CKD

Grippers For Collaborative Robot

UNIVERSAL ROBOTS Certified Grippers

RLSH Series

RHLF Series

RCKL Series

INSTRUCTION MANUAL

SM-A28840-A/2

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's **" RLSH Series / RHLF Series / RCKL Series " Grippers For Collaborative Robot.**
This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly. Keep this Instruction Manual in a safe place and be careful not to lose it.
Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- The product is intended for users who have basic knowledge about materials, piping, electricity, and mechanisms of pneumatic components. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur due to fluid, piping, or other conditions. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device, the fluid control circuit, and the electric system that controls such mechanism is ensured.

To ensure the safety of device design and control, observe organization standards, relevant laws and regulations, which include the following:

ISO 10218、ISO 12100、JIS B 8433
ISO/TS 15066
ISO 4414、JIS B 8370、JFPS 2008(the latest edition)

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠DANGER	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠WARNING	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠CAUTION	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.

The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.

The product must not be used beyond its specifications. Also, the product must not be modified and additional work on the product must not be performed.

The product is intended for use in devices or parts for general industrial machinery. It is not intended for use outdoors or in the conditions or environment listed below.

- In applications for nuclear power, railroad system, aviation, ship, vehicle, medical equipment, and equipment that directly touches beverage or food.
- For special applications that require safety including amusement equipment, emergency shut-off circuit, press machine, brake circuit, and safety measures.
- For applications where life or properties may be adversely affected and special safety measures are required.

(Exception is made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

Do not handle the product or remove pipes and devices until confirming safety.

- Inspect and service the machine and devices after confirming the safety of the entire system. also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that incorporates pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

Precautions on Design and Selection

⚠DANGER

Install a protective cover as a safety measure if the moving workpiece can pose a risk to humans or if human fingers can get caught in the finger and/or the attachment.

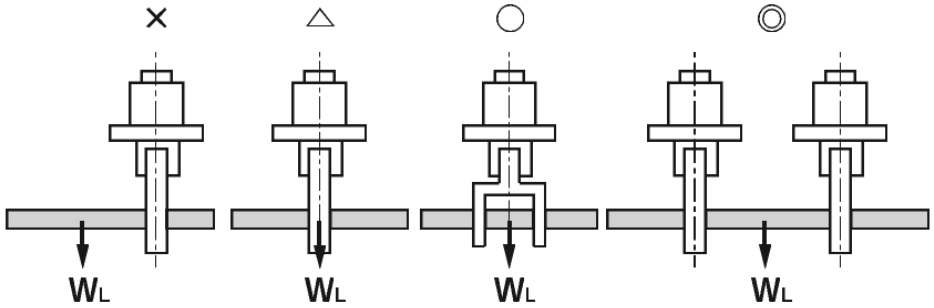
In the circuit pressure drops due to power failure or air source trouble, the gripping force will decrease and the work-piece may fall. Take measures such as drop prevention to prevent injury or damage to the human body or mechanical equipment.

⚠CAUTION

When using the product in a cutting, casting, or welding plant, install a cover to prevent foreign matters such as cutting fluid, chips, powder, and dust from entering.
Do not use the equipment in the following environments.

- Where cutting oil can splash onto the product (abrasives and polishing powder in the oil can abrade the sliding section)
- Where organic solvents, chemicals, acids, alkalis, and kerosene are present
- Where water can splash onto the product

When gripping a long object or large work-piece, the center of gravity must be gripper to provide stable prehension. It is also necessary to stabilize prehension by increasing the size or using multiple jaws.

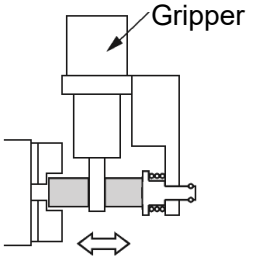


Select a modle that has sufficient power to grip the work-piece weight.

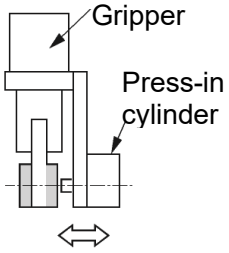
Select a model that has sufficient opening/closing width for the work-piece size.

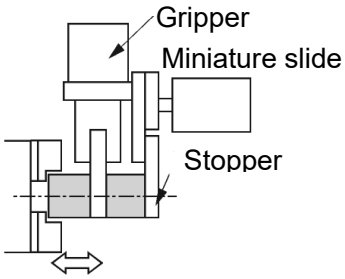
If directry inserting the work-piece into the jig with the hand, consider clearance during design to avoid damaging the hand.

●Pressing to jig by dispensing



●Using a push cylinder





Note :The work-piece is side along the top of the small jaw, so gripper life could drop markedly. Sufficient consideration should be made for the shape of the small jaw.

Ajust the gripper opening/closing speed with a speed control valve. When using at high speed, play may be faster, the work-piece vibrates due to the shock at opening and closing, causing a gripper error, work-piece insertion error, poor repeatability.
Condensation (water drops) may occur in the piping under certain conditions if an actuator with small bore size or short stroke is operated at high frequency. Use a quick exhaust valve to prevent condensation.

Precautions on Product Disposal

⚠CAUTION

When disposing of the product, comply with laws pertaining to disposal and cleaning of wastes and have an industrial waste disposal company dispose of the product.

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1. PRODUCT OVERVIEW

1.1 Model Number Indication

1.1.1 RLSH Series

RLSH – A20D1N – L1 – F Y2V – UR

(A)Robot flange (B)Attachments

Code	Content
(A) Robot Flange	
Blank	Without robot flange
F	With Robot flange (Note 1)

Symbol	Content
(B) Attachments	
Blank	Without attachments
Y2	Small jaw for testing (Note 2)
V	Directional control valve/tube (Note 3)

Note 1 : With robot flange mounting bolts

Note 2 : Because it is made of resin, use it for gripping tests (Mass is 25g per piece)

Note 3 : Directional control valve includes a φ4 push-in fitting (air supply port and A/B port), silencer (R1/R2 port), and mounting plate. The tube has an outer daiameter of φ4 and a length of 2.5m × 2 pieces.

Note 4 : Standard with cylinder switch(F2H).

1.1.2 RHLF Series

RHLF – 16CS – F Y2V – UR

(A)Robot flange (B)Attachments

Code	Content
(A) Robot Flange	
Blank	Without robot flange
F	With Robot flange (Note 1)

Symbol	Content
(B) Attachments	
Blank	Without attachments
Y2	Small jaw for testing (Note 2)
V	Directional control valve/tube (Note 3)

Note 1 : With robot flange mounting bolts

Note 2 : Because it is made of resin, use it for gripping tests (Mass is 30g per piece)

Note 3 : Directional control valve includes a φ4push-in fitting (air supply port and A/B port), silencer (R1/R2 port), and mounting plate. The tube has an outer daiameter of φ4 and a length of 2.5m × 2 pieces.

Note 4 : Standard with cylinder switch(T2H).

1.1.3 RCKL Series

RCKL – 40CS – F Y3V – UR

(B)Attachments

(A) Robot flange

Code	Content
(A) Robot Flange	
Blank	Without Robot flange
F	With Robot flange (Note 1)

Symbol	Content
(B) Attachments	
Blank	Without attchments
Y3	Small jaw for testing (Note 2)
V	Directional control valve/tube (Note 3)

Note 1 : With robot flange mounting bolts

Note 2 : Built-to-order product, made of aluminum. (Mass is 50g per piece)

Note 3 : Directional control valve includes a φ4push-in fitting (air supply port and A/B port), silencer (R1/R2 port), and mounting plate. The tube has an outer daiameter of φ4 and a length of 2.5m × 2 pieces

Note 4 : Standard with cylinder switch(T2H).

1.1.4 Option (Please contact us for single item model number)

■ Attachment <Y2,Y3>

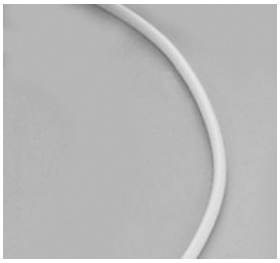
Attachment for testing <Y2>(RLSH,RHLF), <Y3>(RCKL)

Note: The figure on the right is for RLSH. For other models, refer to the dimensional drawings.

< Accessory >
- Attachments 2pieces (RLSH,RHLF), 3pieces (RCKL)
- Mounting Bolts

■ Valve,tube <V>

< Accessory >
- Double solenoid valve 1pc
- Mounting plate 1pc
- φ4push-in fitting 1pc
- Silencer 2pc
- φ4 tube 2.5m×2pc



1.2 Speciffications

1.2.1 RLSH Series

■ Product specifications

Descriptions		RLSH
Cylinder bore size	mm	φ20
Actuation		Double acting
Working fluid		Compressed air
Max.working pressure air	MPa	0.7
Min.working pressure air	MPa	0.1
Port size (Tube size)		Applicatable tube outer diameter φ4 (With speed control valve)
Ambient temperature	°C	0 to 50
Operational stroke length	mm	18
Repeatability	mm	±0.01
Product weight	kg	1

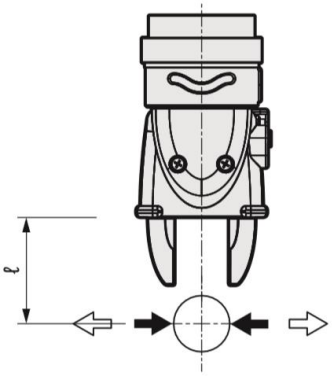
■ Sencor Specifications

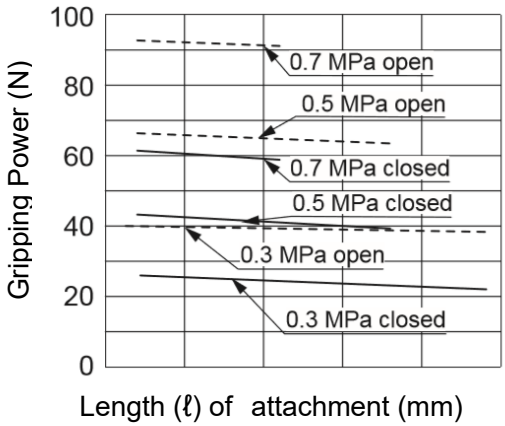
Descriptions		Proximity 2-wire
		F2H
Applications		Programable controller
Load supply voltage		10 to 30VDC
Load current		5 to 20mA
Indicator light	Gripper	Yellow LED (ON lighting)
	Flange	Blue,Green
Leakage current		1 mA or less
Shock resistance		980 m/s^2
Product weight	g	10

