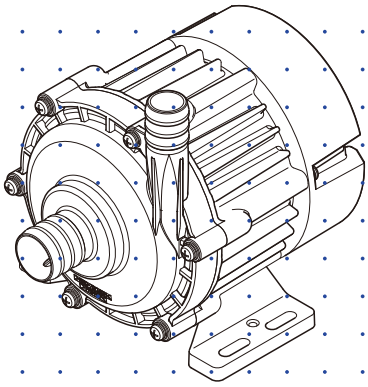
Iwaki Direct Drive Pump

NRD-70/-100 (built-in type)



Instruction manual

Thank you for choosing our product.

Please read through this instruction manual before use.

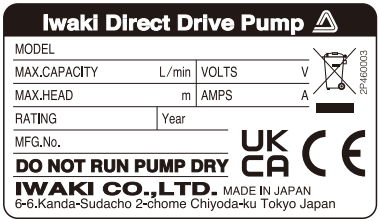
This instruction manual describes important precautions and instructions for the product. Always keep it on hand for quick reference.

Order confirmation

Open the package and check that the product conforms to your order. If any problem or inconsistency is found, immediately contact your distributor.

a. Check if the delivery is correct.

Check the nameplate to see if the information such as model codes, discharge capacity and discharge pressure are as ordered.



*The CE/UKCA markings on our product(s) are for us to market the product(s) into the European Union market/ the Great Britain (England, Wales and Scotland) market, however, the CE/UKCA markings do not ensure any safety or conformity of the product(s) outside the EU/GB markets.
When the pump is incorporated into the equipment marketed in the EU/GB markets, such equipment must meet all the requirements of applicable directives/ regulations.
In such a case, any person who places the equipment on the markets must carry CE/UKCA marks on the equipment as a manufacturer.

b. Check if the delivery is damaged or deformed.

Check for transit damage and loose bolts.

Contents

Safety instructions

Read through this section before use. This section describes important information for you to prevent personal injury or property damage.

■ Symbols

In this instruction manual, the degree of risk caused by incorrect use is noted with the following symbols. Please pay attention to the information associated with the symbols.

⚠ **WARNING**	Indicates mishandling could lead to a fatal or serious accident.
⚠ **CAUTION**	Indicates mishandling could lead to personal injury or property damage.

A symbol accompanies each precaution, suggesting the use of "Caution", "Prohibited actions" or specific "Requirements".

⚠ Export Restrictions

Technical information contained in this instruction manual might be treated as controlled technology in your countries, due to agreements in international regime for export control.

Please be reminded that export license/permission could be required when this manual is provided, due to export control regulations of your country.

⚠WARNING

Turn off power before service

Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.

Requirement

Stop operation

If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.

Requirement

Do not use the pump in any condition other than its intended purpose

The use of the pump in any conditions other than those clearly specified may result in failure or injury. Use this product in specified conditions only.

Prohibited

Do not modify the pump

Alterations to the pump carries a high degree of risk. It is not the manufacturer's responsibility for any failure or injury resulting from alterations to the pump.

Do not rework or alter

Wear protective clothing

Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work. The specific solution will dictate the degree of protection. Refer to SDS precautions from the solution supplier.

Wear protectors

Use of hazardous chemicals

Risk of personal injury or fire. Check/monitor plumbing system for a leak before or in operation when handling a flammable, corrosive or harmful liquid.

Caution

Do not damage the power cable

Do not pull, knot, or crush the power cable. Damage to the power cable could lead to a fire or electrical shock if cut or broken.

Prohibited

Do not operate the pump in a flammable atmosphere

Do not place explosive or flammable material near the pump.

Keep fire away

⚠CAUTION

Qualified personnel only

The pump should be handled or operated by qualified personnel with a full understanding of the pump. Any person not familiar with the product should not take part in the operation or maintenance of the pump.


Requirement

Use specified power only

Do not apply power other than that specified on the nameplate. Otherwise, failure or fire may result. Ensure the pump is properly grounded.


Requirement

Do not run pump dry

Running the pump without liquid, friction heat builds up and damages the internal parts of pump.


Prohibited

Ventilation

Fumes or vapours can be hazardous with certain solutions. Ensure proper ventilation at the operation site.


Requirement

Do not install/store the pump:

- Where ambient temperature can exceed 0-50ºC (32-122ºF).
- In a flammable atmosphere or in a dusty/humid environment.
- In direct sunlight or wind & rain.
- In mechanical vibration.
- In a corrosive atmosphere such as chlorine gas.


Prohibited

Spill precautions

Ensure protection and containment of solution in the event of plumbing or pump damage (secondary containment).


Requirement

Do not stand on the pump

Personal injury may result as the pump turns over.


Prohibited

Do not touch the pump or pipe with bare hands

Risk of burning. The surface temperature of the pump or pipe rises high along with liquid temperature in or right after operation.


Caution

Keep electric parts and wiring dry

Risk of fire or electric shock. Install the pump where it can be kept dry.


Prohibited

Keep away from around the pump when turning ON power

The pump doesn't have an ON-OFF switch and starts as the rated power voltage is provided.


Requirement

Remove foreign matters

Turn off power and clean the pump if foreign matters enter the pump. Otherwise, the pump may be damaged.


Requirement

Static electricity

When low electric conductivity liquids such as ultra-pure water and fluor inactive liquid (e.g. Fluorinert™) are handled, static electricity may generate in the pump and may cause static discharge. Take countermeasures to remove static electricity.


Requirement

Check pump head bolts

Liquid may leak if any of pump head bolts become loose. Tighten the bolts diagonally and evenly by 1.6N•m before initial operation and at regular intervals.


Caution

Do not use the pump in a wet location

The pump is not waterproof. Use of the pump in wet or extremely humid locations could lead to electric shock or short circuit.


Prohibited

Do no use a damaged pump

Using a damaged pump could lead to an electric shock or death.


Prohibited

Disposal of the used pump

Dispose of any used or damaged pump in accordance with local rules and regulations. If necessary, consult a licensed industrial waste disposal company.


Requirement

Do not pressurize the pump excessively

If the pump is pressurized over the maximum discharge pressure, O ring seal may be impaired and leakage may result.


Prohibited

Precautions for use

• Electrical work should be performed by a qualified electrician. Otherwise, personal injury or property damage could result.


Caution

• Do not install the pump:
- In a corrosive/flammable/explosive atmosphere
- In a dusty/humid place.
- In direct sunlight or wind & rain.
- Where ambient temperature can exceed 0-50ºC (32-122ºF).
- Where ambient humidity can exceed 35-90%RH.
- In mechanical vibration.


Requirement

• Allow sufficient space around the pump for easy access and maintenance.


Requirement

• Use care handling the pump. Do not drop. An impact may affect pump performance. Do not use a pump that has been damaged to avoid the risk of electrical damage or shock.


Requirement

• This pump is not capable of self-priming. Always prime the pump before operation.


