⊜SMC

Operation Manual

Electric Vacuum Gripper for Collaborative Robots

MODEL / Series / Product Number

ZXPE5*011P-****-***

-Software (URCap)-
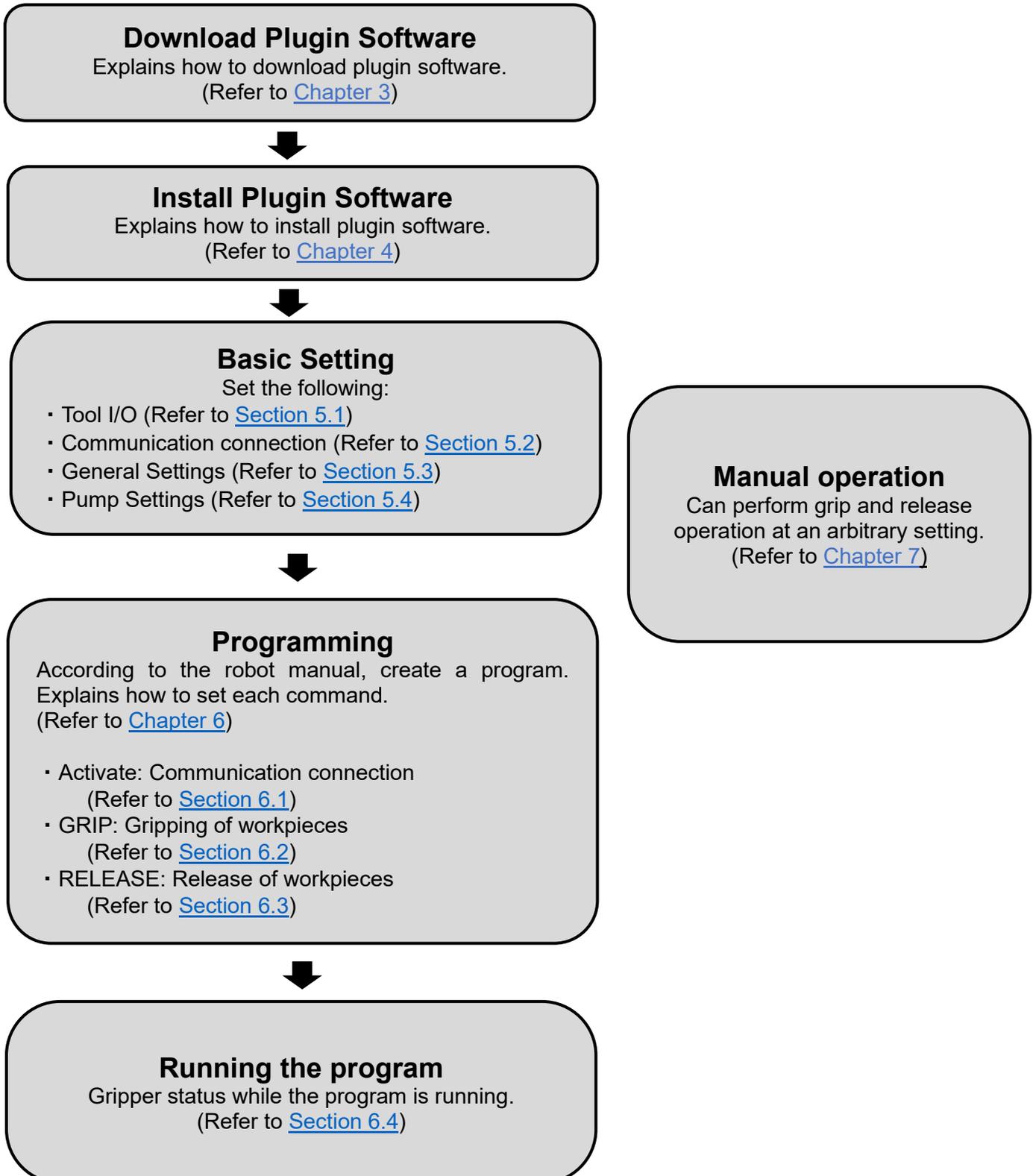
SMC Corporation

Contents

SMC

No. DOC1075117

1. Basic operation

Regarding basic operations such as initial settings of the electric vacuum gripper, search for the product number (ZXPE) on SMC website (https://www.smcworld.com) and refer to the operation manual "Electric Vacuum Gripper for Collaborative Robots - Hardware - " on its product page.

2. Plugin Software overview

This plugin software is for PolyScope5 for UR Robot and controlled via RS485 communication.
The following shows the operation flow for the plugin software.

