

# **ORION DRY-PUMP**

— Oil-less Rotary Vane Vacuum Pump and Blower —

## **Instruction Manual**

KRX1 KRX1H KRX1R

KRX3 KRX3H KRX3R

KRX5 KRX5H KRX5R

KRX6 KRX6H KRX6R

KRS7D

KRA8 KRH8 KRA8R KRH8R

KRA10 KRA10R

KRA12

KRA8-DP KRA9-DP KRA10-DP

KM100

- For proper use of the ORION Dry Pump and Blower, read this instruction manual carefully and thoroughly.

## **SALES**

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## **SERVICE**

## INTRODUCTION

Thank you very much for buying the ORION "COMBINATION" Dry Pump.

The ORION Combination Dry Pump operates without oiling or greasing. When used as a blower, it can supply clean, compressed dry air; and when used as a vacuum pump, the exhaust does not contain any oil vapors.

As opposed to conventional oil type pumps, this dry pump can be used for a wide range of applications because no impurities are imparted to liquids or solids processed with this pump.

In addition to the precautions, description of the construction and operating procedures necessary for the operation of the pump, this instruction manual provides troubleshooting procedures and matters concerning maintenance and inspection of the pump in an easy-to-understand manner.

For normal operation of this Dry Pump, carefully read this manual and observe the instructions concerning the operation, operating procedure, maintenance and inspection.

- For proper use of the ORION Dry Pump and Blower, read this instruction manual carefully and thoroughly.

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## SAFETY PRECAUTIONS

Before using this product, please read the section entitled "Always observe these for safety reasons" and use the product correctly.

The precautions noted here are intended to ensure that the product is used safely and correctly, in order to prevent injury to you and others, and to prevent damage to property.

The following symbols are used in this manual:

 DANGER    WARNING    CAUTION




Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



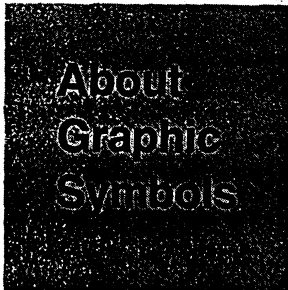
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Items marked with the  CAUTION symbol could also cause severe consequences, depending on the circumstances. Any item which is marked with any of these symbols is extremely important and should always be observed.

- After reading the instruction manual, make sure it is kept where it is easily accessible by anyone handling the equipment.
- If this product is given or lent to anyone else, make sure that this instruction manual is affixed to a conspicuous location on the product main unit, so that the new owner will be sure to notice it and operate the equipment safely.



The triangular symbol alerts the user to items involving danger, warning, or caution. The graphic symbol in the center indicates the specific action requiring caution (in the illustration at the left, this indicates caution concerning electric shock).



A line across the graphic symbol indicates that the action is forbidden. The graphic symbol in the center indicates the specific action that is forbidden (in the illustration at the left, this indicates disassembly).



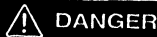
A black circle symbol indicates an action that is mandatory or indicated. The graphic symbol in the center indicates the specific action that is required (in the illustration at the left, this indicates that the power supply plug should be disconnected from the outlet).



This product is intended for industrial use and should be handled extremely carefully.

## Always observe these for safety reasons

### Precautions regarding installation



Indicates an imminently hazardous situation which, if not observed, will result in death or serious injury.

- Keep away from combustible or explosive gases**  
Do not allow combustible or explosive gases to be sucked into the pump. Also, do not use combustible spray near the pump. Using the pump near combustible or explosive gases could result in an explosion or fire.



Indicates a potentially hazardous situation which, if not observed, will result in death or serious injury.

