CKD

Grippers For Collaborative Robot

FANUC CRX Series Compatible
RLSH Series
RHLF Series
RCKL Series

INSTRUCTION MANUAL

SM-A48101-A/3

- 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 "switch" in this document stands for "cylinder switch".

- 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

Used as a gripper for fanuc CRX series.
This product was developed for FANUC's CRX.
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

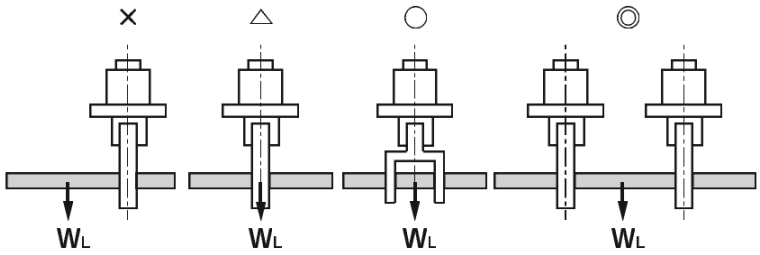
Install a protective cover as a safety measure if the moving workpiece can pose a risk to humans or if human fingers can get caught in the finger and/or the attachment.
In the circuit pressure drops due to power failure or air source trouble, the gripping force will decrease and the work-piece may fall. 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.

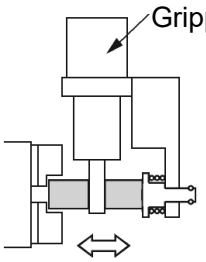


Select a modle that has sufficient power to grip the work-piece weight.

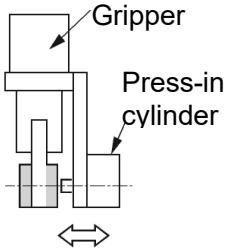
Select a model that has sufficient opening/closing width for the work-piece size.

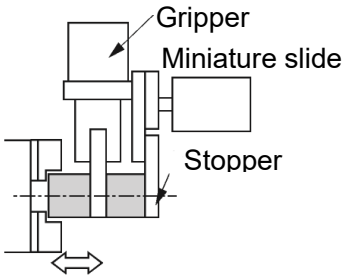
If directry inserting the work-piece into the jig with the hand, consider clearance during design to avoid damaging the hand.

●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.

CONTENTS

1. PRODUCT OVERVIEW

1.1 Model Number Indication

1.1.1 RLSH Series

RLSH – A20D1N – L1 – F Y2V – FN

(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 switch(F2H).

1.1.2 RHLF Series

RHLF – 16CS – F Y2V – FN

(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 switch(T2H).

1.1.3 RCKL Series

RCKL – 40CS – F Y3V – FN

(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 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)

< 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 specification

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 ～ 50
Operational stroke length	mm	18
Repeatability	mm	±0.01
Product weight	kg	0.8

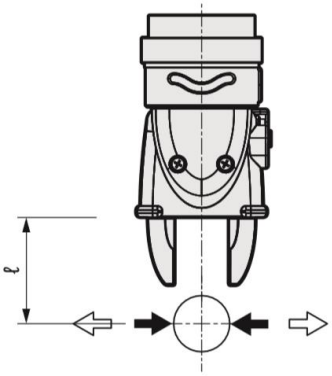
■ Sencor Specifications

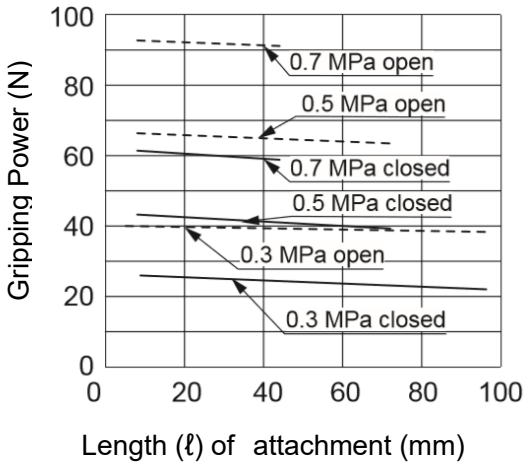
Descriptions		Proximity 2-wire
		F2H
Applications		Programable controller
Load supply voltage		DC 10 ～30V
Load current		5 ～20mA
Indicator light	Gripper	Yellow LED (ON lighting)
	Flange	Blue・Green
Leakage current		1 mA or less
Shock resistance		980 m/s^2
Product weight	g	10

■ 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	°C	5 ～ 50
Operational stroke length	mm	32
Repeatability	mm	±0.03
Product weight	kg	1.0

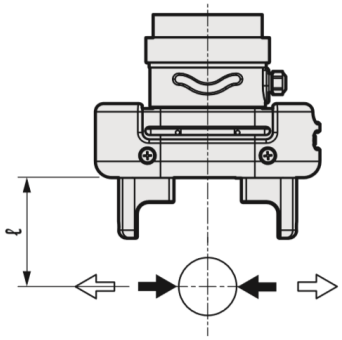
■ Sencor Specifications

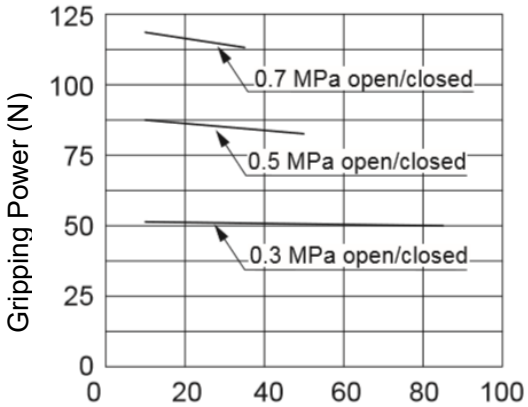
Descriptions		Proximity 2-wire
		T2H
Applications		Programable controller
Load supply voltage		DC 10 ～30V
Load current		5 ～20mA
Indicator light	Gripper	Red LED (ON lighting)
	Flange	Blue・Green
Leakage current		1 mA or less
Shock resistance		980 m/s^2
Product weight	g	18

■ 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)





Length (ℓ) of attachment (mm)

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 diameter ϕ4 (With speed control valve)
Ambient temperature	°C	5 ～ 50
Operational stroke length	mm	10
Repeatability	mm	±0.01
Product weight	kg	1.1

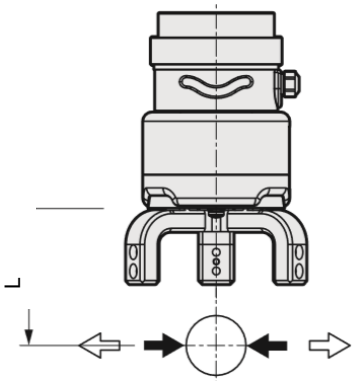
■ Sencor Specifications

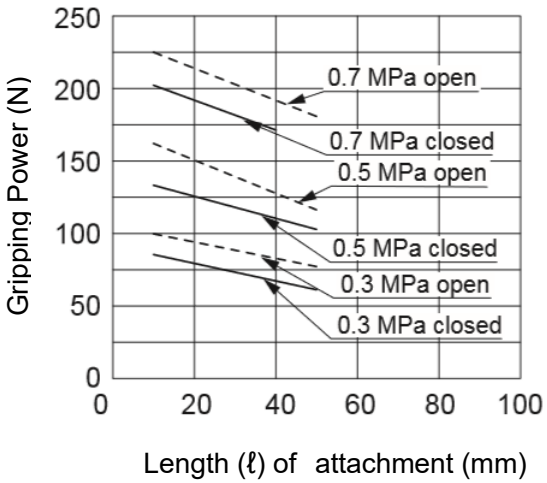
Descriptions		Proximity 2-wire
		T2H
Applications		Programable controller
Load supply voltage		DC 10 ～30V
Load current		5 ～20mA
Indicator light	Gripper	Red LED (ON lighting)
	Flange	Blue・Green
Leakage current		1 mA or less
Shock resistance		980 m/s^2
Product weight	g	18

■ 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)

