

# OPERATION MANUAL

## YAMADA AIR-OPERATED DOUBLE DIAPHRAGM PUMP

DP-10F/N

DP-20F/N

DP-25F/N

## **·Introduction**

Thank you for purchasing a Yamada Diaphragm Pump. This product is a positive-displacement pump that transfers fluids by movement of diaphragms driven by compressed air through the electromagnet valve switching mechanism. The casing that comes in contact with the fluid is made of fluorine resin Yamada.

## **·For safe operation**

This document contains information vital for safe and efficient operation of this product. Before using the pump, be sure to read this document carefully, particularly the "warnings and cautions," and be fully familiar with the operating procedures.

Be sure to keep this document handy for future reference.

## Warnings and Cautions

For safe use of this product, be sure to note the following: In this document, warnings and cautions are indicated by symbols. These symbols are for those who will operate this product and for those who will be nearby, for safe operation and for prevention of personal injury and property damage. The following warning and caution symbols have the meanings described below. Be sure to remember their meanings.

 **WARNING:** If you ignore the warning described and operate the product in an improper manner, there is danger of serious bodily injury or death.

 **CAUTION:** If you ignore the caution described and operate the product in an improper manner, there is danger of personal injury or property damage.

Furthermore, to indicate the type of danger and damage, the following symbols are also used along with those mentioned above:



This symbol indicates a DON'T, and will be accompanied by an explanation on something you must not do.



This symbol indicates a DO, and will be accompanied by instructions on something you must do in a certain situation.

## Operating caution

### Before using this product

#### **WARNING**



- When using compressed gas (hereinafter called "compressed air") to drive this pump, be sure it is one of the following:

- \* Compressed air supplied from an air compressor
- \* Nitrogen (N<sub>2</sub>) gas

Use of compressed air other than the above may cause air pollution, damage to the pump, or even an explosion.



- The maximum permissible pressure for the compressed air, and the fluid pumped by one of these pumps, depending upon the casing material of the model you are using, is as follows:

\*Casing of the fluorine resin : 0.5 MPa (5 kgf/cm<sup>2</sup>)

If the pressure of the compressed air and fluid exceeds the above applicable maximum permissible pressure specified above, there may be leakage of fluid, damage to the casing, or even a severe, possibly even fatal, accident.



- When moving this product, make sure that the internal pressure is released. If the pump is moved while under pressure, any shock imparted by dropping, etc. may damage the pump any shock imparted by drop page or even cause an explosion.



- Hazardous fluids (with strong acid or alkali, flammable or toxic) or gas bubbles generated by such fluids may cause serious injury or even death if accidentally inhaled or consumed or if they come into contact with the eyes or adhere to skin. Therefore, the following precautions are strongly advised.

\*Be fully familiar with the properties of the fluid to be pumped and work in strict accordance with the operating instructions provided by the suppliers of such fluids (such as wearing goggles, gloves, mask or work clothes).

\*When storing a hazardous fluid, strictly comply with the regulatory procedures (such as using proper containers, storage conditions, etc.).

\*Always install the piping and exhaust port of this pump away from human and animal traffic.

When a diaphragm is damaged, fluid will gush out together with air through the exhaust port.

Provide protective measures in consideration of possible leakage of fluid (see Note: Arranging outside exhaust on P.9). When you use the hose and pit etc., be sure you are using a model with appropriate corrosion resistance for the fluid to be pumped.



- The product of the DP-F/N series has aimed at mainly transporting dangerous material, such as strongly acidic solvent and an organic solvent.

When abnormalities are seen about these products, do NOT carry out any decomposition and/or repair by yourself but ask your distributor or our company to repair.

When any decomposition and repair are performed by yourself and the further abnormalities occur for the product, it may be in a very dangerous state depending on the kind of solvent.

## ⚠ WARNING



- DP-F/N series pump uses electricity for signals as well as driving air. Therefore, do not use the pump in any flammable atmosphere. Should the diaphragm be damaged, electric leak shall occur. Never use the pump for transporting flammable fluid.



- After you shut down the pump and disconnect the piping, some fluid may remain inside the pump. Also, if the pump is left unused for a prolonged period, some fluid may remain inside the pump and connected piping. Therefore, be sure to purge the system of fluid and clean the pump before prolonged disuse.  
If the product is left unused for a prolonged period with fluid remaining in the connected piping as well as the pump itself, the fluid may expand, depending on the ambient temperature (because of freezing or heat), which may cause damage to the pump and/or piping and possible leakage of fluid.



- Always use genuine Yamada parts when replacing component parts of this product. Do NOT attempt to modify the components parts or replace them with other than genuine Yamada parts.



- Torque of all tightening parts must be inspected before operation. Designated torque are mentioned in maintenance manual.

### Others

## ⚠ WARNING



- When pumping a hazardous fluid (hot, flammable, strong acid, etc.) with this product, provide protective measures (install a pit, a protection box, sensors, etc.) in consideration of possible leakage of fluid, and post warning signs at necessary places. Make the warning symbols in “12.Warning symbols”, and attach them to the casing and piping, etc. Leakage of fluid may cause fire, air pollution or a serious accident. When pumping a hot fluid, the casing and piping will become hot, which may burn the skin when touched.

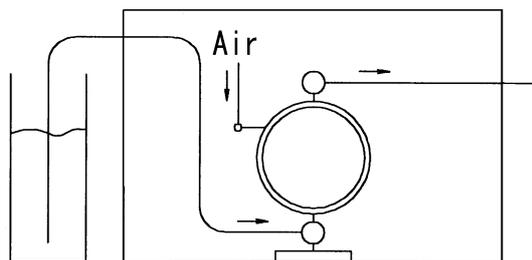


Fig.0.1



- Before using this product, be sure you are familiar with the precautions regarding the fluid to be pumped, and verify the corrosion resistance of the parts that will come into contact with the fluid. NEVER use the product with any fluid against which it does not have sufficient corrosion resistance or with a fluid that poses a risk of explosion. If you are unsure of the corrosion resistance, contact your dealer or our regional office. If you use this product with any fluid against which the parts that will come in contact with the fluid do not have sufficient corrosion resistance, it may result in damaging the product or leakage of fluid.



- When working in the vicinity of pumping of fluid with this product, be sure to wear protective gear (goggles, mask, etc.).



- When using this product, observe the relevant regulatory rules concerning fire prevention, labor safety standards, etc.



- If you have any questions on the operation of this product (method of connection or installation), contact your dealer or our regional office.

## CAUTION



• When operating this product, it may generate loud operating noise, depending upon the condition of use (fluid pumped, supply air pressure and discharge pressure).  
If regulatory rules apply, provide appropriate acoustic measures where necessary. (For the noise value of this product, see “10.1 Main specifications”.)



• To drive this product, use supply air with minimum moisture content.



• If a diaphragm of this product is damaged, supply air may mix with the fluid or the fluid may flow into the main body (air-switching portion). If air supply is inadequate or contaminated, do NOT operate the pump.



• While operating this product, do NOT cover the intake port by hand.



• If more than two years have elapsed since this product was shipped from the factory, notify your dealer or our regional office, and do NOT operate it without assurance from the dealer or our regional office that the pump may be operated safely.

