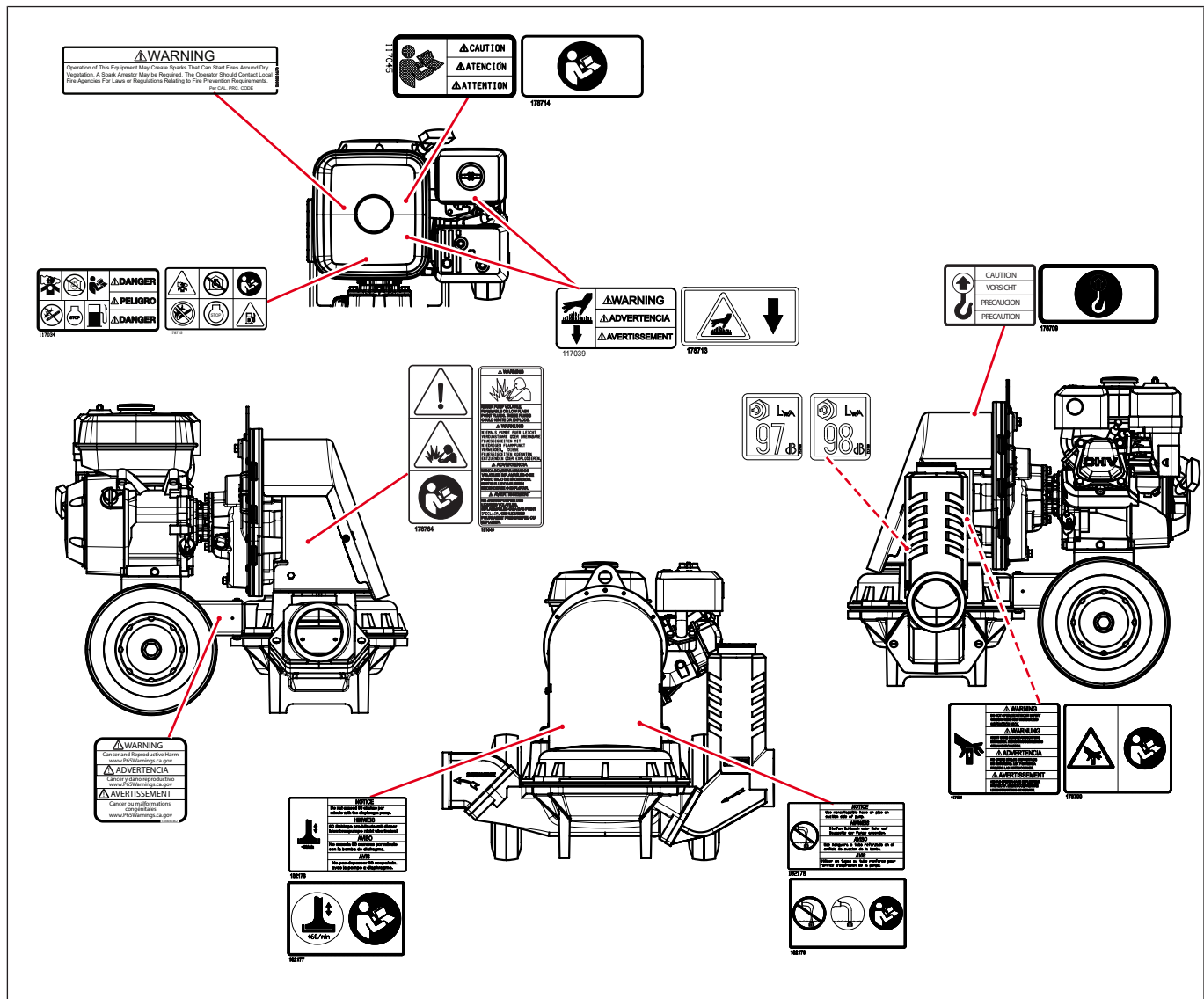
4.1 Machine Description

# 4 Description of the Machine

## 4.1 Machine Description

This machine is a diaphragm pump. The Wacker Neuson diaphragm pump consists of a gasoline engine, a fuel tank, a handle, a set of wheels, and a diaphragm pump with ports for fluid suction and discharge. The engine raises and lowers the diaphragm via a connecting rod. The operator connects hoses to the pump and routes them so that water and solids are drained from the work area and discharged into an appropriate location.

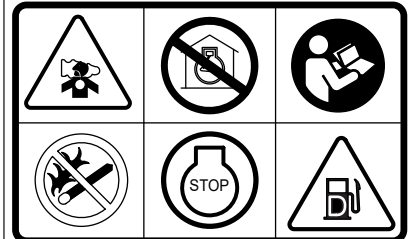
## 4.2 Overview of the Labels



### 4.3 Safety Label Meanings



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#### DANGER

Asphyxiation hazard

- Engines emit carbon monoxide.
- Do not run the machine indoors or in an enclosed area unless adequate ventilation, through such items as exhaust fans or hoses, is provided.
- NEVER use inside a home or garage, EVEN IF doors and windows are open.
- Only use OUTSIDE and far away from windows, doors, and vents.
- Read the Operator's Manual.
- No sparks, flames, or burning objects near the machine.
- Stop the engine before refueling.
- Use only clean, filtered diesel fuel.



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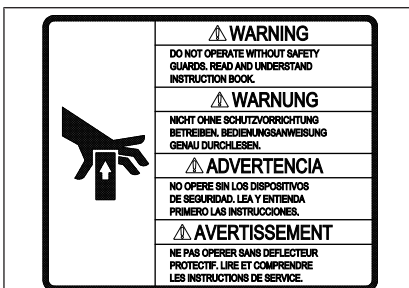


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#### WARNING

Never pump volatile, flammable, or low-flash-point fluids. These fluids could ignite or explode.

Read the Operator's Manual.

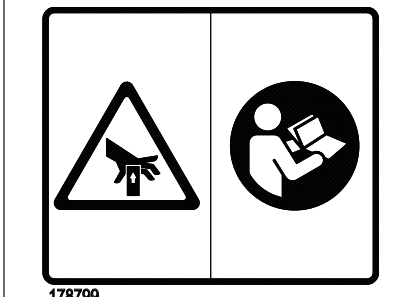


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#### WARNING

Pinch point hazard

Do not operate without safety guards. Read and understand instruction book.



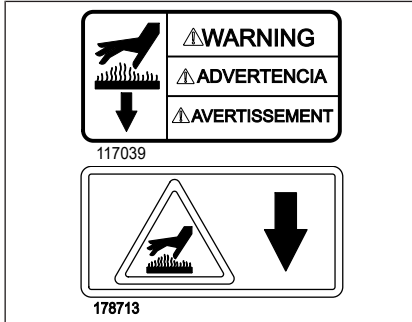
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## 4.3 Safety Label Meanings



### WARNING

Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrester may be required. The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.



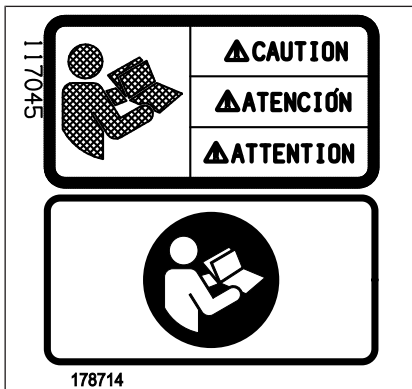
### WARNING

Hot surface



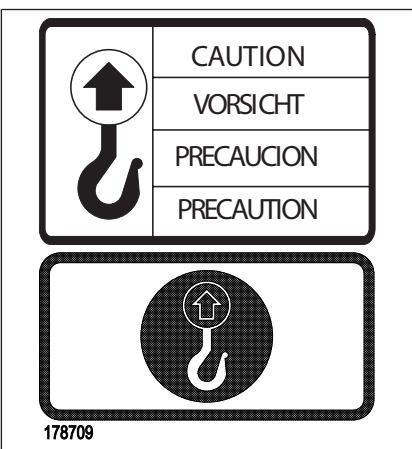
### WARNING

California Proposition 65 Warning  
Cancer and Reproductive Harm  
[www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)



### CAUTION

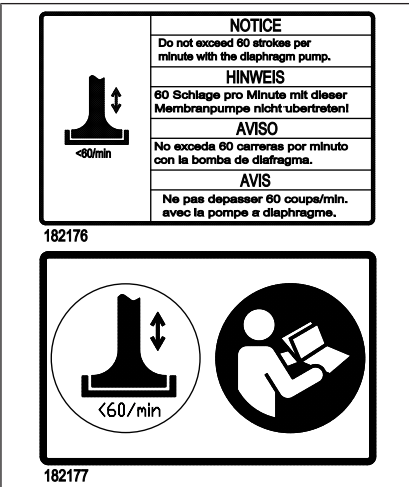
Read and understand the supplied Operator's Manual before operating this machine. Failure to do so increases the risk of injury to yourself and others.



### CAUTION

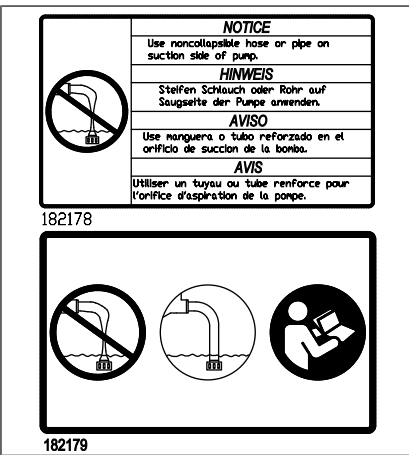
Lifting point





**Notice**

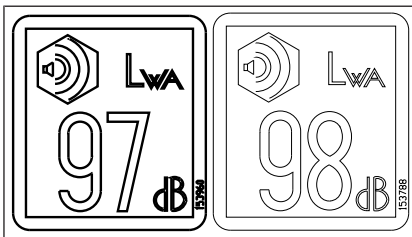
Do not exceed 60 strokes per minute with the diaphragm pump.  
Read the Operator's Manual.



**Notice**

Use non-collapsible hose or pipe on suction side of pump.  
Read the Operator's Manual.

**4.4 Information Label Meanings**



Guaranteed sound power level



## 5 Transportation

### 5.1 Lifting and Transporting



#### ⚠ WARNING

##### Fire hazard

Spilled fuel can ignite and cause severe burns.

- ▶ Lift and transport the machine in an upright position.



#### NOTICE

Do not use the wheels or the casting (1) as tie down locations.

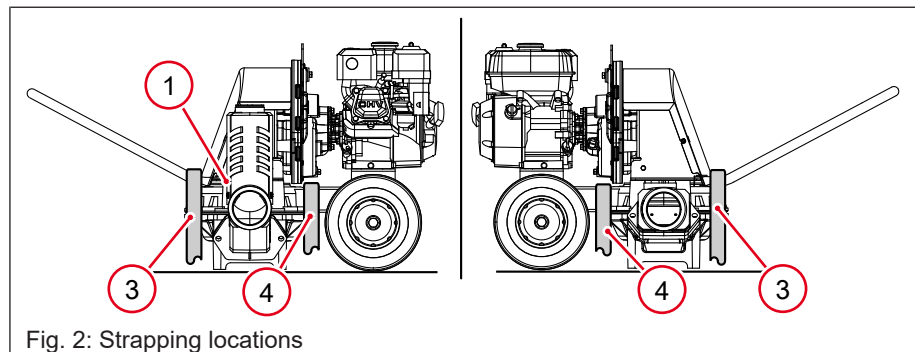


Fig. 2: Strapping locations

#### Requirements

- Transport vehicle capable of carrying at least 70 kg (150 lb)
- Use lifting equipment capable of lifting at least 70 kg (150 lb)

#### Guidelines

Follow the guidelines below when lifting and transporting this machine:

- Close the fuel valve.
- Lift and transport it in an upright position.
- Use the lifting hook (2) to lift the machine.
- To secure the machine to the transport vehicle, attach strapping (3) across the handle. Also attach strapping (4) across the frame of the machine

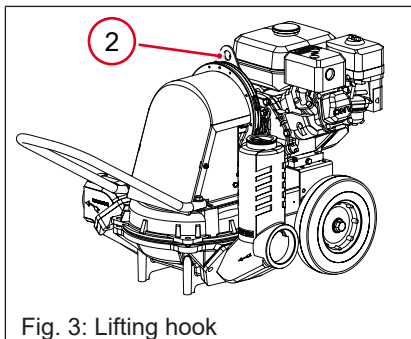


Fig. 3: Lifting hook

## 6 Commissioning

### 6.1 Preparing the Machine for First Use

1. Make sure all loose packaging materials have been removed from the machine.
2. Check the machine and its components for damage. If there is visible damage, do not operate the machine. Contact your Wacker Neuson dealer immediately for assistance.
3. Take inventory of all items included with the machine and verify that all loose components and fasteners are accounted for.
4. Attach component parts not already attached.
5. Add fluids as needed and applicable, including, but not limited to, fuel, engine oil, and coolant.
6. Move the machine to its operating location.

