

# FANUC Robot CRX Plugin

## Quick Start Manual

Model Name: ARH350A

Package File: ASPINA\_ARH350

Rev. 1.02



Shinano Kenshi Co., Ltd.

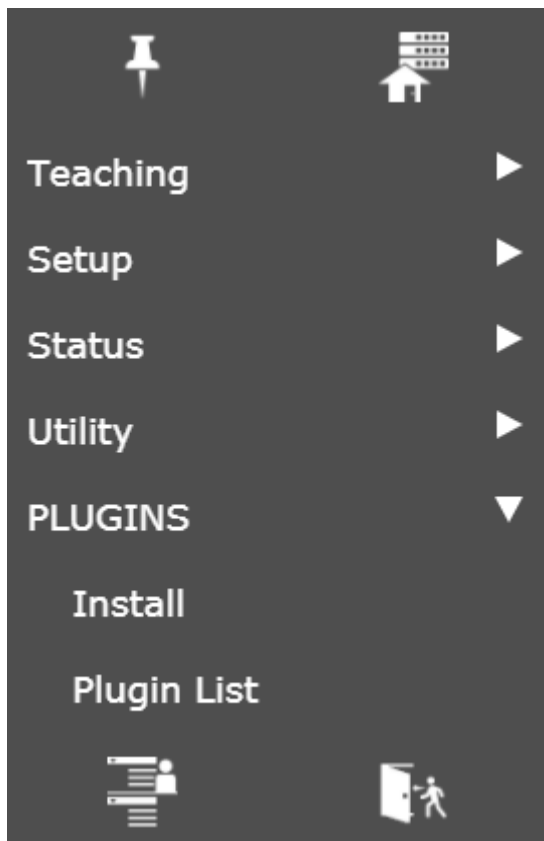
## 1. Installation plug-in



If you install a plug-in of another company's product later, the initial settings of the EE connector may be changed and the gripper may malfunction. In that case, perform the operation to recovery the connector setting according to Section 3.2.

### 1.1. Installation Instructions

1. Copy the plug-in software "ASPINA\_ARH350.IPL" to a USB memory and insert it into the USB socket (UD1) of the robot controller.
2. Tap the menu button on the tablet TP screen to display a pull-down menu of plugins.

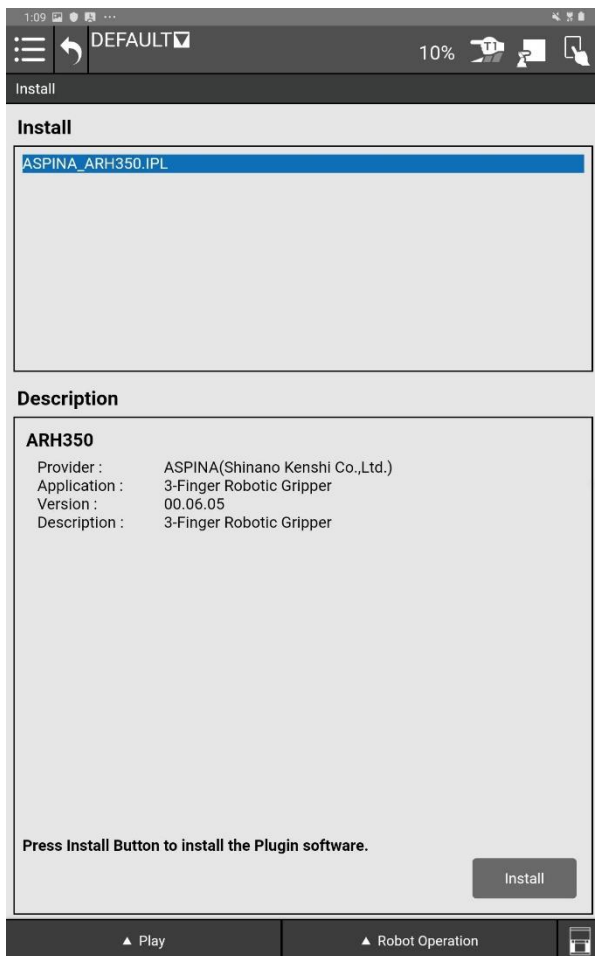


English



Japanese

3. Tap Install.

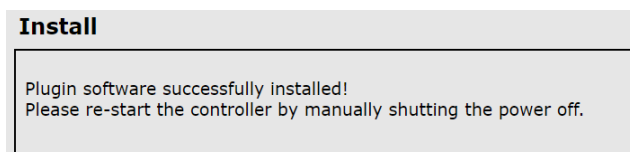


English

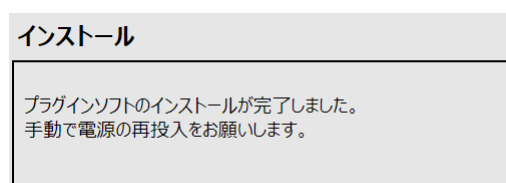


Japanese

4. Select ASPINA\_ARH350.IPL from the installation screen and tap Install at the bottom right.
5. When the installation is complete, you should see the following screen:.



English



Japanese

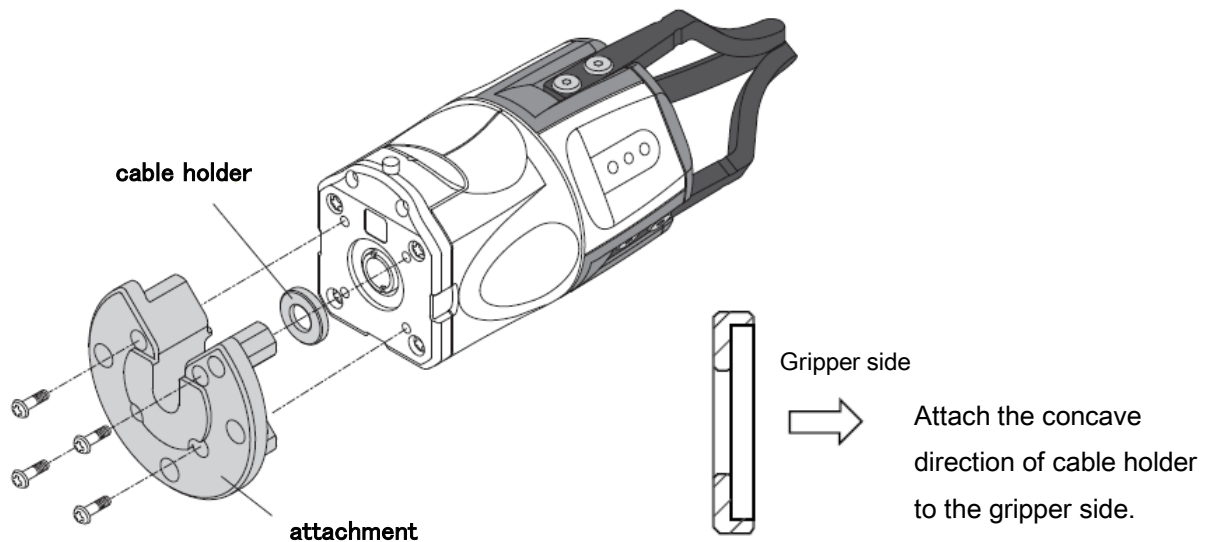
6. After successful installation, power down the robot controller to install the gripper.

## 2. Installation method to robot

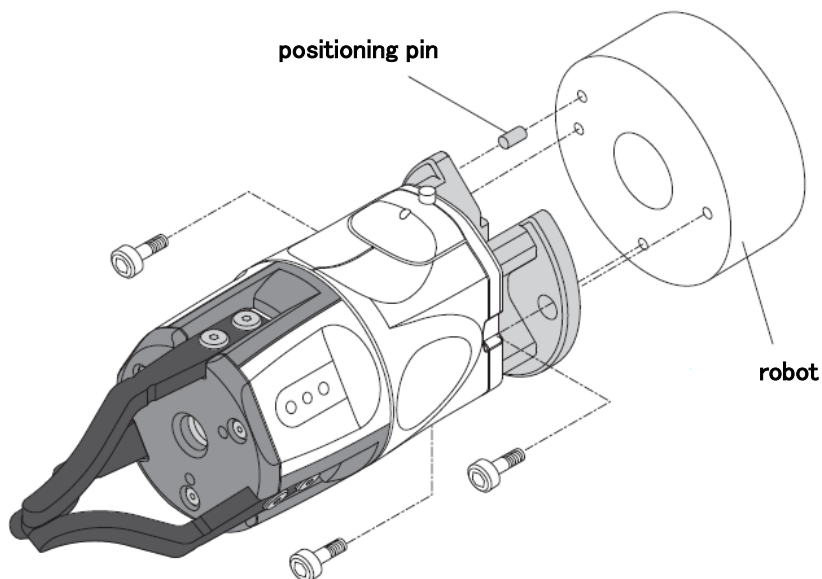


When installing with the robot, keep the power of the robot turned off.

### 2.1. Mounting the gripper



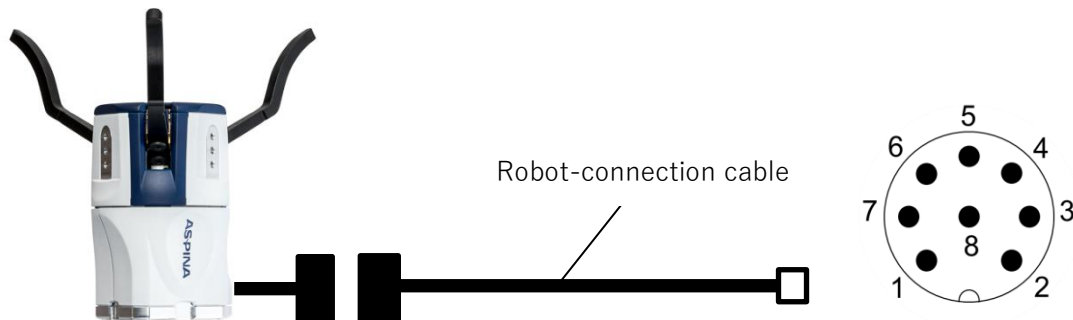
1. Attach the dedicated attachment to the robotic gripper body (A screw is included in the exclusive attachment.).



2. Attach the attachment to the robot end effector mounting surface.

## 2.2. Wiring method

1. Connect the main unit cable to the robot-connection cable.
2. Connect the robot-connection cable to EE connector on the robot wrist.



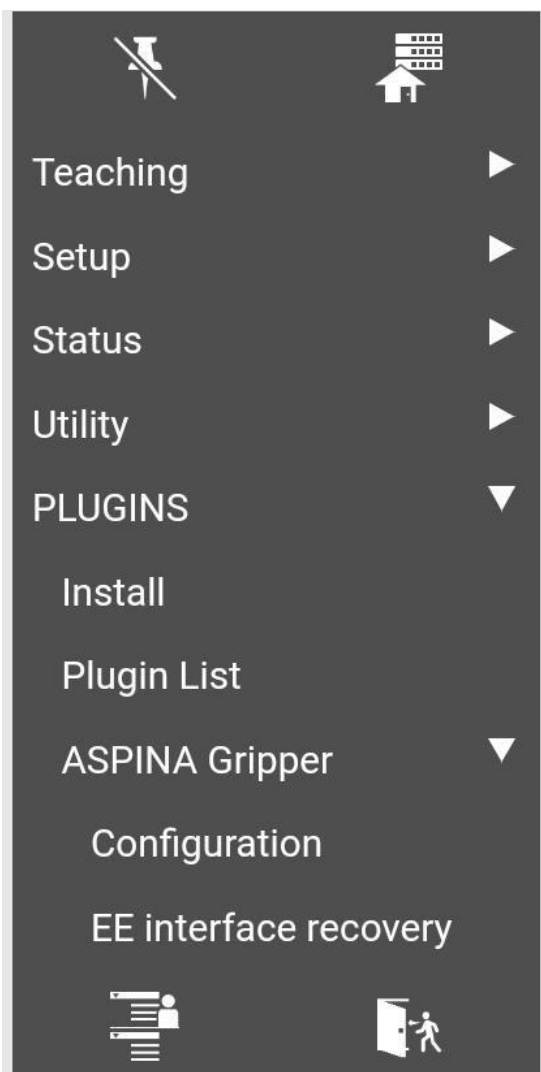
3. Turn on the robot controller and check that the gripper is energized.