Download Plugin Software
Explains how to download plugin software.
(Refer to Chapter 3)

⬇

Install Plugin Software
Explains how to install plugin software.
(Refer to Chapter 4)

⬇

Basic Setting
Set the following:
・Tool I/O (Refer to Section 5.1)
・Communication connection (Refer to Section 5.2)
・General Settings (Refer to Section 5.3)
・Pump Settings (Refer to Section 5.4)

Manual operation
Can perform grip and release operation at an arbitrary setting.
(Refer to Chapter 7)

⬇

Programming
According to the robot manual, create a program. Explains how to set each command.
(Refer to Chapter 6)

・Activate: Communication connection
　　(Refer to Section 6.1)
・GRIP: Gripping of workpieces
　　(Refer to Section 6.2)
・RELEASE: Release of workpieces
　　(Refer to Section 6.3)

⬇

Running the program
Gripper status while the program is running.
(Refer to Section 6.4)

SMC

3. Download Plugin Software

Download the relevant plugin software from the SMC website (https://www.smcworld.com) and put it into a USB memory drive. Search for the product number (ZXPE) from the above link and download it from its product page.
Please note that the plugin software is different depending on the product part numbers.

Table 1. Plugin software

Part No.	Pressure monitor unit specifications	Plugin software
ZXPE5∗011P-∗-∗**C**∗	With unit switching function	SMC- ZXPE5-ElectricVacuumGripper-x.x.x.urcap
ZXPE5∗011P-∗-∗**M**∗	SI unit only	SMC- ZXPE5-ElectricVacuumGripperSI-x.x.x.urcap

Note) The following describes when "SI unit only" is selected.

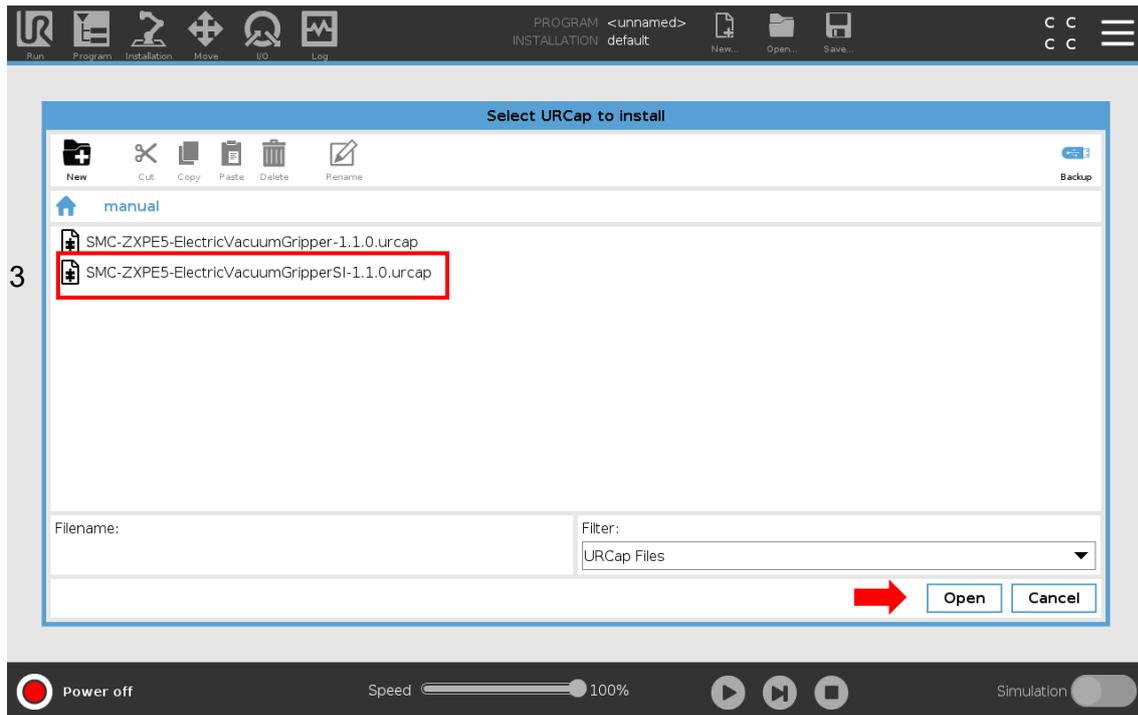# 4. Install Plugin Software

⚠ **Caution**

This plugin software is validated with UR robot PolyScope version 5.9.1. If PolyScope version is lower than 5.9.1, update the PolyScope to the latest version before installing plugin software. Also confirm that your PolyScope version is compatible with 5.9.1. Refer to update information about compatibility listed in note on download page for operation manual.
Note that **PolyScopeX** is not supported.

1. Go to "Settings" from the menu "Ξ" at the top right of the screen and tap "URCaps" in "System".
2. Insert the USB memory drive with a copy of the URCap into the Teach pendant and tap the "+" button.

