

OWNER'S MANUAL

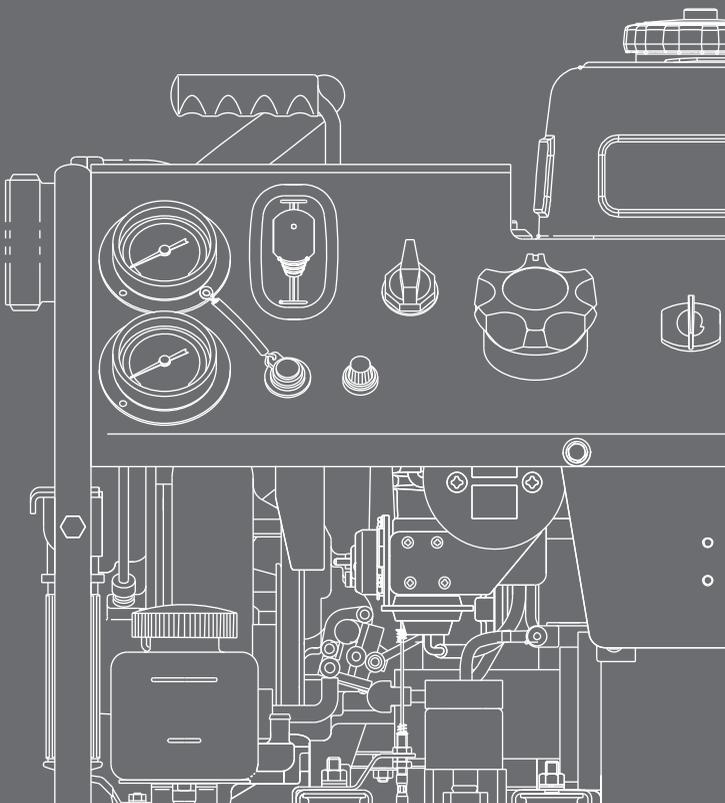
Original instructions



V20FS

PORTABLE FIRE PUMP

No.003-12074-1



**BACKS
YOU
UP™**

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APPLICATIONS OF THIS FIRE PUMP

USAGE

TOHATSU portable fire pump“V20FS” is manufactured for use in firefighting operations.

The portable fire pump is intended only for firefighting activities in collaboration with general public fire extinguishing equipment.

Using it for other applications is regarded as being used for improper purposes.

The manufacturer of the fire pump bears no responsibility for any damages that may result from modification of the fire pump without prior permission from the manufacture, improper use of the fire pump, or use of the fire pump for applications other than those stated above.

Note that use the fire pumps for applications other than those stated above can result in personal injury or damage to the equipment.

Using the fire pump within the range of intended uses implies that the user should follow the instructions provided by the manufacturer relevant to operation, servicing and maintenance.

Intended people

All persons who operate, service or maintain the fire pump must read and understand the following items:

- Owner's manual
- Safety-related instructions on the pump and the other parts such as the battery.
- The other owner's manuals, such as battery charger.

The portable fire pump should be operated by only persons who received training as operators of fire engines along with each country's (region's) regulations.

The range of personal responsibility and supervision must be strictly defined by the user.

If a person does not have adequate professional knowledge which is required for his/her assignment, he/she must undergo relevant training or receive appropriate instructions from an individual who is actually knowledgeable in operation of this fire pump.

A person who does not have enough knowledge is not permitted to operate the fire pump.

When using the fire pump, conditions under which an explosion may occur are not considered.



- **Keep the manual in a safe place for further reference.**
- **Operators of the fire pump must always refer to all the relevant manuals in order to avoid errors, personal injuries and equipment damage when operating the portable fire pump, and to maintain faultless operation.**
- **Place owner's manual so that operators can refer to it where they operate the fire pump.**

INTRODUCTION

Thank you for purchasing the TOHATSU Fire Pump.

This fire pump has passed a range of quality assurance standards.

Owner's manual

The portable fire pump complies with relevant laws and regulations.

The manual includes a description for operation and maintenance. Before using the fire pump, be sure to read and understand the manual thoroughly.

Engine operation

This manual also includes a description for operation and maintenance of the engine.

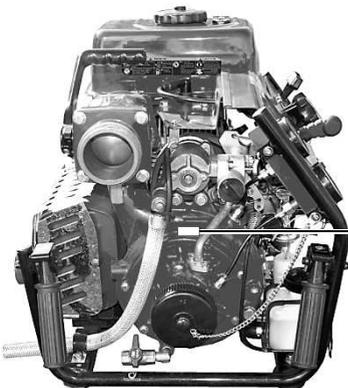
NOTE

- The manual is an important item that goes with your portable fire pump.
- The manual should accompany the fire pump if sold to the other person.

Before using this fire pump, write down the serial number in the following boxes. It will be useful in the case of asking about servicing, repairs and genuine parts.

Serial Number

(Identification Number)



The pump identification number is marked on the pump case.

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GENERAL SAFETY INFORMATION

Overview

Before operating the TOHATSU fire pump thoroughly read the manual to understand the proper operation procedures including “DANGER”, “WARNING”, “CAUTION” and “NOTE”.

These notices are designed to bring attention to very important information necessary to ensure safe, trouble free operation.



Warning sign meaning

This sign is used for safety-related instructions in this manual.

Be sure to follow all safety-related instructions, otherwise personal injury may occur.



Signal words

-  **DANGER** • Failure to observe will result in severe personal injury or death, and possibly property damage.
 -  **WARNING** • Failure to observe could result in severe personal injury or death.
 -  **CAUTION** • Failure to observe could result in personal injury or property damage.
- The instruction provides special information to facilitate the use or maintenance of the pump or to clarify important points.
 - For attaching position of the warning label, refer to the contents “3. LABELS”.
 - **Warning labels should be read clearly at any time.**
If the display of the warning label may become difficult to be read, it was almost come off, you must replace paste immediately.

Safety-related instructions and warning signs

Read and follow the safety-related instructions described in the manual and all warning signs on the portable fire pump thoroughly.

Always keep the warning signs in a legible condition. If any warning sign becomes illegible or detached, replace it immediately.

Transporting the portable fire pump



CAUTION

- When transporting the portable fire pump, assign one person per handle.
- Also, when you transport the portable fire pump, it should be transported holding the handle firmly.
- There is a risk of injury to the leg by fall.



Durability of protection

When you purchase a new pump, it is placed in packing box and protected.

Storage of pump after transportation

Keep the pump away from high humidity, and place it on a horizontal place.

Disposal of packing box

Dispose the packing box by following the environmental laws.

Emissions

Noise emission values

For noise emission values, refer to the "CONTENTS 16. APPENDIX".



CAUTION

- Wear proper hearing protection during operation.



Exhaust gas

Fatal hazard from carbon monoxide (CO) poisoning

Exhaust gas emitted from the engine contains carbon monoxide (CO) etc. that may seriously affect human health.

Do not operate the engine in a room, car, warehouse, tunnel or other closed locations that have poor ventilation.



Safety devices

Before operating this portable fire pump, be sure to check that all the safety devices have been installed in the appropriate positions.

Before removing the safety devices, turn the main switch off.



After protection devices (such as muffler guard) have been disassembled as part of servicing and maintenance work, install them back as soon as possible to their original positions, and make sure that they are in safe secure condition.



Check the portable fire pump visually and functionally on a regular basis.

If you find any faulty device or equipment, remove it immediately, and repair or replace it, if necessary.

Failure to do so may cause an accident.

After it has been repaired or replaced, make sure that it functions correctly.



Protective clothing and Protective equipment

During fire extinguishing training or regular firefighting services, wear normal protective clothing and equipment to protect your body.

- Fire protective clothing
- Fireproof helmet
- Fireproof protective gloves
- Fireproof protective boots



Service and Maintenance

Servicing and maintenance of the fire pump must be carried out by only persons who have professional knowledge, who are familiar with the device and who understand laws and regulations regarding safety and accident prevention.

Before starting maintenance work, turn the main switch off to stop the engine.

Disconnect the negative terminal of the battery.

Before starting maintenance work, securely place the portable fire pump on the ground.

Do not touch the high temperature parts such as the muffler, muffler cover, etc. until these parts will be cold enough. These parts could be very hot and will cause severe burns.



Electrical equipment

Only expert electricians or trained staff members should handle electrical equipment.

When removing the battery cable from the electrical equipment, always disconnect the negative (-) cable first.

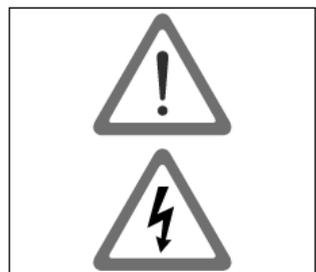
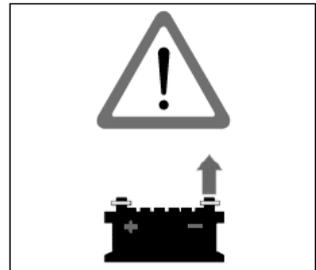
When connecting the cable to the battery, be sure to connect the positive (+) cable first. After that, connect the negative (-) cable.

Do not place any metal on the battery. Doing so may cause a short circuit.

Use a fuse with the same specifications as the original one when replacing it. Using a fuse that has a greater capacity than the rated value may damage the equipment.

While engine is running, do not touch the high voltage ignition wire attached to the spark plug. The wire carries very high voltage which will cause injury and bodily harm.

Check the electrical equipment of the fire pump on a regular basis.



Battery

Follow any safety-related instructions shown on the battery.

The battery can generate flammable hydrogen gas that may cause an explosion.

Do not charge the battery in closed room.

Do not smoke near the battery.

The battery electrolyte is **caustic and may cause personal injuries**.

- Always wear protective clothing.
- Always wear protective gloves.
- Always wear protective glasses.
- Do not tilt the battery. Doing so may cause the battery electrolyte to leak out from the vent hole.



Handling of fuel

Exercise care when handling fuel.

Failure to do so may cause fire.

Do not bring any flames near fuel.

Stop the engine before refueling fuel.

Do not smoke while refueling fuel.

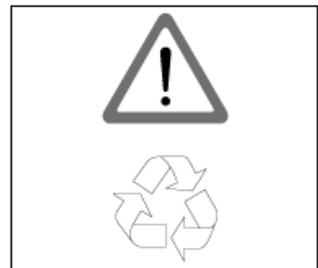
Do not refill fuel in an enclosed room to avoid an explosion by fuel fumes.



If fuel spills, wipe it with a cloth or others, and dispose it according to relevant laws and regulations.

Disposal

Dispose of disused batteries according to relevant laws and regulations.

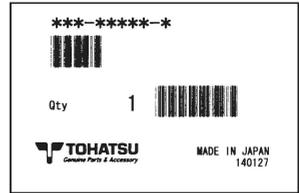


Genuine parts

When replacing parts for servicing and maintenance of portable fire pumps, be sure to use only Tohatsu genuine parts.

If genuine Tohatsu parts and accessories are not used, it may adversely affect the functioning and safety of the fire pump. Use genuine Tohatsu parts only.

Tohatsu bears no responsibility for any personal injuries or equipment damage that may result from use of parts or accessories obtained from outside sources.



Environmental protection measures

Dispose the oil, fuel, batteries, etc. should be done according to relevant environmental laws.

Do not dump waste into the ground, water, or sewerage.

Store the fuel only in the specified container.

When disposing of parts, follow the correct disposal procedure.



Water-prohibiting substance

Do not discharge water to water-prohibited substance.

Use of water

Do not pump combustible liquids, chemical or caustic liquids.



In the case of using this pump in EU, the pump needs to be EU specification. Confirm the following EC Declaration of Conformity.

EC Declaration of Conformity (DoC)

This product conforms to certain portion of the European Parliament directive.