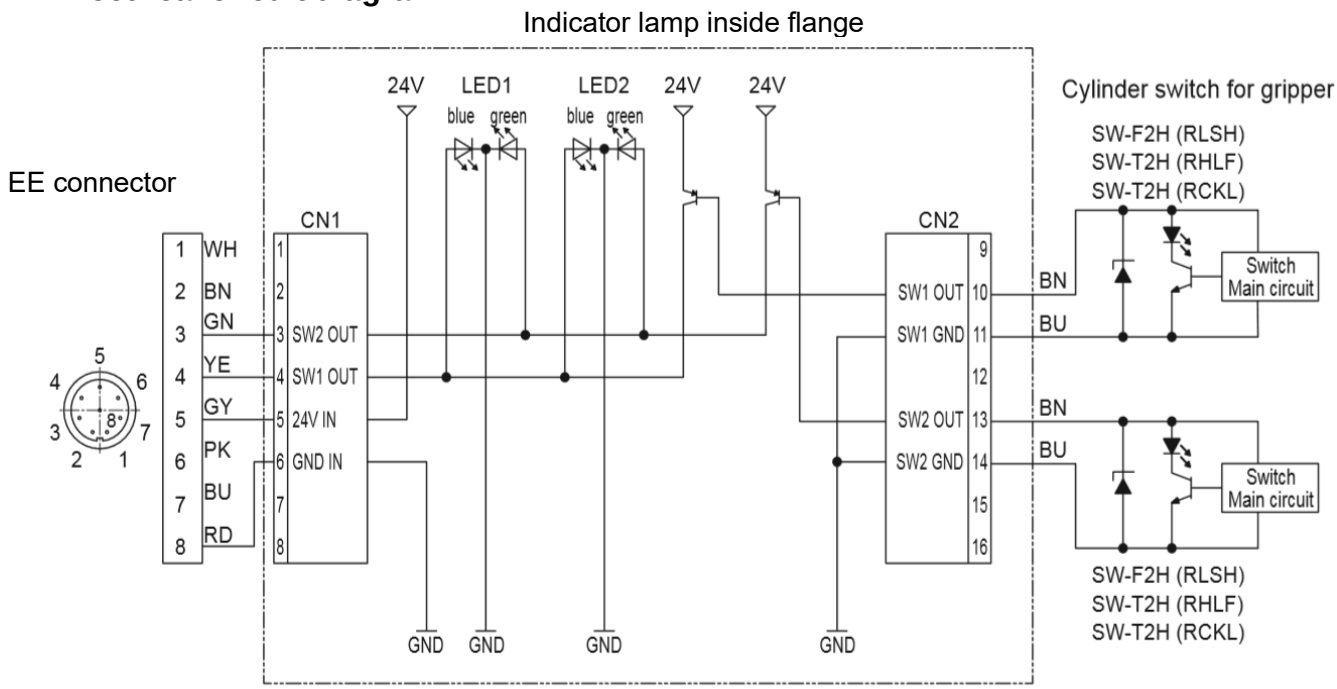
・Opening direction(⇦) - - - - (Dashed line indication)
・Closing direction (➡) ———(Solid line indication)





