

# INSTRUCTION MANUAL

## MODEL KTS3

### 3-Jaw Parallel Gripper

## 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 parallel gripper (model KTS3) so that you can understand its performance and functions and use it safely and correctly.

Before using this gripper, read this manual 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.



Indicates a hazardous situation which, if you do not heed given instructions, will result in death or serious injuries.



Indicates a hazardous situation which, if you do not heed given instructions, could result in death or serious injuries.



Indicates a hazardous situation which, if you do not heed given instructions, could 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 workpiece by being installed on the robot or loader. The product is equipped with the jaws to grip the workpiece and they are operated by air pressure. Please contact us for other applications.

Kitagawa Iron Works Co., Ltd. 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 Iron Works. Kitagawa Iron Works 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.

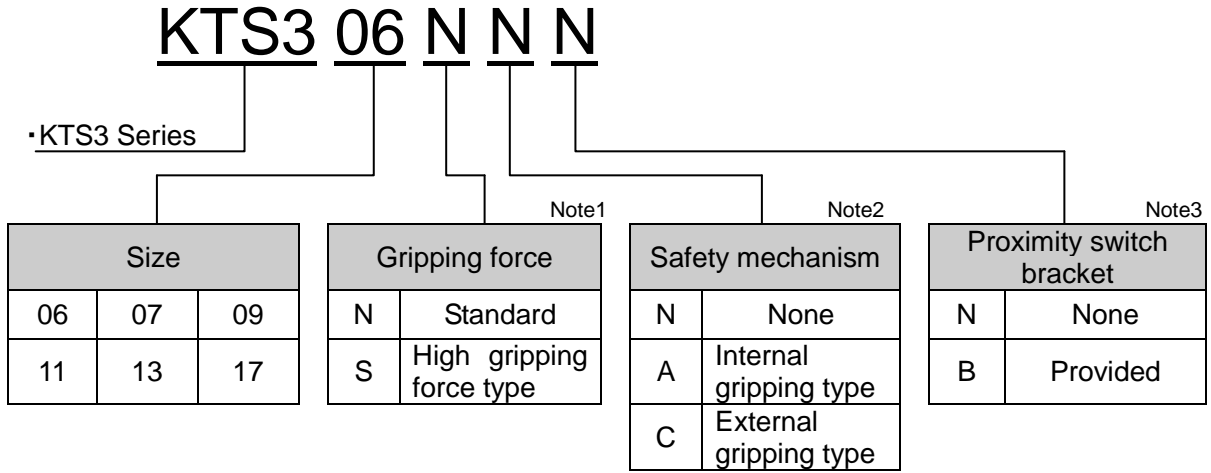
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# 1. Structural Drawing and Parts List

## 1-1. Model Indication

The model indication is as follows:



Note 1: High gripping force type, if selected, can grip the workpiece with higher gripping power than standard gripping force.

However, the high gripping force type has shorter stroke than standard type.

Note 2: The safety mechanism ensures the minimum necessary gripping force mechanically even if the air pressure lowered.

Note 3: This bracket is for mounting the proximity switch to check for jaw opening/closing.

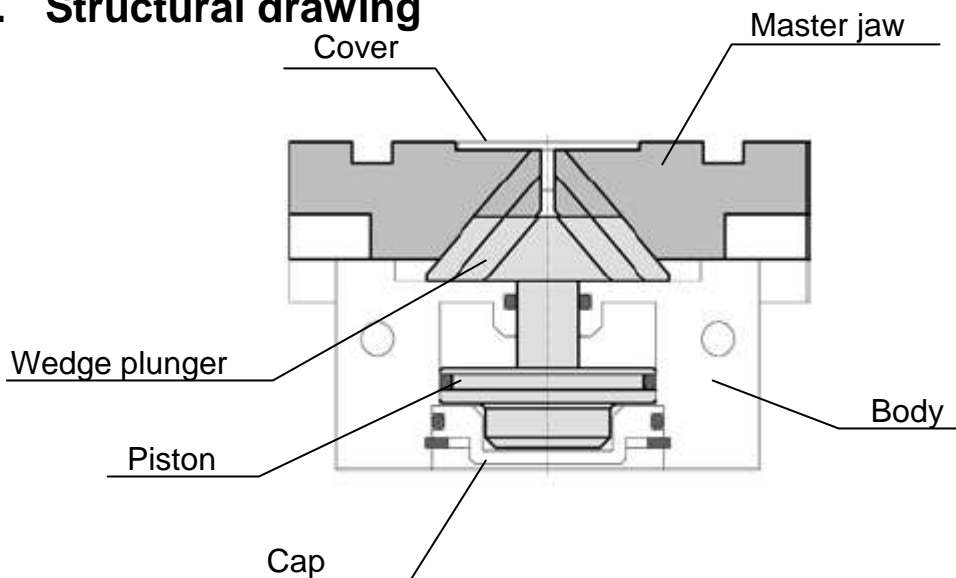
If you select "bracket provided", 2 sets (open side and close side) are supplied.

If you want to use a magnetic switch, its mounting groove is prepared on the circumference of product. Mount the magnetic switch using this groove. (Proximity switch bracket is not necessary.)



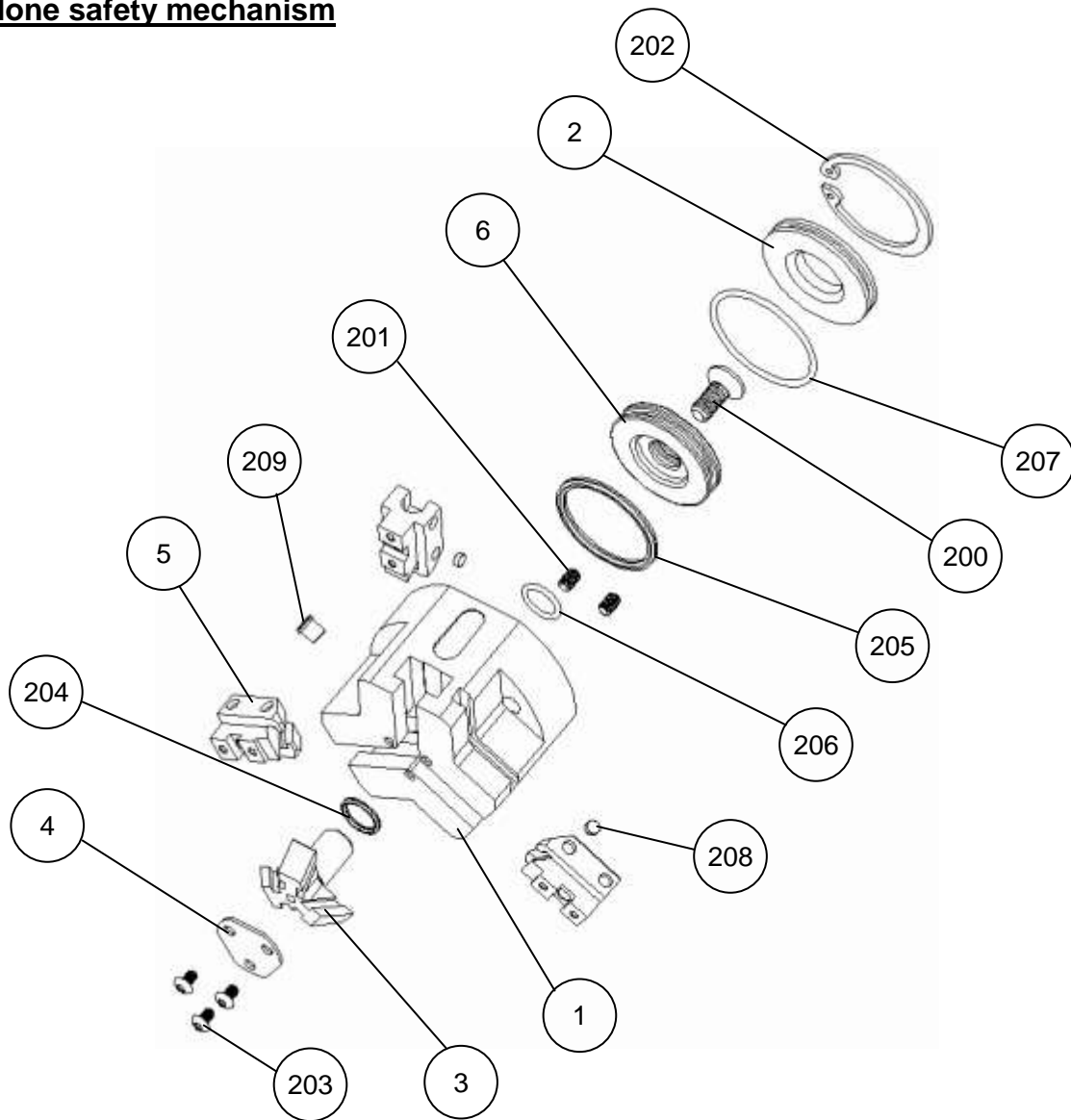
● **Reed switches are not acceptable to be used on KTS306 and KTS307 because they sense the positions of jaw opening and closing unstably. Proximity switches can be replacement for sensing those positions.**

