SMC

Operation Manual
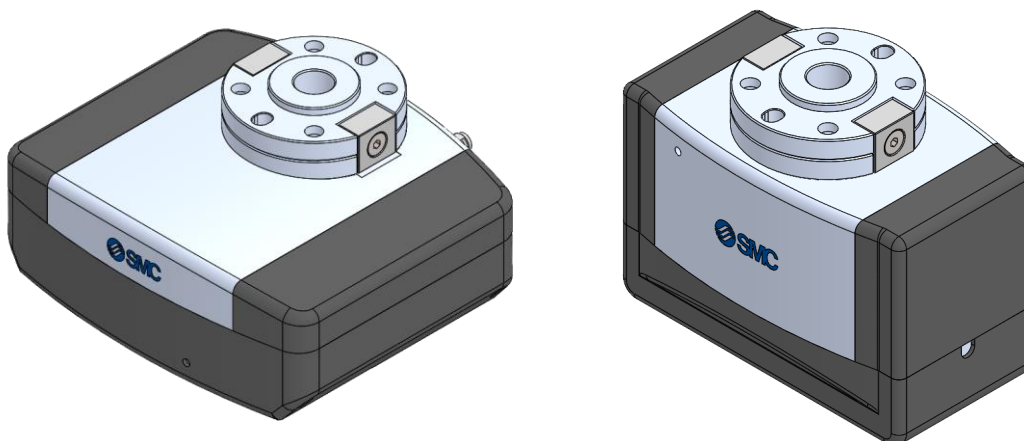
PRODUCT NAME

Electric Gripper for Collaborative Robots

MODEL / Series / Product Number

LEHR Series

─Software(URCap)─

SMC Corporation

SMC

Contents

1   How to Download Software

Please download this software (URCap) from the SMC website and save it in a USB memory.

2   Install URCap

1. Insert the USB memory in which the URCap is stored into the teaching pendant.

2. Click the Header ☰ and select [Robot settings]. (Step 1,2)

3. Click the [System] and select [URCaps]. (Step 3)

4. Press the "+" button, select the SMC-EI GripperUnit--xxx.urcap file and press "Open" button. (Step 4)

5. Click the "Restart" button to restart the electric gripper for collaborative robots. (Step 5)

    ⇒ URCaps is now installed.
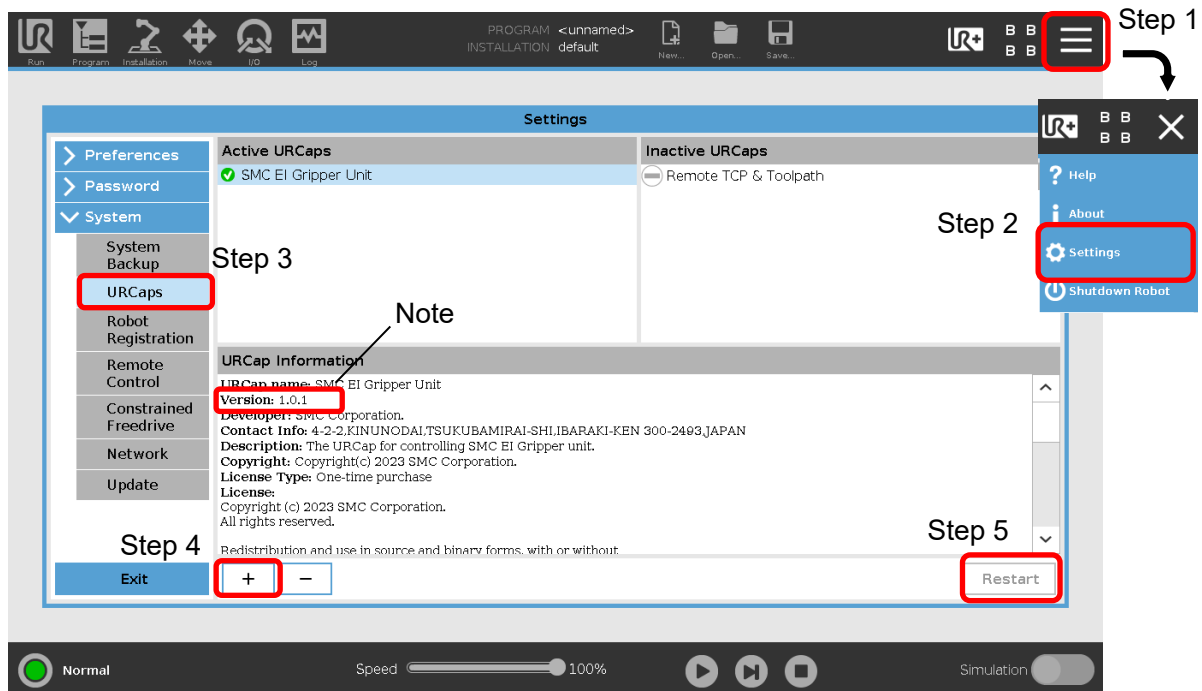
Note: Select the new URCaps in the Active URCaps field for more information.

    Detailed information is displayed in the URCap Information field.

3 Communication connection of electric gripper

3.1 Electric gripper communication setting.

1. Press the [Installation] tab and select [Tool I/O] under the [General] menu. (Step 1,2)

   For "Control source" in the [I/O Interface Control] field, select SMC EL GRIPPER UNIT. (Step 3)
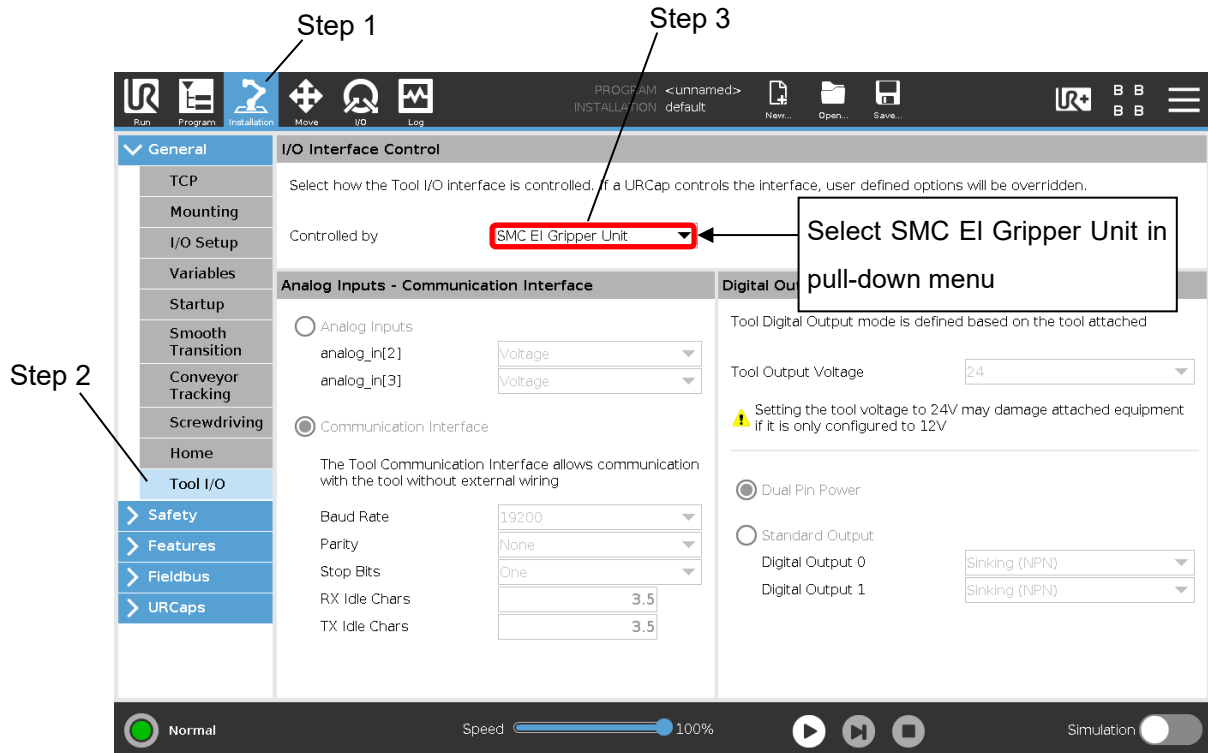
2. Press the [Installation] tab and select [SMC Electric Gripper Unit] from the [URCaps] menu. (Step 4,5)