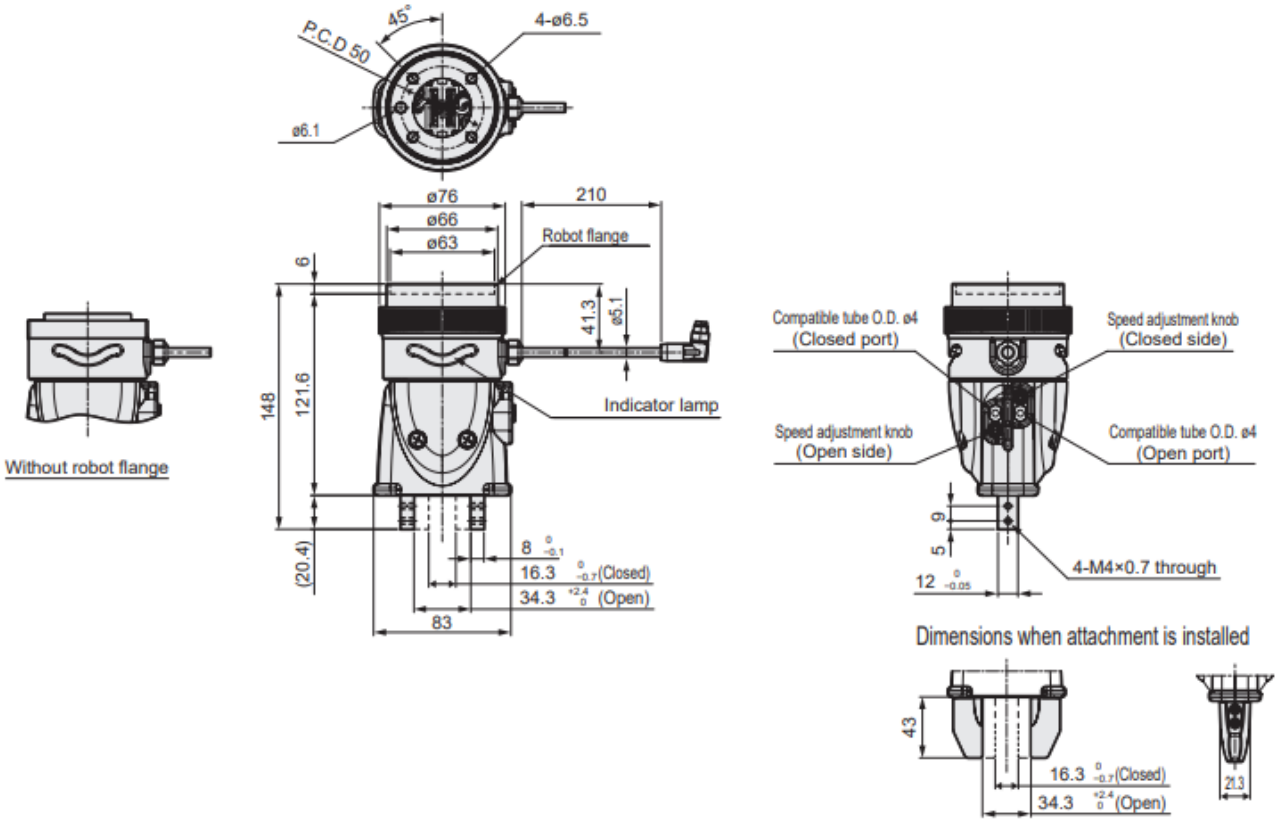
1.3 Electrical Circuit Diagram

■ **Electrical circuit diagram**

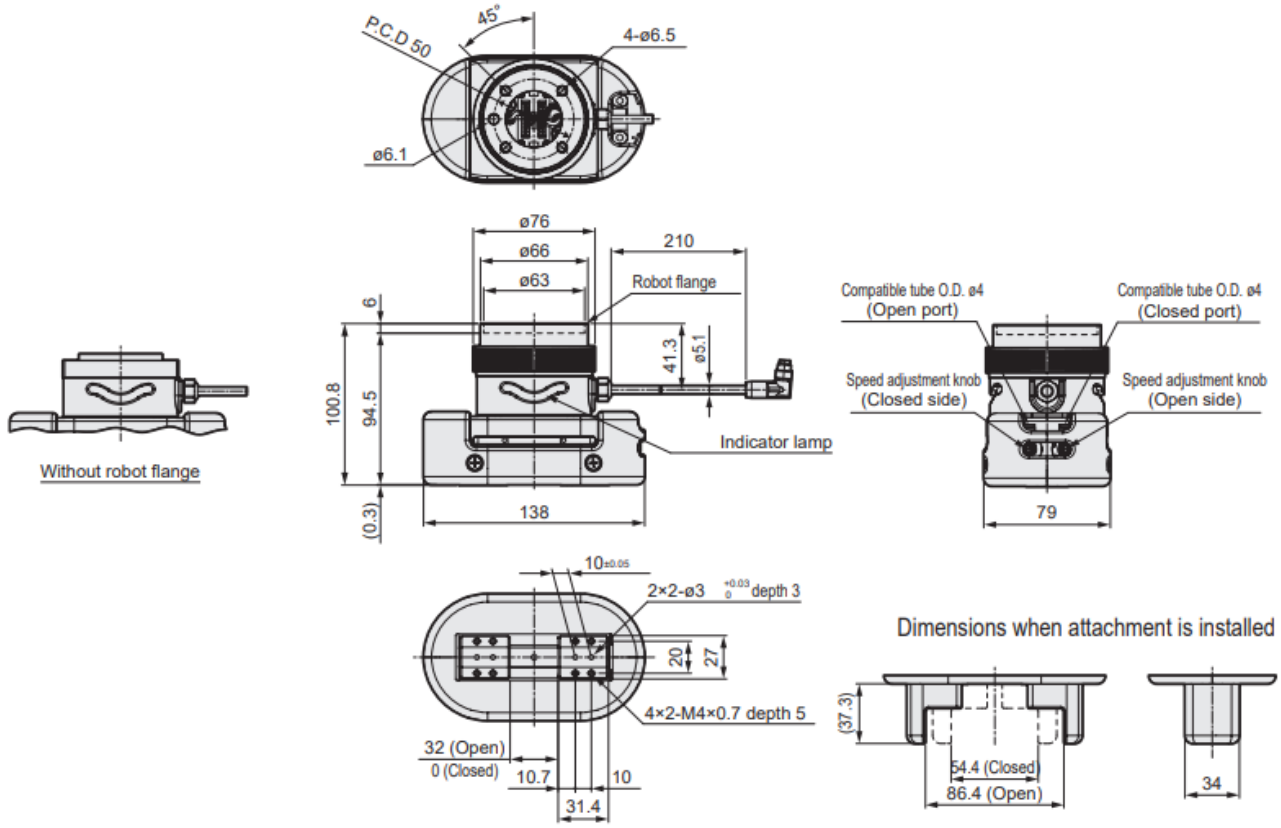


1.4 Dimensions

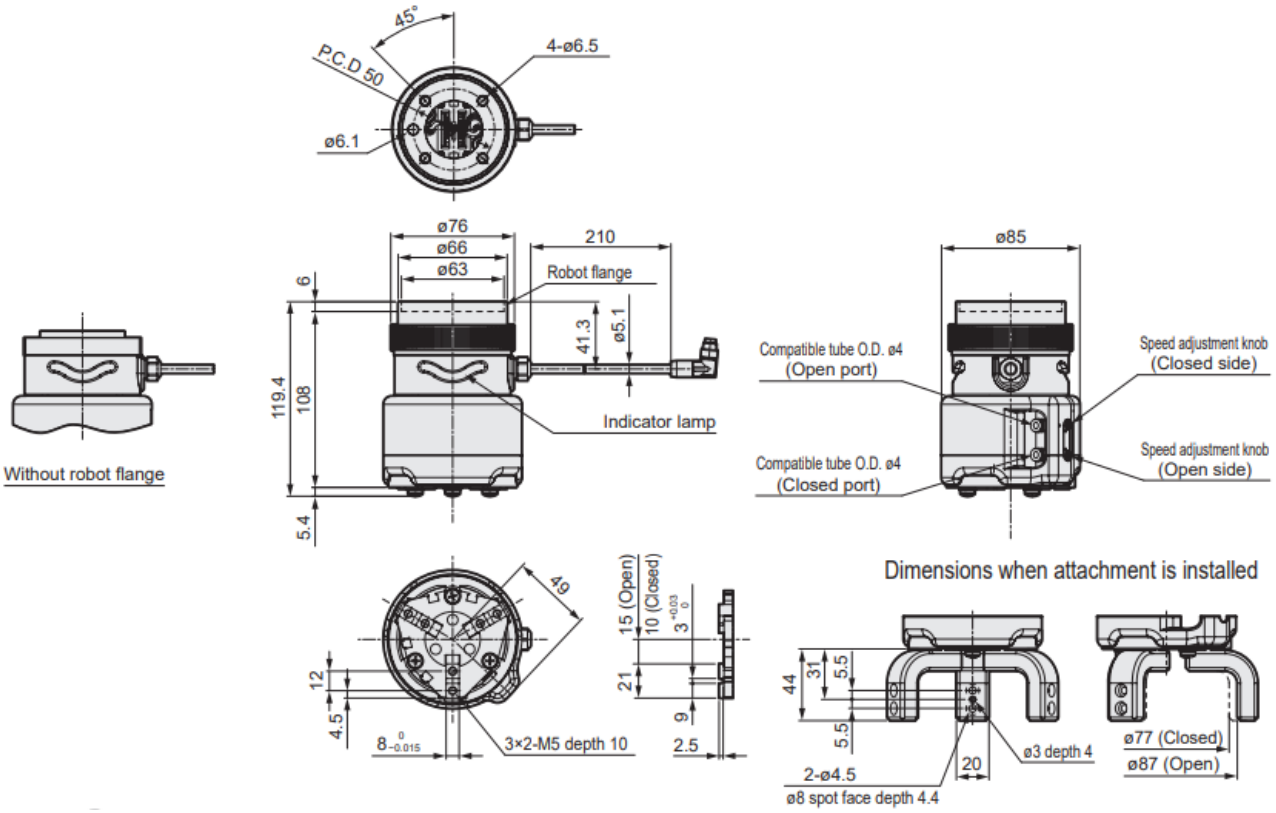
1.4.1 RLSH Series



1.4.2 RHLF Series



1.4.3 RCKL Series



2. INSTALLATION

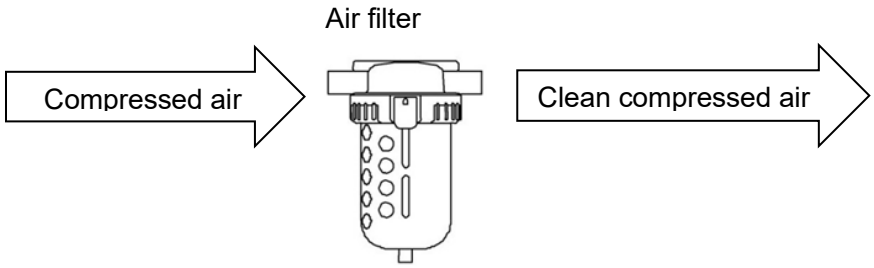
2.1 Environment

⚠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 60°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

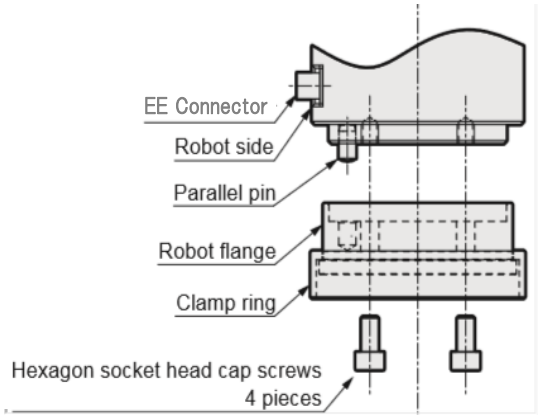
- Check that the model number ordered and the model number indicated on the product are the same.
- Check the exterior of the product for any damage.
- When storing the product, take proper measures to prevent foreign matters from entering the cylinder.

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

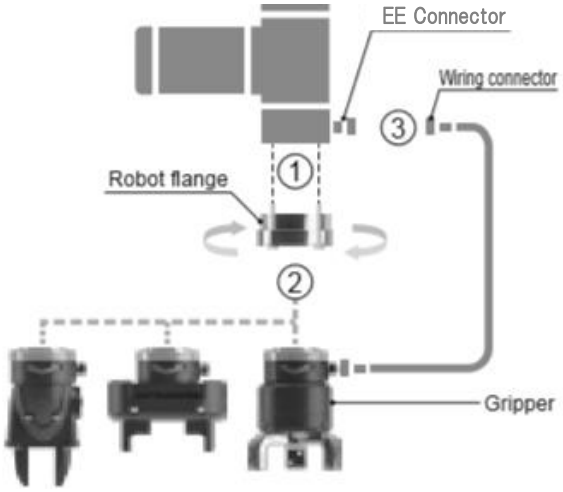
Loosen the clamp ring and remove the robot flange from the gripper.
After inserting the parallel pin(included) to the robot flange surface, mount the robot flange to the robot using the four hexagon socket head cap screws (included).

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 sureit is not loose.



3 Connector connection

Connect the gripper connector to the robot "EE Connector" of the robot.

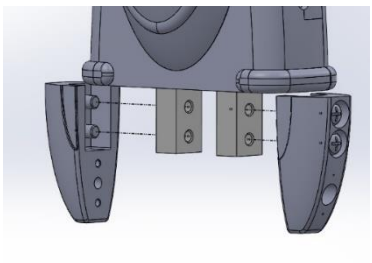
4 Installation of valves

Connect the output port of the pneumatic valve to the input port on the side of the gripper. Connect the valve wires to the designated I/O port terminals in the control box.
To secure the valve piping, secure it with a tie band or screw to provide sufficient room for the robot's operating area. If wiring and piping are not fixed, it will lead to damage to cables and pipes. (For details, please check the wiring of the 2.4.1 valve and robot controller, and the piping to the 2.5.1 gripper.)

5 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.



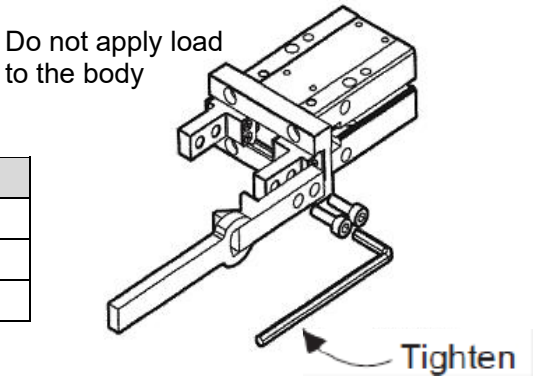
Model	Tightening torque (N·m)
RLSH,RHLF	1.4
RCKL	2.8

■ Rigidity of the attachment

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

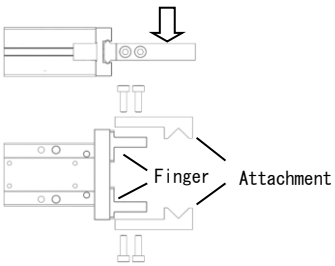
■ Mounting the attachment

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.