### 6.2 Hoses and Clamps

#### Guidelines

Follow the guidelines below for hoses and clamps.

- Use only noncollapsible hoses for the suction side of the pump.  
**Note:** Suction and discharge hoses are available from Wacker Neuson. Contact your Wacker Neuson dealer for more information.
- Use two clamps for connecting suction hoses to the inlet coupling of the pump.  
**Note:** This connection is important. Even a small air leak on the suction side of the pump will prevent the pump from priming.
- For other hose connections, one T-bolt or worm-gear type clamp is usually sufficient to hold hoses in place. In some cases, slight variances in hose diameters may make it necessary to add more clamps in order to maintain tight connections.

### 6.3 Recommended Fuel

#### Type

This engine/machine requires regular unleaded gasoline.

- Use only fresh (no older than three months old), clean gasoline.
- Use a fuel stabilizer per the fuel stabilizer manufacturer's instructions.
- Consult the engine owner's manual for complete fuel specifications.

#### Use of oxygenated fuels

Some conventional gasolines are blended with alcohol. These gasolines are collectively referred to as oxygenated fuels. If you use an oxygenated fuel, be sure it is unleaded and meets the minimum octane rating requirement.

Before using an oxygenated fuel, confirm the fuel's contents. Some states and provinces require this information to be posted on the fuel pump.

The following is the Wacker Neuson approved percentage of oxygenates:

You may use gasoline containing up to 10% ethanol (ethyl or grain alcohol) by volume (commonly referred to as E10). Gasoline containing more than 10% ethanol (such as E15, E20, or E85) may not be used because it could damage the engine.

If you notice any undesirable operating symptoms, try another service station, or switch to another brand of gasoline.

Fuel system damage or performance problems resulting from the use of an oxygenated fuel containing more than the percentages of oxygenates mentioned above are not covered under warranty.

## 7 Operation

### 7.1 Refueling the Machine



#### **⚠ WARNING**

##### **Fire hazard**

Fuel and its vapors are extremely flammable. Burning fuel can cause severe burns.

- ▶ Keep all sources of ignition away from the machine while refueling.
- ▶ Do not refuel if the machine is positioned in a truck fitted with a plastic bed liner.  
Static electricity can ignite the fuel or fuel vapors.
- ▶ Refuel only when the machine is outdoors.
- ▶ Clean up spilled fuel immediately.



#### **⚠ CAUTION**

##### **Fire and health hazard**

Fuel expands when heated. Expanding fuel in an over-filled tank can lead to spills and leaks.

- ▶ Do not fill the fuel tank completely.

#### **Requirements**

- Machine shut down
- Engine cool
- Machine/fuel tank level with the ground
- Fresh, clean fuel supply

#### **Procedure**

1. Remove the fuel cap.
2. Fill the fuel tank until the fuel level gauge indicates that the tank is full.
3. Install the fuel cap.

### 7.2 Before Installing the Pump

#### **Requirements**

- API GL-5 rated gear oil
- Machine off

#### **Procedure**

Perform the tasks below before installing the pump.

1. Read the safety instructions at the beginning of this manual.
2. Place the pump on a firm, flat, level surface.
3. Check the fuel level. Add fuel as needed.
4. Check the engine oil level. Add engine oil as needed.
5. Check the condition of the air filter. Replace the air filter if needed.
6. Fill the pump's gearbox with oil.
  - ⇒ Remove the fill plug **(1)**.
  - ⇒ Slowly pour gear oil into the fill hole until it comes out of the fill hole.
  - ⇒ Install the fill plug.

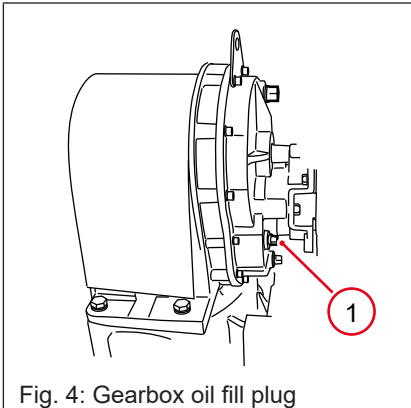


Fig. 4: Gearbox oil fill plug

## 7.3 Installing the Pump

### Requirements

- Hoses
- Hose couplings
- Suction strainer
- Clamps

### Procedure



### NOTICE

Do not use collapsible hoses on the suction side of the pump.



### NOTICE

Maximum discharge head is 8.1 m (25 ft) or 0.8 bar (10.9 psi). Operating the pump over this head or pressure will cause the pump to stall and/or gearbox damage.

1. Place the pump as near to the water to be pumped as possible.
2. Check that hose couplings/nipples **(1)** are installed and secure.

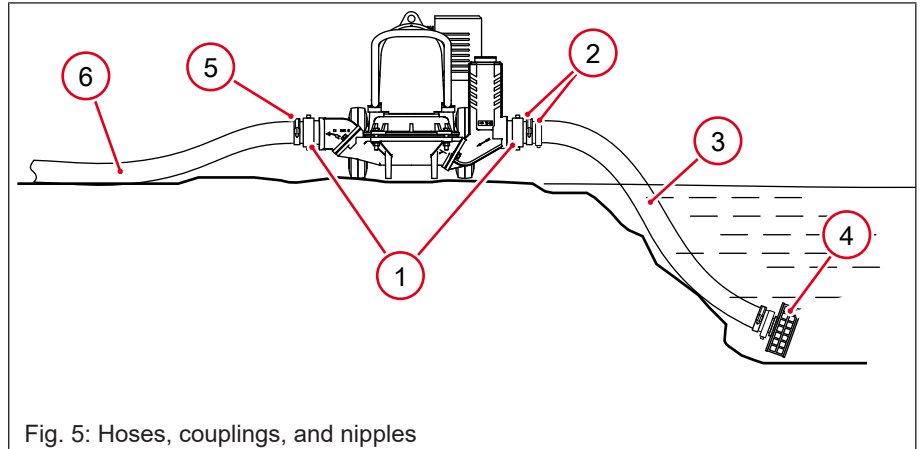


Fig. 5: Hoses, couplings, and nipples

3. Make sure the suction strainer **(4)** is clean and securely attached to the end of the suction hose.
4. Connect the suction hose **(3)** to the pump with two clamps **(2)**. Position the suction hose so that:
  - ⇒ There is a continual upward slope from the water source to the pump.
  - ⇒ The suction hose/strainer in the water source will stay submerged as the water source level drops.
  - ⇒ The suction hose is as short as possible.
  - ⇒ There are no loops in the suction hose.
  - ⇒ There are no air leaks.
5. Connect the discharge hose **(5)** to the pump with a clamp **(6)**.
6. Lay the discharge hose out as straight as possible. Position the discharge hose so that:

- ⇒ There are no sharp bends or loops in the hose.
- ⇒ The hose is less than 8.1 m (25 ft) above or away from the pump.
- ⇒ The hose is not a tripping hazard on the job site.

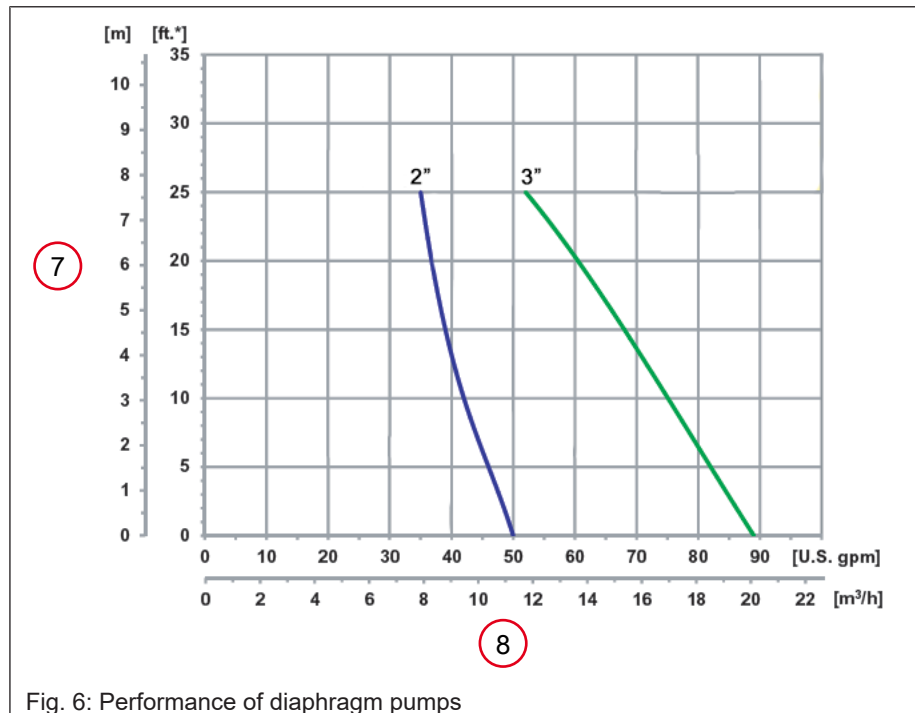


Fig. 6: Performance of diaphragm pumps

Ref	Description	Ref	Description
7	Total head	8	Capacity

\* Convert to psi, divide by 2.31  
 Liquid—water specific gravity 1.0

## 7.4 Starting, Operating, and Stopping the Machine



### NOTICE

Pump speed must not exceed 60 strokes per minute (2800 rpm).

#### Starting the machine

1. Open the fuel valve by moving the lever (1) to the right (2).



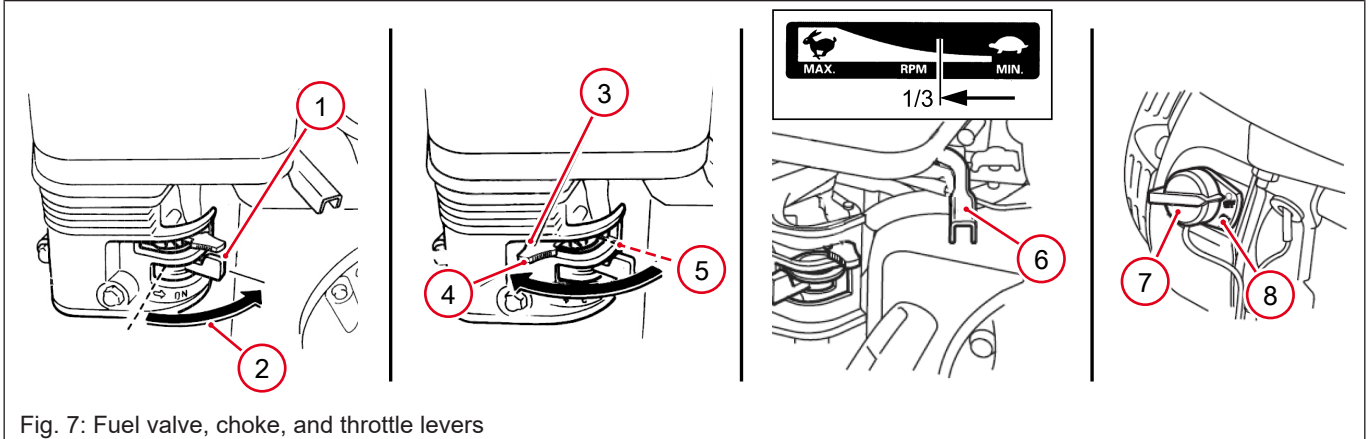


Fig. 7: Fuel valve, choke, and throttle levers

2. If the engine is cold, move the choke lever (3) to the closed position (4). If the engine is hot, set the choke to the open position (5).
3. Open the throttle (6) by moving it slightly to the left.
4. Turn the engine switch (7) to ON (8).
5. Pull the starter rope.