- Do not block the exhaust pipes**  
Do not operate the pump while the pressure controller is totally closed or the exhaust pipes are blocked. Blocking the exhaust air may increase the pressure and temperature in exhaust pipes and result in burst of the pipes and pump parts.
- Do not use organic solvent for cleaning the filter element or the other parts**  
Do not use thinner, alcohol, benzene, gasoline, kerosene or the other organic solvent for cleaning the filter element or the other parts. Using organic solvent may result in an explosion or fire.
- Do not remove the coupling cover**  
Do not remove the coupling cover. Coupling fan rotates high speed and it may cut the finger or result in serious injury.
- Do not damage the power supply cord**  
Do not cut, forcefully bend, pull on or twist the power supply cord. Do not put heavy objects on it or let it get caught or pinched. Damage to the power supply cord could result in electric shock or fire.
- Keep water away from the pump and motor**  
Do not allow the pump and motor to come in contact with water and do not use water to clean them. In addition, do not use the pump in areas where it will come in contact with water or other liquids. Contact with water could result in electric shock or fire.
- Do not touch electrical parts with wet hands**  
Keep wet hands away from switches, electric plugs, and all other electrical components. Touching electrical areas with wet hands may result in electric shock.
- Do not modify the pump and motor**  
The pump and motor should never be disassembled, repaired or altered by anyone other than the service representative, dealer or a suitably qualified engineer. Incorrect operation of the equipment may result in injury and improper repairs could result in electric shock, fire, and other hazards.

### Precautions regarding installation



Indicates a potentially hazardous situation which, if not observed, will result in death or serious injury.

- Always ground the pump**  
The pump must always be grounded using a connection screw which is equipped in the terminal box or under the frame of the electric motor. Improper grounding could result in electric shock. (Except KRX1 Single phase, 100V)
- Stop operation if a problem occurs**  
If a problem occurs with the pump or motor, turn it off and after unplugging the power supply cable or turning off the power supply source, consult a dealer or specialist. Continuing to operate the pump incorrectly could result in electric shock or fire.
- Be sure to turn it off before you begin cleaning, maintenance or inspection work.**  
Be sure to turn it off the pump before you begin cleaning, maintenance or inspection work, or it could result in electric shock or fire. For maintenance and inspection, please consult a dealer or specialist.
- Inspect the power supply plug periodically**  
If a plug is connected to the power supply cord; periodically check that it is not dusty or loose and is fully inserted. Dust or loose connections can cause electric shock or fire.
- Contact a dealer or specialist if the earth leakage breaker is tripped**  
If the earth leakage breaker is tripped, consult a dealer or a specialist. Restarting the power supply without solving the problem could result in electric shock or fire.
- Install the protective equipment**  
Be sure to ask a specialist and install an earth leakage breaker, or it could result in electric shock or fire. Be sure to ask a specialist and install a thermal relay, or it could result in a defect or fire by an overload.
- Use all two (2) support eye bolts for suspension**  
When using support (suspension) eye bolts, make sure all two (2) eye bolts are used and suspension angle should be 60° or more. Improper suspension could result in injury by the pump falls over or falling down.
- Do not use the pump outdoors**  
Do not use the pump outdoors as the pump is designed to be used indoors. Using the pump outdoors could result in electric shock or fire.

## Always observe these for safety reasons

### Precautions regarding Installation



Indicates an imminently hazardous situation which, if not observed, will result in death or serious injury.



**Keep away from combustible or explosive gases**  
Do not allow combustible or explosive gases to be sucked into the pump. Also, do not use combustible spray near the pump. Using the pump near combustible or explosive gases could result in an explosion or fire.



Indicates a potentially hazardous situation which, if not observed, will result in death or serious injury.



**Do not block the exhaust pipes**  
Do not operate the pump while the pressure controller is totally closed or the exhaust pipes are blocked. Blocking the exhaust air may increase the pressure and temperature in exhaust pipes and result in burst of the pipes and pump parts.



**Do not use organic solvent for cleaning the filter element or the other parts**  
Do not use thinner, alcohol, benzene, gasoline, kerosene or the other organic solvent for cleaning the filter element or the other parts. Using organic solvent may result in an explosion or fire.



**Do not remove the coupling cover**  
Do not remove the coupling cover. Coupling fan rotates at high speed and it may cut the finger or result in serious injury.



**Do not damage the power supply cord**  
Do not cut, forcefully bend, pull on or twist the power supply cord. Do not put heavy objects on it or let it get caught or pinched. Damage to the power supply cord could result in electric shock or fire.



**Keep water away from the pump and motor**  
Do not allow the pump and motor to come in contact with water and do not use water to clean them. In addition, do not use the pump in areas where it will come in contact with water or other liquids. Contact with water could result in electric shock or fire.



