

INSTRUCTION MANUAL MODEL NPL2-S

Thin 2-jaw Sealed Gripper With Length Measuring Scale



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 thin 2-jaw sealed gripper with the length measuring sensor (model NPL2-S) so that you can understand its performance and functions and use it safely and correctly.

Before using this gripper, read this manual and the instruction manual of the thin 2-jaw sealed gripper (model NPL2) carefully to understand how to use the gripper correctly. Always follow the instructions and warnings given in **“Important Safety Precautions”** and **“Precautions for Use”**. Failure to follow these precautions could result in serious human accidents.

Terms and Symbols Used for Safety Messages

In this manual, handling precautions that are considered especially important are classified and displayed as shown below according to the degree of risk (seriousness of harm) that could result. Please completely understand the meaning of these terms and follow the instructions for safe operation.

Safety Alert Symbol

This triangle is a safety alert symbol used to alert you to potential safety hazards. To avoid death or injuries that could occur, follow the safety messages given with this safety alert symbol.



Failure to follow the safety precautions below will result in death or serious injuries.



Failure to follow the safety precautions below could result in death or serious injuries.



Failure to follow the safety precautions below may result in minor or moderate injuries.



Indicates instructions which, if you do not heed given instructions, could result in damage to the product or shortened service life, or damage to peripheral equipment.

Disclaimer and How to Use Instruction Manual

This product is suitable for gripping a conveyed workpiece by being installed on the robot or loader. The product is equipped with the jaws to grip the conveyed workpiece and they are operated by air pressure. For any other applications, please contact us.

Kitagawa Corporation shall not be held liable for human accidents, death, damage, or loss that occurred due to a failure to follow the safety precautions given in this manual.

This manual does not predict all potential hazards in operation, inspection, and maintenance under all environmental conditions. There will be an infinite number of matters that cannot or must not be done, and it is impossible for the manual to cover all of them.

Therefore, the matters, unless otherwise mentioned clearly as “can be done” or “may be done” in this manual, should be considered as “cannot be done” or “must not be done”. Please contact us or our agents if you have an uncertainty about safety when you try to perform operation, inspection, or maintenance not mentioned in this manual.

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 void the warranty.

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1. Structural Drawing and Parts List

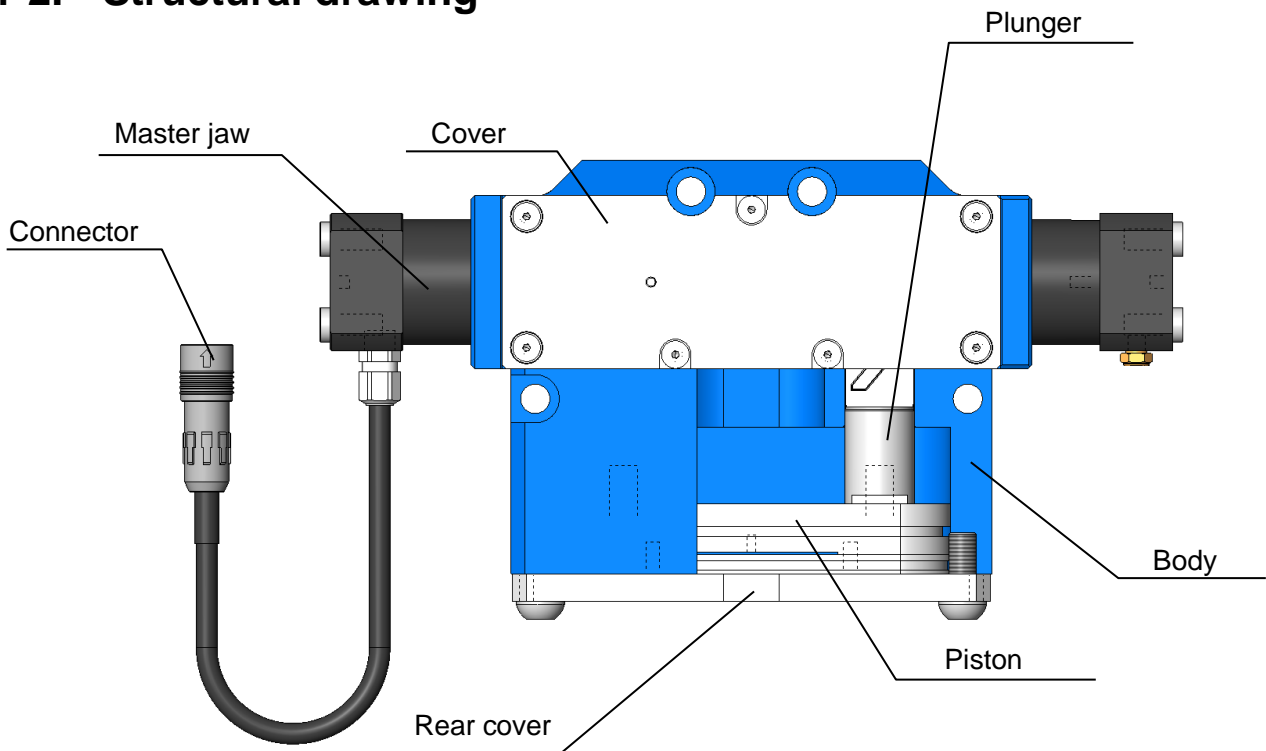
1-1. Model indication

The model indication is as follows:

NPL2 16 S

Series		Size			Length measuring sensor	
NPL2	NBR seal	16			Nil	Not equipped
					S	Equipped

1-2. Structural drawing

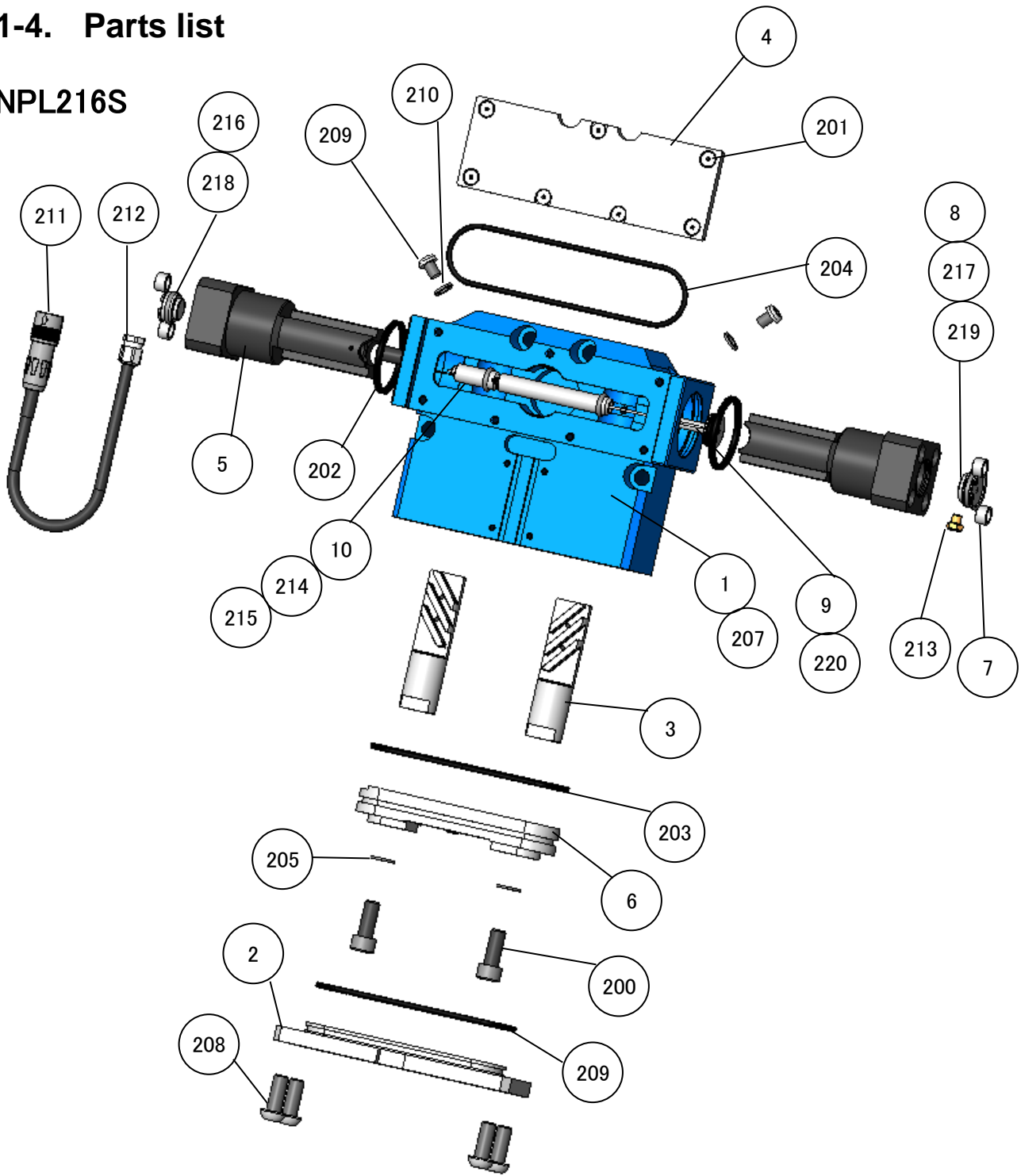


1-3. Seal list

型式	No.					
	202	203	204	205	206	210
NPL216S	X-ring X127	X-ring X151	O-ring S95	Seal washer 8S1	O-ring S80	Seal washer SUS 6S1
	214	218	219	220		
	O-ring P10	O-ring S16	O-ring S18	X-ring X112		

1-4. Parts list

NPL216S



No.	Parts name	Quantity	No.	部品名称	Quantity
1	Body	1	205	Seal washer 8S1	2
2	Rear cover	1	206	O-ring S80	1
3	Plunger L (R)	1(1)	207	Setscrew	4
4	Cover	1	208	Rear cover fixing bolt	4
5	Master jaw L (R)	1(1)	209	Hexagon socket head cap screw fine thread	2
6	Piston	1	210	Seal washer SUS 6S1	2
7	Positioning bushing	4	211	Connector	1
8	Jaw cover	2	212	Capcom	1
9	Piston rod	1	213	Silencer	1
10	Pipe	1	214	O-ring P10	2
			215	Hexagon socket headless tapered	2
200	Plunger fixing bolt	2	216	Retaining ring	1
201	Cover fixing bolt	7	217	Retaining ring	1
202	Jaw packing	2	218	O-ring S16	1
203	Piston packing	1	219	O-ring S18	1
204	O-ring S95	1	220	X-ring X112	1

2. Important Safety Precautions

Important safety precautions that particularly you should know or follow are summarized below. Please read them before starting to use the product.