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 Switch

■ How to move the switch

1 Loosen the fixing screw.

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

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

■ How to replace the switch

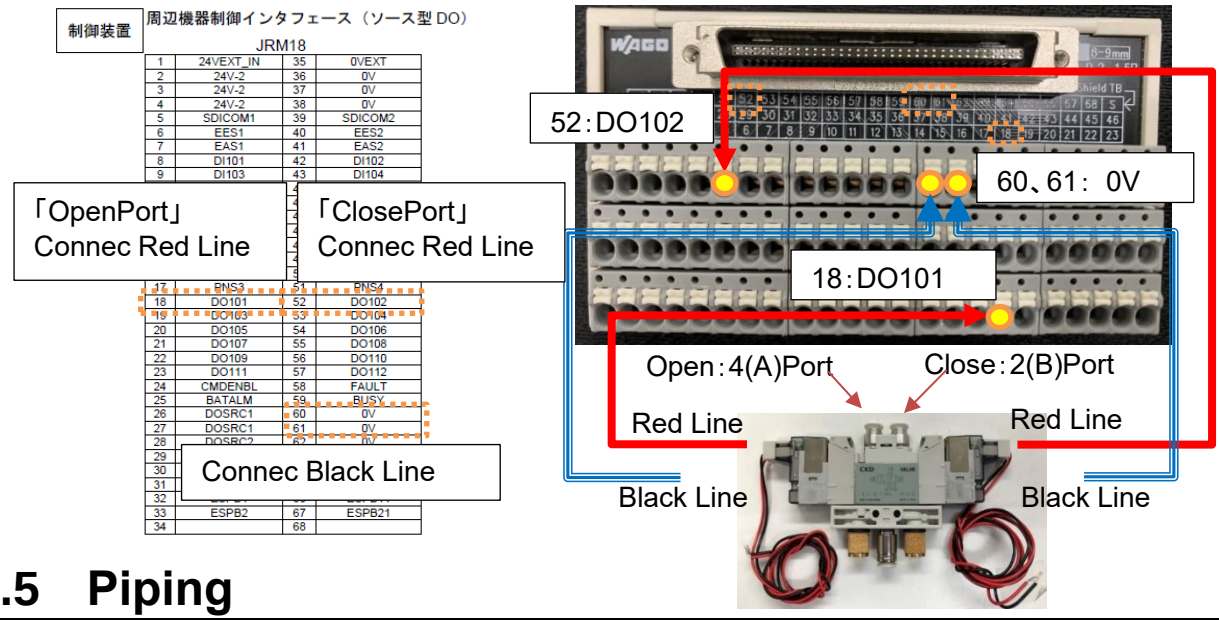
The switch has a special wiring treatment. Please contact us.
Replacement procedure manual is attached to replacement switch.

2.4 Wiring

2.4.1 Wiring of Valve and Robot

■ Wiring of valve and controller

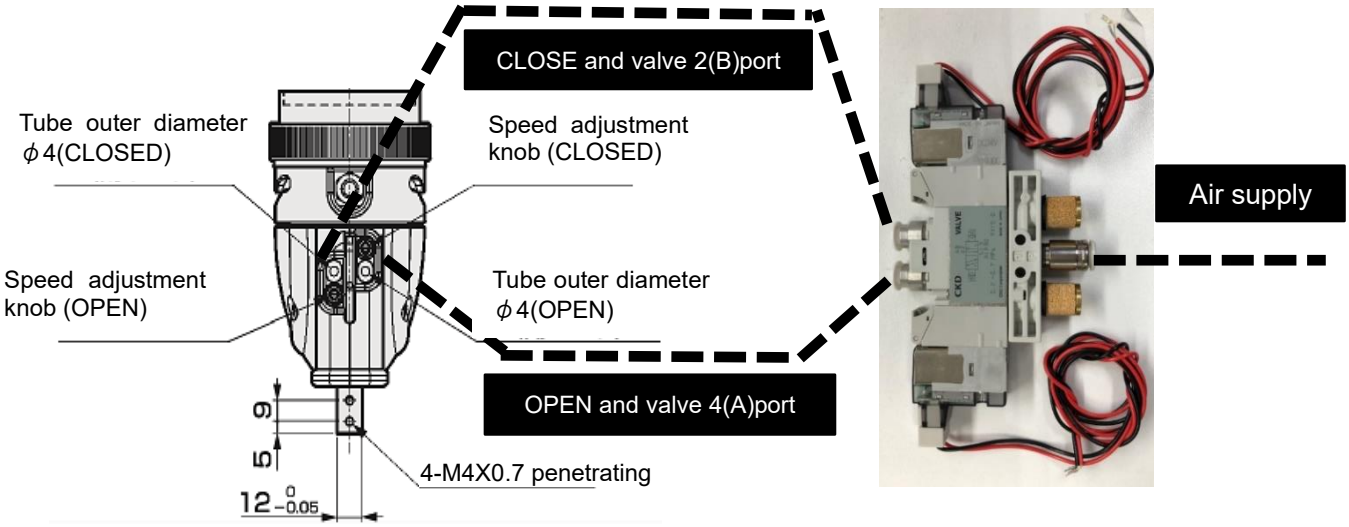
Connect the valve wiring to the I/O terminal. Connect「Open Port」signal、「Close Port」signal to “DO101~DO112”, respectively.
(For more information on connecting terminal block specifications and peripherals, see “FANUC Robot series R-30iB Mini Plus CONTROLLER MAINTENANCE MANUAL「3. PERIPHERAL DEVICE」”)
The figure below is an example connected according to the terminal block specifications in the control box.「Open Port」Signal=DO101、「Close Port」」Signal=DO112



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

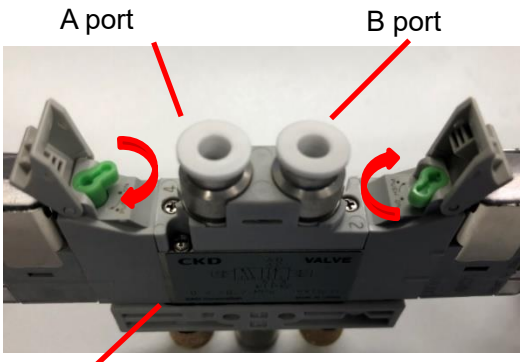
3.1 Using the gripper

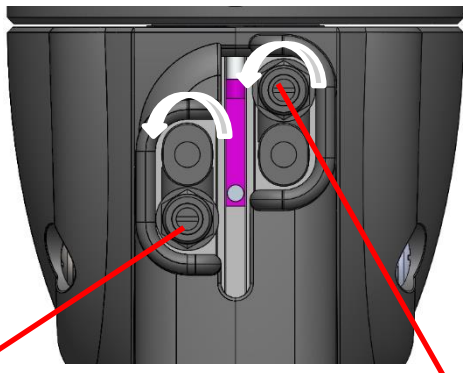
⚠CAUTION

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 "FANUC Robot series TABLET UI R-30iB Mini Plus CONTROLLER OPERATOR'S MANUAL".)
If the robot control software is V9.40P/05 or earlier, update to the latest version of V9.40P/06 or later before installing the plug-in software.

3.1.3 Software installation

1 Prepare a USB memory that can be used with the CRX series.
(For more information on compatible USB, see "FANUC Robot series R-30iB Mini Plus CONTROLLER OPERATOR'S MANUAL (Basic Function)")

2 After downloading the software from the CKD website and unziping the downloaded file (For the password for software extraction, please refer to the appendix* at the end of the book.), and the "ipl" files must store USB memory in the root folder..

Software : CKD Pneumatic Gripper

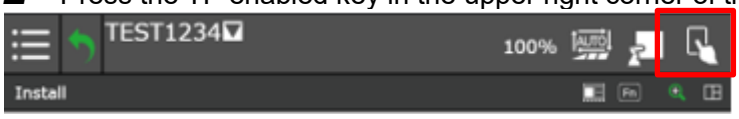
※ The electronic file version instruction manual on the CKD website does not include an appendix at the end of the book with the password for software extraction.

3.1.4 Installing software

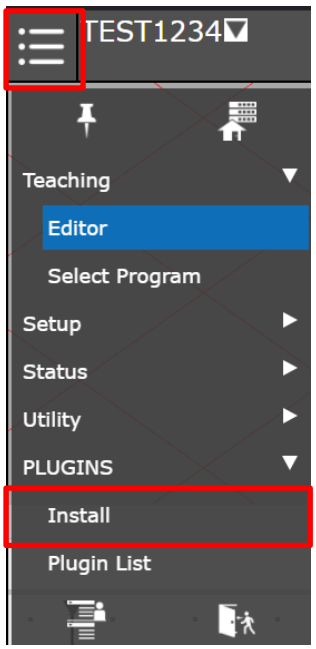
Install the dedicated software of this product on the robot.