Requirement

• The pump is not waterproof. Do not operate the pump while wet with solution or water. Failure or injury may result. Immediately dry off the pump if it gets wet.

• Do not close discharge line during operation. Solution may leak or piping may break.

• Solution in the discharge line may be under pressure. Release the pressure from the discharge line before disconnecting plumbing or disassembly of the pump to avoid solution spray.

• Wear protective clothing when handling or working with pumps. Consult solution SDS for appropriate precautions. Do not come into contact with residual solution.

• Do not clean the pump or nameplate with a solvent such as benzine or thinner. This may discolour the pump or erase printing. Use a dry or damp cloth or a neutral detergent.

• In accordance with the European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), this product features the crossed-out wheelie bin symbol. When this product is disposed of in household wastes, toxic components included in it can cause major environmental and human health problems. Use appropriate waste collection systems for recovery and recycling. Contact your local distributor or nearest Iwaki company for the detailed collection systems.

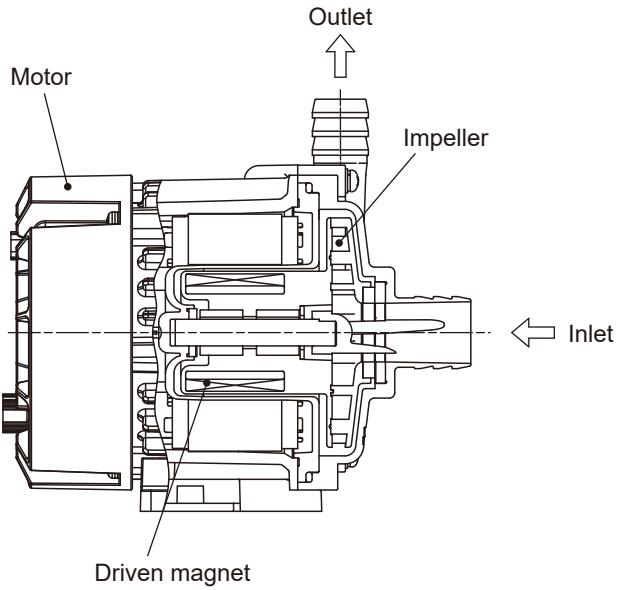
Overview

Pump characteristics, features and part names are described in this section.

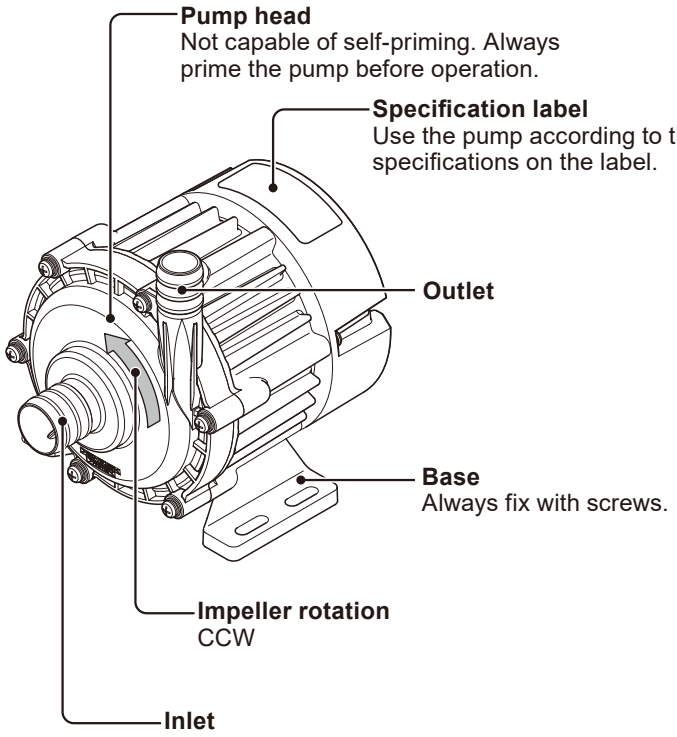
Introduction

Pump structure & Operating principle

The NRD pump is a canned motor pump with a brushless DC motor.
The magnetic force of the motor rotates the driven magnet in order for the impeller to revolve in the pump chamber, where a liquid is transferred from the inlet to outlet.



Part names



Limitations

Before operation

Water hammer phenomenon may occur when starting or stopping operation, especially when the discharge line is too long.

When starting operation:

First prime the pump and close the discharge valve. Run the pump and then start to open the valve slowly until it meets your duty point.

When stopping operation:

Slowly close the discharge valve and then turn off power to stop the pump.

*Do not close the discharge line sharply, or water hammer phenomenon may occur and damage the pump with impact pressure.

Priming

This pump is not capable of self-priming. Always prime the pump before operation. Running the pump without a priming water, internal parts are excessively worn by friction heat and fatal pump damage results.

Liquid to be handled

Do not use the following liquids.

- Fluids which inflate polypropylene
- Paraffinic hydrocarbons such as gasoline and kerosene
- Halogenated hydrocarbons such as trichloroethylene and carbon tetrachloride
- Ether and low-grade ester
- Slurry (which wears out the pump bearing.)
- Magnetic fluid
- Explosive or flammable liquid

A strong magnet is inside the pump.

Do not use the pump with any liquid which contains metals such as iron and nickel.

Observe the viscosity limit of 1 mPa•s with the max SG of 1.07.

Pure water may bring poor lubrication to the bearing. Contact us in advance.

Effect of temperature change

Viscosity, vapour pressure or corrosiveness changes with liquid temperature. Observe the allowable range at each model shown on the specification section on page 35 or later.

ON-OFF operation

Do not cycle the pump more than 2 times per minute. Also, observe the allowable shortest ON time (15 seconds) and OFF time (also 15 seconds). This holds true for both the 1-5VDC control and the PWM control.

Identification codes

The model code represents the following information.

NRD - 70 T V 48 P - R _
a b c d e f g h

a. Series name
NRD

b. Pump size
70/ 70X/ 100/ 100X/ 100H

c. Bearing material
T: Filled PTFE

d. O ring material
V: FKM
E: EPDM

e. Power voltage
48: 48 VDC

f. Speed control
No code: 1-5 VDC
P: PWM (Pulse Width Modulation) with an open collector

g. Connection
No code: Tube
R: R thread
N: NPT thread
G: G thread

h. Special version
01-99: Customized model

Installation

Installation of the pump, tubing and wiring are described in this section.

Observe the following points

- Risk of electrical shock. Be sure to turn off power to stop the pump and related devices before service is performed.
- If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems.
- Do not place explosive or flammable material near the pump.
- Use of a damaged pump could lead to an electric shock or death.
- A strong magnet is inside the pump. Do not bring a watch or magnetic device which may be adversely affected by a magnetic force.