■ Gripping power performance data

Gripping power that functions to opening and closing directions for the length (ℓ) of attachment of gripper at supply pressure 0.3,0.5,0.7MPa is shown. (Represent one finger)

・Opening direction (⇦) – – – – (Dashed line indication)
・Closing direction (➡) ——— (Solid line indication)





1.2.2 RHLF Series

■ Product specification

Descriptions		RHLF
Cylinder bore size	mm	φ16×2
Actuation		Double acting
Working fluid		Compressed air
Max.working pressure air	MPa	0.7
Min.working pressure air	MPa	0.2
Port size(Tube size)		Applicatable tube outer diameter φ4 (With speed control valve)
Ambient temperature	℃	5 to 50
Operational stroke length	mm	32
Repeatability	mm	±0.03
Product weight	kg	1.1

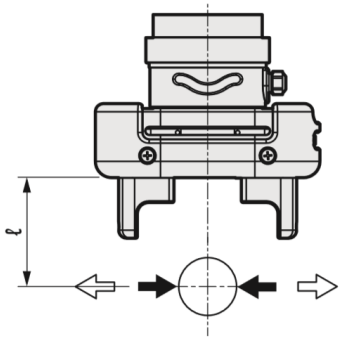
■ Sencor Specifications

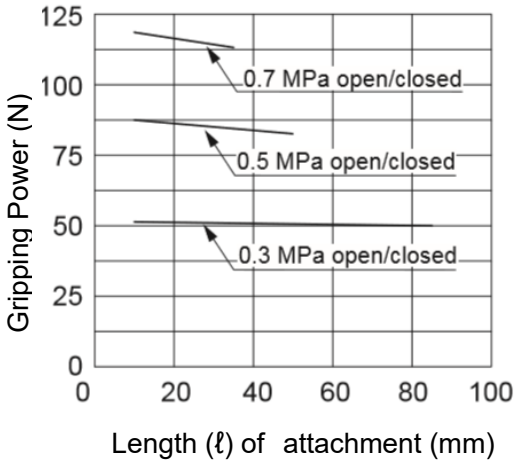
Descriptions		Proximity 2-wire
		T2H
Applications		Programable controller
Load supply voltage		10 to 30VDC
Load current		5 to 20mA
Indicator light	Gripper	Red LED (ON lighting)
	Flange	Blue,Green
Leakage current		1 mA or less
Shock resistance		980 m/s^2
Product weight	g	18

■ Gripping power performance data

Gripping power that functions to opening and closing directions for the length (ℓ) of attachment of gripper at supply pressure 0.3,0.5,0.7MPa is shown. (Represent one finger)

・Opening direction(⇦)・Closing direction(➡)
——— (Solid line indication)





1.2.3 RCKL Series

■ Product specification

Descriptions		RCKL
Cylinder bore size	mm	φ40
Actuation		Double acting
Working fluid		Compressed air
Max.working pressure air	MPa	0.7
Min.working pressure air	MPa	0.3
Port size(Tube size)		Applicatable tube outer diameterφ4 (With speed control valve)
Ambient temperature	℃	5 to 50
Operational stroke length	mm	10
Repeatability	mm	±0.01
Product weight	kg	1.1

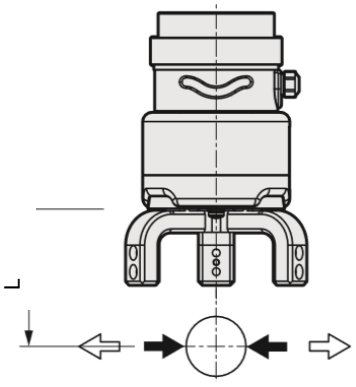
■ Sencor Specifications

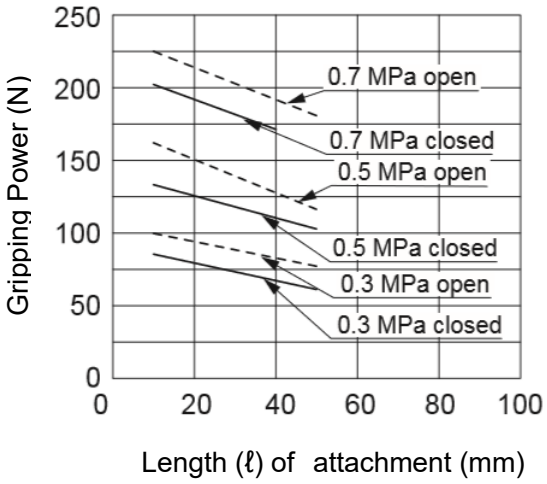
Descriptions		Proximity 2-wire
		T2H
Applications		Programable controller
Load supply voltage		10 to 30VDC
Load current		5 to 20mA
Indicator light	Gripper	Red LED (ON lighting)
	Flange	Blue,Green
Leakage current		1 mA or less
Shock resistance		980 m/s^2
Product weight	g	18

■ Gripping power performance data

Gripping power that functions to opening and closing directions for the length (ℓ) of attachment of gripper at supply pressure 0.3,0.5,0.7MPa is shown. (Represent one finger)

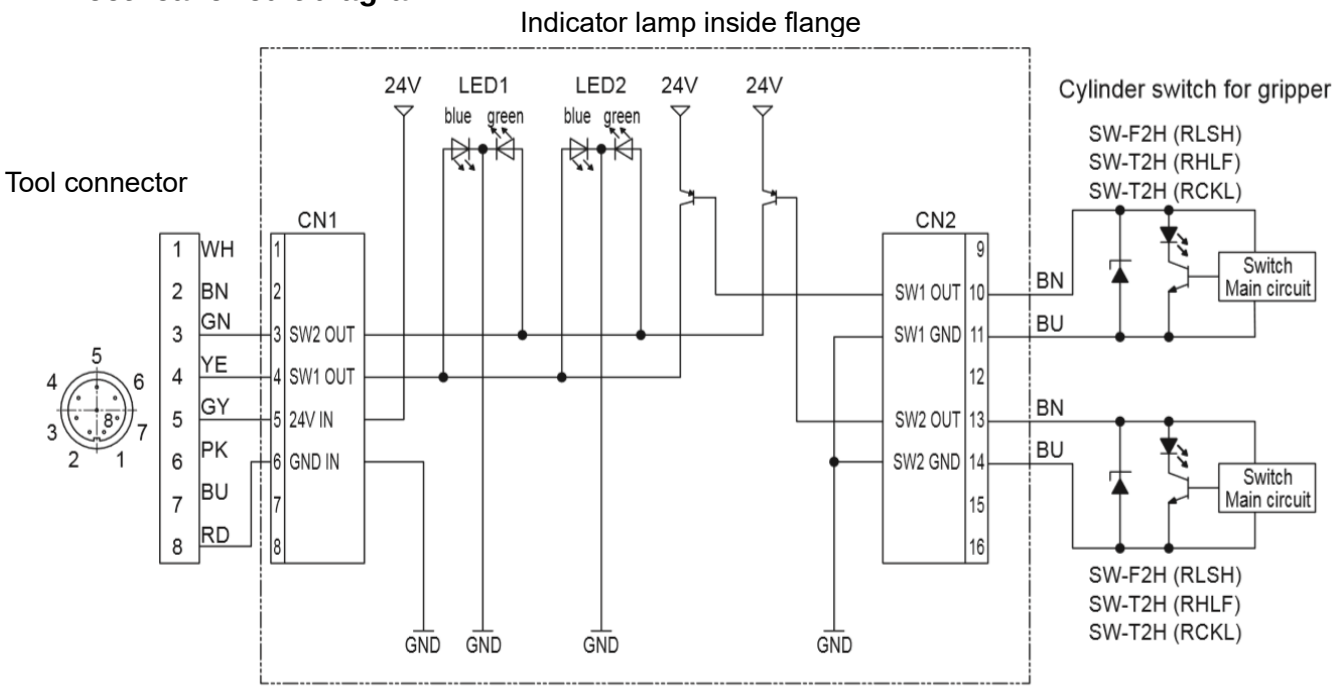
・Opening direction(⇦) - - - - (Dashed line indication)
・Closing direction (➡) ———(Solid line indication)