The gripper ARH series performs homing operation to detect the fully closed and fully opened positions when the power supply is started. Be sure to turn on the power supply with the work piece removed.

### 3. Robot Initialization

#### 3.1. Installation settings

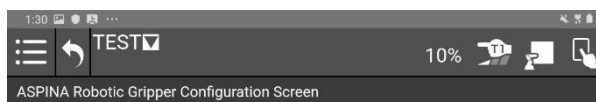


English



Japanese

1. Tap the menu button on the tablet TP screen to display a pull-down menu of plugins.
2. Tap "ASPINA Gripper" from among the plugins.
3. Tap "Configuration" to open the plugin screen.



ASPINA

### ASPINA Robotic Gripper Configuration Screen

Select the gripper setting:

slave ID: 1 ▼

output: RS485 ▼

Test the gripper open/close:

grip: Pattern1 ▼



English



ASPINA

### ASPINA ロボットハンド 設定画面

ハンドへの指令方法を選択してください:

スレーブID: 1 ▼

信号出力: RS485 ▼

ハンド開閉テスト:

グリップ動作: パターン1 ▼



Japanese

4. Tap "OPEN"/"CLOSE" in the Gripper Open/Close test to confirm that the gripper opens and closes.
5. To test the opening/closing operation of Pattern 2(\*1), set the grip pattern to "Pattern 2", then tap "OPEN"/"CLOSE".
6. If you want to move the gripper with the RO output of the EE connector, set the output to "RO[]".

\*1

\*\*\* Configuration : select output RO[] \*\*\*

Pattern 2 requires a preset gripper.

For details, refer to chapter 5 for robotic gripper adjustment method.

### 3.2. Recovery EE connector setting

If the EE connector configuration is updated by installing a plug-in from another company, the gripper may become unusable.

Before replacing and installing the gripper, perform the following steps to restore the connector configuration.



#### EE Interface Configuration Recovery

Recovery EE Interface Configuration:

English



#### EEインタフェース設定復旧画面

EEインタフェース通信設定の復旧：

Japanese



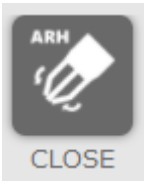

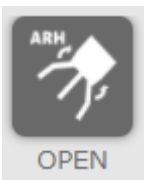

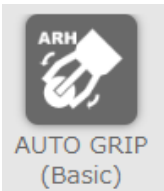

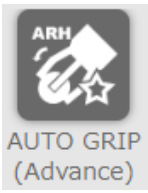

1. Tap the menu button on the tablet TP screen to display a pull-down menu of plug-ins.
2. Tap "EE interface recovery" from among the plug-ins.
3. Tap the "Recovery" button.
4. "Please re-start the controller." will be displayed on the screen. Restart the robot controller.









## 4. Adding to robot program

### 4.1. Robotic gripper manipulation icons

When the plug-in software is installed, the following icons will be added to the icon palette on the program editor screen. By dragging and dropping these onto the program line, you can incorporate the opening and closing movement of the gripper into the movement of the robot.

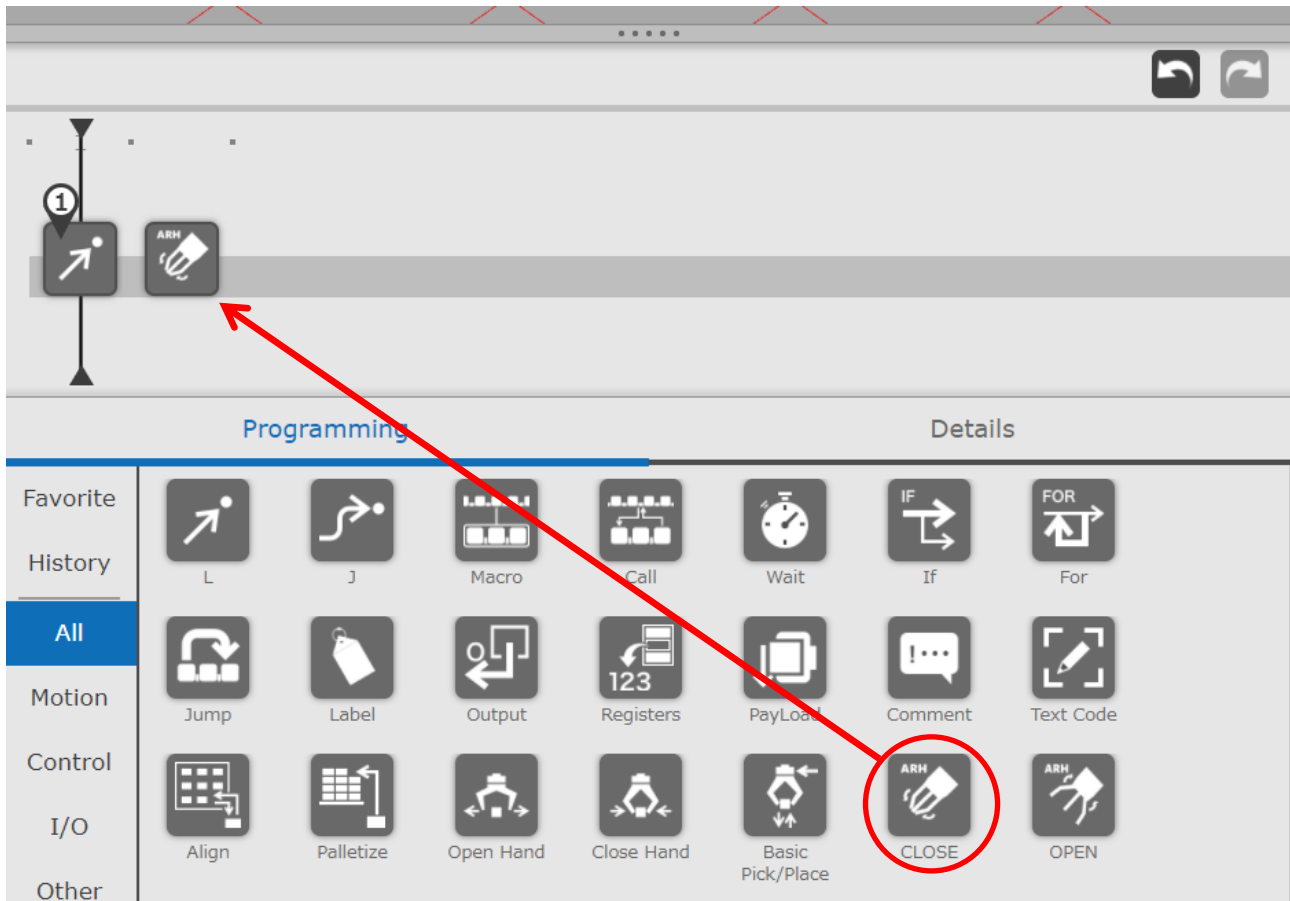
 	<h3>[CLOSE]</h3> <p>The icon to close gripper.</p> <p>You can adjust the wait time so that the arm does not move before closing.</p> <p>You can select the presence or absence of a "grip check" to detect the misgrip of the workpiece.</p>
 	<h3>[OPEN]</h3> <p>The icon to open gripper.</p> <p>You can adjust the wait time so that the arm does not move before opening.</p> <p>It is also compatible with "inner diameter gripping" in which the finger is inserted inside the workpiece and gripped from the inside, and it is possible to check the gripping even when opening.</p>
 	<h3>[AUTO GRIP (Basic)] <i>new!</i></h3> <p>Gripper automatically adjusts the force and grasps the workpiece.</p> <p>You can also select whether or not there is a "grip check" that detects failure to grasp the workpiece.</p>
 	<h3>[AUTO GRIP (Advance)] <i>new!</i></h3> <p>Gripper automatically adjusts the force and grasps the workpiece.</p> <p>You can also adjust the parameters that determine the strength of the grip.</p> <p>You can also select whether or not there is a "grip check" that detects failure to grasp the workpiece.</p>

 	<h2>[SET(Basic)]</h2> <p>This icon adjusts the opening and closing position, torque, and speed of the gripper.</p> <p>You can adjust the strength of the gripping force by setting the torque.</p> <p>If you lower the speed, you can grip slowly.</p> <p>As the open/close position is set, the position range of the grip check is automatically adjusted.</p>
 	<h2>[SET(Advance)]</h2> <p>This icon adjusts the opening and closing position, torque, and speed of the gripper.</p> <p>In addition to SET(Basic), push-in operation can be adjusted.</p> <p>You can also set the position range of the grip check.</p>
 	<h2>[POWER SAVE]</h2> <p>It is an icon to enable / disable the power saving grip function.</p> <p>The function is enabled by default, but it is better to disable function for "fitting" and "pulling out" of the workpiece.</p>

## 4.2. Open/Close Gripper

Use "CLOSE"/"OPEN" icons to close/open the gripper.

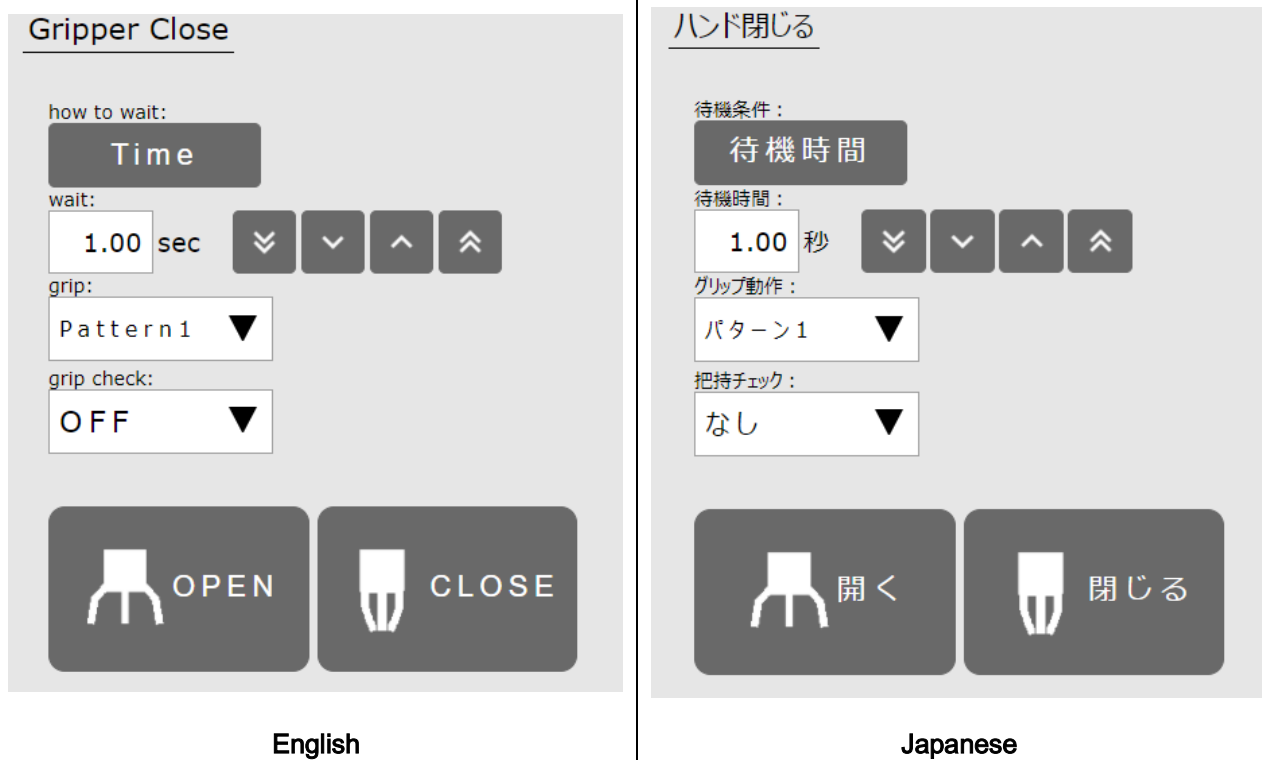
### 4.2.1. Add to program line



1. Drag the "CLOSE" icon (or the "OPEN" icon) from the programming area.
2. Move the icon onto the timeline and drop it.
3. If you drop it by mistake, drag and drop the icon into the 3D view area to remove it.

