MA1541YHG
Version1.00 (20231012)

INSTRUCTION MANUAL

MODEL KWR

Robot Hand Changer

DANGER

- This Instruction Manual has been prepared for intended use for production engineers and maintenance persons who operate this product. When the beginners use this product, be sure to receive the guidance from skilled persons, sales agents, or us in advance.
- Before installing, using, or maintaining this product, read carefully the safety precautions given in this manual so as to understand them completely. If you do not heed given instructions or safety precautions, serious human accidents, death, or physical damage may occur.
- Store this manual with care in the specified place at hand, and reread it as necessary for correct use of the product.
- Please contact the sales agent if you have any uncertainty or doubt about this manual.

Preface

This manual provides detailed information on the robot hand changer (KWR) to understand its performance, functions and use it in a safe and correct manner.
Before using the robot hand changer, be sure to read this instruction manual carefully and understand how to use the product. Also, be sure to follow the instructions and warnings listed in the "Safety" section at the beginning. Failure to comply may result in serious personal injury.
This product is used in combination with a master cylinder and tool adapter. This product has a purpose to be attached to a robot or loader to automate tool exchange. If you wish to use it for any other purposes, please consult us.
Our company cannot be held responsible for any personal injury, death, damage, or loss caused by failure to follow the warnings in this instruction manual.

Disclaimer and how to use the instruction manual

The contents of this document do not anticipate all the dangers that may occur during operation, inspection, and maintenance in all environmental conditions. There are countless things you cannot and must not do, and this book cannot cover them all.

Therefore, unless this manual says ``can do'' or ``may do,'' please think of it as ``cannot do'' or ``must not do.'' If you have any questions regarding safety when performing device operation, inspection, or maintenance that is not described in this manual, please contact us or your dealer.

Warranty and Disclaimer

The product is warranted for one year after the date of delivery.
All parts used shall be those delivered by Kitagawa Corporation. Kitagawa Corporation shall not be held liable for human accidents, death, damage, or loss that occurred due to the use of parts which are not genuine parts manufactured by Kitagawa. Also, the use of parts other than Kitagawa’s genuine parts will invalidate the warranty.

Contents

1. Safety Concern

To prevent harm to the user, others and damage to property, and to ensure that the product is used in a safe and correct manner. Be sure to fully understand the explanations of the general precautions and graphical symbols below before reading.

■About marks and warning labels inside the instruction manual.

For safety and to prevent malfunctions, important items that must be noted are marked with the following symbols to be easily identified. Please follow the instructions.

Display Explanation

The markings below are indicators to help you use the product in a safe and correct manner to prevent harm and damage from being inflicted.

⚠DANGER	Indicates that incorrect handling may result in an imminent danger of death or serious injury.
⚠WARNING	Indicates that incorrect handling may result in death or serious injury.
⚠CAUTION	Indicates that “incorrect handling may result in personal injury*1 or property damage*2”.

*1: Injuries include lacerations, burns, electric shocks, etc. that do not require hospitalization or long-term hospital visits for treatment.

*2: Property damage refers to damage on machinery and extended damage to surrounding equipment.

Graphic Symbols Explanation

The markings below are the symbols use to distinguish actions that people should or should not perform in order to avoid harm or damage.

Symbols	Definition
	Indicates a prohibition (something that must not be done). Specific prohibited contents are indicated with pictures or text inside or near the graphic symbol.
	Indicates compulsion (something you must do). Specific compulsory details are indicated with pictures or text inside or near the graphic symbol.
	Indicates caution. Specific precautions are indicated with pictures or text inside or near the graphic symbol.

2. Part Names

Please refer to the attached cross-sectional structure diagram.

3. Design Precautions

WARNING

1. Confirm Device Specification

The air pressure working range is from 0.35 MPa to 1.0 MPa

*KWRY0010 has an air pressure working range from 0.4 MPa to 1.0 MPa

Please refer to the attached outline drawing for other specifications.