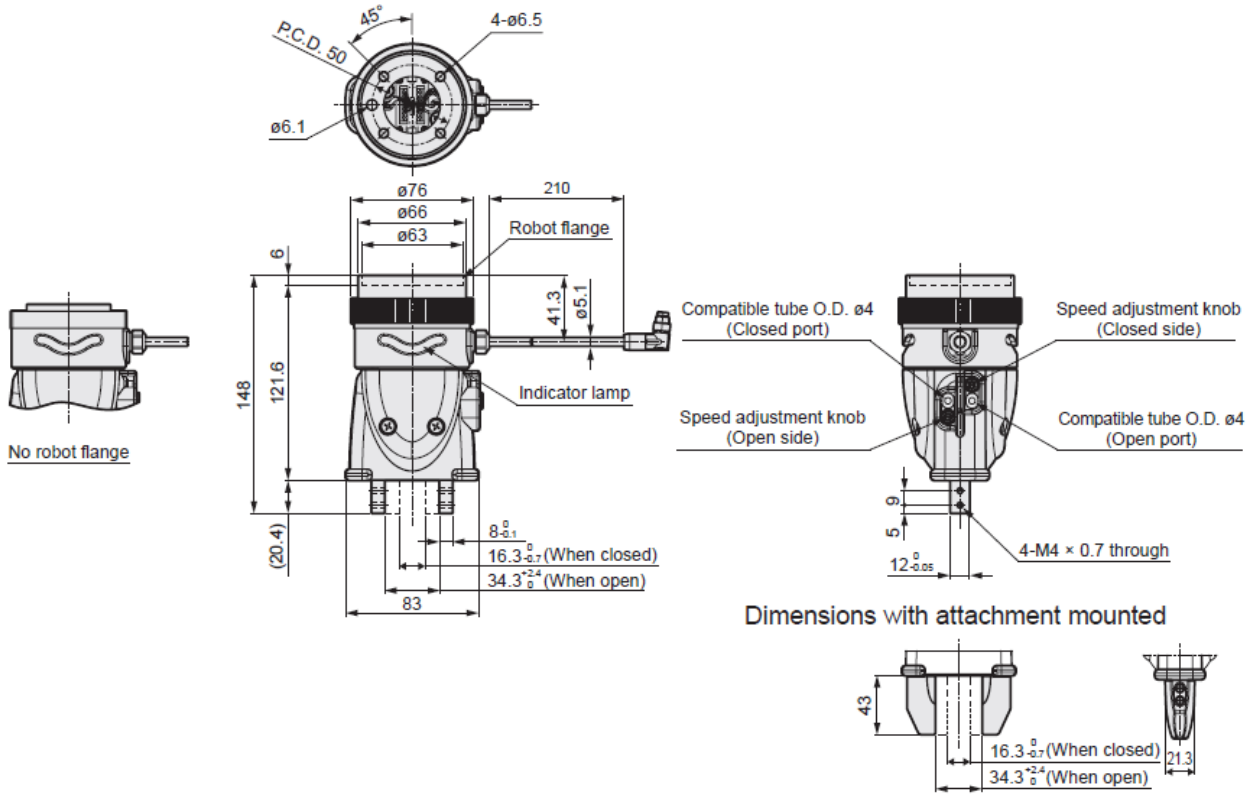
1.3 Electrical Circuit

■ Electrical circuit diagram

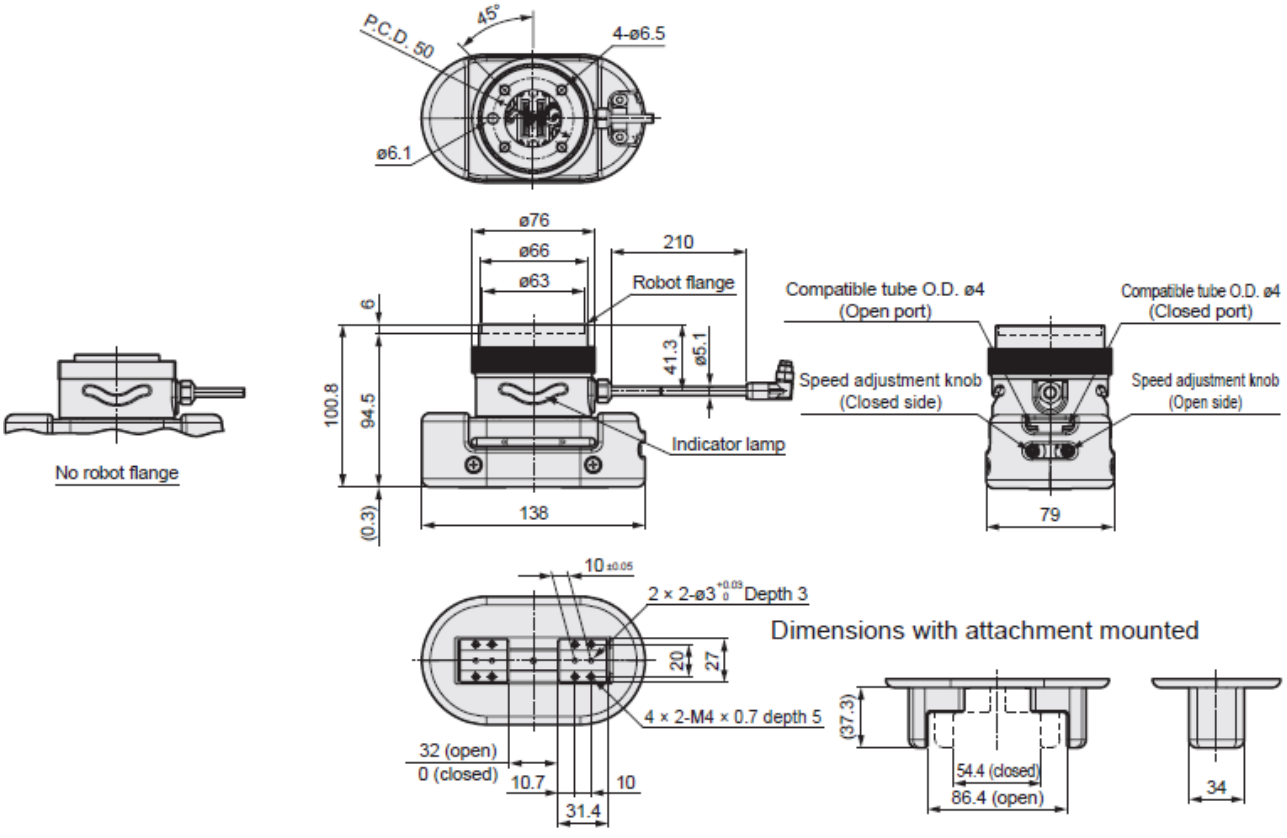


1.4 Dimensions

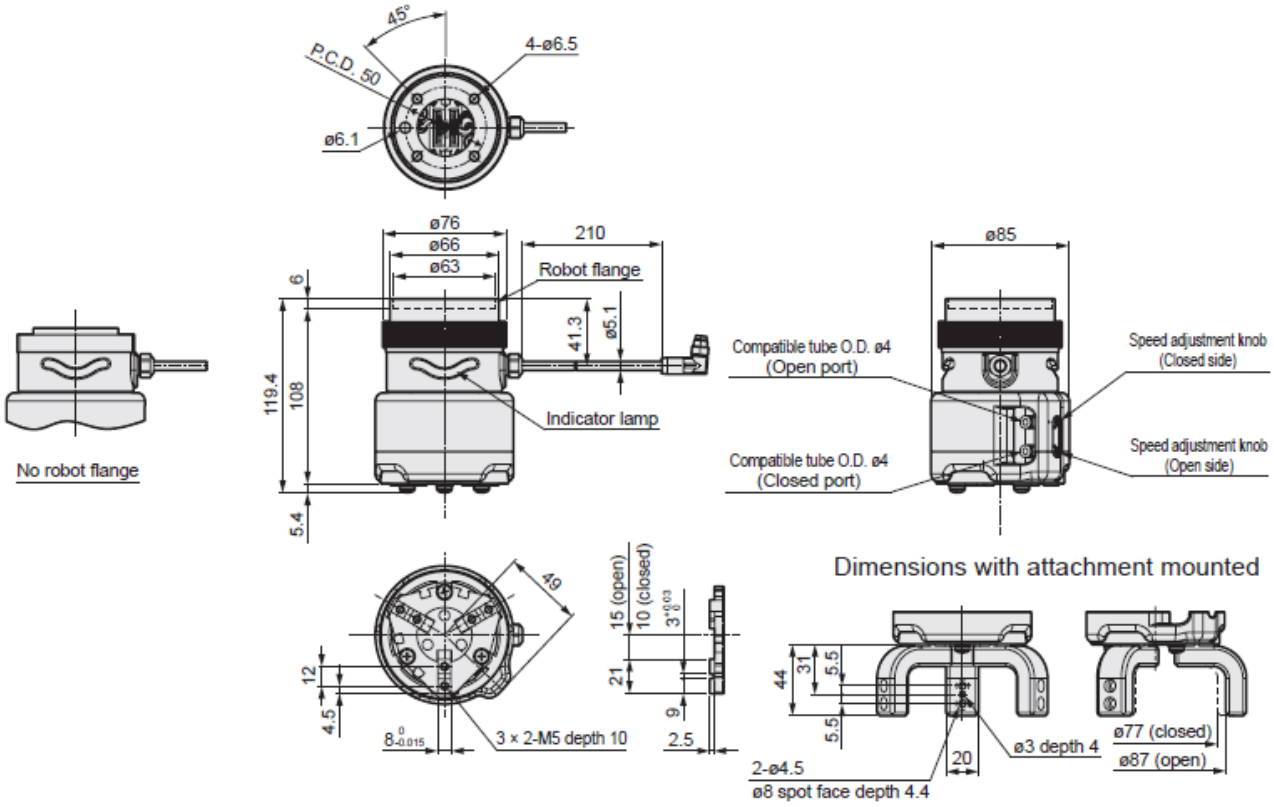
1.4.1 RLSH Series



1.4.2 RHLF Series



1.4.3 RCKL Series



2. INSTALLATION

2.1 Environment

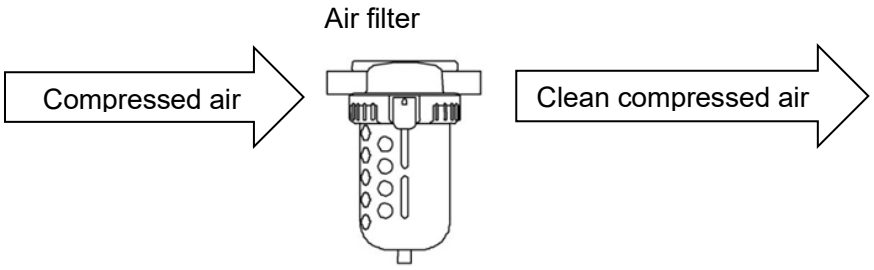
⚠CAUTION

When using the product in a cutting, casting, or welding plant, install a cover to prevent foreign matters such as cutting fluid, chips, powder, and dust from entering.
Do not use the equipment in the following environments.

- Where cutting oil can splash onto the product (abrasives and polishing powder in the oil can abrade the sliding section)
- Where organic solvents, chemicals, acids, alkalis, and kerosene are present
- Where water can splash onto the product

・Use the product within the following ambient temperature range.
0°C to 50°C, RH 85% or less (no freezing)

• For compressed air, use clean and dry air that has been passed through an air filter.
Use an air filter in the circuit and be careful with the filtration rate (a filter that removes particles exceeding 5 μm is desirable), flow rate, and mounting position (install the filter near the directional control valve).



2.2 Unpacking

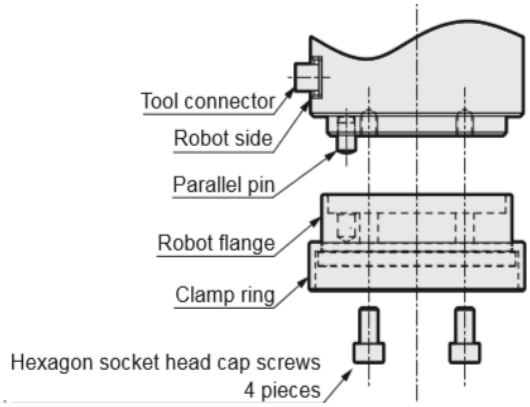
- Check that the model number ordered and the model number indicated on the product are the same.
- Check the exterior of the product for any damage.
- When storing the product, take proper measures to prevent foreign matters from entering the cylinder.