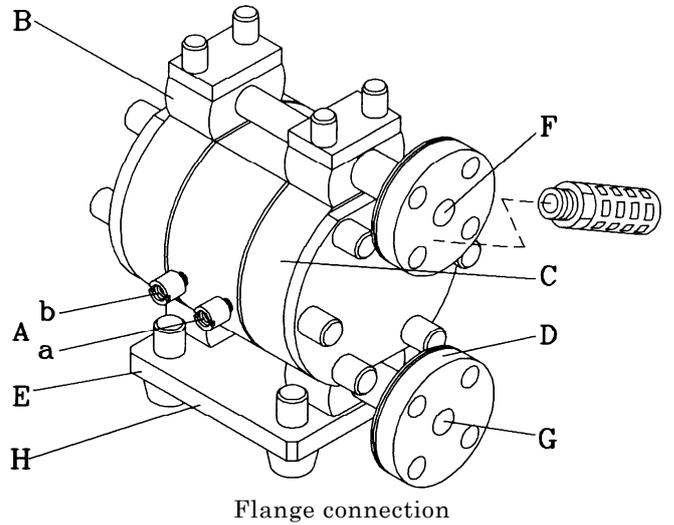
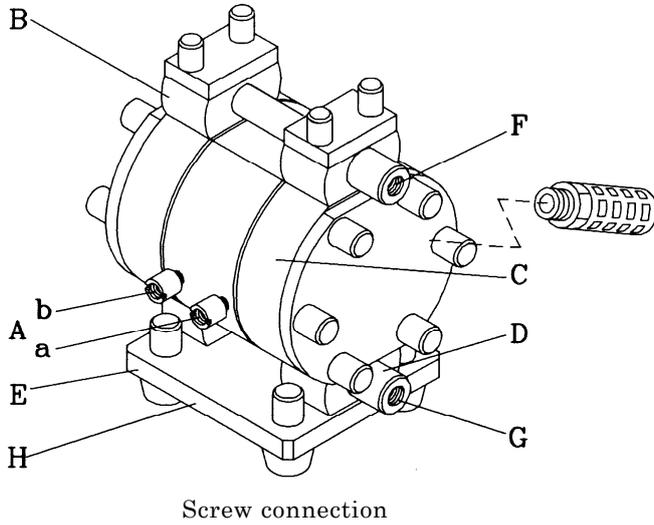
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# 1. Names of parts and materials

## DP-F/N series

- A: Air entrance
- B: Out Manifold
- C: Out Chamber
- D: In Manifold
- E: Pump Base
- F: Discharge Port
- G: Intake Port
- H: Lift Point



- DP-10F/N
- DP-20F/N
- DP-25F/N

Type	DP-10F/N	DP-20F/N	DP-25F/N
Switching Portion	PP		HDPE/PP/POM
Fluid contact Portion	PTFE		
Diaphragm	PTFE		
Ball / O-Ring	PTFE		
Valve Seat	PTFE		

### List of accessories

- Simple Operation Manual ..... 1
- Union (Air entrance) ..... 2
- Union (Exhaust port) ..... 1 (DP-25 is excluded)
- Silencer ..... 1
- Reinforcement Plate ..... 8 (Only flange connection)

## 2. Assembly

### Installation of accessories

First, open the product package and make sure that all the accessories are in order (see “1. Names of parts and materials, List of accessories”).

### CAUTION



• All of the connection parts are capped or taped for shipment. Remove the caps and tapes.



• When installing accessories, make sure that no foreign matter falls into the product, as it could cause malfunction of the switching portion.



• Cover each screw with sealing tape to prevent leakage.



• See “10.1 Main specifications”. Remember that the pump is heavy, so extreme care must be taken when lifting it.

### 3. Installation

#### 3.1 Method of transport

When lifting the pump using a chain hoist or crane before transporting it, be sure to lift it by the specified lift point (see “1. Names of parts and materials”).

<b>⚠ WARNING</b>	
<b>!</b>	• Be careful that nobody will pass under the pump when you lift it. It would be very dangerous if the pump should fall.

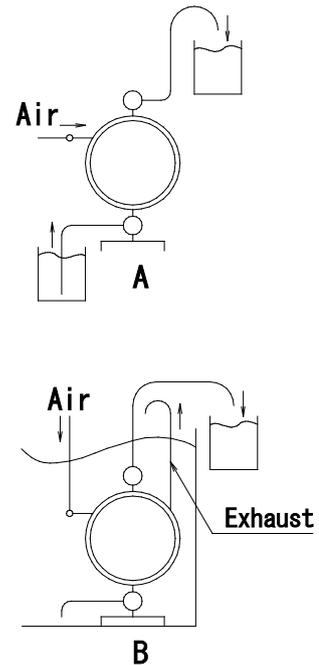
<b>⚠ CAUTION</b>	
<b>!</b>	• See “10.1 Main specifications”. Remember that the pump is heavy, so extreme care must be taken when lifting it.
<b>!</b>	• When moving the pump with a forklift or truck, make sure that the pump will not fall. If it does, it may be damaged and/or cause bodily injury.
<b>⊘</b>	• NEVER try to move the pump by pulling the hose connected to the pump. The hose or the pump may be damaged.

#### 3.2 Installing the pump

- 1) Decide where the pump should be installed and secure a suitable space (see Fig.3.1 A to D).

<NOTE>

- Try to keep the suction lift as short as possible. Protect diaphragm from abnormal breakage, inlet pressure must be kept below the following values:  
 \*PTFE diaphragm: 0.02 MPa (height 2 m) During operation  
 : 0.05 MPa (height 5 m) Not in operation  
 (Condition with fresh water under ambient temperature)
- Remember to provide sufficient space around the pump for maintenance.
- The direction of the fluid intake port and the discharge port can be switched opposite from each other. (For switching, see the maintenance manual.)
- In the event diaphragm failure the exhaust from pump may contain some sludge. When operating the pump where it would have an impact on the environment, the exhaust should be directed to a place where there will be no environmental impact.



- 2) Remove the pump from the package and install it in the designated location.

- 3) When fixing the pump in place, use the cushions on the pump base, and secure the pump by tightening the tied-down bolts a little at a time.