3. Press the "Connect" button to start communication. It may take 2 to 3 seconds. (Step 6)

3
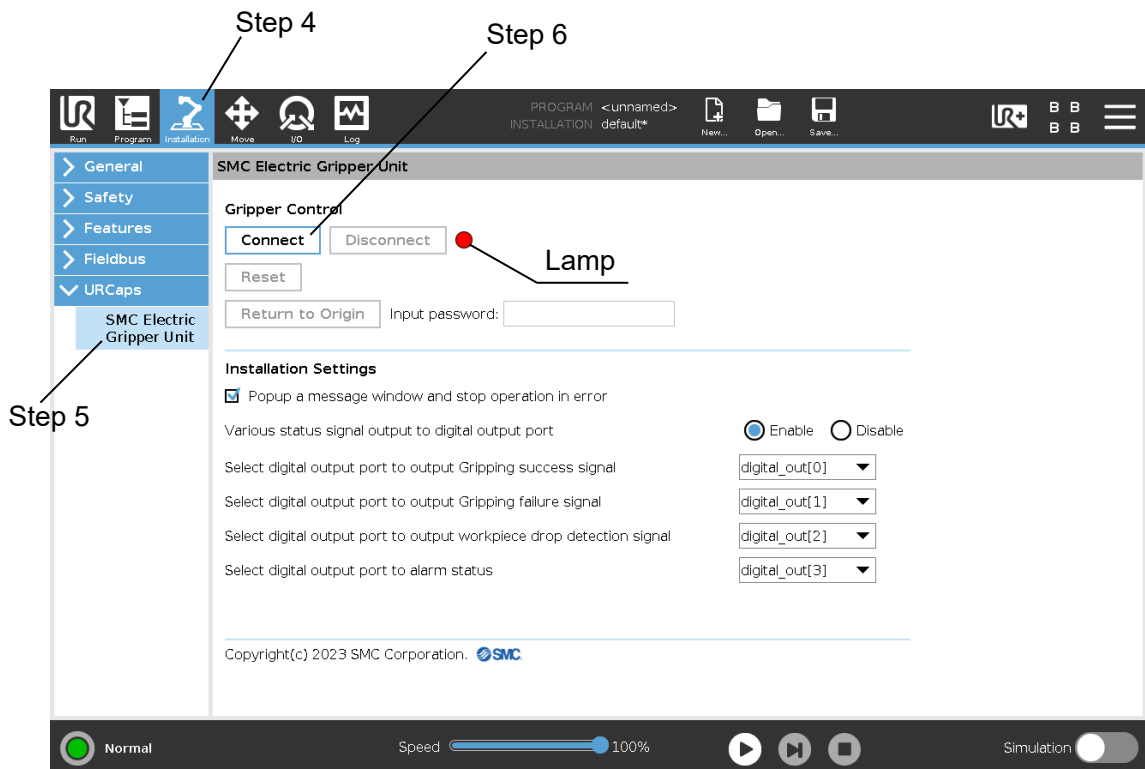
4. When the electric gripper for collaborative robot is connected, the lamp on the teaching pendant turns to green from red.
The electric gripper for collaborative robot turns into a Servo ON state, and the LED lamp lights up in blue.

LED lamp

3.2 Return to Origin
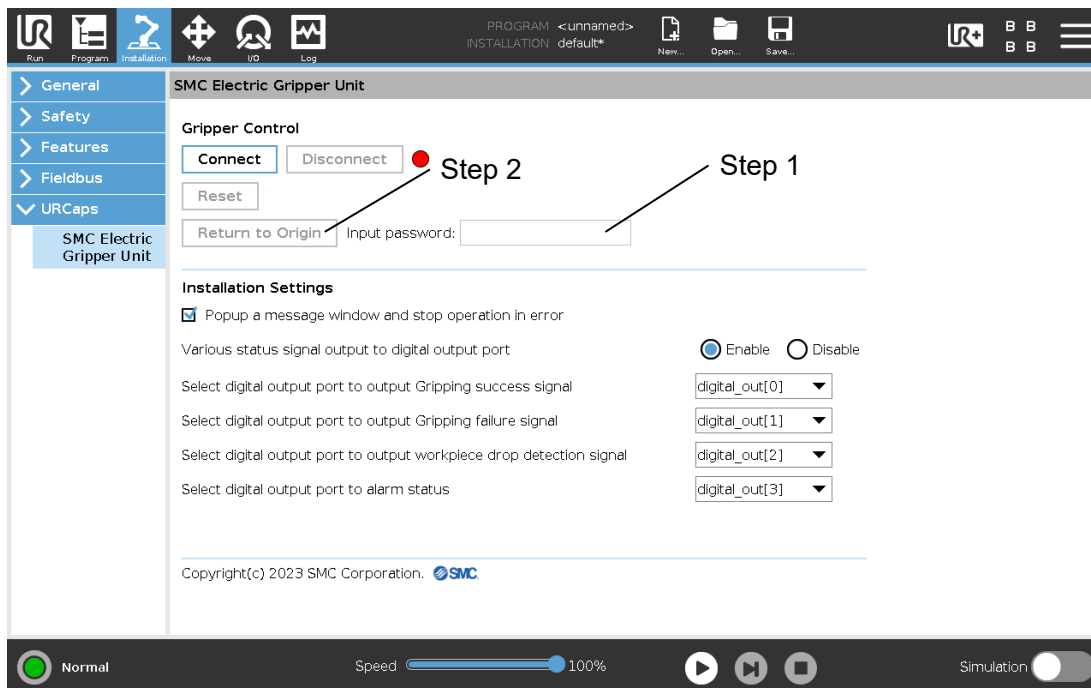
This function moves to the end of the machine and retrieves the origin information if the origin information is lost for some reason.
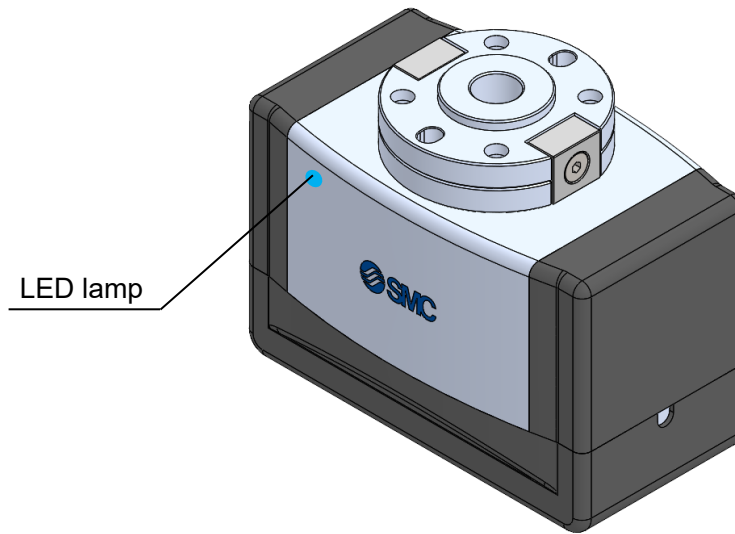
This product uses a battery-less encoder and retains the origin information even when the power is turned off, so there is no need to change the origin information at the time of shipment.

Please use this only when the origin information is lost due to abnormal factors such as external noise.

<How to use>

Enter the password in "Input password" text box and press "Return to Origin" to start the return to origin operation. (Step 1, 2)

Password: **smc1234567**

4   Setting of digital signal

Configure the settings of program to be issued when the gripping has failed or workpiece loss has occurred and the settings of the digital output ports for output of status signals.
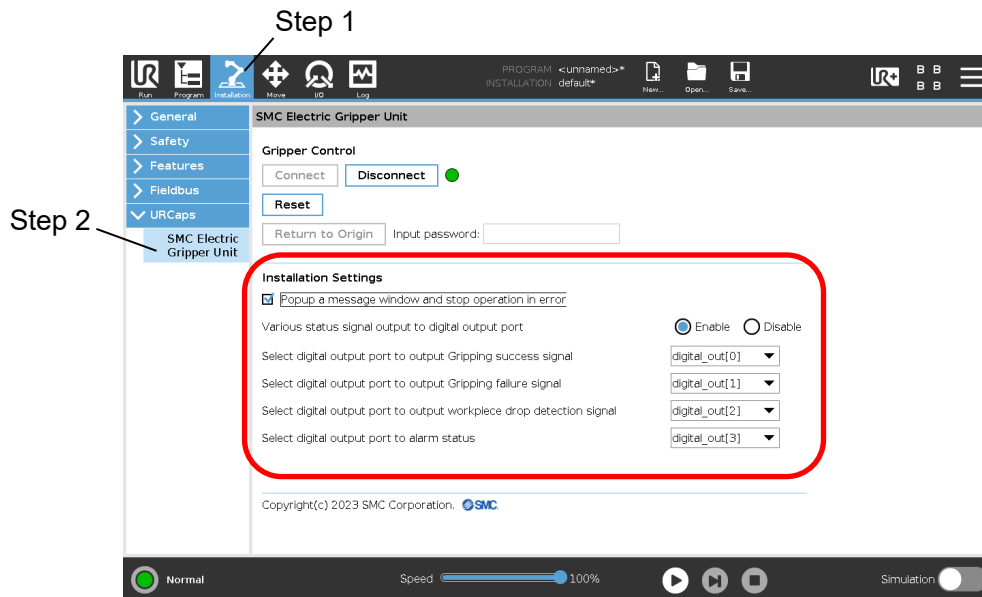
Configure settings at "Installation Settings" for [SMC Electric Gripper Unit] located under the [URCaps] menu on the [Installation] tab. (Step 1,2)

4.1   Program settings to be issued when the gripping has failed or workpiece drop has occurred

It is possible to select "Popup a message window and stop operation in error" to stop or continue the program when gripping failure or workpiece drop is detected.