2. Combination of Master Cylinder and Tool Adapter

The table below shows the suitable master cylinder and tool adapter combination.

Master Cylinder	Tool Adapter
KWRY0010-M	KWRY0010-T
KWR0070-M□	KWR0070-T
KWR0120-M□	KWR0120-T
KWR0250-M□	KWR0250-T
KWR0500-M□	KWR0500-T

3. Allowable Static Moment

Please use the allowable static moment within the range of the bending and torsion moment.

Model Type	Bending Moment	Torsion Moment
KWRY0010	5 N・m	12 N・m
KWR0070	14 N・m	23 N・m
KWR0120	27 N・m	45 N・m
KWR0250	74 N・m	100 N・m
KWR0500	194 N・m	175 N・m

When the moments are combination of both bending and torsion moment calculate the moment from combining the two moment using the given equation below.
Furthermore, select a size with enough margin for the moment.

$$\text{Compound Moment} = \sqrt{(\text{Bending Moment})^2 + (\text{Torsion Moment})^2}$$

4. Electrode Options

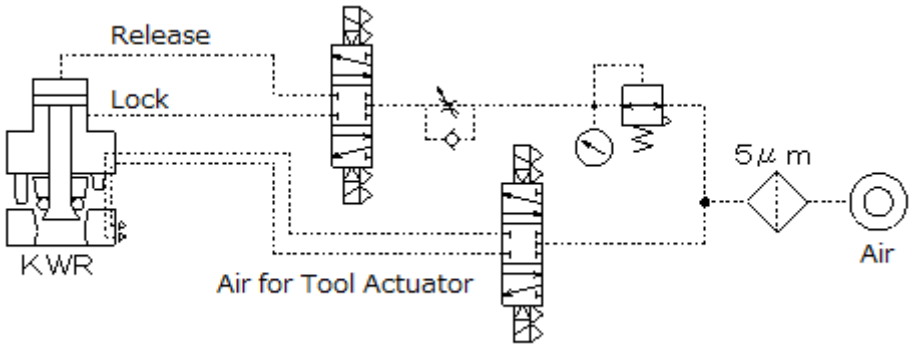
Please refer to the table below and attached outline drawing for electrode options.

Model Type	Rated Voltage	Rated Current	External Options	Number of Electrodes
SWRZ0J0－□	DC24V	2A/1A	Resin Connector	16 poles
SWLZ0C0－□		3A	Solder Terminal with Cable	15 poles
SWRZ0U0－□			Waterproof electrode (simple waterproof type) Equivalent to IP54 only when connected	16 poles
SWRZ0D0－□			D-SUB Connector	15 poles
SWRZ0G0－□			Circular Connector (Based on JIS C 5432)	15 poles
SWRZ0L0－□	DC30V	0.5A	Ethernet Electrode (Based on IEC61076-2-101)	4 poles
SWLZ0K0－□	AC200V DC200V	5A	Compact Power Transmission Type	4 poles
SWRZ0E0－□			Power Transmission Type (Based on MIL-DTL-5015)	8 poles
SWRZ0H0－□		13A	High Current Transmission Type (Based on MIL-DTL-5015)	10 poles
SWRZ0F0－□	AC240V DC240V	20A	Servo Electrode (for power)	6 poles
	DC24V	3A	Servo Electrode (for signal)	17 poles ＋1 pole (Ground)
SWRZ0W/WX0－□	Compact waterproof electrode (non-contact waterproof type) IP67 Compatible			Number of Signals: 4
SWRZ0V/VX0－□	Waterproof electrode (non-contact waterproof type) IP67 Compatible			Number of Signals: 12
SWLZ0R0－□	-	-	Air Joint (3 Ports)	-
SWLZ0P0－□	-	-	Air Joint (4 Ports)	-
SWRZ0Q0－□	-	-	Air Joint (2 Ports)	-