Pump mounting

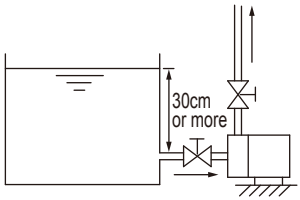
1 Select a suitable place

Allow sufficient space around the pump for easy access and maintenance.

- Select a level location, free from vibration, that won't hold liquid. If the pump is not installed level, output may be affected.
- Keep good ventilation, taking account of the self-heating of pump.

2 Mounting position

This pump is not capable of self-priming. Always keep a liquid level 30cm or higher than the outlet of the tank, or air may enter the suction line and the bearing may be worn badly.

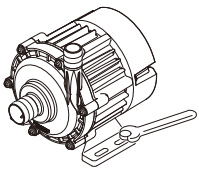


3 Anchor the pump

Use four bolts so it doesn't vibrate. See page 38 for the mounting hole size or suitable bolt size.

NOTE

Do not mount the pump vertically. The pump can be mounted on the wall laterally. Contact us for detail.

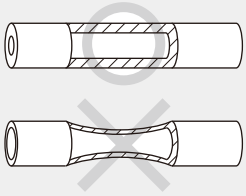


Pipework

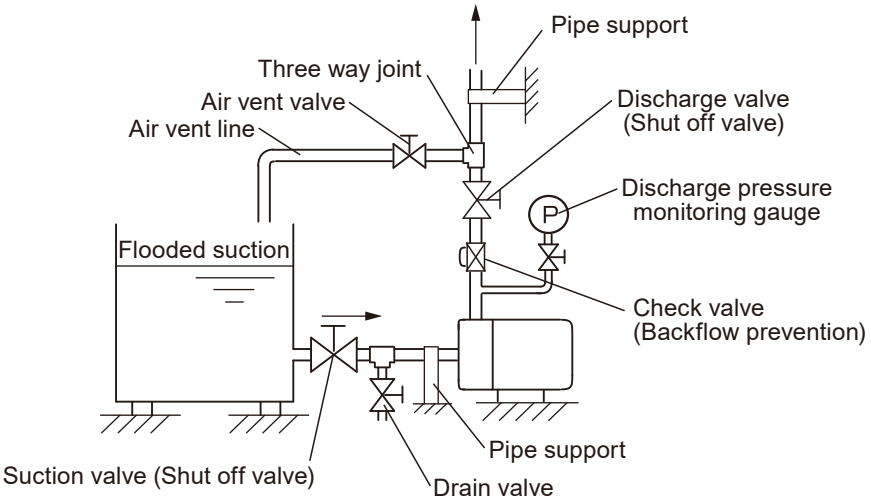
Take the pump into your system.

Precautions

- Using a high flow pump and a small supply tank, a liquid level in the tank changes greatly.
- Do not allow a drop of adhesive agent or sealant into plumbing/tubing. It may cause fatal damage to the pump.
- Use measures to keep the pump connections free from stress. Weight and thermal expansion/contraction of the plumbing/tubing can stress connection points.
- Air may be entrained into the suction line when the supply tank is refilled during operation. Take any action to prevent air ingress such as installing a baffle.
- Make sure every joint in plumbing/tubing is securely sealed.
- Use a corrosion-/pressure-resistant pipe or a Teflon/braided tube. This is important especially for the suction line, or it can be crushed by negative pressure (especially with hot liquid).

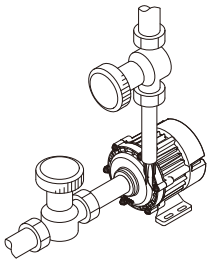


Plumbing layout



■ **Discharge & Suction valves**

Install a ball valve on the discharge line, as close to the pump outlet, for the adjustment of a flow rate/delivery head or shutting off a flow, and the other ball valve on the suction line, as close to the pump inlet, for the convenience of maintenance or shutting off a flow.



■ **Pressure gauge**

Install a pressure gauge for monitoring discharge line pressure.

■ **Drain valve**

Install a drain valve in between the pump inlet and a suction valve for blowing down liquid.

Plumbing

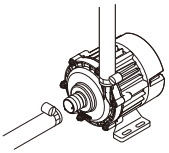
■ **Tube**

1 **Cut the tube end flat**

Select an optimal tube size in accordance with the pump inlet and outlet.

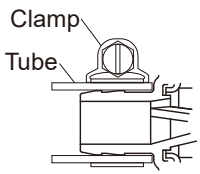
2 **Connect tubes onto the pump inlet/outlet**

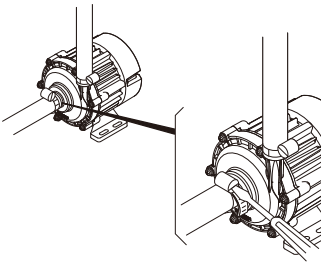
First slide a tube clamp onto a tube. Then push the tube end onto the pump inlet/outlet until it bottoms out.



3 **Tighten the tube clamp**

And eliminate the possibility of a leak.





NOTE

- Do not use excessive force. The plastic inlet and outlet may break.
- Always use a screw/band tube clamp. Do not use a wire clamp.

■ **Pipe (R/NPT thread)**

1 **Prepare plastic thread pipes**

Do not select a metal pipe which can break the plastic inlet/outlet.

2 **Apply thread sealing tape**

Wrap a sealing tape two to three turns to the pump inlet and outlet. Be careful not to wrap too many times, or a connection point may break.

NOTE

Do not use a liquid sealant which could attack plastics.

3 **Tighten the plastic thread pipes**

Do not hold the motor. Hold the pump head and tighten the plastic pipe to the pump inlet/outlet by 4.0 N•m or below.

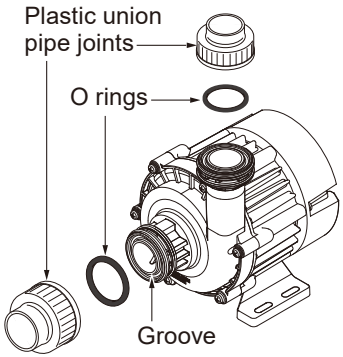
■ **Pipe (G thread)**

1 **Prepare plastic union pipe joints**

Do not select a metal joint which can break the plastic inlet/outlet.

NOTE

Risk of a chemical leak. Observe the maximum allowable liquid temperature of pipe, pump, and union joints.



2 **Fit the O ring to the groove**

Keep the O ring and the O ring groove clear so any debris won't break a seal and watertightness.

3 **Tighten the union pipe joints**

Do not hold the motor. Hold the pump head and tighten the union pipe joint to the pump inlet/outlet.