#### 4.2.2. Instruction detail screen

The waiting time of the gripper, the operation pattern, and whether to check the grip are set in the detail screen.



1. Tap the "CLOSE" icon (or the "OPEN" icon) in the Timeline to open the details screen.
2. To adjust the wait time (\*2) while the gripper is open or closed, tap the how-to-wait to switch to "Time"
3. Sets the wait time in 0.01 second increments.
4. To operate a different pattern(\*3), set the grip pattern to "Pattern 2".
5. If you want to perform a grip check(\*4), set the grip check to "ON".
6. Tap the "OPEN" "CLOSE" button to test each action.

#### \*2

\*\*\* Select "Time" as the wait condition \*\*\*

The wait time setting is 0.00 ~ 10.00 (seconds).

By setting the waiting time to 0, the arm can be moved while the gripper is closed.

**\*3**

*\*\*\* Configuration : select output RO[] \*\*\**

To use signal output pattern 2, the gripper must be preset.

Please refer to chapter 5 for the adjustment of robotic gripper.

If SEL1 is not assigned, selecting pattern 2 will have the same operation as pattern 1.

**\*4**

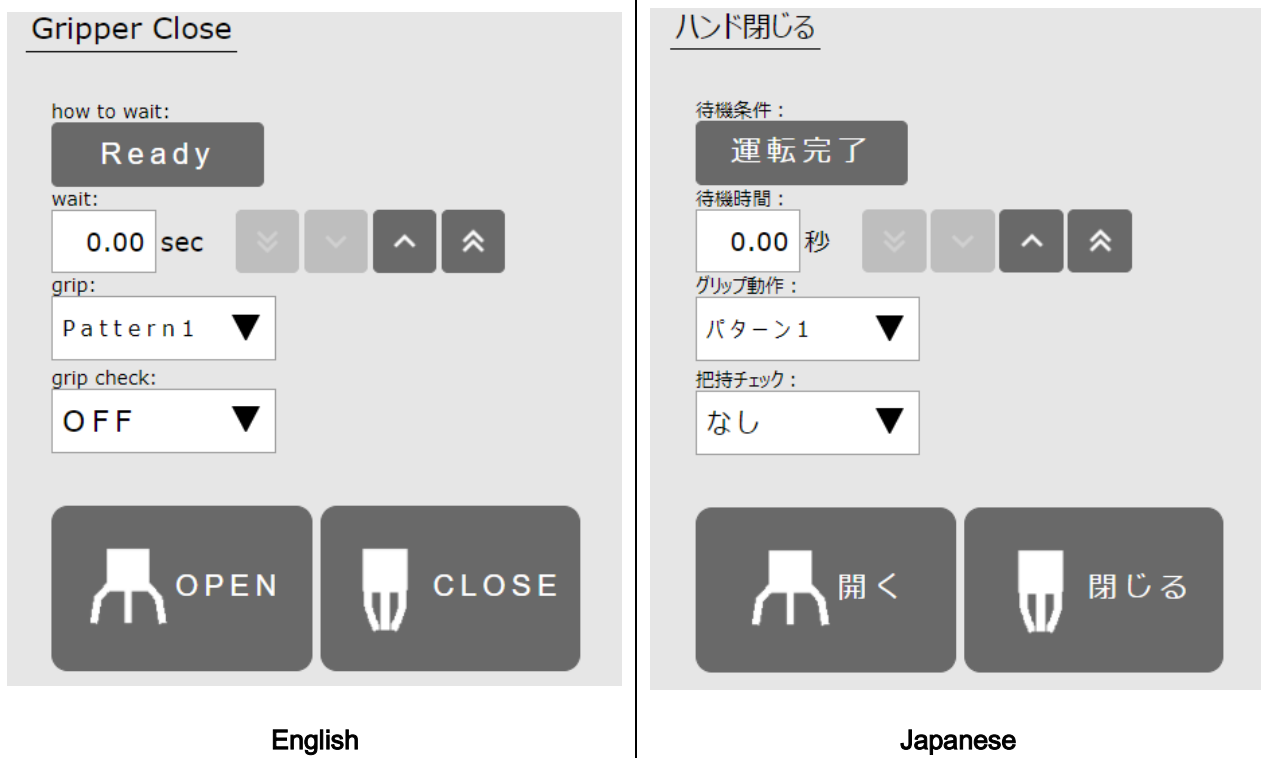
*\*\*\* Select "Time" as the wait condition \*\*\**

When performing a grip check, set the waiting time to 1 second or more. There is a risk of checking before the gripper closes.

The grip check is performed only once after the waiting time has elapsed. It cannot detect the event of dropping the workpiece while the arm is moving.

### 4.2.3. Select wait condition

When the how-to-wait is switched to "Ready", the gripper waits until the operation is completed. This eliminates the need to adjust the wait time individually.



1. Tap the "CLOSE" icon (or the "OPEN" icon) on the program line to open the detail screen.
2. Tap the wait condition to switch to "Ready". The wait time appears as 0.00 seconds (\*5).
3. If you want the grip to behave in a different pattern, set the grip pattern to "Pattern 2".
4. If you want to perform a grip check, set the grip check to "ON".

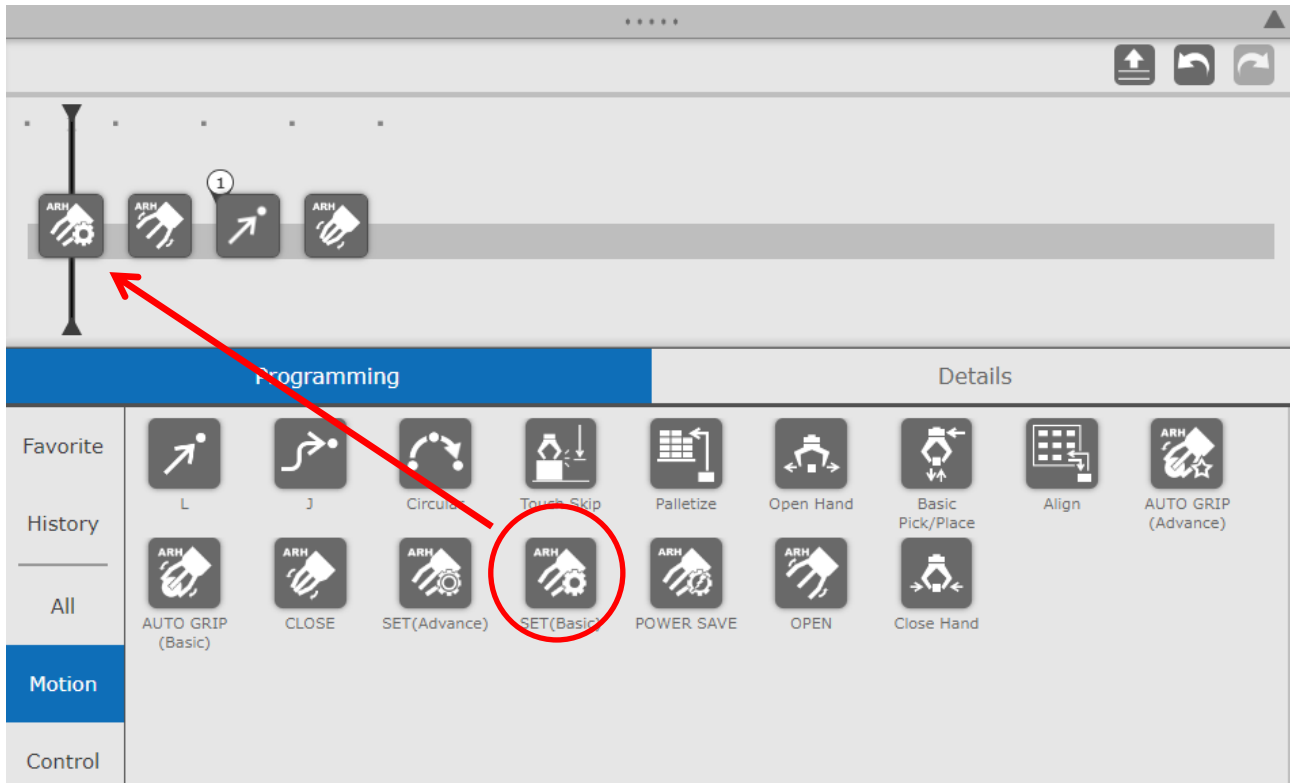
**\*5**

When the wait condition is set to "Ready", the set value of the wait time is invalid.

### 4.3. Adjust gripper position/torque/speed

Use "SET(Basic)" icon to set the gripper motion with a few parameters.

#### 4.3.1. Add to program line

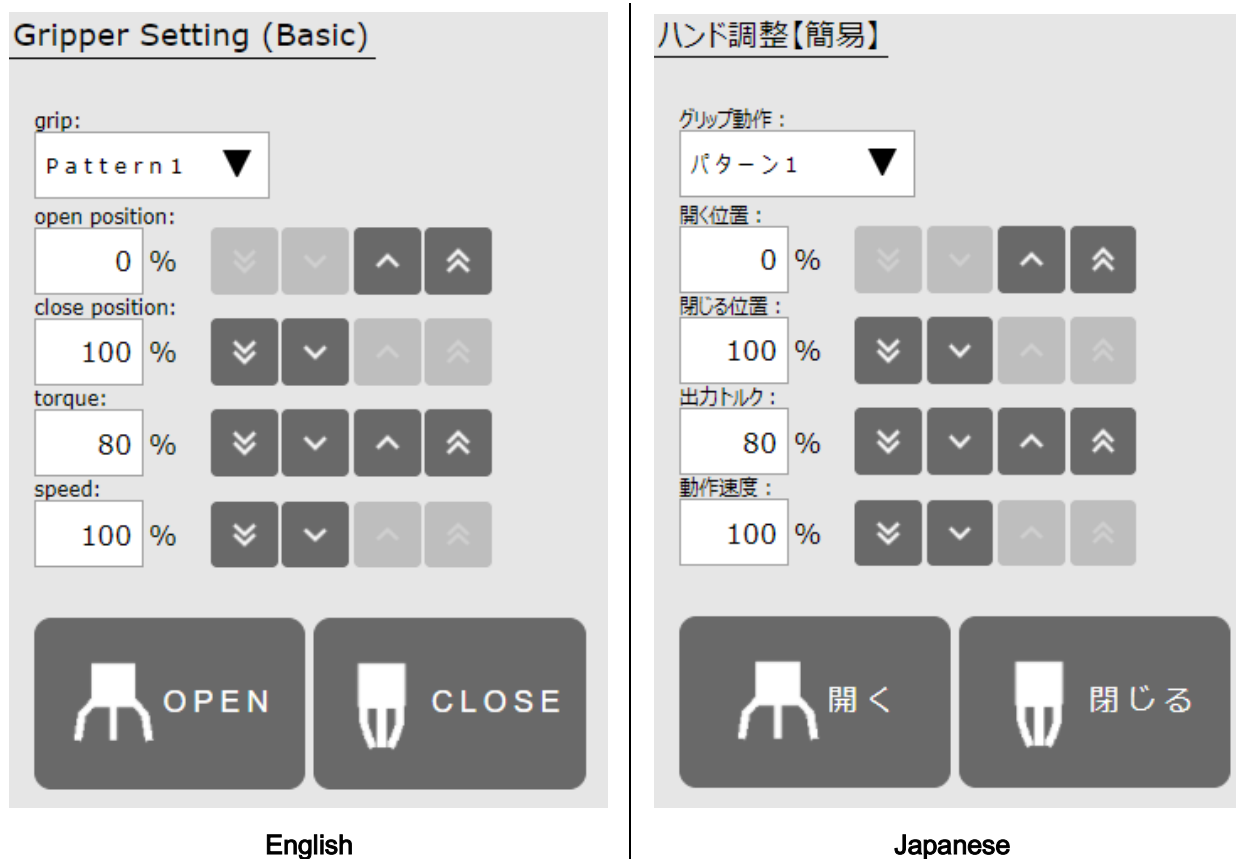


1. Drag the "SET(Basic)" icon from within the programming area.
2. Move the icon over the program line and drop it.
3. If you accidentally drop it, drag and drop the icon to an area outside the program line to remove it.

### 4.3.2. Instruction detail screen

Set the opening position, closing position, torque and operating speed of the gripper in the detail screen (\*6) (\*7).

For details on each parameter, see the glossary in Section 6.2.