When applying high current (1A or more) to electrodes with a rated current of 3A or less, we recommend connecting multiple poles in parallel. By connecting them in parallel, the load per pole is reduced, allowing you to use the contact probe for a longer period of time. (The same effect can be obtained by connecting in parallel even if it is 1A or less.) When applying high current to only one pole, please shorten the energization time as much as possible. (Recommended value 0.5 to 1 second)

CAUTION

1. **Please refer to the diagram below for the pneumatic circuit.**



KWR has a mechanical lock function (holding spring) that allows the tool to be held even if the air is cut off. However, when using a 2-position solenoid valve, for safety reasons, select and connect the KWR operating solenoid valve so that air is supplied to the lock port side when it is not energized. If air is supplied to the release port side when the power to the solenoid valve is stopped, the tool (hand) may drop, which is extremely dangerous.

2. **Regarding The Environment where Device is use (Electrode Option Specifications)**

Do not use in an environment that is exposed to water, water vapor, liquid, splashing chemicals, explosions, or corrosive gases. In addition, in an environment where there is scattering of cutting powder, cutting oil, dust, spatter, etc., it may cause poor conductivity of the electrode. For environments where it is expose to water, steam, liquid, cutting oil, etc., waterproof electrodes (non-contact waterproof type) are available that are IP67 compliant.

3. **Connecting or disconnecting when electrode is energized (optional electrode specifications)**

When a robot hand changer is connected or disconnected while energized (live wire insertion/removal), an electrical discharge phenomenon (spark phenomenon) occurs between the opposing electrodes. The tip of the contact probe (-M: master side) and the tip of the electrode rod (-T: tool side) may be burned or melted by the discharge phenomenon, and even the base metal may melt due to oxidation or abrasion of the gold plating, causing poor conductivity. (Except for W/V: non-contact waterproof type) Always disconnect the robot hand changer from the power source when connecting or disconnecting the hand changer.

4. When performing hand exchange (attach/detach) in the horizontal position

When connecting and disconnecting the Robot Hand Changer in a horizontal position, do not subject it to excessive torque. When selecting a Robot Hand Changer, select a size that is large enough for the payload capacity. During connection, the tool side should not be lifted or tilted more than the allowable position error range. The tool side should not be completely fixed to the tool rest, but should be allowed to move within the allowable position error range. If there is no clearance within the allowable positional error range, positioning accuracy may be affected.

4. Construction Precautions

CAUTION

1. Supply clean air through an air filter（Filtration level 5 μm or less）

2. Treatment before piping

Piping, fittings, etc. should be thoroughly flushed and used in a clean condition. Chips, etc. in the circuit may cause malfunction or air leakage, which may result in serious damage to the inside of the unit. (No filter is provided to remove dust or impurities in the air circuit.)

3. How to Roll the Sealing Tape

When using sealing tape, wrap it around the end of the threads, leaving one or two threads exposed. When installing piping, be careful not to clog the equipment with foreign matter, such as sealing tape, and ensure proper installation. Pieces of tape may cause malfunction or air leakage.

4. Installing and Removing the Master Cylinder/Tool Adapter

Tighten the mounting bolts to the torque shown in the table below.

When mounting, use the pin provided and tighten the bolts evenly so that the master cylinder/tool adapter does not tilt.

Model Type		Bolt Size	Number of Bolts	Tightening Torque (N・m)
Master Cylinder	KWRY0010-M	M3 x 0.5	3	1.3
	KWR0070-M□	M3 x 0.5	4	1.3
	KWR0120-M□	M4 x 0.7	4	3.2
	KWR0250-M□	M5 x 0.8	4	6.3
	KWR0500-M□	M6	4	10
Tool Adapter	KWRY0010-T	M3 x 0.5	3	1.3
	KWR0070-T	M4 x 0.7	4	3.2
	KWR0120-T	M4 x 0.7	4	3.2
	KWR0250-T	M5 x 0.8	4	6.3
	KWR0500-T	M6	4	10

When installing and removing the master cylinder/tool adapter, be careful not to lose the pin provided. If installed without the pin, the moment characteristics may not be secured.