Checkbox status

☑ : If a gripping failure or workpiece drop is detected, the program is paused.

　　When gripping failure or workpiece drop is detected, a message window pop-up appears, and you can choose whether to stop completely or continue the program.

☐ : The program will not stop if a gripping failure or workpiece drop is detected.

5
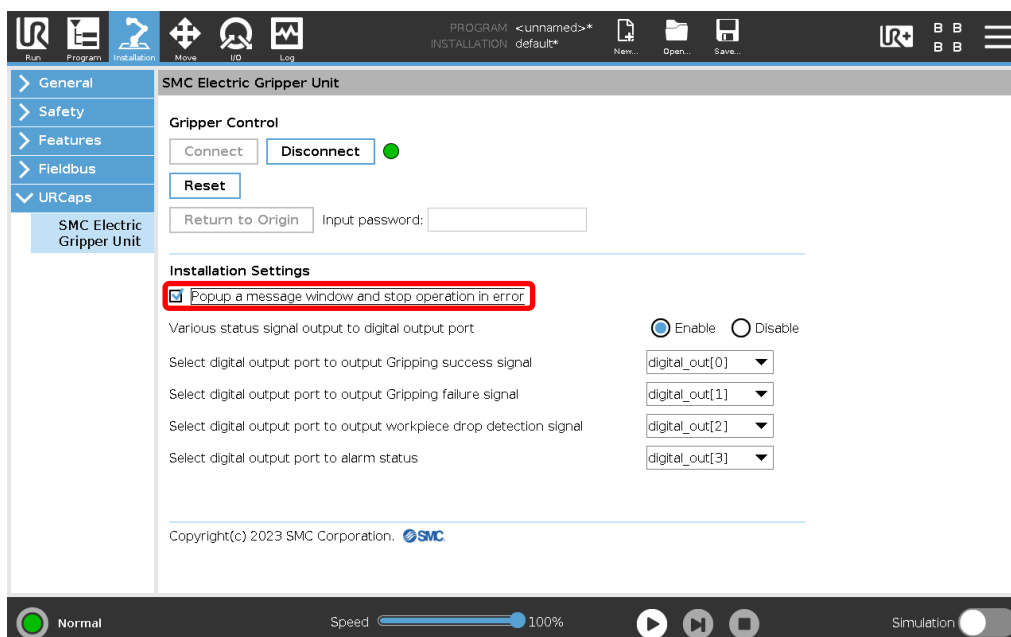
4.2　Settings of the digital output ports for output of status signals

It is possible to select "Various status signal output to digital output port" whether status signals are output to the digital output port when a "Grip success", "Grip failure", "Workpiece drop" or "Alarm" is detected.

＜"Enable" is selected＞

Status signals are output to the digital output port when a "Grip success", "Grip failure", "Workpiece drop" or "Alarm" is detected.

・"grip success": Select digital output port to output Gripping success signal

・"grip failure": Select digital output port to output Gripping failure signal

・"Workpiece drop": Select digital output port to output work-piece drop detection signal

・"Alarm"：Select digital output port to alarm status

※Digital output port can be selected within [0] to [7]

※If you select the same digital output port for different status signals, a warning message will be displayed.

＜Disable is selected＞

The selection of the digital output port is disabled. If any of "Gripping success", "Gripping failure", or "workpiece drop" or "Alarm" is detected, no status signal is output.
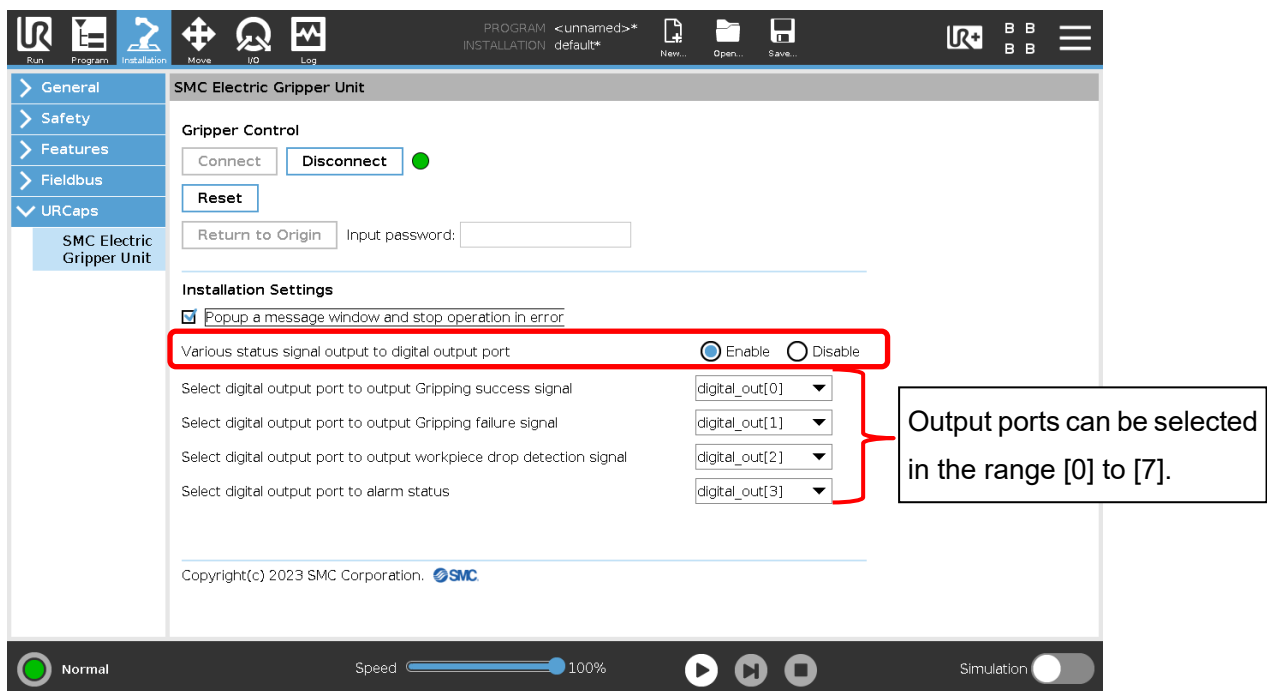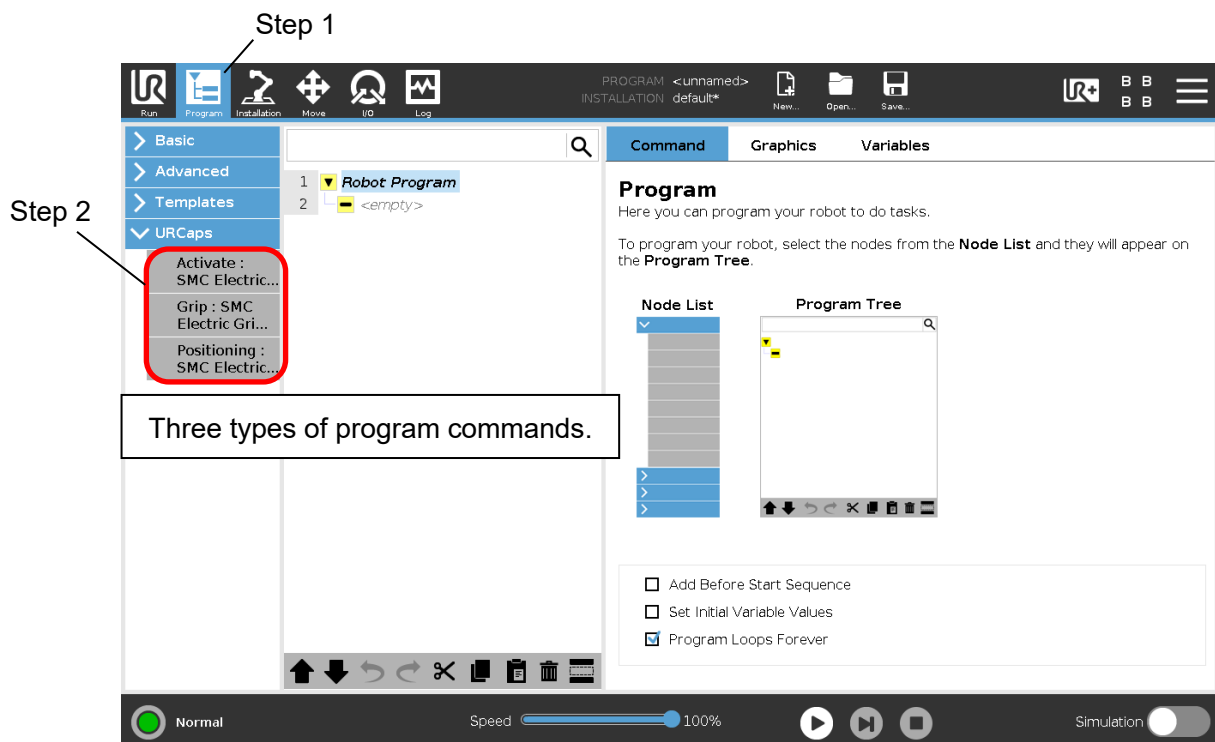
Electric gripper URCap has three types of program commands (Activate command, Grip command, Positioning command).