**Do not touch electrical parts with wet hands**  
Keep wet hands away from switches, electric plugs, and all other electrical components. Touching electrical areas with wet hands may result in electric shock.



**Do not modify the pump and motor**  
The pump and motor should never be disassembled, repaired or altered by anyone other than the service representative, dealer or a suitably qualified engineer. Incorrect operation of the equipment may result in injury and improper repairs could result in electric shock, fire, and other hazards.

### Precautions regarding Installation



Indicates a potentially hazardous situation which, if not observed, will result in death or serious injury.



**Frame**  
**Always ground the pump**  
The pump must always be grounded using a connection screw which is equipped in the terminal box or under the frame of the electric motor. Improper grounding could result in electric shock. (Except KRX1 Single phase, 100V)



**Stop operation if a problem occurs**  
If a problem occurs with the pump or motor, turn it off and after unplugging the power supply cable or turning off the power supply source, consult a dealer or specialist. Continuing to operate the pump incorrectly could result in electric shock or fire.



**Be sure to turn it off before you begin cleaning, maintenance or inspection work.**  
Be sure to turn it off the pump before you begin cleaning, maintenance or inspection work, or it could result in electric shock or fire. For maintenance and inspection, please consult a dealer or specialist.



**Inspect the power supply plug periodically**  
If a plug is connected to the power supply cord, periodically check that it is not dusty or loose and is fully inserted. Dust or loose connections can cause electric shock or fire.



**Contact a dealer or specialist if the earth leakage breaker is tripped**  
If the earth leakage breaker is tripped, consult a dealer or a specialist. Restarting the power supply without solving the problem could result in electric shock or fire.



**Install the protective equipment**  
Be sure to ask a specialist and install an earth leakage breaker, or it could result in electric shock or fire. Be sure to ask a specialist and install a thermal relay, or it could result in a defect or fire by an overload.



**Use all two (2) support eye bolts for suspension**  
When using support (suspension) eye bolts, make sure all two (2) eye bolts are used and suspension angle should be 60° or more. Improper suspension could result in injury by the pump falls over or falling down.











**Do not use the pump outdoors**  
Do not use the pump outdoors as the pump is designed to be used indoors. Using the pump outdoors could result in electric shock or fire.

## Precautions regarding installation

### CAUTION

Indicates a potentially hazardous situation which, if not observed, may result in injury of operator or physical damages.

-  Do not put your hand inside the covers  
Do not put your hand inside the belt, coupling or fan covers, or it could result in severe injury such as cutting of your hands or fingers.
-  Do not operate the electric motor over the rated power source  
Do not operate the electric motor over the rated power source, or it could result in troubles.
-  Do not place objects on the pump  
Do not put heavy objects or containers filled with water on the pump or motor. Injuries could result from objects falling off the equipment, and spilled water could cause a short circuit, rust or electric shock if the electrical insulation is damaged.
-  Do not touch the surface of the equipment while it is hot  
Do not touch the surface of the pump, motor or pipes as it becomes very hot. Touching the surface while the equipment or pipes are hot can result in burns.
-  Periodically inspect the earth leakage breaker  
Operation of the earth leakage breaker should be inspected periodically. Using the pump with a faulty earth leakage breaker can result in electric shock if a short circuit occurs.
-  Install the check valves  
Check valves should be installed to protect the pump if it runs in reverse due to residual pressure when the pump stops. The pump may be damaged or injuries can result if the check valves are not installed.
-  Disconnect the power supply if the pump is not used for a long time  
If the pump is not used for a long period of time, disconnect the power supply plug from the outlet for safety reasons. If it is not disconnected, a short circuit or electric shock can result.
-  Grasp the power supply cord firmly by the plug to disconnect it  
When unplugging the power supply plug, grasp the plug, and not the cord. Pulling on the cord to disconnect it can snap some of the wires and resulting in heat generation or fire.