5. Installing and Removing External Options

For external option mounting bolts, apply adhesive (Three Bond 1401 or equivalent) to the tip of the mounting bolt, and then insert the bolt with the tightening torque shown in Table A. If the robot hand changer has a bracket, apply adhesive (Three Bond 1344 or equivalent) to the tip of the bracket mounting bolt, and then mount the bracket on the robot hand changer with the tightening torque shown in Table B. Then mount the external option with the tightening torque shown in Table A. When mounting, use the supplied pins and tighten the bolts evenly so that the external option does not tilt.

Table A: List of Tightening Torques for External Options

Model Type	External Options	Bolt Size	Tightening Torque (N・m)	With/Without Bracket
SWRZ0J0－□	Resin Connector	M3 x 0.5	0.5	－
SWLZ0C0－□	With Solder Terminal Cable	M3 x 0.5	0.5	－
SWRZ0U0－□	Waterproof electrode (simple waterproof type) Equivalent to IP54 only when connected	M3 x 0.5	0.5	－
SWRZ0D0－□	D-SUB Connector	M4 x 0.7	1.5	○
SWRZ0G0－□	Circular Connector (Based on JIS C 5432)	M4 x 0.7	1.5	○
SWRZ0L0－□	Ethernet Electrode (Based on IEC61076-2-101)	M4 x 0.7	1.5	○
SWLZ0K0－□	Compact Power Transmission Type	M3 x 0.5	0.5	－

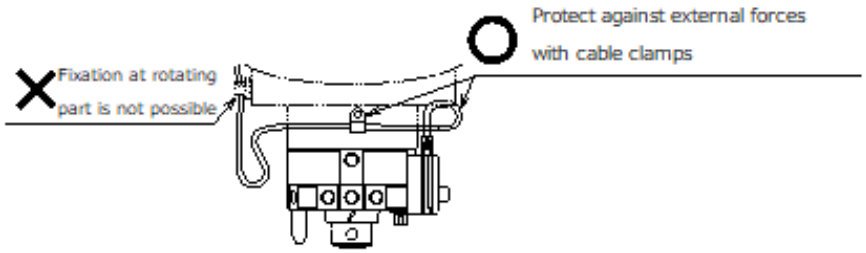
SWRZ0E0－□	Power Transmission Type (Based on MIL-DTL-5015)	M4 x 0.7	1.5	○
SWRZ0H0－□	High Current Transmission Type (Based on MIL-DTL-5015)	M4 x 0.7	1.5	○
SWRZ0F0－□	Servo Electrode	M4 x 0.7	1.5	○
SWRZ0W－□ SWRZ0WX0－□	Compact waterproof electrode (non-contact waterproof type) IP67 Compatible	M3 x 0.5	0.63	－
SWRZ0V－□ SWRZ0VX0－□	Waterproof electrode (non-contact waterproof type) IP67 Compatible	M4 x 0.7	1.5	○
SWLZ0R0－□	Air Joint (3 Ports)	M3 x 0.5	1.3	－
SWLZ0P0－□	Air Joint (4 Ports)	M3 x 0.5	1.3	－
SWRZ0Q0－□	Air Joint (2 Ports)	M4 x 0.7	3.2	○

Table B: List of Tightening Torques for Brackets

Bracket Type	**Excluded Mounting Options**	**Bolt Size**	**Bracket Tightening Torque（N・m）**
SWRZ0Z0	D-SUB Connector	M3×0．5	1．3
	Air Joint (2 Ports)	M4×0．7	3．2
SWRZ0E0	Circular Connector (Based on JIS C 5432)	M3×0．5	1．3
	Ethernet Electrode (Based on IEC61076-2-101)	M4×0．7	3．2
	Power Transmission Type (Based on MIL-DTL-5015)		
SWRZ0H0	High Current Transmission Type (Based on MIL-DTL-5015)	M3×0．5	1．3
		M4×0．7	3．2
SWRZ0F0	Servo Electrode	M3×0．5	1．3
		M4×0．7	3．2
SWRZ0V0	Waterproof electrode (non-contact waterproof type) IP67 Compatible	M3×0．5	1．3
		M4×0．7	3．2

