OPERATION AND MAINTENANCE PW, PW-F, PW-C SERIES

CONTENTS

OPERATION AND MAINTENANCE

1. UNPACKING

Upon receiving the goods, inspect for external damage and check that the goods, including accessories, agree with your order and no bolts have become loose during shipment. Inform your agent of the model and serial number shown on the nameplate when reporting any problems.

2. PRECAUTIONS

DRY RUNNING AND CAVITATION

In normal circumstances, dry running must be avoided, because the pump bearings are lubrication and cooled by the liquid being pumped. In the case of unavoidable dry running, such as in a trial operation to confirm the direction of motor rotation etc., stop the pump within several seconds and wait at least one hour. Then allow liquid into the pump to cool ceramic parts and prevent cracks. Cavitation and running at the closure of the suction and/or discharge valve can damage the pump interior or cause abnormal wear due to increasing temperature and friction of contact parts. In such cases, the pump should be stopped within one minute.

OPERATION TEMPERTURE

The pump should be operated within the following temperature range:

Atmospheric temperature	:	0~40°C
Pumping water temperature	:	0~70°C (PW series)
		0~90°C (PW-C PW-F series)

Refer to the Chemical Resistance Chart for the recommended temperature range of each fluid.

Viscosity, vapor pressure and corrosiveness of the pumping fluid may very with changes in temperature. Thus careful attention should be paid to changes in pumping fluid characteristics.

PERMISSIBLE SYSTEM PRESSURE OF PUMPS

Discharge pressure should not exceed the following pressures.

Model	Pressure
250PW-C, 400PW, 400PW-F	1.7 kgf/cm
401PW-C, 401PW, 401PW-F	2.0 kgf/cm
402PW-C, 402PW, 402PW-F	3.3 kgf/cm
403PW-C, 402PW, 402PW-F	3.7 kgf/cm
405PW-C, 405PW, 405PW-F, 505PW-C, 507PW-C, 657PW-C, 6510PW-C	4.5 kgf/cm

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PERFOMANCE CHANGE DUE TO SPECIFIC GRAVITY AND VISCOSITY

The power requirement discharge and head will be change when the specific gravity and viscosity of the pumping fluid are higher than that of fresh water. Since the pump is recommended according the purchase specification, contact Pan World or agent if the pump is used for another service.

SLURRY HANDLING

As a rule, the pump is unsuitable for slurry. Only type PW-F-AV with a ceramic bearing is available for applications of up 5% slurry concentration, particle size of 50 microns meter and hardness of 80 Hs.

DEGREASING

The ceramic bearing of type PW-F-AV is greased to make test operation smooth. When the fluid must be protected from contamination with the fluorocarbon grease, wipe it away before pump operation.

3, INSTALLATION, PIPING, AND WIRING

PLACE OF INSTALLATION

The pump should be installed as near to a suction tank as possible and readily accessible for inspection and maintenance.

In order to ensure safety during disasters such as floods, provisions should be established for the motor and the power distribution unit.

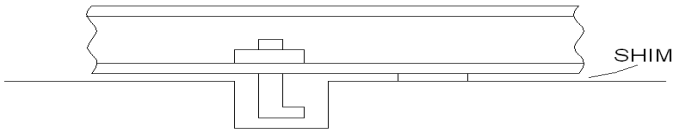
FOUNDATION

Prepare concrete foundations suitable for the weight of the pump and enough depth to resist frost in freezing weather.

The surface should be level. Make sufficiency large for another bolts to suit pump. As much times as possible should be allowed for the concrete to harden 28 days usually being advisable.

INSTALLATION

The metallic shims (shown in 3-1) on the foundation to leave about 25mm between the surface for the foundation and the base for pouring cement mortar.



Mount the pump, with the anchor bolts, on the shims. Fits the nuts to the bolts, flush with their tops, and let the bolts hang down into the holes.