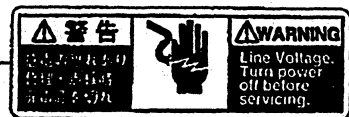
## Place of Warning and Caution labels on the pump body

The following labels, selected as the most important one from the other warnings or cautions, stuck on the pump body. Read them surely before its operation. Replace them with new ones when their surfaces are hard to read due to stains or scratches. On the new labels, please contact your local pump distributor.

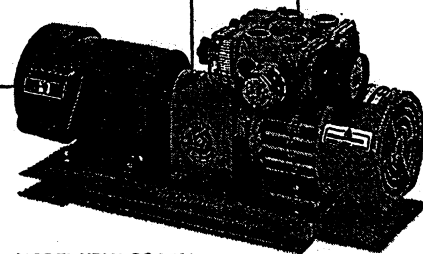
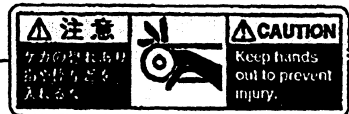
### Scald



### Electric shock



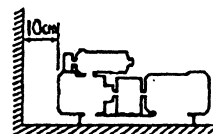
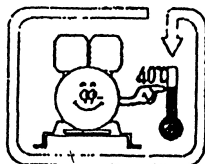
### Injury



MODEL:KRX5-SS-7501

**OBSERVE THE FOLLOWING**

1. Ambient temperature must be under 40 °C (110 °F).
2. Keep pumps from sucking in oil, water or dust. And keep them dry from oil or water.
3. Allow space of more than 10 cm (4") between a pump and wall.



4. Avoid operation over the designated pressure below.

Model	Vacuum (V)	Blower (B)	Total V+B*
KRX1, KRX3, KRX5, KRX6 KRS7D	Max 450 mmHgG (18" HgG) 60kPaG	Max 0.6 kg/cm <sup>2</sup> G (8.5 psiG) 58.8 kPaG	Max 450 mmHgG (18" HgG) 60kPaG
KRX1H, KRX1R KRX3H, KRX3R	Max 550 mmHgG (22" HgG) 733kPaG	Max 0.7 kg/cm <sup>2</sup> G (10 psiG) 68.6 kPaG	Max 550 mmHgG (22" HgG) 733kPaG
KRX5H, KRX5R KRX6H, KRX6R KRH8, KRH8R	Max 600 mmHgG (24" HgG) 80kPaG		Max 600 mmHgG (24" HgG) 80kPaG
KRA8, KRA8R, KRA12 KRA10, KRA10R KRA8-DP, KRA9-DP, KRA10-DP, KM100	Max 400 mmHgG (16" HgG) 53kPaG	Max 0.5 kg/cm <sup>2</sup> G (7.1 psiG) 49kPaG	Max 400 mmHgG (16" HgG) 53kPaG

5. Never use pumps with flammable gases. It may explode. Never make pumps suck liquids.
6. Surely ground pumps according to the codes and regulations of your local electrical safety standards. And install a leakage breaker on a machine.

\*Note: See P. 4 for details.

## CHAPTER 1 BEFORE ACTUAL OPERATION

### 1. INSPECTION ON DELIVERY

Check pumps to ascertain the following when they are delivered to you.

- 1) Whether any damage exists.
- 2) Whether there are any loose nuts or bolts.
- 3) Whether the shaft can be rotated smoothly by hand. (Check while keeping suction or exhaust port open.)
- 4) Whether there are all necessary parts such as gauge and controllers, etc. in the packages.
- 5) (About KRA-DP series)  
Whether V belts are adequately tightened.

### 2. PREPARATIONS FOR OPERATION

#### 1) Recommended Installation Site

- (1) A well ventilated place where ambient temperature is during 0°C(32°F)–40°C(104°F)
- (2) A clean place where pumps are kept clean from dirt or dust.
- (3) A place where no oil or water will fall on pumps.
- (4) A place not exposed to direct sunlight.
- (5) A place where enough surrounding space is allowed for inspection, maintenance or disassembling.

#### 2) Installation

Pay due attention to the following points when you are installing pumps.