6. Handling and Wiring Precautions (Electrode Option Specifications)

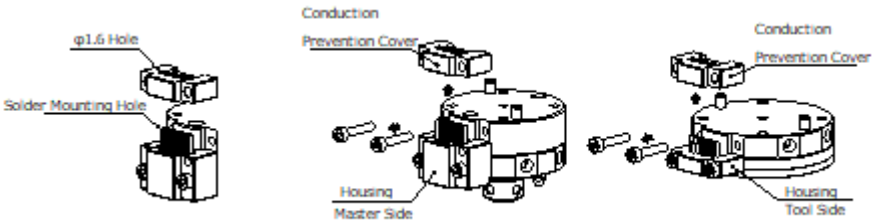
Wire the robot so that the wires and cables are not pulled when the robot moves or rotates, and secure solder joints and connectors so that no external force is applied to them. External force applied to soldered joints and connectors can cause wires to break, connectors to disconnect, or poor contact.



When assigning various electrical signals, it is recommended that the weak electrical signal lines and the power signal lines be separated as much as possible. Noise may be transmitted from the power signal line to the weak electrical signal line.
(F: Except for servo electrodes) Also, for wires and cables connected to electrode options, it is recommended to separate the two signal lines as much as possible, since noise may propagate if the above two signal lines are mixed and bundled.

7. -B: Solder Terminal Connection Method (Electrode Option Specifications)

For the solder terminal type, the connection between the electrical signal pins and wires/cables for both the master cylinder and tool adapter is made by soldering. Remove the anti-conduction cover before soldering.



Soldering should be done within 3 seconds at 280℃. The outer diameter after soldering should be within ϕ1.6 mm, otherwise the anti-conduction cover cannot be attached.

[Recommended Wire Diameter]

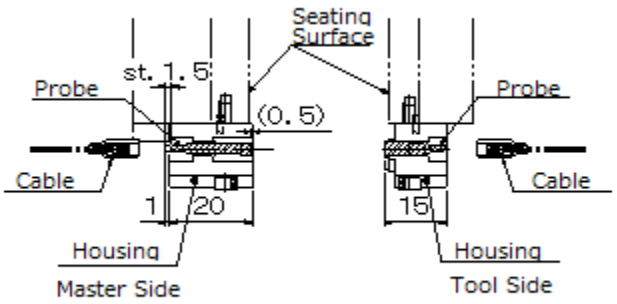
Use AWG26 size or Compacter wire diameter.
If a current greater than the allowable current carrying capacity of AWG26 is required, use a wire within the rated value range of the electrode. In this case, the solder mounting holes and the attached conduction prevention cover cannot be used. If necessary, use heat-shrink tubing or other means of insulation.

8. -D/E/G/H/J/L: Connector Type Connection Method (Electrode Option Specifications)

Insert the connector completely into the electrode.
For -D/E/G/H/L types, the connector must be screwed down.
Insufficient insertion or not screwing down may cause poor contact.

9. -K: Compact Power Transmission Type Precautions (Electrode Option Specifications)

In the compact power transmission type, both the master cylinder and tool adapter have replaceable electrode probes. The electrode probe is designed to be released when the probe is pushed with a certain amount of force from the cable connection side.
After connecting the cable, push the probe in from the seating side before use.



10. Trial Run Method

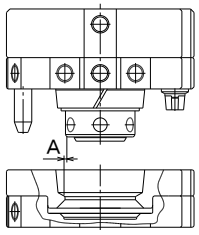
Providing a large flow of air immediately after installation can result in extremely fast run times and serious damage to the Robot Hand Changer. Install a speed controller (meter-in) or similar device near the air source and supply air gradually.