DANGER

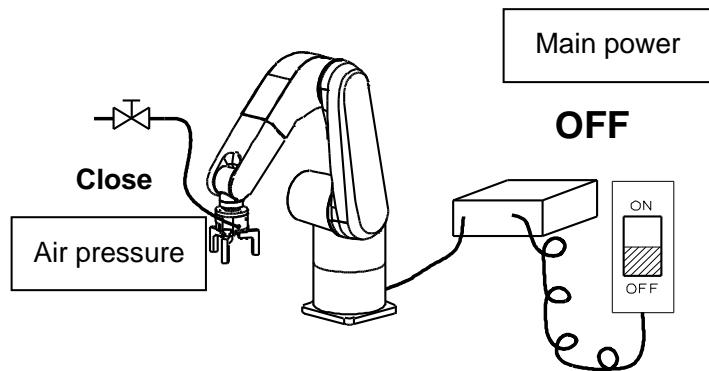
Failure to follow the safety precautions below will result in death or serious injuries.



Be sure to turn off the main power supply when installing, checking, oiling, or replacing the gripper.

Also, shut down the air pressure in the work area.

- During work, the robot or gripper could move abruptly and collide with your body.
- After shutting down the air pressure, release the air pressure remaining inside the gripper.



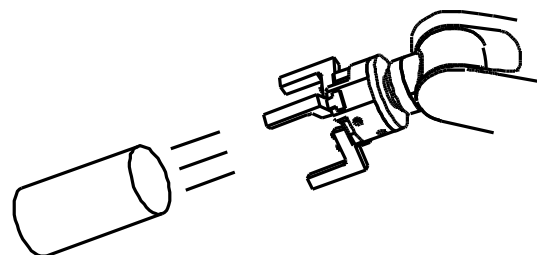
When installing, checking, oiling, or replacing the gripper, post a sign or notice, or provide a fence, and so on to notify people around the machine that work is in progress.

- Notify people around the machine that work is in progress and take measures to keep people other than the operator out of the work area.
Machine motion not predicted by a third party could cause serious danger.



Take safety measures so that the operator is not injured even if the conveyed workpiece flies out due to the reduced air pressure.

- Observe the legal safety standards defined by each country, such as installation of safeguards or fall prevention covers.





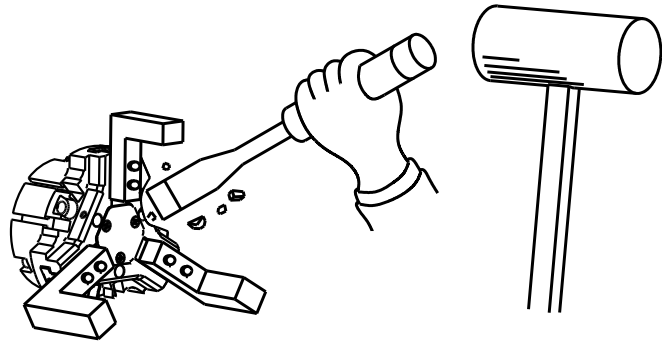
DANGER

Failure to follow the safety precautions below will result in death or serious injuries.



Do not modify the gripper.

- Not only the gripper is damaged but also the gripper and fixed workpiece may fly out.



If using the gripper as a workpiece fixture when the workpiece is drilled, deburred, welded, or modified additionally, confirm the specifications.

- If the gripper is used out of the specifications, not only the gripper is damaged but also the fixed workpiece may fly out.



Be sure to tighten the bolts with the specified torque.

- Lack of bolt quantity or tightening torque, or excessive torque could damage the bolt, causing the gripper or conveyed workpiece to fly out.
- When tightening the bolts, fix the gripper so that it will not rotate. Failure to do so may result in injury by slipping your hands when tightening the bolts.

Gripper body fixing bolt

Bolt size	Tightening torque	
M8	27	N·m
M10	58	N·m

Hexagon socket button head screw

Bolt size	Tightening torque	
M8	10.5	N·m

Plunger fixing bolt

Bolt size	Tightening torque	
M8	33	N·m

Cover fixing bolt

Bolt size	Tightening torque	
M4	2	N·m



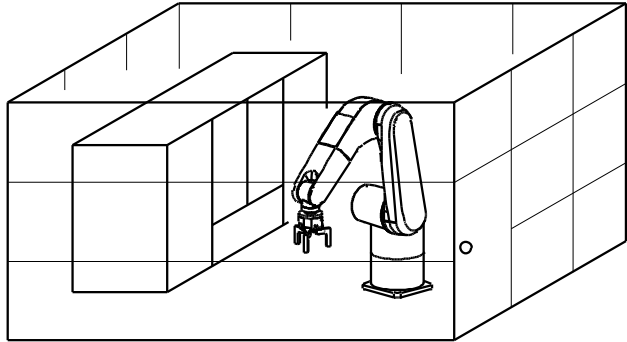
DANGER

Failure to follow the safety precautions below will result in death or serious injuries.



Use the gripper in accordance with the legal safety standards.

- Use the gripper in accordance with the legal safety standards defined by each country, such as installation of safeguards or safety covers.





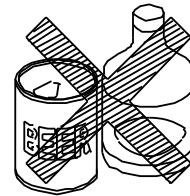
WARNING

Failure to follow the safety precautions below will result in death or serious injuries.