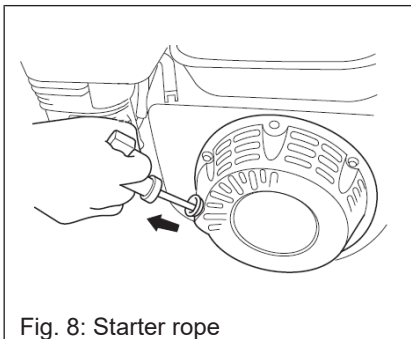


Fig. 8: Starter rope

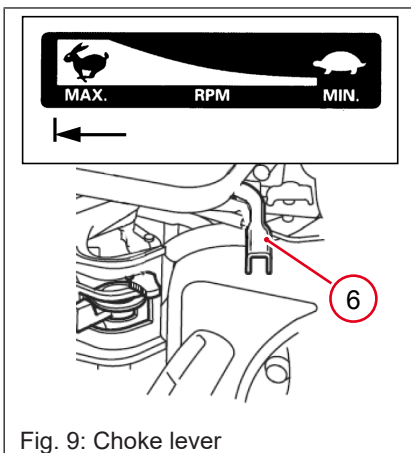


Fig. 9: Choke lever

6. Open the choke as the engine warms.
7. Open the throttle (6) fully to operate.

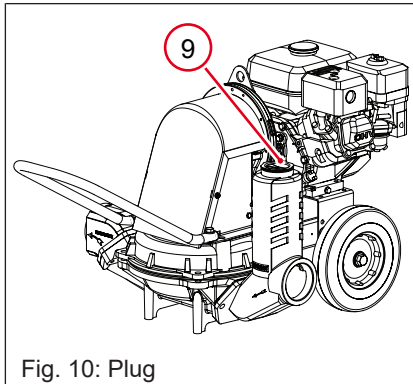


Fig. 10: Plug

### Operating the machine

- The machine should begin pumping water within a minute depending on the length of suction hose and height of the machine above water. Longer hoses will require more time.
- If the machine does not prime:
  - Check for loose fittings or an air leak in the suction hose. Make sure the strainer is submerged in water and is not blocked.
  - Stop the engine, remove the plug (9), add water, install the plug, and restart the engine.
- Run the engine at full speed while operating the machine.

### Stopping the machine

1. Reduce engine RPM to idle by moving the throttle (6) completely to the right.

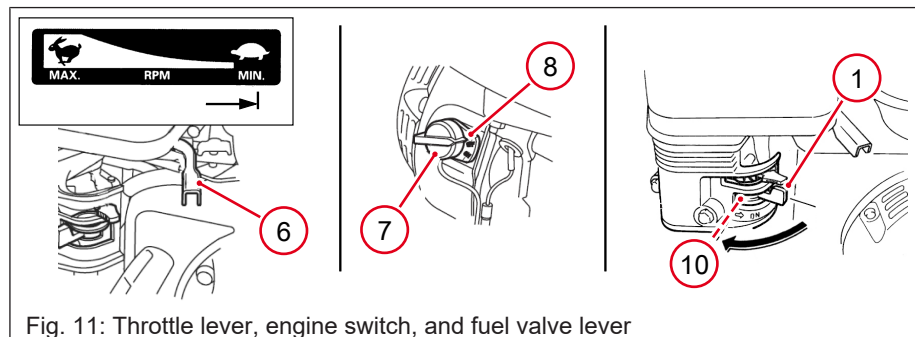


Fig. 11: Throttle lever, engine switch, and fuel valve lever

2. Turn the engine switch (7) to OFF (8).
3. Close the fuel valve by moving the lever (1) to the left (10).

## 7.5 Clearing Jams



### NOTICE

Do not overtighten or undertighten the lockscrew. Improper torque can break the connecting rod or cause premature wear of internal parts.

### Overview

Large solids or accumulated sand and sediment may become lodged in the pump housing. This debris prevents the plunger arm from making a full stroke, causing the pump to stall or the crank to slip on the output shaft. The debris must be cleared before resuming operation.

### Requirements

- Engine is stopped
- Machine is cool to the touch

### Procedures

Perform the procedure below to clear a jam if the pump has stalled.

1. Remove the handle (1).

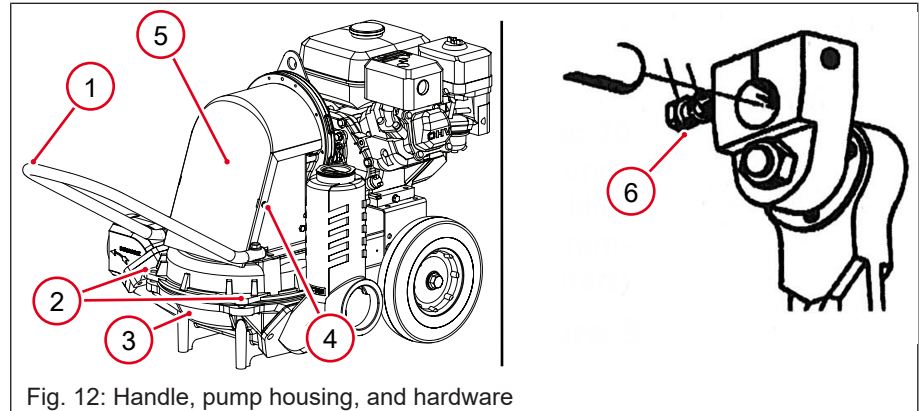


Fig. 12: Handle, pump housing, and hardware

2. Remove the four bolts (2) securing the pump housing (3).
3. Clean all debris and obstructions from the pump housing.
4. Install the four bolts and handle.

Perform the procedure below to retighten the crank if a jam has caused it to slip.

1. Loosen the hand knob screws (4) and remove the metal guard (5).
2. Remove the handle and bolts as described in the above procedure.
3. Clean all debris and obstructions from the pump housing.
4. Loosen the crank lockscrew (6). Tighten the crank lockscrew to 95 Nm (70 ft. lbs.)
5. Install the metal guard, handle, and bolts.

## 7.6 Emergency Shutdown Procedure

If a breakdown or accident occurs while the machine is operating:

1. Stop the engine.
2. Turn off the fuel supply.
3. Remove any obstructions.
4. Unkink the hoses.
5. Allow the machine to cool.
6. Contact the rental yard or machine owner for further instructions.

## 8 Maintenance

### 8.1 General Maintenance



#### **⚠ WARNING**

##### **Injury and machine damage hazard**

A poorly maintained machine can malfunction, causing injuries or permanent damage to the machine.

- ▶ Keep the machine in safe operating condition by performing periodic maintenance and making repairs as needed.

### 8.2 Maintaining the Emission Control System

Normal maintenance, replacement, or repair of emission control devices and systems may be performed by any repair establishment or individual; however, warranty repairs must be performed by a dealer/service center authorized by the engine manufacturer. See the supplied engine owner's manual for the applicable emission warranty information.

### 8.3 Periodic Maintenance Schedule

Maintenance cycle	Personnel	For further information	
Daily	Operating personnel	[▶ 28]	Daily Inspection
		[▶ 29]	Servicing the Air Cleaner
		[▶ 30]	Greasing the Connecting Rod Bearing
First 20 hours	Operating personnel	[▶ 31]	Changing the Engine Oil
First 40 hours	Operating personnel	[▶ 33]	Checking and Changing the Gearbox Oil
20 hours	Operating personnel	[▶ 33]	Checking and Changing the Gearbox Oil
100 hours	Operating personnel	[▶ 31]	Changing the Engine Oil
		[▶ 32]	Cleaning the Sediment Cup
		[▶ 32]	Maintaining the Spark Plug
350 hours	Operating personnel	[▶ 33]	Checking and Changing the Gearbox Oil
	Service personnel	[▶ 35]	Checking and Adjusting Valve Engine Clearances
		[▶ 35]	Checking and Adjusting the Idle Speed
		[▶ 35]	Replacing the Fuel Filter
As needed	Operating personnel	[▶ 34]	Cleaning the Pump

### 8.4 Daily Inspection

Inspect the following items daily:

- Check the fuel level. For further information, see [Refueling the Machine on page 21](#).
- Check the engine oil level. For further information, see [Changing the Engine Oil on page 31](#).
- Inspect air cleaner elements. Replace as needed. For further information, see [Servicing the Air Cleaner on page 29](#).
- Check external hardware.

## 8.5 Servicing the Air Cleaner



### **⚠ WARNING**

#### **Fire hazard**

Flammable liquids pose a fire hazard when cleaning.

- ▶ Do not use gasoline or other types of low flash point solvents to clean the air cleaner.



### **NOTICE**

#### **Engine damage hazard**

Severe engine damage will occur if the machine runs without the air cleaner.

- ▶ Do not run the machine without the air cleaner.



### **Environment**

Dispose of waste oil and soiled rags in accordance with environmental protection legislation.

#### **When**

- Inspect the air cleaner elements daily.
- Clean the air cleaner elements as needed.
- Replace the air cleaner elements if they are damaged or cannot be cleaned.

#### **Requirements**

- Machine shut down
- Mild detergent and warm water
- Clean engine oil

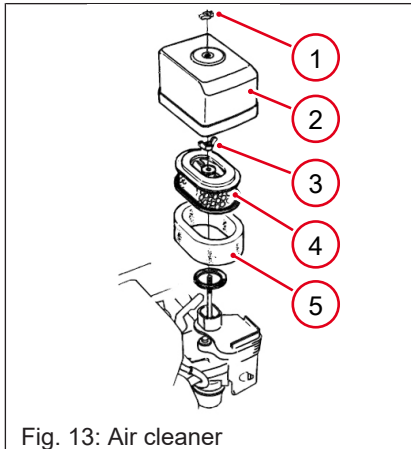


Fig. 13: Air cleaner

**Procedure**

1. Stop the engine.
2. Remove the wing nut (1) and remove the air cleaner cover (2).
3. Remove the second wing nut (3) and remove the air filter.  
**Note:** The air filter has two elements: a foam element and a paper element.
4. Remove the foam element (5) from the paper element (4).
5. Clean the elements if they are to be reused.
  - ⇒ Tap the paper element on a hard surface to remove dirt, or blow low-pressure (less than 207 kPa (30 psi)) through the paper element from the inside.  
NOTICE! Do not try to brush dirt off the paper element. Brushing will force dirt into the fibers of the paper element.
  - ⇒ Wash the foam element in a solution of mild detergent and warm water.
  - ⇒ Rinse the foam element thoroughly in clean water, and allow it to dry completely.
  - ⇒ Soak the foam element in clean engine oil until saturated. Squeeze out excess oil.
6. Install the filter elements and air cleaner cover.

## 8.6 Greasing the Connecting Rod Bearing

**When**

Every 8 hours of operation

**Requirements**

- General automotive grease
- Machine shut down

**Procedure**

1. Remove the pump cover by loosening the two screws.
2. Grease the fitting on the end of the bearing.
3. Using a grease gun, pump grease into the fitting until new grease seeps out between the bearing and the journal.

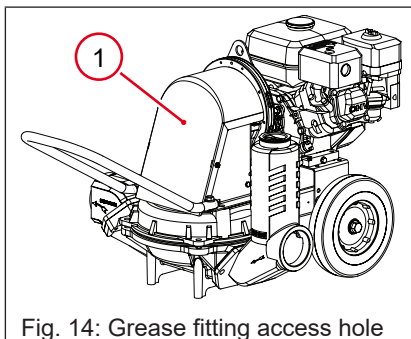


Fig. 14: Grease fitting access hole

## 8.7 Changing the Engine Oil



### ⚠ WARNING

#### Health hazard

Most used liquids from this machine contain small amounts of materials that can cause cancer and other health problems if inhaled, ingested, or left in contact with skin for prolonged periods of time.