## 1-2. Structural drawing



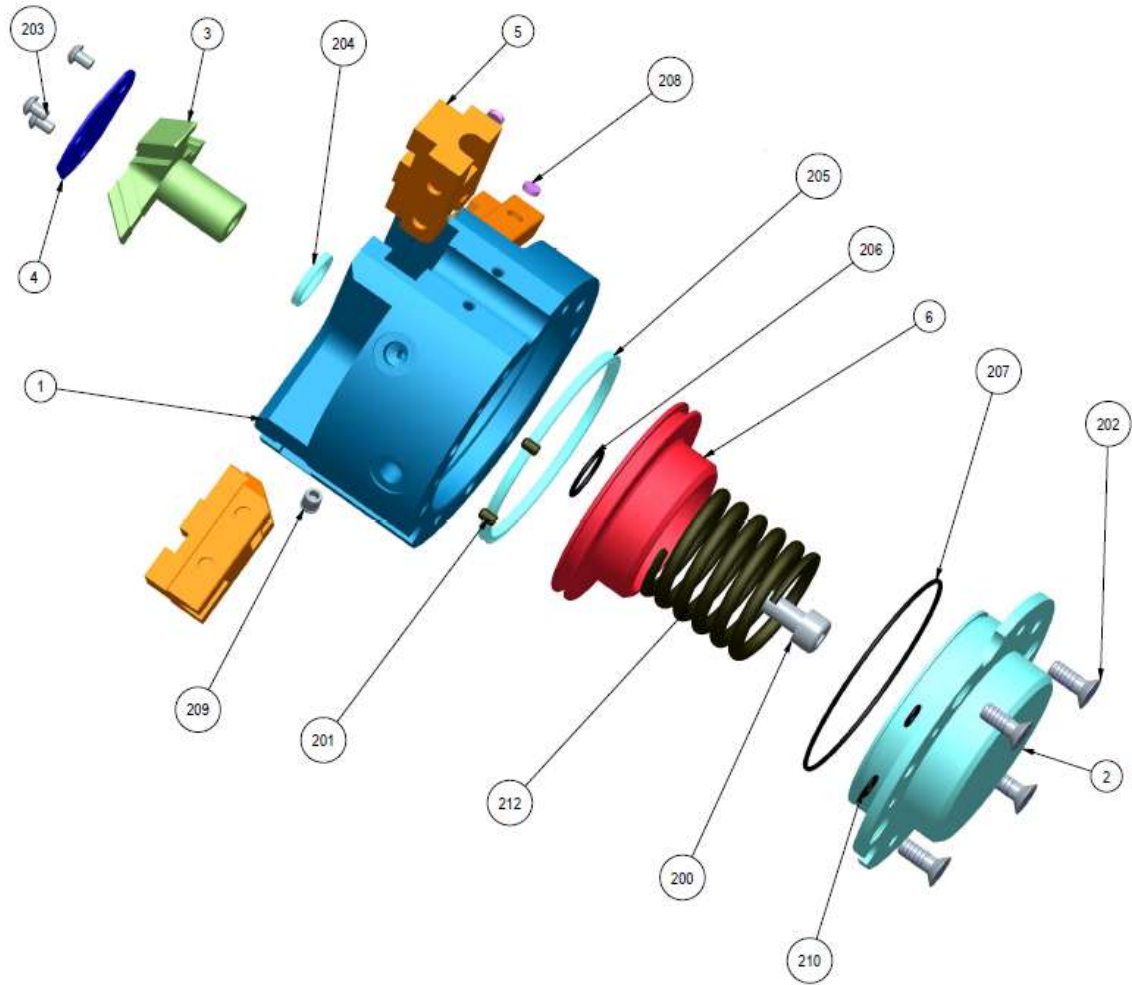
# 1-3. Parts list

## (1) None safety mechanism



No.	Parts name	Quantity	No.	Parts name	Quantity
1	Body	1	202	Snap ring	1
2	Cap	1	203	Cover fixing bolt	3
3	Wedge plunger	1	204	Shaft packing	1
4	Cover	1	205	Piston packing A	1
5	Master jaw	3	206	Piston packing B	1
6	Piston	1	207	Cap packing	1
200	Piston fixing bolt	1	208	Magnet	2
201	Setscrew	2	209	Grease nipple	1

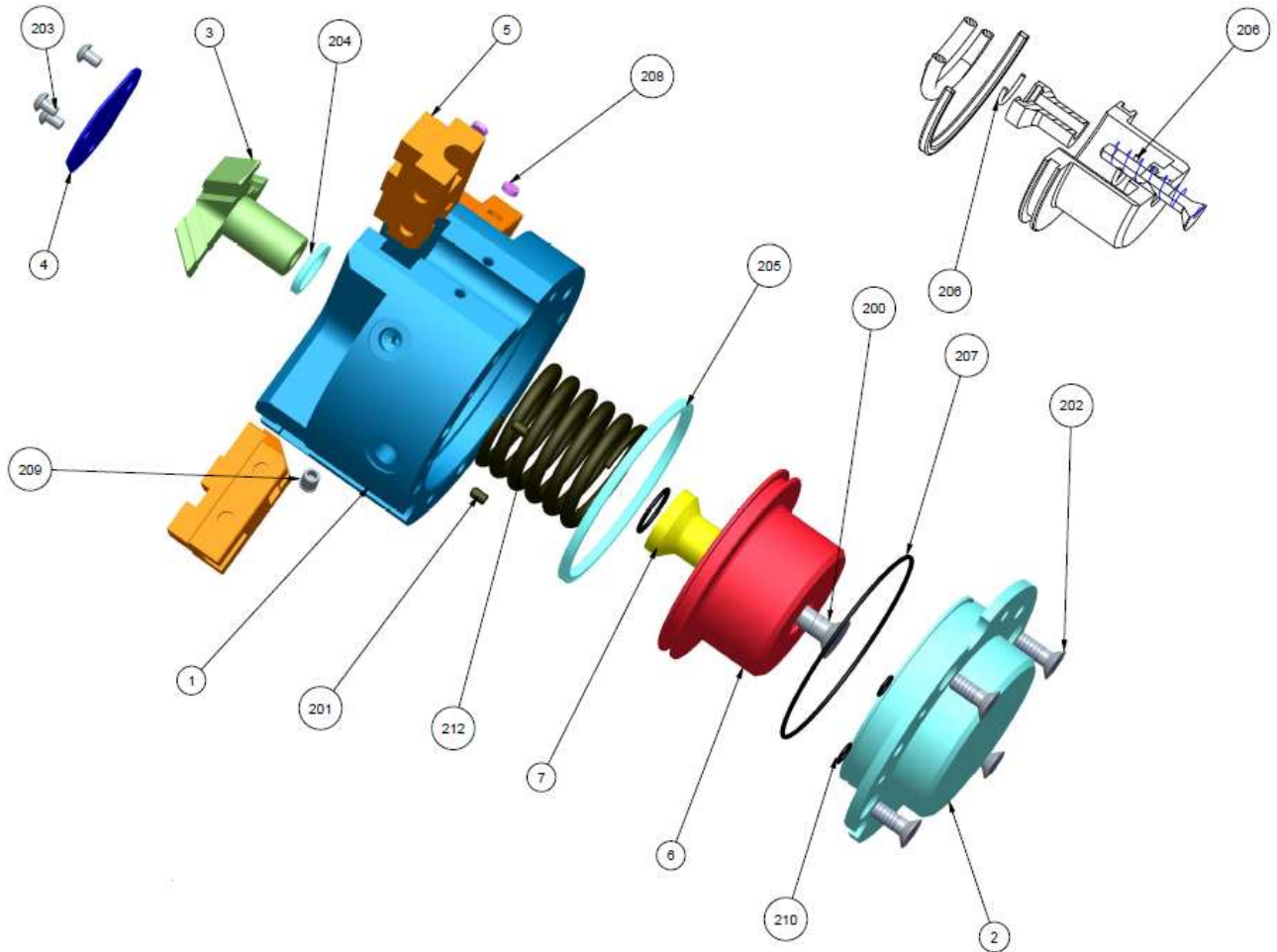
**(2) With safety mechanism of internal gripping type**