Do not operate the machine after drinking alcohol or taking medicine.

- Impaired judgment or operation mistake may cause serious hazards.



Alcohol

Medicine



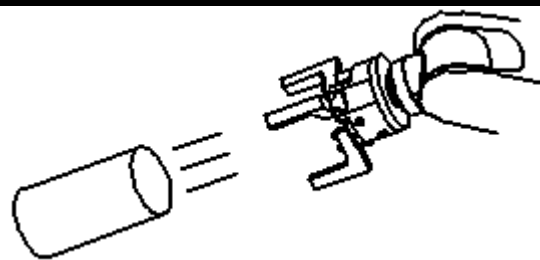
Do not wear clothing or accessories such as a necktie, necklace, etc. which are easy to be caught in.

- You may be caught in the gripper.

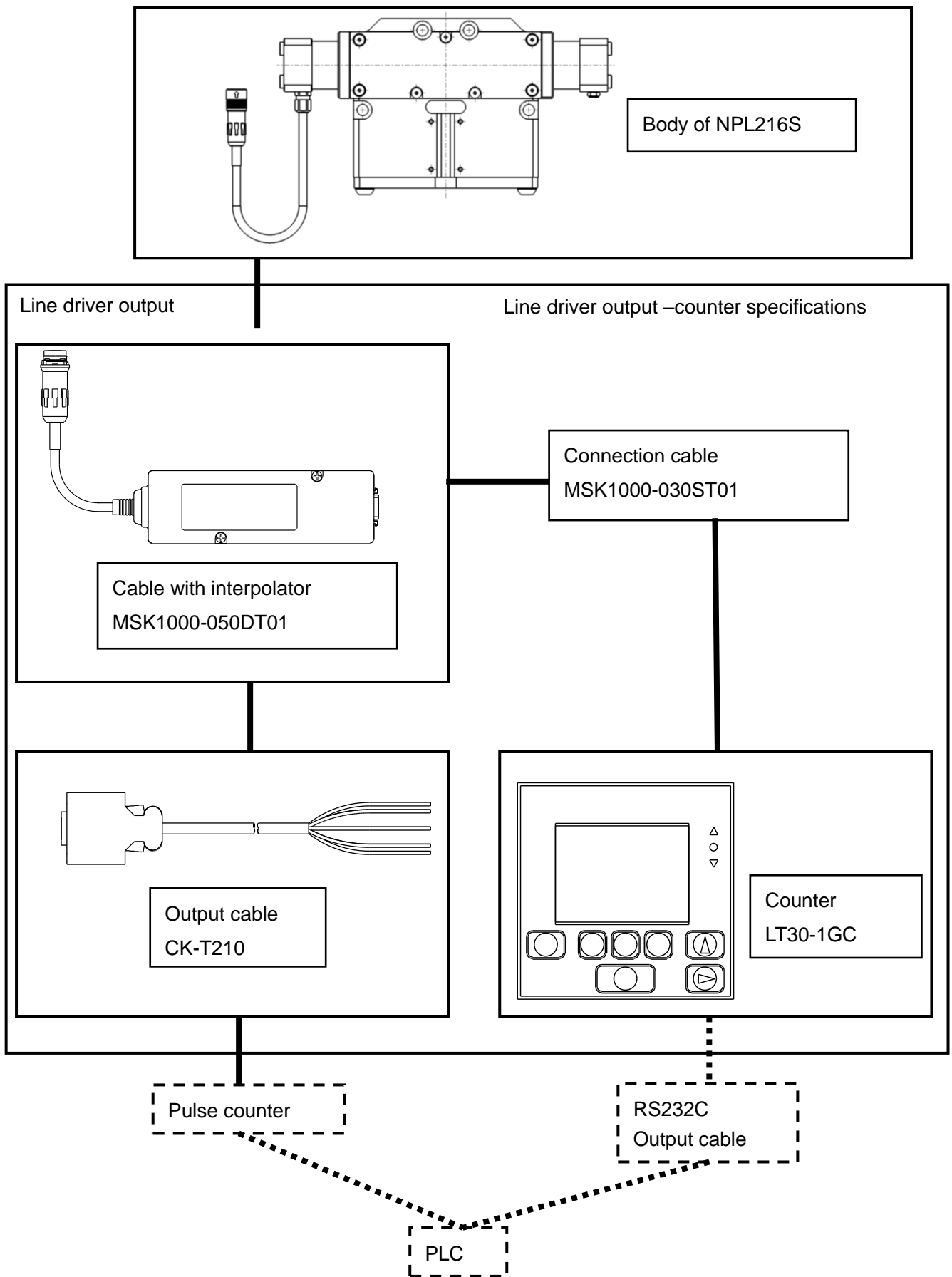


Use the gripper within the range of specification values.