- ▶ Take steps to avoid inhaling or ingesting used liquids.
- ▶ Wash skin thoroughly after exposure to used liquids.



### Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

#### When

Change the engine oil after the first 20 hours of operation and then after every 100 hours of operation or 6 months, whichever comes first.

#### Requirements

- Warm engine
- Plastic sheet to protect against drips or spills
- Container of sufficient volume to collect waste oil
- Replacement oil (see [Technical Data on page 40](#) for quantity and type)
- New gasket

#### Procedure

1. Position the machine on a flat, level surface.
2. Stop the engine.
3. Place the plastic sheet and container under the engine.
4. Remove the drain plug (1) and gasket and allow the oil to drain.

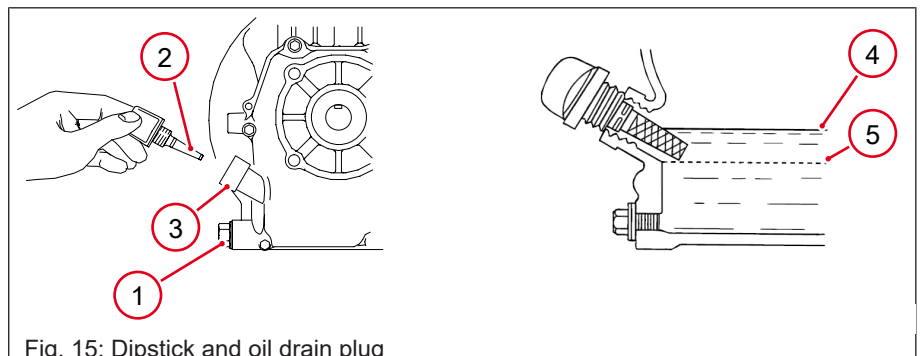


Fig. 15: Dipstick and oil drain plug

5. Install the drain plug with a new gasket.

6. Remove the dipstick **(2)** and wipe it clean.
7. Fill the engine crankcase with fresh oil through the filler opening **(3)**. Check the oil level by inserting the dipstick into the filler opening. Do not thread the dipstick into the engine to check the oil level. Fill the crankcase so that the oil level reaches the upper mark on the dipstick.  
**Note:** **(4)** = crankcase upper limit; **(5)** = crankcase lower limit
8. Install the dipstick.

## 8.8 Cleaning the Sediment Cup



### ⚠ WARNING

#### Fire hazard

Gasoline or low-flash-point solvents are flammable and may ignite if used to clean the machine.

- ▶ Use only nonflammable solvents when cleaning the sediment cup.

#### When

Clean the engine sediment cup every 100 hours or 6 months.

#### Requirements

- Machine shut down
- Nonflammable solvent
- A clean cloth

#### Procedure

1. Set the fuel valve to the OFF position.
2. Remove the sediment cup **(1)** and the O-ring **(2)**.
3. Wash the sediment cup and the O-ring thoroughly in a nonflammable solvent.
4. Dry and install them.
5. Set the fuel valve to the ON position and check for leaks.

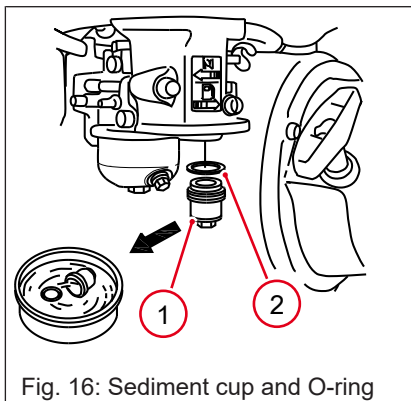


Fig. 16: Sediment cup and O-ring

## 8.9 Maintaining the Spark Plug



### ⚠ WARNING

#### Burn hazard

The engine and muffler become very hot while running.

- ▶ Allow the engine to cool before performing this procedure.





## NOTICE

### Engine damage hazard

Too loose or too tightly screwed in spark plug can lead to engine damage.

- ▶ Tighten the spark plugs to the correct torque.

### When

Clean the spark plug every 100 hours of operation or every 6 months. Replace the spark plug as needed.

### Requirements

- Machine shut down
- Engine cool
- Standard shop tools

### Procedure

1. Remove the spark plug.
2. Inspect the spark plug. Replace the spark plug if the insulator is cracked or chipped, or if the electrode is damaged.
3. Clean spark plug electrodes with a wire brush.
4. Set the electrode gap (1). See chapter [see Technical Data on page 40](#) for the recommended gap.
5. Install the spark plug and tighten it to the recommended torque from the engine owner's manual.

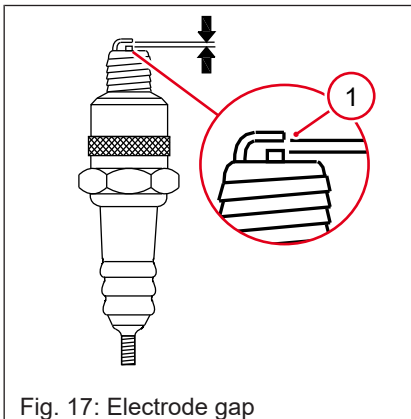


Fig. 17: Electrode gap

## 8.10 Checking and Changing the Gearbox Oil



## ⚠ WARNING

### Burn hazard

The engine and muffler become very hot while running.

- ▶ Stop the engine before performing this procedure.



### Environment

Use a suitable container to collect, store, and dispose of drained fluids and lubricants in accordance with current environmental protection regulations.

**When**

- Check gear box oil level every 20 hours of operation or at least once a week; more often if any leakage is detected around the gear box.
- Change gearbox oil after the first 40 hours of operation. Change gearbox oil every 350 hours of operation.

**Requirements**

- Machine shut down
- Engine warm
- API GL-5 rated gear oil
- Container for used oil

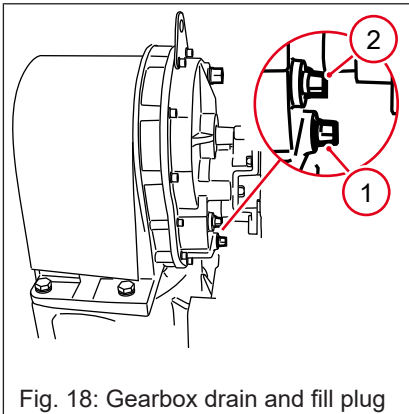


Fig. 18: Gearbox drain and fill plug

**Procedure**

1. Remove the drain plug **(1)** and drain the oil into a suitable container.
2. Install the drain plug.
3. Remove the oil level plug **(2)**.
4. Slowly pour gear oil into the fill hole until it comes out of the fill hole.
5. Install the oil level plug.

**8.11 Cleaning the Pump****⚠ WARNING****Fire hazard**

Gasoline or low-flash-point solvents are flammable and may ignite if used to clean the machine.

- ▶ Do not use flammable solvents to clean the machine.

**Requirements**

- Machine shut down
- Machine cool

**Overview**

When pumping heavy sludges or water containing large amounts of dirt and solids, clean the pump often. Materials left in the pump can dry and harden which may lead to damage of the valves or the diaphragm.

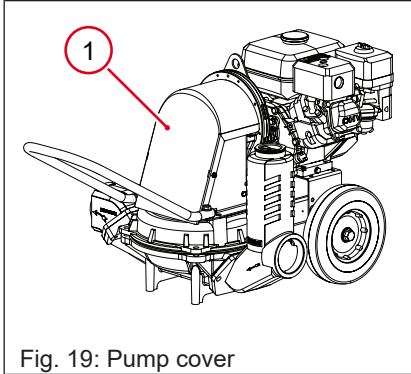


Fig. 19: Pump cover

### Procedure

1. Pump clean water through the pump for a few minutes.
2. Stop the engine and allow the machine to cool.
3. Remove the dirt from between the engine cooling fins.
4. Remove the pump cover (1) and clean dirt and grease build-up from the connecting rod and from the inside of the pump cover.
5. Install the pump cover.

## 8.12 Checking and Adjusting Valve Engine Clearances

This maintenance task should be performed by a qualified technician. Contact an authorized Wacker Neuson dealer or service center for assistance.

## 8.13 Checking and Adjusting the Idle Speed

This maintenance task should be performed by a qualified technician. Contact an authorized Wacker Neuson dealer or service center for assistance.

## 8.14 Replacing the Fuel Filter

This maintenance task should be performed by a qualified technician. Contact an authorized Wacker Neuson dealer or service center for assistance.

## 9 Storage

### 9.1 Long-Term Storage

#### When

Prepare your machine for extended storage if it will not be operated for 30 days or more.

#### Overview

Extended storage of equipment requires preventive maintenance. Performing these steps helps to preserve machine components and ensures the machine will be ready for future use. While not all of these steps necessarily apply to this machine, the basic procedures remain the same.

#### Preparing for storage

Perform the procedures below to prepare your machine for storage.

- Complete any needed repairs.
- Replenish or change oils (engine, exciter, hydraulic, and gearcase) per the intervals specified in the Periodic Maintenance Schedule table.
- Grease all fittings and, if applicable, repack bearings.
- Inspect engine coolant. Replace coolant if it appears cloudy, is more than two seasons old, or does not meet the average lowest temperature for your area.
- If your machine has an engine equipped with a fuel valve, start the engine, close the fuel valve, and run the engine until it stops.
- Consult the engine owner's manual for instructions on preparing the engine for storage.

#### Stabilizing the fuel

After completing the procedures listed above, fill the fuel tank completely and add a high-quality stabilizer to the fuel.

- Choose a stabilizer that includes cleaning agents and additives designed to coat/protect the cylinder walls.
- Make sure the stabilizer you use is compatible with the fuel in your area, fuel type, grade, and temperature range. Do not add extra alcohol to fuels which already contain it (for example, E10).
- For engines with diesel fuel, use a stabilizer with a biocide to restrict or prevent bacteria and fungus growth.
- Add the correct amount of stabilizer per the manufacturer's recommendations.

#### Storing the machine

Perform these remaining steps to store your machine.

- Wash the machine and allow it to dry.
- Move the machine to a clean, dry, secure storage location. Block or chock the wheels to prevent machine movement.

- Use touch-up paint as needed to protect exposed metal against rust.
- If the machine has a battery, either remove or disconnect it.
- Cover the machine. Exposed rubber items should be protected from the weather. Either cover them or use a protectant.

# 10 Shutdown

## 10.1 Decommissioning

### Overview

This machine must be properly decommissioned at the end of its service life. Responsible disposal of recyclable components, such as plastic and metal, ensures that these materials can be reused—conserving landfill space and valuable natural resources.

Responsible disposal also prevents toxic chemicals and materials from harming the environment.

The operating fluids in this machine, including fuel, engine oil, and grease, may be considered hazardous waste in many areas.

Before decommissioning this machine, read and follow local safety and environmental regulations pertaining to the disposal of construction equipment.

### Preparation

- Move the machine to a protected location where it does not pose any safety hazards and cannot be accessed by unauthorized individuals.
- Ensure that the machine cannot be operated from the time of final shutdown to disposal.
- Drain all fluids, including fuel, engine oil, and coolant.
- Seal any fluid leaks.

### Disposal

- Disassemble the machine and separate all parts by material type.
- Dispose of recyclable parts as specified by local regulations.
- Dispose of all non-hazardous components that cannot be recycled.
- Dispose of waste fuel, oil, and grease in accordance with local environmental protection regulations.