No.	Parts name	Quantity	No.	Parts name	Quantity
1	Body	1	203	Cover fixing bolt	3
2	Cap	1	204	Shaft packing	1
3	Wedge plunger	1	205	Piston packing A	1
4	Cover	1	206	Piston packing B	1
5	Master jaw	3	207	Cap packing	1
6	Piston	1	208	Magnet	2
200	Piston fixing bolt	1	209	Grease nipple	1
201	Setscrew	2	210	Axial feed packing	2
202	Cap fixing bolt	4	212	Spring	1



**(3) With safety mechanism of external gripping type**



No.	Parts name	Quantity	No.	Parts name	Quantity
1	Body	1	203	Cover fixing bolt	3
2	Cap	1	204	Shaft packing	1
3	Wedge plunger	1	205	Piston packing A	1
4	Cover	1	206	Piston packing B	2
5	Master jaw	3	207	Cap packing	1
6	Piston	1	208	Magnet	2
7	Shaft	1	209	Grease nipple	1
200	Piston fixing bolt	1	210	Axial feed packing	2
201	Setscrew	2	212	Spring	1
202	Cap fixing bolt	4			

## 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.



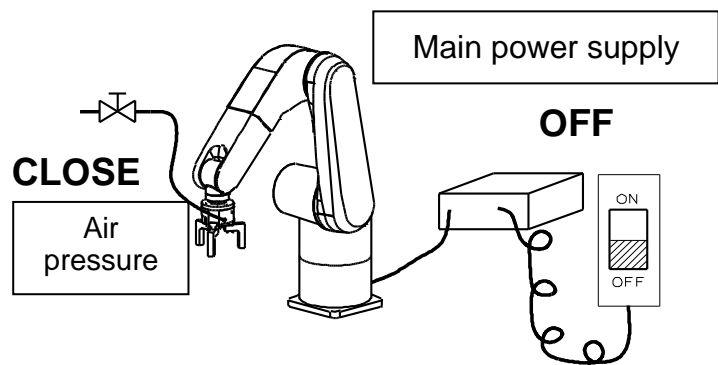
# DANGER

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



Shut down the air pressure and main power supply in the work area when installing, checking, oiling, or replacing the gripper.

- During work, the gripper or robot could move abruptly.
- After shutting down the air pressure, release the residual pressure.
- During work, preclude possible access by outsiders.



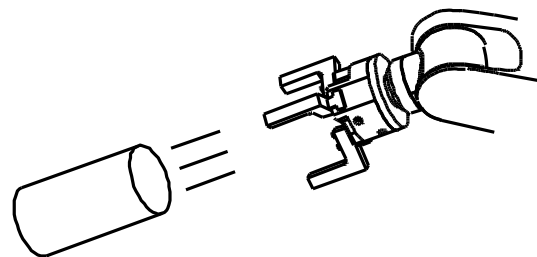
When installing, checking, oiling, or replacing the gripper, post a sign or notice, or provide a fence, and so on to notify people around the machine that work is in progress.

- 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 measures so that the operator is not injured even if the workpiece fall due to the reduced air pressure.

- Take measures such as installation of safeguards or fall preventive covers.





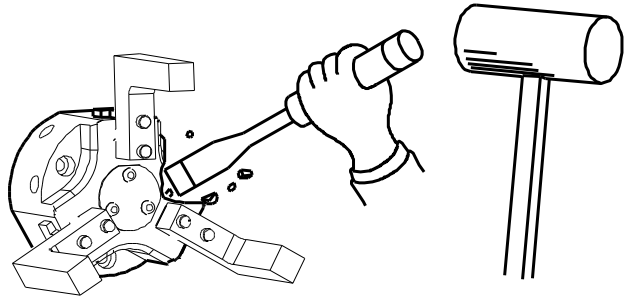
# DANGER

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



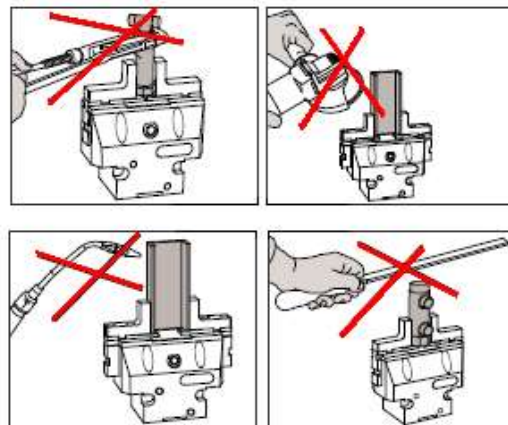
Do not modify the product not mentioned in this instruction manual.

- Using the modified product could cause unexpected accidents.



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 workpiece to fly out.

Bolt Size	Tightening torque		Bolt Size	Tightening torque	
M3	1.0	N·m	M10	36.0	N·m
M4	2.0	N·m	M12	58.5	N·m
M5	4.5	N·m	M14	68.4	N·m
M6	7.65	N·m	M16	115.0	N·m
M8	18.0	N·m	M18	116.0	N·m



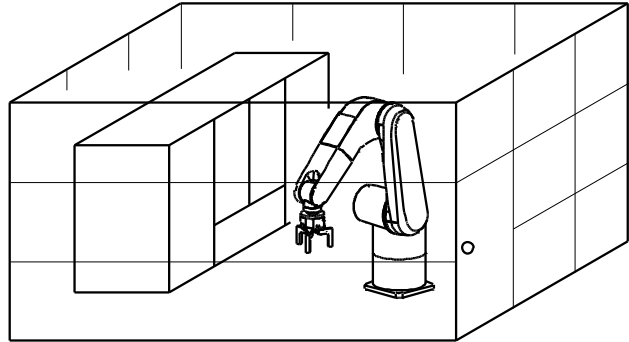
**DANGER**

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 of each country, such as installation of safeguards or safety covers.





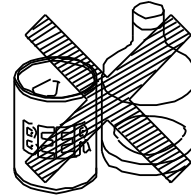
## WARNING

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.



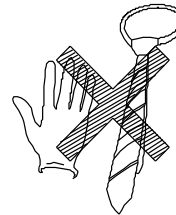
Alcohol

Medicine



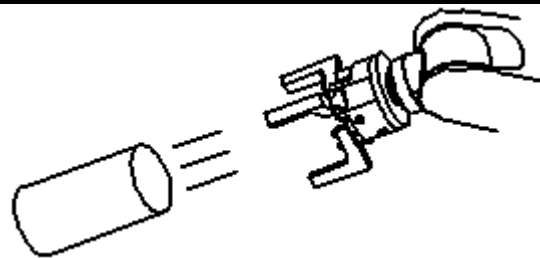
**Do not wear clothing or accessories such as a necktie, necklace, etc. which are easy to be caught in.**

- You may be caught in the gripper.