DoC contains the following information;

- Name and Address of the manufacturer
- Applied community directives
- Reference standard
- Description of the product (Model name and serial number)
- Signature of the responsible person (Name / Title / Date and place of issue)

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1. SPECIFICATIONS

Model	V20FS
Description	Portable pump
Applicable standard	EN 14466
Type brief designation	PFPN 6-500
Max. permissible inclination angle	During transport : 35°at all sides In operation : 15°at all sides
Max. operating pressure P _{alim}	1.1 MPa (11 bar)
Max. water temperature	+ 60 °C
Temperature range	-15 °C ~ +40 °C ambient temperature
Engine	
Manufacturer	TOHATSU CORPORATION
Model	T66C
Type	2-stroke, air-cooled spark ignition engine
Bore ×Stroke	66 mm x 58 mm (2.60 in x 2.28 in)
Number of Cylinder	1
Piston displacement	198 cm ³
Authorized output	11.7 PS (8.6kW)
Fuel type	Unleaded petrol RON91
Fuel tank capacity	5.95 L (1.57 gal(US))
Fuel consumption	5.9 L/h (1.56 gal(US)/h)
Ignition	Flywheel magneto (C.D.I. system)
Spark plug	NGK BR7HS
Starting system	Electric starter and recoil
Lubrication	Auto mixing
Fuel feed system	Single carburetor with Auto Choke
Battery	12V-14Ah/10Hr
Flooding bulb	12V-35W

1. SPECIFICATIONS

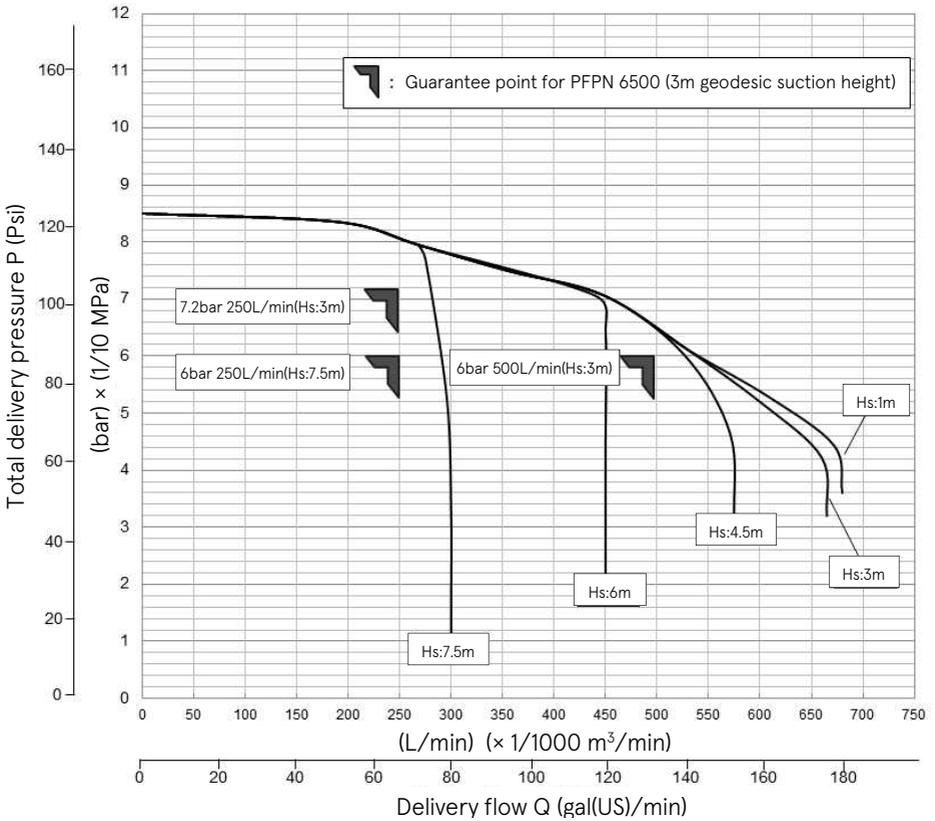
Model	V20FS
Primer	
Type	Rotary-vane vacuum pump (Oil less type)
Max. suction height	Approx. 9 m (29.5 ft)
Pump	
Type	Single suction, single stage, high pressure turbine pump
Number of delivery outlet	1
Discharge port coupling	BSP thread 2-1/2", JIS-B-9912 2-1/2", G-2-1/2" (65 mm/2.5 in)
Suction port coupling	<ul style="list-style-type: none"> • BSP thread 2-1/2" • JIS-B-9912 2-1/2",G-2-1/2" (65 mm/2.5 in)
Pump performance (Suction height: 3 m /9.8 ft)	589 L/min at 0.525 MPa 155 gal(US)/min at 75 psi
	525 L/min at 0.6 MPa (6 bar) 139 gal(US)/min at 87 psi
	437 L/min at 0.7 MPa / 115 gal(US)/min at 100 psi
	250 L/min at 0.8 MPa (8 bar) 66 gal(US)/min at 116 psi
Dimensions and weight	
Overall Length x Width x Height	530mm x 507mm x 537mm (20.9 x 19.9 x 21.1 in) ~EU spec. 560mm x 475mm x 537mm (22.0 x 18.7 x 21.1 in)~with suction port cap 530mm x 475mm x 537mm (20.9 x 18.7 x 21.1 in)
Mass	46 kg/101.4 lbs (dry), 52 kg / 114.7 lbs(ready for operation) EU specification:47 kg/103.6 lbs (dry), 52 kg / 114.7 lbs(ready for operation)
Center of gravity	221mm (8.7 in)

Materials

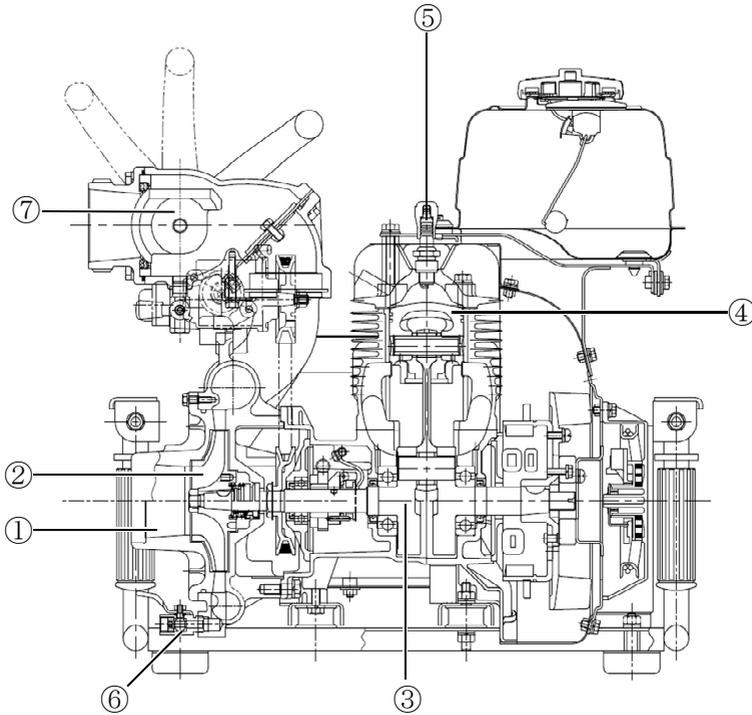
Engine	
Crankcase, Cylinder, Cylinder head	Aluminum alloy
Crankshaft	Chromium-molybdenum steel
Connecting rod	Chromium-molybdenum steel
Piston	Aluminum alloy
Pump shaft	Chromium-molybdenum steel
Muffler	Steel
Pump	
Pump casing, Pump cover	Aluminum alloy
Impeller	Aluminum alloy
Shaft seal	
Type	Mechanical seal

1. SPECIFICATIONS

Performance curve

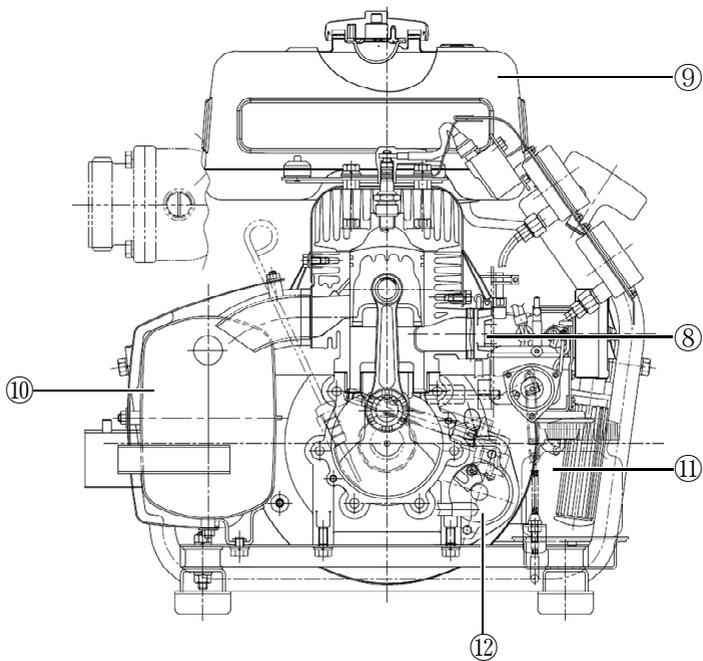


2. OPERATION DEVICE



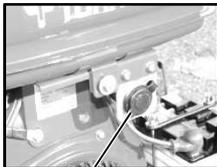
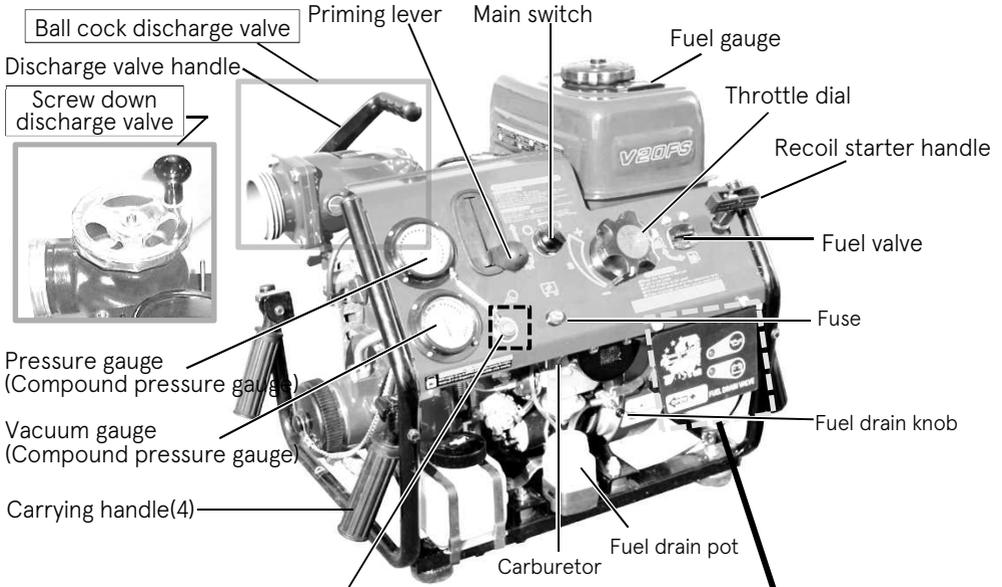
- ① Suction port
- ② Impeller
- ③ Crankshaft
- ④ Piston
- ⑤ Spark plug
- ⑥ Drain valve
- ⑦ Discharge valve

2. OPERATION DEVICE



- ⑧ Carburetor
- ⑨ Fuel tank
- ⑩ Muffler
- ⑪ Oil tank
- ⑫ Starter motor

2. OPERATION DEVICE



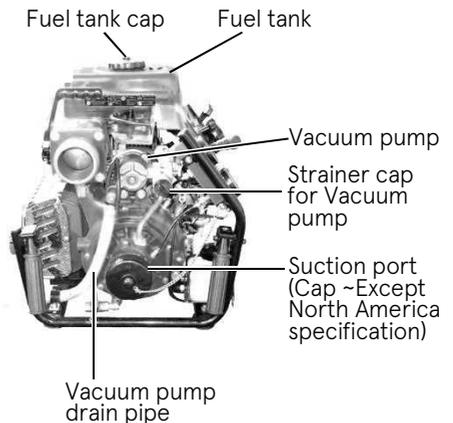
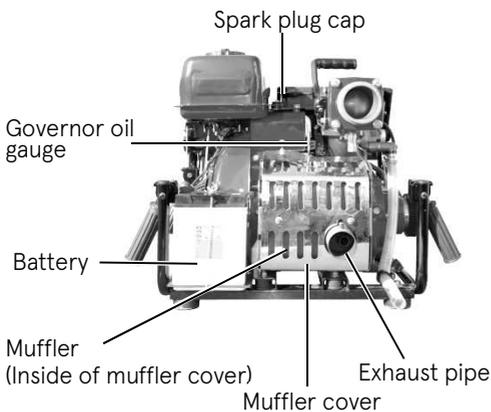
Socket
 (For EU spec. battery charger.)

Socket
 (For battery charge and floodlight except EU spec. battery charger.)

Engine oil level warning lamp
 Low battery warning lamp

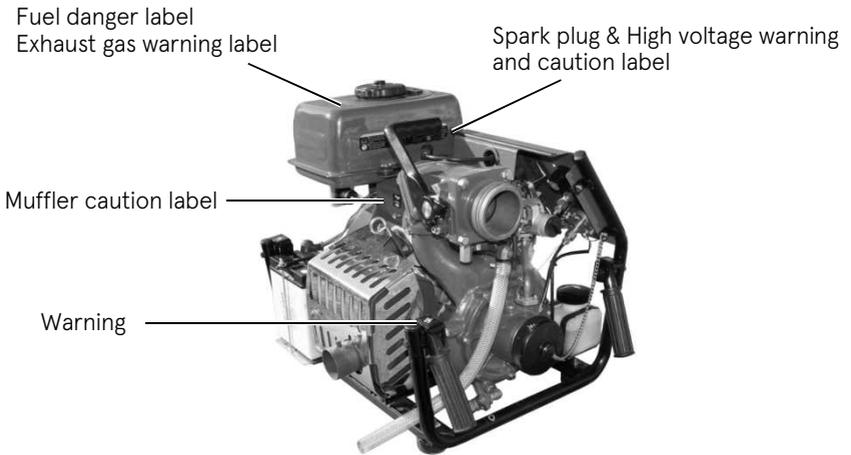
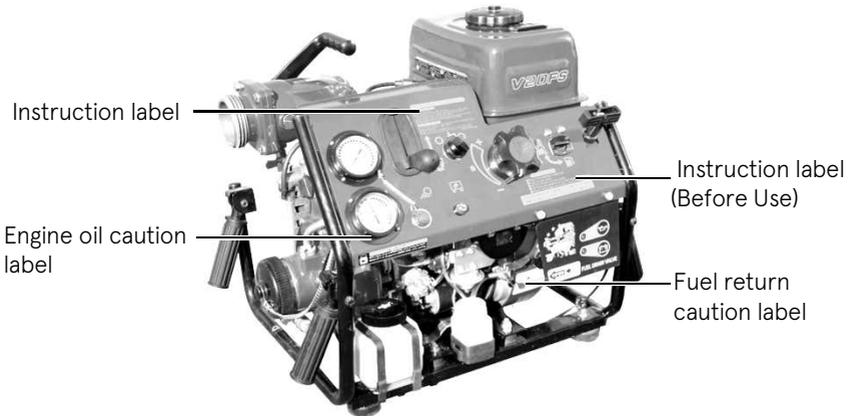


(EU specification pump only)



3. LABELS

WARNING & CAUTION



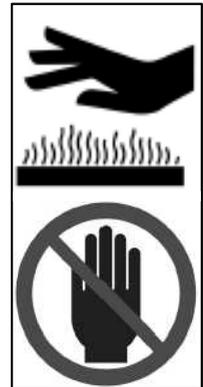
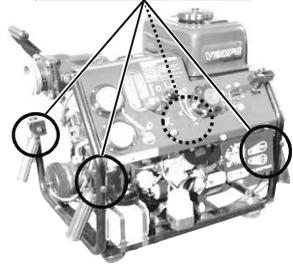
4. OPERATING PRECAUTIONS

Installing pump

 **CAUTION**

- The fire pump must be installed on level ground. Otherwise, an accident may occur.
- If the fire pump should be installed on uneven ground, it must be secured.
- When installing the portable pump in the vehicle, place the vehicle on a level place, and install the pump.
- Do not put your hand or finger in the retractable part when using the handle.
- When transporting the portable fire pump, assign one person per handle. Also, when you transport the portable fire pump, it should be transported holding the handle firmly.
- Do not touch the exhaust pipe and the muffler while the engine is running, or for more than 10 minutes after the engine has been stopped.
- Confirm the engine temperature is cooled down enough. These parts are very hot and will cause severe burns.