# 11 Troubleshooting

## 11.1 Troubleshooting

Problem	Cause	Remedy
Engine does not start	Engine oil level too low	Add oil to engine.
	Pump housing filled with dirt and debris	Clean pump.
Pump does not prime	Air leak in suction line	Repair or replace suction line.
	Defective flapper valve	Replace the flapper valves.
	Clogged strainer	Clean or replace the strainer.
	No liquid in suction line	Fill the pump and suction line with water.
	Pump housing filled with dirt and debris	Clean pump.
Flow rate is slow	Incorrect engine speed	Check engine speed.
	Hoses are damaged	Replace the hoses.
	Too many bends in the hoses	Straighten the hoses.
	Hoses are too long	Shorten the hoses.
Pump runs but no fluid is pumped	Faulty suction hose	Replace the suction hoses.
	Pump located too far from fluid source	Place the pump closer to the source.
	Flapper valve closed	Clean or replace the flapper valves.
	Clogged strainer	Unclog or replace the strainer.
	Height of discharge hose above pump is too great	Lower the discharge hose.
Pump pumps erratically	Leak in suction hose	Repair or replace the suction hose.
	Diaphragm has crack or hole	Replace the diaphragm.
	Defective or clogged flapper valves	Clean or replace the flapper valves.
Excessive noise while pumping	Pump not secured to firm foundation	Secure the pump.
	Restricted suction hose	Clean or replace the suction hose.
Water accumulates on top of the diaphragm	Diaphragm has crack or hole.	Replace the diaphragm.
	Screw loose holding diaphragm	Tighten the screw.
Pump stalls repeatedly or stops for no apparent reason	Discharge hose height over 7.62 m (25 ft) of head	Lower the discharge hose.
	Pump housing filled with dirt and debris	Clean the pump.

## 12 Technical Data

### 12.1 Engine Data

#### Engine Power Rating

Net power rating per SAE J1349. Actual power output may vary due to conditions of specific use.

Machine	Unit	PDI2 / PDT2 / PDI3 / PDT3
Type	—	Air-cooled
Engine make	—	Honda
Engine model	—	GX120UT3X QX2
Max. rated power @ rated speed	kW (hp)	2.6 (3.5) @ 3600 rpm
Operating speed	rpm	2800
Spark plug	type	NGK BPR6HS
Electrode gap	mm (in.)	0.7–0.8 (0.028–0.031)
Running time	hr	2
Displacement	cm <sup>3</sup> (in. <sup>3</sup> )	118 (7.2)
Number of cylinders	—	1
Engine oil	type	10W30 API SJ, SL or equivalent
Engine oil capacity	mL (oz.)	600 (20)
Fuel	type	Regular unleaded gasoline
Fuel tank capacity	L (qt)	2 (2.1)
Fuel consumption	L/hr (qt/hr)	1.1 (1.2)

### 12.2 Machine Data

Machine	Unit	PDI2 / PDT2	PDI3 / PDT3
Suction and discharge hose diameter	mm (in.)	50 (2)	75 (3)
Shipping weight	kg (lb)	75 (165)	79 (175)
Maximum discharge head	m (ft)	7.6 (38)	7.6 (38)
Maximum flow rate	L/min (gpm)	189 (50)	333 (88)
Maximum suction lift	m (ft)	6.1 (20)	6.1 (20)
Maximum solid size diameter	mm (in.)	32 (1.25)	41 (1.625)

### 12.3 Sound Measurements

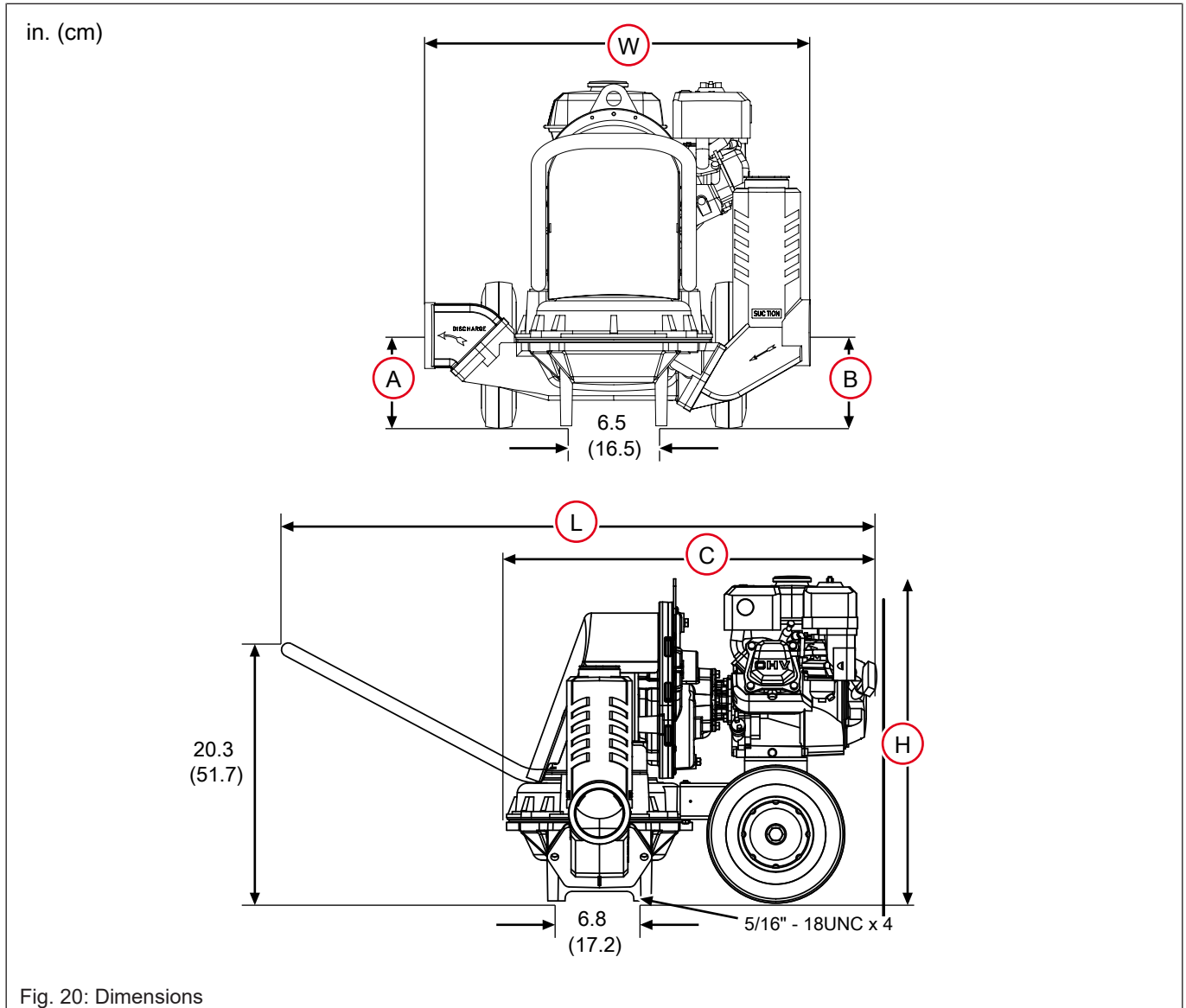
Products are tested for sound pressure level in accordance with EN ISO 11201:2010.

Sound power level is tested in accordance with European Directive 2000/14/EC—Noise Emission in the Environment by Equipment for use outdoors.



Machine	Sound Pressure at Operator's Location dB(A)	Guaranteed Sound Power dB(A)
PDI2 / PDT2	86	97
PDI3 / PDT3	86	98

## 12.4 Dimensions



in. (cm)

Machine	A	B	C	L	W	H
PDI2 / PDT2	7.3 (18.5)	5.7 (14.5)	28.6 (72.7)	43.3 (110.1)	22.1 (56.1)	23.2 (59.0)
PDI3 / PDT3	6.2 (15.7)	6.3 (16.0)	28.6 (72.7)	43.4 (110.1)	26.4 (67.0)	23.4 (59.4)

## 13 Emission Control System Information and Warranty

The Emission Control Warranty and associated information is valid only for the U.S.A., its territories, and Canada.

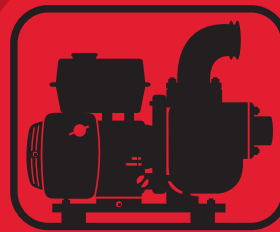
### 13.1 Limited Defect Warranty for Exhaust Emission Control System

See the supplied engine owner's manual for the applicable emission warranty statement.



# SAFETY MANUAL

FOR OPERATING AND MAINTENANCE PERSONNEL



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## Acknowledgment

We wish to thank the members of the Association of Equipment Manufacturers for their invaluable contributions in preparing this Safety Manual.

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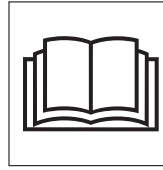
# Foreword

This safety manual is intended to point out some common safety situations that may be encountered during the normal operation and maintenance of your pump and to instruct you in safety practices for dealing with these conditions. This manual is **NOT** a substitute for the manufacturer's operating manual(s).

Additional precautions may be necessary, or some instructions may not apply, depending on equipment, attachments and conditions at the job site or in the service area. The manufacturer has no direct control over equipment loading, transportation, unloading, application, operation, inspection or maintenance. Therefore, it is **YOUR** responsibility to use good safety practices in these areas.

The information provided in this manual supplements the specific information about your pump that is contained in the manufacturer's operating manual(s). Other information that may affect the safe operation of your machine may be contained in the following:

- Safety signs, tags, nameplates
- Insurance requirements
- Employer safety and training programs
- Safety codes
- Local, state/provincial, and federal laws, rules, and regulations



**Read and understand manuals before operating**

**IMPORTANT!** Before you operate this machine, make sure you have the manufacturer's manual(s) for this pump and all attachments or accessories. If the manufacturer's manual(s) are missing, obtain replacements from your employer, equipment dealer, or directly from the manufacturer. Keep this safety manual and the manufacturer's manual(s) with the machine at all times. Read and understand all applicable manuals before operating this pump or any other piece of equipment.

Safety videos and other training resources are available from some manufacturers and dealers. Operators are encouraged to periodically review these resources.

## Safety Alerts

### Safety Alert Symbol

This Safety Alert Symbol means:  
**"Attention! Stay alert! Your safety is involved!"**



The Safety Alert Symbol identifies important safety messages on equipment, safety signs, in manuals, or elsewhere. When you see this symbol, be alert to the possibility of death or personal injury. Carefully read the message that follows and inform other operators. Follow instructions in the safety message.

### Signal Words

Signal words are distinctive words that are typically found on safety signs on the portable pumps and other job site equipment. These words may also be found in this manual and the manufacturer's manual(s). These words are intended to alert the operator to a hazard and the degree of severity of the hazard.



**DANGER** indicates a hazardous situation that, if not avoided, will result in death or serious injury.



**WARNING** indicates a hazardous situation that, if not avoided, could result in death or serious injury.



**CAUTION** indicates a hazardous situation that, if not avoided, may result in minor or moderate injury.



**NOTICE** is used to address practices not related to physical injury.

# A Word to the User/Operator

It is **YOUR** responsibility to read and understand this safety manual and the manufacturer's manual(s) before operating this equipment. This safety manual takes you step by step through the working day.

Graphics have been provided to help you understand the text.

Hazard recognition and accident prevention depend upon you being alert, careful, and properly trained in the inspection, operation, transport, maintenance, and storage of this equipment.



Read and understand all safety signs – replace damaged signs

Remember that **YOU** are the key to safety. Good safety practices not only protect you but also protect the people around you. Study this manual and the manufacturer's operating manual(s) for the specific machine. Make them a working part of your safety program. Keep in mind that this safety manual is written only for portable pumps.

After studying the manufacturer's operating manual(s) and this safety manual, please contact the equipment manufacturer with any remaining questions.

**Practice all usual and customary safe working precautions and remember:**

**Safe operation is up to you!**

**You can prevent death or serious injury caused by unsafe work practices!**

5

## Follow a Safety Program

### For Safe Operation

You must be a qualified and authorized operator for safe operation of this pump. You must clearly understand the written instructions supplied by the manufacturer, be trained—including actual operation—and know the safety rules and regulations for the job site. It is a good safety practice to point out and explain safety signs and practices to others, and to make sure they understand the importance of following these instructions.



Never operate while impaired by alcohol or drugs

**⚠ WARNING!** Death or serious injury could result from operating machinery while impaired by drugs or alcohol. Drugs and alcohol affect operator alertness, coordination, and the ability to safely operate the equipment. **Never operate the pump while impaired by use of alcohol or drugs. Never knowingly allow anyone to operate the machine when their alertness or coordination is impaired.**

An operator taking prescriptions or over-the-counter medication must consult a medical professional regarding any side effects of the medication that would hinder their ability to safely operate this equipment.