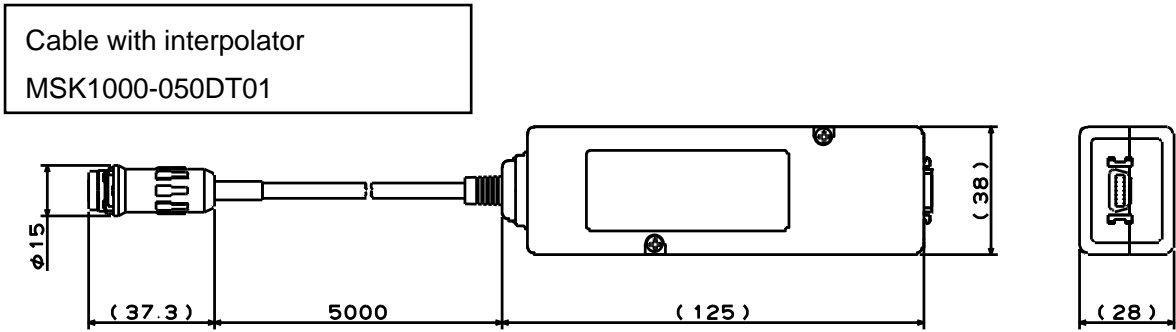
- Have the gripper grip the conveyed workpiece at the position of its center of gravity.
- If not, not only the gripper is damaged but also the conveyed workpiece may fly out.



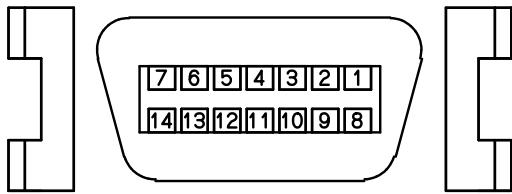
3. Configuration



3-1 Line driver output



Output connector: 10214-52A2PL manufactured by 3M (MDR connector receptacle)

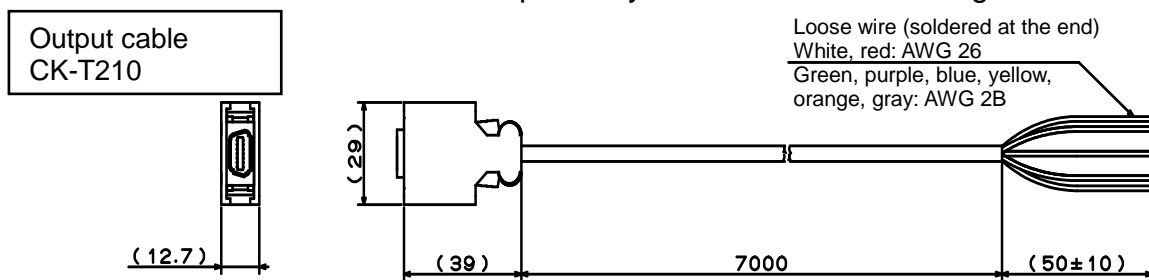


Output Connector	Signal	Output cable (CK-T210)	
		Wire color	Twisted pair
1	A	Blue	①
2	*A	Yellow	①
3	B	Orange	②
4	*B	Gray	②
5	N.C.		
6	N.C		
7	Unconnectable		
8	N.C		
9	N.C		
10	N.C		
11	0V	Green	③
12	0V	White	④
13	+5V	Red	④
14	+5V	Purple	③

Specification

Item	Specification
Resolution	0.5 μm
Min. phase difference	200ns
Output	A/B phase (EIA-422 compliant)
Supply voltage	DC5V ± 5%
Current consumption	300mA
Max. response speed	1m/s
Operating temperature range	0~40°C
Storage temperature range	-10~50°C

* Be sure to connect two wires respectively for the +5 V and 0 V signals.

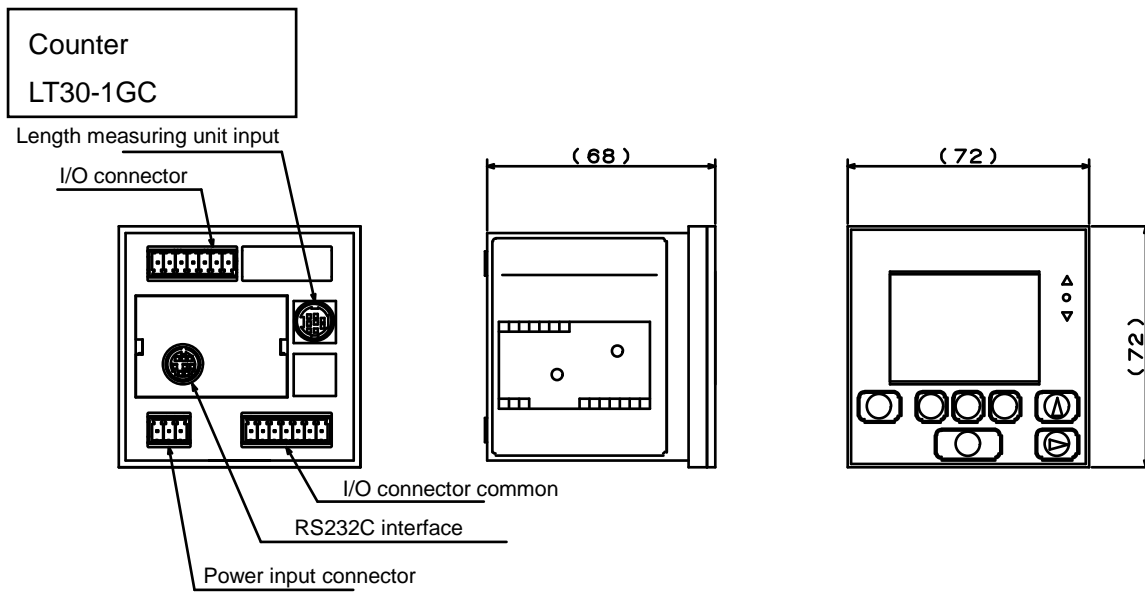


Input side connector : 3M MDR connector
Plug 10114-3000PE, Shell 10314-52F0-008

* The pulse counter and PLC are to be prepared by the customer.