Do not put your hand or finger



4. OPERATING PRECAUTIONS

NOTE

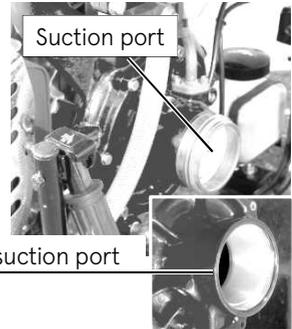
- Place the pump as near as possible to water source, and water suction height as low as possible.
- When putting the portable fire pump down on the ground, put it gently and horizontally.
Max. permissible inclination angle : 15°
- In case of the inclined location or uneven ground, make sure that water suction hose is lower than suction port of the pump.
- In case of the suction hose is put undulated, air can be left easily in the hose, and possibly cause suction inability when the water discharge valve is opened.
- In case of the suction inability due to air remaining in the suction hose, set the water discharge valve half-opened, and operate vacuum pump until water is discharged continuously. (More operation of vacuum pump for 3 to 5 seconds from beginning of water discharge.)
- Be sure to install strainer and basket at the end of suction hose. If the pump may suck sand or mud of the water source bottom, place sheet below the basket.
- Strainer and basket of suction hose should be placed more than 30 cm below water surface to prevent suck of air.
- Discharge hose should be arranged not to be bent.
- When starting / operating the pump, connect the battery. Even if starting the engine by operating the recoil starter.

5. DESCRIPTION OF DEVICES

Suction port

The diameter of the thread for fire pump is

- BSP thread 2-1/2"
- JIS-B-9912 2-1/2", G-2-1/2" (65 mm/2.5 in)



WARNING

- Putting a finger or a hand into the suction port while the pump is running without installing the strainer, it may be seriously damaged by the rotating inducer.



CAUTION

- Installed the standard strainer to the suction port.
- Do not run the pump if the strainer is not installed.
- If the pump is operated without the strainer attached, gravel can enter the pump and the drainage capacity may be decreased considerably.



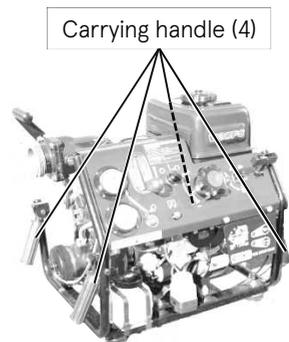
Carrying handle

The fire pump is equipped with four carrying handles.



CAUTION

- To prevent injuries, two persons should work together when carrying and placing the pump.

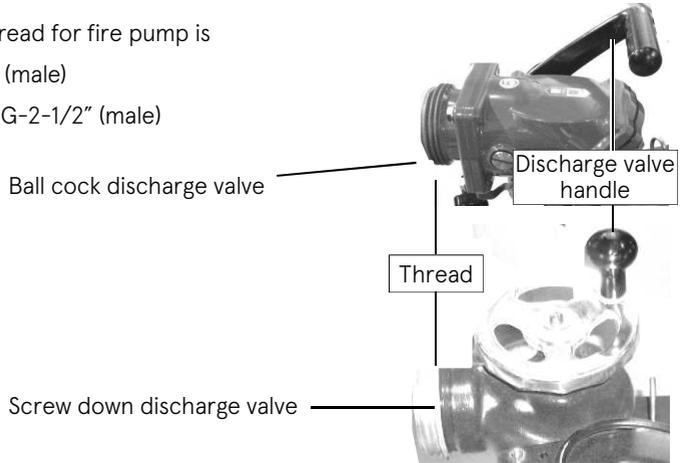


5. DESCRIPTION OF DEVICES

Discharge port

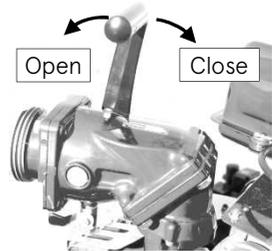
The diameter of the thread for fire pump is

- BSP thread 2-1/2" (male)
- JIS-B-9912 2-1/2", G-2-1/2" (male)



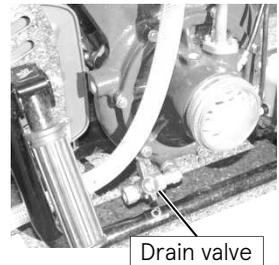
Discharge valve

Use the discharge valve lever handle for opening and closing the discharge valve.



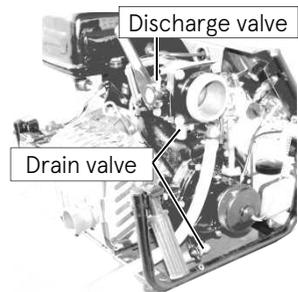
Drain valve

Use the drain valves to drain water.



NOTE

- Close all the valve(s) when operating the fire pump. If the valve is opened, water cannot be sucked up.



5. DESCRIPTION OF DEVICES

Fuel tank

Refill appropriate amount of gasoline to the fuel tank.
Close the fuel tank cap all the time except refuel.



Engine oil tank

Refill appropriate amount of oil to the oil tank.
Close the oil tank cap all the time except filling.
The oil tank has an oil level sensor.
The warning buzzer sounds, if the engine oil is not enough filled.



- **If you run the pump despite of the warning buzzer sounds, the engine could be damaged and/or be stuck.**

NOTE

- If the engine oil is not enough, the warning buzzer sounds.

V-belt cover

A V-belt cover is attached to the pump for safe.



- **While the engine is running, do not touch the moving and rotating parts such as a belt and a pulley to avoid personal injuries.**



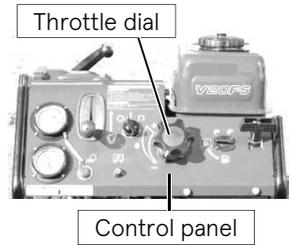
5. DESCRIPTION OF DEVICES

Control panel

The control panel is equipped with all the necessary operating and control instruments as follows.

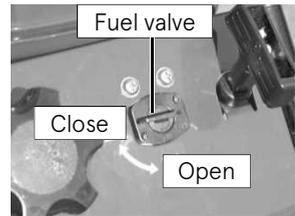
- Throttle dial

Use the throttle dial to control discharge pressure.



- Fuel valve

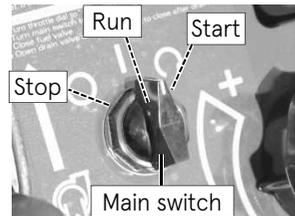
Turn the fuel valve to control the fuel supply by full open or close completely.



- Main switch (Stop switch)

Turn the main switch (Stop switch) to start, run or stop the engine.

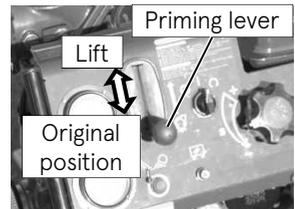
Description	Function
○ (Stop)	To stop the engine
I (Run)	Running position
⌚ (Start)	To start the engine



- Priming lever

Use the lever for suctioning water.

After starting the engine, lift the priming lever to suck up water. After priming has been completed, return the priming lever to the original position.

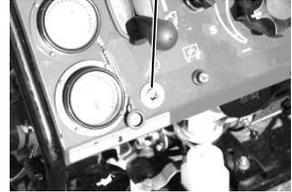


5. DESCRIPTION OF DEVICES

- Battery charger socket

Connect the battery charger plug to the socket when you charge a battery of the pump.

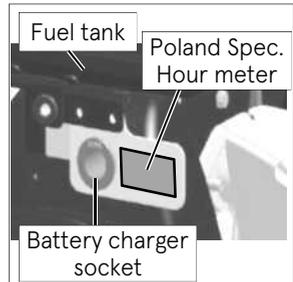
Battery charger plug socket except EU spec.



- **Before charging the battery, turn the main switch OFF.**
- **When starting the pump operation, be sure to remove the battery charger plug from the socket before turning the main switch ON.**
- **The socket is for a battery and a floodlight except EU specification pump. The EU specification pump has a battery charging socket and a hood light socket, respectively.**
- **Do not connect a cigarette lighter to the socket, because it is not a heat-resistant specification.**

- Hour meter (Only for Poland specification)

- The hour meter starts counting when the main switch is turned on.
- The hour meter only works during the main switch turned on.
- The hour meter does not have reset function.
- If the hour meter counts over the operable hours, it resets to 0.

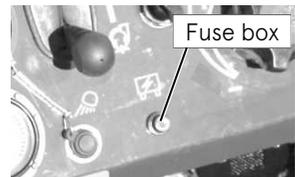


- Fuse box

Fuse is in the fuse box

* Fuse: 5A

Security fuse is installed for electrical circuit in the fuse box.

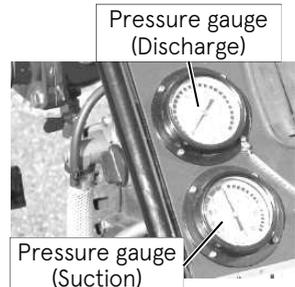


- Pressure gauge for discharge

The pressure gauge for discharge indicates the actual operating pressure.

- Pressure gauge for suction

The pressure gauge for suction indicates the negative suction pressure and the input pressure supplied from an external water source.



5. DESCRIPTION OF DEVICES

Alarm system

NOTE

- All the specification pumps have an alarming buzzer system for low oil level caution.

Warning lamp & buzzer

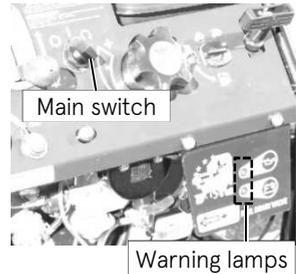
- * Warning lamps are only for EU specification pump.

When you turn the “Main switch” to the “Run(|) ” position, the lamp and buzzer check mode starts. The warning lamps light up and the buzzer sounds for a moment to check the functions.

If the lamp and buzzer check mode shows the failure, refer to the chapter 15 troubleshooting to solve problems.

CAUTION

- **In the case of warning shown (warning lamp does not turn off), remove the cause by following “Chapter 15 TROUBLESHOOTING”.**



The monitor indicate the following information:

- Engine oil level
- Battery charge level

Low engine oil level warning lamp (Only for EU specification)

When the engine oil in the oil tank reduced until the low level indication of the oil tank, the warning lamp turns on and the warning buzzer sounds.

CAUTION

- **Even if the low engine oil level warning light turns on, the engine will not stop immediately. This is to give priority to the continuation of fire fighting over protection of the engine. The engine remains operational for more than 30 minutes even after the warning lamp lights up. However, if the engine is operated for longer than this, it may stuck. Refill the oil immediately when the warning lamp lights or the warning buzzer sounds.**



5. DESCRIPTION OF DEVICES

Low battery warning (Only for EU specification)

Battery voltage low warning lamp turns on when the battery voltage decreases below the limit.

Leaving the battery as it is, the battery will deteriorate, so charge the battery immediately.

NOTE

- The battery charge warning buzzer does not sound.



Low battery warning lamp

Restart prevention function (Only for EU specification)

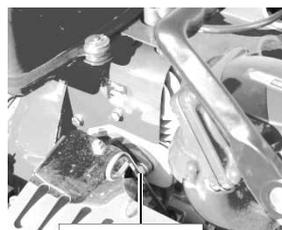
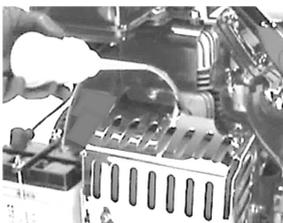
When the engine speed goes over 1200 r/min, the engine will not start even if the main switch is turned to the "🔌" position.

Governor case

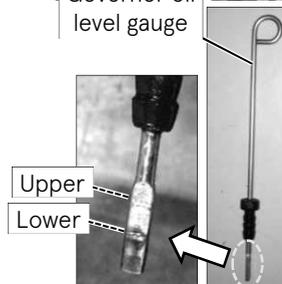
Check the governor oil level with the governor oil level gauge (dipstick).

The governor oil gauge shows upper and lower level of the oil on the gauge.

If the oil is needed, add 2-stroke engine oil from the oil gauge port up to the area between Lower and Upper limit line.



Governor oil level gauge



⚠ CAUTION

- Be sure to stop the engine before checking the oil level. If you pull the dipstick when the pump is running, the oil may blow out.

5. DESCRIPTION OF DEVICES

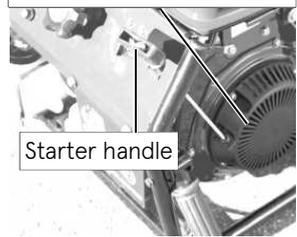
Manual starter

If the engine will not start with the starter motor, use the manual (recoil) starter.