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

- When selecting a gripper, select the model by referring to "Model selection" in page 12.
- 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. Specifications

#### 3-1. Specification table

Model	KTS											
	306N	306S	307N	307S	309N	309S	311N	311S	313N	313S	317N	317S
Fluid used	Air											
Operating pressure (MPa)	0.2 to 0.8											
Lubrication	Oilless											
Operating temperature range (°C)	5 to 60											
Stroke (diameter) (mm)	8	4	12	6	16	8	20	10	24	12	32	16
Internal volume (reciprocating) (cm <sup>3</sup> )	8.4	8.4	22.1	22.1	45.5	45.5	108	108	201	201	485	485
Repeatability (mm)	±0.01											
Body Mass (kg)	0.26	0.26	0.6	0.6	0.85	0.85	1.3	1.3	2.4	2.4	5	5
Operating humidity range (%)	30 to 95											
Storage temperature range (°C)	-10 to 60											
Noise level (dB)	79											

\*Noise level is measured at a distance of 1m from the gripper in front, rear, left, and right four positions of the gripper.

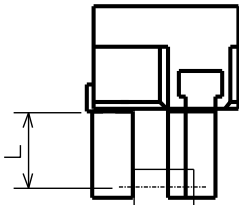
## 3-2. Gripping force

### (1) Standard for selecting a model

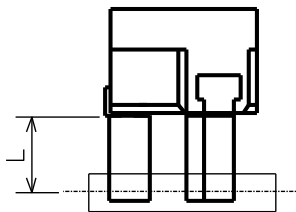
Select the model that provides a gripping force 10 to 20 times the workpiece weight, though a gripping force varies depending on the shape or friction coefficient between jaws and workpiece. Also, select a model having larger gripping force if large acceleration or shock acts.

### (2) Gripping force

#### ● External gripping



#### ● Internal gripping

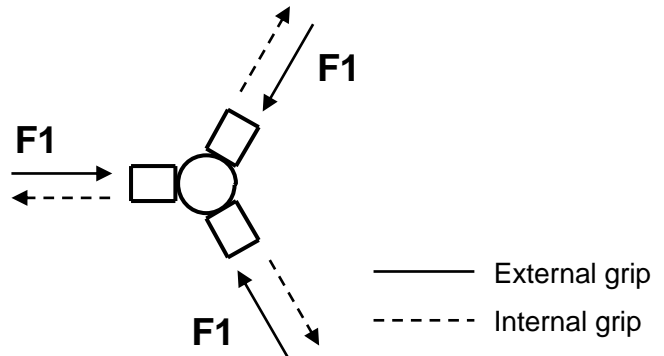


L: Distance up to a grip point(mm)

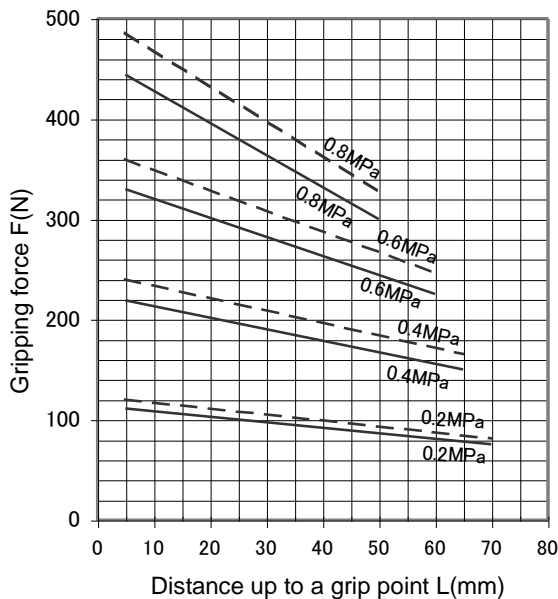
#### ● Expression of gripping force

The gripping force F on the graph shows actual measured gripping force per jaw × the number of jaw.