2.3 Mounting

⚠WARNING

Install a protective cover as a safety measure if the moving workpiece can pose a risk to humans or if human fingers can get caught in the finger and/or the attachment.
Take proper measures to prevent the workpiece from falling so that people are not injured andmachines and devices are not damaged.
If the circuit pressure drops due to a power failure or a problem with the air source, the gripping power may decrease and the workpiece may fall.

2.3.1 Body



1 Mounting the robot flange

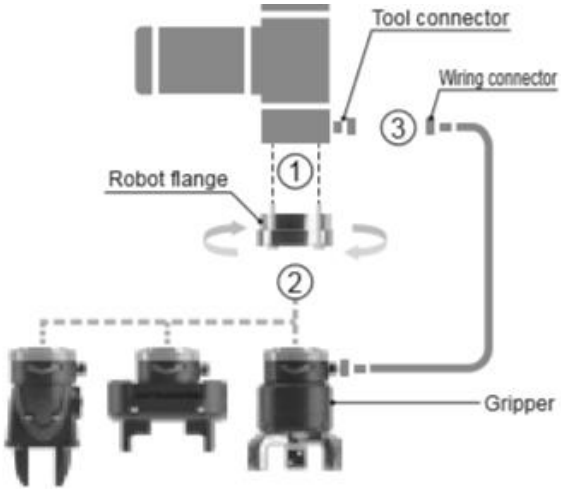
Loosen the clamp ring and remove the robot flange from the gripper.
After inserting the parallel pin(included) to the robot flange surface, mount the robot flange to the robot using the four hexagon socket head cap screws (included).

Note:Tightening torque=7N・m

2 Mounting the gripper

Mount the gripper to the robot flange and tighten the Clamp ring

Note: Tighten the clamp ring by hand to make sure it is not loose.



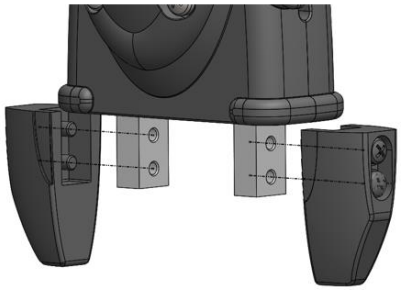
3 Connector connection

Connect the gripper connector to the robot tool Connectot of the robot.

4 Attachment of accessory jaws

Attach the jaws to the fingers or table with the attached screw or bolt.

Note 1：Accessory jaws for RLSH and RHLF is made of resin. Use for gripping test.
Note 2: Accessory jaws for RCKL is made of aluminum. Use for gripping test.
Note 3: Use the following for the tightening torque of the accessory fingers.



Model	Tightening torque (N・m)
RLSH,RHLF	1.4
RCKL	2.8

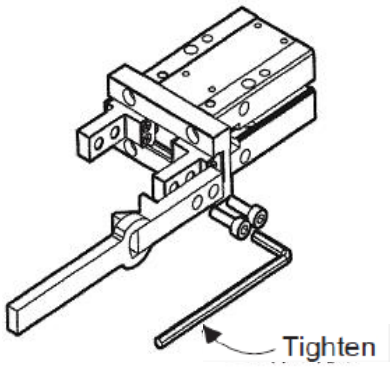
■ Rigidity of the attachment

If the attachment is not rigid enough, sagging can result and cause the finger to twist or adversely affect operation.

■ Mounting the attachment

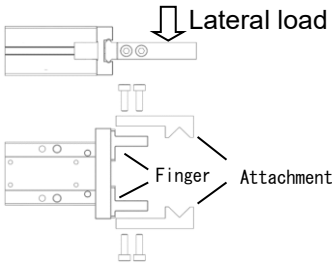
The effect on the hand body must be taken into consideration when mounting the attachment to the finger. Support the attachment with a wrench when tightening it so as not to twist the finger.

Do not apply load to the body



Descriptions	Bolt used	Tightening torque(N・m)
RLSH Series	M4×0.7	1.4
RHLF Series	M4×0.7	1.4
RCKL Series	M5×0.8	2.8

Be careful not to apply a lateral load to the finger when mounting the attachment.



Backlash or damage may occur when an excessive lateral load or an impact load is applied. Use the product so that the external force applied to the finger does not exceed the allowable load described in the catalog.

2.3.2 Sensor

■ How to move the sensor

1 Loosen the fixing screw.

2 Move the sensor slong the groove and tighten the screw.

Model	Tightening torque(N･m)
RLSH(F2H)	0.03 to 0.08
RHLF,RCKL(T2H)	0.1 to 0.2

■ How to replace the sensor

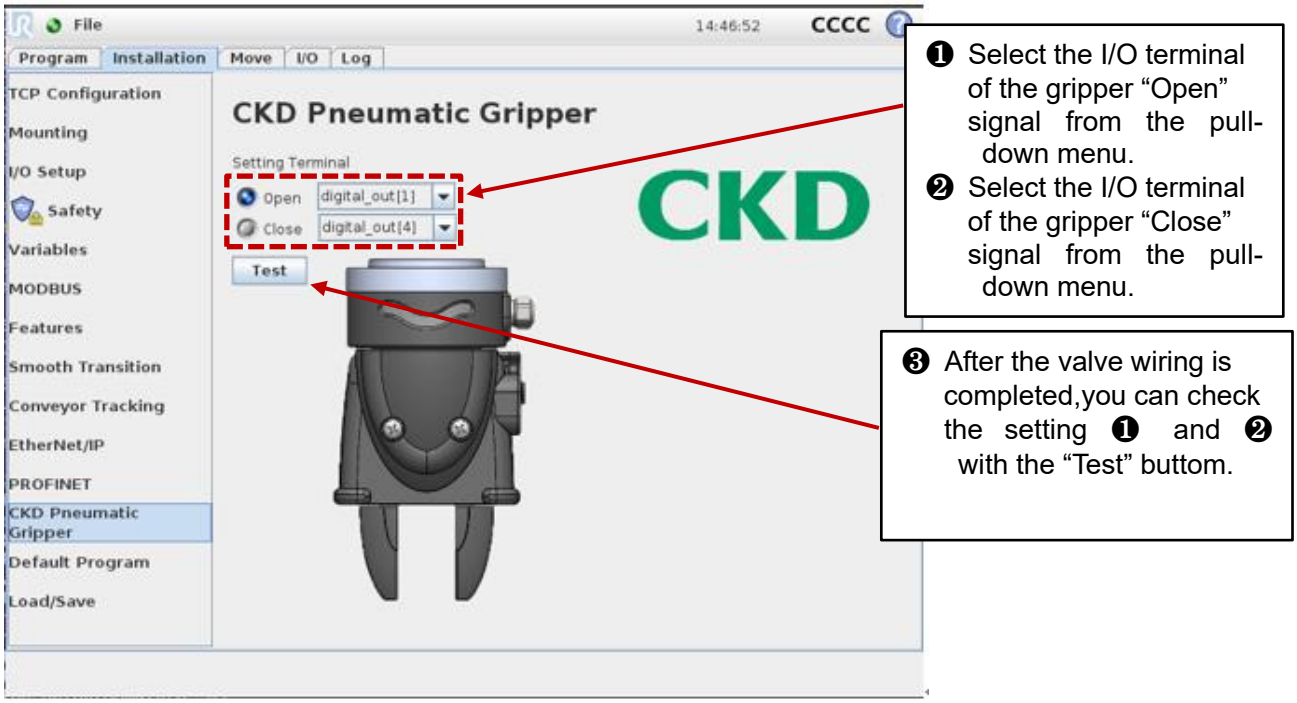
The sensor has a special wiring treatment. Please contact us.
Replacement procedure manual is attached to replacement sensor.

2.4 Wiring

2.4.1 Wiring of Valve and Robot

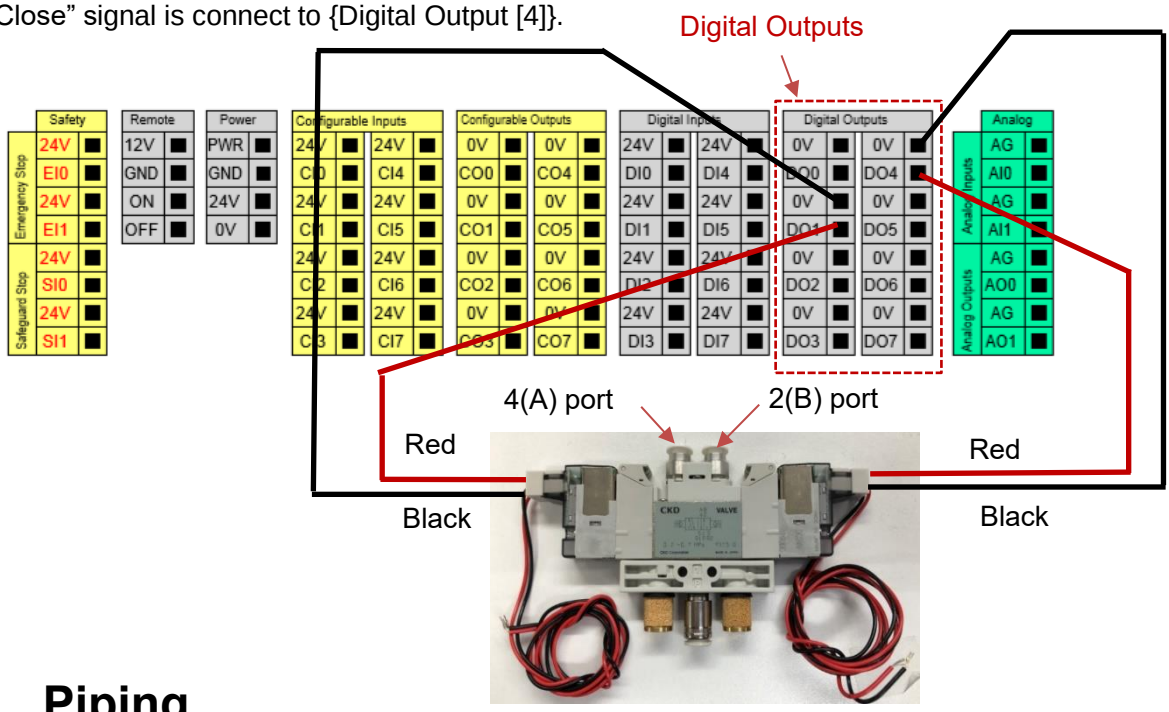
■ Setting method of I/O terminal for valve wiring

After installing the the decicated software from the USB memory stick attached to the product (see 3.1.3). Set the valve wiring I/O terminal from the setting screen.