CAUTION • Personal injuries may occur. Do not pull the manual starter handle when the pump is running. Otherwise, the manual starter may be damaged.

Manual (Recoil) starter



Mechanical governor

A built-in mechanical governor controls the throttle valve so that the maximum engine speed does not exceed 6600 r/min.

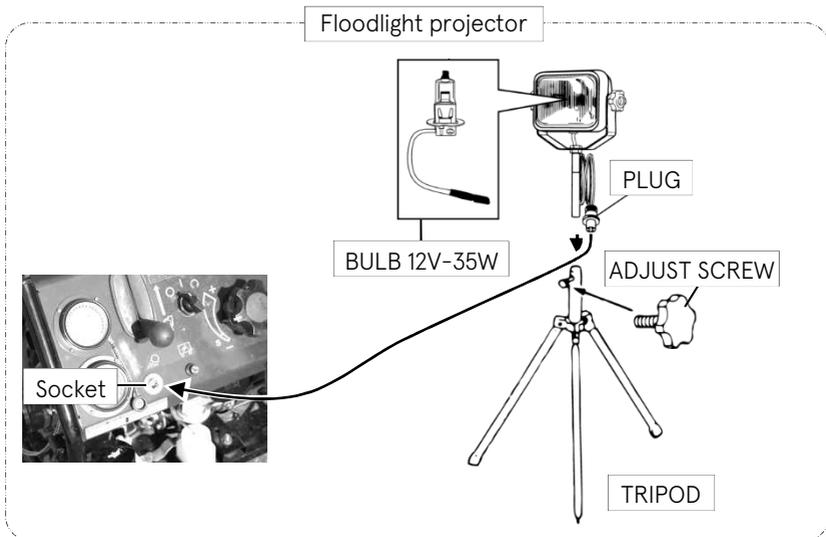


Floodlight (Search light)

Use the floodlight projector to illuminate the location where the fire pump is operated.

Connect the floodlight plug to the outlet socket of the pump.

Fix the projector to the tripod with tightening the adjust screw.



CAUTION • Secure adequate lighting for the location where the fire pump is operated, otherwise an accident may occur.

6. PREPARATION FOR OPERATION

Initial charge of battery

The battery can be used immediately after filling cells with electrolyte.

In the case of the battery is maintenance free of electrode (Sealed type battery), do not open the battery after filling it with electrolyte.

Refer to the instruction of the battery.



CAUTION

- Do not operate the pump while charging the battery.

Fuel

Fuel tank capacity : 5.95L (1.57gal)

Fill the tank with gasoline until the maximum level by checking the gauge indicator (red).

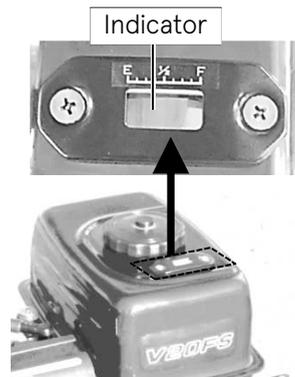
- * Gasoline:87 octane minimum at pump posted rating...91 based on the research octane rating method.

NOTE

- Use of low-quality fuel results in a short engine life as well as starting difficulty and other engine problems.

Fuel containing alcohol, methanol (methyl), or ethanol (ethyl), may cause:

- Deterioration of rubber parts and plastic parts.
 - Starting, idling and other engine performance problems.
- Do not use fuel that contains more than 10% ethanol or more than 5% methanol. Damages caused by the use of fuel contain alcohol are not covered under the limited warranty. Keep fuel tank full with gasoline at all times to ensure readiness.



6. PREPARATION FOR OPERATION

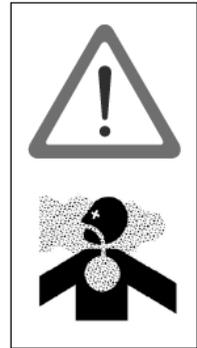
DANGER

- Vaporized fuel may cause ignition or an explosion.
- Do not bring any flames near fuel.
- Smoking, (errant) sparks, static electricity, heat and the other sources of fire can cause explosion.
- Stop the engine before refueling or draining fuel from carburetor.
- Do not spill fuel or overfill fuel into the tank.



CAUTION

- Do not breathe in vapor!
- Petrol fumes are very toxic.
- After stopping the engine, do not touch it while it is hot.
- Refill fuel after the engine has cooled down.
- Fuel tank cap should be always tightly closed.
- Fuel tank cap should be removed only to fill tank with fuel.
- Properly clean up all the fuel spills (checking for gasoline vapor) before starting engine.
- If the petrol or the fuel spills, wipe it off using a cloth or materials, and dispose of them according to the relevant laws and regulations.



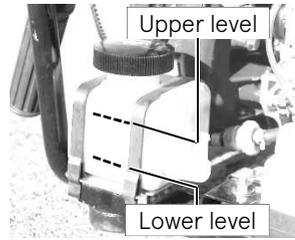
6. PREPARATION FOR OPERATION

Engine oil

Refill the 2-stroke engine oil to the oil tank until "UPPER LEVEL".

CAUTION

- **The warning buzzer sounds, if the engine oil is not enough filled.**
- **We recommend the engine oil of ISO FB grade or higher quality.**
- **Always wipe off the spilled oil.**



Governor oil

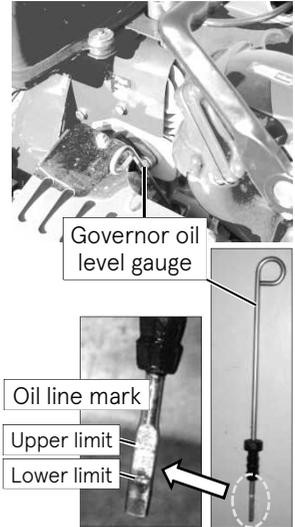
Before using fire pump, check the governor oil level.

1. Place the pump on a level place.
2. Remove the governor oil level gauge (dipstick), and wipe it with a cloth.
3. Insert the governor oil level gauge into the original position(port/hole) completely.
4. Pull out the governor oil level gauge (dipstick) again, and check the oil level. The oil level should be between upper and lower limit line on the gauge.

If the oil level is below the Lower limit, add 2-cycle engine oil from the oil gauge port up to the oil mark line(between Lower-Upper limit).

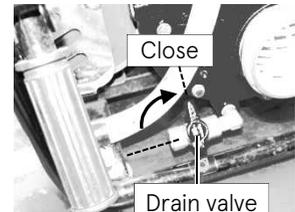
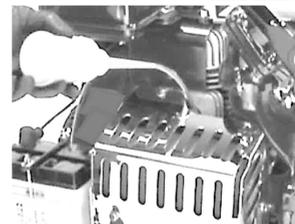
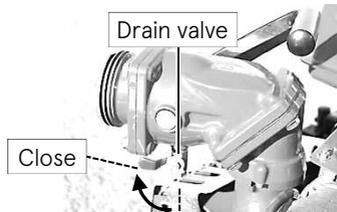
CAUTION

- **Be sure to stop the engine before checking the oil level. If you pull the dipstick when the pump is running, the oil may blow out.**



Drain valves

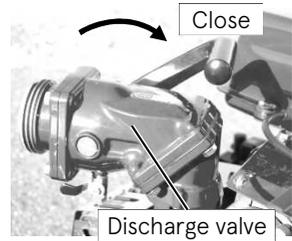
Make sure all the drain valves are closed.



6. PREPARATION FOR OPERATION

Discharge valve

Make sure the discharge valve is closed.

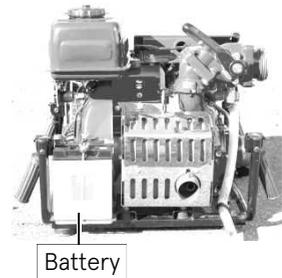


Battery installation

The battery mounted on the engine can be used immediately after filling cells with electrolyte (1.28 specific gravity at 20°C=68°F). Refer to the instruction of the battery.

NOTE

- Do not operate the engine without a battery, the gauge lamp may burn out.



Warning lamp & buzzer (Only for EU specification)

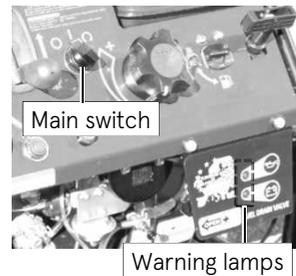
When you turn the “Main switch” to the “ | ” position, the lamp and buzzer check mode starts. The warning lamps light up and the buzzer sounds for a moment to check the functions.

If the lamp and buzzer check mode show the failure, refer to “Chapter 15 TROUBLESHOOTING” to solve the problems.



CAUTION

- **In the case of warning shown, remove the cause by following “Chapter 15 TROUBLESHOOTING”.**



The monitor shows the following information:

- Engine oil level
- Battery charge level

6. PREPARATION FOR OPERATION

Installation pump



WARNING

- The temperature around the engine will become high because of the muffler and exhaust gas, install the pump on level ground at least three meters away from inflammable materials including dry grass and wood.
- Exhaust gas, which contains carbon monoxide, is deadly poisonous gas with no color and no smell.
- Do not operate engine in a closed space or in an insufficient ventilation place, such as indoor, in the vehicle, warehouse, tunnel, well, in the hold of a ship.
- Do not start engine with discharge valve opened.
- Do not pump and discharge liquids other than water (e.g. flammable liquids or chemicals).
- This pump is only designed for pumping water.
- Do not discharge water to water-prohibiting substance.
- Do not insert your hand into the suction port to avoid serious injury by the rotating inducer.



CAUTION

- Do not run the pump without suction port strainer.
- If gravels go into the pump, then the pump could have been damaged and the performance would be significantly reduced.

7. STARTING THE ENGINE

1. Place the pump near the water source on a flat area.
2. Connect suction hose and delivery hose to the pump securely. Put the end of suction hose in water source. The suction hose must have a strainer and a basket at the tip of the hose.
3. When the discharge operation of the pump will be done using a branch pipe with nozzle fitted, recommend nozzle bore are within the range below.

Low pressure 21 mm (0.83 in) ~ High pressure 15.5 mm (0.61 in)



- **Over 21 mm nozzle bore can cause pump damages.**

Starting engine



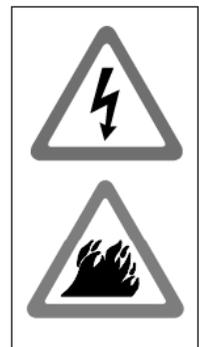
- **Wear proper hearing protection during operation.**



- **While engine is running, do not touch the high voltage ignition wire attached to the spark plug.
The wire carries very high voltage which will cause injury and bodily harm.**



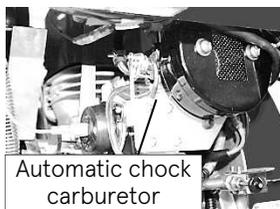
- **Do not operate pump on dry grasses.
The exhaust system will be very hot and will ignite dry grasses. Sweep the area if necessary.**



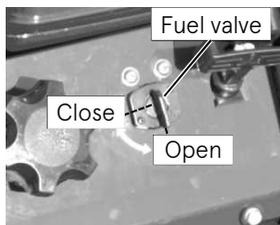
7. STARTING THE ENGINE

NOTE

- This model is equipped with an automatic choke carburetor.
- The pump has no choke lever for manual.

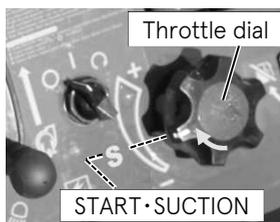


1. Turn and open the fuel valve to flow the fuel to the carburetor.



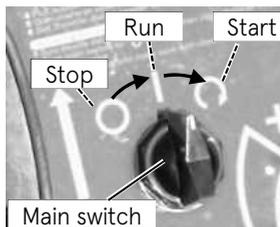
2. Turn the throttle dial to the "START·SUCTION/S*1" position.

*1: S ~ For EU specification
(Showing in the picture)



3. Turn the main switch to the run(| *1) position.
Turn the main switch to the start(⊙*1) position.
Release the main switch immediately after the engine started.

*1: | , ⊙ ~ For EU specification



NOTE

- Extended operation of the starter motor will run the battery drain. Operate the starter motor within maximum 3 seconds. If the engine does not start, wait for over 5 seconds before operating the starter motor again.
- Do not operate the starter motor after the engine started (while the engine running).
- If the starter motor does not work, check that the battery terminals are tightly connected and the battery is fully charged.

* If the electric starter does not work to start, use manual (recoil) starter.

7. STARTING THE ENGINE

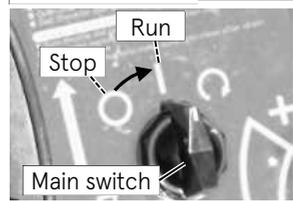
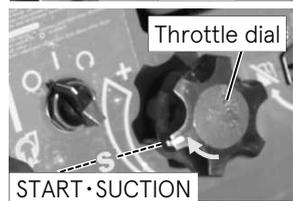
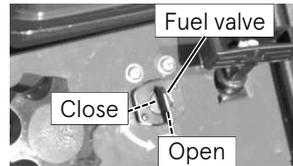
Starting engine using a manual starter

When you use a manual starter, operate the engine as shown below.

*If electric starter does not work, use a manual starter.



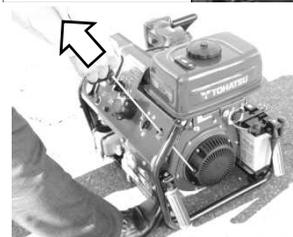
1. Turn the fuel valve to the "OPEN" position to flow the fuel to the carburetor.
2. Turn the throttle dial to the "START · SUCTION / S*1" position.
*1: S ~ For EU specification
3. Turn the main switch to the run(| *1) position.
*1: | ~ For EU specification



4. Engage the starter ratchet by pulling the starter handle slowly towards you. When you feel the ratchet engage, pull the handle sharply (holding the fire pump in place with your foot).
5. After the engine started, return the starter handle to the original position slowly so as not to damage the recoil starter.