SMC

No. DOC1075117
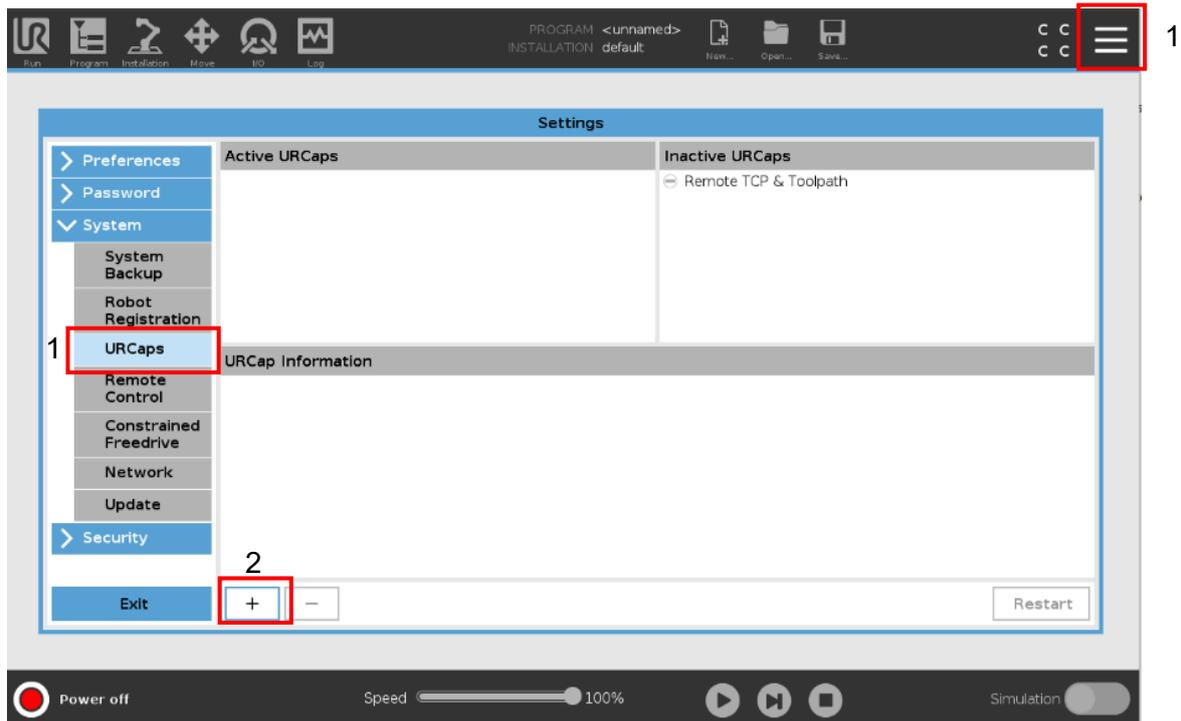
3. Select "SMC-ZXPE5-ElectricVacuumGripperSI-x.x.x.urcap" from "Files" and tap the "Open" button.