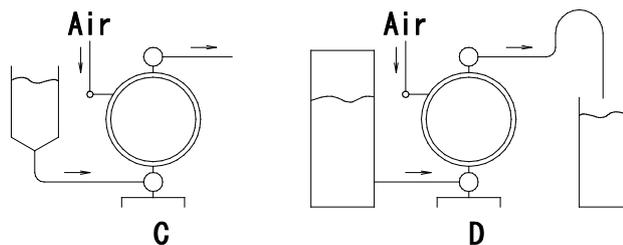


Fig. 3.1

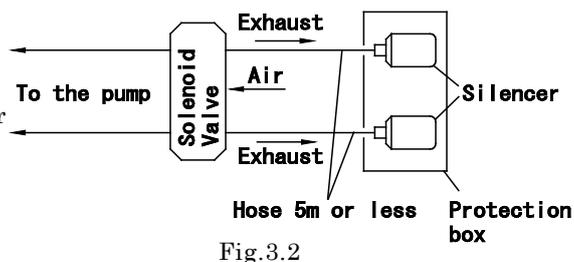
## ⚠ CAUTION

- 
  - Even if you do not use the cushions to secure the pump in place, mount it in such a way that vibration generated by pump operation will be absorbed.
- 
  - If the pump will be submerged during operation, follow the steps below:
    - \*Verify the corrosion resistance of each component of the pump, and do NOT expose the pump to any fluid for which it does not have proper corrosion resistance.
    - \*Exhaust should be directed outside, not into the fluid in which the pump is submerged. For information on how to arrange the exhaust, see NOTE: Arranging outside exhaust and Fig. 3.2 below.
    - \*Make sure that you can reach all of the valves without submerging your hand.
    - \*Please do NOT use the electromagnetic valve and/or the pump controller dipping in water.
- 
  - When operating the pump, operation noise may be generated, depending upon conditions of use (kind of fluid being pumped, supply air pressure and discharge pressure). If any regulatory rules apply, provide appropriate acoustic measures. (For the noise level of this product, see “10.1 Main specifications”.)
- 
  - When pumping a hazardous fluid (hot, flammable, strong acid, etc.), provide protective measures (installation of a pit or sensors, etc.) in consideration of possible leakage of fluid, and post warning signs at necessary places. For details, see the applicable operating caution on P.2.

<NOTE>

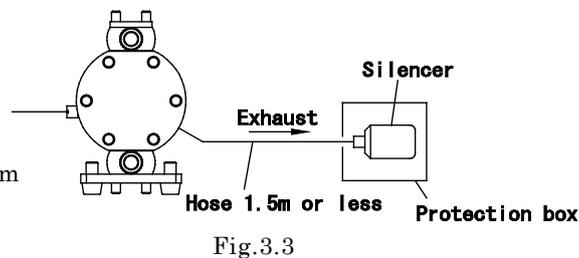
### Arranging outside exhaust

- Remove the silencer of the electromagnetic valve.
- Connect a hose with a ground wire to the electromagnetic valve exhaust port, and attach the silencer to the tip of the hose. Use a hose of the same diameter as the exhaust port. (If the hose length from the solenoid valve to the silencer is longer than 5 meters, consult your dealer or our regional office.)



### Air exhaust from the pump

- Remove the silencer of the pump.
- Connect a hose to the exhaust port of the pump, and attach the silencer at the tip of the hose. (Use the hose of 8mm or more of the inside diameters, with a length of 1.5m or less.)



## ⚠ WARNING

- 
  - Be sure to have a pit, a protection box, etc. at the end of the hose in preparation for the flow of fluid in case of damage to a diaphragm. [Fig.3.2, Fig.3.3]
- 
  - Pump exhaust should be directed to a safe place, away from people, animals and food.

## 4. Connection

### 4.1 Connecting fluid piping

- 1) Connect a flow valve and a drain valve to the fluid discharge port of the pump.
- 2) Connect a valve for maintenance to the fluid suction intake port of the pump.
- 3) Connect a hose to the valve on the suction-port side and the valve of the discharge port side of the pump.
- 4) Connect a hose on the suction-side intake and the discharge-port side to the respective vessels.

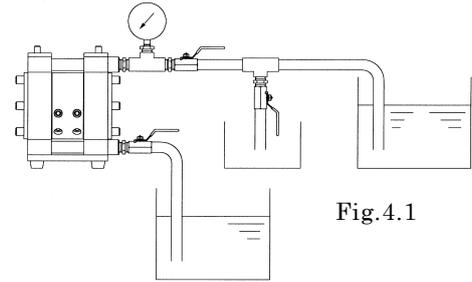


Fig.4.1

## ⚠ CAUTION



- Use a flexible hose to absorb pump vibration, and ground the hose.



- Make sure that there will be no external force on any connection part of the pump. Be especially careful not to have the pump support part of the weight of the hose and the Piping.



- Use a sturdy hose that will not collapse under the strong suction of the pump. Also, make sure the hose is of more than sufficient pressure rating.



- Use a hose of a diameter the same as or larger than the pump's ports. If you use a hose of smaller diameter, the pump's performance will be adversely affected, and it may even malfunction.



- When pumping a fluid that contains slurry, verify that the particle size is below the slurry limitation (see "10.1 Main specifications"). If it exceeds the limitation of slurries indicated in the main specifications, attach a strainer to the pump to stop larger particles. Otherwise, such particles may cause a malfunction.



- If, depending upon the place of pump installation, the volume of the pumped fluid changes drastically, install a relief valve on the discharge side, and bring the pressure down below the maximum permissible value. If owing to a change in the volume of fluid, the pressure inside the pump exceeds the maximum permissible pressure, it may cause damage.

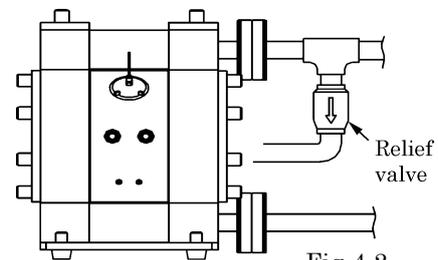


Fig.4.2



- Keep a vessel below the relief valve to catch any drain off.



- When testing piping for leakage, do NOT apply pressure to the pump's inlet and outlet sides with compressed air from outside. It may cause abnormal breakage to the diaphragm or the switching portion. When testing the piping, either install a valve between the pump's suction inlet and the discharge outlet and piping, or disconnect the pump from the piping and install plugs so that there will be no pressure from outside.



- In our product inspection, clean water is used. To prevent mixture of dirty water into the fluid to be pumped, clean the inside of the pump before finishing installation work.



- When installing a standby pump or two pumps in parallel from, be sure to provide a valve on each of the IN and OUT sides and perform pump switching by using the liquid material valve. If the valve of the stop-side pump is open, the diaphragm will be inverted by the discharge Pressure of the operating-side pump, resulting in damage in an early stage.

## 4.2 Connecting air piping

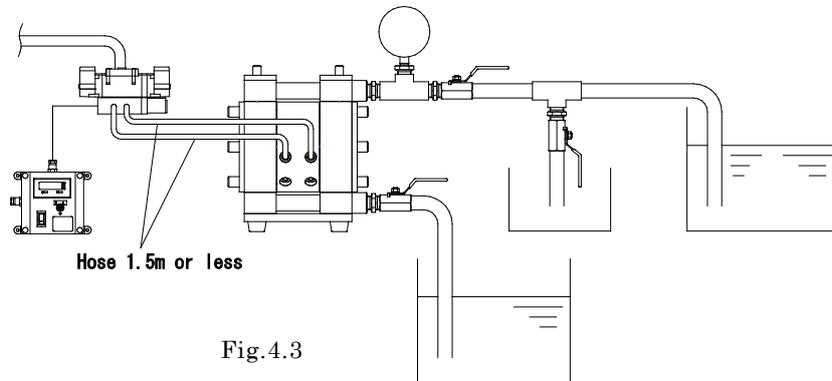
### WARNING



- Before starting work, make sure that the air compressor is shut off.

- 1) Connect an air valve, air filter, regulator and if necessary lubricator (hereinafter called the "peripheral equipment") to hose which connected to compressor. Refer (NOTE) for detail information.
- 2) Install these peripheral items supported by brackets, etc., near the pump.
- 3) Connect the hose from the peripheral equipment to the air valve of the pump's supply port.
- 4) See "1. Name of parts and materials" to connect the air hose from the electromagnetic valve to the air valves a and b of the pump.