CAUTION • Do not pull the manual starter handle when the pump is running. Otherwise, the manual starter may be damaged.

NOTE • To start the engine with manual starter, engage the manual starter ratchet by pulling the starter rope slowly. And then pull the starter handle quickly with great force from the position in which feeling harder resistance.



8. PRIME AND DISCHARGE

⚠ WARNING

- While the engine is running, do not touch the rotating parts of the pulley or belt. This can cause personal injuries.
- Close the discharge valve before suck up water.



NOTE

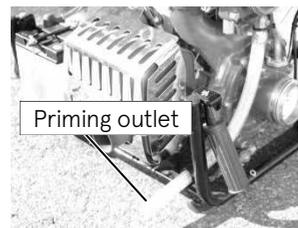
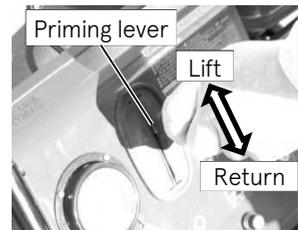
If the pump cannot suck up water during the operation of the vacuum pump for 30 seconds, or can't keep the water in the water path of the pump during the water discharge operation, check the following:

- The tip of the suction pump hose should be completely under the water surface.
- Air should not be sucked through the joint of the suction hose.
- The suction hose should not have damage.
- The vacuum performance of the priming pump should be enough.
- The pump case should not leak vacuum.
- The vacuum leak should not occur when connecting the suction hose which has closed tip to the pump. (Confirm no leak in the water line.)

* Refer to "Chapter 15 TROUBLESHOOTING".

PRIME AND DISCHARGE

1. After starting the engine, lift the priming lever up to put tension on the V-belt of vacuum pump to suck up water.
2. Check that the pumped water is discharged continuously from the vacuum pump drain pipe. Be sure the pressure gauge shows positive side.
3. Return the priming lever to the original position.



8. PRIME AND DISCHARGE

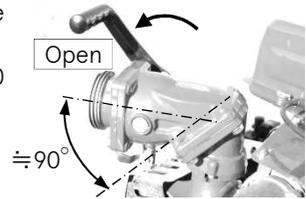
NOTE

- Limit the vacuum pump operating time within 30 seconds. If the pump can't suck up water within 30 seconds, it may have another problem.
Refer to "Chapter 15 TROUBLESHOOTING" to rectify the problem.
- When priming water from a water source that is considerably lower location than the pump, suction may fail to bring water up to pump.
- The engine is cooled by air, but should be operated at slow speeds when pump is running with no water. The pump may be damaged when it runs with no water for more than 2 minutes even at slow engine speed.
- The pump should be run with water discharging for protecting some parts of the pump such as mechanical seal.

4. Open the discharge valve.

Turn the discharge valve handle towards the discharge port adapter(hose) at slow speed.

The discharge port can be turned approximately 90 degrees.



CAUTION

- **Before opening water discharge valve of the pump, be sure to warn the person holding the nozzle, and confirm to be ready to discharge water.**
- **During operation, check the suction and discharge hoses.**
- **They must be free of kinks, pinches, etc., possibly caused from emergency vehicles rolling over hose.**

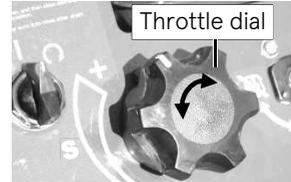


8. PRIME AND DISCHARGE

NOTE

- To avoid the air left in the hose, the pump should be located above the suction hose. If some air left in the hose, the pump may not be able to discharge the water by the accumulated air in the hose when you open the discharge valve. In this case, open the discharge valve and operate the vacuum pump for 3 to 5 seconds more until the water is continuously discharge. (To discharge the air in the suction hose.)

5. Adjust the water pressure using the throttle dial turning.

**CAUTION**

- **In the case of using a branch pipe, the person holding the branch pipe must be notified of changes in water discharge pressure caused from engine speed changes or discharge valve setting changes.**
- **Discharged water should not be directed toward people under any circumstances.**
- **Do not look into the nozzle opening at any time.**
- **Do not put fingers or hands into the discharge nozzle.**

8. PRIME AND DISCHARGE

Performing relayed water supply (When using water from fire hydrant)

1. Determine the pump pressure in consideration of the water discharge pressure (nozzle pressure), hose pressure loss, and height loss.

Pump pressure = needed pressure + friction loss + height loss

2. Foreign materials such as dirt, gravel, iron rust, etc. may go into a fire hydrant. Before connecting a hose, open a fire hydrant to discharge water in order to remove foreign materials.
3. When using water from a fire hydrant, use a mediation metal to connect a delivery hose to the suction port without using the suction hose in principle.
4. Set the discharge valve handle of the pump to the full open position.
5. Gradually open the fire hydrant on-off valve. However, check the water pressure from fire hydrant with suction pressure gauge of the pump and adjust the opening of fire hydrant on-off valve, if necessary.



CAUTION

- **If the water pressure from fire hydrant is higher than 0.6 MPa (6 bar, 87 psi), do not open the fire hydrant on-off valve more.**
 - * **If the water pressure from fire hydrant is higher than the required discharge pressure, it is not necessary to start the pump.**
- **If the water pressure from fire hydrant has not reach the required pressure, then start the engine.**

6. If the water pressure from fire hydrant is insufficient, start the engine and adjust the pressure to the required level by operating the throttle dial. Stop increasing discharge pressure if the suction pressure gauge shows 0.1 MPa (1 bar, 15 psi) or below. If it does, stop increasing the pressure and keep the throttle dial as it is.
7. To end discharge water, turn the throttle dial to the low pressure position firstly, then stop the engine, and close the fire hydrant on-off valve.



CAUTION

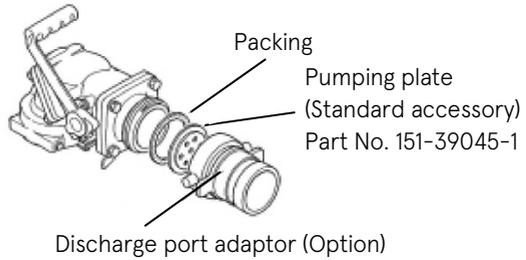
- **Be sure not to close the discharge valve and nozzle of any pumps until all the pumps stopped and the fire hydrant on-off valve is closed.**

8. Set the discharge valve to the half-open position, and open all the drain valves to drain the remaining water in the pump as maintenance after the operation.

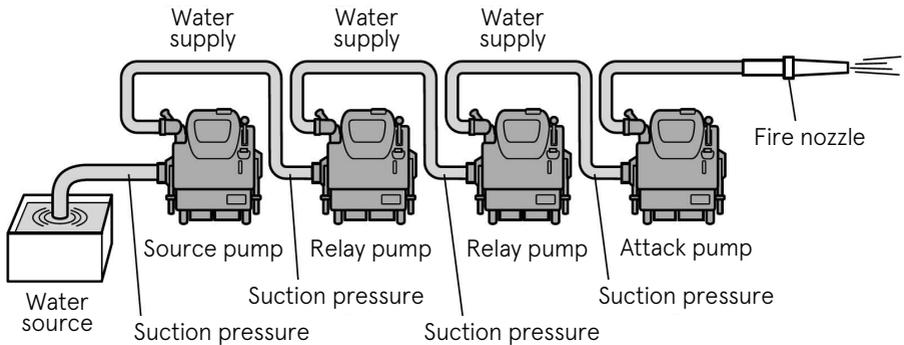
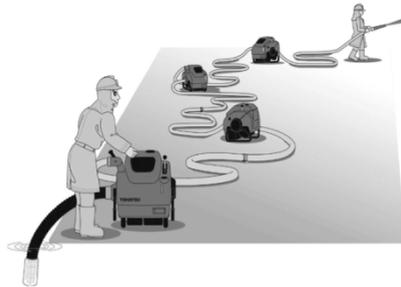
8. PRIME AND DISCHARGE

Relay pumping operation

CAUTION · In the case of relay pumping operations training in a flat place, if the number of extending hose is less than ten, use the pumping plate (safety nozzle) attached.



Description of replay pumping operation



8. PRIME AND DISCHARGE

Preparation for operation

**WARNING**

- **Do not close the discharge valve of source pump , relay pumps and fire nozzle. If the discharge valves or nozzle are(is) closed, there will be a risk of damage to the pumps and hoses with excessive pressure or water hammer.**

1. Decide how many relay pumps are needed in the consideration of distance and height between the water source and the fire ground.
2. Place the pumps according to the decision, and connect the hoses.
3. Make sure that the discharge valve(s) and the fire nozzle are all opened.
4. Decide the discharge pressure of each pumps in consideration of needed pressure for next pump (or fire nozzle) , the friction loss and height loss.

$$\text{Pump pressure} = \text{needed pressure} + \text{friction loss} + \text{height loss}$$

Start the source pump

**WARNING**

- **Once the water supply has started, keep supplying it until finishing the discharge operation. If reduce or stop supplying water, overheat or cavitation may occur in the relay pumps.**

1. Start the source pump according to “Chapter 7 ENGINE START”.
2. Start supplying water according to “Chapter 8 PRIME AND DISCHARGE”.

8. PRIME AND DISCHARGE

Start the Relay pump

1. Make sure that the discharge valve is opened and wait for supplied water.
2. Check that the water is supplied from the source pump. At first, the hose swells due to air pressure. Step on a hose to judge whether the swelling of the hose is due to water or air.
3. Confirm that the water is supplied to the pump checking the pressure gauge.
Start the engine if the pressure is lower than the required pressure.
If the pressure is high enough, no need to start the engine.
4. Adjust the discharge pressure turning the throttle dial. The suction pressure decreases with opening up the throttle. Always confirm the pressure with the suction pressure gauge.
5. If the suction pressure drops below 0.1 MPa (1 bar, 15 psi), order the operator of the pre-stage pump to increase the water pressure, and adjust the relay pump pressure by the throttle operation.
6. If the suction pressure rises, adjust the throttle again.

Start the Attack pump

Same as the relay pump.

Finish the relay pumping operation



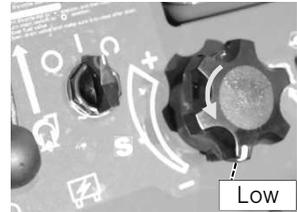
- **Do not close the fire nozzle.**
- **Stop the attack pump running first.**
- **Stop the relay pump running from the pump closest the nozzle in order.**
- **Finally, stop the source pump.**
- **Do not touch the muffler while the engine is running, and also do not touch it for 10 minutes or more after the engine has been stopped. Confirm the engine temperature is cooled down enough. The muffler becomes very hot while the running and will cause severe burns.**



9. STOPPING THE ENGINE

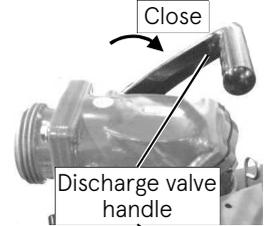
1. Turn the throttle dial to "Low/toward —*1" position.

*1: — ~ For EU specification
(Showing in the picture)

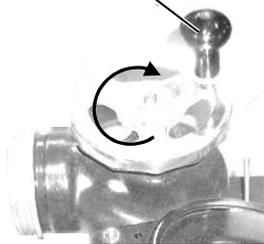


2. Close the discharge valve.

Ball cock discharge valve -----



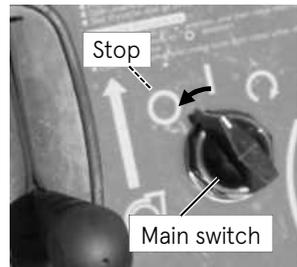
Screw down discharge valve ----



3. Stop the engine

Turn the main switch to "Stop/○*1" position.

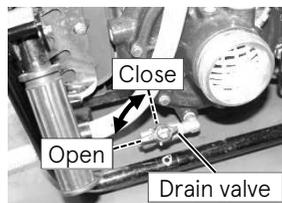
*1: ○ ~ For EU specification



10. MAINTENANCE AFTER OPERATION

Drain Water

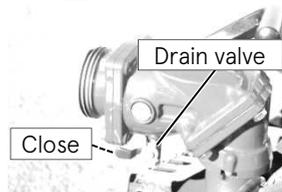
1. Open the drain valves and drain out all the water from the pump. Do not leave the water in the pump.
2. Close the drain valves for the next operation.



Check Suction Performance.

After the drainage of all the water from the pump,

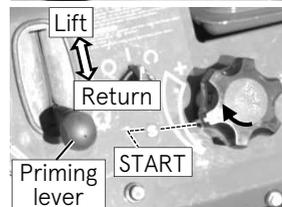
1. Confirm the drain valves are all closed. (at the pump case and discharge valve.)
2. Install the suction port cap.
 - *Close the suction port not to leak air into the pump side.



NOTE

- Prepare the suction port cap that is suitable for the suction port coupling.

3. Turn the throttle dial to the "START" position, and start the engine. Lift the priming lever to decompress the inside of the pump. (within 30 seconds)
4. After sufficiently depressurizing the inside of the pump, return the priming lever to the original position immediately, and stop the engine.
5. Check the vacuum pressure of the pressure gauge for suction is approximately -0.08MPa ($-0.8\text{ bar}, -12\text{ psi}$).
6. In order to check that there is no vacuum leak, leave it for 30 seconds and confirm that the pointer of the pressure gauge for suction keeps the same pressure indication.
7. Open the drain valve slowly to expose it to the atmosphere, and check that the pointer of the pressure gauge for suction returns to "0".
8. Close the drain valve again.