1. Tap "SET(Basic)" icon on the program line to open the details screen.
2. Select the grip pattern number (\*8) whose parameter you want to change.
3. If you want to adjust the opening of the gripper, set the open position in 1% increments.
4. If you want to adjust the closing of the gripper, set the close position in 1% increments.
5. To adjust the strength of the gripping force, set the torque in 1% increments.
6. If you want to adjust the operating time of the gripper, set the speed in 1% increments.
7. Tap the "open" "Close" button to test each action.



**\*6**

The parameters that can be set by the plug-in's "SET" icon are in % units.  
If you want to adjust the parameters more precisely, use the setup software.  
For details, refer to chapter 5 for the robotic gripper adjustment method.

**\*7**

Do not use the "SET" icon to operate according to the parameters stored in the gripper memory.  
If you perform an open/close test or operation with the "SET" icon even once, it will be rewritten to the new setting. Please restart the gripper.

**\*8**

*\*\*\* Configuration : select output RO[] \*\*\**

To use signal output pattern 2, the gripper must be preset.

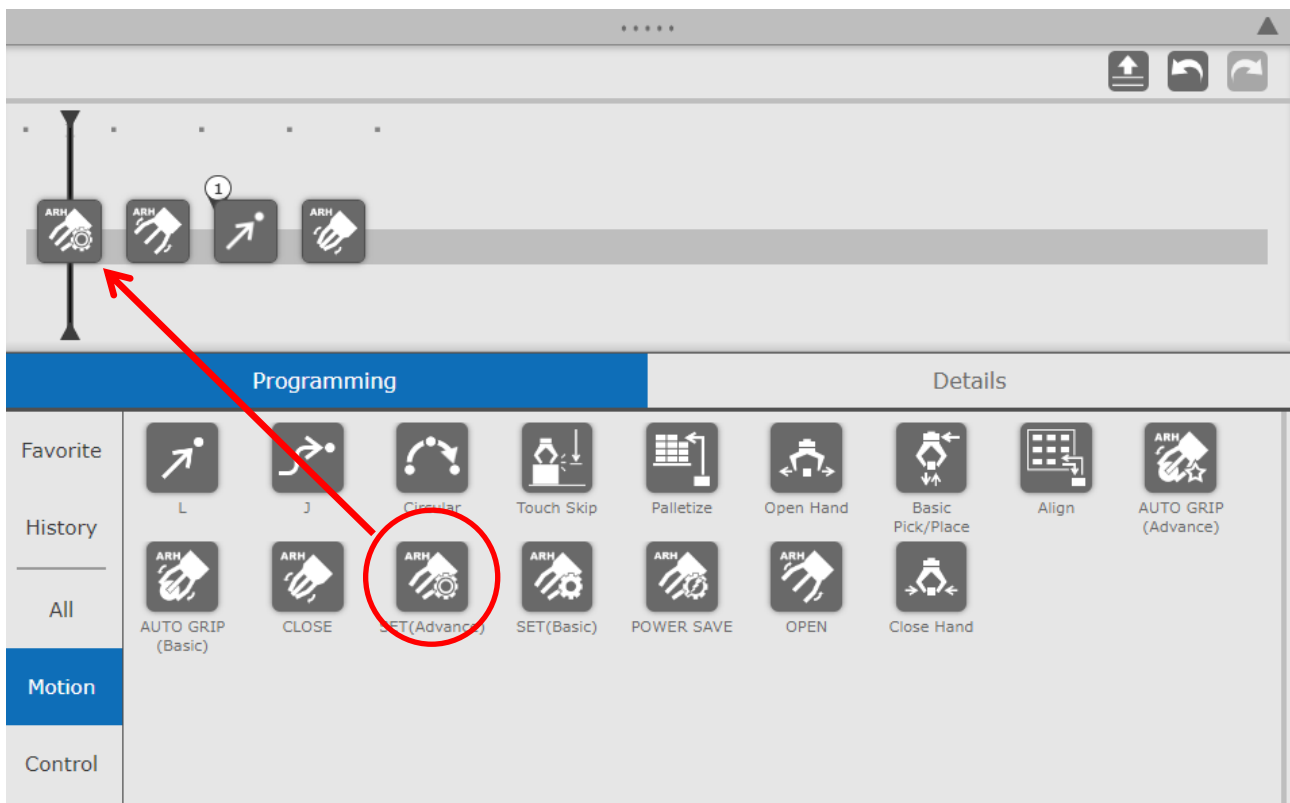
Please refer to chapter 5 for the adjustment of robotic gripper.

If SEL1 is not assigned, selecting pattern 2 will have the same operation as pattern 1.

#### 4.4. Setting of push-in operation / grip check range

Use the "SET(Advance)" icon to set the position range of the grip check and the push-in operation to change the operating speed and grip force during opening and closing.

##### 4.4.1. Add to program line

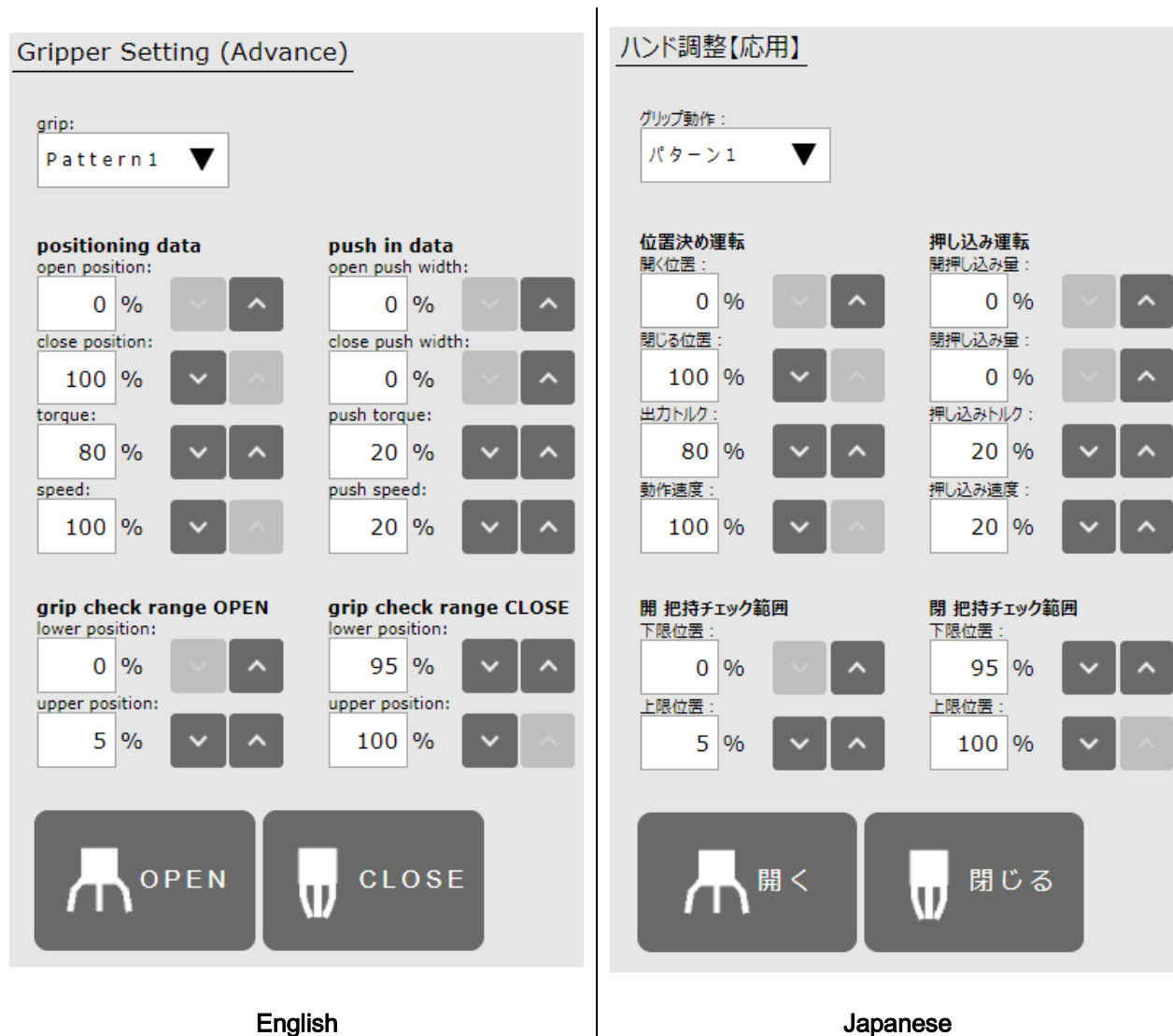


1. Drag the SET(Advance) icon from within the programming area.
2. Move the icon over the program line and drop it.
3. If you accidentally drop it, drag and drop the icon to an area outside the program line to remove it.

#### 4.4.2. Instruction detail screen

In addition to the opening and closing positions of the gripper, torque, and operating speed, the push-in operation parameters and the grip check range parameters are set on the detailed screen.

See the glossary in Section 6.2 for details on each parameter.



1. Tap the "SET(Advance)" icon on the program line to open the detail screen.
2. Select the pattern number of the grip whose parameters you want to change.
3. If you want to adjust how much the gripper opens, set the position in 1% increments.
4. If you want to adjust how close the gripper closes, set the position in 1% increments.
5. To adjust the grip strength, set the output torque in units of 1%.
6. If you want to adjust the gripper movement time, set the movement speed in 1% increments.
7. Tap the "OPEN" "CLOSE" button to test each action.

**Push-in operation**

8. If you want to push into the open side during the open operation, set the open push amount in units of 1%.
9. If you want to push it to the closed side during the closing operation, set the closing push amount in units of 1%.
10. If you want to adjust the strength of the force during the push, set the push torque in units of 1%.
11. If you want to adjust the push speed, set the push speed in 1% increments.
12. Tap the "OPEN" "CLOSE" button to test the open/close operation of the push operation.

**Grip check position range (\*9)**

13. If you want to adjust the range of the grip check when the gripper opens, set the lower and upper limits of the "grip check range OPEN" in 1% increments.
14. If you want to adjust the range of the grip check when the gripper closes, set the lower and upper limits of the "grip check range CLOSE" in 1% increments.

**\*9**

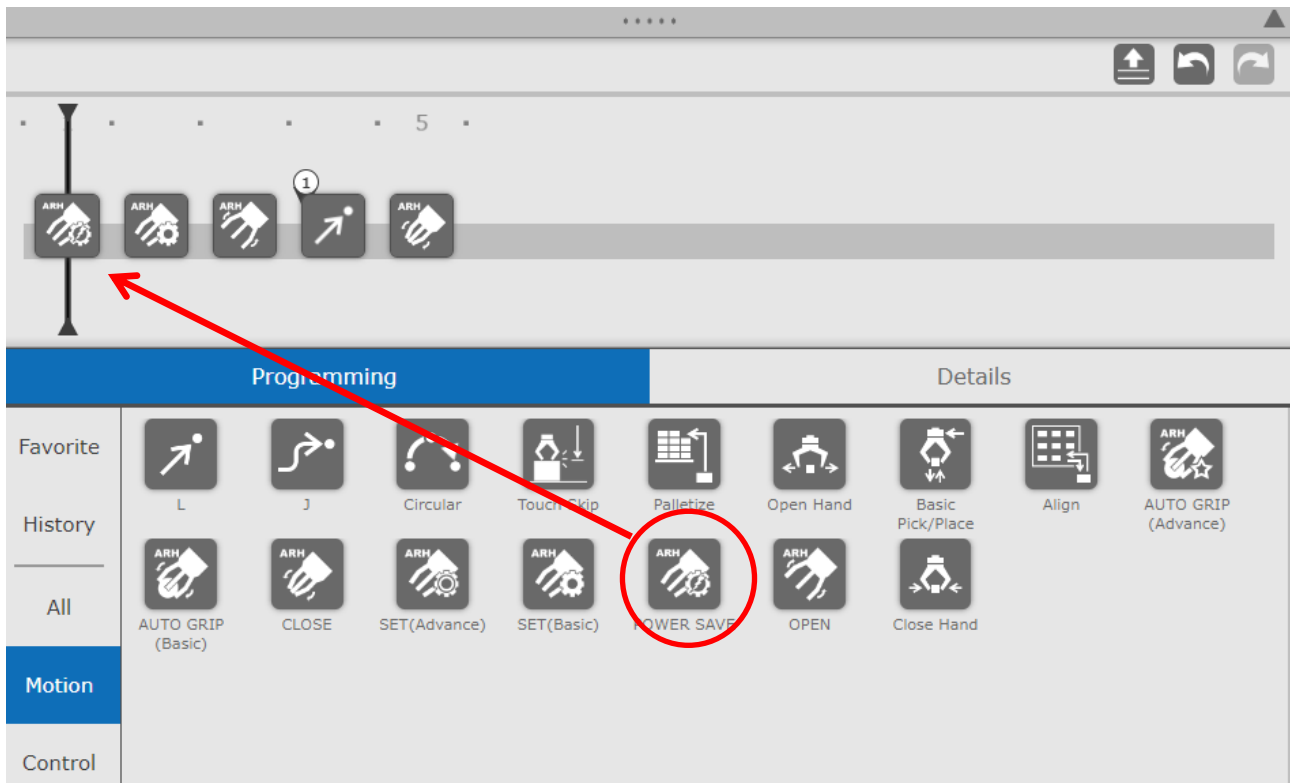
Set the lower and upper limits of the grip check range to "Lower limit position < Upper limit position". When "Lower limit position > Upper limit position" is set, the grip check function is disabled.