### Be Alert!

Know where to get assistance. Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone. Know how to use a first aid kit and fire extinguisher/fire suppression system; know their location and practice getting to them. Ensure they have been properly tested and maintained.

Let others know where you will be working, and what time you will be returning. In case of an emergency, you want others to know where to find you.

### Be Aware!

Take advantage of training programs offered.

Know the proper response to a fire or chemical spill involving your pump.

# Follow a Safety Program

## Be Careful!

Human error is the result of many factors: carelessness, fatigue, sensory overload, preoccupation, unfamiliarity with the machine or attachments, or drugs and alcohol, to name a few. You can avoid death or serious injury caused by these and other unsafe work practices. Be careful; never assume accidents cannot happen to you.

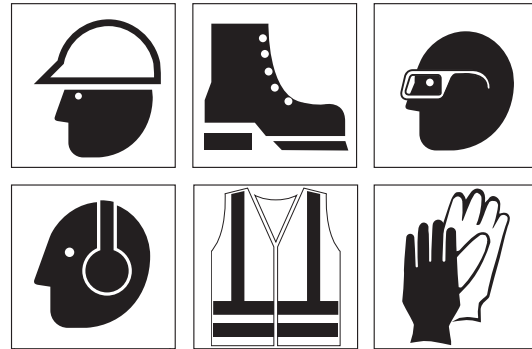
For your safety and the safety of others, act safely and encourage your fellow workers to act safely as well.

## Protect Yourself

Wear all the personal protective clothing and Personal Protective Equipment (PPE) issued to you or called for by job conditions.

You may need:

- Hard hat
- Safety shoes
- Safety glasses, goggles, or face shield
- Heavy duty gloves
- Hearing protection
- Reflective clothing
- Wet weather gear
- Respirator or filter mask



Wear whatever is needed to protect yourself—don't take chances.

**⚠ WARNING!** Avoid death or serious injury from entanglement. **Do not wear loose or frayed clothing or accessories that could catch on moving parts.** Examples of items to avoid include flopping cuffs, dangling neckties and scarves, wallets attached to chains, jewelry and wrist watches.

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# Follow a Safety Program

## Know the Rules

Most job sites have rules governing equipment use and maintenance. Before you start work at a new location, check with the supervisor or safety coordinator. Ask about the rules you will be expected to obey.

OSHA enforces federal laws within the United States that apply to the safe operation, application, and maintenance of equipment on some job sites. It is the employer's responsibility to comply with these laws. A federal representative may periodically inspect a job site to see that these laws are being followed.

There may be other local, state/provincial, federal laws or international organizations that regulate the use of this equipment, along with specific job site or employer rules. It is important that you know and comply with all applicable laws and rules, **including those requiring operator training and certification.**

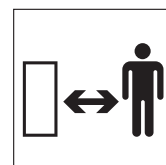
**These are some of the rules you must work by:**

- Only qualified and authorized individuals may operate this equipment
- Inspect your machine and attachments before each use as specified by the manufacturer and your employer

- Know the operating characteristics of your equipment. Do not misuse it
- Wear proper clothing and PPE. Check that others are also wearing appropriate clothing
- All shields, guards, air filters, access panels, and doors must be properly installed before each use
- Know the rules regarding traffic at your job site. Know what all signs, flags, and markings mean. Know hand, flag, horn, whistle, siren, or bell signals, if used
- Never modify or remove any part of the machine (except for service; then make sure the part is re-installed or replaced if defective or worn out)



**Know and understand rules of operation**



**Keep bystanders away**

# Follow a Safety Program

- **Never allow children to play near, ride on or operate the equipment**
- Keep bystanders well clear of the operation
- Know the work area before you use the equipment. Be aware of possible hazards
- Only use attachments and parts that are approved by the manufacturer
- Follow all safe shutdown instructions (See page 23, **Shut Down Safely**)

## Know the Equipment

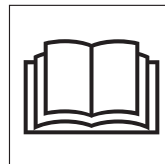
Read and understand the DANGER, WARNING, CAUTION, and NOTICE safety labels and other informational signs on the machine, the attachments, and in the manufacturer's operating manual(s). Ask your supervisor or dealer to explain any information you do not understand. Failure to obey safety instructions could result in death or serious injury.

### Know the following about your equipment:

- Function, purpose, and use of all controls
- Correct operation speeds
- How to quickly stop equipment in an emergency
- Rated operating capacity

Keep in mind that rain, snow, ice, loose gravel, soft ground, slopes, and other site conditions can affect your machine's operating capabilities. Make sure you are thoroughly familiar with your machine's stability, and other handling characteristics under any conditions you are likely to encounter.

Pumps are used in a variety of applications, both indoor and outdoor. Develop a safety program that complies with requirements of your work site and follows the manufacturer's recommendations for safe equipment operation.



**Read and understand manual(s) before operating**

**IMPORTANT:** This manual covers safe practices for portable pumps. Do not pump volatile/flammable or caustic/corrosive liquids. If your pump is engine driven, do not operate in the presence of toxic, volatile or explosive gases.

Refer to the owner's manual or consult with the manufacturer for proper pump materials if you are to pump hazardous caustic/corrosive liquids.

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# Prepare for Safe Operation

## Check and Use All Available Safety Devices

To protect you and others around you, your machine may be equipped with the safety equipment listed below. Additional equipment may be required or some items may not apply, depending on attachments used, job site conditions, or applicable job site rules. Check that each required item is securely in place and in operating condition:

- Hard Hat
- Safety Shoes
- Eye Protection
- Respirators
- Heavy Gloves
- Reflector Vests
- Hearing Protection
- Face Protection
- Back Supports
- Fire Extinguisher
- First Aid Kit
- Guards
- Grab Handles
- Special enclosures or accessories required for specific applications or job site conditions

- Safety Signs
- Beacons and/or alarms to indicate automatic starting

Use them! Never remove or disconnect any safety device.

## Check the Machine

Before beginning your work day, inspect the machine and have all systems in good operational condition.



**Inspect the machine before each work day**

- Perform daily and periodic service procedures as instructed by the equipment manufacturer
- Check for broken, missing, loose, or damaged parts. Make necessary repairs
- Keep handholds clean and free of grease, oil, dirt, snow or ice
- Ensure shielding is properly installed and in good condition. Repair or replace if damaged or missing
- Ensure all tools or loose objects are removed or securely fastened while operating the machine

# Prepare for Safe Operation

## Use Caution When Fueling

**⚠ WARNING!** Avoid injury from fire or explosion. **Never fill the fuel tank with the engine running, while smoking or when near an open flame.**

Never overfill the tank or spill fuel. If fuel is spilled, clean it up immediately.

Be sure to use the correct type and grade of fuel.

Ground the fuel funnel or nozzle against the filler neck to prevent sparks that could ignite fuel vapors. Be sure to replace the fuel fill cap (if equipped) when you are done.

## Ultra-Low Sulfur Diesel (ULSD) Fuel Hazard

### Avoid Static Electricity Risk When Fueling

**⚠ WARNING!** Ultra-Low Sulfur Diesel (ULSD) poses a greater static ignition hazard than earlier diesel formulations. Avoid death or serious injury from fire or explosion; **consult with your fuel or fuel system supplier to ensure the delivery system is in compliance with fueling standards for proper grounding and bonding practices that are crucial when refueling any vehicle.**



Static discharge during fueling can cause explosion

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# Prepare for Safe Operation

## Check the Cooling System

When checking the cooling system, make sure the engine is turned off and is cool. Remove the key to prevent fans from unexpectedly starting. Ensure the coolers and engine compartment are clean and free from debris, which could ignite and cause a fire.

If the machine is air-cooled, be sure the cooling unit has an unobstructed air flow. If it is liquid-cooled, check coolant level (at overflow tank, if provided).



Allow radiator to cool before removing cap slowly

**⚠ WARNING!** Allow the radiator to cool before checking the level. Hot radiator fluids could escape as steam and burn you. (See page 29, **Engine Coolant Hazards.**)

## Know the Working Area

Learn as much about your working area as possible.

### Check at Ground or Floor Level

Inspect the surface over which you will travel. Look for holes, drop-offs, and obstacles. Look for rough spots or hidden obstacles on surfaces which could cause a collision or loss of control. Look for weak spots on docks, ramps, or floors. Look for oil spills, wet spots, and slippery surfaces. Look for soft soil, deep mud, or standing water. Watch for anything that might make you lose control or cause the machine to roll over.

Ensure that the pump is situated on a firm, flat surface to prevent it from falling down a slope, into a ditch or into the liquid. Also, ensure that you consider the possibility of rising water inundating the pump.



# Prepare for Safe Operation

## Loading & Transporting Pumps

**⚠ WARNING!** Before loading or unloading any type of pump, make sure to wear all necessary PPE such as steel toed boots, gloves, safety glasses and hard hat.



**Wear necessary PPE when loading and unloading**

## Loading Hauling Pumps

Before unloading and loading hauling pumps, always refer to the manufacturer's operating manual for specific instructions.

When loading and unloading pumps, check for the following:

- Pump hauled on vehicles **MUST** be securely tied down with approved straps or chains
- When loading the pump, place unit as far forward on the truck bed as possible
- Before hauling the pump in an open-bed truck, walk around the vehicle to assure all fittings on the machine are not over-hanging the truck bed

- Any fitting that is not securely attached to the pump must be removed and secured separately before transport
- Do not lift, load, relocate or unload pumps when section or discharge hoses are attached

## Loading Wheel Mounted Pumps

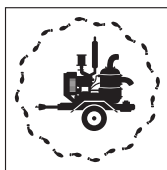
- Check your surroundings while pulling up to the pump with a lift truck
- Stop, lock the brake, turn off the lift, remove the seatbelt and get off the lift
- If applicable, use appropriate tools to loosen, lower, tighten or raise the support stands on trailer-mounted pumps
- Get on the lift truck, fasten the seatbelt, start the lift truck and disengage the parking brake
- Put the lift in forward and drive the forks under the pump being careful not to damage the pump, tires, support legs or anything nearby
- Carefully raise the forks and tilt the pump back slightly until it is approximately 4"-6" inches off the ground and carefully transport as needed
- Check the overall height to ensure compliance with DOT restrictions

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# Start Safely

## Warn Personnel Before Starting

Before starting, walk completely around the machine. **Make sure no one is on it or close to it.** Let others know you are starting up and don't start until everyone is completely clear of the machine. As the equipment operator, you are responsible for the safe use of the machine, so always make sure you have communicated your work plans to others on the site.



**Before starting, walk completely around pump**

Check the pump thoroughly at delivery for any shipping damage.

Locate the pump in an accessible location, as close to the liquid as possible.

Secure the pump after it is placed in its intended operating position so it does not tip, roll, slide or fall.

## Starting the Engine

**⚠ WARNING!** Never attempt to start the engine by shorting across starter terminals. Serious injury or death may result.

Know the exact starting procedure for your machine. See the manufacturer's operating manual(s) for starting.

- Familiarize yourself with warning devices, gauges and operating controls
- Make sure controls are in the neutral/locked position
- Clear the area of all persons
- Start the engine following the instructions in the manufacturer's operating manual(s)
- If necessary to run the engine or operate the machine in an enclosed area, ensure there is adequate ventilation

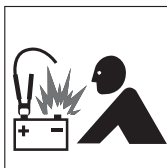
**⚠ WARNING!** Exhaust fumes can kill. **Do not breathe exhaust fumes!**

# Start Safely

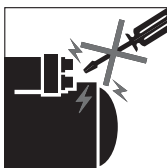
## Starting Aids

If you have trouble starting the engine and need to use jumper cables, follow the instructions in manufacturer's operating manual(s). **Jump-starting is a two-person operation.** The operator must be in the operator's seat when jump-starting so the machine will be under control when the engine starts.