4. Tap the "Restart" button to restart the robot.
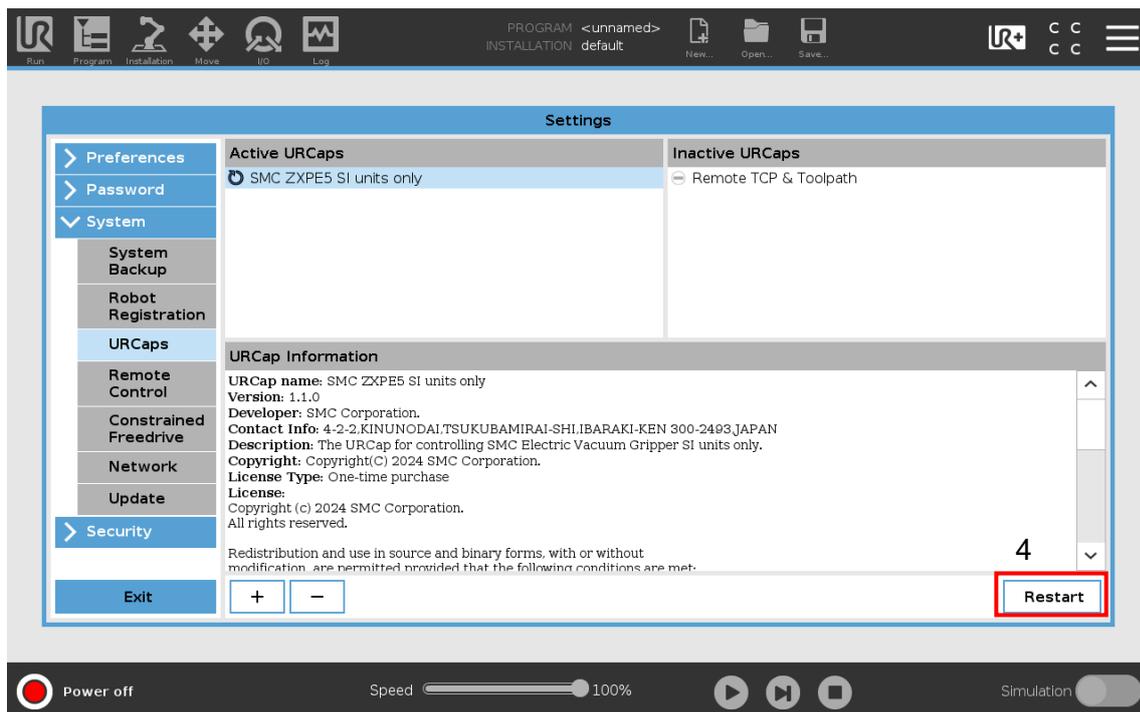
⚠️ **Caution**

URCap which is installed on "Active URCaps" must be only "SMC ZXPE5 SI units only" so uninstall any other URCaps. It may not communicate properly when multiple plugin software are installed.

5. Basic Setting

5.1. Tool I/O