● Activate command is a function for making a communication connection for the electric gripper: using the Activate command, when the electric gripper stops due to an emergency stop of the collaborative robot, after the collaborative robot returns, the procedure in [3. Communication connection of electric gripper] can be omitted and the program can be quickly restored.

● Grip command is a function that instructs the gripping movement. The position, speed and gripping force can be set freely.

● Positioning command is a function that instructs the opening and closing movement of the fingers. The position and speed can be set freely.

To add a program command, select the program to which you want to add the command and select the [URCaps] menu on the [Program] tab. Select the program command under the [URCaps] menu. (Steps 1, 2)
When a command is selected, the command setting screen is displayed. On the setting screen, you can set the operation details and execute a test run. The following sections provide an explanation of the setting screen for each command.

Step 1

Step 2

Three types of program commands.

5.1　Activate Command

Activate command is a function for making a communication connection for the electric gripper: using the Activate command, when the electric gripper stops due to an emergency stop of the collaborative robot, after the collaborative robot returns, the procedure in [3. Communication connection of electric gripper] can be omitted and the program can be quickly restored.

Activate command must be executed only once at the beginning of the program.

1.　add a ✓ to "Add Before Start Sequence" to display the Before Start program. (Step 1)
2.　Select "BeforeStart" and select the Activate command. (Step 2)
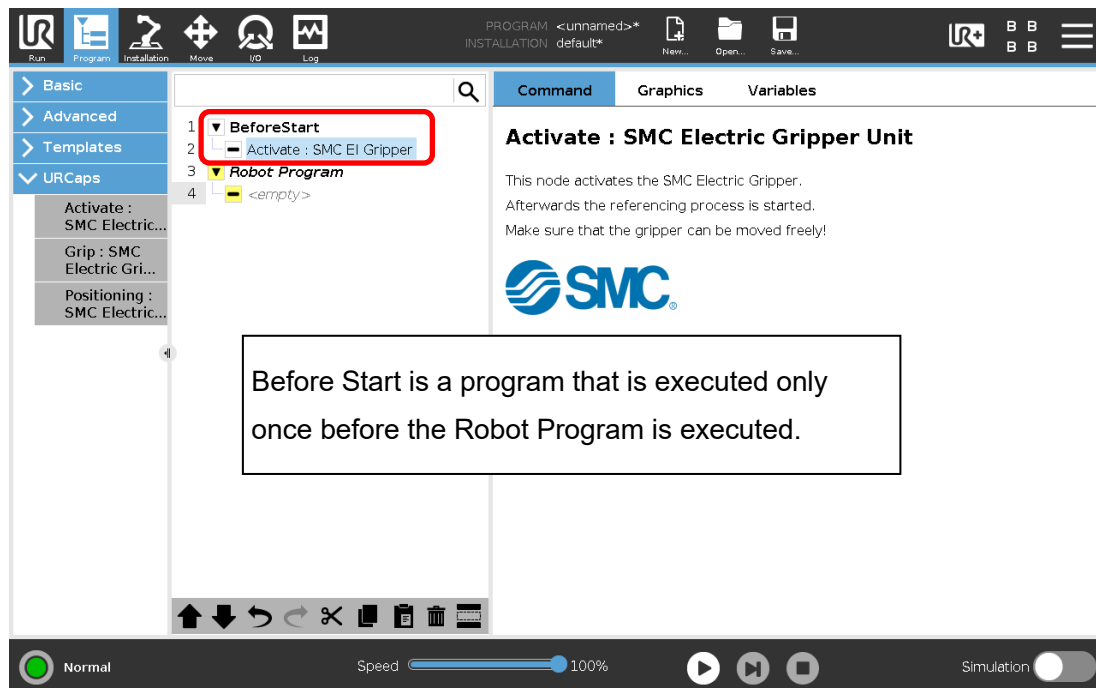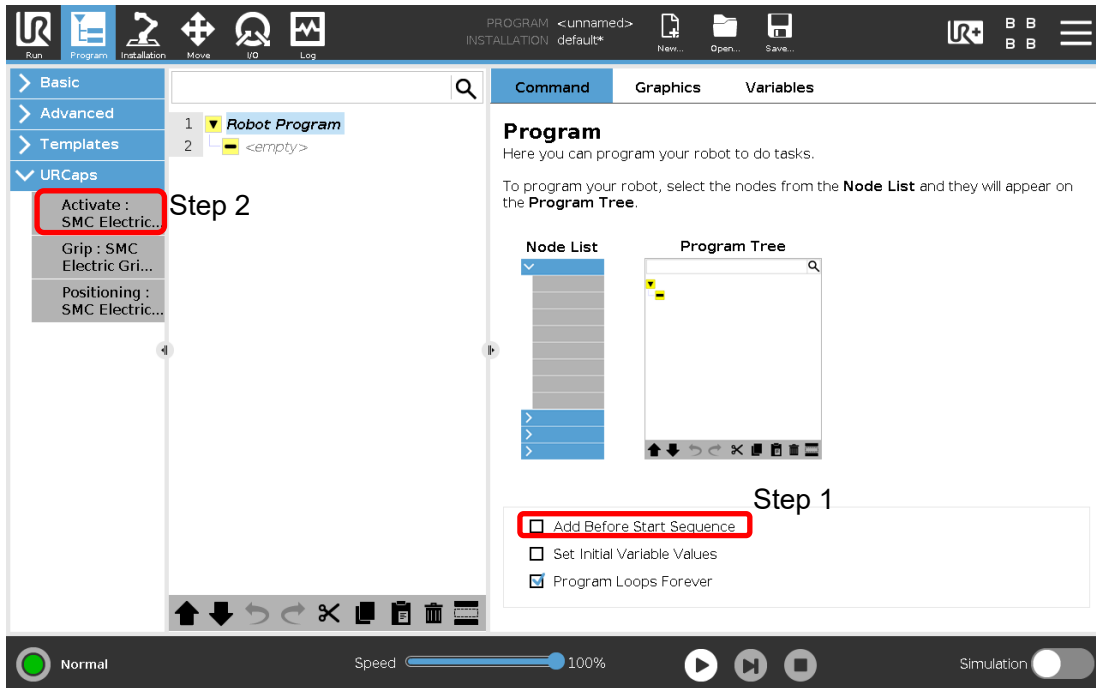
5.2　Grip Command

Grip command is a function that instructs the gripping movement.

① 　　Setting for "Select Operation".

Select an action instruction to the electric gripper for collaborative robot.

・External grip

Used to grip the workpieces with outer diameter.

・Internal grip

Used to grip the workpieces with inner diameter.

② 　　Setting for "Settings"

In order to send action instructions to the electric gripper for collaborative robot, set the Gripping

Position, Speed, and Force settings.

・Gripping Position

Set the gripping position.