## 4.5. Power saving grip

If you want to enable / disable the power saving function of the hand, use the "POWER SAVE" icon.

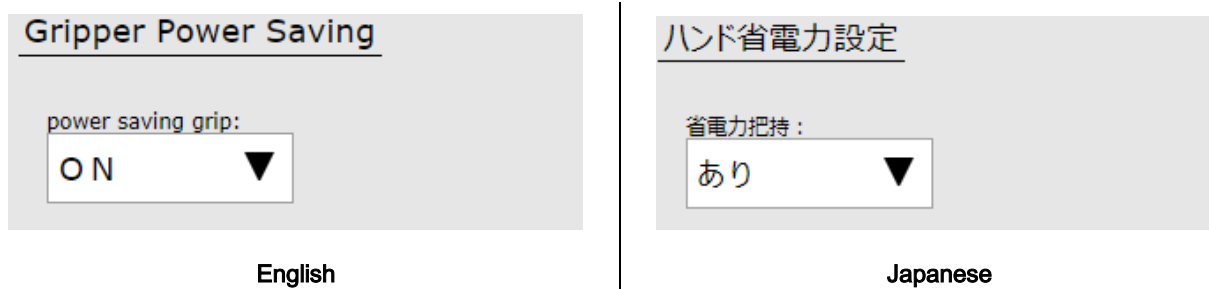
The default setting of the hand is "Enabled", so if you want to use it with power saving, you do not need to execute this icon.

### 4.5.1. Add to program line



1. Drag the "POWER SAVE" icon from within the programming area.
2. Move the icon onto the program line and drop it.
3. If you accidentally drop it, drag and drop the icon to an area outside the program line to remove it.

#### 4.5.2. Instruction detail screen



1. Tap the "POWER SAVE" icon on the program line to open the details screen.
2. If you want to disable the power saving grip, set the item to "OFF".
3. If you want to enable the power saving grip, set the item to "ON".

#### 4.6. Automatic grip



To use Automatic grip,  
A version of robotic gripper that supports the Automatic grip function is required.



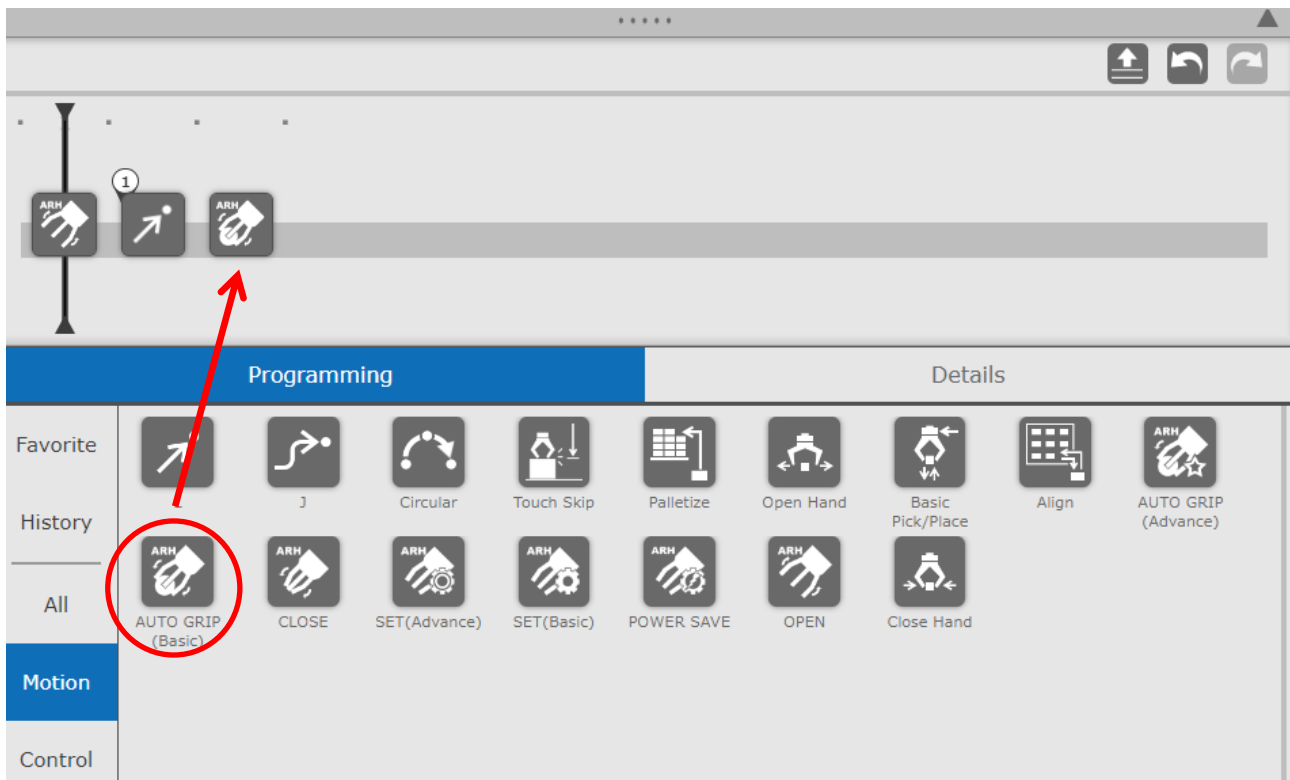
The Automatic grip is only valid for communication commands.  
Set the slave ID correctly on the installation settings screen.

"AUTO GRIP" is a gripping function that automatically adjusts the force while monitoring changes in the position of the claw after touching the finger of gripper with a certain force for a workpiece of unknown hardness.

This function can be used simply by placing the "AUTO GRIP" icon on the program line.

There are two types of automatic grip icons, which are divided into basic command that can be grasped with a small number of setting items and application commands that can be finely set. First of all, please test with basic commands, and if you are not satisfied with your grasp, use the advance command.

#### 4.6.1. Add to program line

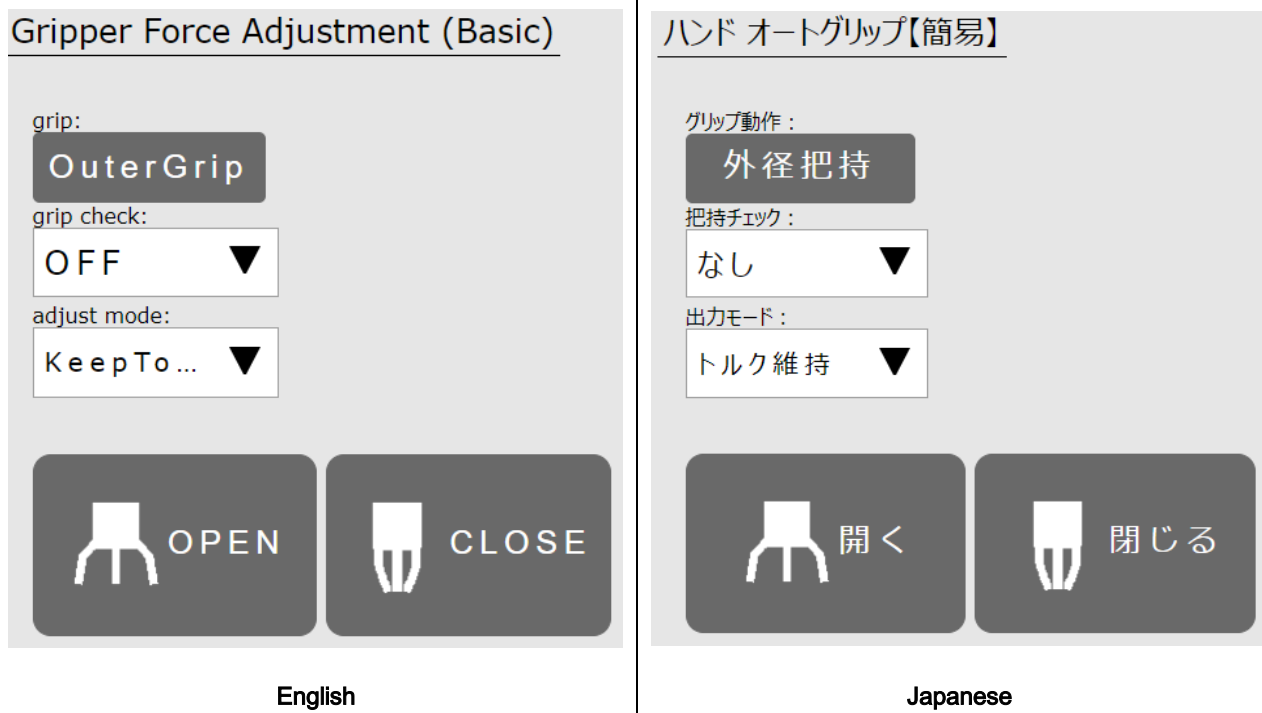


1. Drag the "AUTO GRIP (Basic)" icon or "AUTO GRIP (Advance)" icon from the programming area.
2. Move the icon over the program line and drop it.
3. If you drop it by mistake, delete it by dragging and dropping the icon to an area outside the program line.



#### 4.6.2. Instruction details screen: Basic Command

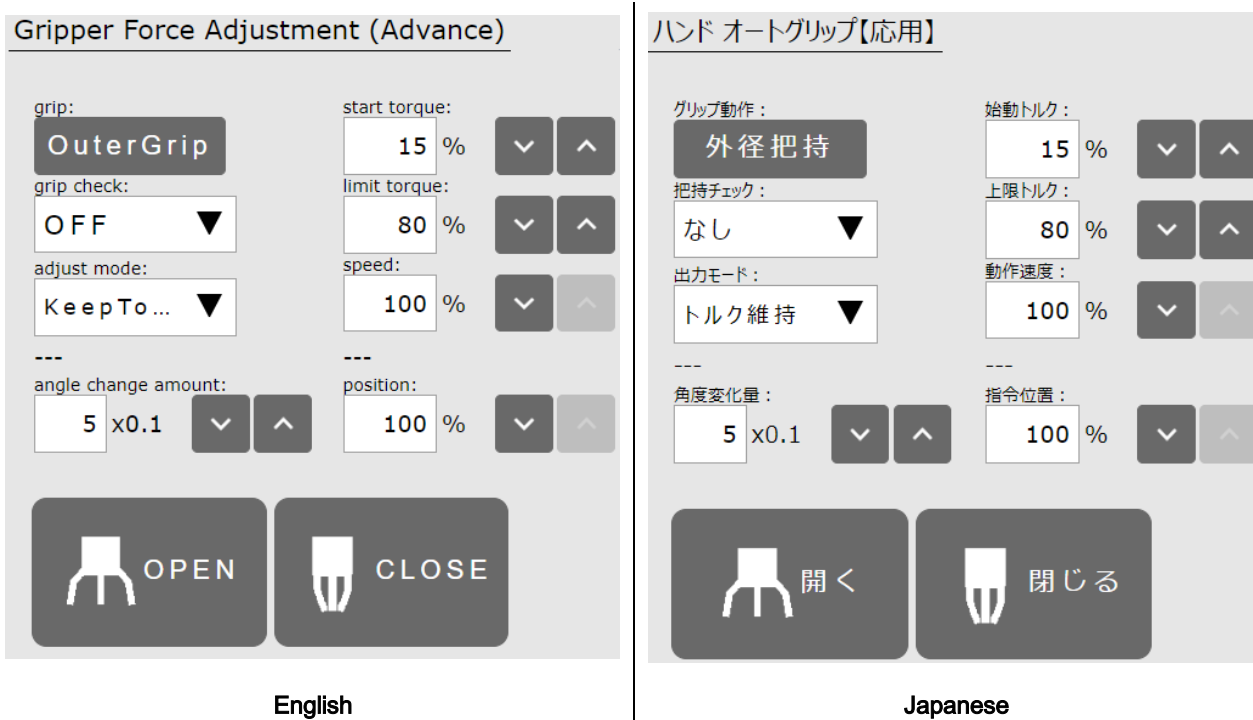
Set the hand gripping method (outer or inner gripping), whether or not the grip check is checked, and the force adjust mode of the automatic grip on the detail screen.