11. Allowable Position Error During Teaching

The positional error between the master cylinder and tool adapter during teaching should be within the allowable positional error range shown below. At this time, the tool adapter and tool rest should not be completely fixed, and a gap should be left between the tool adapter and tool rest within the allowable positional error range.

1. Allowable Position Offset in Horizontal Direction

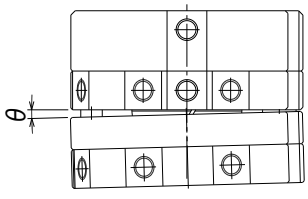
Model Type	Allowable Offset A mm
KWRY0010	±0．8mm
KWR0070	±0．8mm
KWR0120	±0．8mm
KWR0250	±1．0mm
KWR0500	±1．3mm



1. Horizontal Position Offset

2. Allowable Position Offset in Tilt Direction

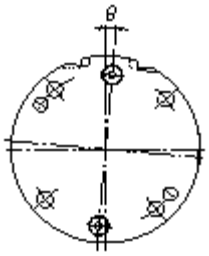
Model Type	Allowable Offset θ
KWRY0010	θ＝1．5deg
KWR0070	θ＝1．5deg
KWR0120	θ＝1．5deg
KWR0250	θ＝1．2deg
KWR0500	θ＝1．0deg



2. Tilt Position Offset

3. Allowable Position Offset in Radial Direction

Model Type	Allowable Offset θ
KWRY0010	θ=±3 deg
KWR0070	θ=±3 deg
KWR0120	θ=±3 deg
KWR0250	θ=±2 deg
KWR0500	θ=±2 deg



3. Radial Position Offset

12. Optimum Clearance Between Master Cylinder and Tool Adapter During Connection

The clearance between the master cylinder and the tool adapter when connecting should be within the range of [lift] to [lift +0.5 mm] shown in the outline drawing.
If the lift +0.5 mm or more is exceeded, the connection may not be possible.

13. Optimum Clearance Between Tool Adapter and Tool Rest During Detachment

The clearance between the tool adapter and the tool rest should be greater than or equal to the lift amount shown in the outline drawing.
The tool adapter is forcibly released by the payout (lift) mechanism of the master cylinder.
It is recommended that a cushioning mechanism be provided between the tool adapter and tool rest.

5. Handling Precautions

WARNING

1. Please have this handled by a person with sufficient knowledge and experience.

Handling and maintenance of machinery and equipment with hydraulic and pneumatic devices must be performed by persons with sufficient knowledge and experience.

2. Do not handle or remove any equipment until you are sure that it is safe to do so.

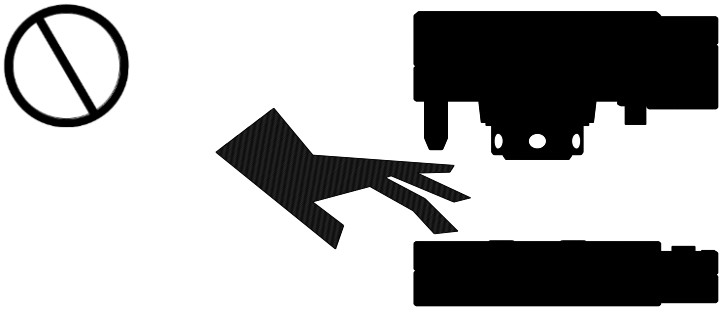
1. Before inspecting or servicing the machine or equipment, make sure that measures have been taken to prevent the driven object from falling or running out of control.
2. Before removing the equipment, confirm that the safety measures described above have been taken, shut off the pressure source and power supply, and confirm that there is no pressure in the hydraulic-pneumatic circuit.
3. If you remove the equipment immediately after shutting down, the temperature of the equipment may have risen, so wait until it has cooled down.
4. When restarting the machine or equipment, do so after checking for loose bolts and abnormalities in various parts.