Vacuum pressure gauge



Dry operation

In the case of reducing moisture inside the pump so that the inside of the pump does not corrode, do the "Check Suction Performance" process. It should be carried out for about 30 seconds.(Do not it over 30 seconds)

10. MAINTENANCE AFTER OPERATION

NOTE

- Before storing the fire pump, flush with fresh water to purge debris such as salt water, muddy water, contaminated water, etc. from the pump.
- Rubber gaskets, O-rings, seals for the discharge and suction hose fitting wear: Worn rubber seals will cause water leaks, poor vacuum, etc. Frequent inspection of these items is mandatory.

Fuel and Oil

1. Fuel

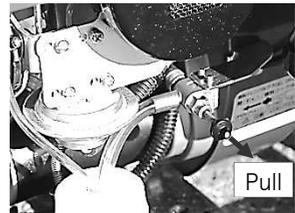
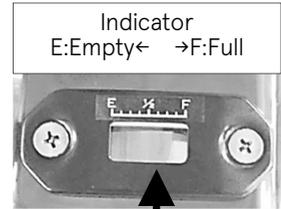
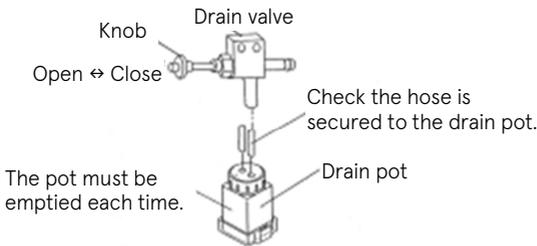
- Fill fuel until the maximum level of the fuel tank.

The maximum level can be confirmed by the indicator(Red). * Fuel tank capacity : 5.95L (1.57 gal)

- Draining fuel from the carburetor.

* Drain the fuel completely from the carburetor float chamber after using the pump each time.

- a. After stopping the engine, close the fuel valve.
- b. Pull the knob of the drain valve. (Fuel will flow out.)
- c. After all the fuel has drained, release the knob. (The drain valve will return to the closed position.)
- d. Fuel from the drain pot should be returned to the fuel tank. (If the drain tank and fuel are clean.)



WARNING

- **Wipe off fuel using a cloth or others if there is fuel out of the fuel tank.**

NOTE

- Drained fuel collects into the drain pot. The drain pod must be emptied. Return the fuel to the fuel tank. (If it is clean.)
Make sure the fuel is kept full in the fuel tank.

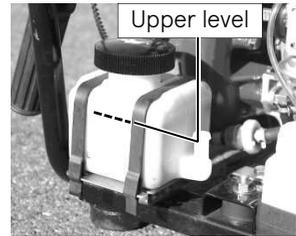
10. MAINTENANCE AFTER OPERATION

2. Engine oil

Fill the oil tank with 2-stroke engine oil up to the upper level.

NOTE

- Use 2-stroke engine oil of ISO FB grade or higher.

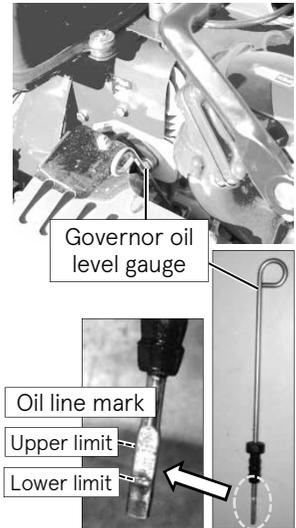


3. Governor oil

Check the oil level using the governor oil level gauge. (Dipstick)

At least check the oil every six months or every 50 hours operating time.

Refer to "Chapter 6 PREPARATION FOR OPERATION, Governor oil".



10. MAINTENANCE AFTER OPERATION

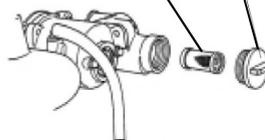
Cleaning strainer for prime

Remove the strainer cap and clean the strainer with fresh water.

If the strainer is dirty with dust, etc., vacuum performance efficiency will be reduced.



Strainer Strainer cap



Charging battery



WARNING

- **Hydrogen gas from the battery is explosive. Keep battery away from flame and sparks.**



CAUTION

- **Charge the battery in well ventilated area. Do not charge battery in unventilated area.**
- **Read the cautions attached to the battery carefully before use.**

Be sure to charge the battery after each operation.

<Specification of accessory socket>

- Voltage : DC12V
- Max. allowable current : 5A

Battery charger plug socket except EU spec.



Battery charger socket for EU spec.

10. MAINTENANCE AFTER OPERATION

<Battery charger>

Read the instruction manual of the battery charger before use.

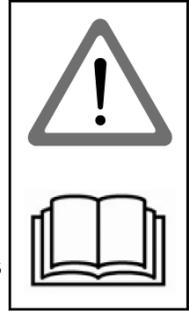
*The instruction manual is packed with the charger.

WARNING

- **Do not connect a cigarette lighter to the battery charger socket. It may cause melt or burn out the socket due to overheating.**

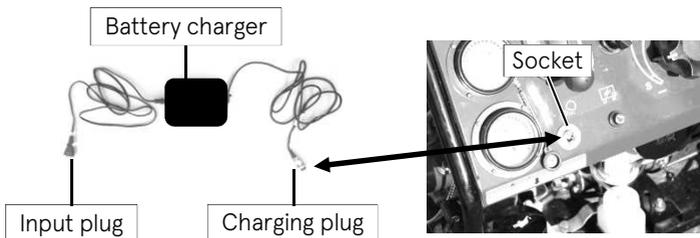
CAUTION

- **Use an automatic battery charger that has prevention function.**
- **Set the battery charger on a suitable non-inflammable stand or fix on wall, and do not put it directly onto the ground.**
- **Automatic charger should be kept in a dry place and a well-ventilated place.**
- **The battery capacity must be 12V/14 Ah(10HR).**



Disconnect the battery charger after charging is completed.

1. Confirm that there is no dirt, no slack, no backlash of the terminal.
2. Confirm quantity of liquid of the battery.(Shield type battery is excluded)
3. Set the main switch to the "OFF" position.
4. Plug the charging plug to the battery charger plug socket.
5. Insert the input plug to household power supply.
6. Confirm the battery charging status referring to the battery instruction manual.
7. Disconnect the battery charger when using the pump.



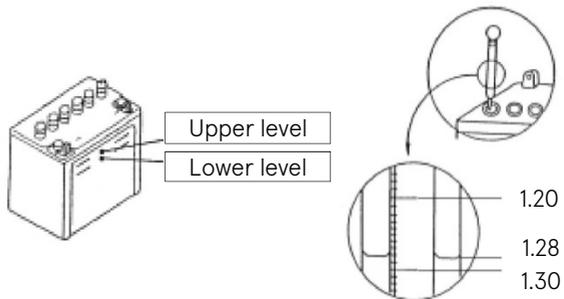
10. MAINTENANCE AFTER OPERATION

<Battery>

-  **WARNING**
- Hydrogen gas from the battery is explosive. Keep battery away from flame and spark.
 - Charge the battery in a well ventilated area. Do not charge battery in unventilated area.
-  **CAUTION**
- The battery capacity must be 12V/14Ah (10HR).
 - Read the instruction (caution) attached to the battery carefully before use.

--In the case of Opening type battery--

- If battery liquid is "Lower level", supplement replenisher to "Upper level".
- To know the exact state to charge, measure specific gravity of the battery liquid by an areometer. The specific gravity of the full charge is 1.28 (20°C conversion).
- The outer surface of the battery should be kept always clean.
- The battery life is normally 2~3 years even if the battery is used properly.
- Replace with new battery every 2~3 years checking the deterioration of the charging performance.
- When connecting battery cables, attach the positive (+) battery cable first. (When disconnecting battery, remove the negative (-) cable first.)
- Hydrogen gas released from the battery can cause damage and severe burns of the clothes and skin.



-- In the case of Maintenance-free battery--

-  **CAUTION**
- Do not open the caps of the battery.
 - Replace with new battery every 2~3 years.
 - Maintenance-free battery is not required to replenish the distilled water and replenisher.

11. MAINTENANCE IN COLD CONDITION

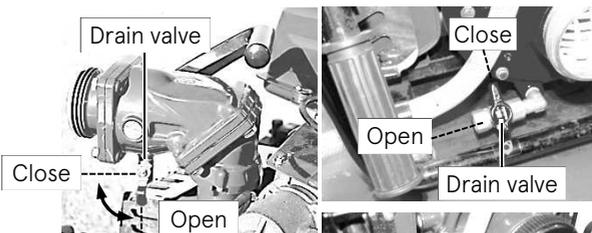
Infuse anti-freezing fluid



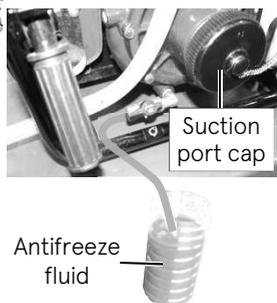
CAUTION

- If the temperature around the pump could be subzero, the inside water of the pump can be frozen up. Then you can't start the engine, and could have some damages in the pump.
- In order to prevent internal corrosion and damage by the water frozen in the pump, drain all the water from the pump unit. After draining the water, put antifreeze fluid into the water pump and the vacuum pump.

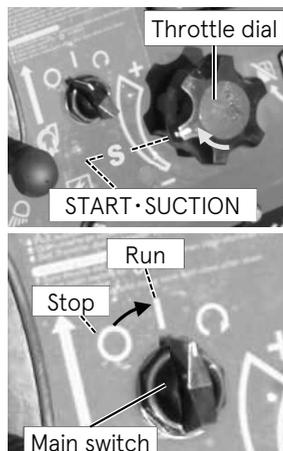
1. Open the drain valves to drain all the water from the pump.
2. After drainage of the water, close the drain valves.



3. Attach the plastic tube to the pump drain valve and open the valve at the pump case.
4. Insert the plastic tube in the container filled with antifreeze fluid (180~200 mL/0.048~0.053 gal). Attach the suction port cap to the suction port.

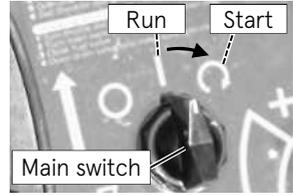


5. Turn the throttle dial to "START • SUCTION" position (Showing as "S" for EU specification). Turn the main switch to the RUN position.



11. MAINTENANCE IN COLD CONDITION

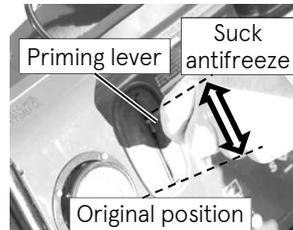
6. Turn the main switch to start position. Release the main switch immediately after the engine started.



7. After starting the engine, suck antifreeze fluid by operating the priming lever (vacuum pump).

NOTE

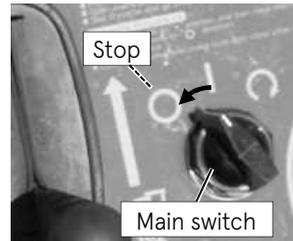
- Even if all antifreeze fluid is sucked up, continue lifting a priming lever for approximately 30 seconds. (Do not doing it over 30 seconds.)



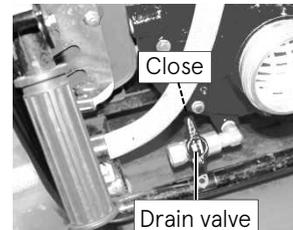
Return the priming lever to the original position.

8. Stop the engine.

Turn the main switch to the stop position.



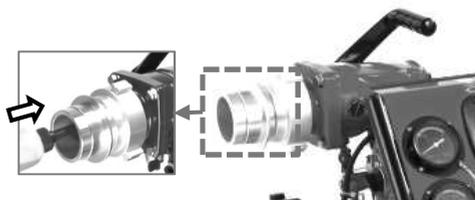
9. Close the drain valve.



11. MAINTENANCE IN COLD CONDITION

10. Put antifreeze fluid into the seal area of the discharge valve.

*To use a long nozzle containing is helpful when pouring antifreeze fluid, especially in the case of using a coupling. (Refer to the picture.)



11. Put antifreeze (undiluted 50 ml/ 0.01 gal) into the strainer guide.

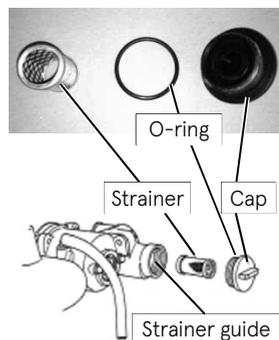
After putting it, assemble the strainer.

CAUTION

• **When installing the strainer, exercise care so that the O-ring does not get caught in, and tighten the ring nut securely. If the ring nut is not tightened completely, the vacuum leak may occur.**

NOTE

• When you install a strainer, pay attention to the protrusion of the O-ring and install it correctly. Otherwise, the vacuum leak may occur.



12. USE OF ACCESSORY

Battery

Battery performance deteriorates if the temperature falls. Further, battery may freeze if the specific gravity is low.

Battery specification

Capacity: 12V-14Ah/10Hr



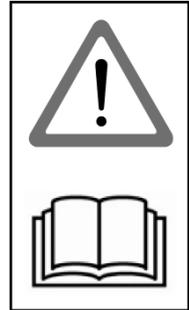
WARNING

- Hydrogen gas from the battery is explosive. Keep battery away from flame and sparks.