After restarting the robot, tap "Installation" tab to open "Tool I/O" in "General" menu. Then, select "SMC ZXPE5 SI units only" from the "Controlled by" drop down list.
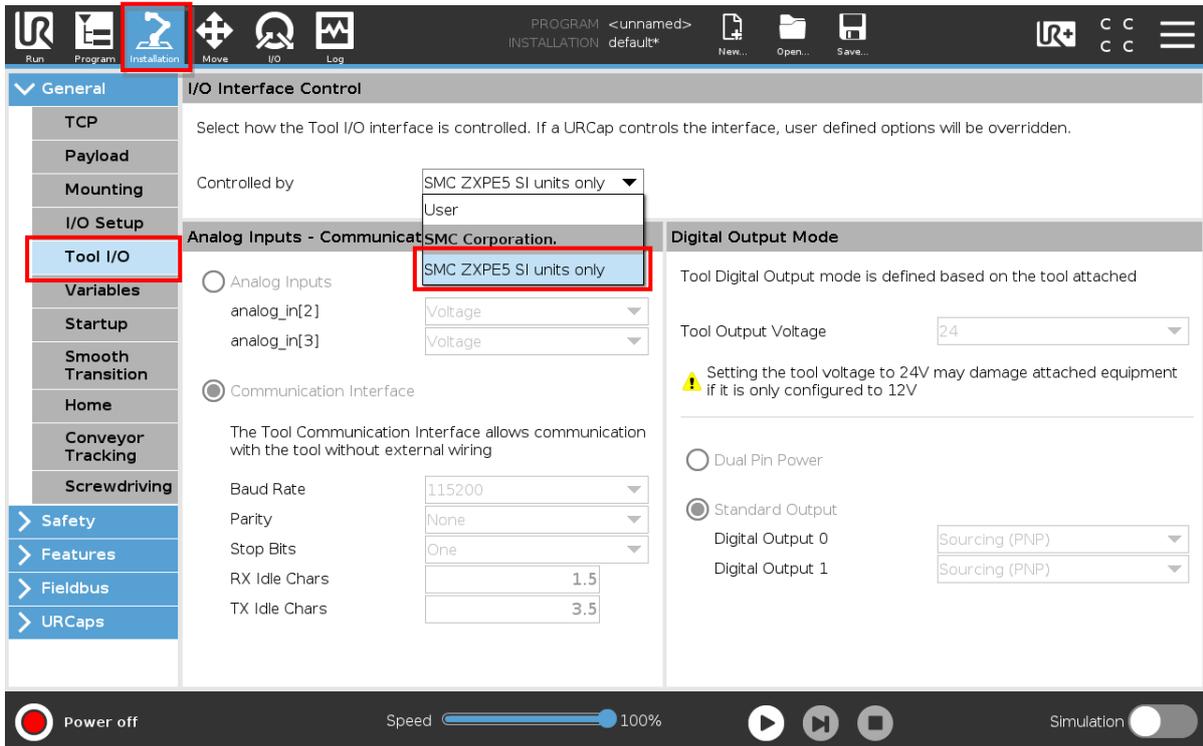
"Analog Inputs – Communication Interface" and "Digital Output Mode" will be set automatically.
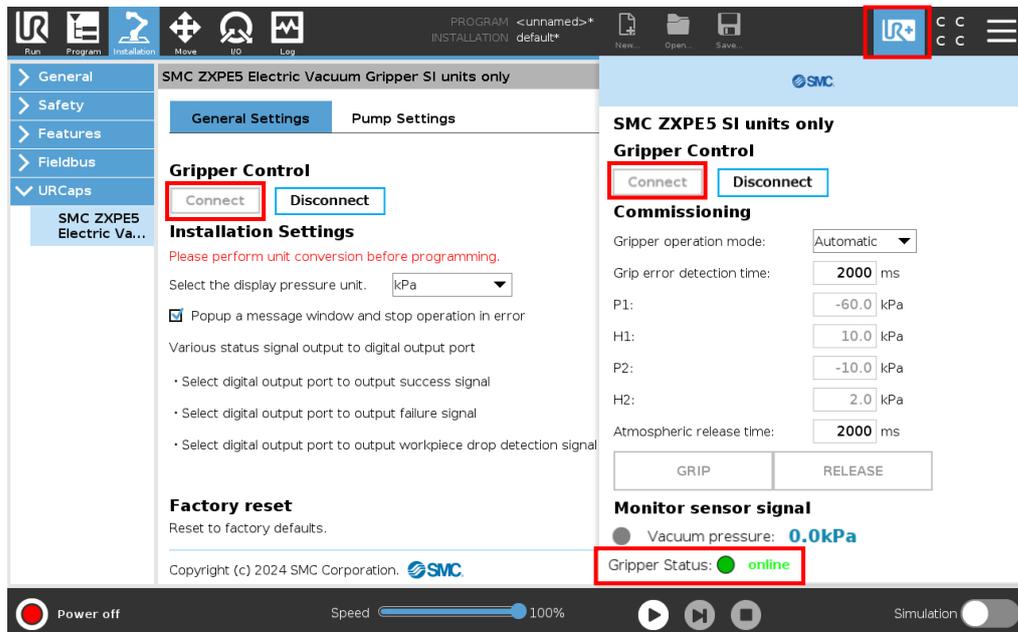
5.2. Communication connection