Minimum value：0.00mm ／Maximum value：50.00mm

・Speed

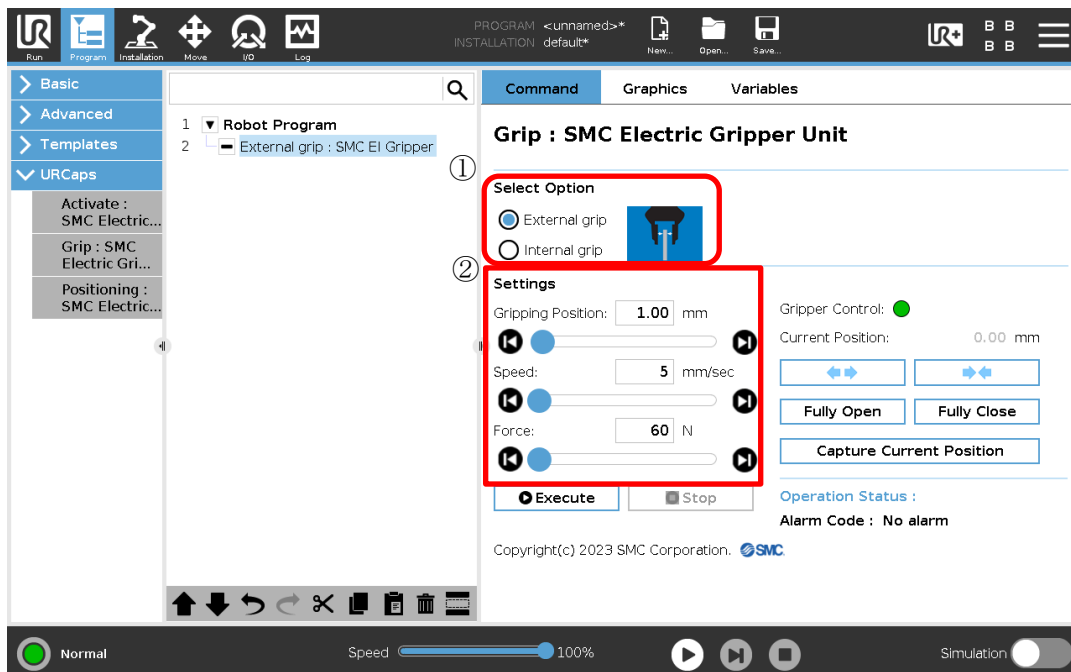Set the gripping speed of the workpiece to the gripping position.

Minimum value：5mm/sec／Maximum value：30mm/sec

・Force

Set the Gripping force.
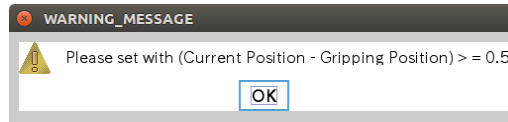
Minimum value：60N ／Maximum value：140N

9

③　Test operation

・"Execute" button

By using the set [Select Operation], Gripping Position, Speed, and Force, test the action of the Grip command.

During the test run, operations other than the "Stop" button are disabled.

If an alarm occurs when moving from the current position to the set Gripping Position value, a pop-up message warning is displayed without performing the move.

⊗ WARNING_MESSAGE

⚠ Please set with (Current Position - Gripping Position) > = 0.5

OK

・"Stop" button

The test operation executed by the "Execute" button is stopped.

This button acts as a reset button to release the alarm when an alarm occurs on the electric gripper.

*When an alarm has occurred, check the details of the alarm via [Alarm Code] and the LED on the electric gripper for collaborative robot.

④　Manual operation

It is possible to manually position the electric gripper for collaborative robot. If the "Gripper Control" lamp is green, the electric gripper is controllable.

・"Current Position"

Displays the current position of the electric gripper.

・ "Open Jog" button　　　　　

Performs the opening operation of the electric gripper while the button is pressed.

・"Close Jog" button　　　　　

Performs the closing operation of the electric gripper while the button is pressed.
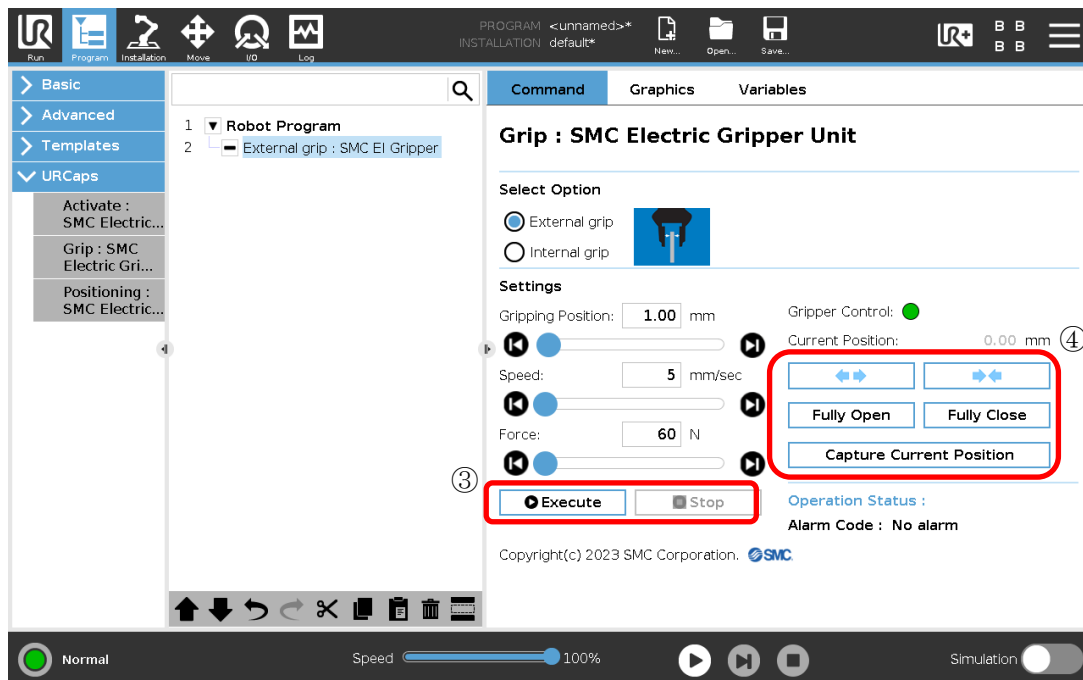
・"Fully Open" button

Performs a fully open operation of the electric gripper.

・"Fully Close" button

Performs a fully close operation of the electric gripper.

・"Capture Current Position" button

Capture the current position of the electric gripper into the "Gripper Position" setting in "Settings".

⑤ Operation Status

The test operation executed by the "Execute" button is displayed.

- ・"Execute"   : Test run is being executed
- ・"Success"   : Workpiece gripping successful, test operation completed normally
- ・"Failure"   : Workpiece gripping error occurred, test operation abnormally ended.
- ・"Workpiece lost"   : Detects workpiece drop after successful workpiece gripping.
- ・"Stop"   : Stopped by "Stop" button during test operation

11
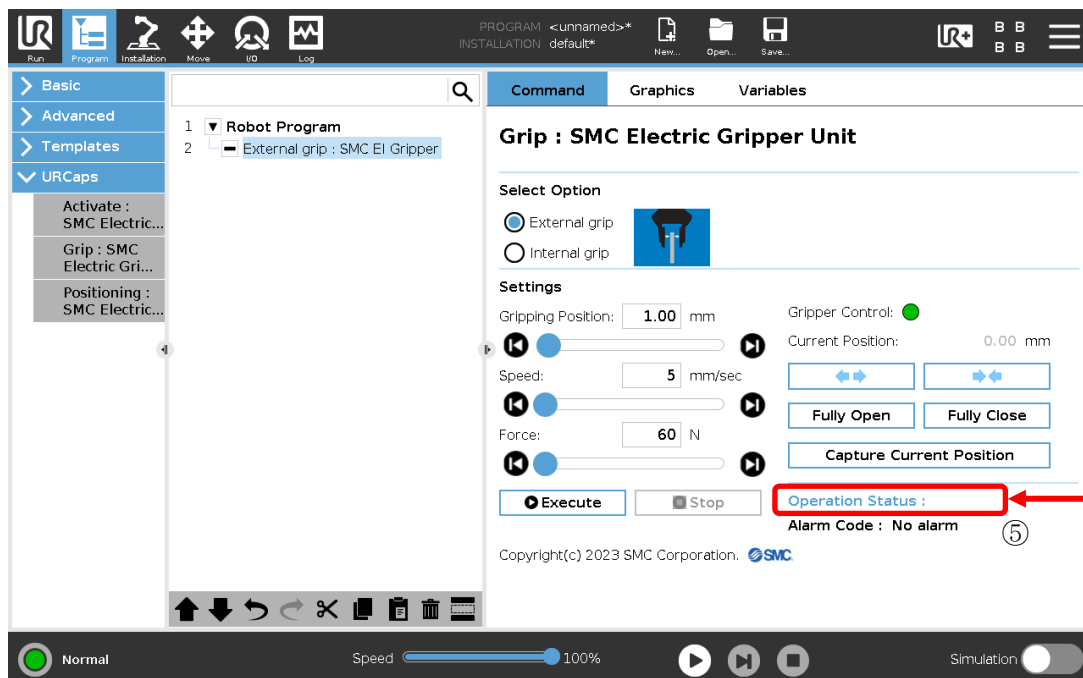
⑥　Workpiece drop detection

From the execution of the Grip command to the next Release command, the grip status of the workpiece is monitored and the workpiece drop is detected.