- (1) Install pumps on a smooth, level surface.
- (2) Rigid foundation made of concrete is desirable. If concrete is unavailable, install them securely on a steel or sturdy wooden frame.
- (3) Keep pumps from vibrating if the foundation is unstable.
- (4) Rubber feet can be used to cut vibration effectively. Purchase them locally if necessary.
- (5) Don't drag pumps on floor, but use a forklift vehicle or a suspending tool for transporting pumps.

#### 3) Installation Direction

- (1) When pump is installed near a wall, make its fan cover side face the wall and allow a space of more than 10 cm (4") between them for sufficient ventilation.
- (2) Make belt cover side face opposite to a wall for effective cooling of exhaust air, if the pump is "with-after-cooler" type. And allow space of more than 20 cm (8") between pump and wall, if such disposition should not be available.

#### 4) Piping

Remove stain, dust, water or oil from piping parts and pipes.

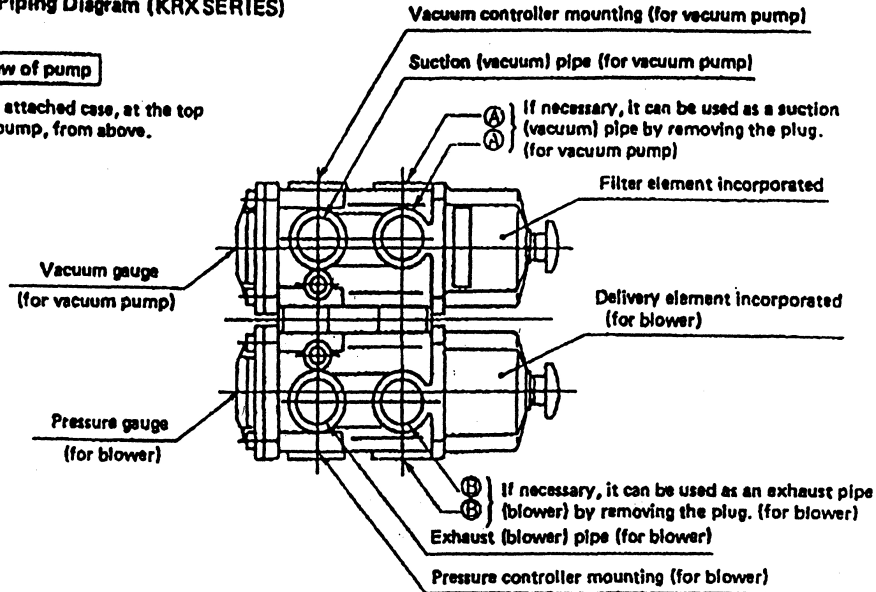
- (1) Use steel pipe or hose of more than 88 kPa (14 psi) of pressure resistance for piping. Connect pipe or hose with a pump securely so that air does not leak. Heat resistance of hose must be over 150 °C (300 °F) if it is connected to discharge port of pump.
- (2) Fit vacuum gauge and controller on the INLET side, and pressure gauge and regulator on the OUTLET side. Make pumps run in allowed range of pressures. See P. 3 for illustration.
- (3) Arrange the piping as short as possible. Be sure that the piping does not make stress to the pump.  
Additionally fasten the gauges till their faces come to horizontal between one and two rotation with proper tools after fastening ganges hand tight.  
※Excess tightness can cause crack to the delivery and suction case cap.
- (4) When seal tape is used for tight installation of gauges, never let its fragment in pumps. And use an adequate tool when you are to fit them.
- (5) Put a suitable extra filter on the suction side if sucked air contains plenty of dust in it, or the particle of dust is too minute (smaller than 10 μm).
- (6) Since some liquid or its mist such as water or oil can be the cause of trouble if sucked in pumps, install a separator when there is such a possibility.
- (7) Put a check valve on either the INLET or OUTLET port if vacuum pipe or discharge pipe is too long, because residual pressure in piping may rotate pumps adversely when the switch is turned off.



### Standard Piping Diagram (KRXSERIES)

#### Top view of pump

See the attached case, at the top of the pump, from above.



- KRA and KRH series have different cases from the ones shown above. But the principle of piping is same.

#### NOTES:

- (1) Controllers and gauges can be mounted on the pipes. But be sure to locate them in a place as near to the pump as possible.
- (2) It should be noted that exhaust air does not pass through the delivery element, if exhaust pipe is connected to port B.