1. Tap the "AUTO GRIP" icon in the program line to open the details screen.
2. Depending on the gripping method of the workpiece, tap the gripping movement to select "OuterGrip " or "InnerGrip".
3. If you want to perform a gripping check, set the grip check to "ON".
4. To keep exerting force while gripping the workpiece, select "KeepTorque" for the adjust mode.
5. Tap the "OPEN" and "CLOSE" buttons to test the automatic grip.

### 4.6.3. Instruction details screen: Advance Command

Set the hand gripping method (outer or inner grip), whether or not the grip check, and various parameters of the automatic grip on the detail screen.



1. Tap the "AUTO GRIP" icon in the program line to open the details screen.
2. Depending on the gripping method of the workpiece, tap the gripping movement to select "OuterGrip " or "InnerGrip".
3. If you want to perform a gripping check, set the grip check to "ON".
4. To keep exerting force while gripping the workpiece, select "KeepTorque" for the adjust mode.
5. If you are in a low temperature environment or wearing gloves on gripper and want to increase gripping force, tap the start torque and enter a higher value.
6. If you want to grip hard and heavy workpieces with more force, tap the limit torque and enter a higher number.
7. If you want to limit the amount of movement of the finger to protect the workpiece, tap the command position to enter.
8. Tap the "OPEN" and "CLOSE" buttons to test the auto grip.



Automatic grip does not allow you to select a waiting condition.  
Wait for the gripper to finish moving.



When the gripping action is selected as "InnerGrip",  
Tap the test button "Open" to grip the workpiece with the automatic grip while opening.  
Tap the test button "Close" to fully close the operation.



If it is a priority to prevent deformation of the workpiece,  
Select "HoldFinger" as the adjust mode to prevent the finger from moving towards the workpiece.  
Since it is easy to fall during workpiece transportation, please use it with a non-slip on the finger.



If you select "KeepTorque" as the adjust mode and set the upper torque limit to 100%,  
In order to continue to grasp hard workpieces with 100% force, as time passes, the temperature inside the gripper rises, and there is a risk of abnormal overheating.

## 5. Robotic gripper adjusting method

By using the robotic gripper application, you can fine adjust the opening and closing position, opening and closing speed, and gripping force of the gripper. If you want to perform an operation other than fully closed or fully open, or if you want to change the grip strength, use a computer to teach the robot in advance before attaching the gripper to the robot.

For how to obtain the dedicated application, please contact our company.

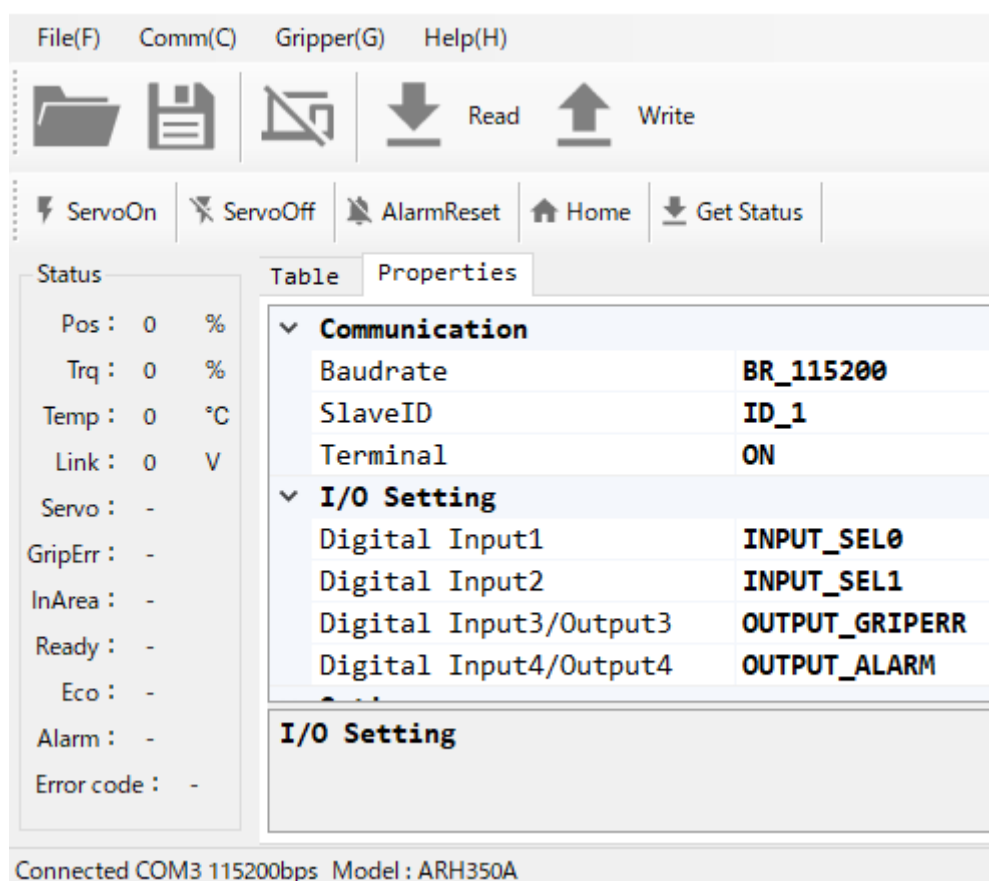
You will also need a USB-RS485 converter to connect your computer to gripper.

### 5.1. Setting of gripper input signal

To open/close with RO output, be sure to assign INPUT\_SEL0 to the Digital input 1.

To open or close 2-patterns, assign INPUT\_SEL1 to the Digital Input 2.

For IOport3 and IOport4, set the output signals OUTPUT\_GRIPERR and OUTPUT\_ALARM.



## 5.2. Setting position / operating time / torque

Use the dedicated application to adjust the parameter with the driving number 0 ~ 3.

(To use the operation numbers 2 and 3 at RO output of EE connector, assign SEL1 to the input signal.)

For details, please refer to the attached "Robotic Gripper Setup Quick Start Manual".

The screenshot shows the Plexmotion software interface. The 'Table' tab is active, displaying a list of operation parameters. A red box highlights the first four rows (0-3) of the table, which correspond to the parameters mentioned in the text.

Num	Button	Pos	Trq	Time	NextNum
0	GO	0	800	1000	-1
1	GO	1000	800	1000	-1
2	GO	0	200	3000	-1
3	GO	1000	200	3000	-1
4	GO	1000	800	1000	-1
5	GO	1000	800	1000	-1
6	GO	1000	800	1000	-1
7	GO	1000	800	1000	-1

Connected COM3 115200bps Model : ARH350A

**Table 1 Example of robotic gripper operation parameter setting**

operation number	target position	torque	operating time	object motion
0	0.0%	80.0%	1.000 seconds	Open pattern 1
1	100.0%	80.0%	1.000 seconds	Close pattern 1
2	0.0%	20.0%	3.000 seconds	Open pattern 2
3	100.0%	20.0%	3.000 seconds	Close pattern 2

### 5.3. Setting of grip check range

Use the dedicated application to adjust the parameter with the driving number 0 ~ 3.

(To use the operation numbers 2 and 3 at RO output of EE connector, assign SEL1 to the input signal.)

The range of the grip check must be set in "Lower limit position  $\leq$  Upper limit position".

For details, please refer to the attached "Robotic Gripper Setup Quick Start Manual".

Num	Button	Pos	Trq	Time	PushPos	PushTrq	PushSpd	AreaL	AreaH	GripErrL	GripErrH	NextNum
0	GO	0	800	1000	0	0	0	0	0	0	50	-1
1	GO	1000	800	1000	0	0	0	0	0	950	1000	-1
2	GO	0	100	3000	0	0	0	0	0	0	50	-1
3	GO	1000	100	3000	0	0	0	0	0	950	1000	-1
4	GO	1000	800	1000	0	0	0	0	0	950	1000	-1
5	GO	1000	800	1000	0	0	0	0	0	950	1000	-1
6	GO	1000	800	1000	0	0	0	0	0	950	1000	-1
7	GO	1000	800	1000	0	0	0	0	0	950	1000	-1

Table 2 Example of setting the grip check range

operation number	target position	grip error range		object motion
		lower limit position	upper limit position	
0	0.0%	0.0%	5.0%	Open pattern 1
1	100.0%	95.0%	100.0%	Close pattern 1
2	0.0%	0.0%	5.0%	Open pattern 2
3	100.0%	95.0%	100.0%	Close pattern 2



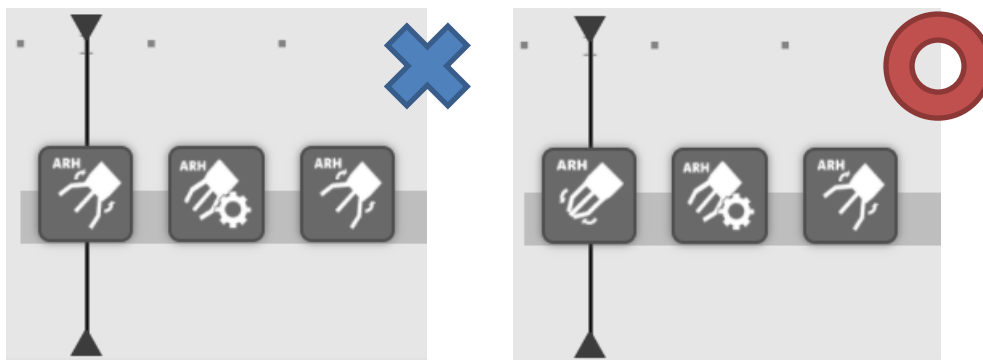
The grip check is determined by the finger position when opening and closing.

For thin workpieces, the finger position approaches 100.0%, so grip check is not possible.

## 5.4. Precautions when operating with digital signals

Only when moving the gripper with RO output, even if you place the "SET" icon between "OPEN" and "OPEN" as in the example below, the adjustment content will not be applied to the second opening operation(\*10).

If you place the "SET" icon between "CLOSE" and "CLOSE", the adjustment will not be applied to the second closing operation.



### \*10

This note describes when you select RO[] for the output signal on the configuration screen.

If you want to repeat the closing action or the opening action, set the gripper settings in Section 3.1.

Select "RS485" for the output on the screen.

The trigger to start the open/close operation is the rise/fall of the outputs RO[1] and RO[2] of the EE connector.

If you place the "SET" icon between the two "OPEN" icons, the output of the EE connector will not change during the second open operation, so it will remain open as before.

It is recommended to place the "SET" icon between "OPEN" and "CLOSE" to ensure that the adjustment of the "SET" icon is applied.