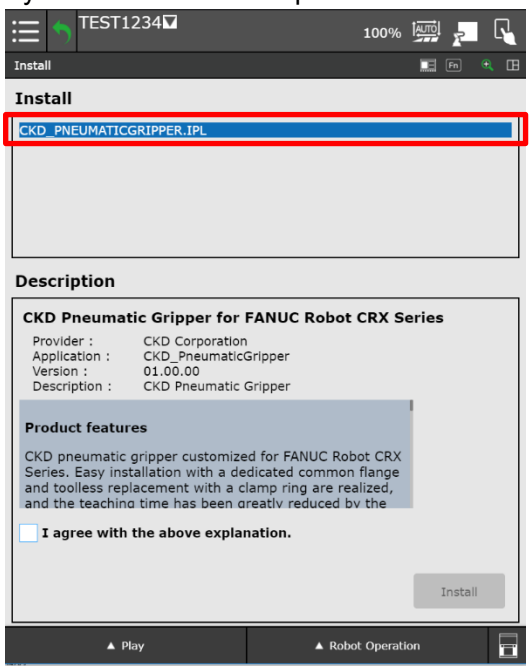
1 Insert the USB containing the software into the USB port(UD1) of the robot control box.
(Please refer to "FANUC Robot series R-30iB Mini Plus CONTROLLER OPERATOR'S MANUAL (Basic Function)" for information on how to install the software from the USB port.)

2 Press the TP enabled key in the upper right corner of the "Tablet TP" to enable TP.

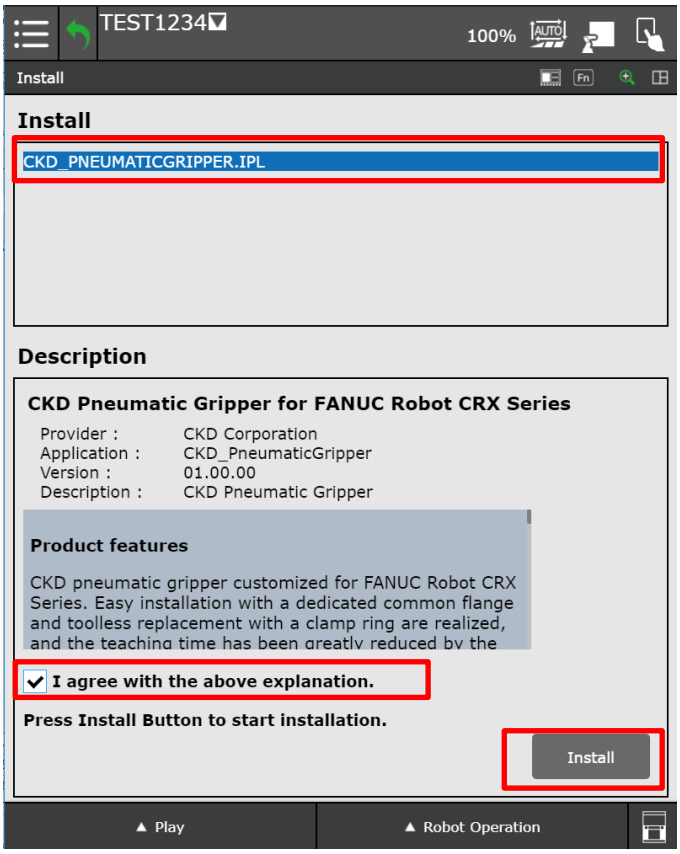


3 "Tablet TP" Menu > [Plugin] > [Install], Display the Install screen.
Software [CKD_PneumaticGripper] is displayed in the list at the top of the Install screen.

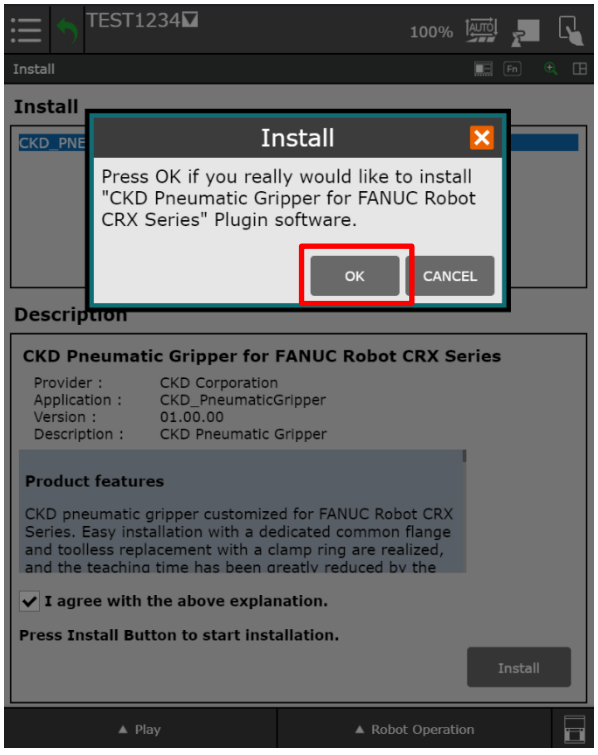


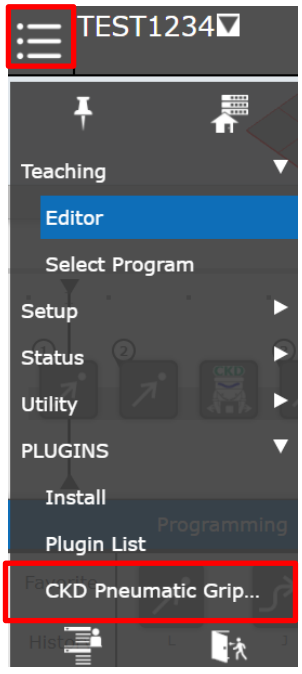


4 Select the software " CKD_PneumaticGripper " displayed in the list at the top of the installation screen, check " I agree with the above explanation." and press the installation button.



5 Follow the pop-up to complete the installation and restart the robot. After rebooting, “Tablet TP” Menu > [Plugin] > [CKD Pneumatic Gripper] is displayed.

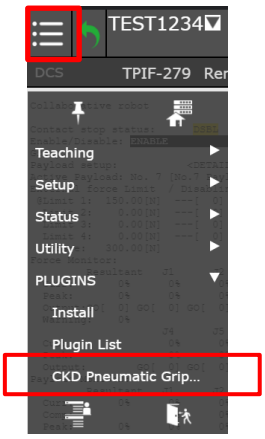


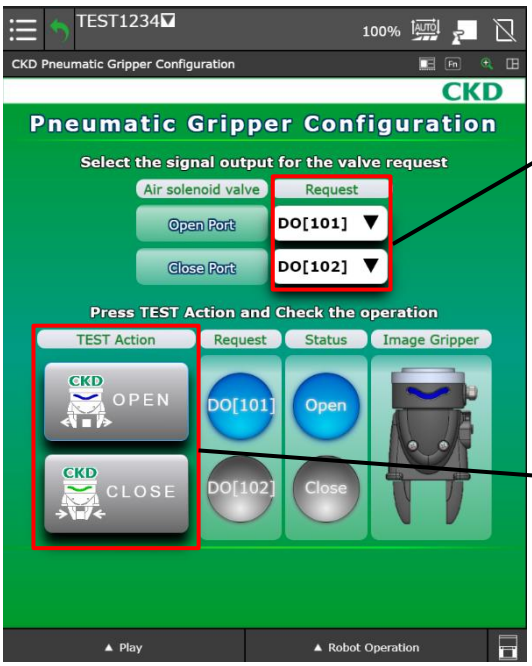


3.1.5 Controller I/O terminals and valve wiring settings

1. “Tablet TP” Menu> [Plugin] > [CKD Pneumatic Gripper] Display Setting CKD screen
2. Installation Method Select the I/O terminal connecting the red lines on the Open:4(A) and Close:2(B) ports from the valve in "2.4.1 Wiring valves and robot controllers" in the List down of "Request".
3. After selecting, check the gripper opening and closing in "Test Action" after confirming the air supply. The "Status" lamp on the screen receives the signal of the switch and lights up open when pressed "open", and close when pressed "close".

(Please refer to "3.3.1 CKD setting screen" for the screen description.)





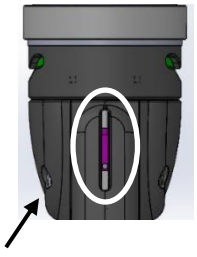
■ Set the operation signal settings "Open Port" and "Close Port" signals of the directional switching valve to the Interface general-purpose signals for robot control device peripherals.