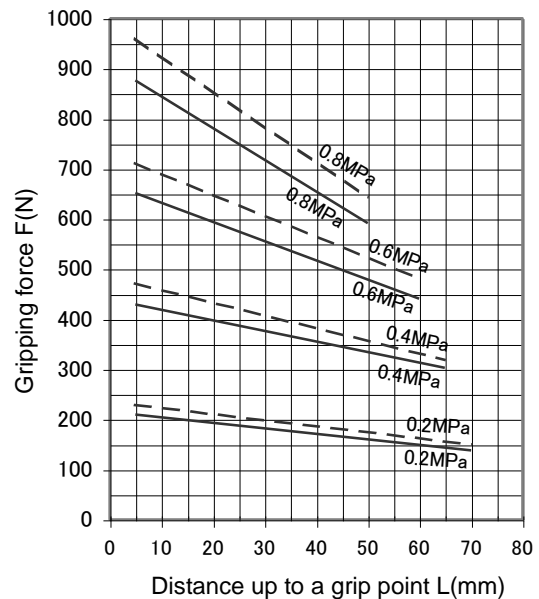
$$(F = F1 \times 3)$$



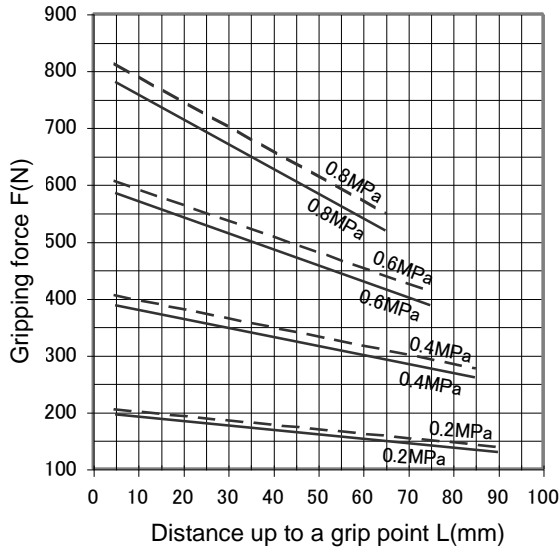
#### ■ KTS306N



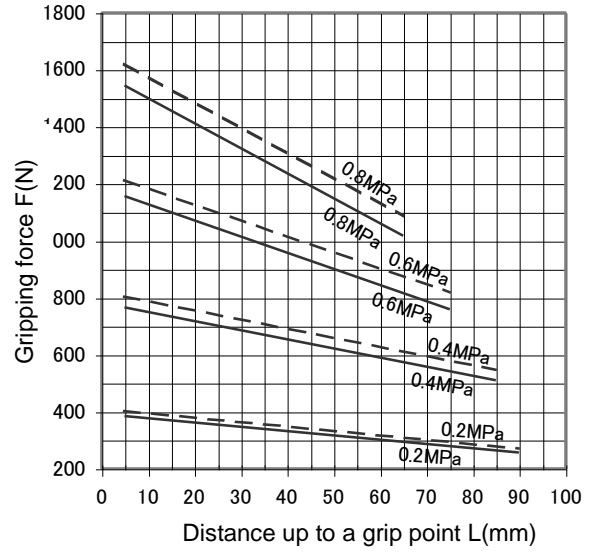
#### ■ KTS306S



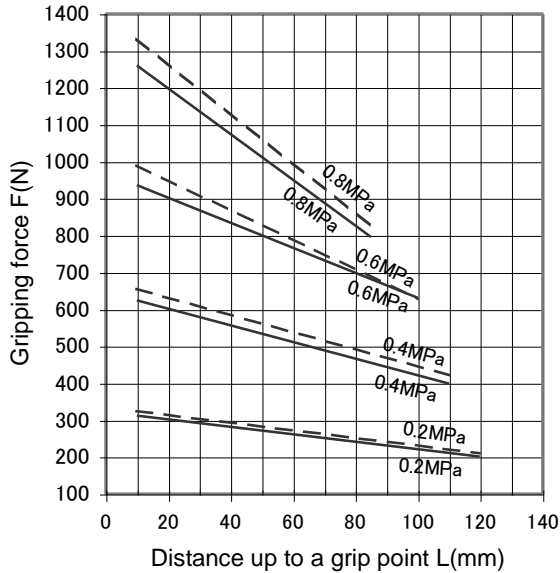
**KTS307N**



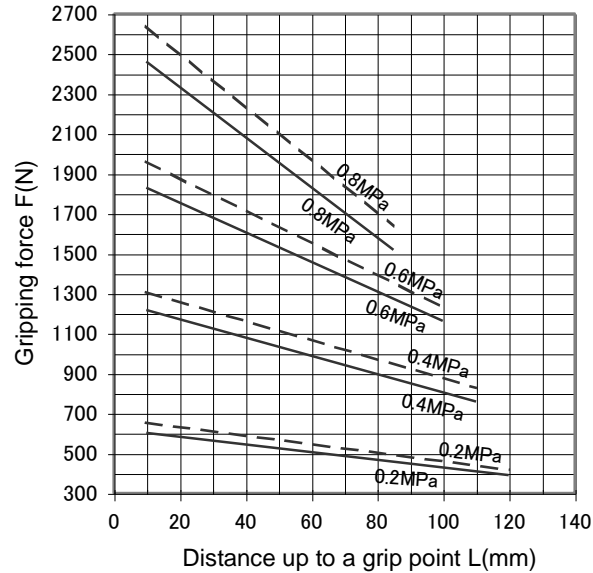
**KTS307S**



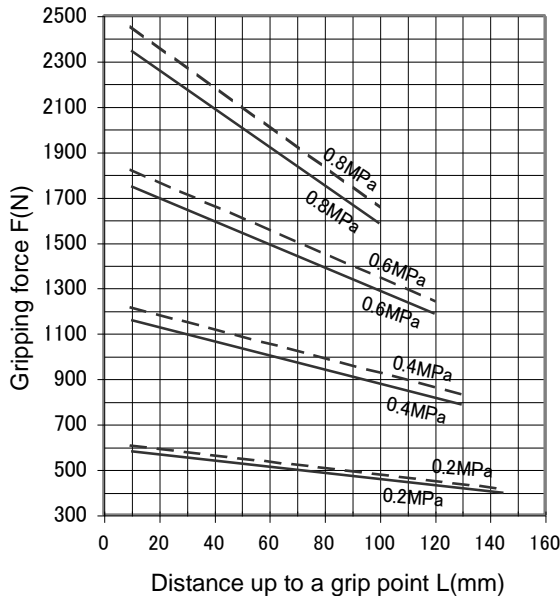
**KTS309N**



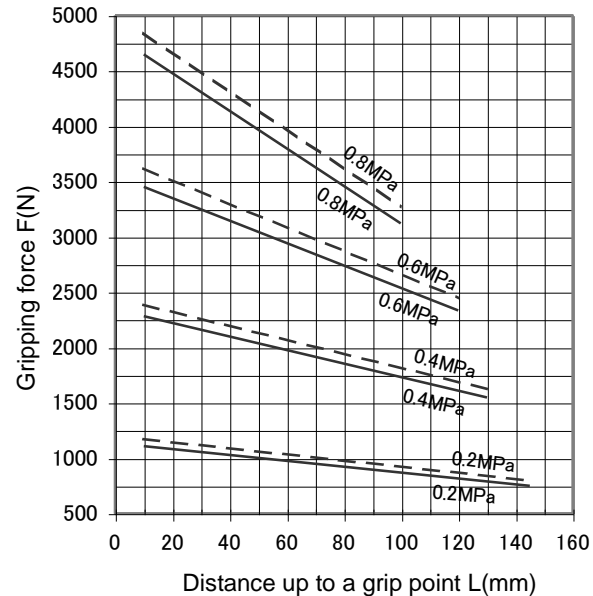
**KTS309S**



**KTS311N**

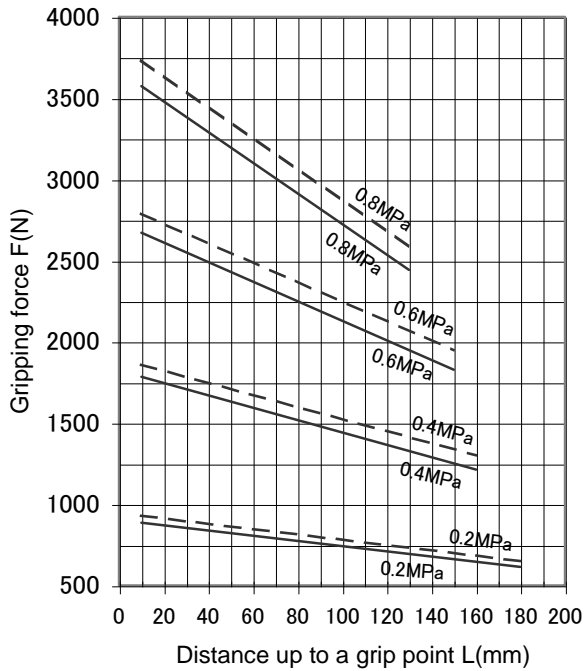


**KTS311S**

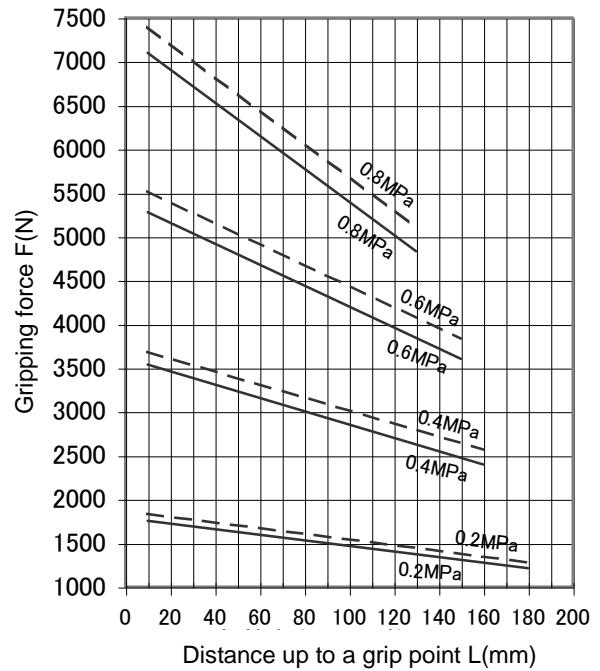




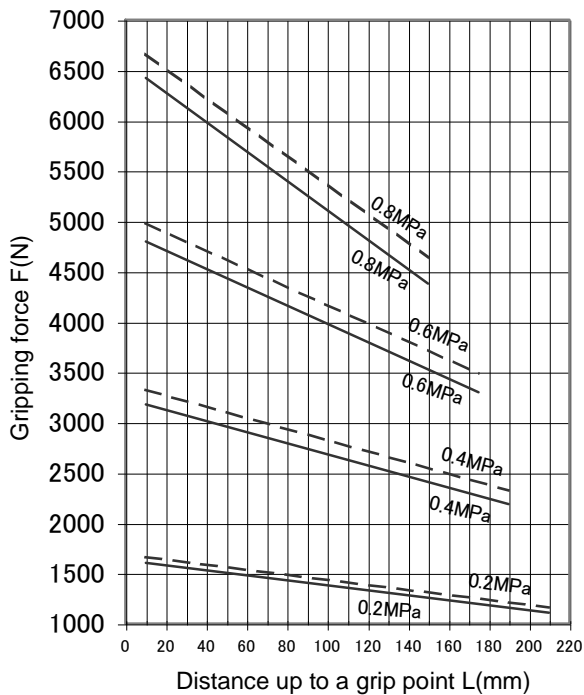
**■ KTS313N**



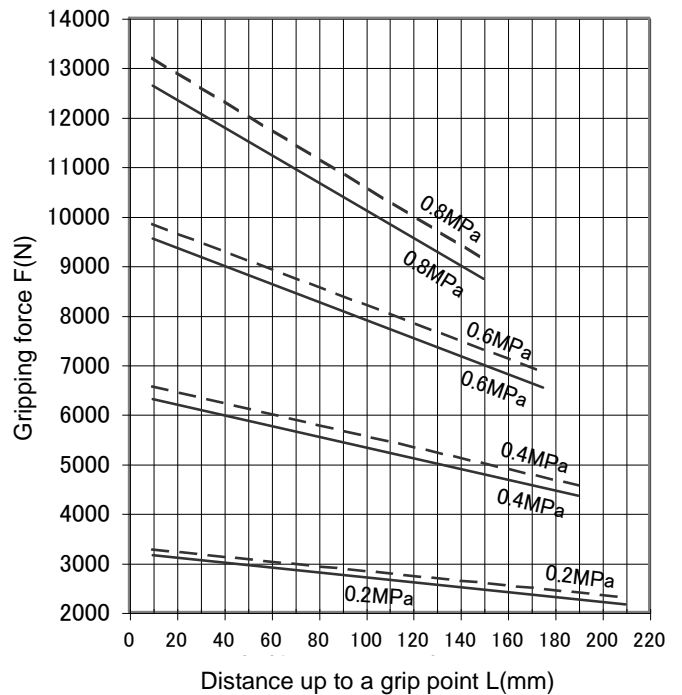
**■ KTS313S**



**■ KTS317N**



**■ KTS317S**



**NOTICE**

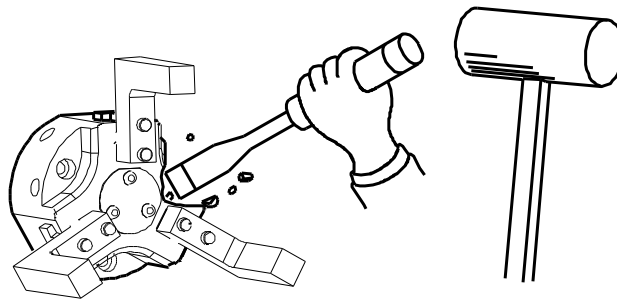
Determine the distance up to a grip point  $L$  as short as possible when designing the jaws. Also, the distance up to a grip point  $L$  should be used within a range shown in graph. If it is used out of the range, the specified gripping force may not be obtained or the wear of sliding parts may be increased.

## 4. Use

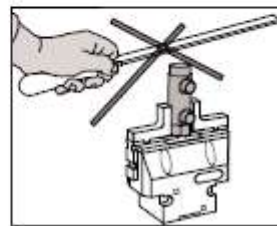
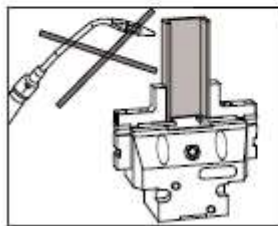
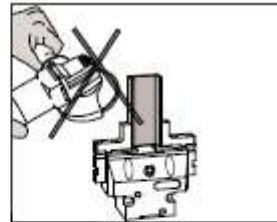
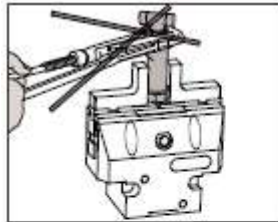
This product supplies pneumatic pressure to the unit to move the jaws to the open or close side for gripping the workpiece and transfers the workpiece up to any location. After transfer, the jaws are moved to the close or open side for removing the workpiece.