In addition, the length of the air hose should never be more than 1.5 meters long. (For the dedicated electromagnetic valve, connect the electromagnetic valve A port to the air valve b port of the pump, and connect the electromagnetic valve B port to the air valve a port of the pump.)



### CAUTION



- Use a flexible hose to absorb pump vibration, and ground the hose.



- Make sure that there will be no external force on any connection part of the pump. Be especially careful not to have the pump support part of the weight of the hose and the piping.



- The piping and the peripheral equipment may become clogged with sludge. Clean the inside of the piping for 10 to 20 seconds before connecting it to the pump.



- Be sure to sufficiently ground the piping and peripheral equipment.

#### <NOTE>

- In order to obtain sufficient air, have your air hose diameter equal to or larger than the pump intake and length not longer than 1.5m. If the length exceeds 1.5m, it is recommended to use a quick exhaust valve to allow the exhaust to flow smoothly. For further information, please contact us or your distributor.  
If you are not going to use optional equipment or provided valve, select a device that can provide sufficient air and a solenoid valve with 5 port 3 position center exhaust.
- Use of a coupler for the connection part of each hose will make operation and maintenance easier.

### 4.3 Example of equipment composition

- In DP-F/N series, the surveillance of the stroke with the proximity sensor and such, for preventing elution of the metal ion to the transfer material or degradation of the pump composition parts caused by gas transport, has not been carried out.
- The switch of the pump is performed by the switch of the electromagnetic valve using the flicker circuit.

[Example of equipment composition]

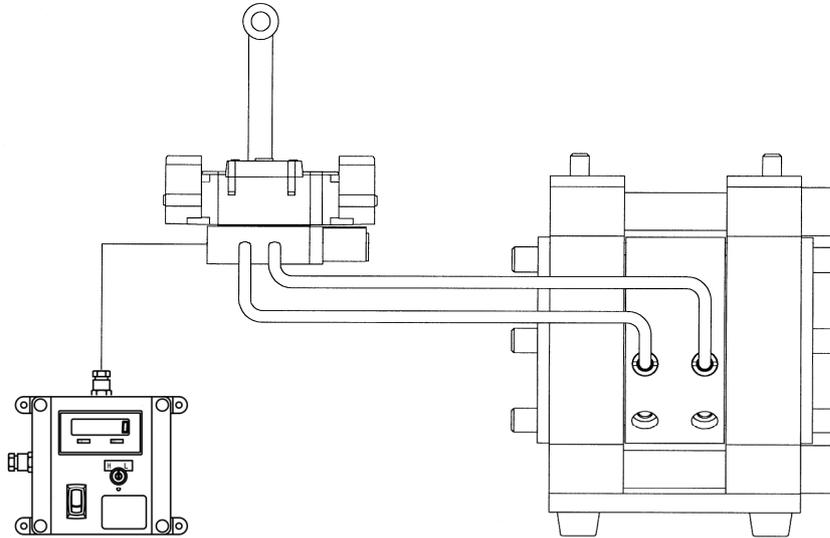


Fig.4.4

<NOTE>

- The pump controller can use the sequencer also. For details, see <NOTE> Example of the operation by the sequencer.
- By using a timer, speed control of a stroke becomes easy.
- By installing a counter, maintenance time can be checked easily.

**⚠ CAUTION**

- While operating a pump, do NOT supply compressed air to both a and b of the air entrance of the pump simultaneously. It becomes the cause of breakage.
- If air piping distance is long (or narrow) and exhaust speed becomes slow, shorten the distance by installing an electromagnetic valve near the pump or install a rapid exhaust valve (optional) near the air entrance of the pump.

<NOTE> Example of the operation by the sequencer.

Switch the electromagnetic valve by using the flicker circuit when the sequencer and the electromagnetic valve (5-port, 3-position) are used to operate the pump.

[Example of the circuit]

For the output of 1CR and 2CR shown in Fig.4.5, use an auxiliary relay inside a sequencer. Since SOL-A and SOL-B are the final output, connect them with the electromagnetic coil part at both ends. When START/STOP is turned ON, the pump is in an operating state

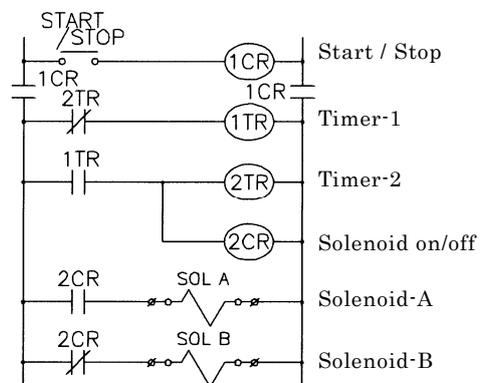


Fig.4.5

## 5. Operation

### 5.1 Method of operation

#### CAUTION



• Before starting the pump, make sure that all piping is properly connected.



• Also, before starting the pump, make sure that all the bolts are securely tightened. (Refer to the maintenance manual for the bolts that regulation torques are explained.)



• Make sure that the air valve, regulator and the drain valve on the discharge side are closed. Also, make sure that the valve on the suction side is opened.

- 1) Start the air compressor.
- 2) Open the air valve in front of peripheral equipment, and adjust the supply air pressure with the regulator to a value within the regulated range (see “10.1 Main specifications”).
- 3) Open the flow valve on the discharge side.
- 4) Adjust the switch speed.
- 5) Make the pump into an operating state by the pump controller.
- 6) Open the air valve before the electromagnetic valve little by little.
- 7) After checking that the material flowed the inside of piping and has been supplied to the discharge side, make the air valve full open.

#### CAUTION



• Do NOT open the air valve suddenly.



• Set the switch speed at the time of pump starting as about 1 second, and set it as required switch speed after the material is supplied in piping.

### 5.2 Flow adjustment

- Attain the regulation of flow either by changing the switch speed of the pump or by adjusting the valve for flow adjustment at the discharge side.
- Refer to “10.3 Performance curve” for the relation between flow and supplied air pressure, flow and discharge pressure, and also flow and switch speed.
- From the number of strokes per minute, dividing up the required flow by the amount of discharge per one stroke, calculate one stroke time, and set the time as the switch time. Moreover, adjust the switch time and the supplied air pressure with application.

#### CAUTION



• As you start closing the flow valve, the supply air pressure may rise. Make sure that the pressure is kept within the normal operating range (see “10.1 Main Specifications”).



• Depending upon the viscosity and specific gravity of the fluid, the suction stroke and other conditions, the permissible suction flow speed of fluid into the pump will vary; however, if the pump speed (flow speed of fluid) increases greatly, cavitation will occur, and this not only will reduce pump performance, but it may cause a malfunction. Adjust the supply air pressure as well as the flow in order to prevent cavitation.



• If fluid is not discharged after you start the pump, or if you hear an abnormal noise or notice any irregularity, shut down the pump immediately (see “8. Troubleshooting”).

### 5.3 Shutdown

- Make the pump a stopped state by the pump controller, close the air valve to intercept supply air.