[Conditions for starting the workpiece drop detection.]

・"Various status signal output to digital output port." in "Installation Settings" of the electric gripper URCap is valid.

・The Grip command ends successfully.

5.3   Positioning Command

Positioning command is a function that instructs the opening and closing movement of the gripper fingers.

①   Select Operation

Set the operation of the command when the workpiece is released.

"Wait for the Positioning process to complete"

Check box ☑：When the workpiece release command is completed, the next operation is performed.

☐：Moves to the next operation without waiting for the completion of the command

when the workpiece is released.

②   "Setting for "Settings"

In order to send action instructions to the electric gripper for collaborative robot, set the Position
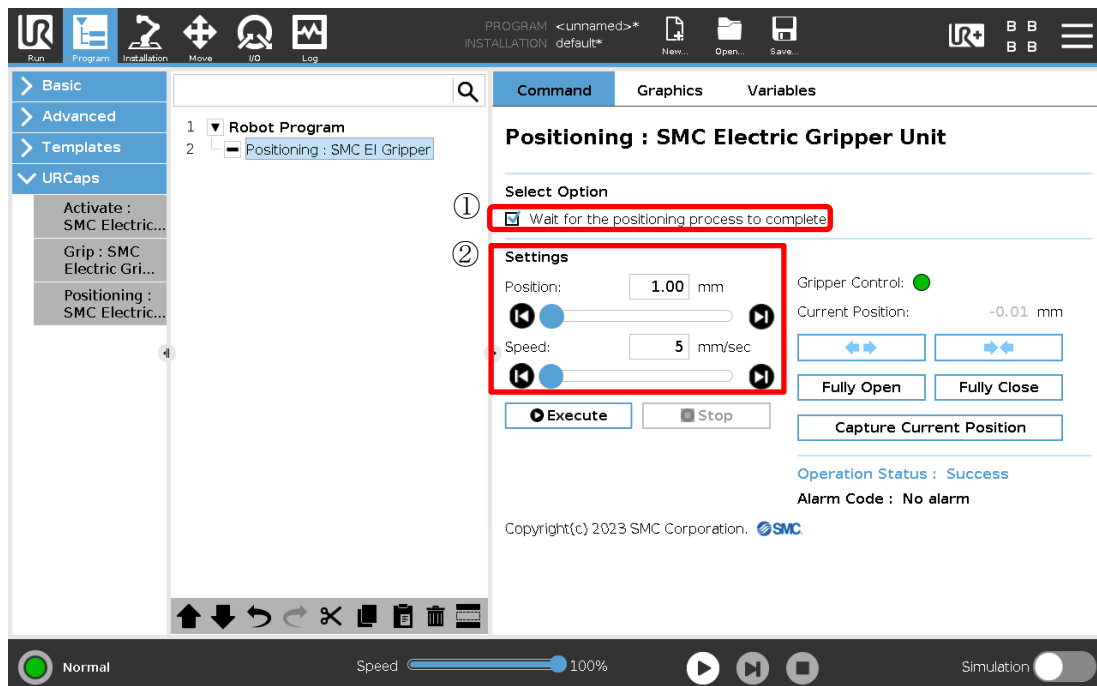
and Speed parameters.

・Position

Set the target position

Minimum value：1.00mm ／Maximum value：50.00mm

・Speed

Set an opening/closing speed to Position.
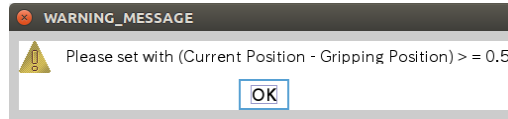
Minimum value：5mm/sec ／Maximum value：100mm/sec

③　Test operation

・"Execute" button

Test the operation with the set Position value and Speed value.

During the test run, operations other than the "Stop" button are disabled.

If an alarm occurs when moving from the current position to the set Gripping Position value,

a pop-up message warning is displayed without performing the move.

・"Stop" button

The test operation executed by the "Execute" button is stopped.

This button acts as a reset button to release the alarm when an alarm occurs on the electric gripper.

*When an alarm has occurred, check the details of the alarm via "Alarm Code" and the LED on the electric gripper for collaborative robot.

④　Manual operation

It is possible to manually position the electric gripper for collaborative robot. If the "Gripper Control" lamp is green, the electric gripper is controllable.

・Current Position

Displays the current position of the electric gripper.

・ "Open Jog" button

Performs the opening operation of the electric gripper while the button is pressed.

・"Close Jog" button

Performs the closing operation of the electric gripper while the button is pressed.
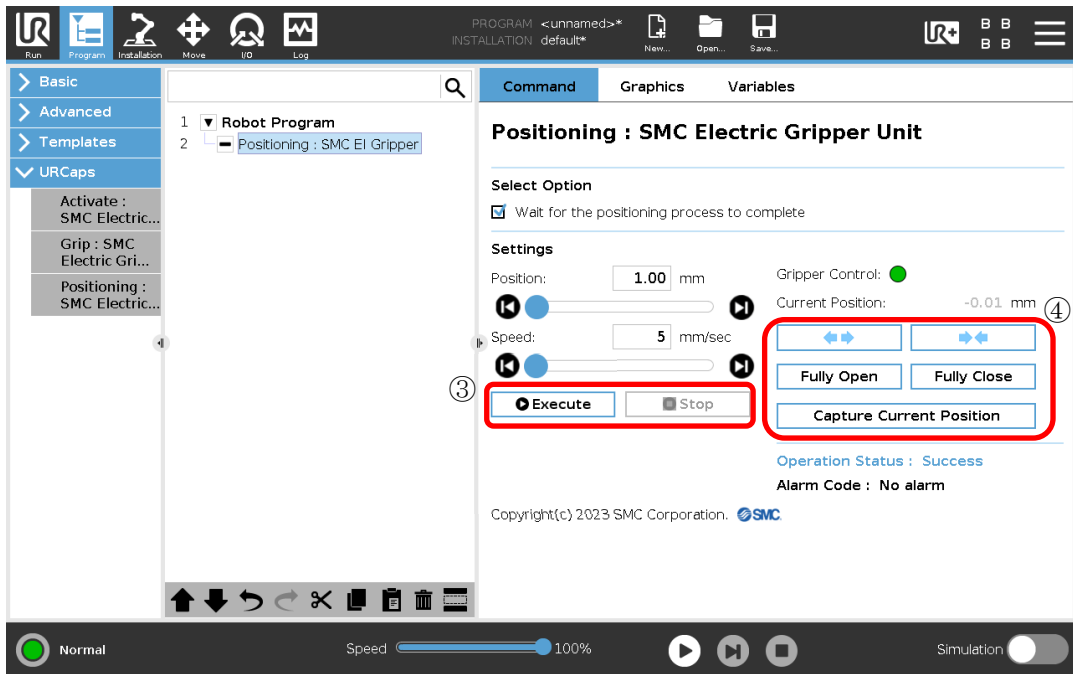
・"Fully Open" button

Performs a fully open operation of the electric gripper.

・"Fully Close" button

Performs a fully close operation of the electric gripper.

・"Capture Current Position" button

Capture the current position of the electric gripper into the "Gripper Position" setting in "Settings".

⑤　Operation Status

The test operation executed by the "Execute" button is displayed.