### **DANGER**

- Do not modify the product not mentioned in this instruction manual. 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.



- Do not use the gripper as a workpiece fixture when the workpiece is drilled, deburred, welded, or modified additionally.



### **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.

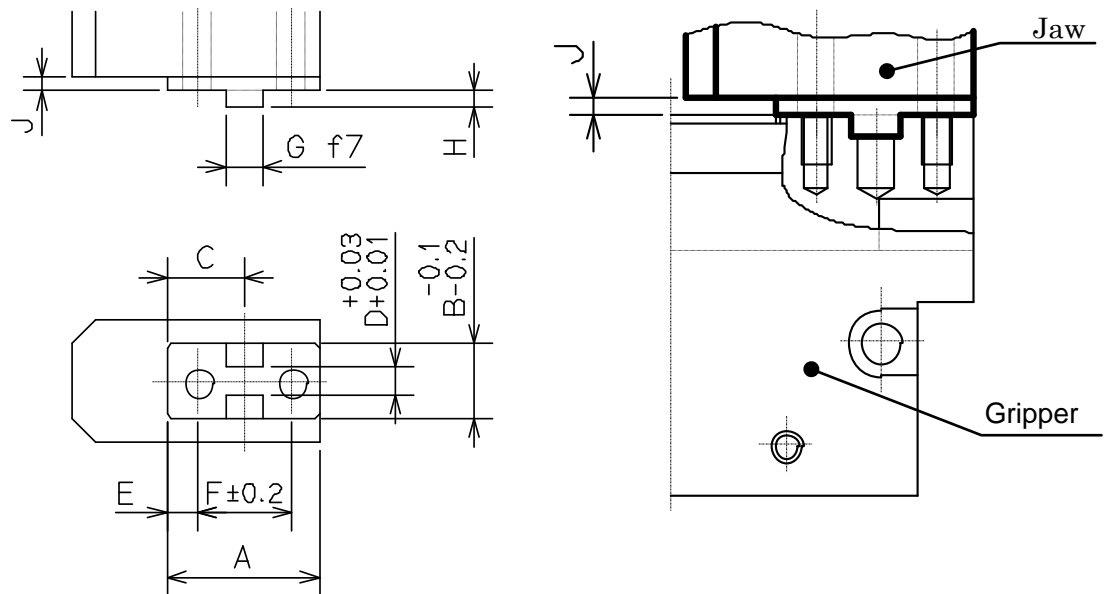
## **NOTICE**

- **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.**

## 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 <sup>(※)</sup>	E	F	G <sup>(※)</sup>	H <sup>(※)</sup>	J
KTS 306N/S	18	8	9	4	3	12	5	2	0.5
KTS 307N/S	21	10	10.5	4	4	13	5	2.5	0.5
KTS 309N/S	25	12	12.5	5	4.5	16	6	3	0.5
KTS 311N/S	32	16	16	6	6	20	8	3.5	0.5
KTS 313N/S	40	19	20	6	8	24	8	4	0.5
KTS 317N/S	50	22	25	8	9	32	10	4	0.5

※ Dimensions D, G, and H in the table are used for positioning the jaws.

Dimension D is used for positioning in the lateral direction, and dimensions G and H are used for positioning in the longitudinal direction.

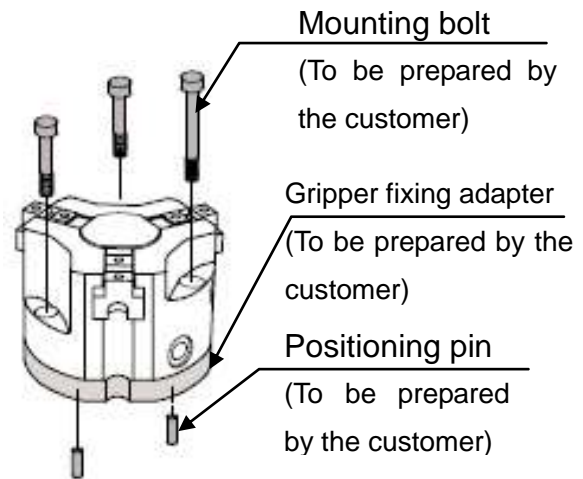
## 6. Installation

### 6-1. Installing the gripper body

#### (1) Front face installation

Install the gripper body using three mounting bolt holes and two positioning pin holes.

The mounting bolts and positioning pins are to be prepared by the customer.