- Keep the gripper close, then execute the "SET" icon and open the gripper
- Keep the gripper open, then execute the "SET" icon and close the gripper



RO[1]	OFF
RO[2]	OFF
RS485	



RO[1]	ON OFF
RO[2]	OFF
RS485	

## 6. Plug-in specification

### 6.1. Supported products

#### Supported Products

- FANUC Robot CRX-5iA
- FANUC Robot CRX-10iA
- FANUC Robot CRX-10iA/L
- FANUC Robot CRX-20iA
- FANUC Robot CRX-20iA/L

#### Software version condition of robot control device

- V9.40P/01 or later



## 6.2. Glossary

Term	Description
<b>how to wait</b>	<p>Set items in the detail screen of the OPEN/CLOSE command.</p> <p>Select "Time" to weight the wait time during the open/close operation in seconds.</p> <p>When "Ready" is selected, a wait is set until the opening/closing operation is completed while acquiring the state of the gripper by communication.</p>
<b>wait time</b>	<p>Set items in the detail screen of the OPEN/CLOSE command.</p> <p>After instructing the gripper to open and close, put the weight for a certain time.</p> <p>The wait time setting is 0.00 ~ 10.00 (seconds). By setting the waiting time to 0, the arm can be moved while the gripper is closed.</p>
<b>grip pattern</b>	<p>Set items in the detail screen of the OPEN/CLOSE/SET command.</p> <p>By selecting a pattern, the signal output from the EE connector changes to enable another opening/closing operation (See Table 3).</p>
<b>grip check</b>	<p>Set items in the detail screen of the OPEN/CLOSE command.</p> <p>The robot checks the GRIP_ERR signal to determine the success or failure of the grip after a waiting time has elapsed after the gripper starts to open and close.</p>
<b>SEL0</b>	<p>The signal name of the robotic gripper.</p> <p>When the gripper detects an input signal, it moves finger according to the operating parameters inside the gripper.</p>
<b>SEL1</b>	
<b>GRIP_ERR</b>	<p>The signal name of the robotic gripper.</p> <p>If you fail to grip the workpiece and finger position reaches the grip error output range, a signal is output.</p> <p>The range of the output position of the GRIP_ERR signal can be adjusted with parameters.</p>

Term	Description
<b>ALARM</b>	<p>The signal name of the robotic gripper.</p> <p>A signal is output if it is normal after the power is turned on. The signal is turned off when the gripper detects abnormality.</p>
<b>open position</b>	<p>Set items in the detail screen of the SET command.</p> <p>Adjust from 0% to 100%. The gripper is fully open at 0%.</p> <p>You can reduce closing time by setting the open state to an intermediate position greater than 0%.</p>
<b>close position</b>	<p>Set items in the detail screen of the SET command.</p> <p>Adjust from 0% to 100%. The gripper is fully closed at 100%.</p> <p>By setting the closed position to less than 100%, you can grip the workpiece without crushing it.</p>
<b>torque</b>	<p>Set items in the detail screen of the SET command.</p> <p>Adjust from 10% to 100%. 80% is the default.</p>
<b>speed</b>	<p>Set items in the detail screen of the SET command.</p> <p>Adjust from 10% to 100%. The lower number, the slower speed.</p> <p>100% of the operating speed is based on the speed at which the gripper moves the full stroke distance from full open to full close in 1 second.</p> <p>A setting of 10% moves the full stroke in 10 seconds, so set a longer wait time for opening and closing.</p>
<b>open/close push width</b>	<p>Set items in the detail screen of the SET(Advance) command.</p> <p>Set how far you want to start pushing in the target position of opening and closing in% of the opening and closing width.</p> <p>If the closing position is 100% and the push amount is 30%, switch to push operation at the 70% position and move the pawl according to the push torque and push speed.</p>

Term	Description
<b>push torque</b>	<p>Set items in the detail screen of the SET(Advance) command.</p> <p>Adjust the force between 10% and 100% during pushing operation.</p> <p>If the output torque is 80% and the push torque is 20%, reduce the force being pushed to 1/4.</p>
<b>push speed</b>	<p>Set items in the detail screen of the SET(Advance) command.</p> <p>Adjust the speed between 10% and 100% during pushing operation.</p> <p>If the operating speed is 100% and the pushing speed is 20%, reduce the pawl movement speed to 1/5 during pushing.</p>
<b>grip check range</b> (Lower limit position/Upper limit position)	<p>Set items in the detail screen of the SET(Advance) command.</p> <p>If the gripper is set to close by 100%, the position of the finger will be in the fully closed position when you fail to grip the workpiece. Therefore, the position range of the grip check is changed from 90% to 100%.</p> <p>This allows you to check the position of the finger when the gripper is closed and to identify the success or failure of the grip.</p> <p>If you set the grip check to "ON" using the OPEN and CLOSE icons, an alarm message is output when you fail to grip the workpiece.</p>
<b>power saving grip</b>	<p>Set items in the detail screen of the POWER SAVE command.</p> <p>Since the ARH350A has a self-locking mechanism that prevents the fingers from moving even when the power is off, the "power saving grip" function that lowers the output after a certain period of time has passed after gripping the workpiece works.</p> <p>By selecting whether or not to hold the power saving, you can set the permission / prohibition of the function that transitions from the normal output to the power saving state.</p>

Term	Description
<b>Automatic grip method</b>	<p>Set items in the detail screen of the AUTO GRIP command.</p> <ul style="list-style-type: none"> <li>Outer grip: Apply the automatic grip in the direction of closing the gripper. The grip check range is also set near the fully closed position of the finger.</li> <li>Inner grip: Apply the automatic grip in the direction of opening the gripper. The grip check range is also set near the fully open position of the finger.</li> </ul>
<b>Automatic grip start torque</b>	<p>Set items in the detail screen of the AUTO GRIP command.</p> <p>The starting torque for contacting the pawl with the workpiece can be adjusted in the range of 10% ~ 50%.</p>
<b>Automatic grip limit torque</b>	<p>Set items in the detail screen of the AUTO GRIP command.</p> <p>The limit torque when gripping hard workpieces can be adjusted in the range of 10% ~ 100%. Torque increase can be limited.</p> <p>In the case of "start torque &gt; limit torque", the limit torque is applied.</p>
<b>Automatic grip angle change amount</b>	<p>Set items in the detail screen of the AUTO GRIP command.</p> <p>The amount of change in nail position allowed by Auto Grip can be adjusted in the range of 0.1 ~ 1.0 degrees.</p> <p>After the claw is brought into contact with the workpiece to start the torque increase, it is the amount of change in the claw angle that is used as a guideline to stop the torque increase, and the smaller the specified change amount, the shorter the torque increase time and the weaker the force.</p>
<b>Automatic grip adjust mode</b>	<p>Set items in the detail screen of the AUTO GRIP command.</p> <ul style="list-style-type: none"> <li>Keep Torque: The automatic grip maintains the optimized torque and prevents the workpiece from falling by continuously applying force.</li> <li>Hold Finger: By fixing the finger position of the gripper, the deformation of the workpiece is prevented.</li> </ul>

**Table 3 Signal output of each operation pattern (SEL0 = RO [1], SEL1 = RO [2])**

motion pattern	RO[1] Output	RO[2] Output	gripper operation number
Open Pattern 1	Off	Off	0
Open Pattern 2	Off	On	2
Close Pattern 1	On	Off	1
Close Pattern 2	On	On	3

## 7. Trouble shooting

### 7.1. Alarm list

#### ARH-E01 Gripper alarm detected

[Cause]

The robot detected an abnormal stop of the gripper.

[Countermeasure]

Turn off the power of the gripper, remove the cause of abnormal stop, and restart. The error can be checked by the number of times the gripper LED flashes. For details, refer to the manual of the robotic gripper.

#### ARH-E03 Grip error detected

[Cause]

Failed to grip the workpiece.

[Countermeasure]

Review the position of the workpiece and the stop position of the robot arm. Check the ON/OFF of the grip check in the program detail screen, as the grip check may be performed at an unnecessary timing.

#### ARH-E05 Serial comm failure

[Cause]

Serial communication for open operation parameter setting failed.

[Countermeasure]

Verify that the slave ID of the gripper is correct. The settings of the EE connector may have been changed by another plug-in. Tap the recovery button to restart the robot controller.

#### ARH-E06 Serial comm failure

[Cause]

Serial communication for close operation parameter setting failed.

[Countermeasure]

Verify that the slave ID of the gripper is correct. The settings of the EE connector may have been changed by another plug-in. Tap the recovery button to restart the robot controller.

**ARH-E07 Serial comm failure****[Cause]**

Serial communication of gripper open/close command failed.

**[Countermeasure]**

Verify that the slave ID of the gripper is correct. The settings of the EE connector may have been changed by another plug-in. Tap the recovery button to restart the robot controller.

**ARH-E08 Serial comm failure****[Cause]**

Serial communication of gripper power-saving command failed.

**[Countermeasure]**

Verify that the slave ID of the gripper is correct. The settings of the EE connector may have been changed by another plug-in. Tap the recovery button to restart the robot controller.

**ARH-E09 Serial comm failure****[Cause]**

Serial communication of automatic grip parameter setting failed.

**[Countermeasures]**

Prepare a version of the robotic gripper that supports the automatic grip function.

Make sure the slave ID of the hand is correct. Since the EE connector settings may have been re-written by another plug-in, tap the restore settings button to restart the robot controller.

**ARH-E10 RS485 is not selected****[Cause]**

Serial communication is disabled.

**[Countermeasures]**

Automatic grip commands do not support RO[ ] output. Open the gripper setting screen from the A SPINA robotic gripper menu, and set the signal output to "RS485" in the command method item to the gripper.

## 7.2. Case and countermeasure

case	probable cause	countermeasure
The gripper doesn't work.	No power	<ul style="list-style-type: none"> <li>Make sure the power is on and the gripper LED is on.</li> </ul>
	Cables are not connected properly	<ul style="list-style-type: none"> <li>Check that there is no loose connection between the cable and the robot.</li> </ul>
	The operating parameters of the gripper are not correct.	<ul style="list-style-type: none"> <li>Check that the operating parameters are set correctly in the dedicated application.</li> <li>Use the SET icon to set the close/open position.</li> </ul>
Opened with a close command Closed with a open command	Incorrect gripper signal selection parameters	<ul style="list-style-type: none"> <li>Check that input signal 1 is assigned to SEL0 in the dedicated application.</li> <li>Change the signal output to RS485 in the configuration menu.</li> </ul>
	Gripper target position parameter is incorrect	<ul style="list-style-type: none"> <li>Check that the target position of each operation number is set correctly in the dedicated application.</li> <li>Use the SET icon to set the close/open position.</li> </ul>
Grip check does not work	Grip check "None" is selected	<ul style="list-style-type: none"> <li>Select "Yes" for the grip check in the command detail screen.</li> </ul>
	Incorrect wait time	<ul style="list-style-type: none"> <li>Set the wait time to 1 second or longer on the command detail screen.</li> <li>If the operating time is set longer in the gripper operating parameters, set the standby time in accordance with the parameters.</li> </ul>
	Incorrect gripper signal selection parameters	<ul style="list-style-type: none"> <li>Check that GRIP_ERR is set correctly for the output signal allocation of gripper in the dedicated application.</li> </ul>



case	probable cause	countermeasure
	The grip check range of gripper is not correct.	<ul style="list-style-type: none"> <li>• Check that the grip check range of each operation number is set correctly in the dedicated application.</li> <li>• Check that the upper and lower limit positions of the grip check range are appropriate for the size of the workpiece.</li> <li>• Use the SET(Advance) icon to set the grip check range for the closed and open sides.</li> </ul>
Communication error occurred	Wrong communication configuration parameters	<ul style="list-style-type: none"> <li>• Check if the communication setting of the gripper is as follows in the dedicated application. <ul style="list-style-type: none"> <li>– Baudrate: 115,200 [Bps]</li> <li>– Terminal: Yes</li> </ul> </li> <li>• If you are changing the communication settings to connect to another device, use the configuration menu to set the signal output to RO[] and open/close the device using a digital signal.</li> </ul>
	Robot communication settings are incorrect	<ul style="list-style-type: none"> <li>• Check the slave ID on the screen dedicated to the plug-in.</li> </ul>
	The cable is not connected properly.	<ul style="list-style-type: none"> <li>• Check that there is no loose connection between the cable and the robot.</li> </ul>

## 8. Release notes

### 8.1. ASPINA\_ARH350 version 00.01.00 beta

- initial public version

### 8.2. ASPINA\_ARH350 version 00.01.01 beta

#### Specification change

- Changed the English notation of the gripper from "robot hand" to "robotic gripper"
- Changed the output message of user alarm ARH-E01 from Hand to Gripper

### 8.3. ASPINA\_ARH350 version 00.02.00 beta

#### Specification change/function addition

- Items to select signal output patterns are added to the plug-in screen

#### Bug fix

- Gripper fixes "RobotHand" on plug-in screen
- Review detailed API usage
- Remove unnecessary functions in detail
- Corrects the use of unnecessary local registers in the TP program
- Delete unnecessary user alarm definitions

### 8.4. ASPINA\_ARH350 version 00.02.01 beta

#### Specification change/function addition

- Removed items to select RI and RO from the plug-in screen

#### Bug fix

- Delete serial communication settings on EE connector

**8.5. ASPINA\_ARH350 version 00.02.02 beta****Specification change/function addition**

- Disable the grip check if the wait time in the close/open detail screen is 0.05 seconds or less

**8.6. ASPINA\_ARH350 version 00.02.03 beta****Quality improvement**

- Addition of comments to the TP program

**8.7. ASPINA\_ARH350 version 00.03.00 beta****Specification change/function addition**

- ASPINA logo is displayed in the upper right corner of the command details screen.
- Changed so that opening and closing operation does not occur even if the alarm is canceled after the alarm ARH-E01 and ARH-E02 occur.