* Select a pulse counter having specifications of 2 phases, x4 multiplication, and 500 kHz or higher.

3-2 Line driver output –counter specifications



For details, refer to the instruction manual of Magnecale counter LT20A-101C.
<http://www.magnescale.com/>

* The RS-232C cable and PLC are to be prepared by the customer.

4. Use

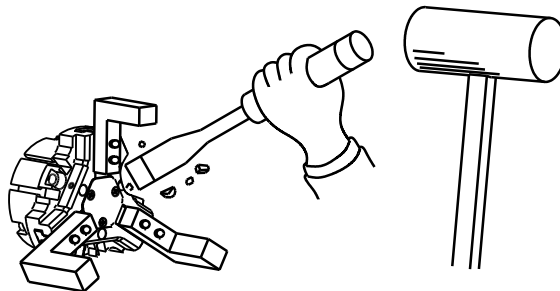
This product supplies pneumatic pressure to the unit to move the jaws in the open or close direction for gripping the conveyed workpiece and transfers the conveyed workpiece up to any location. After transfer, the jaws are moved in the close or open direction for removing the conveyed workpiece.

NOTICE

- For stable measurement, provide a flow control valve on the pneumatic circuit and adjust the jaw opening/closing speed by reducing the flow rate.
- If no flow control valve is used, the jaw opening/closing speed may increase, causing a display error.
- If the display error alarm occurs, reduce the speed using the flow control valve.

! DANGER

- Do not modify the gripper. Using the modified product could cause unexpected accidents. Kitagawa shall not be held liable for human accidents, death, damage, or loss that occurred due to the modification.



- If using the gripper as a workpiece fixture when the workpiece is drilled, deburred, welded, or modified additionally, confirm the specifications. If the gripper is used out of the specifications, not only the gripper is damaged but also the fixed workpiece may fly out.

! WARNING

- Wear appropriate clothing suitable for the work and wear gloves, safety glasses, safety shoes, and helmet.
 - Wearing inappropriate clothing causes the clothing to be stuck, resulting in danger.
 - Appropriate clothing will be preventive measures to prevent hazards due to the carelessness or unexpected accidents during work.

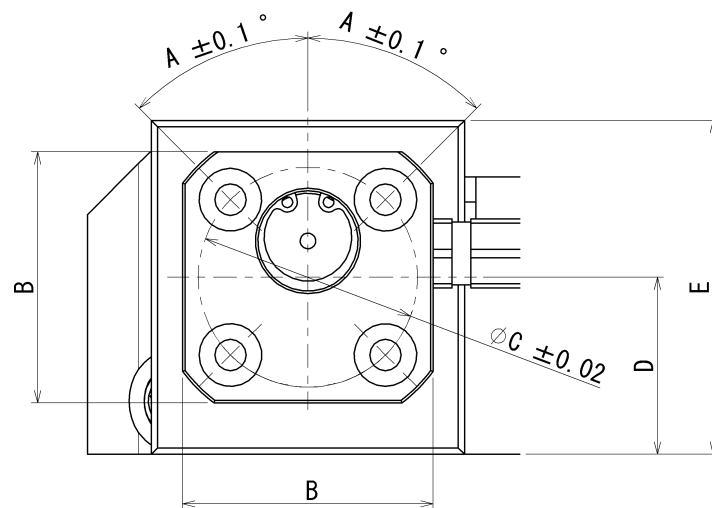
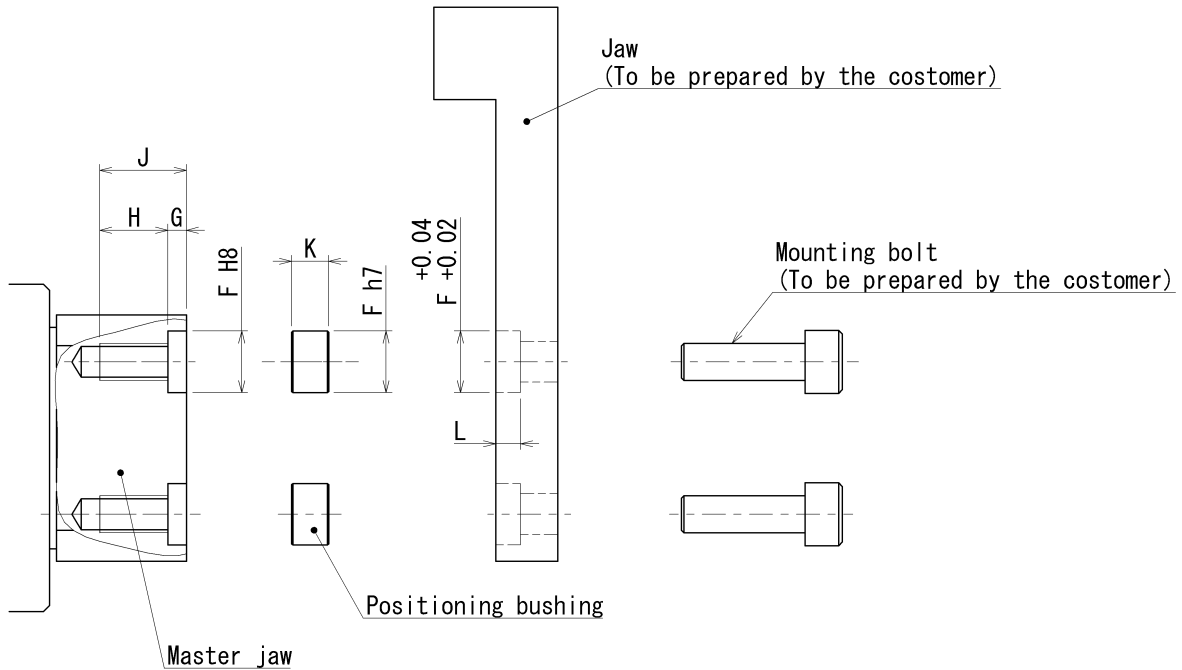
NOTICE