Select "SMC ZXPE5 Electric Vacuum Gripper SI units only" from "URCaps" menu in "Installation" tab. Tap the "Connect" button under "Gripper Control" in "General Settings" to start communication. It may take a few seconds.
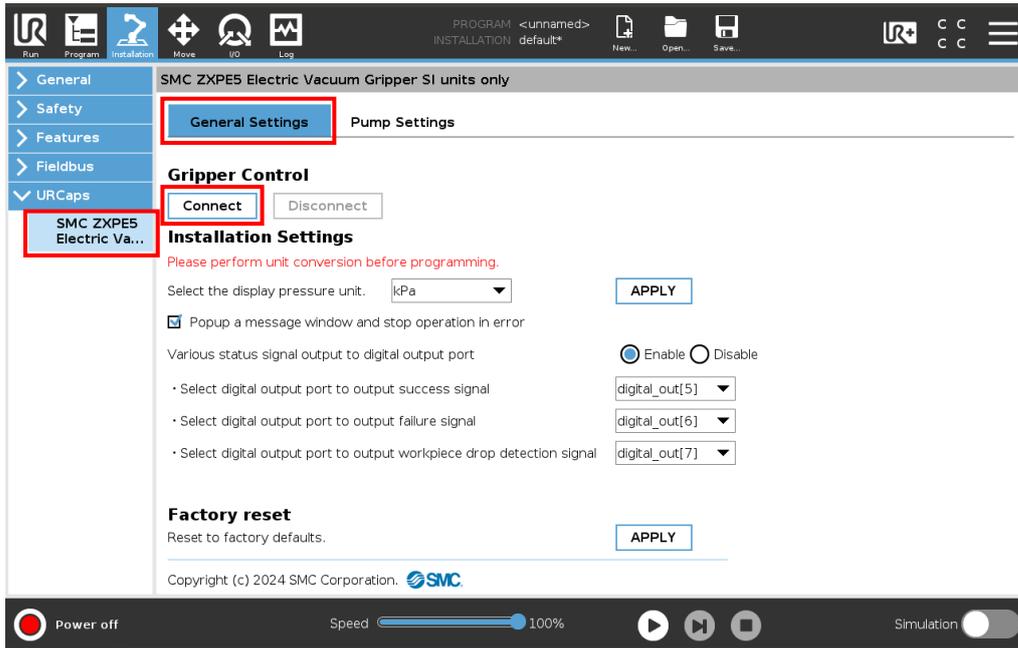
After the communication connection is started, the "Connect" button will be deactivated. When tapping the "Disconnect" button in this state, the communication connection will be disconnected.

The status of the connection between the gripper and the robot can be monitored on "Gripper Status" in "Monitor sensor signal" displayed on the toolbar by tapping the UR+ icon at the top right of the screen. Refer to 7. Manual operation for details.

No. DOC1075117

5.3. General Settings

Select "SMC ZXPE5 Electric Vacuum Gripper SI units only" from "URCaps" menu in "Installation" tab.
Set the "Installation Settings" in "General Settings".