■ Wiring of valve and controller

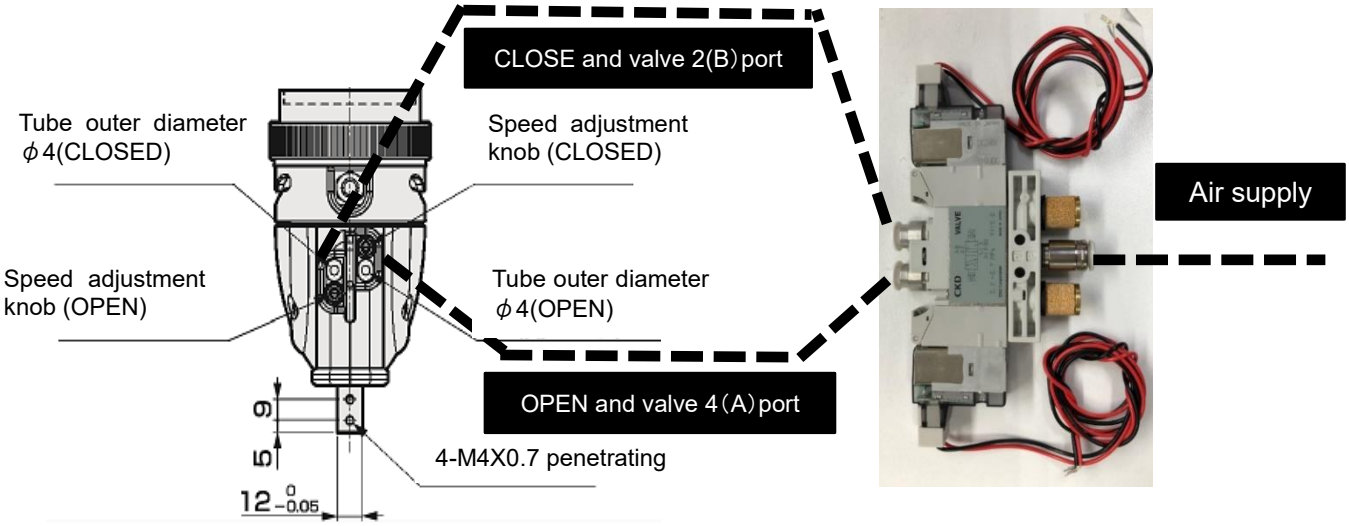
Connect the valve wiring to the I/O terminal set on the previous page.
In the case of the figure below, the “Open” signal is connect to {Digital Output [1]}, and the “Close” signal is connect to {Digital Output [4]}.



2.5 Piping

2.5.1 Piping for gripper

Refer to the figure below for piping between the valve and gripper and piping to the valve.



3. USAGE

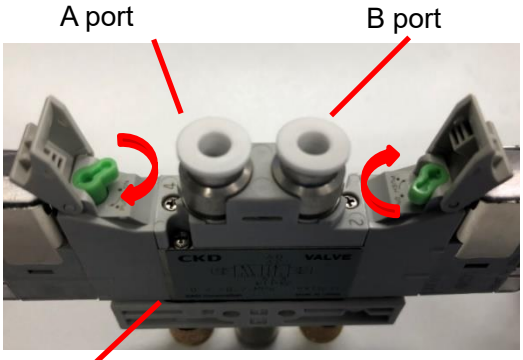
3.1 Using the gripper

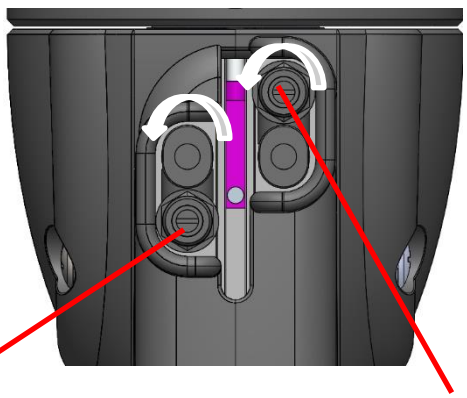
⚠CAUTION

Make sure that no excessive load is applied to the fingers and claws during work removal and transfer. The linear rolling surface of the finger may be damaged or dented, resulting in malfunction.

3.1.1 Usage

1. Supply air to the valve. It is recommended to check the operation from about 0.3MPa.
2. Open the cover of the A port of the valve and the lever will appear. When the lever is pressed, air flows to A port
3. Turn the speed control valve knob of the gripper “OPEN” port slowly counterclockwise with a flathead screwdriver to confirm that the gripper opens.
   Note : Please do not turn it too quickly as it is dangerous.
4. Open the cover of the B port of the valve and lever will appear. When the lever is pressed, air flow to the B port.
5. Turn the speed control valve knob of the gripper “CLOSE” port slowly counterclockwise with a flathead screwdriver to confirm that the gripper close.
   Note : Please do not turn it too quickly as it is dangerous.
6. After confirming that the lever is not locked, close the cover.





Valve
Double solenoid valve

“CLOSE” port speed control valve
Ajust the speed of the “CLOSE” direction.
Speed increases counterclockwise.

“OPEN” port speed control valve
Ajust the speed in the “OPEN” direction.
Speed increases counterclockwise.

3.1.2 Starting the robot

Turn on the robot. (For details, see the robot manual.)

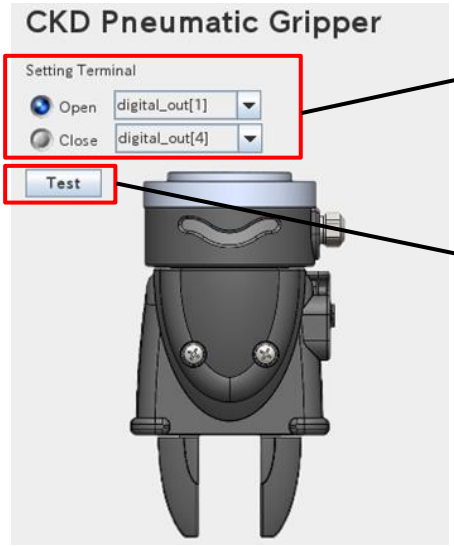
3.1.3 Software installation

Insert the included USB into the teachpendant and install the software.
Software ： CKD Pneumatic Gripper
For details , see the “Installation of「3.2.1Software installation 」.

3.1.4 Setting “CKD Pneumatic Gripper”

On the screen, select the location where you wired the valve 「2.4.1 Setting method of I/O terminal for valve wiring」. After wiring, check the open/close of the gripper with the “Test” button.

If there is no air supply, use the energization indicator on the solenoid valve. When “OPEN” is selected, check that the energization indicator lamp on the 4(A) port is lit, when “CLOSE” is selected, check that the energization indicator lamp on the 2(B) port is lit.



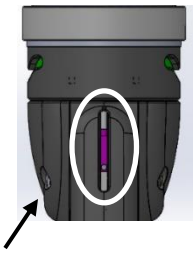
■Operation signal setting for directional control valve
Set “OPEN” and “CLOSE” signals to the controller I/O terminal.

■Test of signal
With the “TEST” button, the “OPEN” and “CLOSE” signals output from the set I/O terminal.

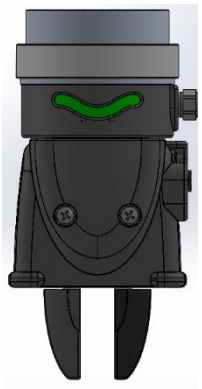
3.1.5 Adjustment of sencor

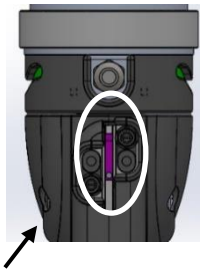
Adjust the sensor according to the work piece referring to「2.3.3 Sensor」.
It is rcommended to unify the display color of the gripper and the display color of the teachpendant.
For details, see「3.2.2 Sensor status and indicator display 」.

Model	Tightening torque(N･m)
RLSH(F2H)	0.03 to 0.08
RHLF, RCKL(T2H)	0.1 to 0.2



Setting the sensor position in the ”CLOSE” direction





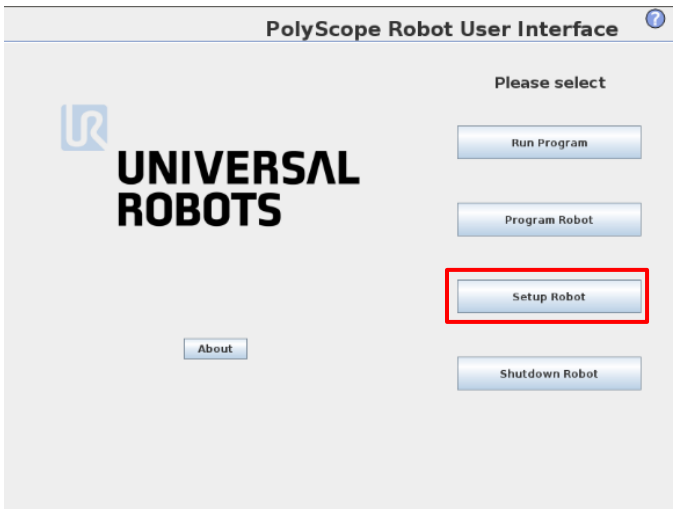
Setting the sensor position in the ”OPEN” direction

3.2 Program functions and operations

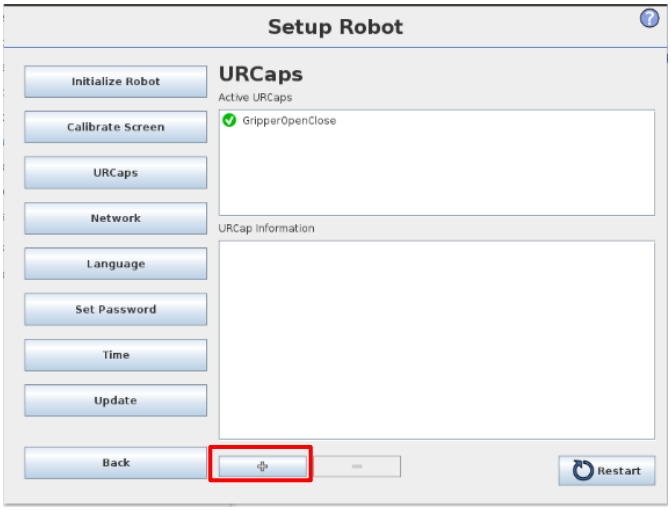
3.2.1 Software installation

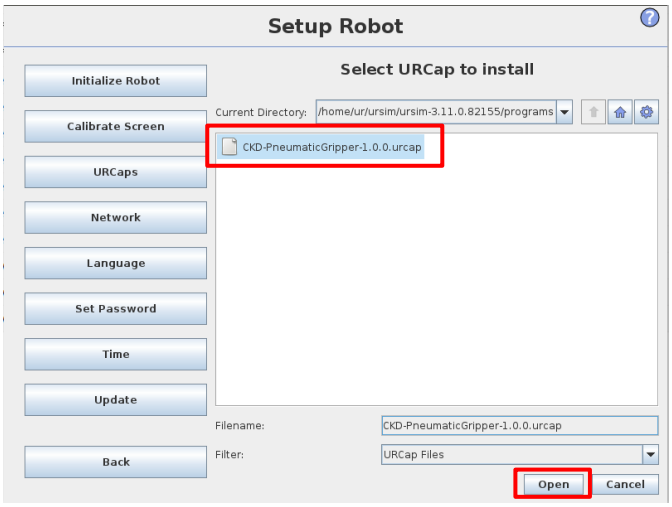
Install the dedicated software for product on the robot.