**⚠ WARNING!** Improper jump-starting procedures may cause serious injury or death from a battery explosion or a run-away machine. **Always use proper jump-starting procedure.** (See page 31, **Battery Hazards.**)



To avoid explosion, follow proper jump-starting procedures



Never start engine by shorting across starter terminals

Ether/cold start fluid is **HIGHLY FLAMMABLE**. Before using it, always read the instructions on the ether/cold start fluid container and the instructions in the manufacturer's operating manual(s).

**⚠ WARNING!** Avoid injury from explosion or fire. If the engine is equipped with a glow plug pre-heater or other intake manifold type pre-heater, follow manufacturer's instructions before using ether/cold start fluid.

## After Starting Engine

Observe gauges, instruments, and warning lights to assure that they are functioning and their readings are within the operating range.

## Run an Operating Check

Do not use a machine that is not in proper operating condition. It is your responsibility to check the condition of all systems and to run the check in a safe area.

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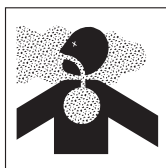
# Operate Safely

## Follow Safe Operating Practices

### Exhaust Fumes in a Closed Space Can Kill

Vent exhaust and assure a flow of fresh air when an internal combustion engine is used in a closed space.

**⚠ WARNING!** Exhaust fumes from diesel, gasoline or LP gas engines can kill. **Do not breath exhaust fumes from any kind of engine.**



Ventilate work area

## Operating in Flammable/Explosive Atmospheres

**⚠ WARNING!** A pump cannot be operated in flammable or explosive atmospheres. Use in explosive atmospheres can result in fires and/or explosions which could cause serious injury or death.

**Use only an approved pump with a label designation of G, GS, D, DS, DY, LP, LPS, G/LP, or GS/LPS.** See Code of Federal Regulations (OSHA) 29 CFR Part 1910.178 to determine permissible areas where these machines can be operated.



Do not operate in explosive/flammable atmosphere

# Operate Safely

## Pumps in General

### Safe Working Procedures

**USE COMMON SENSE!** Most accidents can be avoided by using common sense and concentrating on the job to be done.

**Only Experienced and Qualified Personnel** should install and operate pump equipment.

**KNOW THE PROPER starting procedure for your equipment. Follow the manufacturer's operation manual(s) ... to the letter.**

**DO NOT operate a pump** without all guards and shields in place. (If OSHA required guards are damaged or misplaced, contact the manufacturer for a replacement.)

When **lifting pump** use only lifting equipment in good repair and with adequate capacity. Follow manufacturer's lifting recommendation.

**Check all lubricant levels** before pump installation in accordance with manufacturer's maintenance programs.

**Keep hands and feet clear** of moving parts. **DO NOT** stick fingers into a pump when in operation. Check suction strainer and hose regularly for proper submergence and to be sure it is free of obstructions.

**NEVER operate** a self-priming pump unless the volute is filled with liquid. The pump will not prime when dry.

**PUMP only liquids** for which the pump has been designed to handle. Verify the hoses and piping have the correct pressure rating for the application.

**DO NOT** pump flammable, corrosive, hazardous, volatile or caustic materials unless the pump and piping are explicitly designed for that purpose.

**NOTE the direction of rotation** — operation of a pump in the wrong direction can cause the impeller to unscrew and damage the volute case.

**A pump should not be operated against a closed valve or other no flow conditions.** Refer to the pump manufacturer's recommended practice for start-up, operation and shut-down procedures. **DO NOT** close down or restrict a discharge hose. **Be careful** of discharge hose whipping under pressure.

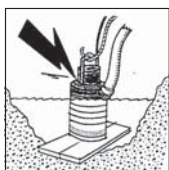
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# Operate Safely

**MAKE CERTAIN** that whatever is to be connected to the pump is not subjected to pressures greater than those given in the manufacturer's instructions.

**MAKE CERTAIN all connections are securely made and hoses under pressure are secured, with appropriate safety devices, to prevent whipping.**

**BE AWARE OF LIGHTNING.** Stay clear of the pumping equipment during electrical storms. It can attract lightning.



**Stay clear of pump during electrical storms**

**Not for use with potable water** unless otherwise stated by the manufacturer.

Overheating Precautions

**Overheated pumps can cause severe damage** to the equipment and can cause severe physical burns and injury.

**Operating a pump with the suction and/or discharge valve closed** is a principal cause of overheating. Approach cautiously any pump that has been in operation.

**DO NOT remove hoses** from a pump until the system is properly cooled to ambient temperature.

**DO NOT remove the cover plate** or drain plugs from any overheated pump. Allow the pump to cool. Check pump temperature before opening fill port or drain plug.

**If overheating of the pump casing occurs:**

- STOP the pump immediately
- Allow the Equipment to cool completely
- Slowly and cautiously vent the pump
- Refer to the manufacturer's instruction manual before restarting the unit
- Remove hoses carefully. Heated water can be in hoses and static head produces pressure

# Operate Safely

## Before Starting

Check the pump thoroughly at delivery for any shipping damage.

Locate the pump in an accessible location, as close to the liquid as possible.

Secure the pump after it is placed in its intended operating position so it does not tip, roll, slide or fall.

## Immediately On Starting the Pump

Observe gauges, instruments and warning lights to ensure that they are functioning and their readings are within the normal operating range.

- Be sure the immediate work area is safe for operation
- Operate controls; make certain all operate properly and “feel” right. Accustom yourself to the “feel” of the equipment
- Listen for any unusual noises, smell for any unusual odors; look for any signs of trouble

- Be sure to open all manual valves slowly to prevent WATER HAMMER
- Check all warning and safety devices and indicators
- If safety-related defects or malfunctions are detected, SHUT DOWN the equipment. Correct the problem, or notify your supervisor. DO NOT OPERATE EQUIPMENT WITH DEFECTS OR MALFUNCTIONS UNTIL CORRECTED
- If an unsafe condition cannot be remedied immediately, notify your supervisor and tagout/ lockout the pump on the start switch and/or appropriate, prominent location



Use a “DO NOT OPERATE” tag

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# Operate Safely

## Engine Driven Pumps

### Do not jump start engine battery.

When operating internal combustion engines in an enclosed area, always make provisions to pipe exhaust fumes to the outside.

**Exhaust Fumes Can Kill: do not operate** engine driven pump equipment in a confined or enclosed space without adequate ventilation.

**Exhaust gases are odorless and deadly poison.**

**DO NOT TOUCH:** Exhaust system components get hot and stay hot after shutting the engine off.

**Follow** engine manufacturer’s instructions explicitly on hand cranking.

**Do not shut down** high head pumps quickly:

- A) Throttle back slowly
- B) Open by-pass line
- C) Should have a check valve
- D) Slowly close gate valve on discharge if so equipped

**Check** for fuel, oil and hydraulic fluid leaks, worn and damaged hoses/lines or power cables.

## Refueling

**When refueling, the following precautions must be followed:**

- Maintain separate fuel tanks for diesel and gasoline. Keep tanks clean and free of debris
- Add fuel of proper type and grade, only when the pump is not running and engine is cool
- Fuel in well ventilated area
- Turn off all electrical switches
- Keep lighted smoking materials, flames or spark producing devices at a safe distance while refueling
- Keep fuel nozzle in contact with tank being filled, or provide a ground to prevent static sparks from igniting fuel
- **Do not spill fuel on hot surfaces**
- Clean up spillage immediately
- Do not start engine until fuel cap is secured to the fuel tank
- **Always** make sure that fuel is being put in the fuel tank, motor oil in the proper location and hydraulic oil into hydraulic oil reservoirs

# Operate Safely

## Electric Motor Driven Pumps

Allow only qualified personnel to **INSTALL, WIRE and OPERATE** electric motor driven pumps. Whenever electricity is present there is the possibility of **electrocution**.

**NEVER** use a pump/motor in an explosive atmosphere if it is not exclusively designed for the application.

**Always** ground electrical units.

**Make certain** to connect pump motor to the right phase and voltage.

**Do not** run pump if voltage is not within limits.

**Make sure motor rotation** is in accordance with impeller rotation (which should be indicated somewhere on the pump — check the manufacturer's manual).

**Make all electrical installations** in accordance with National Electric Code, State and Local electrical codes.

**Never use gas piping** as an electrical ground.

**Make sure** the related electrical circuits are dead and locked out before performing any maintenance.

**Follow** motor manufacturer's recommended maintenance and operation instructions.

**If circuit breaker or fuse is tripped**, examine the system for the problem before restarting pump.

**NEVER** use the power cord to aid lifting the pump.

**NEVER** operate a pump with a plug-in type power cord without a ground fault circuit interrupter.

**NEVER** use cords with frayed, cut or brittle insulation. Check the cord on the pump for nicks in the insulation and for sound connections to the ground fault interrupter plug and motor.

**NEVER** let extension cords or the plug connections lay in water. Locate the pump so that the cord cannot fall into any water or be submerged by rising water, unless the pump is designed for such use.

**NEVER** handle energized power cords with wet hands.

**MOTOR OVERLOAD:** do not exceed the manufacturer's recommendation for maximum lift or discharge head. See manufacturer's published curve for proper sizing of motors. A misapplied motor can overheat.

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# Operate Safely

## Submersibles

Allow only qualified personnel to **INSTALL, WIRE and OPERATE** submersible pumps.

Whenever electricity is present there is the possibility of **electrocution**.

**NEVER** use a pump/motor in an explosive atmosphere, if it is not exclusively designed for that application.

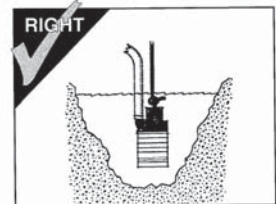
**ALWAYS** ground the pump.

**Make certain to connect the pump to the right phase and voltage.**

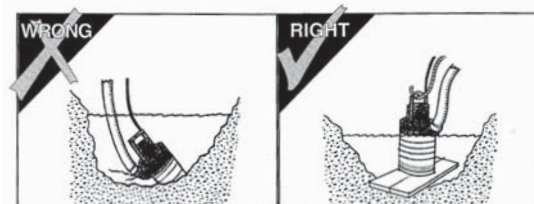
**DO NOT** run the pump if voltage is not within limits. **Make all electrical installations** in accordance with National Electric Code, State and Local electrical codes.

**Mount electrical control box** in a vertical position, protected from the elements.

**NEVER** use the power cord or hydraulic hoses to lift or lower submersibles. Attach a lifting cable to the manufacturer's recommended attachment point on the pump for lowering and lifting the pump.



**NEVER** position the pump directly on a soft, loose bottom. To attain maximum capacity and prevent excessive wear, position the pump so it will not burrow itself into sand or clay. Stand the pump on a plank, a bed of coarse gravel, within a perforated container, on a suitable floatation device, or retain it hanging freely by a lifting cable.



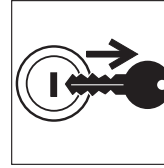
# Shut Down Safely

**⚠ WARNING!** Avoid death or serious injury. **Never leave a machine unattended with the engine running.**

## Safe Shutdown

The detailed shutdown procedure is given in your manufacturer's manual(s). In general, this includes:

- Stop machine
- Position controls in neutral or locked position
- Idle engine for short cool-down period
- Stop engine and remove ignition key (if equipped)
- Cycle hydraulic controls to eliminate pressure
- Lock covers and enclosures
- Shut off master electric switch (if equipped)



**Shut engine off,  
remove key**

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# Perform Maintenance Safely

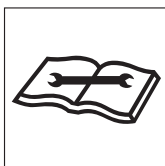
## Know What You're Doing

Maintenance on this type of machine is not for inexperienced or untrained personnel. It can be hazardous unless performed properly. Be sure you have the necessary skill, information, correct tools, and proper equipment to do the job safely.

Be sure to maintain the equipment according to the manufacturer's instructions. Regularly check the operation of the protective and safety devices.

**Do not** perform any work on a machine unless you are authorized and qualified to do so.

If you have been authorized to perform maintenance, **read the manufacturer's operating and service manual(s)**. Study the instructions: check the lubrication charts, examine all the instruction messages on the machine.



**Maintain equipment**

## Protect Yourself

Wear all the personal protective clothing and PPE issued to you or called for by job conditions.