#### CAUTION



• There is no problem in shutting down the pump with the flow valve closed while air is being supplied; however, if this condition continues for many hours while there is nobody watching the pump, it may continue running when there is a leak from the pump or piping, and fluid may continue flowing out of the position of leakage. Upon finishing your work, release the internal pressure from the pump and close the air valve (see “5.4 Releasing the pressure”).



• When the pump is shut down while pumping slurry, particulate matter contained in the slurry will be deposited and get stuck inside the out chamber. If the pump is started again as-is, the diaphragm may be damaged or the center disk may be overloaded, and this may cause damage such as bending of the center rod. After finishing your work, purge the remaining fluid from the pump (see “6. Method of cleaning”).

### 5.4 Releasing the pressure

- 1) Check that the valve before the electromagnetic valve has closed.
- 2) Stop the air compressor or close the valve before auxiliary machinery.
- 3) Close the valve for flow adjustment at the discharge side, and discharge the pressurized material by opening the valve for drain little by little.
- 4) Operate the pump opening the air valve before the electromagnetic valve, and discharge all the air that remained.
- 5) After checking that the pump stopped and pressure was discharged, shut off the power supply making the pump controller a stopped state, and close the air valve and the drain valve in front of the electromagnetic valve leaving the regulator full open.

#### CAUTION



• Keep a vessel below the relief valve to catch any drain off.



• Fluid under pressure will gush out as soon as you open the valve, so be careful.



• If the pump will be unused for a prolonged period, purge and clean the pump (see the Operating caution on P.3).

## 6. Method of cleaning

### WARNING



• Before starting operation, make sure that compressed air is not supplied to the pump.



• Before starting operation, make sure that the pump is not pressurized.

- 1) Remove the hose from the suction side of the pump.
- 2) Close the flow valve on the discharge side, open the drain valve, and then operate a pump by starting air pressure for a while to discharge any fluid remaining inside the pump as much as possible.
- 3) Remove the hose from the discharge side, and attach different hoses to the suction side and the discharge side for cleaning.
- 4) Be ready with a vessel with cleaning solution, select cleaning solution appropriate for the type of fluid pumped, and then connect the suction-side and the discharge-side hoses of the pump.
- 5) Operate a pump by starting air pressure slowly, and let the cleaning solution circulate for sufficient cleaning.
- 6) Finally, flush with clean water.
- 7) Remove the hose from the suction side of the pump, run the pump for a while and purge the pump of remaining fluid as much as possible.

### CAUTION



• Be careful when removing piping. Fluid will gush out.



• After cleaning with clean water, turn the pump upside down to drain out the water.

## 7. Daily check

- Before starting pump operation, be sure to conduct the following check every day. If any irregularity is found, do NOT start running the pump until the cause of the irregularity has been found and corrective measures have been taken.
  - a) Verify the drain flow through the air filter.
  - b) Make sure that there is no leakage of fluid from any connection part or the pump.
  - c) Make sure that there are no cracks in the pump casing or piping.
  - d) Check the tightness of every bolt of the pump and retighten if necessary. For details, see the maintenance manual.
  - e) Make sure that the connection parts of the piping and peripheral equipment are not loose.
  - f) Make sure that each consumable parts of the pump has not been inspected or replaced. For details, see the maintenance manual.

## 8. Troubleshooting

### 8.1 Pump does not run

Cause	Action to be taken
Supply and exhaust port of pump is clogged with sludge.	Check and clean the supply port and exhaust port.
Air is not supplied.	Start the compressor, and open the air valve and air regulator.
The supply air pressure is low.	Check the compressor and the configuration of air piping.
Air leaks from connection parts.	Check the connection parts and tightness of bolts.
Air piping or peripheral equipment is clogged with sludge.	Check and clean the air piping.
The flow valve on the discharge side is not open.	Open the flow valve on the discharge side.
The fluid piping is clogged with sludge.	Check and clean the fluid piping.
The pump is clogged with sludge.	Disassemble the casing, check and clean.

### 8.2 Pump runs, but fluid does not come out

Cause	Action to be taken
The suction lift or discharge head is long.	Confirm the piping configuration and shorten the length.
The discharge-side fluid piping (including the strainer) is clogged with sludge.	Check and clean the fluid piping.
The valve on the suction side is not open.	Open the valve on the suction side.
The pump is clogged with sludge.	Disassemble the casing, check and clean.
The ball and valve seat are worn out or damaged.	Disassemble the manifold, check and replace parts.

### 8.3 Flow (discharge volume) decreased

Cause	Action to be taken
The supply air pressure is low.	Check the compressor and configuration of air piping.
Air piping or peripheral equipment is clogged with sludge.	Check and clean the air piping.
The discharge-side flow valve opens differently.	Adjust the discharge-side flow valve.
Air is taken in together with fluid.	Replenish fluid and check the configuration of the suction side piping.
Cavitation occurs.	Adjust the supply air pressure and discharge pressure, and shorten the suction lift.
Chattering occurs.	Adjust the supply air pressure and discharge pressure. Reduce inlet flow valve to adjusting liquid pressure and volume.
The fluid piping (including the strainer) is clogged with sludge.	Check and clean the fluid piping and strainer.
The exhaust port (silencer) of the pump is clogged with sludge.	Check and clean the exhaust port and silencer.
The pump is clogged with sludge.	Disassemble the casing, check and clean.

### 8.4 Liquid leakage from exhaust port (silencer)

Cause	Action to be taken
The diaphragm is damaged.	Disassemble and check the pump and replace the diaphragm.

### 8.5 High air consumption during operation

Cause	Action to be taken
The electromagnetic valve, packing of the center rod section and O-ring are worn out.	Check and replace the electromagnetic valve, packing of the center rod section and O-ring.

### 8.6 Irregular noise

Cause	Action to be taken
The supply air pressure too high.	Adjust the supply air pressure.
Occur ball chattering.	Adjust the supply air pressure and discharge pressure. Reduce inlet flow valve to adjusting liquid pressure and volume.
The pump is clogged with sludge with particles of larger than the permissible diameter.	Disassemble the casing, check and clean.

### 8.7 Irregular vibration

Cause	Action to be taken
The supply air pressure is too high.	Adjust the supply air pressure.
Occur ball chattering.	Adjust the supply air pressure and discharge pressure.
Connection parts and pump mounting are loose.	Check each connection part and tighten the bolts.

- If disassembly is required, refer to the maintenance manual and follow with the instructions.
- If any of the above mentioned causes does not apply to your problem, contact your dealer or our regional office.

## 9. Returning the product for servicing

### 9.1 Before returning the product

- 1) Purge the pump of fluid and clean (see “6. Method of cleaning”).
- 2) Return the product in the same package as when it was first shipped from the factory.

### WARNING



- It will be the end-user responsibility to thoroughly wash a clean the pumps to prevent accidents caused by liquid leaks.

### CAUTION



- Be sure to prevent liquid leak from pump for safe transport.