1 The USB memory stick provided with product contains the dedicated software URCaps. Insert this USB port of the teachpendant.
On the teachpendant of the UR robot, go to the [Setup Robot] screen and select [URCaps] .

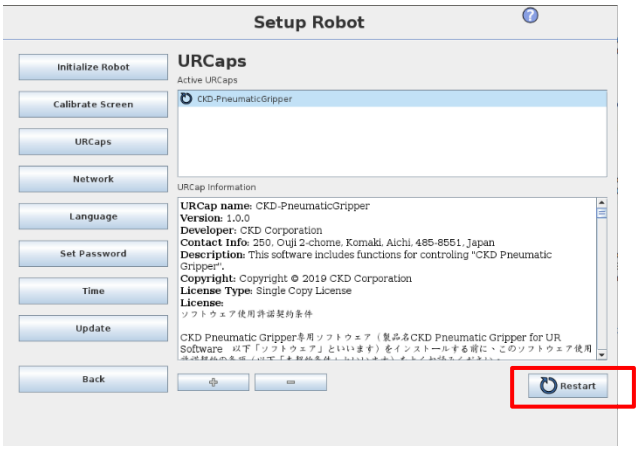


2 Select the [+] button on the screen, select [CKD Pneumatic Gripper] from data in USB, and press [OPEN] .





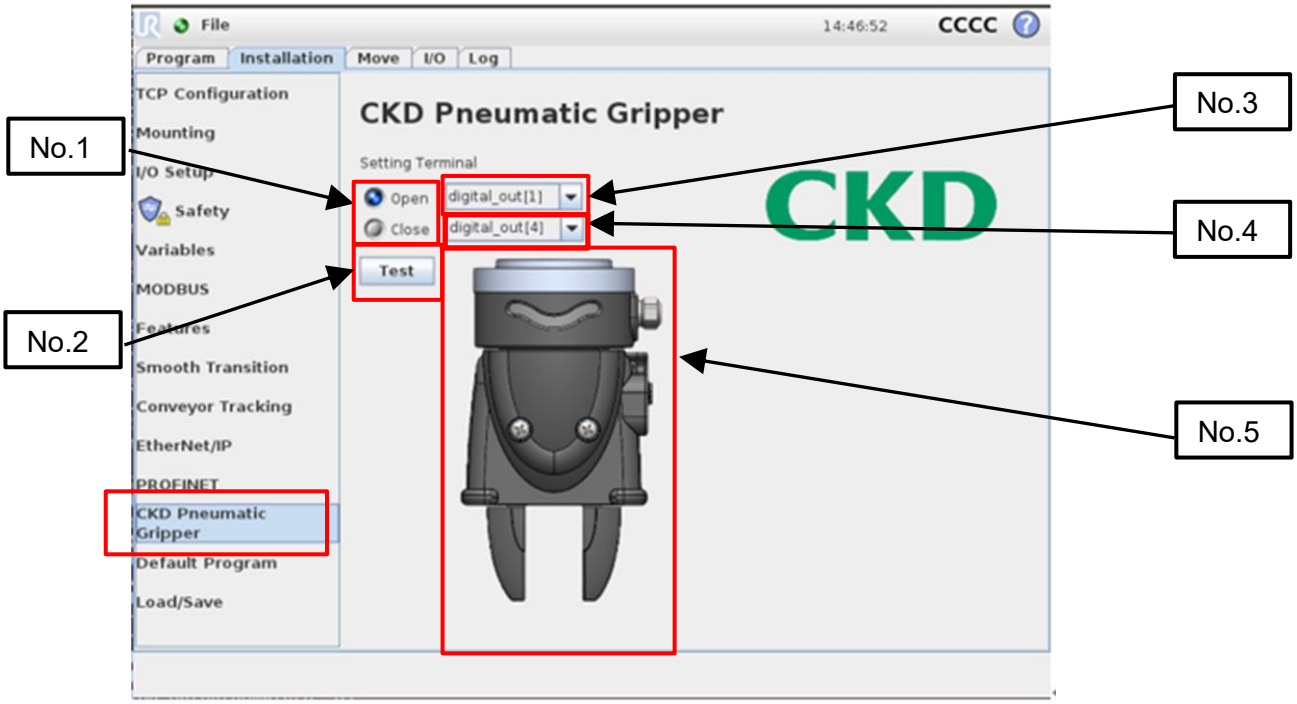
Press [Restart] to restart the robot. The installation is completed.
Note : For details on how to use [URCaps], refer to the UR robot manual.



3.2.2 Explanation of operation screen

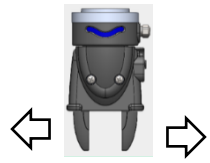
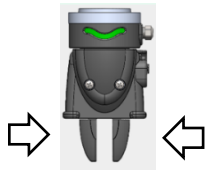
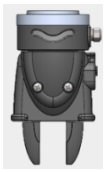
■ Setting screen

The setting screen is displayed by pressing [CKD Pneumatic Gripper] under the [installation].



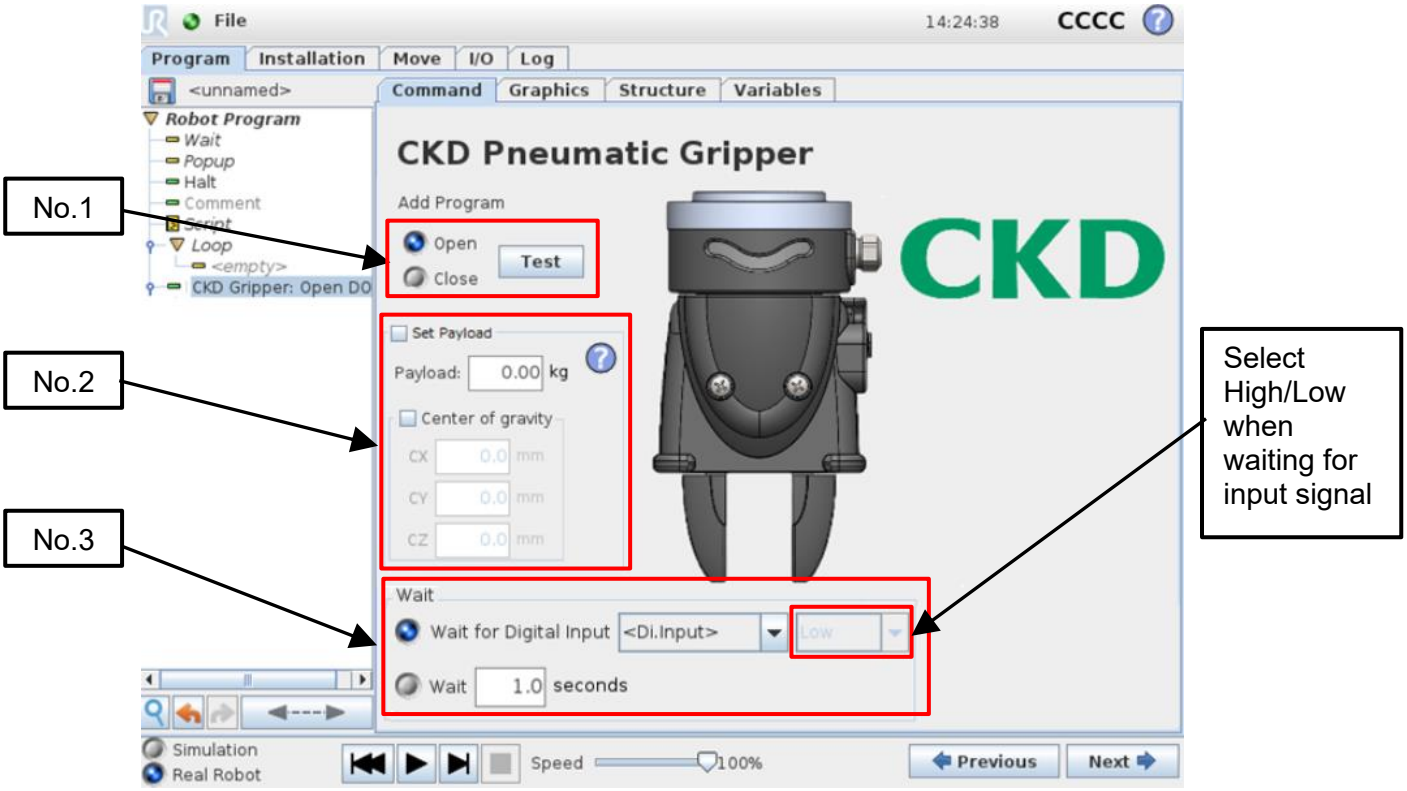
No.	Name	Discription
1	Check button of Open/Close	Open and Close selection button of gripper.
2	“Test” button	By pressing the button, the operation test selected in No.1 is performed.
3	Drop-down list of Open button	Set each signal of Open and Close. Select and set the digital I/O terminal of the controller from the drop-down list. A reboot is required to apply the settings to the system.
4	Drop-down list of Close button	
5	Indicator	An indicator that indicates the state of the gripper. The Open/Close state of the gripper and the operation status of the sensor are displayed by color change.