**Bug fix**

- Added the initial setting of EE connector to the installation CSV file.

**8.8. ASPINA\_ARH350 version 00.03.01 beta****Specification change/function addition**

- Corrected the heading of the plug-in setting screen when Japanese is selected.
- Corrected the signal output pattern display on the plug-in setting screen.

**8.9. ASPINA\_ARH350 version 00.03.02 beta****Specification change/function addition**

- Changed ASPINA logo on the plug-in setting screen.
- Changed ASPINA logo on the plug-in list screen.

#### 8.10. ASPINA\_ARH350 version 00.03.03 beta

##### Bug fix

- Corrected source code description error on the plug-in setting screen.
- Corrected source code description error on the command details screen.
- Corrected input method of waiting time on the command details screen.

#### 8.11. ASPINA\_ARH350 version 00.04.00 beta

##### Specification change/function addition

- Add the connector recovery menu to the plug-in configuration screen
- Add "SET" Icon

#### 8.12. ASPINA\_ARH350 version 00.04.01 beta

##### Specification change/function addition

- Update the plug-in menu structure
- The open/close test button of "SET" icon has been changed from signal output to open/close operation via communication.

##### Bug fix

- Correction of the "SET" icon program local register description error.

#### 8.13. ASPINA\_ARH350 version 00.04.02 beta

##### Bug fix

- Correction of KAREL program calling method on the instruction details screen of the "SET" icon

**8.14. ASPINA\_ARH350 version 00.04.03 beta****Bug fix**

- Removed the process of displaying "SAMPLE program SUCCESS" in message line on the teaching operation panel.

**8.15. ASPINA\_ARH350 version 00.05.00 beta****Specification change/function addition**

- Change the gripper image displayed on the plug-in list screen.

**8.16. ASPINA\_ARH350 version 00.05.01 beta****Bug fix**

- Corrected the operation group setting of the TP program.
- Delete the process that was duplicated in the KAREL program.
- Corrected her packet generation part of the send command to set parameters
- Corrected to execute the EE connector setting recovery with the KAREL program.

**8.17. ASPINA\_ARH350 version 00.05.02 beta****Bug fix**

- The size of gripper image displayed on the plug-in list was reduced because it exceeded 100KB.

**8.18. ASPINA\_ARH350 version 00.06.00 beta****Specification change/function addition**

- A communication slave ID selection function has been added to configuration of the plug-in dedicated screen.
- The open/close test of the configuration screen was changed from the digital output of RO[1] and RO[2] to the command system using RS485 communication.
- The open/close test of the close icon was changed from the digital output of RO[1] and RO[2] to the command method by RS485 communication.

- The open/close test of the open icon was changed from the digital output of RO[1] and RO[2] to the command method by RS485 communication.

#### Bug fix

- The duplicate parts of the KAREL program for parameter setting and operation command are deleted.

### 8.19. ASPINA\_ARH350 version 00.06.01 beta

#### Specification change/function addition

- Change the close icon for program execution from the digital output of RO[1] or RO[2] to the command mode via RS485 communication
- The icon to be opened when the program is executed is changed from the digital output of RO[1] or RO[2] to the command mode by RS485 communication.

### 8.20. ASPINA\_ARH350 version 00.06.02 beta

#### Specification change/function addition

- Adding SET(Advance) Icon
- Addition of the function to select the wait condition from "Time" or "Ready" to the CLOSE icon
- Addition of the function of selecting wait conditions from "Time" or "Ready" to the OPEN icon
- The function to select the output signal to the gripper from "RO" or "RS485" was added to the configuration screen dedicated to the plug-in.
- The opening/closing test of the configuration screen was changed to the method according to the output signal selection of the gripper.
- Change the CLOSE icon open/close test to the method according to the output signal selection of the gripper.
- Change the OPEN icon open/close test of the method according to the output signal selection of the gripper.

**8.21. ASPINA\_ARH350 version 00.06.03 beta****Specification change/function addition**

- Adding POWER SAVE Icon

**Bug fix**

- Added KAREL program to initialize some KAREL variables
- The horizontal scroll bar is displayed on the instruction detail screen of the SET(Advance) icon, so adjust the horizontal width of the display.

**8.22. ASPINA\_ARH350 version 00.06.04 beta****Specification change/function addition**

- Changed the title notation in the recovery menu on the plug-in configuration screen.

**Bug fix**

- Corrected the notation of pushing torque and pushing speed on the instruction details screen of the SET(Advance) icon.
- Corrected the argument passed to the TP program of the POWER SAVE icon.

**8.23. ASPINA\_ARH350 version 00.06.05 beta****Specification change/function addition**

- Changed “Recovery” in the plug-in menu to “EE interface recovery”
- Changed the notation on the EE interface recovery screen

**8.24. ASPINA\_ARH350 version 00.07.00 beta****Bug fix**

- Changed to check the SEL0 register only when the output signal is RO[ ] in the CLOSE icon.
- Changed to check the SEL0 register only when the output signal is RO[ ] in the OPEN icon.
- Added description to convert numerical input data to a character string on the detail screen.

**8.25. ASPINA\_ARH350 version 00.08.00 beta****Specification change/function addition**

- Adding AUTO GRIP Icon
- Added User Alarms ARH-E09 and ARH-E10

**8.26. ASPINA\_ARH350 version 01.02.00****Specification change/function addition**

- Updated version



## 9. Revision history

date	revision	contents
2020/11/04	0.00	Initial Creation
2020/11/05	0.00.01	Section 7.1 Modification of grip check on/off with/without modification
2020/11/10	0.00.02	Section 5.3 Added grip check range adjustment Section 6.2 Added glossary Section 7.1 Corrected the message of user alarm ARH-E01 Section 7.2 Added case and countermeasure Section 8.2 Added release notes for version 00.01.01
2020/11/16	0.00.03	Section 3.1 Deletion of selection of RI and RO and addition of signal output pattern Section 4.3 Correction of Notes on Signal Pattern 2 Section 7.2: Delete the description of signal selection on the plug-in dedicated screen Section 7.2 Addition of symptoms and countermeasures for non-functioning grip check Section 8.3 Added Release Notes for version 00.02.00 Section 8.4 Added Release Notes for version 00.02.01 Section 8.5 Added Release Notes for version 00.02.02
2020/11/20	0.00.04	Section 8.6 Added Release Notes for version 00.02.03 Section 8.7 Added Release Notes for version 00.03.00
2020/11/20	0.01	Update revision
2020/11/30	0.01.01	Chapter 1 Corrected the caution statement Section 1.1 Corrected the description of the installation method Section 1.1 Updated menu image Section 2.1 Corrected the description of how to attach the gripper Section 2.2 Corrected the description of the wiring method Section 2.2 Updated EE connector image Section 3.1 Updated menu image Section 4.1 Corrected the description of the operation icon Section 4.2 Modified timeline to program Line Section 4.3 Corrected the timeline to a program line Section 6.1 Corrected the software version condition of the robot controller
2020/12/01	0.01.02	Section 8.8 Added Release Notes for version 00.03.01
2020/12/09	0.02	Update revision
2020/12/11	0.02.01	Added photo of CRX-10iA on the cover Section 3.1 Updated setting screen image Section 8.9 Added Release Notes for version 00.03.02

date	revision	contents
2020/12/16	0.02.02	Section 8.10 Added Release Notes for version 00.03.03
2020/12/24	0.03	Update revision
2021/01/08	0.03.01	Changed the photo of ARH350A on the cover Section 2.1 Changed the image of ARH350A Section 2.2 Changed the image of ARH350A
2021/02/01	0.03.02	Section 2.2 Changed the cable name from interface cable to robot connection cable
2021/02/11	0.04.00	Section 3.2 Added EE connector setting recovery Section 4.1 Added SET icon Section 4.2 Heading changed to open/close gripper operation Section 4.2.1 Moved Additions to Program Line to Section 4.2.1 Section 4.2.2 Moved the instruction details screen to Section 4.2.2 Section 4.3 Added gripper position/torque/speed adjustment Section 6.2 Added terms for SET icon Section 7.1 Added the alarm explanation of ARH-E05, E6 Section 8.11 Added release notes for version 00.04.00
2021/02/24	0.04.01	Section 1.1 Added notes on attaching the cable holder Section 3.1 Updated menu image Section 3.1 Updated the description of configuration menu operation Section 3.2 Updated the description of the recovery menu operation Section 8.12 Added release notes for version 00.04.01
2021/02/25	0.04.02	Section 8.13 Added release notes for version 00.04.02
2021/02/26	0.04.03	Section 8.14 Added release notes for version 00.04.03
2021/03/01	0.05	Section 4.3.2 Added a note about SET icon Section 7.2 Added countermeasures for communication error Section 8.15 Added release notes for version 00.05.00
2021/03/09	0.05.01	Section 7.1 Removed description of the alarm code that does not occur Section 8.16 Added release notes for version 00.05.01
2021/03/12	0.05.02	Section 8.17 Added release notes for version 00.05.02
2021/03/31	0.06	Section 3.1 Updated Instructions for Pattern 2 Section 4.2.2 Updated the precautionary statement about Pattern 2. Section 4.3.2 Updated the precautionary statement about Pattern 2. Section 4.3.2 Updated notes on adjustment methods Chapter 5: Updating the description of SEL0 and SEL1 from the gripper input setting Section 7.2 Notes on communication slave ID are added. Section 8.18 Added release notes for version 00.06.00

date	revision	contents
2021/04/02	0.06.01	Section 6.2 Add Terminology Descriptions for Wait Conditions Section 7.1 Adds ARH-E07 to the alarm list Section 8.19 Added release notes for version 00.06.01
2021/04/14	0.06.02	Section 4.1 Added description of SET(Advance) icons Section 4.2.2. Add statements to select wait conditions Section 4.2.3. Add a description of wait condition selection Section 4.4 Additional adjustment methods for push-in operation and gripping check range Chapter 5 Renaming a Dedicated Application to RoboticGripperSetup Section 6.2 Terminology of push-in operation and grip check range added. Section 8.20 Added release notes for version 00.06.02
2021/05/07	0.06.03	Section 4.1 Added description of POWER SAVE icon Section 4.5 Added explanation of power saving grip setting Chapter 5 Updated RoboticGripperSetup images Section 5.4 Adjustment method in Section 4.2.2 Moved the note to Section 5.4 Section 7.1 Added ARH-E08 to the alarm list Section 8.21 Added release notes for version 00.06.03
2021/05/14	0.06.04	Section 3.2 Updated connector recovery images Section 4.4.2 Updated SET(Advance) images Section 8.22 Added release notes for version 00.06.04
2021/05/19	0.06.05	Section 3.1 Updated menu image Section 3.2 Updated EE connector recovery screen Image Section 8.23 Added release notes for version 00.06.05
2021/05/21	0.06.05.1	Section 3.1 Updated menu image Section 3.1 Updated Gripper configuration screen image Section 3.2 Updated EE connector recovery screen Image
2021/06/21	0.07	Section 8.24 Added release notes for version 00.07.00
2022/11/04	0.08	Section 4.1 Added description of AUTO GRIP icon Section 4.6 Added description of automatic grip function Section 6.2 Added glossary of terms related to automatic grip Section 7.1 Added ARH-E09, ARH-E10 Section 8.25 Added release notes for version 00.08.00
2022/12/01	1.02	Section 8.26 Added release notes for version 01.02.00