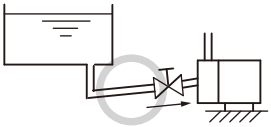
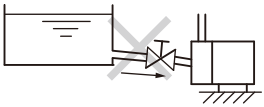
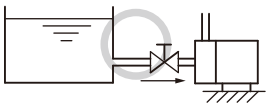
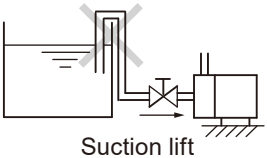
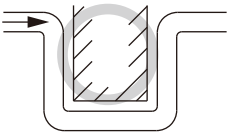
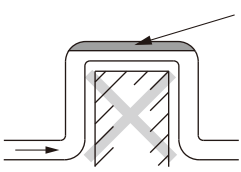
If necessary, consult the manufacturer's manual of your joints.

Plumbing precautions

■ Suction line

- In order to minimize plumbing resistance, have plumbing shortest with the minimum bends. Note cavitation* tends to occur when plumbing length is too long.
- A liquid level should be at least 30 cm higher than the tank outlet for the prevention of air ingress.
- Keep liquid in a supply tank free from foreign matters. Clean the tank at intervals.
- Do not allow any projection where air may be trapped along the suction line. Also, the suction line should have an ascending gradient of 1/100 toward the pump so that no air pocket is created.
- Be sure to secure connections on the suction line for the prevention of entrained air. The presence of air in the suction line may prevent liquid delivery.
- Do not use a suction tube, pipe or coupler with a smaller I.D. than the pump inlet.

Suction line examples

Acceptable	Unacceptable
 Ascending gradient	 Descending gradient
 Flooded suction	 Suction lift
 U-shaped piping	 Arched piping

Glossary

Cavitation

Air bubbles caused by a negative pressure in the pump head, accompanied with vibration and noise. Performance deterioration or part damage results.

■ **Discharge line**

- Use measures to keep the pump connections free from stress. Weight and thermal expansion/contraction of the plumbing can stress connection points.
- The longer the plumbing length, the more pipe resistance. If the plumbing length is long, widen the pipe I.D. accordingly to reduce the pipe resistance and ensure the rated pump performance is kept.
- Liquid in the pump and plumbing may freeze and consequently cause damage at a freezing temperature. Drain or flush the pump and plumbing before leaving them for a long period.

Wiring

Wiring for power source, earthing and external signal.

Observe the following points

- Electrical work should be performed by a qualified electrician. Conform to local electric codes.
- Risk of electrical shock or short circuit. Be sure to turn off power to stop the pump and related devices before service is performed.
- Be careful for power not to be turned on during work.

Power line

- Check that the main power is turned off.
- Electrical work should be performed in accordance with local electric codes, with an appropriate wire gauge or so.
- Apply the rated power voltage. See the spec label.
- The pump doesn't have an ON-OFF switch and starts as the power cable is plugged in with the 1-5VDC or PWM control signal.
- When an external fuse is used and it has blown, always solve the root cause of blowout. Be sure to unplug the pump before investigation.
- Check power voltage has reduced to 0 VDC before turning on power, especially right after operation. Otherwise, the pump may not start to run.

- Use a DC power supply that assures voltage increment to 48 VDC within 50 ms. If it takes more than 50 ms, the pump may not start to run.
- Use the 1-5VDC or PWM control signal (terminal 1 and 2) in order to make the ON-OFF operation. If you want to directly turn on and off the DC power voltage instead, install the switch between the DC power supply and the pump. Installing it between the DC power supply and the AC power supply, the pump may not run.

- Induction noise comes from the DC power solenoid and relay. Make sure it does not affect peripheral devices in your system, especially when the same DC power supply is shared with such a solenoid and a relay.
- Switching noise accompanies operation of the DC motor. Make sure it does not affect peripheral devices in your system.
- If the DC power supply is shared with the DC power solenoid or relay, take protective measures against surge.

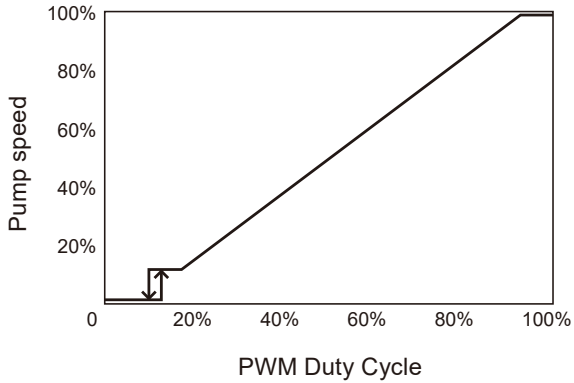
1-5VDC or PWM (Pulse Width Modulation) control

The speed of this pump can be controlled with the 1-5 VDC control voltage from your device to the pump terminal 1 and 2 (see page 25.), or the PWM control signal, which comes from the NPN bipolar transistor (an open collector output type) or the MOSFET (an open drain output type) of your device such as a PLC (Programmable Logic Controller) to also the pump terminal 1 and 2.
If your device uses the NPN bipolar transistor, the Collector-Emitter saturation voltage of the open collector must be 1 VDC or below.
The pulse width of the PWM signal can be modulated within the 0-100 % duty cycle and the 400Hz±10% signal frequency.

*Risk of motor failure. This pump has three-different speed-control methods. See the spec label and the speed control code of your pump to give a correct signal to the motor drive circuit.

- When the NPN bipolar transistor of your device is switched ON, the voltage applied to the terminal 1 comes to "Low" that is 1 VDC or below, and when it's OFF, the voltage comes to "High" that is 5 VDC. That is to say, the duty cycle (ON-OFF) of the PWM control signal is always inverted. Take this into your consideration.
- Observe the 400Hz±10% signal frequency, or the motor goes wrong.
- If you wish to establish the feedback control system with this product, you will need an external device with a pulse generator like a flow meter so that the pump will run in proportion to the incoming signal from such a device.

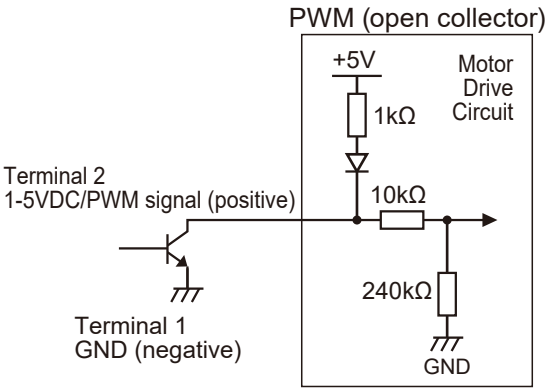
■ PWM and Pump speed



NOTE

- There is a variety of devices that generates the PWM control signal, and the pump performance could change depending on each device actually used.
- By the nature of the pump is, the less discharge pressure, the more flow rate the pump outputs you will see; however, the pump flow will stop increasing when the discharge pressure comes close to 0MPa, and that's when the overcurrent protection circuit turns on to protect the motor.
- Also, the optimal duty cycle of the signal to run the pump best could change depending on plumbing, liquid characteristics, and other operating conditions. Additional adjustment will be needed to determine the optimal duty cycle.