■ Sensor status and indicator display

Open sensor	Close sensor	Color of flange	Gripper display	message
ON	OFF	Blue	OPEN 	None
OFF	ON	Green	CLOSE 	None
OFF	OFF	Gray	Intermediate posiion 	None
ON	ON	Light blue	Intermediate position 	Display check the “Cylinder Position Sensors”

■ Proguram registratio

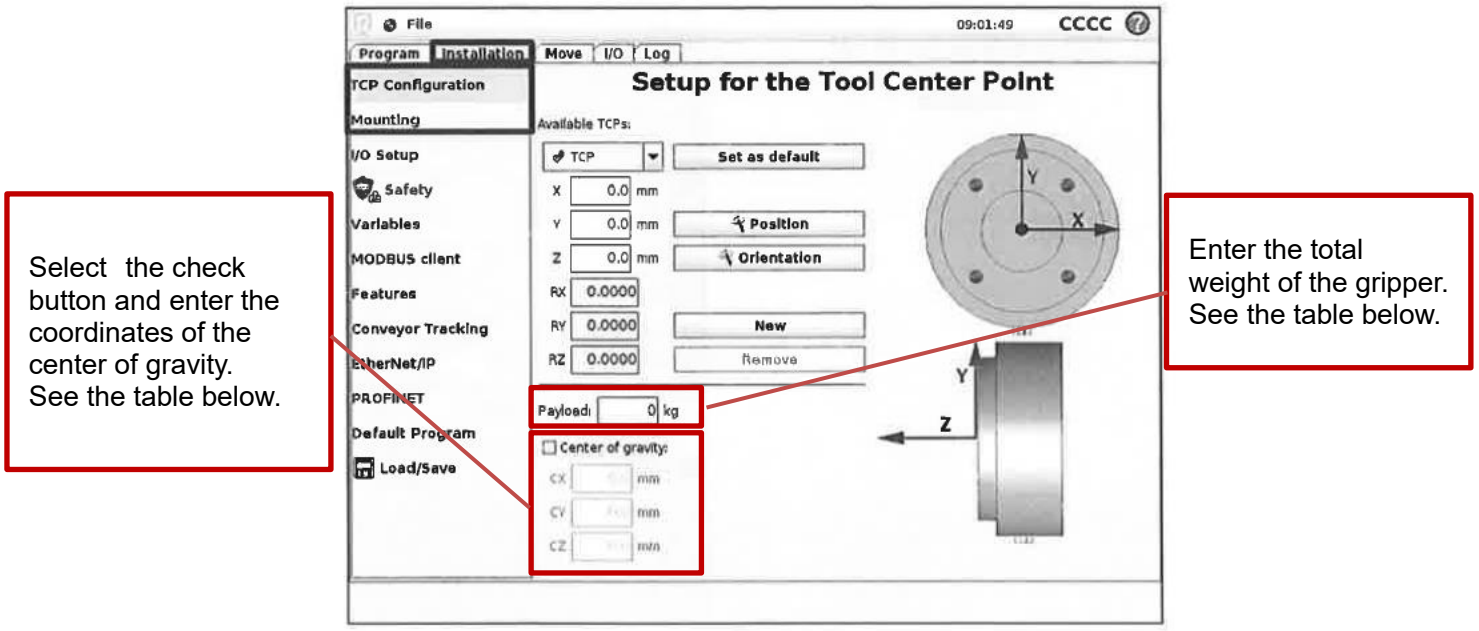
Display when select [Program], and select [Structure], and select [URCaps], press [CKD Pneumatic Gripper], and press “ CKD Gripper” on the program list.



No.	Name	Discription
1	・Operating direction selection buton ・“Test” button	Select the operation direction with the “Open” or “Close” check button and register it in the program list. Operation can be checked with the “Test” button.
2	Total mass and center of gravity setting	In Payload, enter the toal weight of the gripper and the load, and enter the coordinates of the center of the total weight of the gripper and the load. (Note .1)
3	Operating condition setting	Set the conditions unil the next operaion. Select a signal from the pull-down menu when waiing for an inputsignal, and set a waiting time when setting a waiting time.

Note 1: The setting on the [CKD Pneumatic Gripper] screen is available only for “Close”.
At the time of “Open” makes setting on the UR robot default setting screen shwn below.

■ Default setting for total mass and center of gravity



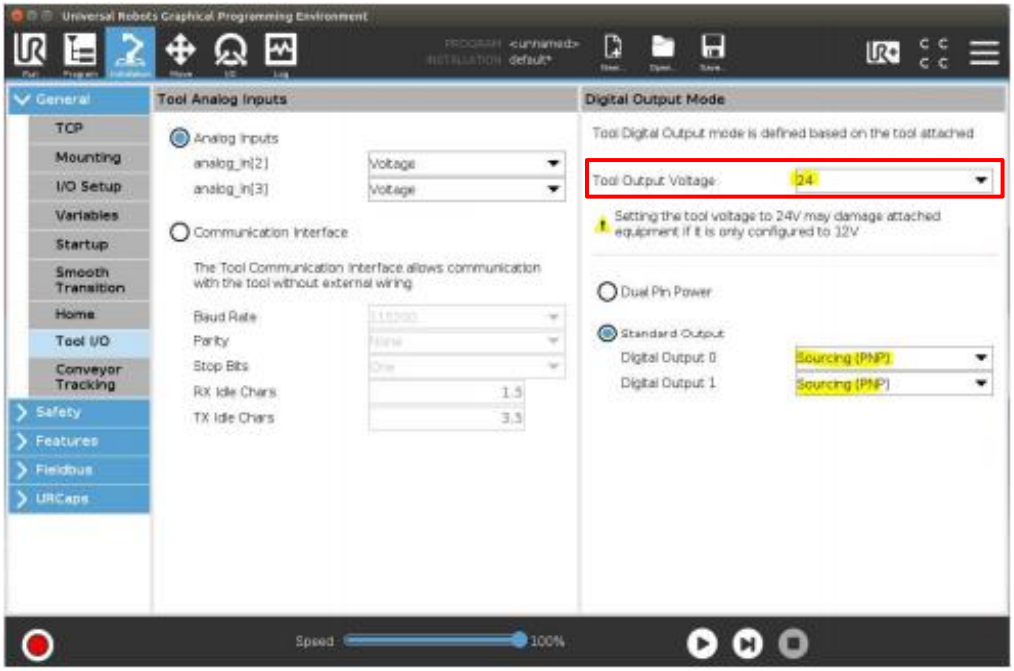
Model	Center of gravity (mm)			Total weight (kg) (Note.2)
	CX	CY	CZ	
RLSH	0.0	1.1	56.7	0.8
RHLF	0.0	1.8	58.5	1.0
RCKL	0.0	1.4	63.6	1.0

Note 2 : If the jig is made according to the work piece, enter the total center of gravity and the total weight of the gripper and the jig.

3.2.3 Program setting procedure

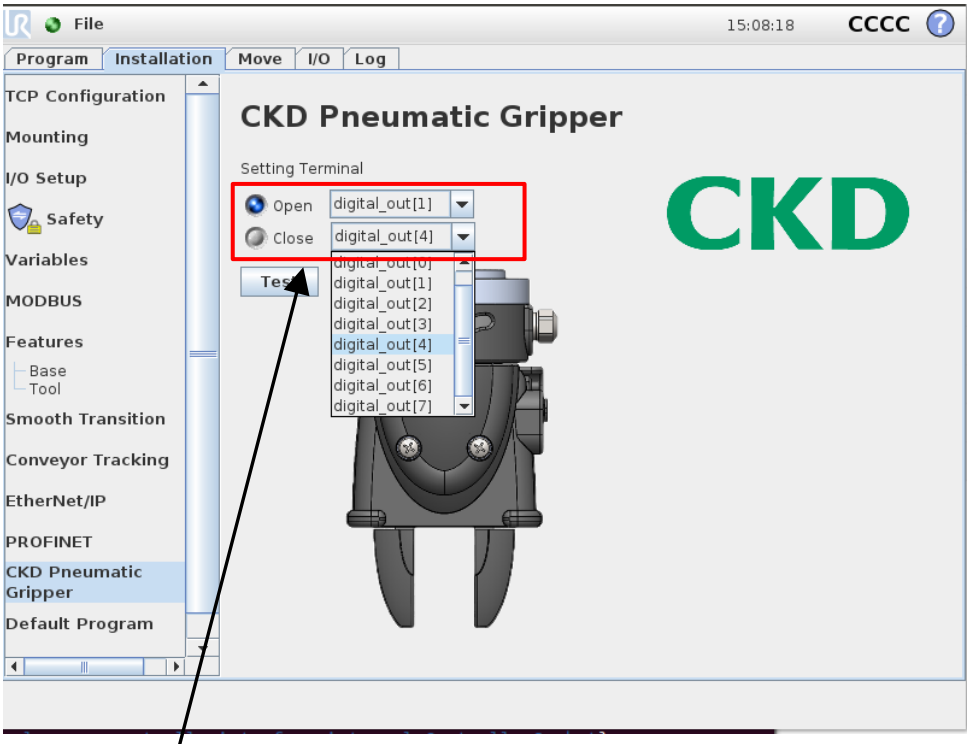
After setting up the UR robot and connecting this product, set up the software.

1 Go to the [Installation] tab, Set the [Tool output voltage] to 24V.



2 Set the “Open” signal and “Close” signal on the setting screen.

The figure below shows the case where the ｛digital output [1]｝ is set to “Open (valve A port output)” and the ｛digital output [0]｝ is set to “Close (valve B port output)｝.

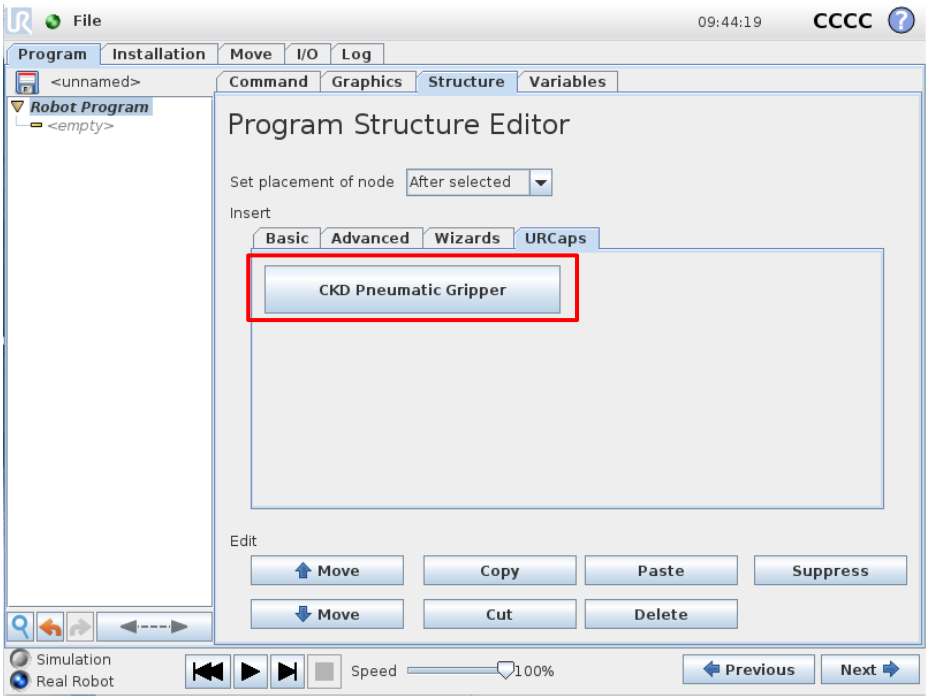


Set the I/O terminal of the controller connected to the valve from the drop-down list.