Be sure that the pump is in a perfectly horizontal.

Pour cement mortar into the anchor bolts hole and space under the base plate. Allow several days for it to harden. Then tighten the nuts paying particular attention to the level of the pump.

*PIPING **CAUTION***

All piping should be supported independently so that unnecessary weight and vibration are not transmitted directly to the pump. Flexible piping is recommended to avoid damage of the plastic pump casing. The best piping arrangement for minimum loss is based on straight runs with as few bends and fittings as possible. Do not screw piping excessively on to the pump casing. Screw of the casing is not tapered but straight. Use of O-ring is always recommended for sealing.

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SUCTION PIPING

The suction piping should be as short as possible and with minimum number of small radius bend. Excessive length and sharp change in the direction of flow may lead to flow instability and cavitation.

The available NPSH should exceed 120% of the required NPSH. See the respective performance curve for the NPSH.

The suction piping should never be smaller than the pump inlet. The flow velocity must not exceed 2m/sec. When pumping viscous or hot liquids, lower flow velocities may be required to ensure enough NPSH.

In the case of flooded suction

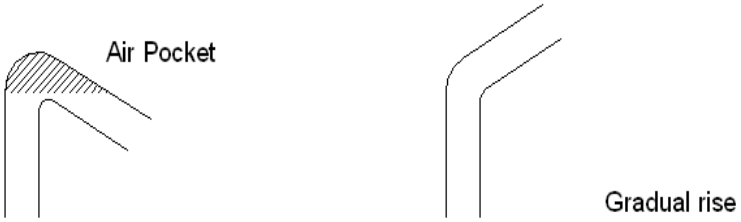
- The piping should be laid with a slight descent the pump.
- Install a valve in the suction line for dismantling and checking. The valve should fully opened during operation.

In the case of negative suction (shown in 4-1~4)

- Upward loops should always be avoided as possible sources of air pockets. Where looping is unavoidable, a downward loop is preferable to an upward loop.

Upward loop is incorrect Down loop is incorrect

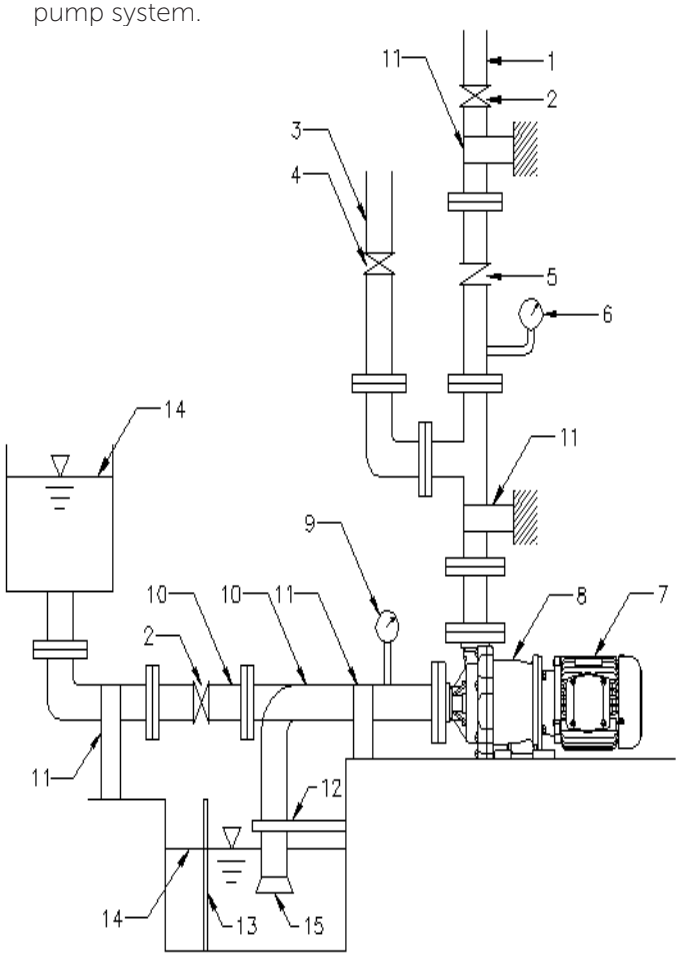
Ideally, suction pipe should rice continuously to the pump inlet with a rise of more than 1/100.