1. "Select the displayed pressure unit"
   Can select the pressure unit displayed on the URCap and the gripper's pressure monitor. When selecting a pressure unit in the pull-down menu and tapping "APPLY", a popup window will be displayed to double check whether to change the pressure unit or not. When "OK" is selected, the displayed pressure unit is changed. Refer to "8. List of setting items" for details.

⚠ **Caution**

| Change the pressure unit before programming. |
| - If changing the pressure unit after programming, it may cause malfunction due to a conversion error of the set pressure values in the existing program. If the pressure unit is changed after programming, review all the set pressure values in the existing program and conduct a trial run of the gripper before starting full operation. |
| Change the pressure unit by URCap. |
| - If changing the pressure unit by the pressure monitor button, the change will not be remained and the pressure unit gets back to the one before the change when rebooting the gripper. |

2. "Popup a message window and stop operation in error"
   Select whether to display a popup window when workpiece drop is detected and whether to stop the program when an operation fails.
   Default: ☑ Popup a message window and stop operation in error

3. "Various status signal output to digital output port"
   Select whether to use digital output ports or not. When "Enable" is selected, the user can select the output port numbers for the signals for success, failure, and workpiece drop detection. Note that different signals cannot be assigned to the same port. When the output ports are not used, select "Disable".
   Default   : "Enable"
   Default port numbers : Success signal - digital_out[5]
                                         Failure signal - digital_out[6]
                                         Workpiece drop detection signal – digital_out[7]
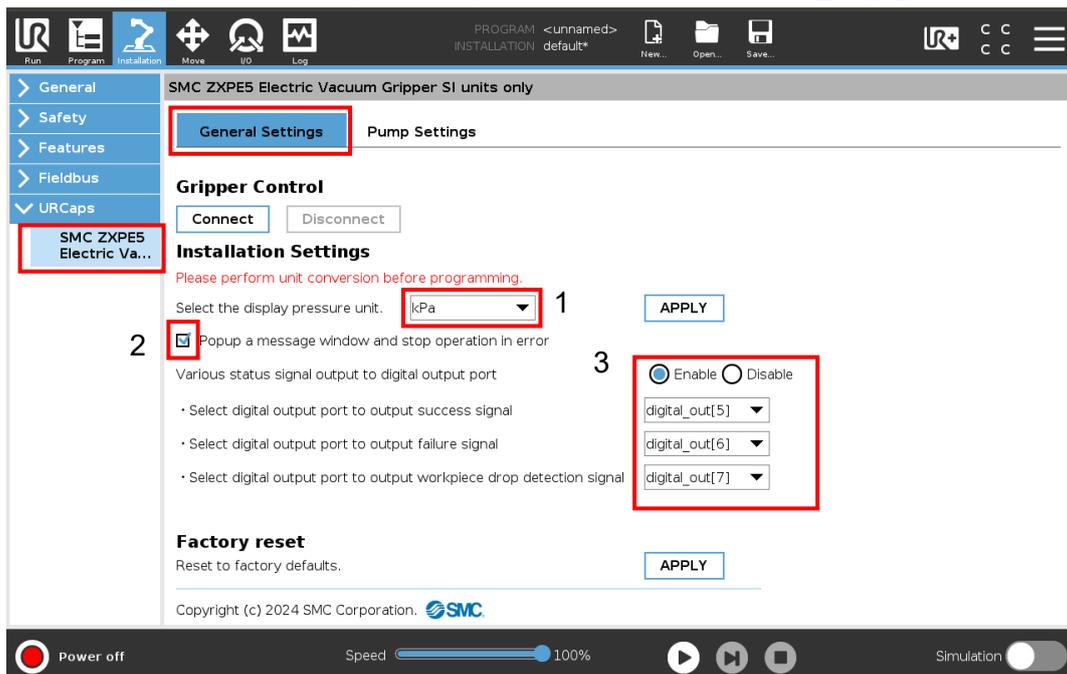
4. "Factory reset"
   If the current settings of the gripper are uncertain, the settings can be reset to the factory default. When tapping "APPLY", a popup window will be displayed to double check whether to perform "Factory reset" or not. When "OK" is selected, the settings of the gripper and the URCap will be reset to factory default. Refer to "8. List of setting items" for details.
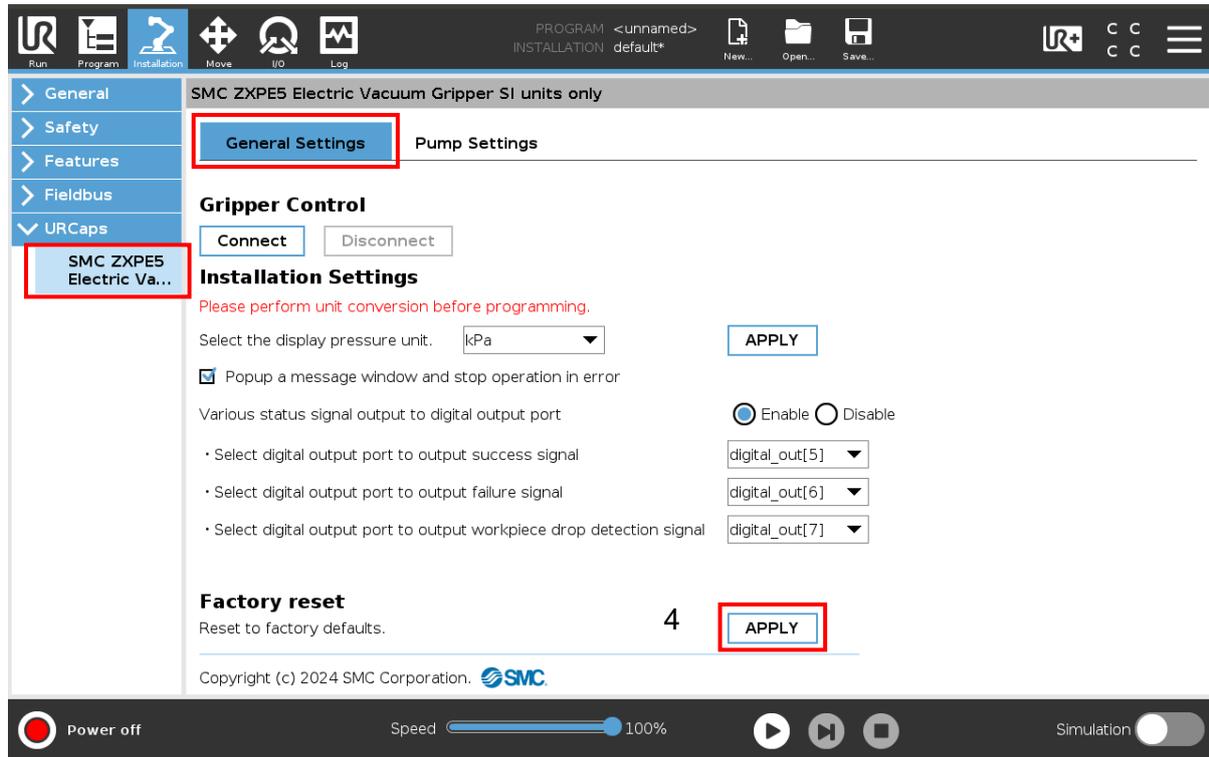
5.4. Pump Settings