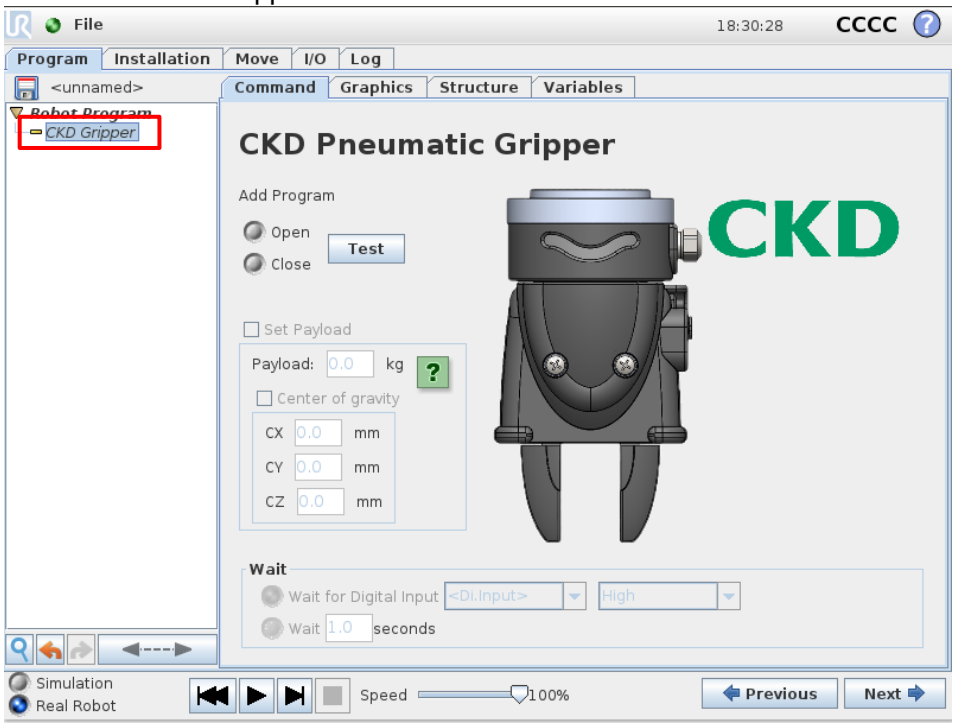
3.2.4 Procedure for registering commands in the program

After completing the software setting, register the command in the UR robot program.

1 If you select [Structure] tab, [URCaps] tab, and press [CKD Pneumatic Gripper] on the program screen, “CKD Grip:” will be added to the UR robot program list displayed on the left side of the screen.
Press the [CKD Pneumatic Gripper] button displayed on the [URCaps] tab.



2 Press the “CKD Gripper:” and the screen changes to the [CKD Pneumatic Gripper] screen.
Press the “CKD Gripper:

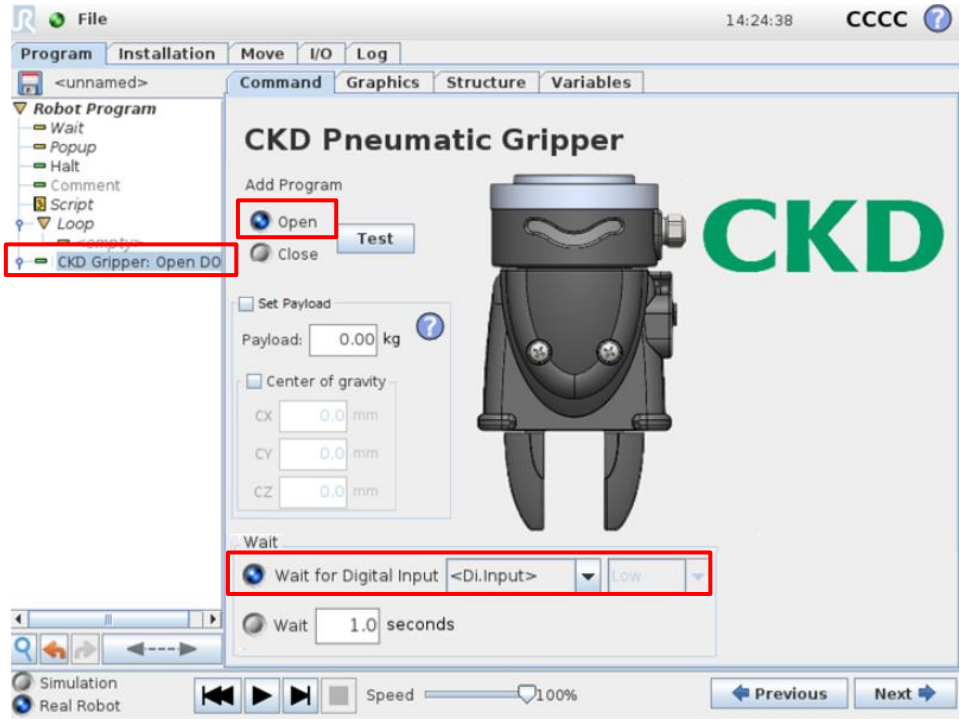


3 Press the button of “Open” or “Close” on the [CKD Pneumatic Gripper] screen, and the name of program is changed, and the command is registered in the UR robot program.

■ Sensor status and gripper display

Operation	Screen display	Content
No operation	CKD Gripper:	Operation direction not set
Press the “Open” button	CKD Gripper: Open	“Open” set
Press the “Close”button	CKD Gripper: Close	“Close” set

Example of registering a command of the “Open” in a program.



4. MAINTENANCE AND INSPECION

⚠WARNING

Do not touch electrical wiring connections (bare live parts) of actuators equipped with solenoid valves, actuators equipped with switches, and other such actuators.
Do not touch live parts with bare hands.
An electric shock may occur.

⚠CAUTION

Plan and perform daily and periodic inspections so that maintenance can be managed properly.
If maintenance is not properly managed, the product's functions may deteriorate significantly and this may lead to faults (such as short service life, damage, and malfunction) or accidents**.**

4.1 Periodic Inspection

In order to use the product under optimum conditions, perform a periodic inspection every six months or when the operation count reaches 5 hundred thousand times

<Inspection item>
• Actuation state
• Air leakage
• Looseness of screws and bolts
• Backlash in the finger
• Stroke abnormality

4.2 Maintenance of the product

Regularly grease the sliding section of the finger with lithium grease. Regular greasing can extend
• service life further.

Manufacturer	Model
THK	AFF grease

4.3 Maintenance of the circuit

• Discharge the drainage accumulated in the air filter periodically before it exceeds the specified line.
• Since foreign matters such as carbide (carbon or tar substance) from the compressor oil may contaminate the circuit and cause an operation fault of the solenoid valve or the cylinder, be careful when performing maintenance or inspection of the compressor.

5. TROUBLESHOOTING

5.1 Problems, Causes, and Solutions

If the product does not operate properly, check the table below for a possible solution.

5.1.1 Finger (cylinder)

Failure phenomenon	Cause	Treatment method
Finger does not operate.	No pressure or insufficient pressure is applied.	Secure sufficient pressure.
	No signal is input to directional control valve.	Repair the control circuit.
	Centers were not aligned when mounted.	Correct the way the cylinder is mounted. Change the mounting style
	Piston packing is damaged.	Replace the cylinder.
Finger does not operate smoothly.	Speed is lower than minimum working piston speed.	Mitigate load fluctuation.
	Centers were not aligned when mounted.	Correct the way the cylinder is mounted. Change the mounting style.
	Lateral load is applied.	Install a guide. Correct the way the cylinder is mounted. Change the mounting style
	Load is too large.	Increase the pressure. Enlarge the bore size.
	Speed control valve has meter-in circuit.	Change the mounting direction of the speed control valve.
Finger is damaged or deformed.	Force of shock due to high-speed actuation is excessive.	Decrease the speed. Lighten the load. Install a more effective cushion mechanism (external cushion mechanism).
	Lateral load is applied.	Install a guide. Correct the way the cylinder is mounted. Change the mounting style.

5.1.2 Sensor

Failure phenomenon	Cause	Treatment method
Switch turns on but indicator does not blink.	Contact is welded.	Replace the switch.
	Rating of load is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
	Indicator is damaged.	Replace the switch.
	External signal is faulty.	Check the external circuit.
Switch does not turn on.	Cables are disconnected.	Replace the switch.
	External signal is faulty.	Check the external circuit.
	Voltage is wrong.	Use specified voltage.
	Switch is not mounted in right place.	Mount the switch in right place.
	Switch is not positioned correctly.	Position and tighten the switch correctly.
	Switch is facing opposite direction.	Mount the switch so that it faces the correct direction.
	Load (relay) cannot respond for intermediate position detection.	Lower the speed. Replace the relay with one recommended by CKD.
	Rating of load is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
Switch does not turn off.	Piston is not moving.	Move the piston.
	Contact is welded.	Replace the switch.
	Rating of relay is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
	Ambient temperature is too high or too low.	Use the switch at an ambient temperature of 0°C to 60°
	Magnetic field is nearby.	Install a magnetic shield.
	External signal is faulty.	Check the external circuit.

If you have any other questions or concerns, contact your nearest CKD sales office or distributor.

6. WARRANTY PROVISIONS

6.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty
product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:
• Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
• Failure caused by incorrect use such as careless handling or improper management.
• Failure not caused by the product.
• Failure caused by use not intended for the product.
• Failure caused by modifications/alterations or repairs not carried out by CKD.
• Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
• Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
• Failure caused by acts of nature and disasters beyond control of CKD.
The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery,or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

6.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.