■After setting, the valve can be sent a request signal for opening and closing to test the gripper operation.

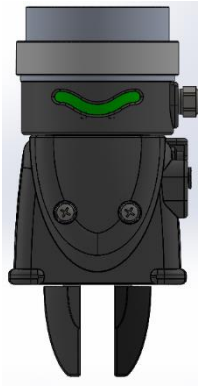
3.1.6 Adjustment of sencor

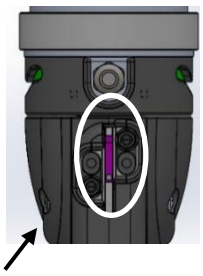
Adjust the switch according to the work piece referring to「2.3.2 Switch」.
It is rcommended to unify the display color of the gripper and the display color of the “Tablet TP”.
For details, see「Table 1 Gripper status and screen display list」.

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



Setting the switch position in the ”CLOSE” direction





Setting the switch position in the ”OPEN” direction

3.1.7 Setting the Payload setting number of the robot body

When gripper Open / Close operation If you have a load setting number that you want to set, you must register it in the load setting number in advance.
(For instructions on how to set the load setting number, please refer to "FANUC Robot CRX-10iA, CRX-10iA/L MECHANICAL UNIT OPERATOR'S MANUAL")

■ Total mass and center of gravity location of the gripper (Attachment nails, flanges included)

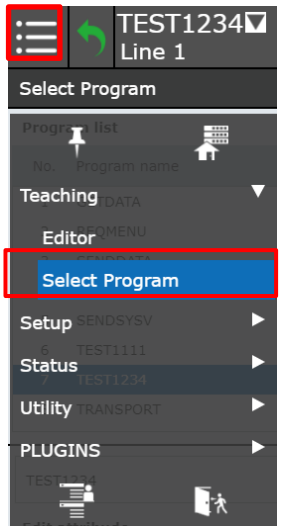
Model	Center of gravity (mm)			Total weight (kg) ※1
	X	Y	Z	
RLSH	0.0	1.1	56.7	0.8
RHLF	0.0	1.8	58.5	1.0
RCKL	0.0	1.4	63.6	1.1

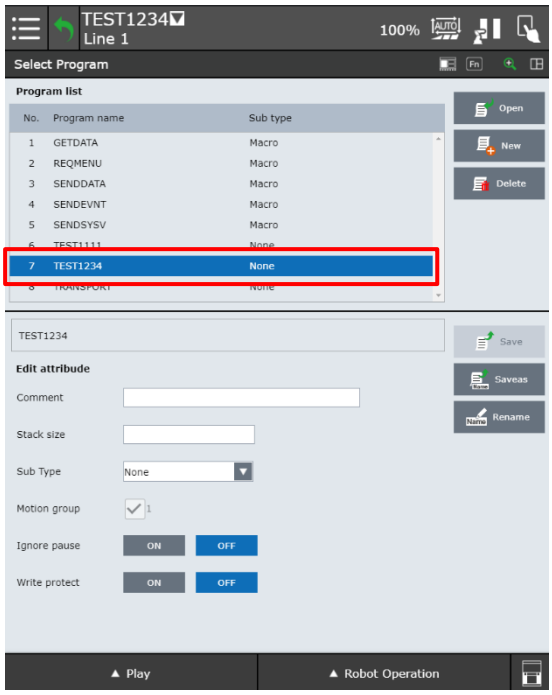
※1. If the jig is made according to the work piece, enter the total center of gravity and the total weight of the gripper and the jig

3.2 Program functions and operations

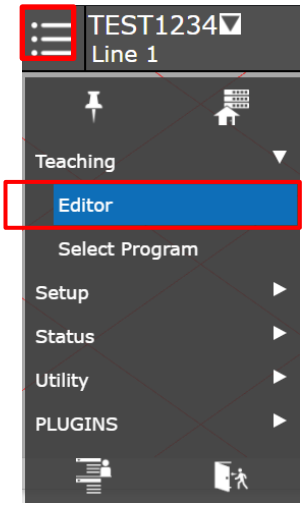
3.2.1 Procedure for creating a robot program using CKD software

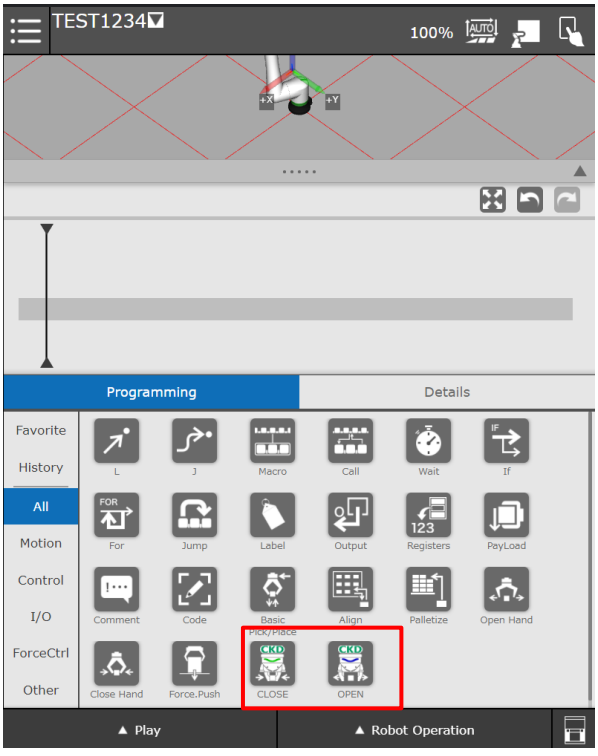
1 “Tablet TP” Menu> [Teaching] >[Select Program] Operate to display the robot program selection screen. Select the robot program you want to edit. ※The figure below shows an example of selecting the robot program "TEST1234"
(When creating and editing robot programs, Please check the robot "FANUC Robot series TABLET UI R-30iB Mini Plus CONTROLLER OPERATOR’S MANUAL".)



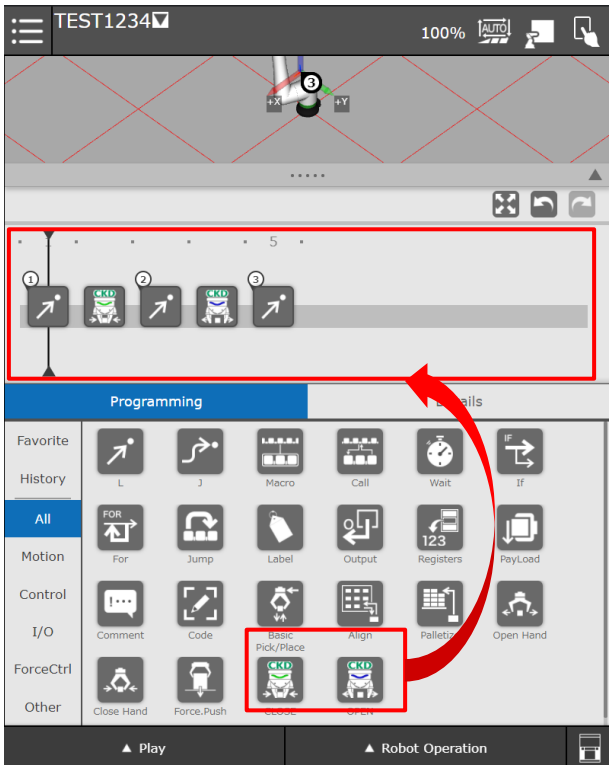


2 “Tablet TP” Menu> [Teaching] >[Editor] Operate to display the robot program Editor screen. Then there is “CKD gripper icon”.

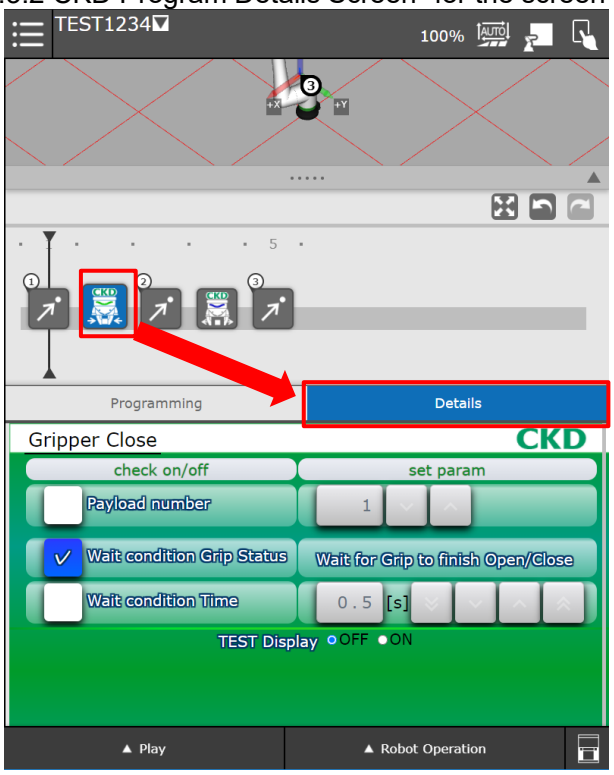




3 As shown in the figure below, you can add the CKD gripper's Open /Close program to the robot program by dragging and dropping the Open / Close icon of the CKD gripper and arranging the icons in the order you want to run them.
(When creating and editing robot programs, Please check the robot "FANUC Robot series TABLET UI R-30iB Mini Plus CONTROLLER OPERATOR'S MANUAL".)