You may need:

- Hard hat
- Safety shoes
- Safety glasses, goggles or face shield
- Heavy duty gloves
- Hearing protection
- Reflective clothing
- Wet weather gear
- Respirator or filter mask

Wear whatever is needed to protect yourself. Do not take chances.

# Perform Maintenance Safely

**⚠ WARNING!** Avoid death or serious injury from entanglement. **Do not wear loose clothing or accessories. Stay away from all rotating components when the engine is running.** Contact, wrapping or entanglement with rotating or moving parts could result in death or serious injury.

Wear a rubber apron and rubber gloves when working with corrosives. Wear gloves and safety shoes when handling wooden blocks or sharp-edged metal.

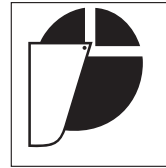
Always use safety glasses, goggles or a face shield. They provide eye protection from fluids under pressure, during grinding and while servicing batteries. Protection is also needed from flying debris, liquids and loose material produced by equipment, tools and pressurized air/water.

Wear a face shield and follow manufacturer's instructions when you disassemble spring-loaded components or work with battery acids. Keep pockets free of all objects that could fall out and drop into machinery.

Handle tools and heavy parts sensibly, with regard for the safety of yourself and others. Lower items; don't drop them.



**Avoid rotating parts**



**Wear eye protection**



**Do not  
loosen  
radiator cap  
until cool**

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# Perform Maintenance Safely

## Prepare the Work Area

- Position the machine in a level area out of the way of other working equipment
- Make sure there is adequate light, ventilation and clearance
- Remove oil, grease or water to eliminate any slippery surfaces
- Clean around the area to be serviced to minimize contamination

## Prepare the Machine

Stored energy sources (electrical, mechanical, hydraulic, pneumatic, chemical, thermal, etc.) must be controlled or reduced to a practical minimum before performing any maintenance, repair, or service procedures.

Safety practices to prevent potential injuries from energy-releasing sources include:

- Place controls in NEUTRAL or LOCKED position before shutting off engine
- Allow all moving parts to stop
- Shut off engine
- Relieve hydraulic system pressure by moving controls several times in all directions

- Lock ignition, remove key (if equipped) and take it with you
- Look and listen for evidence of moving parts before servicing
- Shut off master electrical switch (if equipped)
- Securely support or block up machine before working underneath machine or other lifted components
- Securely support, block up, or lock up other components with approved locking devices before working near or underneath them
- Relieve pressure before disconnecting or disassembling any pressurized system
- Block or relieve spring pressure before disassembling any spring-loaded mechanism
- Avoid flames, sparks, or smoking near any fuel, hydraulic fluid or other flammable material such as spraying debris



**Avoid falls, clean  
slippery surfaces**



# Perform Maintenance Safely

Attach a “DO NOT OPERATE” warning tag to the control levers. Lock out the unit according to the manufacturer’s operating manual. If there is a key, remove it and take it with you.

Install approved support device(s) when working under or near raised equipment.

Remove only guards or covers that provide access to the area being serviced. Replace all guards and covers when work is complete.

**⚠ WARNING!** Avoid injury or death. **Never work on machinery with the engine running unless instructed by the manufacturer’s manual(s) for specific service.**

## Pump Maintenance and Repair

**MAKE SURE** the pump is disconnected from the power source or the appropriate circuits are dead and OSHA Lockout/Tagout is applied before doing any maintenance or repair work on the pump.

Pumps with float switches or other automatic devices can start without warning if not properly locked out.

**ALWAYS** replace safety devices removed during the service or repair before returning pump to operation.

**NEVER** use the power cord to aid in lifting the pump.

## Sizing Extension Cords

Use the following chart to select the correct size extension cord to prevent excessive amperage draw or voltage drop which would cause the motor to overheat.

**Cables that are too long or coiled** can cause a voltage drop. **Be aware** that strong sunlight can cause a voltage drop.

Amperes	Wire Gauge and Cord Length (in feet)		
	50	100	150
6	16	16	14
8	16	14	12
10	16	14	12
12	14	14	12
14	14	12	10
16	12	12	10

**Check oil level ONLY** when pump is cool.

**USE ONLY** recommended oil per manufacturer’s recommendation.

**INSPECT ELECTRICAL WIRING** for worn or damaged insulation. **INSTALL** new wiring if wires are damaged.

**After repairs are made, clean the equipment before putting the pump back into position.**

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# Perform Maintenance Safely

## Common Maintenance Safety Practices

### Use Proper Ventilation

If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.



Ventilate work area

If you do not have an exhaust pipe extension, make sure you open doors and windows to get plenty of outside air into the area.

**⚠ WARNING!** Exhaust fumes contain carbon monoxide which could be deadly if inhaled. **Never operate any type of engine without proper ventilation. EXHAUST FUMES CAN KILL.**



No smoking and no open flames

## Fuel Hazards

**⚠ WARNING!** Avoid serious injury or death. **Always use approved fuel containers and/or fuel dispensing equipment to reduce the risk of explosion or fire.**

Always observe these practices to reduce the possibility of a serious accident:

- Shut off engine and ignition during refueling
- Turn off all electrical switches
- Ground the fuel nozzle against the filler neck
- Keep sparks and open flames away from fuel. Do not smoke while refueling or when handling fuel containers
- Do not cut or weld on or near fuel lines, tanks or containers
- Do not overfill the tank or spill fuel. Clean up spilled fuel immediately. Clean spills immediately



# Perform Maintenance Safely

## Ultra-Low Sulfur Diesel (ULSD) Hazard

**⚠ WARNING!** Ultra-Low Sulfur Diesel (ULSD) poses a greater static ignition hazard than earlier diesel formulations with higher sulfur content. Avoid death or serious injury from fire or explosion; **consult with your fuel or fuel system supplier to ensure the delivery system is in compliance with fueling standards for proper grounding and bonding practices.**

## Engine Coolant Hazards

**⚠ WARNING!** Avoid serious injury or death. Liquid cooling systems build up pressure as the engine gets hot, so **use extreme caution before removing the radiator cap.**

- Stop the engine and wait for the system to cool
- Wear protective clothing and safety glasses
- Turn the radiator cap slowly to the first stop to allow the pressure to escape before removing completely



**Allow radiator to cool before removing cap slowly**

## Hydraulic System Hazards

Be sure to follow manufacturer's instructions for relieving fluid pressure before performing any maintenance. The hydraulic system is pressurized whenever the engine is on and may hold pressure even after the engine is shut off. Cycle hydraulic controls, including auxiliary hydraulic control (if equipped), after the engine is shut off.



**Check for leaks and inspect hoses**

During inspection of the hydraulic system:

- Wait for fluid to cool before disconnecting the lines  
Hot hydraulic fluid can cause **severe burns**
- Wear appropriate eye protection. Hydraulic fluid can cause permanent eye injury
- When venting or filling the hydraulic system, loosen the filler cap slowly and remove it gradually
- **Never** reset any relief valve in the hydraulic system to a pressure higher than recommended by the manufacturer

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# Perform Maintenance Safely

## Hydraulic Fluid Injection Hazard

**⚠ WARNING!** Accidental injection of high-pressure fluid into the hands or body is dangerous and could result in death or serious injury. **Use caution when checking hydraulic leaks as pressurized hydraulic fluid has enough force to penetrate skin, causing serious personal injury.**

If a leak is discovered:

- Ensure engine is turned off; relieve pressure in hydraulic circuit
- Wear proper hand and eye protection
- Visually examine the hydraulic hoses or fluid lines in the vicinity of the leak for breaks or cracks. **Do not** use your hand to check for leaks
- Repair or replace hydraulic lines according to the manufacturer's recommendations

Fluid injection injuries are not always obvious. Victims have reported such injuries feel like a bee sting or splinter under the skin. If you suspect you have a fluid injection injury, do not take chances. Seek proper medical care immediately. If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury.



**Wear eye protection**



**High pressure fluid can inject into the body**

# Perform Maintenance Safely

## Battery Hazards

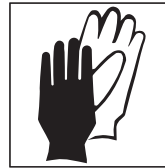
The liquid in batteries contains acid, which is a POISON and could cause SEVERE CHEMICAL BURNS.

Avoid injury:

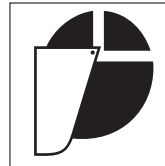
- Wear a face shield to prevent contact with your eyes
- Wear chemical-resistant gloves and clothing to keep electrolyte off your skin and regular clothing

**⚠ WARNING!** Electrolyte will damage eyes or skin on contact. **Always wear a face shield to avoid electrolyte in eyes.**

If liquid from the battery contacts your eyes, flush immediately with clean water and get medical attention. Wear chemical-resistant gloves and protective clothing to keep liquid off your skin. If liquid contacts exposed skin or clothing, wash off immediately with clean water. If liquid is ingested, drink large quantities of water or milk. DO NOT induce vomiting. Seek medical attention immediately.



Wear hand protection



Wear face protection

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# Perform Maintenance Safely

## Avoid Explosion

**⚠ WARNING!** Avoid serious injury from explosion. Lead-acid batteries produce extremely explosive gases especially when being charged. **Keep arcs, sparks, flames and lighted tobacco away.**

- Do not smoke near batteries
- Keep them away from arcs, sparks and open flames
- Provide adequate ventilation

**Never** check the battery by placing a metal object across the battery posts. The resulting spark could cause an explosion.

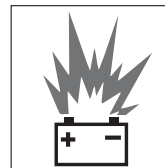
**⚠ WARNING!** Avoid serious injury from battery explosion. **Do not charge a battery or jump-start the engine if the battery is frozen.**

Warm to 60°F (15.5°C) or the battery may explode and could cause serious injury.

Safety rules during battery jump-starting:

- Follow the instructions for proper battery jump-starting, as specified in the manufacturer's manual
- Be sure the machines are not touching
- Observe the polarity of the batteries and connections

- Make the final cable connection to the engine or the furthest ground point away from the battery. Never make the final connection at the starter or dead battery. Sparks may ignite the explosive gases present at the battery
- When disconnecting cables, remove the cables in reverse order of connection (e.g., final connection first)



Avoid sparks and open flames near batteries



When jump-starting, observe polarity and make final connection at ground point

# Perform Maintenance Safely

## Complete Service and Repairs Before Machine is Released

Tighten all bolts, fittings, and connections to torques specified by the manufacturer.

Are there any missing cotter pins, washers, locknuts, etc.? Are there any parts left over?



High pressure fluid  
can inject into  
the body

Start the engine and check for leaks. (See page 29, **Hydraulic System Hazards**.) Operate all controls to make sure the machine is functioning properly. Test the machine if necessary. After testing, shut down and check the work you performed.

Recheck all fluid levels before releasing the equipment for operation.

All parts should be inspected during repair and replaced if worn, cracked or damaged. Excessively worn or damaged parts could fail and cause injury or death.

Install all guards, covers, and shields after servicing. Refill and recharge pressure systems only with manufacturer-approved or recommended fluids.



Verify service work  
when completed



The information in this safety manual is the consensus of the Contractors Pump Bureau.

# Final Word to the User

You have just finished reading the AEM Portable Pumps Safety Manual. It is impossible for this manual to cover every safety situation that you may encounter on a daily basis. Your knowledge of these safety precautions and your application to the basic rules of safety will help to build good judgment in all situations. Our objective is to help you develop, establish, and maintain good safety habits to make operating a portable pump easier and safer for you.

Many pictorials in this safety manual can be downloaded at <http://pictorials.aem.org>.

For additional publications, visit our website at [www.safetymaterials.org](http://www.safetymaterials.org).



ASSOCIATION OF  
EQUIPMENT MANUFACTURERS

e-mail [safetymaterials@aem.org](mailto:safetymaterials@aem.org)  
[www.aem.org](http://www.aem.org)

This manual is one in a series on the safe operation of machinery, published by AEM.



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**WACKER  
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*all it takes!*

**Wacker Neuson America Corporation**  
N92W15000 Anthony Ave  
USA-53051 Menomonee Falls, WI

Tel.: +01 262 255-0500  
EMail: [info@wackerneuson.com](mailto:info@wackerneuson.com)  
[www.wackerneuson.us](http://www.wackerneuson.us)

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