Incorrect Correct

- If the piping is buried underground, it is recommended to perform a hydraulic pressure test at 16 kgf/cm before filling up.
- If the suction piping is larger than the pump inlet, connect them with an eccentric reducer. Do not use a symmetrical reducer as it creates an air pocket in the horizontal line.
- If a gate valve is used for any reason, it should be installed with its spindle positioned or perpendicularly downward to prevent an air pocket at the spindle section.
- Air leakage from the joints the piping system may cause pump failure.

» A screen and a foot valve with a strainer are recommended to prevent foreign matter from entering the pump system.



1. Discharge pipe
2. Valve
3. Priming pipe
4. Gate valve
5. Non-return valve
6. Pressure gauge
7. Motor
8. Pump
9. Vacuum gauge
10. Absorbent pipe
11. Pipe support
12. Absorbent pipe shock absorber support
13. Screen
14. Reservoir
15. Bottom valve

DISCHARGE PIPING

Determine the discharge pipe diameter after calculating friction loss head.

Install a gate valve in the discharge line to control the flow rate and to prevent overload.

Install a non-return valve in the following conditions:

» If the line is extremely long

» If the static discharge head exceeds 15m

» If the total static head exceeds 9m

» If two or more pumps are connected in parallel to a common piping.

Refer to the above figure for the arrangement order of the gate and non-return valves.

Install a pressure gauge to monitor the performance of the pump during operation.

If the horizontally laid piping is very long, provide sir vents and expansion joints in the discharge line

It is advisable to provide drain cocks to wash the piping and to protect the piping from the danger of freezing.

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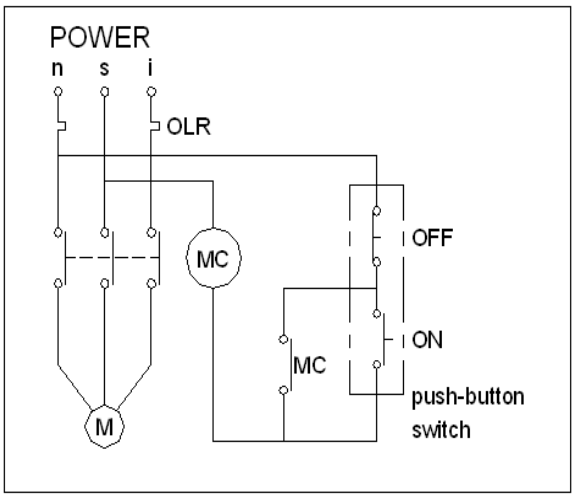
WIRING

Provide a push-button switch and an Electro-magnetic relay in accordance with the voltage and out put of the motor.

Wire in accordance with following circuit diagram. When the pump is installed outdoors, to protect against rain wire with conduits a gasket seal.



M..... Motor
OLR..... Overload relay
ON , OFF... Push-button switch
MC..... Electro-magnet relay
TR..... Time relay
AR..... Auxiliary relay
R..... Resistor

4. OPERATION

POINTS OF CARE IN OPERATION

- DRY RUNNING - Dry running must be avoided. Before operating, make sure that the pump is primed.
- CAVITATION - Capitation damages the bearing or causes abnormal wear therefore the pump should be stopped within one minute under capitation running. Do not close the suction gate valve while the pump is in operation.
- MAGNET COUPRING - When the magnet coupling is disconnected due to overload or other reason, stop the pump within one minute. If the pump is operated for a longer period under these conditions, the magnet coupling torque is demagnetized.
- VARIATION OF LIQUID TEMOERTURE - If the temperature of the liquid varies 80°C, the ceramic components may crack.
- ELECTRIC FALURE - When the electric power gives out press the push-button "OFF" at once and closes the discharge gates valve.