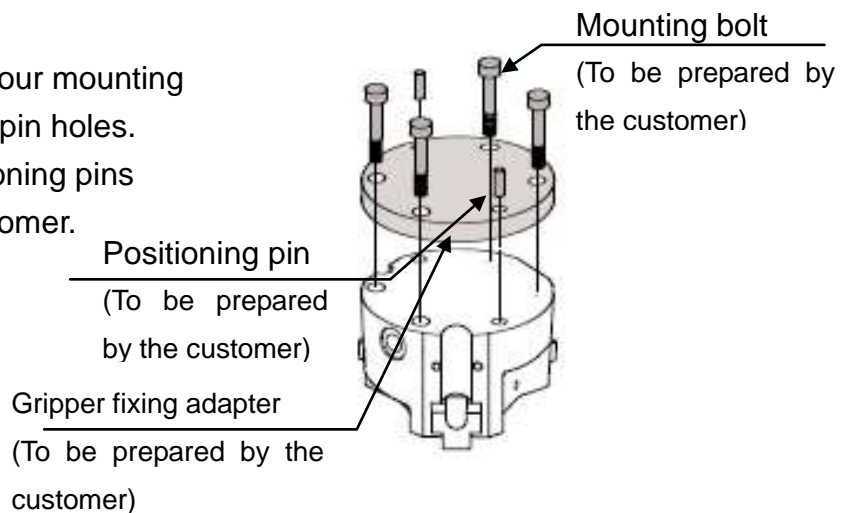


Model	KTS	306	307	309	311	313	317
Mounting bolt size		M3	M5	M6	M6	M8	M8
Positioning pin hole	Diameter (mm)	φ3	φ4	φ5	φ5	φ6	φ6
	Depth (mm)	6	8	10	10	12	12

#### (2) Rear face installation

Install the gripper body using four mounting bolt holes and two positioning pin holes.

The mounting bolts and positioning pins are to be prepared by the customer.



Model	KTS	306	307	309	311	313	317
Mounting bolt	Size	M4	M5	M6	M6	M8	M8
	Thread depth (mm)	8	9	11	11	16	16
Positioning pin hole	Diameter (mm)	φ3	φ4	φ5	φ5	φ6	φ6
	Depth (mm)	6	8	10	10	12	12

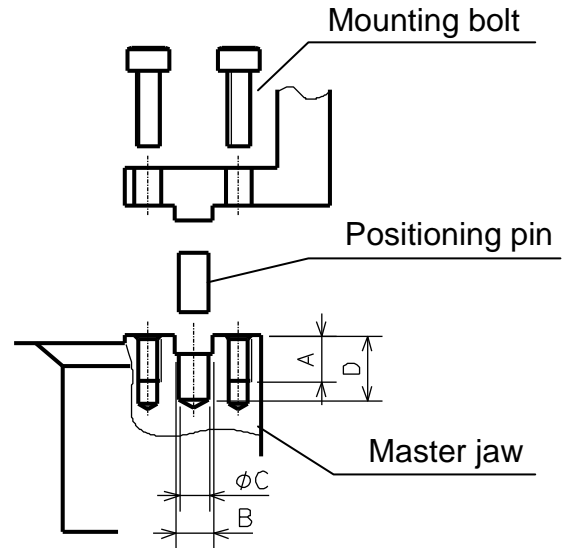
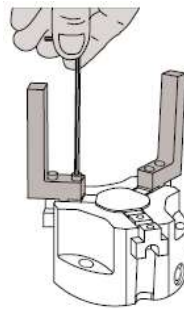
**! DANGER**

- Be sure to tighten the bolts with the specified torque. Lack or tightening torque or excessive torque could break the bolt, causing the gripper or workpiece to fly out.

## 6-2. Installing the jaws

Install the jaws using two mounting bolt holes, fitting portion, and positioning pin hole.

The jaws, mounting bolts, and positioning pins are to be prepared by the customer.



Model	KTS	306	307	309	311	313	317
Mounting bolt	Size	M3	M4	M4	M5	M6	M8
	Thread depth A(mm)	6	8	8	10	12	16
Fitting portion B(mm)		5	5	6	8	8	10
Positioning pin hole	Diameter C(mm)	φ4	φ4	φ5	φ6	φ6	φ8
	Depth D(mm)	8.5	8	9.5	12	12.5	16.5

**! DANGER**

- Be sure to tighten the bolts with the specified torque. Lack or tightening torque or excessive torque could break the bolt, causing the jaw or workpiece to fly out.
- Before installing the jaws, disconnect the air piping.

## 6-3. Installing the switches



- Reed switches are not acceptable to be used on KTS306 and KTS307 because they sense the positions of jaw opening and closing unstably. Proximity switches can be replacement for sensing those positions.

### (1) Installing the magnetic switch

Install the magnetic switch in the magnetic switch mounting groove on the side face of the body.

#### ● Adjustment of close position

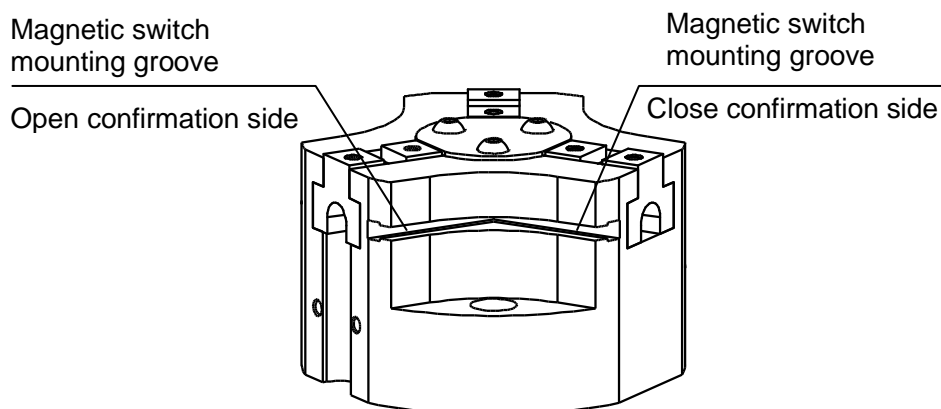
- Move the master jaw to the close position.
- Insert the magnetic switch into the mounting groove on the close confirmation side until it operates.
- Clamp the switch with setscrews.
- Open and close the master jaw to confirm that the switch detects it.

\*In the case of workpiece external gripping, make the above-mentioned adjustment with the workpiece gripped.

#### ● Adjustment of open position

- Move the master jaw to the open position.
- Insert the magnetic switch into the mounting groove on the open confirmation side until it operates.
- Clamp the switch with setscrews.
- Open and close the master jaw to confirm that the switch detects it.

\*In the case of workpiece internal gripping, make the above-mentioned adjustment with the workpiece gripped.



## **(2) Installing the proximity switch**

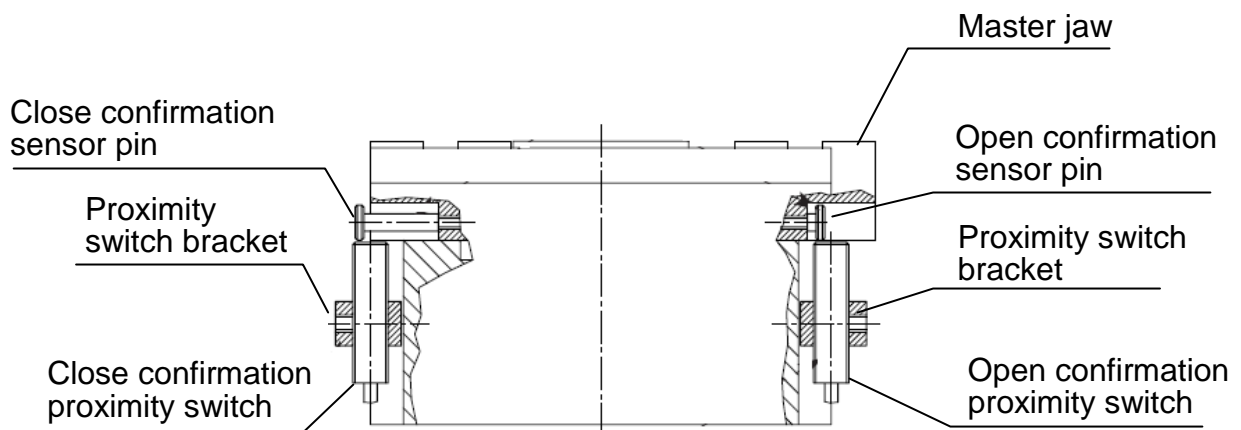
Insert the open confirmation sensor pin and the close confirmation sensor pin into the master jaw.