## 10. Main body specifications

### 10.1 Main specifications

#### DP-F/N series

Nominal Diameter		DP-10F/N	DP-20F/N	DP-25F/N
Nominal Diameter		3/8" (10 mm)	3/4" (20 mm)	1" (25 mm)
Fluid Connection	Suction Port	Rc 3/8 or Equivalent to JIS FLANGE 10K10A	Rc 3/4 or Equivalent to JIS FLANGE 10K20A	Rc 1 or Equivalent to JIS FLANGE 10K25A
	Discharge Port			
Air Connection	Air Supply/ Exhaust Port	Rc 1/4 × 2 *4*5		Rc 1/2 × 2 *4*5
	Auxiliary Exhaust Port	Rc 3/8		Rc 3/4
Nominal Air Pressure		0.2 - 0.5 MPa		
Maximum Discharge Pressure		0.5 MPa		
Switch speed *1		0.2 - 0.5 sec/cycle	0.5 - 1.0 sec/cycle	0.2 - 1.0 sec/cycle
Discharge Volume/cycle *2		60 mL	180 mL	270 mL
Maximum Discharge Volume		22 L/min	35 L/min	58 L/min
Maximum Air Consumption *3		350 L/min (ANR)	400 L/min (ANR)	1200 L/min (ANR)
Slurry Limitation		1 mm or less	2 mm or less	3 mm or less
Limitation of Viscosity		1 Pa·s or less	2 Pa·s or less	2.5 Pa·s or less
Operating Temperature Range	Temp. Ambient	0 - 70 °C		
	Temp. Liquid	0 - 80 °C		
Maximum Operating Noise		82dB	85dB	
Weight		6.4 kg	14.2 kg	29.5 kg

\*1. The minimum allowable switching speed is 10 sec./cycle.

\*2. Discharge volume (per cycle) varies according to use conditions.

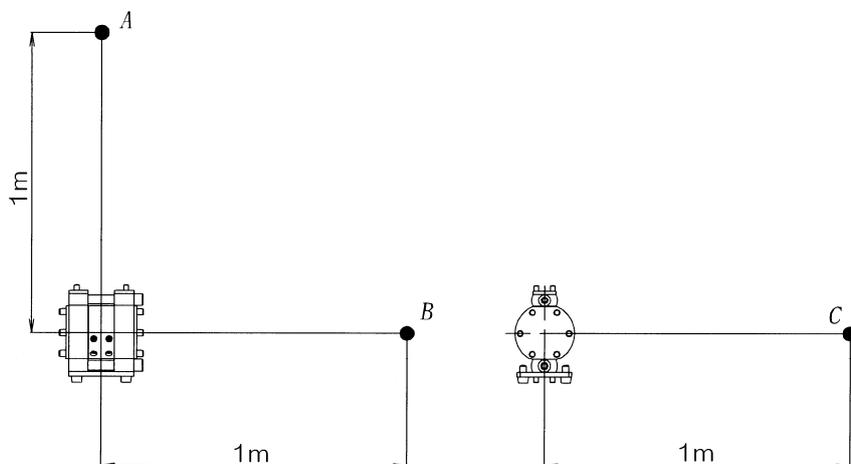
\*3. Measured at 0.2 sec./cycle (10F/N,25F/N) and 0.5 sec./cycle (20F/N).

\*4. The maximum allowable pipe length from an air valve to the pump is 1.5 m.

\*5. When connecting an exhaust pipe from the air valve to a different location, the maximum allowable pipe length is 5 m.

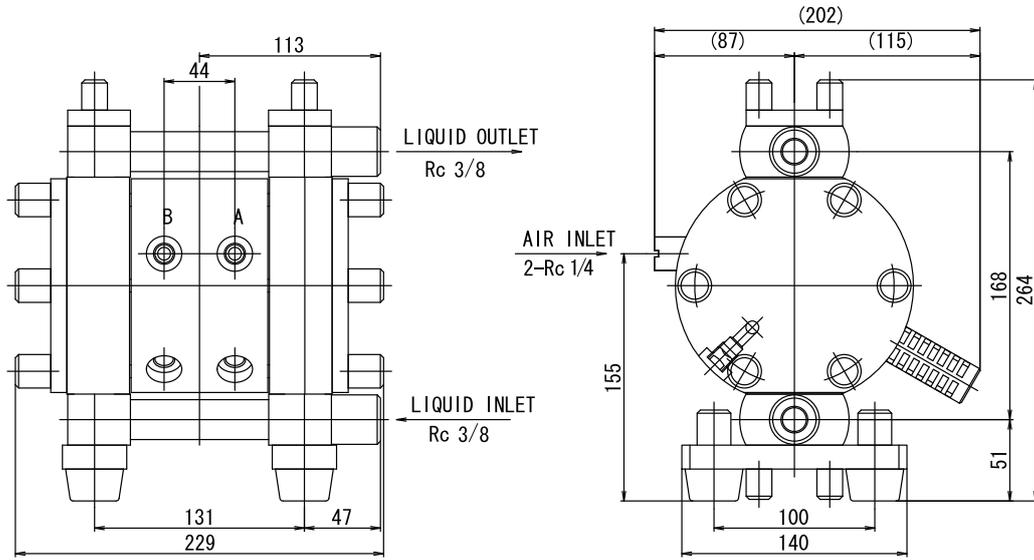
#### <NOTE> Method of measurement of operating noise

With a specified noise meter, the operating noise is measured at measurement points A, B and C, and the maximum value is to be used.