### 3. OPERATION

#### 1) Before actual operation

- (1) The arrow on a label indicates the direction of pump revolution. Confirm it when you finished installation of pumps. Turn on the switch of pump for an instant period of time for checking it. Never let pumps rotate in the reverse direction for a long period, or the vanes can break.
- (2) Prepare protective device such as thermal protector or fuse in electric circuit.  
Thermal protector capacity : 120~130% of current rating of attached motor.  
Fuse : 2 times by the current rating of the motor.
- (3) Each pump has its own maximum rotation speed as shown below. And never run the pumps at a speed over the limit.

Model		50 Hz	60 Hz
Coupling driving type	KRX 1 to 6, KRX 1H to 6H, KRX 1R to 6R	1,450 rpm	1,730 rpm
	KM 100	1,450 rpm	1,730 rpm
	KRA 8, KRA 8R, KRH 8, KRH 8R	945 rpm	1,135 rpm
Belt driving type	KRA 10, KRA 10R	920 rpm	1,100 rpm
	KRA 12	660 rpm	790 rpm
	KRA8-DP	790 rpm	950 rpm
	KRA9-DP	1,100 rpm	1,300 rpm
	KRA10-DP	750 rpm	900 rpm
	KRS 7D	1,020 rpm	1,210 rpm

- (4) Direction of rotation is shown by an arrow on plate. Make sure it correctly by short time operation about 1~2 seconds at first using.

2) Starting

- (1) Follow the procedure below as the correct method of starting when piping has been completed. Turn the knob of vacuum controller and pressure regulator fully toward minus (-).
- (2) When operation of pumps is suspended for a long period of time or when pumps are reassembled after disassemblage for service, confirm if the shaft rotates lightly by hand before power switch is turned on.

3) During operation

- (1) Use pumps in the designated range of pressure.

	Pressure	Applicable pumps
Vacuum	Max 55 kPa	KRA series, KRA-R series, KM100
	Max 60 kPa	KRX series, KRS7D
	Max 75 kPa	KRX1H, KRX3H, KRX1R, KRX3R
	Max 80 kPa	KRX5H, KRX6H, KRX5R, KRX6R, KRH8, KRH8R, KRH10
Blower	Max 50 kPa	KRA series, KRA-R series, KM100
	Max 60 kPa	KRX series, KRS7D
	Max 70 kPa	KRX1H, to KRX6H, KRX1R to KRX6R, KRH8, KRH8R
V + B*	Max 55 kPa	KRA series, KRA-R series, KM100
	Max 60 kPa	KRX series, KRS7D
	Max 75 kPa	KRX1H, KRX3H, KRX1R, KRX3R
	Max 80 kPa	KRX5H, KRX6H, KRX5R, KRX6R, KRH8, KRH8R

- (2) Pump becomes fairly hot when operated for a long period of time, but this is not abnormal.

\* See foot of this page.

4) Stopping

Confirm if pumps do not rotate in the reverse direction when switch is turned off. And investigate a check valve if they rotate abnormally.

4. STORAGE

Store pumps carefully to protect them from rusting, if it will be an extended period of time before they are actually operated.

- (1) Store pumps indoors and put a suitable cover over them.
- (2) Select a place where water, oil, etc. will not fall on them.
- (3) Store them in a dry and clean place.
- (4) Keep them in a well ventilated place, where ambient temperature is below 40 °C (104 °F).
- (5) Mind especially to avoid keeping them in a place with very high temperature, chlorine gas, sulfuric acid gas or other corrosive gases.

\* How to calculate total of V and B (vacuum and blower pressures)

- (1) Total pressure of V (vacuum) and B (blower)  
Total pressure of V and B must be under the pressure for normal use of a pump, when it is used as a vacuum pump and a blower simultaneously.

$$V + B \leq \text{Pressure for normal use}$$

- (2) In case of KRX series with a pressure of 60 kPa for normal use of 60 kPa

Vacuum	Blower
0 kPa	60 kPa
10 "	50 "
20 "	40 "
30 "	30 "
40 "	20 "
50 "	10 "
60 "	0 "