### ● Adjustment of close position

- Move the master jaw to the close position.
- Install the proximity switch bracket on the side face of the body.
- Insert the proximity switch into the bracket until the switch operates.
- Clamp the proximity switch with setscrews.
- Open and close the master jaw to confirm that the switch detects it.

### ● Adjustment of open position

- Move the master jaw to the open position.
- Install the proximity switch bracket on the side face of the body.
- Insert the proximity switch into the bracket until the switch operates.
- Clamp the proximity switch with setscrews.
- Open and close the master jaw to confirm that the switch detects it.





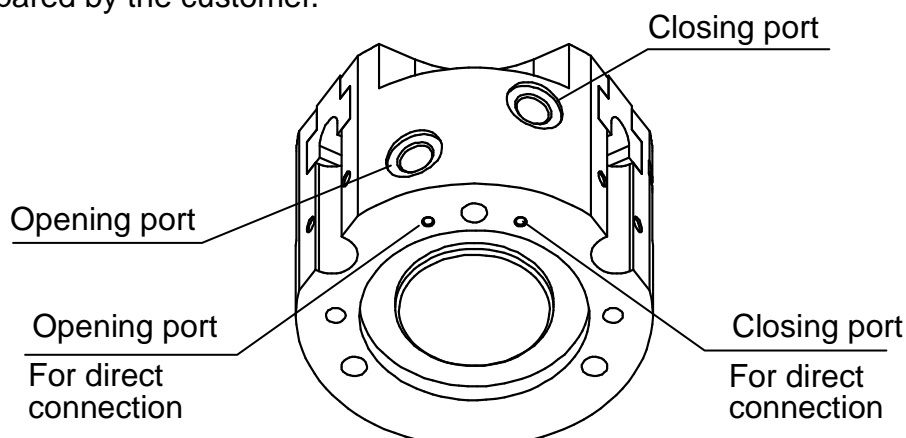
## 6-4. Connecting the air piping

The air pressure supply ports to open and close the gripper jaws are provided on the side face and rear face of the body.

When using the supply port on the side face of the body, connect the air piping directly.

When using the supply port on the rear face of the body, remove the setscrew, which is attached at the delivery to prevent air leakage, and supply air from the adapter to fix the gripper.

The screws to close the opening/closing ports on the side face of the body are to be prepared by the customer.



Model	KTS	306	307	309	311	313	317
Port size		M5	M5	G1/8	G1/8	G1/8	G1/8
Port size (for direct connection)		M3	M3	M3	M4	M5	G1/8

### NOTICE

- The setscrews in the air pressure supply ports on the body rear face are mounted with adhesive applied to them to prevent air leakage, so it is very difficult to remove them. Therefore, when removing the setscrews, be careful not to damage them.
- After removing the setscrews, take away adhesive fixed to the body screw hole clearly. Be careful not to drip the adhesive into the cylinder.

### WARNING

- Shut off the air piping paths when the air pipes are connected.

## 7. Maintenance and Checking

### 7-1. Periodic checking

- Before work or at the grease supply, move the jaws over full stroke to check that the jaws are within the full stroke range.
- At the end of work, clean the gripper body and sliding surfaces with an air gun.
- At least every three months, check that respective bolts have been tightened.

### 7-2. Maintenance interval

- The interval between maintenance is 1 million cycles. After 1 million times open and close, disassemble the gripper, and clean, inspect, replace the seals, apply grease, and reassemble the gripper.

### 7-3. Grease supply

#### (1) Filling location

- Supply grease from the grease nipple on the side face of the body using a grease gun. After that, open and close the jaws several times without gripping the workpiece.

#### (2) Grease used

- Be sure to use the specified grease listed below. If unspecified grease is used, adequate effect may not be obtained.

Brand	Manufacturer
CHUCK GREASE PRO	Kitagawa genuine grease (Kitagawa sales agents in each country)
Kitagawa Chuck Grease	Former Kitagawa genuine grease (not available at present)
Molykote EP Grease	Toray Dow Corning: Japan domestic only
Chuck-EEZ Grease	Kitagawa-NorthTech Inc. : North America territory
Molykote TP-42	Dow Corning: Europe and Asia territories
Klueber Paste ME31-52	Klueber Lubrication: Whole world

### **(3) Supply frequency**

- Supply the grease once per 1 million cycles.
- Increase the supply frequency according to the operating conditions such as the use of large quantity of water-soluble coolant.



- **Grease supply is important to use the grease for a long period of time under best condition. Lack of grease supply will cause reduced gripping force, operation failure due to low pressure, reduced gripping accuracy, abnormal wear, or seizure. Reduced gripping force causes the workpiece to fly out.**

### **(4) Safety information on grease and antitrust oil**

#### **Scope of application**

- Specified grease
- Antitrust oil applied to the product at delivery

#### **First-aid treatment**

- **Aspiration:** In case of much aspiration, go to a place where there is fresh air, and cover your body with a blanket to keep your body warm. Consult a doctor if necessary.
- **Sticking to your skin:** Wipe off the oil, and wash your skin with water and soap. If you feel itchy or you get inflamed, consult a doctor immediately.
- **Entering your eye:** Wash your eye with fresh water for at least 15 minutes, and then consult a doctor.
- **Accidental drinking:** Consult a doctor immediately without vomiting forcibly.
- **For the grease other than the specified one and antitrust oil prepared by the customer,** refer to the safety information prepared for respective oils.

## 7-4. Disassembly

### Disassembly procedure

By referring to the parts list on page 5, disassemble the product through the procedure below:

- (1) Disconnect the air piping.
- (2) Remove the snap ring (No.202) and remove the cap (No.2).
- (3) Loosen the piston fixing bolt (No.200) and remove the piston (No.6).
- (4) Loosen the cover fixing bolt (No.203) and remove the cover (No.4).
- (5) Push the wedge plunger (No.3) forward to remove.
- (6) Remove the master jaws (No.5).

Reassemble the product through reverse procedure of disassembly while applying the grease.

Of three master jaws (No.5), the magnets (No.208) for switch detection are attached on the side face of two master jaws. When reassembling the product, install the master jaws so that the magnets come to the switch mounting groove side on the side face of the body.



- **Be sure to tighten the bolts with the specified torque. Lack or tightening torque or excessive torque could break the bolt, causing the workpiece to fly out.**

## 8. Troubleshooting

### 8-1. Gripper is faulty

Check the following, and take corrective actions.

Symptom	Cause	Corrective actions
Gripper does not operate	Gripper internal part is broken	Disassemble, and replace broken part
	Slideways get seized	Disassemble, and correct the seized part with an oilstone, or replace the part
	Cylinder does not operate	Check if 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	
Switch is faulty or mounting failure	Check if the switch operates normally	
Lack of master jaw stroke	Much dust exists in master jaws	Disassemble and clean the gripper
Low gripping force	Air pressure is low	Set the air pressure within operating pressure range
	Air leaks from the seal	Disassemble and replace the seal
	Master jaw movements are not smooth	Supply grease from grease nipple, and open and close the master jaws several times without gripping the workpiece
		Disassemble and clean the gripper

### 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 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.

### 8-2. Contact address in case of trouble

Please get in touch with our sales agent from which you purchased the gripper or our office of the address given on the back cover when the gripper troubled.

## **9. Others**

### **9-1. 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 12100-1:2003+A1:2009
- EN ISO 12100-2:2003+A2:2009

### **9-2. Disposal of gripper**

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