・"Execute"　　　　　：Test run is being executed

・"Success"　　　　　：Workpiece gripping successful, test operation completed normally

・"Failure"　　　　　：Workpiece gripping error occurred, test operation abnormally ended

・"Stop"　　　　　　：Stopped by "Stop" button during test operation

15
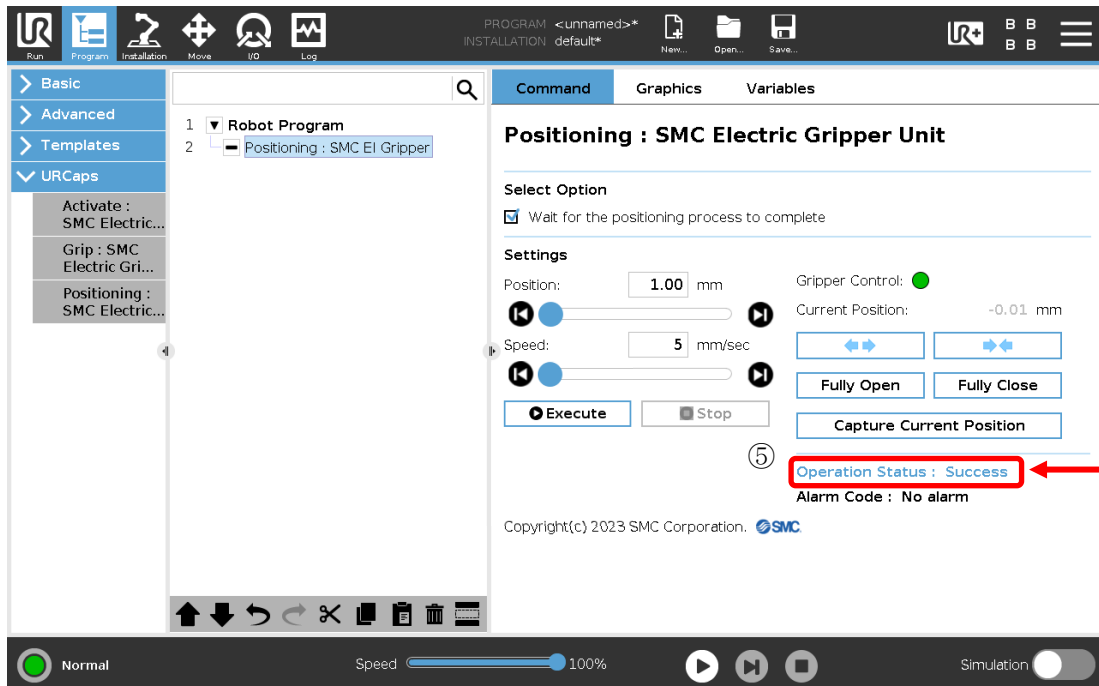
5.4　UR+ tool bar

From the UR+ icon at the top right of the screen, you can check the communication status and current position, and manually operate the electric gripper.

Manual operation

　　・Current Position

　　Displays the current position of the electric gripper.

　　・ "Open Jog" button

　　Performs the opening operation of the electric gripper while the button is pressed.

　　・"Close Jog" button

　　Performs the closing operation of the electric gripper while the button is pressed.

　　・"Fully Open" button

　　Performs a fully open operation of the electric gripper.

　　・"Fully Close" button

　　Performs a fully close operation of the electric gripper.
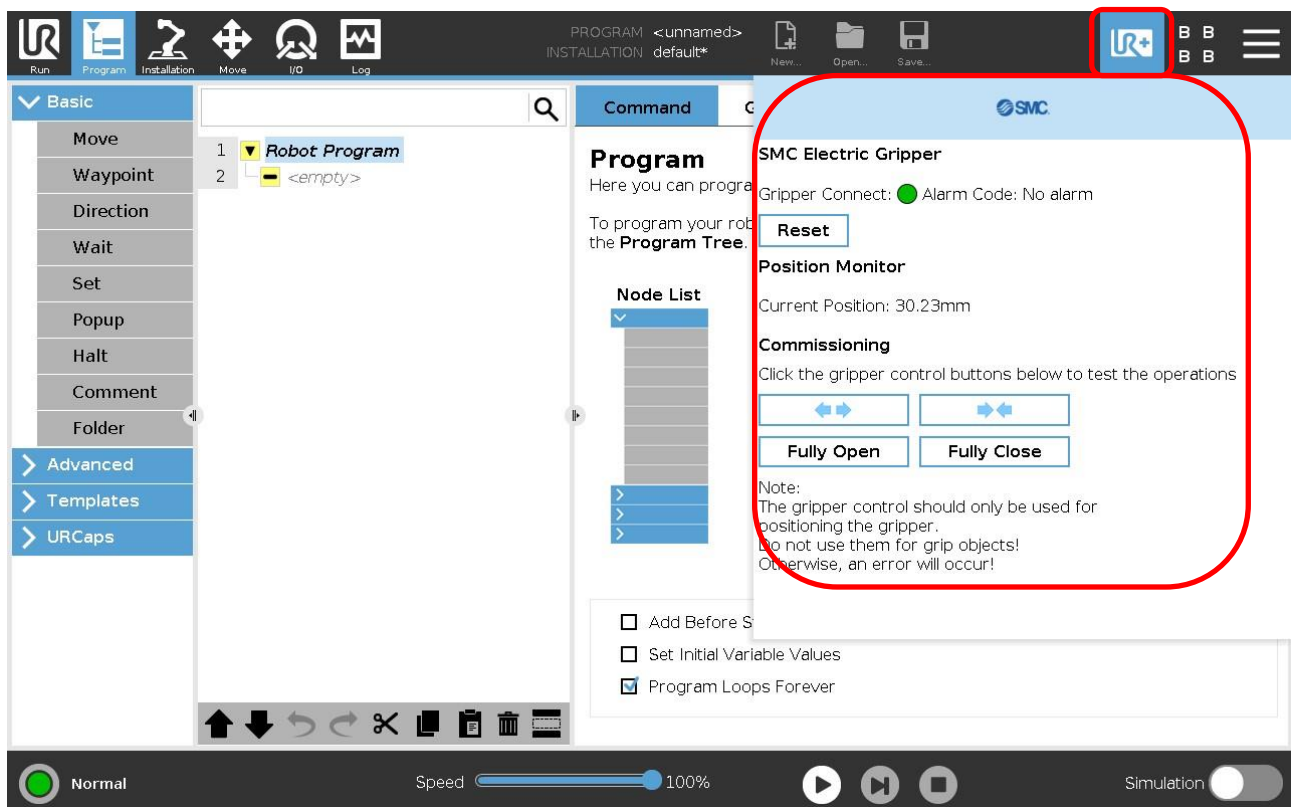
　　・"Capture Current Position" button

　　Capture the current position of the electric gripper into the "Gripper Position" setting in "Settings".

5.5　Program setting example

The following is an example of a program setup procedure for gripping a workpiece in external gripping.

① 　Select the Grip command to the program.
② 　Grip the workpiece by means of the "Close Jog" button and check the current position value.
　　(Here, a workpiece with a stroke value of 10 mm is assumed.)
③ 　Select "External grip" in "Select Option".
④ 　To Gripping Position of "Settings," enter a value that is smaller than the stroke value in ② by 1 mm
　　or more. *1
⑤ 　Enter appropriate values to Speed and Force under "Settings."
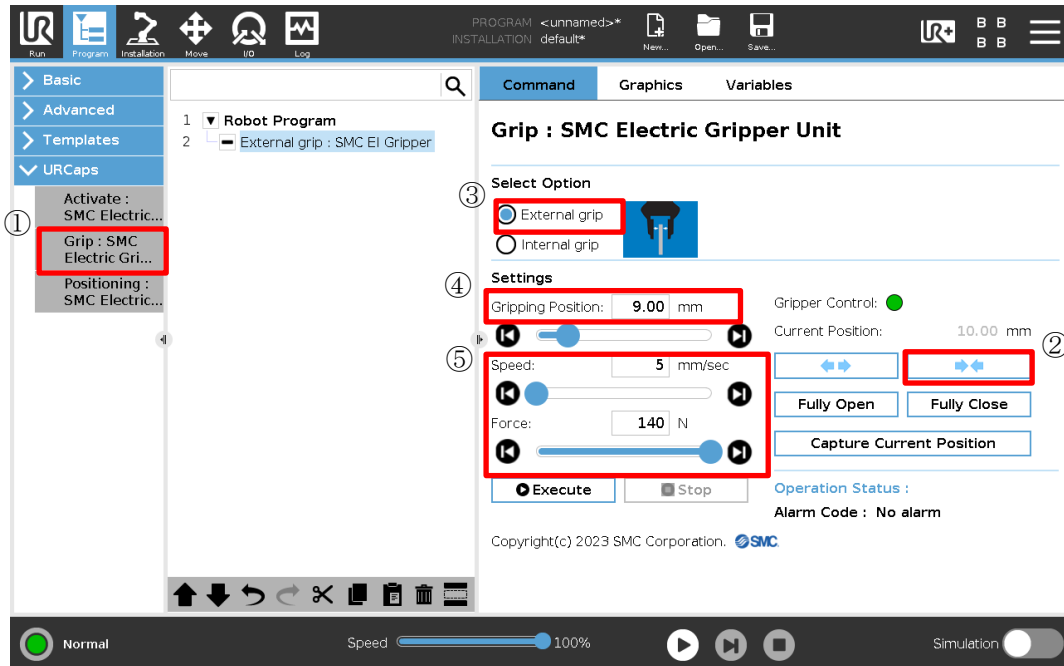
*1 For internal gripping, enter a value that is greater than the stroke value by 1 mm or more.