- Do not use the product in the environment of corrosive chemicals, corrosive gas, dust, and vibration, avoiding high temperature or direct sunlight.
- * When storing the product, apply antirust treatment and then store it in a place free from water leakage, dew condensation, or freeze.
- Increase the maintenance frequency when gripper is used in an environment directly exposed to water or oil because the seal life will be reduced.
- Since the master jaw is fitted with a silencer (M5) (protection class IP54), an additional hose for ventilation must be connected to the gripper for use in protection class IP67. If not connected, the degree of protection is reduced to IP54.

5. Design of Jaws

5-1. Designing jaws to be installed on the gripper

When designing jaws to be installed on the gripper, form the installation face to the master jaw as shown below.

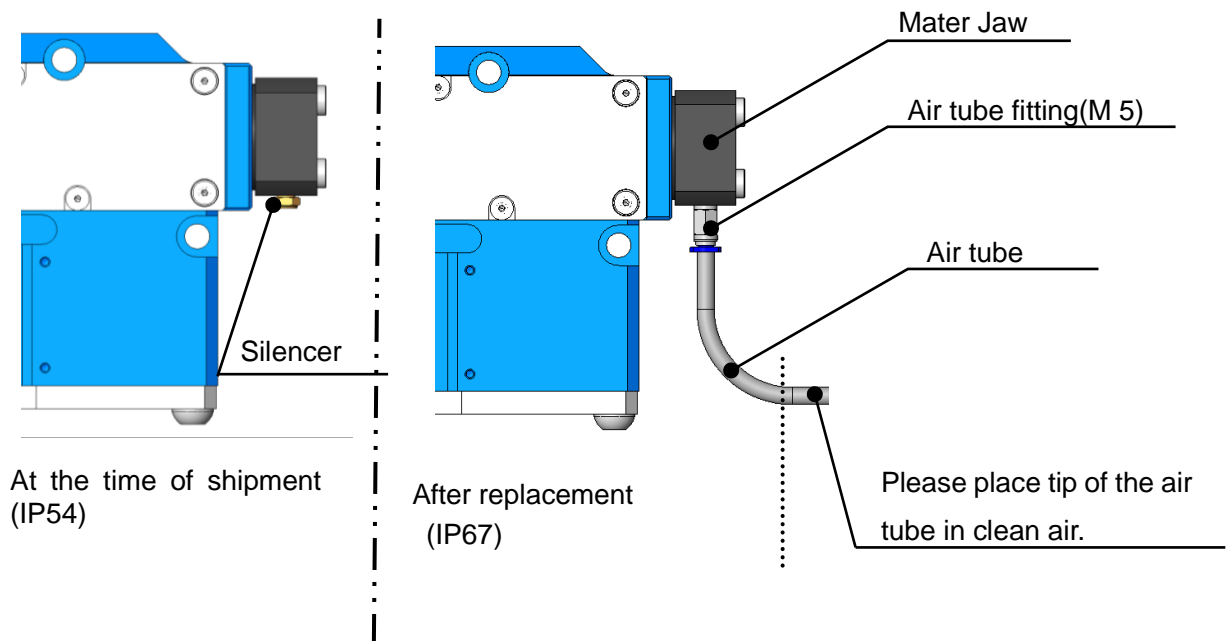


Model	A	B	C	D	E	F	G	H
NPL216S	45	40	35	28.2	53.2	10	3	11

Model	J	K	L	Mounting bolt size
NPL216S	14	6	4	M6

5. About waterproof protection

At the time of shipment from our company, a silencer (M5) is attached to the master jaw so that it can be used in an environment of dustproof and splashproof standard IP54. If the robot hand is used in an environment where it receives direct jets of water, coolant, etc., or if it is used in a submerged environment, the IP67 dust-proof and drip-proof standard is required. Remove the silencer (M5) from the master jaw, connect the air tube joint (M5) prepared by the customer and the air tube, and vent the tip of the air tube to clean outside air that is not directly exposed to water or coolant.