■ **Motor-driver input circuit**

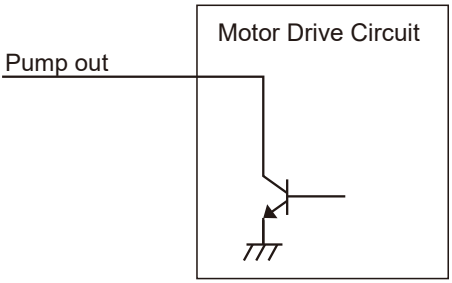


Encoder output

The pump out (the terminal 1 and 3, an open collector type NPN bipolar transistor) transmits the pulse signal in sync with the pump speed (one pulse per rotation).

■ **Motor-driver output circuit**

This output circuit is capable of handling the applied voltage up to 24 VDC with 50 mA. Do not exceed that rate.



Rated/Starting current

Pump size	Rated current	Starting current
NRD-70	4.0 A	4.0 A
NRD-70X	3.6 A	3.6 A
NRD-100	5.0 A	5.0 A
NRD-100X	5.4 A	5.4 A
NRD-100H	6.2 A	6.2 A

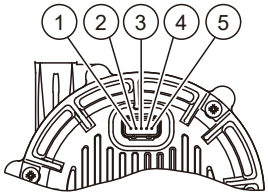
Connectors

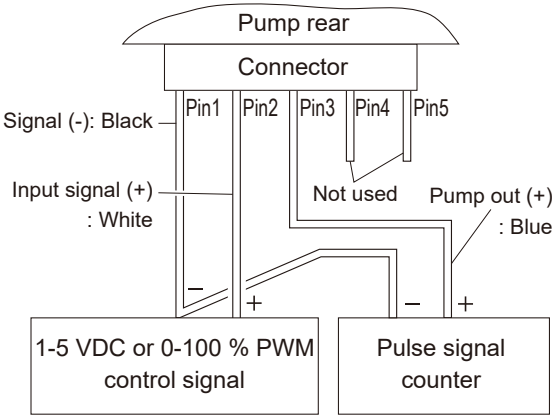
A 500mm option cable is available.

■ 1-5 VDC or PWM signal

Pin assignment					Receptacle	Applicable connector		Applicable lead wire
1	2	3	4	5	M. housing	F. housing	Terminal	
GND (–)	Input signal (+)	Pump out (+)	N/A	N/A	CB01A1-05NA	CB01A6-05N0-01	CB01C6-010A	AWG#24 AWM3265

*Terminal 2 (positive) and terminal 3 (positive) share the same GND (negative).



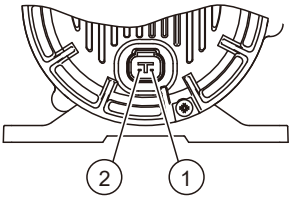


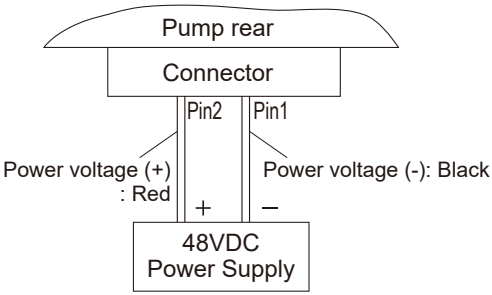
NOTE

Observe polarity, otherwise failure or malfunction may result.

■ 48 VDC power supply

Pin assignment		Receptacle	Applicable connector		Applicable lead wire
1	2	M. housing	F. housing	Terminal	
Power (–)	Power (+)	CL07E02M	CL07DE02M	215004-2M	AWG#16 AWM3266





NOTE

Observe polarity, otherwise failure or malfunction may result. Note that the rotational direction of the motor can not be changed by reversing polarity.

Operation

The pump becomes ready after pipework and wiring is completed.

Observe the following points

- Do not operate the pump with the suction valve (gate valve) closed. Otherwise, the internal parts of the pump will be damaged.
- For the prevention of water hammer, close the discharge valve completely at the start of operation and then gradually open the valve as discharge pressure increases.
- Do not close the discharge line during operation. Or liquid temperature rise may damage the pump.
- Risk of scald injury. The surface temperatures of the pump and pipe rise high along with liquid temperature. Do not touch the pump or pipe surface directly in or right after operation.
- Do not cycle the pump more than 2 times per minute. Also, observe the allowable shortest ON time (15 seconds) and OFF time (also 15 seconds). This holds true for both the 1-5VDC and PWM controls.

Pump operation

Start-up

1 **Check if plumbing and wiring are done correctly**

See the plumbing and wiring sections.

2 **Check if the power supply voltage is correct**

3 **Fill the supply tank with liquid**

Clean the tank and plumbing and remove debris in advance.

4 **Open the suction valve and close the discharge valve**

Close the air vent valve if it's open.

5 Supply the main power and send the 1-5VDC/PWM control signal

The minimum starting torque changes with plumbing, liquid property and other operating conditions.

*The pump may not start to run if starting torque is too low in your system. This may be where the motor is locked by the internal protective circuit. Turn OFF power and then ON with the 3VDC (or 60% duty cycle) or higher signal to start the motor, and then modulate to a target value.

6 Open the discharge valve slowly to meet the duty point

*Do not rotate the valve sharply.

*The allowable minimum flow rate is one tenth of the max flow rate. Operation below that flow rate builds up friction heat to a break down if it continues more than 1 minute.

7 Expel air from the pump

Keep the discharge line resistance to 1m or below and repeat 15-second operation about 5 times.

*Air may not be expelled well if plumbing resistance is too high. Open the air vent line if necessary (and close afterwards).

*Completely expel air from the pump, as premature bearing wear will result in pump failure.

8 Check the operation

Use the flow meter or the pressure gauge.

*Do not allow foreign matters to enter the pump. Foreign matters may cause the impeller to be locked, hindering liquid circulation. In this case turn off power immediately and contact us.

*Turn off power when the fuse has blown.

NOTE

Suspend operation and turn off power if you notice any abnormal conditions. See the troubleshooting section on page 30 and inspect/solve problems.

Shutdown

Observe the following points

- Liquid in the pump and plumbing may freeze and consequently cause damage. Drain or flush the pump and plumbing before leaving them for a long period at a freezing temperature.
- Use a heater to prevent liquid from freezing even when the pump is temporarily stopped at a freezing temperature.
- In case of power failure, switch off the pump and close the discharge valve.

1 **Close the discharge valve slowly**

*The pump may be damaged. Do not use a solenoid valve that closes the valve sharply.

2 **Reduce the 1-5VDC control signal to zero or the PWM duty cycle to 0% to stop the pump**

*Depending on operating environments such as the plumbing and liquid property of your system, your flow meter could read zero pump output while the pump is still running. Make sure the 1-5VDC control signal or the PWM duty cycle is completely eliminated before turning off the external 48VDC power supply.

3 **Turn off the 48VDC power supply**

Maintenance

Troubleshooting, inspection, wear part replacement, exploded views and specifications are described in this section.