CAUTION

- Charge a battery in well ventilated area. Do not charge a battery in unventilated area.
- Read the instructions attached to the battery carefully before use.
- When charging a battery, be sure to use an automatic battery charger.
- Use an automatic battery charger that matches the battery specifications. Use of a mismatched automatic battery charger may cause the battery to explode.
- Keep the battery surface clean.
- Battery life is normally 2~3 years even if battery is used properly. Replace with new battery every 2~3years checking the deterioration of the charging performance.
- When connecting battery cables, positive(+) lead shall be connected first. (When disconnecting battery, remove the negative(-) lead first.)
- Battery electrolyte is very caustic acid, which will cause severe burns to your skin and damage to clothing.



12. USE OF ACCESSORY

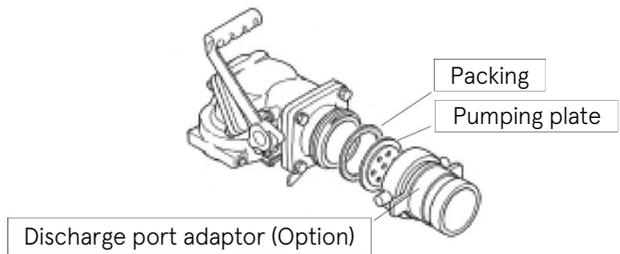
Pumping plate



CAUTION

- When the fire pump is used for water pumping pump, such as pumping water out of a cellar, install the pumping plate* with holes in between the discharge port adapter and the bracket packing to avoid the pump cavitation which may cause damages to the pump.

* Pumping plate is the standard accessory: Part No. 151-39045-1



13. PERIODICAL INSPECTION

Pay your serious attention to keep the pump in good condition.

1. To store a fire pump properly:
 - Place it in a level place.
 - Keep it in a dry area. High humidity may cause corrosion in some parts of the pump.
2. Keep the fire pump free of dust.
3. Keep the fuel in the fuel tank full.
4. Fill the governor case with 2-stroke oil to proper level.
5. Run and operate the pump at least once a month.
6. Check the battery condition once a month. Add distilled water if the battery liquid level is lower than the specific level and charge the battery.
In case of the battery is maintenance free battery, do not add any water. (Including distilled water) Just charge the battery.
7. Drain the fuel completely from the carburetor. (After using the pump each time.)
8. Replace the spark plug* if it is dirty or worn.
* No.: NGK BR7HS... Gap 0.6~0.7 mm (0.02~0.03 in)
9. Replace the V-belt of the vacuum pump if the V-belt is cracked or worn.
10. When storing the pump, close the suction port with a cap to avoid foreign objects entering into the pump.

13. PERIODICAL INSPECTION

Perform periodical inspections and maintenance according to the following procedures.

Description		Inspection intervals				Inspection items	Measure
		After each operation	0.5years or 50hr	1year or 100hr	3year or 300hr		
Fuel System	Fuel *2 (Tank)		●			Impurities (ie. Water and/or waste)	Clean out*1
		●				Quantity of fuel	Refuel
			●			Preservation period 6 month or more	Replace*1
			●			Degradation (ie. Stink or color)	Replace*1
	Strainer		●			Impurities (Water and/or waste has accumulated)	Clean out*1
	Fuel hose		●			Curling, crack, leakage, connection	Replace*1
	Carburet or	●				Remaining fuel in carburetor	Drain
Ignition	Spark plug		●			Fouling, wear, inappropriate gap	Clean out or Replace
Engine	Cranking				●	Locked(Seizing), poor compression pressure	Replace parts if necessary*1
	Engine oil	●				Oil level	Refill the same oil
	Governor oil		●			Oil level with oil level gauge	Refill
Starting system	Starter rope		●			Wear, damage	Replace*1

13. PERIODICAL INSPECTION

Description		Inspection intervals				Inspection items	Measure
		After each operation	0.5years or 50hr	1year or 100hr	3year or 300hr		
Starting system	Battery	●				Voltage measure	Charge
					●	Period of use	Replace *1 *3
Priming system	V-Belt			●		Wear, crack, belt-tension	Replace*1
	Strainer	●				Clogging or broken mesh	Clean out or replace
	Primer	●				Is not locked Check performance (-0.08 MPa,-0.8 bar, -12 psi)	Replace parts if necessary *1
		●				Air check	Check pump unit if necessary
Pump unit	Closed discharge valves operation after priming water		●			Check performance (1 MPa,10 bar,145 psi)	Replace parts if necessary *1
Discharge	Valve			●		Vacuum leakage	Replace parts if necessary*1
All parts					●		Replace parts if necessary*1

*1. Ask our customer service staff to replace the parts.

*2. When the preservation period is 6 months or more, then replace all the fuel. And check the fuel line including fuel cock regarding with clogging.

*3  **WARNING** Batteries that have been used for more than three years may explode if charged.

Inspection interval which has been reached earlier in the running time and the periodic inspection period should be the Inspection timing.

14. SERVICE AND MAINTENANCE

General

Servicing and maintenance of the fire pump must be only carried out by personnel who have professional related knowledge and who is familiar with the fire pump and regulations regarding safety and accident prevention.

Before starting maintenance work:

- Stop the engine.
- Disconnect the negative terminal of the battery.
- Place the pump on a level location.



Safety devices



- **In case of disassembling the safety device or protective device as a part of maintenance work, return it immediately to the original position after the maintenance, and check that the pump operates normally without problems.**

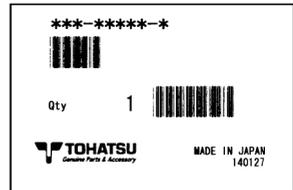
Genuine parts

When replacing parts as part of servicing and maintenance of the fire pump, use only Tohatsu genuine parts.

If genuine Tohatsu parts and accessories are not used, it may adversely affect the function and safety of the fire pump.

Therefore, for safety reason, use only Tohatsu genuine parts.

Tohatsu bears no responsibility for any personal injuries or equipment damage that may result from the use of parts or accessories obtained from outside sources.



Environmental protection measures

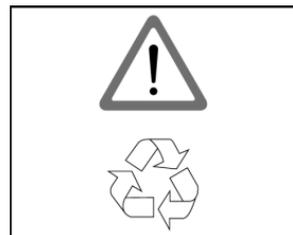
Dispose of oil, fuel, batteries, etc. according to relevant environmental laws in the region.

Do not dump to nature or sewerage.



Waste

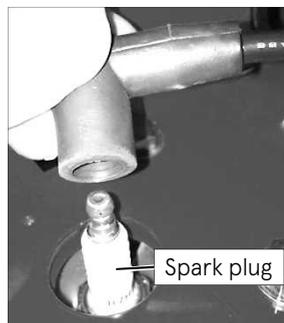
When discarding parts, go waste in accordance with environmental laws in the region procedure.



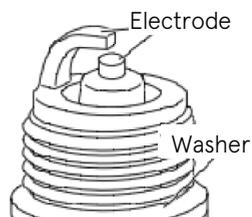
14. SERVICE AND MAINTENANCE

Spark plug

1. Remove the plug cap, and remove the spark plug.

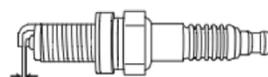


2. Use a wire brush or spark plug cleaner to clean the electrode of the spark plug.
3. Check the spark plug for excessive carbon deposits, electrode erosion and check the washer for damage.
4. Measure the spark plug gap. If the gap is out of specification, replace the spark plug with the specified spark plug.



If necessary, adjust the gap to the specification.

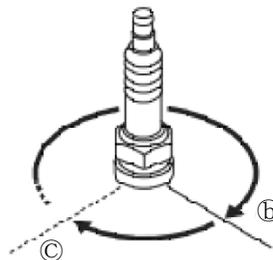
- Spark plug gap : 0.6-0.7 mm (0.02~0.03 in)
- Spark plug : NGK BR7HS(for EU specification pump)
NGK B7HS



Spark plug gap

5. After assembling the spark plug, tighten it as far as ⑥ by hand. And tighten it further using a plug wrench with the specified torque.Ⓒ

- Tightening torque : 24.5~29.4 Nm



14. SERVICE AND MAINTENANCE

Battery

General safety information

Follow the safety instructions of the battery.

When charging a battery, highly explosive oxyhydrogen gas mixture is produced.

Do not charge a battery in a poorly ventilated place.

Do not smoke near the battery.



DANGER

Danger of injury due to caustic substances of battery.

- Always wear protective clothing.
- Always wear protective gloves.
- Always wear protective glasses.
- Do not tip the battery, acid may be discharged from the air vents.



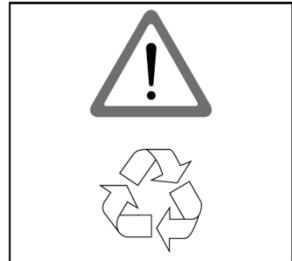
Disposal

Disused batteries should be disposed of according to local laws or regulations.

After each operation of the battery, check the voltage.

Replace the battery if necessary.

- Disconnect the negative terminal of the battery cable first, and disconnect the positive terminal.



CAUTION

- There is a risk of injury.
When handling the battery, be sure to wear safety glasses and protective gloves.



14. SERVICE AND MAINTENANCE

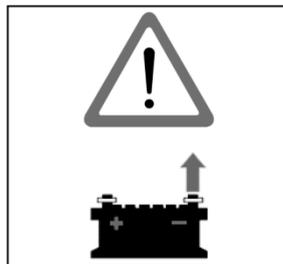
Electric equipment

Only expert electricians or trained staff members should handle the electrical equipment.

Be sure to disconnect the battery cables before handling electrical equipment.

Disconnect the negative terminal first, and disconnect the positive terminal.

When connecting the battery cables, connect the positive terminal first, connect the negative terminal next.



Fuse

Security fuse is installed in electrical circuit used for electrical equipment.

Before replacing the fuse, isolate the cause of the short circuit, and take the appropriate action.

After the appropriate action has been taken, replace the fuse with a new one.

Use the fuse with the same rated current (ampere) as the attached fuse. Using a higher resistance fuse, there is a possibility that the electrical equipment will not prevent the failure.

Prepare the spare fuse at all times for emergency.

14. SERVICE AND MAINTENANCE

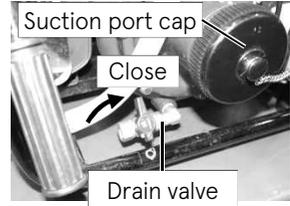
Suction performance check



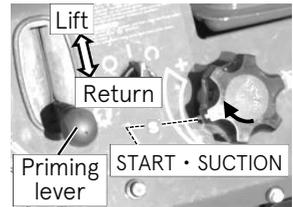
CAUTION

- **Limit continuous operating time of the vacuum pump to 30 seconds or less. Operating the vacuum pump for more than 30 seconds continuously may cause the overheat damage to some parts.**

1. Close the drain valves and suction port (with a suction port cap).



2. Turn the throttle dial to suction position. Start the engine. Lift the priming lever to run the vacuum pump, and check that the pressure gauge for suction indicates approximately -0.08 MPa (-0.8 bar, -12 psi). Return the priming lever to the original position.



Vacuum leak check

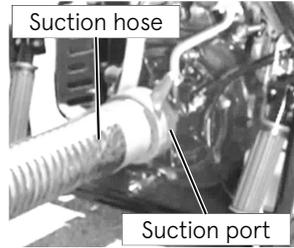
After completing the vacuum performance check, leave it for 30 seconds and confirm that the pointer of the suction pressure gauge keeps the same pressure indication.

If the vacuum leak is found, isolate the cause by referring to “Chapter 15 TROUBLESHOOTING”. Then, take the appropriate action and check the vacuum leak again.

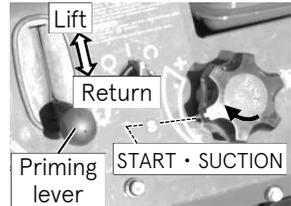
14. SERVICE AND MAINTENANCE

Water leak check

1. Connect one end of the suction hose to the suction port, put the other end of the hose in water. Close the discharge valve handle and all the drain valves.



2. Start the engine, and lift the priming lever to run the vacuum pump.



3. Operate the throttle dial to raise the pump pressure almost to 1 MPa (10 bar, 145 psi), and then check for water leaks from each part of the pump.



If the water leak is found, isolate the cause by referring to “Chapter 15 TROUBLESHOOTING”. Then, take the appropriate action and check the water leak again.

15. TROUBLE SHOOTING

Typical causes of engine troubles are listed in the following table.

Trouble		Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling rev. is too high	Poor acceleration	Engine over-rev.	Engine overheating	Engine seizing	Action
Fuel and Lubrication	Fuel shortage			●	●			●				Refuel.
	Deterioration of fuel			●	●	●		●				Replace with new fuel.
	Fuel filter clogging			●	●	●		●				Clean out clogging.
	Fuel pipe kink or snap			●	●	●		●				Fix routing of pipe.
	Carburetor			●	●	●	●	●	●			Clean or replace with new carburetor.
	Throttle dial at other than "Start" position			●								Turn dial to "Start" position.
	Breather hole clogging				●							Clean out clogging
	Oil filter clogging						●		●		●	Replace oil filter. (Do not fill it up with the different brand of oil)

15. TROUBLE SHOOTING

Trouble												Action												
Cause												Battery charging failure		Starter motor does not work		Engine start failure		Engine stumble or stall		Rough idling		Idling rev. is too high		Poor acceleration
Electrical	Spark plug cap comes off																						Plug in surely.	
	Use of unspecified spark plug																							Replace with specified spark plug.
	Spark plug fouling (No spark or weak spark)																							Clean or replace with specified spark plug.
	Battery loose connection, terminal corrosion or disconnection of cable		●	●																				Clean terminal and/or tighten terminal screw. Replace if necessary.
	Battery charger defective		●																					Check 5A fuse and/or Battery charger. Replace if necessary.