STARTING PROCEDURE

- Thoroughly wash foreign matter from all pipes and the reservoir, with clean water. Check that every bolt is fastened securely.
- Closed the cocks of the pressure and vacuum gauges. Open the cocks only when measuring and always keep closed after use.

- Fully open the suction gate valves and partly opens the valve on the discharge line
- For suction-life application, priming the pump, turn motor-fan with a screwdriver to rotate the pump impeller to drive away the residual air around the impeller from the air on the discharge pipe. In the case of the flooded suction, check by the suction pressure gauge that liquid is following in the pump.
- Ensure that the piping and wiring are fitted correctly.
- Turn the motor-fan with a screwdriver and ensure that the fan rotates smoothly. Press the push-button "ON" and operate for a few seconds to check that the motor is rotating in the correct direction.
- An arrow shown on the motor indicates the correct rotation. If rotation is incorrect, interchange power source leads of 2 phases.
- Press the push-button "ON" for starting the pump. If the pump fails to start, check the wiring to determine the cause of the trouble.
- Check the discharge pressure and then gradually open the gate valve until the received pressure is reached. When the valve is opened excessively, it will cause overload and magnet coupling disconnection.
- Check that the required flow capacity is obtained. Ensure that the capacity exceeds 10L/min for models NH400PW, NH401PW(S), NH401PW-F,NH400PW-For20L/minformodelsNH402PW,NH403PW,NH402 PW-F,NH403PW-F,NH405PW,NH405PW-F and whole PW-C model.
- Do not close the discharge valve excessively. If a flow meter is not installed, obtain the value of capacity from the values of pressure gauges and amp motor.

STOPPING

- Gradually close the discharge gate valve. Do not close the discharge piping suddenly using a solenoid valve or like. It may damage the pimp by water hammer if the piping is long
- Press the push-button "OFF". See if the speed of rotation falls slowly and smoothly. If it is not smooth, check the inside of the pump and the drive magnet for any abnormal condition.
- When stopping the pump for an extended period, remove all liquid from the pump or keep the pump warm with a band-heater and open either the discharge or suction gate valve to prevent possible freezing.
- Where a stand-by pump is available, it is recommended that it be used from time to time.
- When the electric power gives out, press the push-button "OFF"