Troubleshooting

Handling of the pump, maintenance and inspection should be carried out within this instruction manual. Do not go beyond the descriptions in this manual.
It is not the manufacturer's responsibility for personal injury or property damage resulting from unauthorized service. Contact us or your nearest distributor as necessary.

States	Possible causes	Solutions
Abnormal heat	A motor has locked up or a circuit has failed.	Contact us.
	Specific gravity or viscosity is too high.	Replace with a suitable pump.
	Liquid and ambient temperature are out of spec.	Contact us.
Pump does not run.	Wrong wiring	Inspect wiring. Rewire as necessary.
	A motor has locked up or a circuit has failed.	Contact us.
	Specific gravity or viscosity is too high.	Replace with a suitable pump.
	Power capacity shortage	Check power capacity.
	Frequent ON-OFF	Avoid a high ON-OFF frequency. See page 13.
	An improper 1-5VDC signal or PWM duty cycle	Optimise 1-5VDC signal or PWM duty cycle.
Flow rate/ delivery head is too low.	Air trap in the pump	Expel air.
	Entrained air from the suction line	Check the line.
	Dry running	Check for possibility of dry running before operation.
	Specific gravity or viscosity is too high.	Replace with a suitable pump.
	Pump head mounting screws are loose.	Tighten the mounting screws by 1.6 N•m.
	An improper 1-5VDC signal or PWM duty cycle	Optimise 1-5VDC signal or PWM duty cycle.

States	Possible causes	Solutions
Over current	Wrong wiring	Inspect wiring. Rewire as necessary.
	A motor has locked up or a circuit has failed.	Contact us.
	Dry running	Check for possibility of dry running before operation.
	Specific gravity or viscosity is too high.	Replace with a suitable pump.
Significant noise and vibration	A motor has locked up or a circuit has failed.	Contact us.
	Air trap in the pump	Expel air.
	Dry running	Check for possibility of dry running before operation.
Leakage	Pump head mounting screws are loose.	Tighten the mounting screws by 1.6 N•m.
Pump speed is out of control.	Wrong wiring	Inspect wiring. Rewire as necessary.
	A motor has locked up or a circuit has failed.	Contact us.
	An improper 1-5VDC signal or PWM duty cycle	Optimise 1-5VDC signal or PWM duty cycle.
Pump out signal is not outputted.	Wrong wiring	Inspect wiring. Rewire as necessary.
	A motor has locked up or a circuit has failed.	Contact us.
	Pump out signal is NOT connected to the input circuit with a pull-up resistor of your device.	Connect the signal in the correct manner. See page 24.

Retightening of pump head fixing screws

After a long period of operation or storage, the pump head mounting screws may come loose. Tighten the mounting screws by 1.6N•m as necessary.
Do not use excess force. The plastic pump head may deform.

Wear parts replacement

To run the pump for a long period, wear parts need to be replaced periodically. It is recommended that the wear parts such as the impeller and the O ring are always stocked for immediate replacement. Contact us or your nearest distributor for detail.

Drainage

No drain port is provided to this pump. See drainage procedure below.

Observe the following points

- Turn off power before drainage.
- Always wear protective clothing such as an eye protection, chemical resistant gloves, a mask and a face shield during disassembly, assembly or maintenance work. The specific solution will dictate the degree of protection. Refer to SDS precautions from the solution supplier.
- Solution in the discharge line may be under pressure. Release the pressure from the discharge line before disconnecting plumbing or disassembly of the pump to avoid solution spray.
- Do not drain chemical liquids directly on the ground or the floor. Dispose of chemicals in accordance with local rules and regulations.
- The pump is not waterproof. Do not operate the pump while wet with solution or water. Failure or injury may result. Immediately dry off the pump if it gets wet.
- Dilute and flush out harmful liquid before removing a tube or a pipe.

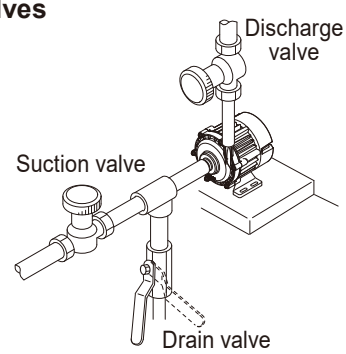
Blowdown

1 **Turn off power**

Make sure no one turns on power by mistake in service.

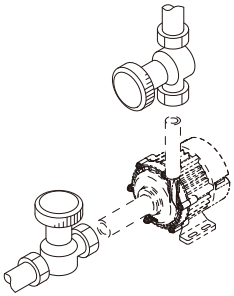
2 **Close both the discharge and suction valves**

Use the drain valve if it's equipped on the suction line; however, this manner won't empty the pump completely. So you'll need to follow the later steps anyway.



3 **Remove tubes or pipes from the inlet and outlet**

Collect residual liquid from plumbing in a container.

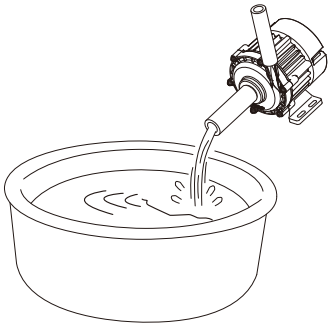


NOTE

Do not get wet with dripping residual liquid.

4 **Remove anchoring bolts of the pump**

5 **Drain liquid directly into the container**



Inspection

Perform daily and periodic inspections to keep pump performance and safety.

Daily inspection

Check the following points. If you notice any abnormal or dangerous conditions, suspend operation immediately and inspect/solve problems according to the troubleshooting section. If it does not help removing problems, contact us or your nearest distributor. Do not disassemble the pump.

No.	States	Points to be checked	How to check
1	Evidence of a leak	• Check for a leak. Do not start operation with a leak.	Visual
2	Pumping	• If liquid is pumped.	Flow meter or visual inspection
		• If the suction pressure and the discharge pressure are normal.	Check specification.
		• If a liquid level in a supply tank is proper.	Visual
		• If liquid is deteriorated, crystallized or settled.	Visual or audio inspection
3	Noise and vibration	• If abnormal noise or vibration occurs. They are signs of abnormal operation.	Visual or audio inspection
4	Air ingress from pump head joints and the suction line	• If discharge liquid includes air bubbles, check lines for a leak and retighten as necessary.	Visual or audio inspection
5	Load to the pump	• If discharge pressure and electric current are normal.	See the motor spec label.
6	Abnormal parameters	• If discharge pressure, a flow rate or load current fluctuates. If so, see the troubleshooting section.	See the performance specification.

Specification/Outer dimension

Information in this section is subject to change without notice. If you have a custom pump, the information below would not be applicable. Consult the specification sheet of your pump.