15. TROUBLE SHOOTING

Trouble		Cause		Insufficient water discharge			Floodlight, Gauge lamp, do not work	Action	
				Caused by engine unit	Caused by playpipe	Caused by pump unit			
Electrical		Vacuum pressure defective		Water suction failure	Air leaking				
		Spark plug cap comes off					●	Plug in surely.	
		Use of unspecified spark plug						●	Replace with specified spark plug.
		Spark plug fouling (No spark or weak spark)						●	Clean or replace with specified spark plug.
		Battery loose connection, terminal corrosion disconnection of cable						●	Clean terminal and/or tighten terminal screw. Replace if necessary.
Battery charger defective							Check 5A fuse and/or Battery charger. Replace if necessary.		

15. TROUBLE SHOOTING

Trouble		Cause										Action
		Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling rev. is too high	Poor acceleration	Engine over-rev.	Engine overheated	Engine seizing	
Electrical	5A fuse blown	●										Replace with spare fuse. When the blowout of the fuse happens repeatedly, check cause. 5A: Charging connector. Floodlight.
	Starter motor defective		●									Check terminals, cords and screws. Replace parts if necessary.
	Operation panel defective	●	●									Check input of starter solenoid. (Equal to operation panel output.) Replace parts if necessary.
	Blown light (bulb)											Replace parts.

15. TROUBLE SHOOTING

Trouble		Cause		Action						
				Floodlight, Gauge lamp, do not work						
Vacuum pressure defective		Air leaking		Water suction failure		Insufficient water discharge		Caused by engine unit		
						Caused by playpipe				
Blown light (bulb)		Operation panel defective		Starter motor defective		Caused by pump unit		5A fuse blown		
						Caused by suction hose				
Electrical	Blown light (bulb)								●	Replace parts.
	Operation panel defective								●	Check input of starter solenoid. (Equal to operation panel output.) Replace parts if necessary.
	Starter motor defective									Check terminals, cords and screws. Replace parts if necessary.
	5A fuse blown								●	Replace with spare fuse. When the blowout of the fuse happens repeatedly, check cause. 5A: Charging connector. Floodlight.

15. TROUBLE SHOOTING

Trouble												Action									
Cause		Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling rev. is too high	Poor acceleration	Engine over-rev.	Engine overheats	Engine seizing										
Compression	Piston, piston ring or cylinder excessively worn			●	●	●		●			●	Correct or replace.									
	Carbon deposition in the combustion chamber						●			●	●	Clean out.									
Suction	Suction height too high or length too long											Place pump near water source and lower position.									
	Suction hose end location											Put the tip of hose into water more than 30cm deep from surface of water.									
	Suction hose coupling loose or gasket defective											Clean out the gasket and tighten securely. Replace the gasket if necessary.									
	Suction hose strainer clogged with dead leaf or waste etc.											Clean out.									
	Suction hose cracking or Lining peeling off											Repair or replace.									

15. TROUBLE SHOOTING

Trouble		Cause	Vacuum pressure defective	Air leaking	Water suction failure	Insufficient water discharge			Floodlight, Gauge lamp, do not work	Action
						Caused by pump unit	Caused by playpipe	Caused by engine unit		
Compression	Piston, piston ring or cylinder excessively worn							●		Correct or replace.
	Carbon deposition in the combustion chamber							●		Clean out.
Suction	Suction height too high or length too long			●						Place pump near water source and lower position.
	Suction hose end is not in water	●	●	●	●					Put the tip of hose into water more than 30cm deep from surface of water.
	Suction hose coupling loose or gasket defective	●	●	●	●					Clean out the gasket and tighten securely. Replace the gasket if necessary.
	Suction hose strainer clogged with dead leaf or waste etc.			●	●					Clean out.
	Suction hose cracking or lining peeling off	●	●	●	●					Repair or replace.

15. TROUBLE SHOOTING

Trouble									Action			
Cause		Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling rev. is too high	Poor acceleration	Engine over-rev.	Engine overheats	Engine seizing	
Primer	Vacuum pipe loose or cracking											Tighten securely a clamp of vacuum pipe or replace.
	Strainer cap loose or O-ring failure											Tighten securely or replace.
	V-belt damaged or worn											Replace.
	Vacuum pump rotor shaft seizing											Repair or replace.
	Vane, Side plate worn or damaged											Replace.
Water stop valve	Water stop valve contamination											Clean out.
	Water stop valve diaphragm failure											Replace.

15. TROUBLE SHOOTING

Trouble		Cause							Action		
		Vacuum pressure defective	Air leaking	Water suction failure	Insufficient water discharge	Floodlight, Gauge lamp, do not work	Caused by engine unit	Caused by playpipe		Caused by pump unit	Caused by suction hose
Primer	Vacuum pipe loose or cracking	●		●							Tighten securely clump of vacuum pipe or replace.
	Strainer cap loose or O-ring failure	●		●							Tighten securely or replace.
	V-belt damaged or worn	●		●							Replace.
	Vacuum pump rotor shaft seizing	●		●							Repair or replace.
	Vane, side plate worn or damaged	●		●							Replace.
Water stop valve	Water stop valve contamination	●	●	●							Clean out.
	Water stop valve diaphragm failure	●	●	●							Replace.

15. TROUBLE SHOOTING

Trouble		Cause										Action						
		Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling rev. is too high	Poor acceleration	Engine over-rev.	Engine overheating	Engine seizing							
Pump	Drain valve(s) is not closed																Close securely.	
	Suction port strainer clogged with dead leaf or waste etc.																Clean out.	
	Discharge valve imperfect open									●	●						Open securely.	
	Gauge pipe connector loose or gasket defective																Tighten securely. Replace gasket if necessary.	
	Pump cover bolts loose																Tighten securely.	
	Pump cover O-ring degradation																	Clean out or replace.
	Impeller or guide vane caught a stone or damaged																	Clean out or replace.
	Mechanical seal damaged																	Replace.

15. TROUBLE SHOOTING

Trouble		Cause		Vacuum pressure defective	Air leaking	Water suction failure	Insufficient water discharge			Floodlight, Gauge lamp, do not work	Action
							Caused by suction hose	Caused by pump unit	Caused by playpipe		
Pump	Drain valve(s) is not closed	●	●	●							Close securely.
	Suction port strainer clogged with dead leaves or waste etc.			●	●						Clean out.
	Discharge valve insufficiently open						●				Open sufficiently.
	Gauge pipe connector loose or gasket defective	●	●	●	●						Tighten securely. Replace gasket if necessary.
	Pump cover bolts loose	●	●	●	●						Tighten securely.
	Pump cover O-ring degradation	●	●								Clean out or replace.
	Impeller or guide vane caught a stone or damaged						●				Clean out or replace.
	Mechanical seal damaged	●	●								Replace.

15. TROUBLE SHOOTING

Cause		Trouble										Action
		Battery charging failure	Starter motor does not work	Engine start failure	Engine stumble or stall	Rough idling	Idling rev. is too high	Poor acceleration	Engine over-rev.	Engine overheating	Engine seizing	
Nozzle	Too large discharge nozzle diameter								●	●		Change nozzle for suitable size or incorporate safety nozzle.
	Spray nozzle clogged											Clean out.
Governor	Governor adjustment out of specified range						●	●				Readjust it securely.
	Governor link disconnected			●		●	●	●	●			Attach it securely.

15. TROUBLE SHOOTING

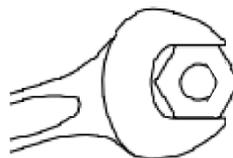
Trouble		Cause						Action
		Vacuum pressure defective	Air leaking	Water suction failure	Insufficient water discharge	Insufficient water discharge	Floodlight, Gauge lamp, do not work	
Nozzle	Too large discharge nozzle diameter					●		Change nozzle for suitable size or incorporate safety nozzle.
	Spray nozzle clogged					●		Clean out.
Governor	Governor adjustment out of specified range					●		Readjust it securely.
	Governor link disconnected	●		●			●	Attach it securely.

16. APPENDIX

Noise Emission Level

Machine Model : V20FS Operating condition: According to EN 1446 ANNEX E E.5 and ISO 20361 Clause 8 Other information : See each test results								
Declared DUAL-NUMBER Noise Emission Values A-weighted Emission Sound Pressure Level: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-bottom: 1px solid black; padding: 2px;"><u>LpA at the operating position</u></td> <td style="border-bottom: 1px solid black; padding: 2px; text-align: right;">96.5 dB(A)</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 2px;"><u>Uncertainty KpA</u></td> <td style="border-bottom: 1px solid black; padding: 2px; text-align: right;">2.5 dB(A)</td> </tr> </table> Measured A-weighted Sound Power Level: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-bottom: 1px solid black; padding: 2px;"><u>LWA</u></td> <td style="border-bottom: 1px solid black; padding: 2px; text-align: right;">113 dB(A)</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 2px;"><u>Uncertainty KWA</u></td> <td style="border-bottom: 1px solid black; padding: 2px; text-align: right;">2.5 dB(A)</td> </tr> </table>	<u>LpA at the operating position</u>	96.5 dB(A)	<u>Uncertainty KpA</u>	2.5 dB(A)	<u>LWA</u>	113 dB(A)	<u>Uncertainty KWA</u>	2.5 dB(A)
<u>LpA at the operating position</u>	96.5 dB(A)							
<u>Uncertainty KpA</u>	2.5 dB(A)							
<u>LWA</u>	113 dB(A)							
<u>Uncertainty KWA</u>	2.5 dB(A)							

Tightening torque specifications.

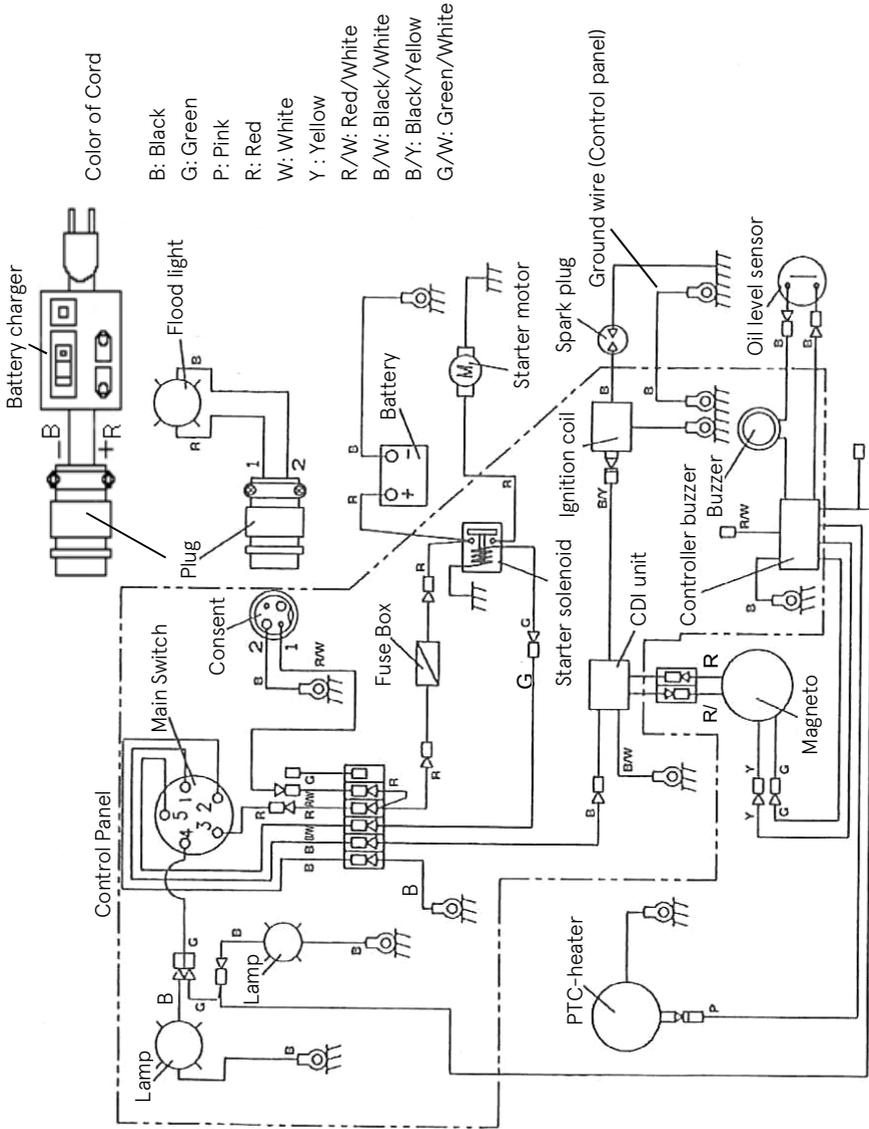


		M3	M4	M5	M6	M8	M10
Standard Bolt	N·m	0.7	1.6	3	6	13	27
	lb·ft	0.5	1.2	2	4	9	20
	kgf·m	0.07	0.16	0.3	0.6	1.3	2.7
Heat Treated Bolt	N·m	-	-	-	9	24	47
	lb·ft				7	17	34
	kgf·m				0.9	2.4	4.7

17. TOOL AND STANDARD ACCESSORY

Description	Remarks	Quantity
Owner's manual		1
Tool bag		1
Tools (Crown spanner 21mm)		1
Tools (Handle for spanner)		1
Spark plug	• NGK B7HS • NGK BR7HS for EU Specification pump	1
Pumping plate		1
Battery charger	12V	1
Fuse	5A	1
Search light(Floodlight)		1

18. WIRING DIAGRAM



OWNER'S MANUAL

V20FS

PORTABLE
FIRE PUMP

No.003-12074-1

TOHATSU CORPORATION

5-4, Azusawa 3-Chome, Itabashi-Ku
Tokyo 174-0051, Japan
Phone: +81-3-3966-3137