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5. TROUBLESHOOTING

PROBLEM	CONDITION		CAUSE	ACTION
	WHEN DISCHARGE VALVE IS CLOSED	WHEN DISCHARGE VALVE IS OPENED		
LIQUID IS NOT LIFETD UP		Needles of pressure gauge and vacuum gauge stays at 0	• Priming water is not sufficient • Dry running	• Stop the pump and start the pump again with sufficient priming water
	Priming water goes down too quickly		• Foreign matter exists in foot valve	• Clean strainer and foot valve
	Water drops when discharge valve is opened after starting of pump	Needles of pressure gauge and vacuum gauge swing and drop to 0	• Air is penetrating trough suction pipe or gasket	• Check it flange are sufficiently scaled • Check it suction water level is abnormal low
			• Disconnection of magnet coupling	• If motor-fan does not rotate smoothly with a screwdriver, make sure that there is no foreign matter in the pump and around pump bearing • Check for overload and incorrect power voltage
	Needle of pressure gauge stays at low position and dose not go up		• Rotation speed is low • Impeller reverses	• Check power supply and motor • Replace or correct wiring
DISCHARGE CAPACITY IS TOO SMALL		Vacuum gauge shows high valve	• Strainer is clogged with foreign matter	• Remove foreign matter in strainer
	Both pressure gauge and vacuum gauge show normal values	Vacuum gauge indicates very high value	• Air pocket exists in suction pipe	• Check arrangement of suction pipe and adjust it property
			• Foreign matter clogs the inlet of impeller	• Disassembly partially then remove foreign matter
		Needles of vacuum gauge and pressure gauge swing	• Air penetrates through suction line	• Check flange are sufficiently sealed
			• Foreign matter clogs the discharge side of pump	• Remove foreign matter
		Vacuum gauge shows high value, but pressure gauge shows normal value	• Air pocket or some resistance exists in suction pipe	• Check it a rising part exists in suction line • Clean suction pipe
		Pressure gauge shows high value, while vacuum gauge shows normal value	• Total dynamic head is higher than planned values	• Check dynamic head including friction loss
	Both pressure gauge and vacuum gauge show low value	Both pressure gauge and vacuum gauge show low value	• Direction of rotation is incorrect	• Change wiring arrangement
MOTOR IS OVERHEATED			• Voltage drop • Overload • Ambient temperature is too high	• Take nescessary measure if voltage or frequency are incorrect • Check if specific gravity and viscisty of the liquid are proper • If motor-fan dose not rotates smoothly with a screwdriver, make sure that there is no foreign matter in pump and around pump bearing • Make draught consition better
DISCHARGE CAPACITY SUDDENLY DROPS		Vacuum gauge shows high value	• Strainar is clogged with foreign matter	• Remove foreign matter
PUMP VIBRATES			• Incomplete foundation • Mounting bolts are loose • Cavitation exists • Pump bearing, spindle or magnet capsule broke, worn or melt down • Drive magnet broke • Motor bearing worn	• Make proper foundation • Retighten them • Check suction piping and NPSH • Replace with new one • Replace with new one • Replace with new one

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5. MAINTENANCE AND INSPECTION

An overhaul every 3 mouths mentioned below is recommended. Daily inspection of discharge and suction pressure, flow rate, vibration, voltage, noise and the electric motor current is recommended to detect pump failure earlier. When any abnormal condition is found, contact March May.

If a stand-by pump is installed, be sure to operate it once in a while so that it can be operated at any time.

PART	INSPECTION
Drive Magnet Assembly	Check that there is not rubbing contact Check to see if drive magnet assembly is correctly mounted and poistioned on motor shaft
Rear Casing	Check that there is no crack or trace of rubbing on outside of rear casing Check that there is no trace of abnormal wear and no crack on rear thrust ring Wash and clean
Magnet Capsule	Check that there is no crack or trace of rubbing Wash and clean Measure inside diamete of bearing
Impeller, Mouth Ring	Check that there is no crack or deformation Wash and clean Measure thickness of mouth ring
Front Casing	Check that there is no crack Check that there is no trace of abnormal wear and no crack on front thrust ring Wash and clean
Spindle	Check that there is no crack and no trace of abnormal wear Wash and clean Measure diameter
O Ring	Check that there is no crack or no swelling Replace with new O rings every overhaul

6. WEARING PARTS MEASUREMENT

MODEL	SPINDLE		BEARING		FRONT THRUST PAD
	N	W	N	W	FRONT CASING
400PW, 400PW-F, 250PW-C	20	19	20	21	When 1mm worn
401PW, 401PW-F, 401PW-C	20	19	20	21	When 1mm worn
402PW, 402PW-F, 402PW-C	25	24	25	26	When 1mm worn
403PW, 403PW-F, 403PW-C	25	24	25	26	When 1mm worn
405PW, 405PW-F, 405PW-C	25	24	25	26	When 1mm worn
505PW-C, 507PW-C	25	24	25	26	When 1mm worn
675PW-C, 6510PW-C	25	24	25	26	When 1mm worn

N = New part size in mm, w = Worn part size in mm when worn out and should be replaced

When the difference between the spindle and the bearing diameters is greater than 1mm replace the part which has shown the most wear.