Specification

<table>
<tr><th rowspan="2">Model code</th><th colspan="2">Connections</th><th rowspan="2">Max flow</th><th rowspan="2">Total head</th><th rowspan="2">Max noise</th><th rowspan="2">Max SG</th><th colspan="2">Motor</th><th rowspan="2">Weight</th></tr>
<tr><th>Inlet</th><th>Outlet</th><th>Power voltage</th><th>Rated output</th></tr>
<tr><td rowspan="4">NRD-70</td><td>ø25mm</td><td>ø19mm</td><td rowspan="4">55L/min</td><td rowspan="4">19.1m</td><td rowspan="8">55dB</td><td rowspan="12">1.07</td><td rowspan="12">48VDC</td><td rowspan="4">135W</td><td rowspan="12">2.7kg</td></tr>
<tr><td>R1"</td><td>R¾"</td></tr>
<tr><td>NPT1"</td><td>NPT¾"</td></tr>
<tr><td>G1·½"</td><td>G1·¼"</td></tr>
<tr><td rowspan="4">NRD-70X</td><td colspan="2">ø32mm</td><td rowspan="4">112L/min</td><td rowspan="4">9.3m</td><td rowspan="4">120W</td></tr>
<tr><td colspan="2">R1·¼"</td></tr>
<tr><td colspan="2">NPT1·¼"</td></tr>
<tr><td colspan="2">G1·½"</td></tr>
<tr><td rowspan="4">NRD-100</td><td>ø25mm</td><td>ø19mm</td><td rowspan="4">64L/min</td><td rowspan="4">22.2m</td><td rowspan="8">60dB</td><td rowspan="4">165W</td></tr>
<tr><td>R1"</td><td>R¾"</td></tr>
<tr><td>NPT1"</td><td>NPT¾"</td></tr>
<tr><td>G1·½"</td><td>G1·¼"</td></tr>
<tr><td rowspan="4">NRD-100X</td><td colspan="2">ø32mm</td><td rowspan="4">140L/min</td><td rowspan="4">12.2m</td><td rowspan="4">170W</td></tr>
<tr><td colspan="2">R1·¼"</td></tr>
<tr><td colspan="2">NPT1·¼"</td></tr>
<tr><td colspan="2">G1·½"</td></tr>
<tr><td rowspan="4">NRD-100H</td><td>ø25mm</td><td>ø19mm</td><td rowspan="4">70L/min</td><td rowspan="4">26.0m</td><td rowspan="4">195W</td></tr>
<tr><td>R1"</td><td>R¾"</td></tr>
<tr><td>NPT1"</td><td>NPT¾"</td></tr>
<tr><td>G1·½"</td><td>G1·¼"</td></tr>
</table>

*The max flow & head fields show average values obtained at our shipping inspection. There may be deviation up to ±10% of the values on each individual.
*The measuring conditions of a noise level: 1m away from the pump front, A scale.
*This data is based on pumping clean water at ambient temperature.
*The max flow could be obtained if the actual head was 0 m.
*The total head could be obtained if a flow rate was 0 L/min.
*The maximum viscosity is 1mPa•s with the max SG of 1.07.

*Observe the allowable ranges of ambient temperature/humidity and liquid temperature as below. Note the ranges may change with operating conditions such as liquid property and development of heat cycle (do not use the prohibited liquid on page 13).

Model	Ambient temperature	Liquid temperature	Ambient humidity
NRD-70/-70X /-100/-100X	0-50ºC/32-122ºF	0-80ºC/32-176ºF	35-90%RH
NRD-100H		0-70ºC/32-158ºF	

*The pumps are equipped with a BLDC motor and its drive circuit provides the following protections.

a. Pump lock protection

A speed detector monitors the impeller speed. The motor stops when it is upset by foreign matters. Solve the root cause and then reboot. Now the pump is ready to restart.

b. Heat protection

The pump stops when the motor temperature becomes extremely high due to a sharp rise of an ambient/liquid temperature or an overload to the motor. Solve the root cause and then reboot. Now the pump is ready to restart.

c. Overcurrent limiting control circuit

The drive circuit is protected from a surge current.

d. Fuse

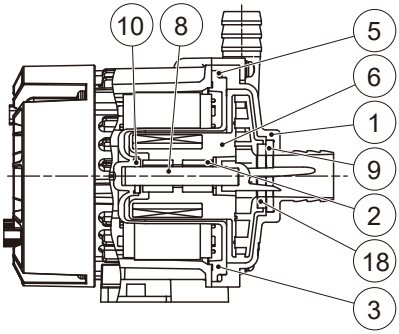
A fuse is equipped in driving circuit in order to protect other equipment or to prevent a fire which may occur when an internal circuit has failed.
The built-in fuse can not be replaced. If necessary, install an external time-lag surge withstand fuse to protect the built-in fuse.

Model	Blow out ampere
NRD-70/-70X	5.0A
NRD-100/-100X/-100H	6.3A

Wet ends

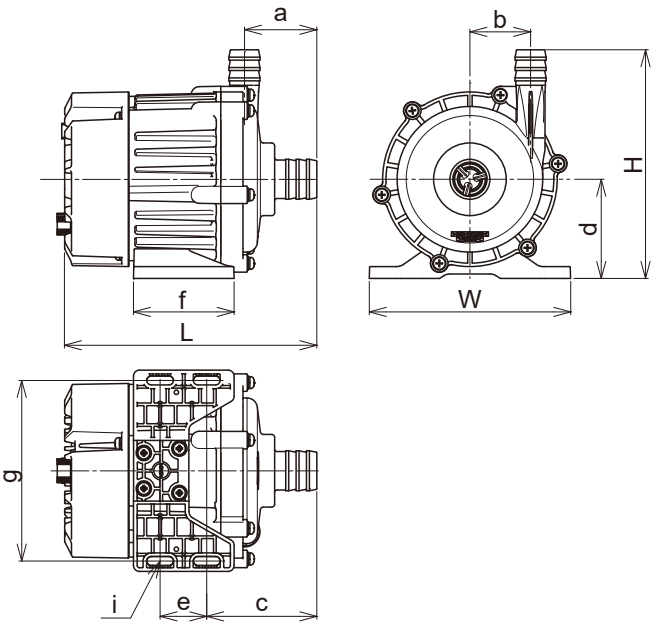
■ NRD-70/-70X/-100/-100X/-100H

No.	Names	Materials
1	Front casing	GFRPPS
2	Bearing	Filled PTFE
3	Rear casing	GFRPPS
5	O ring	FKM or EPDM
6	Impeller	GFRPPS
8	Spindle	Alumina ceramic
9	Liner ring	Alumina ceramic
10	Thrust	Alumina ceramic
18	Mouth ring	Filled PTFE