3. Note when using only the Robot Hand Changer

Applying pressure to the Robot Hand Changer itself is very dangerous and may result in damage to the equipment.Air should be supplied after the robot or plate is mounted.

4. Do not touch the master cylinder or tool adapter during operation

Hands can get caught in the master cylinder or tool adapter, resulting in injury.



5. Do not disassemble or modify the product.

Disassembly or modification of the product, even within the warranty period, will invalidate the warranty.

6. Maintenance and Inspection

WARNING

1. Equipment removal and pressure source shut down

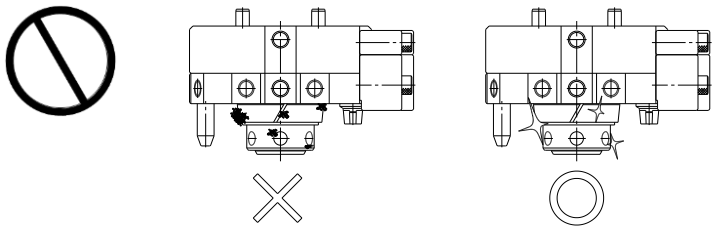
When removing the equipment, make sure that measures are taken to prevent the driven object from falling or getting out of control, turn off the pressure source and power supply, and make sure that there is no pressure in the air circuit before removing the equipment.

When restarting the machine, make sure that there are no loose bolts or abnormalities in any part before restarting the machine.

Request

1. Cleaning the Master Cylinder and Tool Adapter

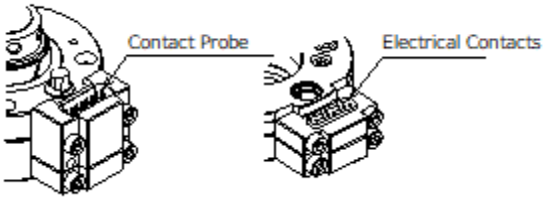
Using a master cylinder or tool adapter with dirt, foreign matter, or highly viscous substances adhering to the taper reference surface or seat surface may cause positioning inaccuracy, malfunction, or air leakage. (Do not apply grease to the taper reference surface.)



2. **Tighten and inspect the piping, mounting screws, and wiring for looseness on a regular basis.**

3. **Inspect prior to use and at regular intervals.**

   Dirt or dust on the electrical contacts makes it difficult to conduct electrical signals. Clean with a clean cloth soaked in an organic solvent such as IPA and blow with air. If contact failure occurs during use, inspect and clean the electrical contacts first. The contact probe on the master cylinder side must be replaced if an abnormality is found during inspection.



4. **Make sure that the supply air is clean.**

5. **Make sure that it operates smoothly and that there are no air leaks, etc.**

   (If the unit is left unattended for an extended period of time and then restarted, make sure it is operating properly). If there is air leakage during connection, overhaul/repair is required. Please contact us.

6. **Store in a cool, dark place away from direct sunlight and moisture.**

7. **Please contact us for overhaul and repair.**

7. Warranty

1. Warranty Period

The Product is warranted for one year from the date the Product is delivered.

2. Warranty Coverage

If a malfunction or nonconformity occurs during the warranty period due to our responsibility, we will replace or repair the malfunctioning part of the equipment at our expense.

However, this warranty does not apply to any malfunction or failure related to the management of the product that falls under any of the following items.

1. Failure to perform required maintenance and inspections
2. In the event that the product is used in a nonconforming state at the discretion of the user, and a malfunction, etc., results from such use.
3. In the event of improper use or handling by the user
   (including damage caused by the wrongful act of a third party)
4. If the failure is caused by something other than our products
5. If the product has been modified or repaired by anyone other than our company, or if the modification or repair has not been approved or confirmed by our company.
6. Other cases caused by natural disasters or catastrophes for which we are not responsible.
7. Parts or replacement costs due to wear and tear or deterioration
   (rubber, plastic, sealing materials and some electrical components, etc.)

Damage caused by product failure is excluded from the warranty.

kitagawa

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■ OVERSEAS

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