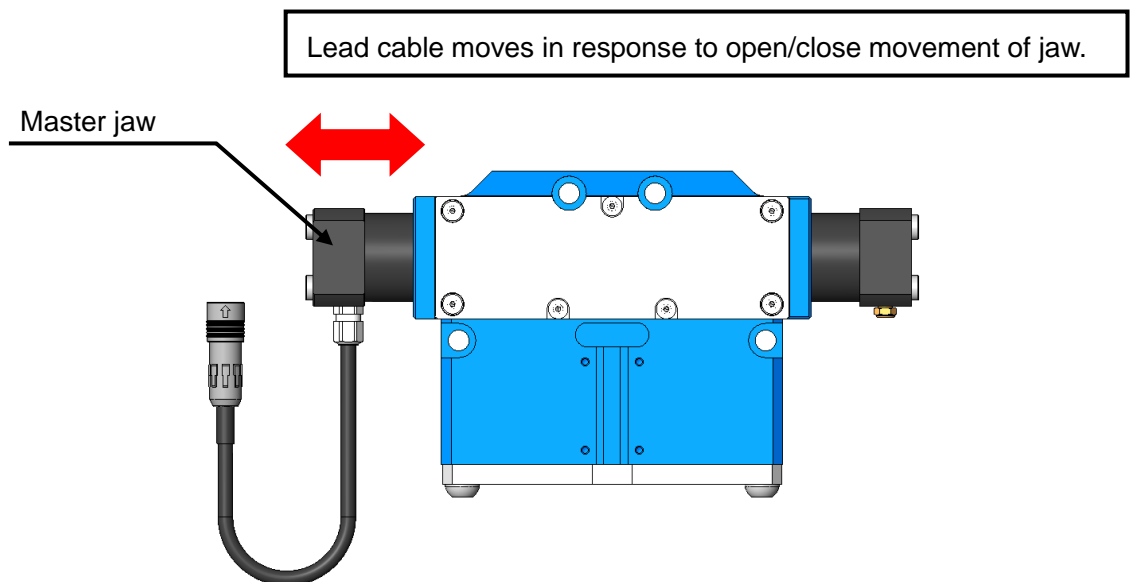
6. Handling of Lead Cable

Fixing of Lead Cable

Bending, twisting, or pulling the lead cable repeatedly may break the cable, resulting in failure. To prevent such a problem, fix the lead cable with no load applied to it using the connector at the end of the lead cable at the start of use.

Note that the lead cable moves according to the opening/closing movement of the gripper jaw. Therefore, when fixing the lead cable, make allowance for the movement of the cable.

In the case where the cable with interpolator connects to the lead cable using a robot cable it must be movable because of the system configuration, thus the lead cable should be fixed so that the cable with interpolator can be moved.



NOTICE

- When using the product, prevent the lead cable coming out from the gripper body from being repeatedly bent, twisted, or pulled as far as possible.
- Fix the lead cable coming out from the gripper body so that it is routed with the minimum bend radius of 50 mm or more. When fixing the cable using cable ties, be careful not to tie the cable at a point where a load is applied to the cable.
(Will cause cable to break if bent repeatedly)

7. How to Use Length Measuring Function

Output: A/B phase incremental

When using the function, turn on the power and then perform presetting.

8. Precautions With Regard to Installation

NOTICE

- Do not pass the lead cables and connection cables together with the power wire through the same duct.
- Be sure to install the product at least 0.5 m away from any high voltage source, large current source, and large power relay.
- Do not use the cable with interpolator, output cable, and counter in a place where chips, coolant, and machine oil will splash.(This product is not oil- and water-resistant.)

9. Troubleshooting

9-1. Problems and countermeasures

Check the following, and take corrective actions.

Symptom	Cause	Corrective actions
Gripper does not operate	Gripper internal part is broken.	Replace the gripper with a new one.
	Slideways get seized.	Disassemble, and correct the seized part with an oilstone, or replace the gripper with a new one.
	The piston does not operate.	Check that the air pressure is within the operating pressure range.
		Check for air leakage. Check the piping and solenoid valve, and if normal, disassemble and clean the cylinder.
	The switch is faulty or installed incorrectly.	Check that the switch can detect normally.
Lack of master jaw stroke	Much dust exists in master jaws.	Disassemble the gripper, clean it, replace the seals, and apply grease.
Low gripping force	Low air pressure	Check that the air pressure is within the operating pressure range.
	Air leaks from the seal.	Disassemble the gripper, clean it, replace the seals, and apply grease.
	Master jaw movements are not smooth.	Remove the cover and supply grease, and open and close the master jaws several times without gripping any conveyed workpiece.
Disassemble the gripper, clean it, and apply grease.		

WARNING

- If the gripper failed due to a seizure or damage, disassemble the gripper following the disassembly procedure. If the gripper is in the state that you cannot disassemble, do not disassemble it forcibly but please contact us or our agents.
- Stop using the gripper immediately if the situations are not improved though corrective actions given in above table were taken. Continuous use of faulty product or part could cause serious human accidents due to flying gripper or conveyed workpiece.
- The gripper must be repaired only by skilled persons who have received the training course. Repair by unskilled persons or persons other than us or our agents could cause serious human accidents.

9-2. Contact address in case of trouble

Please get in touch with our sales agent from which you purchased the gripper or our office when the gripper troubled.

10. Others

10-1. Standards and directives to which the gripper conforms

This product conforms to the following standards and directives:

- Machinery Directive:2006/42/EC Annex I
- EN ISO 12100:2010
- FCC Part 15 Subpart B Class A Digital Device
- ICES-003 Class A Digital Device
- EN61000-6-4
- EN61000-6-2

10-2. Disposal of gripper

Dispose of this unit in accordance with the laws and regulations of your country.

Kitagawa Corporation Kitagawa Global hand Company
 77-1, Motomachi, Fuchu-shi, Hiroshima, 726-8610, Japan Tel. +81-847-40-0561 Fax. +81-847-45-8911

■ JAPAN DOMESTIC

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