Outer dimension

■ NRD-70/-70X/-100/-100X/-100H

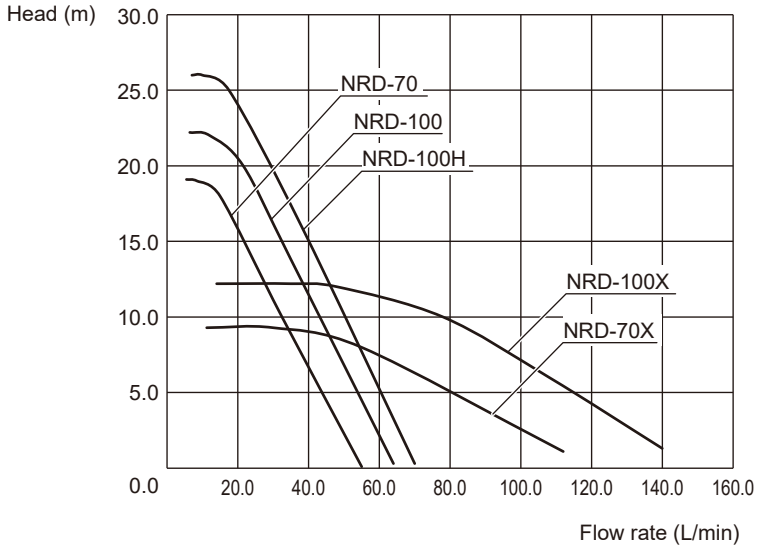


Unit (mm)

Model	Connection	W	H	L	a	b	c	d	e	f	g	i
NRD-70 NRD-100 NRD-100H	Tube	136	(155)	(170)	48.9	41	(74)	(67)	31.5	68	122	4×18×6
	R thread											
	NPT thread											
	G thread											
NRD-70X NRD-100X	Tube		(162)	(174)	52.6	42	(78)					
	R thread											
	NPT thread											
	G thread											

Performance curves

■ NRD-70/-70X/-100/-100X/-100H



EC DECLARATION OF CONFORMITY

A copy of the original Declaration of Conformity

(SUPPLIER'S NAME)

WE

IWAKI CO.,LTD.

(ADDRESS)

6-6 2-CHOME KANDA-SUDACHO CHIYODA-KU TOKYO JAPAN

(PRODUCT)

DECLARE UNDER OUR SOLE RESPONSIBILITY THAT THE PRODUCTS

DIRECT DRIVE PUMP

(MODEL NAME)

NRD SERIES

TO WHICH THIS DECLARATION RELATES ARE IN CONFORMITY
WITH THE FOLLOWING STANDARDS OR DIRECTIVES AS FAR AS APPLICABLE

(DIRECTIVES)

MACHINERY DIRECTIVE 2006/42/EC (ANNEX IIA)
EMC DIRECTIVE 2014/30/EU
RoHS DIRECTIVE 2011/65/EU

(STANDARDS)

EN ISO12100:2010 EN61000-6-2:2005 EN IEC63000:2018
EN809:1998+A1:2009 EN61000-6-4:2007+A1:2011

(A PERSON WHO IS AUTHORISED TO COMPILE THE TECHNICAL FILE
IN THE COMMUNITY)

IWAKI EUROPE GMBH
SIEMENSRING 115 D-47877 WILLICH GERMANY

NOTE: THIS DECLARATION BECOMES INVALID IF TECHNICAL OR OPERATIONAL MODIFICATIONS ARE INTRODUCED WITHOUT THE MANUFACTURER'S CONSENT.

T. Sawada.

TSUTOMU SAWADA
DEPUTY SENIOR GENERAL MANAGER,
QUALITY ASSURANCE HEAD OFFICE

Tokyo, Sep. 13, 2021

(PLACE AND DATE OF ISSUE) **(NAME AND SIGNATURE OR EQUIVALENT MARKING OF AUTHORIZED PERSON)**

DOCUMENT NO. IS-51K-492-3

UK DECLARATION OF CONFORMITY

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(SUPPLIER'S NAME)

WE

IWAKI CO.,LTD.

(ADDRESS)

6-6 2-CHOME KANDA-SUDACHO CHIYODA-KU TOKYO JAPAN

(PRODUCT)

DECLARE UNDER OUR SOLE RESPONSIBILITY THAT THE PRODUCTS

DIRECT DRIVE PUMP

(MODEL NAME)

NRD SERIES

TO WHICH THIS DECLARATION RELATES ARE IN CONFORMITY WITH THE FOLLOWING REGULATIONS OR STANDARDS AS FAR AS APPLICABLE

(REGULATIONS)

S.I. 2008/1597 SUPPLY OF MACHINERY (SAFETY)
S.I. 2016/1091 ELECTROMAGNETIC COMPATIBILITY
S.I. 2012/3032 RESTRICTION OF HAZARDOUS SUBSTANCES

(STANDARDS)

EN ISO12100:2010 EN61000-6-2:2005 EN IEC63000:2018
EN809:1998+A1:2009 EN61000-6-4:2007+A1:2011

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柳原 利典

TOSHINORI YANAGIHARA
EXECUTIVE OFFICER SENIOR GENERAL MANAGER,
ENGINEERING HEAD OFFICE

Tokyo, July 26, 2024

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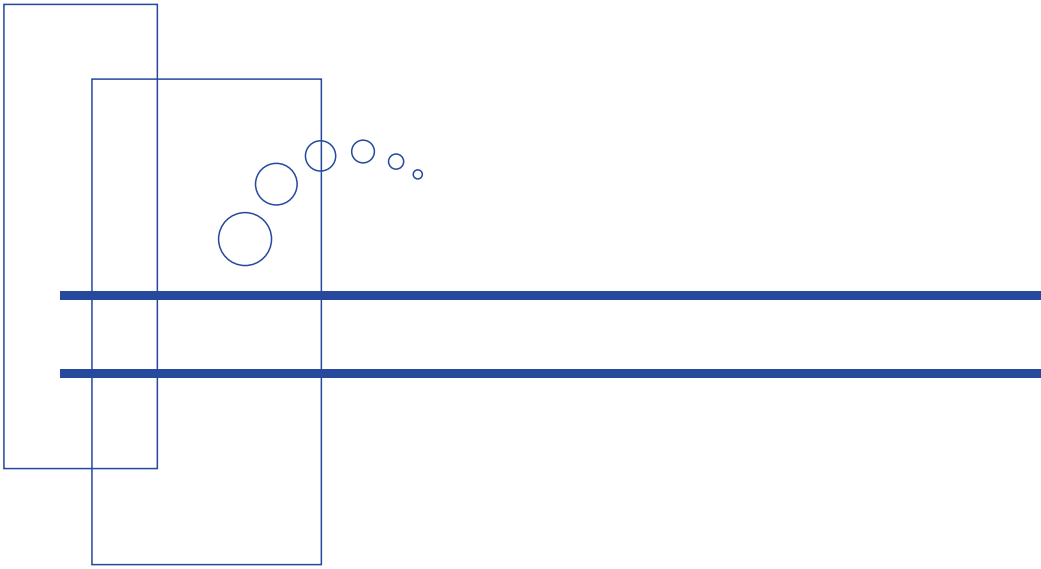

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