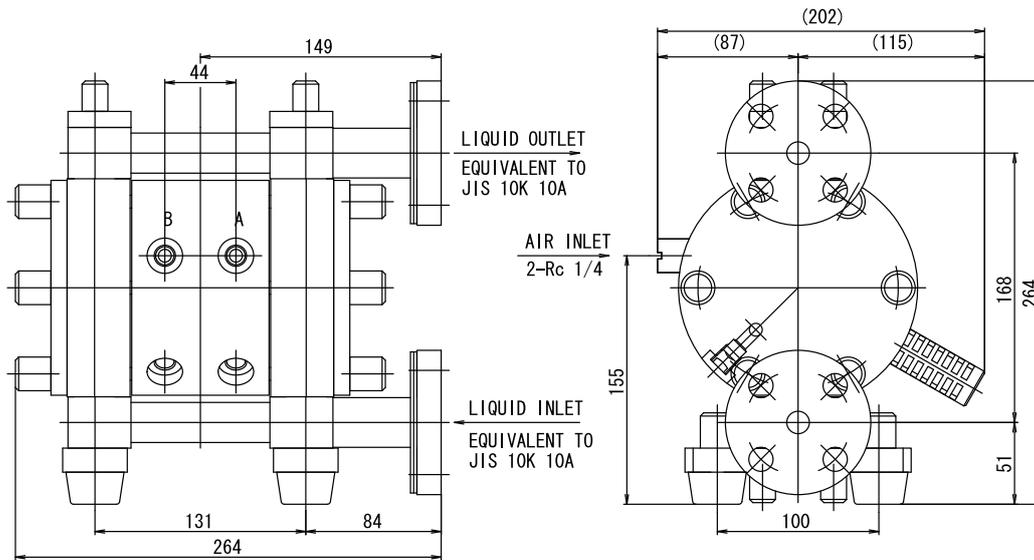


## 10.2 Appearance and dimensions

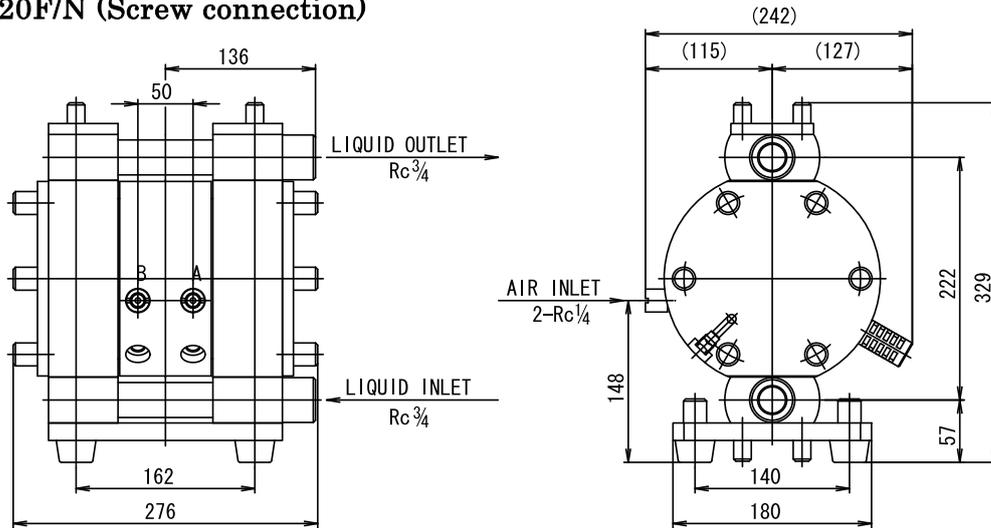
### DP-10F/N (Screw connection)



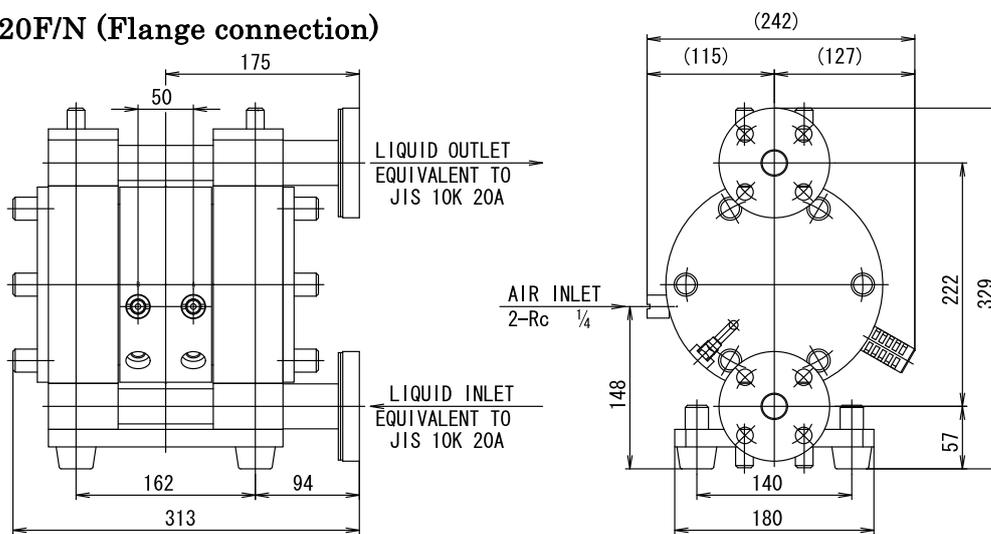
### DP-10F/N (Flange connection)



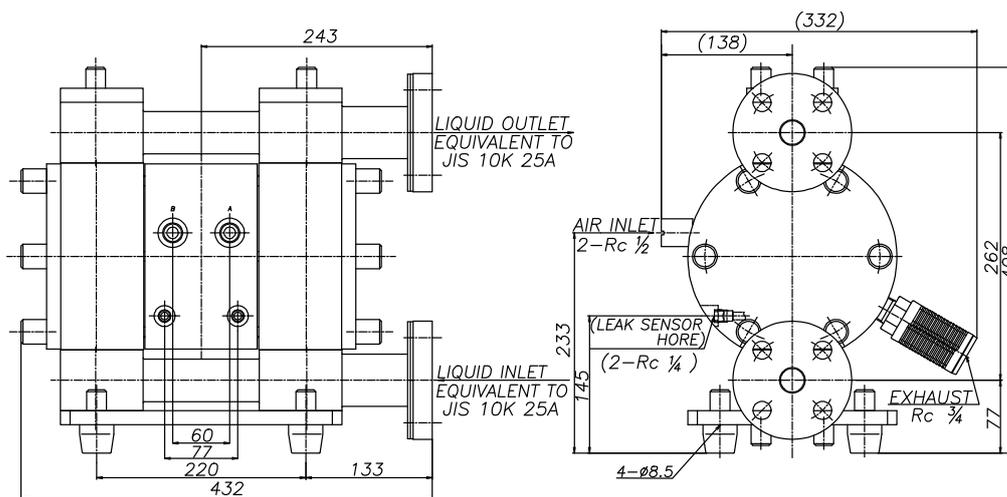
**DP-20F/N (Screw connection)**



**DP-20F/N (Flange connection)**



**DP-25F/N (Flange connection)**



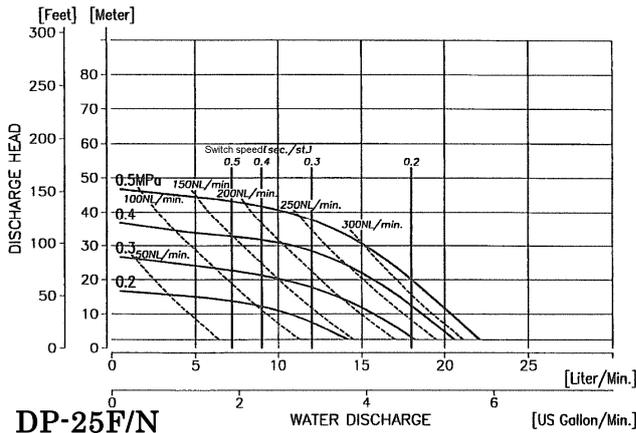
**⚠ CAUTION**



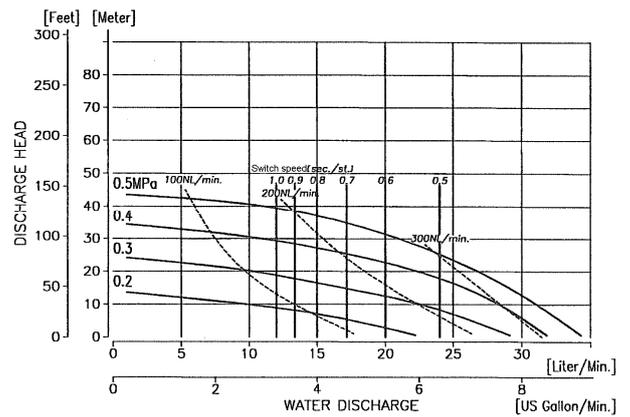
· Due to improvement or modification of products, dimensions may change without notice. Please contact your distributor or our regional office for detailed information.