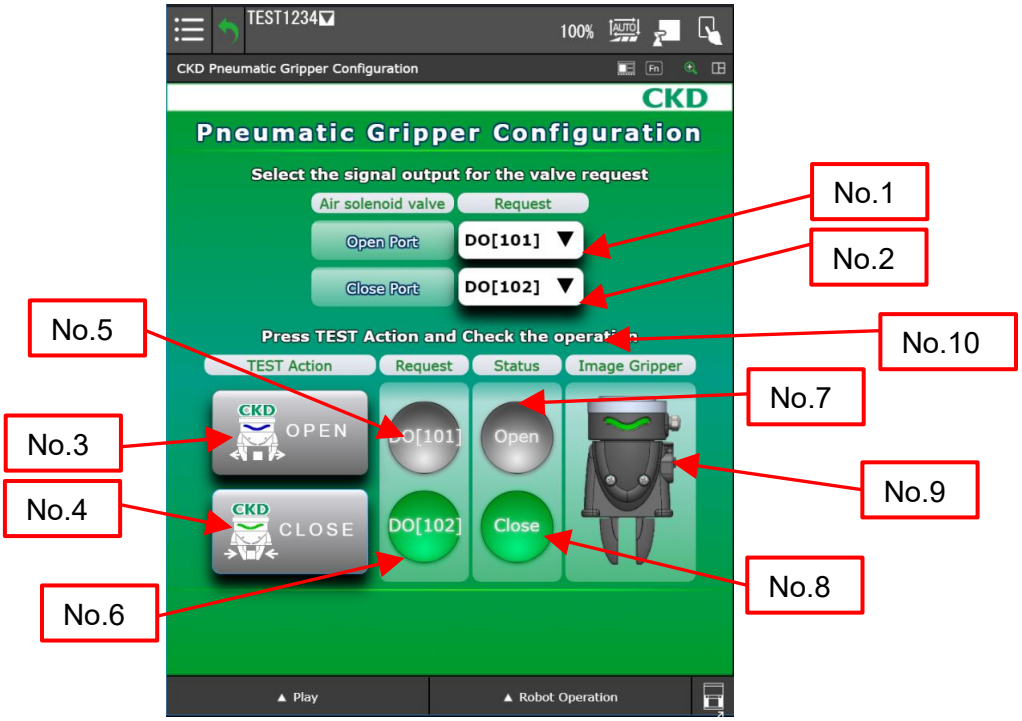
4 As shown in the figure below, when the Open / Close icon is selected and the [Details] tab is selected, the screen of the parameter settings of Open and Close is displayed.
You can specify the load setting number when opening and closing the gripper, wait operating conditions for the next step after the gripper operation ends, and wait time conditions can be set.(Please refer to " 3.3.2 CKD Program Details Screen" for the screen description.)



3.3 Screen description

3.3.1 CKD Settings screen

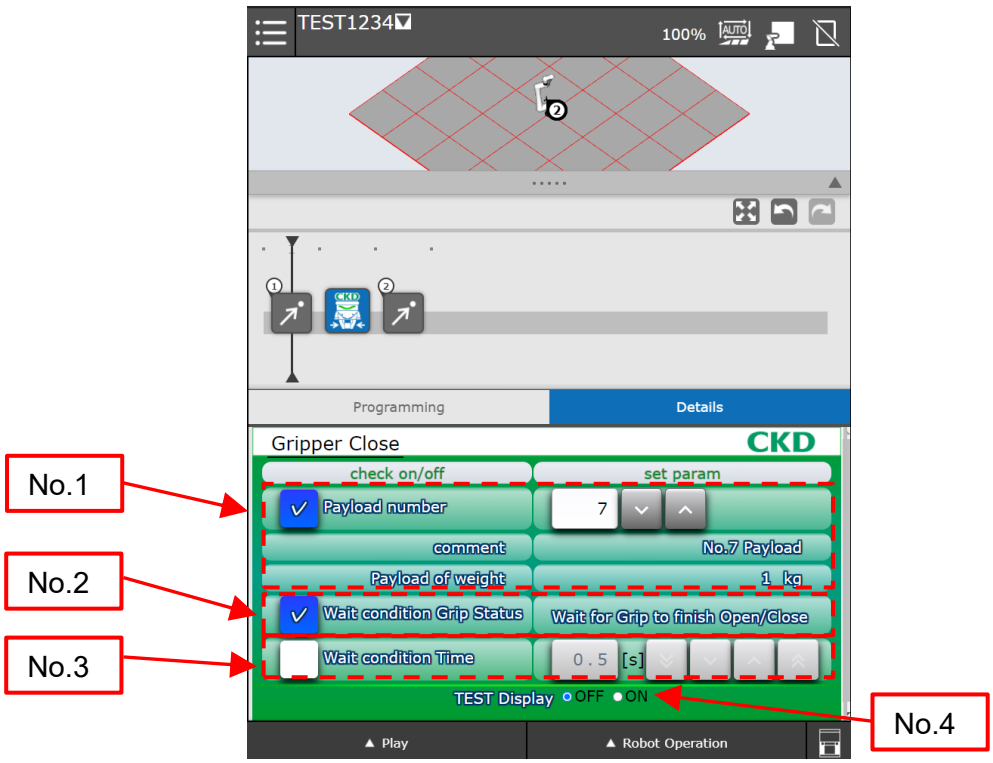
Function : This is a screen to test the setting screen and setting contents related to the CKD function.
Screen transitions ： Menu> [Plugin] > [CKD Pneumatic Gripper]



No.	Name	Description
1	Valve Open Port Setting Drop Down List	Set the I/O terminal of the valve “Open Port / Close Port”. According to the destination of「2.4.1 Wiring of Valve and Robot」,Select and assign DO[101] to [112] in the drop-down list. ※ Initially, "Select" is selected.
2	Valve Close Port Setting Drop Down List	
3	Gripper Open request button	When “Gripper Open/Close request button” is pressed, it is requested to the valve as follows. If the request is successful, the gripper activates the air pressure. OPEN request: Open Port=TRUE、Close Port=FALSE CLOSE request: Open Port=TRUE、Close Port=FALSE
4	Gripper Close request button	
5	Open Port request indicator	When “Open/Close request button” is pressed, Lights up to meet valve requirements（Table 1 Gripper status and screen display list） TestAction Message is not “Usually represented”（Table 2 List of message display contents）,It does not light up because it does not issue a request.
6	Close Port request indicator	
7	Open Switch indicator	When you press the "Open/Close request button", it changes according to the state of the switch of the gripper.（Reference：Table 1）
8	Close Switch indicator	
9	Gripper Image	
10	TestAction Message	When the “Open/Close request button” is pressed, If there is an abnormality, the display switches.（Reference：Table 2）

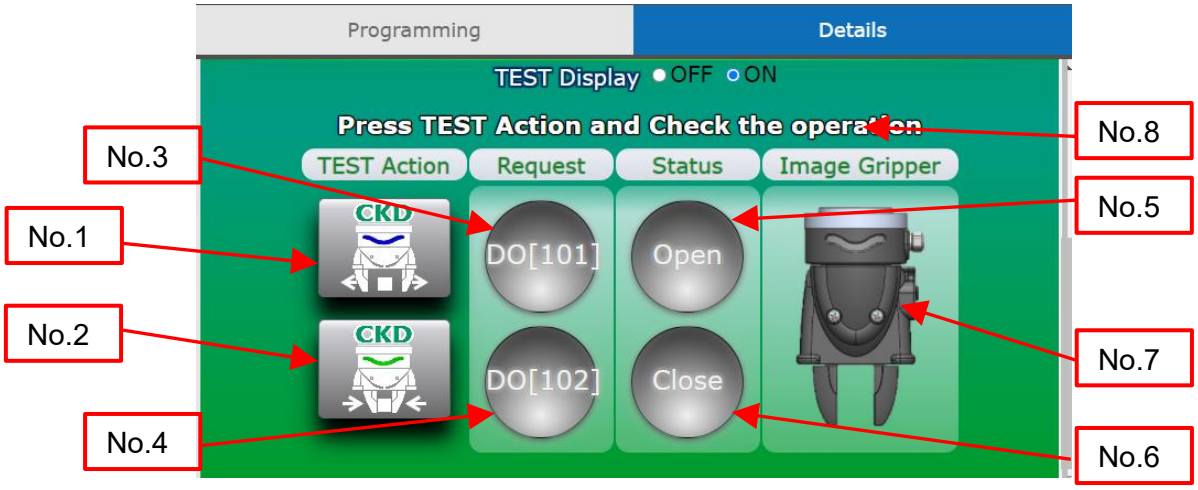
3.3.2 CKD Program detail screen

Function ： This screen specifies the parameters of CKD Open / Closeprogram.
Screen transitions ： “Tablet TP” Menu> [Teaching] > [Editor] and Select [Detail] on program screen.