Next, an example of procedures for setting a program for a case where movement to before workpiece gripping position is conducted by the Positioning command in order to shorten the operation time and then workpiece external gripping is conducted by means of the Grip command.

① Select the Positioning command to the program.
② Check the stroke value at the position where gripping is performed using the "Close Jog" button. (Here, a workpiece with a stroke value of 10 mm is assumed.)
③ To Position of "Settings," enter a value that is greater than the stroke value in ② by 1 mm or more.[*2]
④ Enter appropriate values to Speed under "Settings."
⑤ Select the Grip command to the program.
⑥ Select "External grip" in "Select Option".
⑦ To Gripping Position of "Settings," enter a value that is smaller than the stroke value in ② by 1 mm or more. [*1]
⑧ Enter appropriate values to Speed and Force under "Settings".
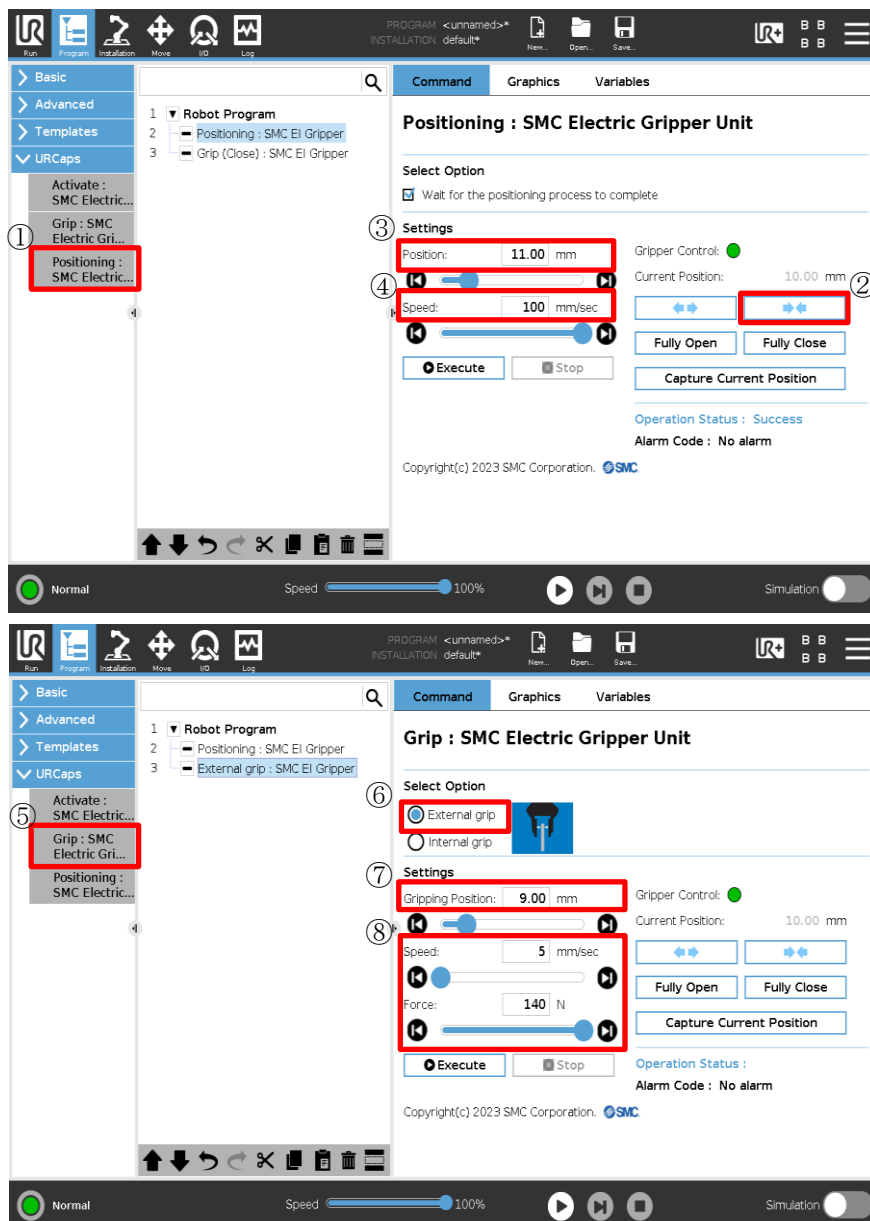
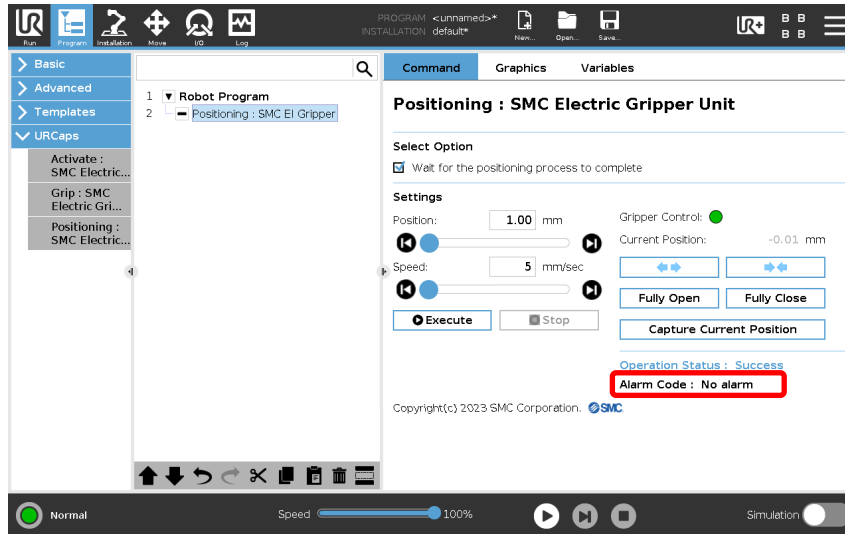*1 For internal gripping, enter a value that is greater than the stroke value by 1 mm or more.
*2 For internal gripping, enter a value that is smaller than the stroke value by 1 mm or more. Depending on the operating conditions and environment, the Positioning command may cause contact with the workpiece. In this case, while performing a test operation via the "Execute" button, adjust Position and Speed.

6 Alarm detection

The detection of a warning/alarm is notified by the LED lamp on the actuator and "Alarm Code" on the teaching pendant. For details of alarms and warnings, refer to the table below.

When an alarm is issued, the servo will be turned off.

Alarm Code	Content	Countermeasures
OverLoad alarm	This alarm is issued after a certain time has elapsed from the occurrence of a load warning.	Eliminated the cause of load warning
OverCurrent alarm	This alarm is issued when a current exceeding the rated current flows.	Check whether there is any factor that prevents the operation of the Electric Gripper for Collaborative Robot or an external force is applied to the finger.
OverTemperature alarm	This alarm is issued when the internal temperature of the motor has exceeded 110°C.	Check whether the ambient temperature in the operating environment is exceeding 40°C.
OverVoltage alarm	This alarm is issued when the input voltage exceeds 30 V.	Check the power supply voltage for the collaborative robot.
UnderVoltage alarm	This alarm is issued when the input voltage falls below 18 V.	
OverFlow alarm	This alarm is issued when the location deviation inside the controller exceeds a certain value.	Check whether there is any factor that prevents the operation of the Electric Gripper for Collaborative Robot or an external force is applied to the finger.
Push Motion Alarm	This alarm is issued when gripping of the workpiece by the Grip command has failed and nothing has been gripped.	Check whether the Gripping Position of the Grip command is correct.
Workpiece lost Alarm	This alarm is issued when the workpiece was lost in the time period from the execution of the Grip command to the subsequent execution of the Positioning command.	Check the gripping force, gripping position, and workpiece weight, and check whether an external force is applied to the finger.
Overload Alarm	This alarm is issued when the motor torque exceeds the specified value.	Check whether there is any factor that prevents the operation of the Electric Gripper for Collaborative Robot or an external force is applied to the finger.
Temperature Alarm	This alarm is issued when the internal temperature of the motor has exceeded 80°C.	Check whether the ambient temperature in the operating environment is exceeding 40°C.

Revision history
January 2024: Frist edition March 2024: Section 3.2, 5.4 addition

SMC Corporation

4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021 JAPAN

Tel: + 81 3 5207 8249 Fax: +81 3 5298 5362

URL https://www.smcworld.com