### 10.3 Performance curve

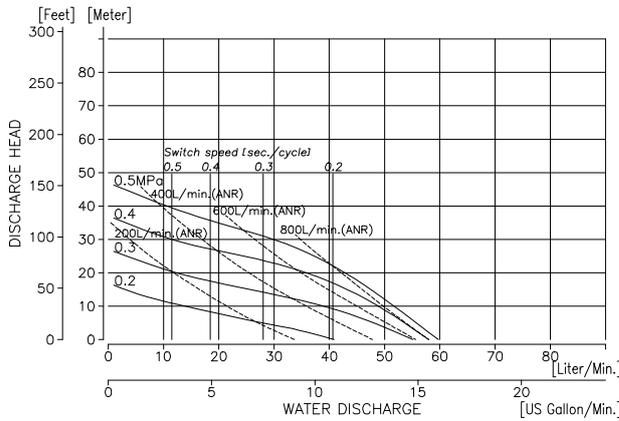
**DP-10F/N**



**DP-20F/N**



**DP-25F/N**



**<NOTE> Method of measurement of performance curve**

Measuring instruments and procedure

**DP-10F/N, DP-20F/N**

1. VFR3400 H.P HOSE 3/4"
2. TUBE  $\varnothing 10 \times \varnothing 8 \times 1.5\text{m}$   
(System A)

**DP-25F/N**

1. VFR5400 H.P HOSE 3/4"
2. TUBE  $\varnothing 12 \times \varnothing 10 \times 1.5\text{m}$   
(System B)

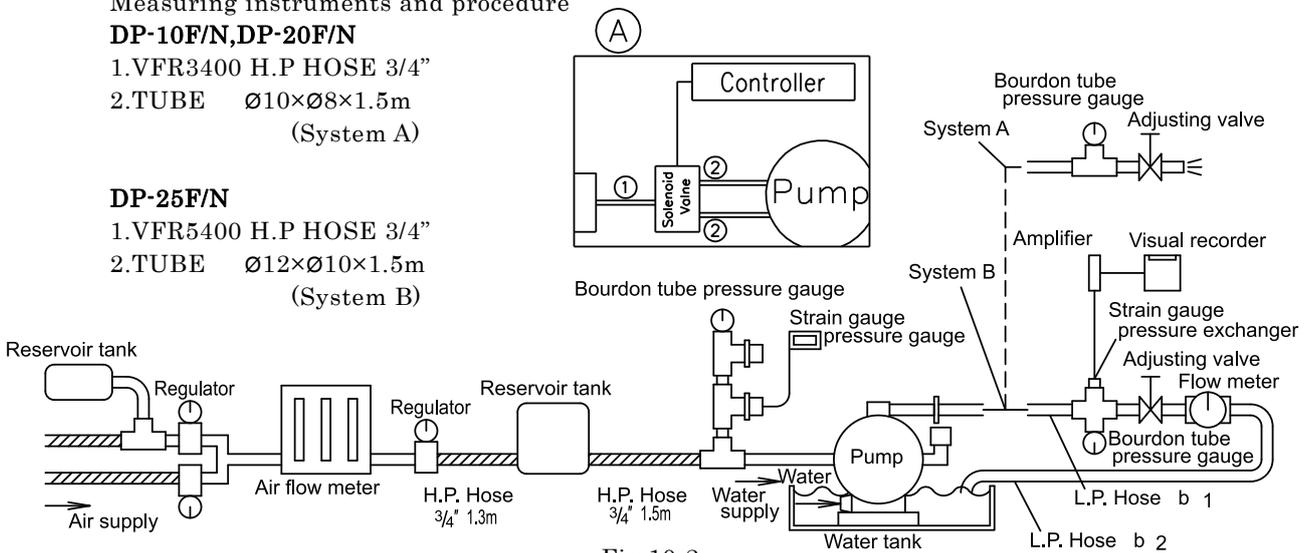


Fig.10-2

**Conditions**

- a) Supplied air pressure: Maintaining preset pressure
- b) Liquid pumped: Fresh water
- c) Temperature: Ambient
- d) Condition of suction: Flat suction 0 meter head
- e) Measuring system: System A --- Converting weight of discharged fluid to volume.  
System B --- By liquid meter

## 11. Limited warranty

If an abnormality occurs during normal operation in accordance with the operating instructions and other operating cautions within the warranty period (12 months after date of purchase) that can be attributed to a manufacturing defect, the defective parts of this product will be serviced or the product will be replaced free of charge. However, this warranty will not cover compensation for incidental damage or any malfunction listed below.

### 1. Warranty period

This warranty will be valid for a period of 12 months after the date of purchase.

### 2. Warranty

If, during the warranty period, any of the material of the genuine parts of this product or the workmanship of this product is found defective, and is so verified by our company, the servicing cost will be fully born by our company.

### 3. Exclusion

Even during the warranty period, this warranty does not cover the following.

- (1) Malfunction arising from use of parts other than manufacturer-specified genuine parts
- (2) Malfunction arising from misuse or operating errors, or lack of storage or maintenance care
- (3) Malfunction arising from use with a fluid that may cause corrosion, inflation or dissolution of the component parts of the product
- (4) Irregularity arising from repair made by other than by our firm, our regional office, dealer or authorized service personnel
- (5) Malfunction arising from modification of the product by other than authorized service personnel
- (6) Wear and tear of parts that must be regularly replaced in the course of normal operation, such as diaphragms, center disk, valve seats, balls/flat valve, air switch sleeve valves, pilot valve, O-rings and gasket.
- (7) Malfunction and/or damage due to use with incorrect voltage.
- (8) Malfunction and/or damage due to transportation, moving or drop page of the product after purchase
- (9) Malfunction and/or damage due to fire, earthquake, flood or other force majeure
- (10) Malfunction arising from use of compressed air that contains impurities or excessive moisture or use of gases or fluids other than the specified compressed air
- (11) Malfunction arising from use of excessively abrasive material or of inadequate grease.

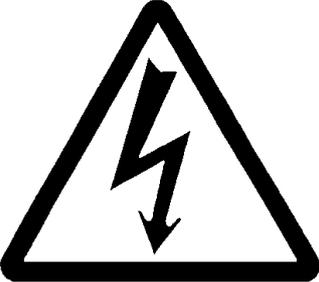
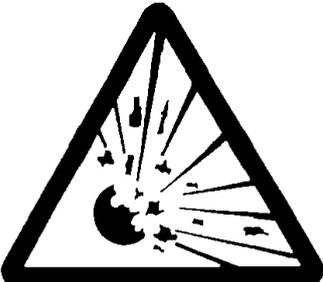
Furthermore, this warranty does not cover the rubber parts, or other parts used in this product and its accessories, which are subject to wear in normal operation.

• hoses    • packings    • cords

### 4. Parts

Parts for this product will be kept available for 5 years after discontinuation of production. Once 5 years have elapsed after close of production, availability of parts for this product cannot be guaranteed.

## 12. Warning symbols

<p>BEWARE: HIGH TEMPERATURE</p> 	<p>ELECTRIC SHOCK</p> 	<p>POISON</p> 
<p>FLAMMABLE</p> 	<p>CORROSION</p> 	<p>EXPLOSION</p> 
<p>General warnings, cautions and danger notifications</p> 	<p>FIRE STRICTLY PROHIBITED</p> 	



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