No.	Name	Description
1	Payload	It works when the check box is turned on. When you run “ Open / Close” program, you can change it to the specified load setting number. The load setting number can be set from 1 to 10. "FANUC Robot series R-30iB Mini Plus CONTROLLER OPERATOR’S MANUAL (Basic Function)"to set the load setting number)
2	Wait Action	It works when the check box is turned on. After running “Open / Close” program, you can wait for “Open / Close” signal from the switch.
3	Wait Time	It works when the check box is turned on. You can wait for a specified time after running “Open / Close” program. 0.1 to 10 (seconds) can be set.
4	TEST Display	When the radio button ON is selected, the Test item is displayed at the bottom of the screen. Please refer to "3.3.3 CKD program details screen (TEST Display = on)" for the display contents.

3.3.3 CKD Program details screen (Test Display = On)



No.	Name	Description
1	Gripper Open request button	When “Gripper Open request button” is pressed, it is requested to the valve as follows. Open Port=TRUE、Close Port=FALSE If successful, it operates under pneumatic pressure and the gripper opens.
2	Gripper Close request button	When “Gripper Close request button” is pressed, it is requested to the valve as follows. Open Port=FALSE、Close Port=TRUE If successful, it operates under pneumatic pressure and the gripper closes.
3	Open Port request indicator	When “Open/Close request button” is pressed, Lights up to meet valve requirements（Table 1 Gripper status and screen display list） TestAction Message is not “Usually represented”（Table 2 List of message display contents）,It does not light up because it does not issue a request.
4	Close Port request indicator	
5	Open Switch indicator	When you press the "Open/Close request button", it changes according to the state of the switch of the gripper.（Reference：Table 1）
6	Close Switch indicator	
7	Gripper Image	When the “Open/Close request button” is pressed, The image changes according to the state of the gripper switch（Reference：Table 1）
8	TestAction Message	When the “Open/Close request button” is pressed, If there is an abnormality, the display switches.（Reference：Table 2）

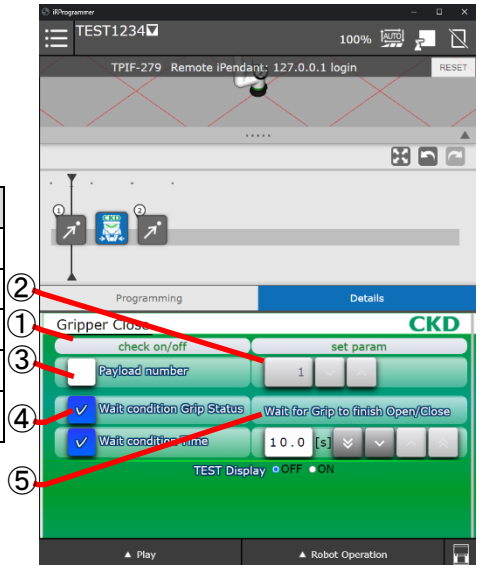
3.4 TP Program

3.4.1 CKD Command text

Drag and drop the CKD icon on the “Tablet TP” program screen to add instructions “IPL_CKD_GRP_OPEN / IPL_CKD_GRP_CLOSE”. In addition, the parameter setting contents of the 3.3.2 CKD program details screen are reflected in the arguments of the robot program instruction.

Argument : IPL_CKD_GRP_＊(①,②,③,④,⑤)

No.	Name	Explanation
①	Payload check function	Function OFF:0 / ON:1
②	Payload Number	Number:1～10
③	Wait Action check function	Function OFF:0 / ON:1
④	Wait Time check function	Function OFF:0 / ON:1
⑤	Wait Time (second)	Second:0.1 ～ 10.0



3.4.2 CKD Alarm

If a trouble is detected while the CKD program is running, the following alarm may be displayed. Include alarm contents and countermeasures.

No.	CKD Alarm
1	PLUG-001 Please review CKD signal output setting. Cause: "Select" is selected for the output terminal. Countermeasure :3.3.1 Set the I/O terminal on the CKD setting screen.
2	PLUG-001 CKD gripper not detected. Check the switch sensor. Cause : For Standby Operation ON, both OPEN and CLOSE switch are turned on. Countermeasure : Review the position of the switch.

If you want to restart the program from the state where the alarm is displayed, please restart it after measures are taken.

※Please refer to "R-30iB Mini Plus CONTROLLER OPERATOR’S MANUAL Alarm Code List OPERATOR’S MANUAL" for the return operation from the alarm.

※For details of other alarms, please refer to "R-30iB Mini Plus CONTROLLER OPERATOR’S MANUAL(Basic Function) 6.1 PROGRAM HALT AND RECOVERY".

Table 1 Gripper status and screen display list

※Ex. Open Port=DO[101], Close Port=DO[102]

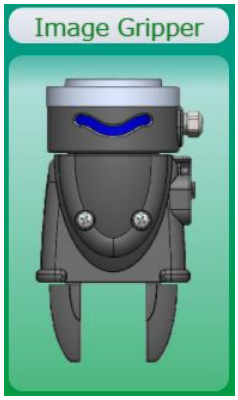
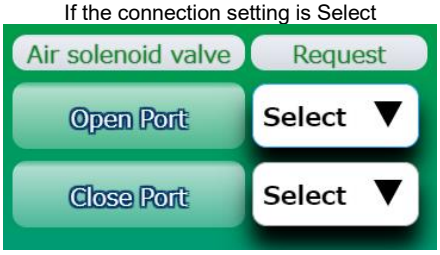
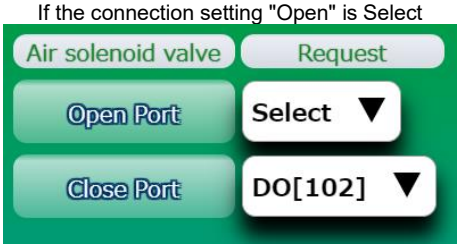
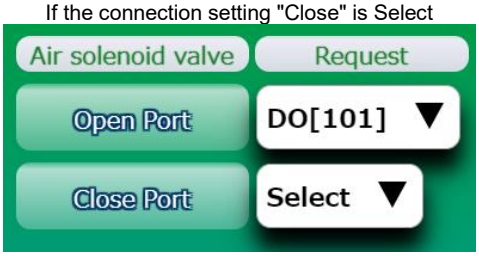
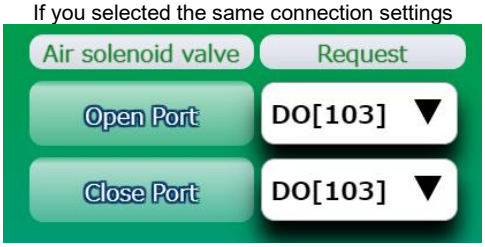
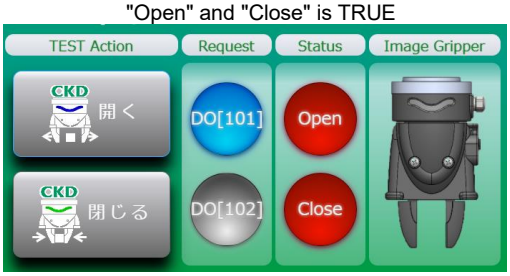
Status [color]	Requirements for valves		Switch		Gripper
Center position [Grey]		DO[101]=false DO[102]=false		Open=false Close=false	
Open [Blue]		DO[101]=true DO[102]=false		Open =true Close =false	
Close [Green]		DO[101]=false DO[102]=true		Open =false Close =true	
Switch Installation abnormality [Water]	-	DO[101]=true DO[102]=true		Open =true Close =true	

Table 2 List of message display contents

Reason	Display message
Usually represented	'Press TEST Action and Check the operation'
If the connection setting is Select 	'The signal output is default value Open & Close Port.'
If the connection setting "Open" is Select 	'The signal output is default value Open Port.'
If the connection setting "Close" is Select 	'The signal output is default value Close Port.'
If you selected the same connection settings 	'The signal output is the same terminal.'
If both switch "Open" and "Close" is TRUE 	'Check the sensor Open / Close installation position'

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)

Problem	Cause	Solution
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 Switch

Problem	Cause	Solution
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.