Select "SMC ZXPE5 Electric Vacuum Gripper SI units only" from "URCaps" menu in "Installation" tab.
Gripper operation mode and thresholds for each parameter can be changed in "Pump Settings".

1. "Default mode"
   Can change the gripper operation mode shown as default in the program window and the manual operation window. Refer to the operation manual "Electric Vacuum Gripper for Collaborative Robots - Hardware - " for details of the operation modes.

   Selectable modes: "Automatic" (default), "Manual" and "Continuous".

2. "Default pump settings"
   Can change thresholds for each parameter shown as default in the program window and the manual operation window when "Manual" mode is selected. For the setting range of the threshold values, refer to "8. List of setting items".

   "P1: Threshold of pressure for energy-saving operation"
   "H1: Energy-saving operation range"
   "P2: Pressure for gripping success detection"
   "H2: Hysteresis of pressure for gripping success detection"
   (P2+H2: Pressure for workpiece drop detection)

3. "Notes"
   Shows the initial values of each parameter.

No. DOC1075117
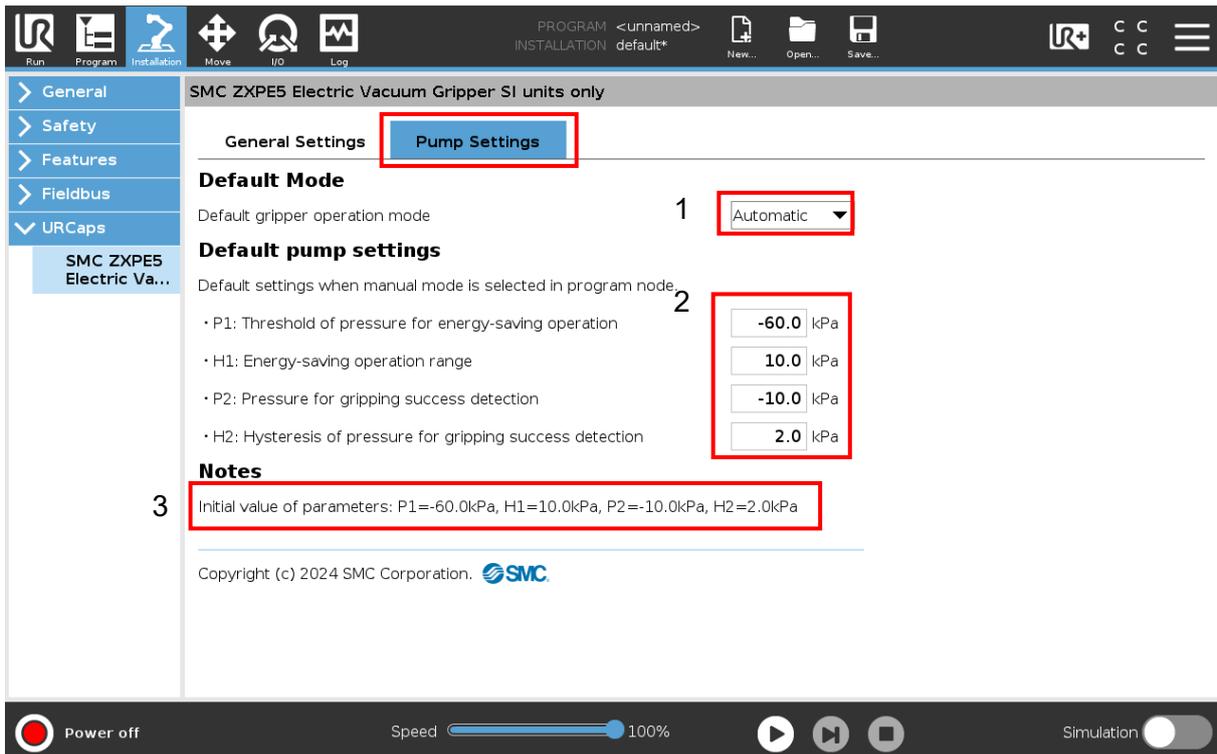
6. Command settings

This product has three program commands: "Activate", "GRIP" and "RELEASE".

6.1. Activate command
Activate command is a function for making a communication connection between the electric vacuum gripper and the robot. By using the Activate command, the program can be quickly restarted when the electric vacuum gripper stops due to an emergency stop of the collaborative robot because the procedure in "5.2. Communication connection" can be skipped after rebooting the robot.

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

1. When placing a check mark on "Add Before Start Sequence" in "Command" in the "Program" tab, the "Before Start" program will be displayed.
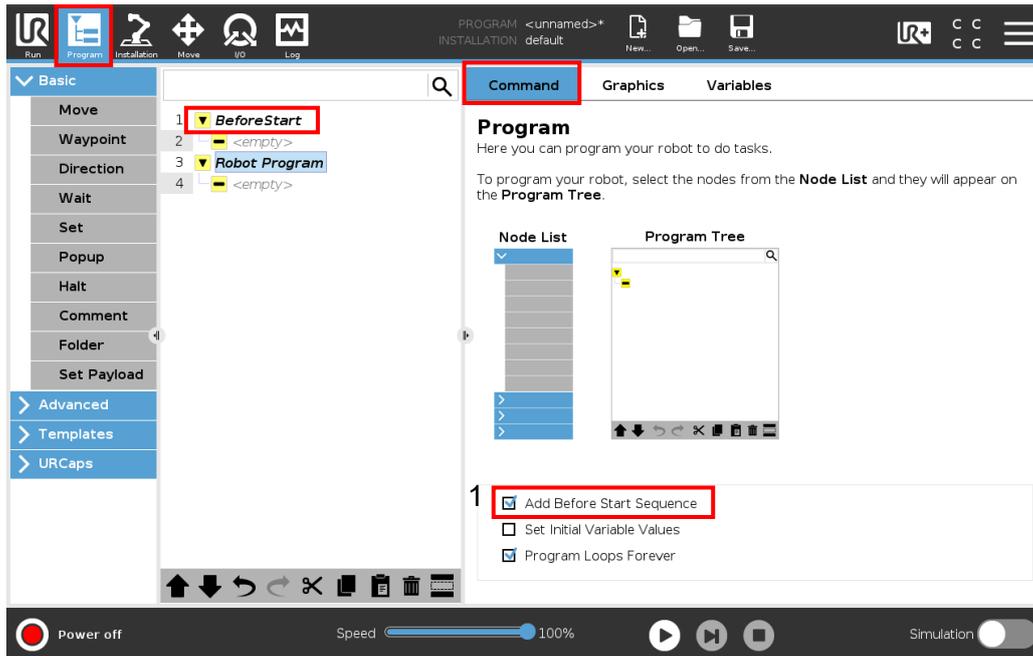
2. Tap "Activate: SMC ZXPE5 SI units only" in the "URCaps" menu to add the "Activate: SMC ZXPE5 SI units only" command to the "Robot Program".

No. DOC1075117
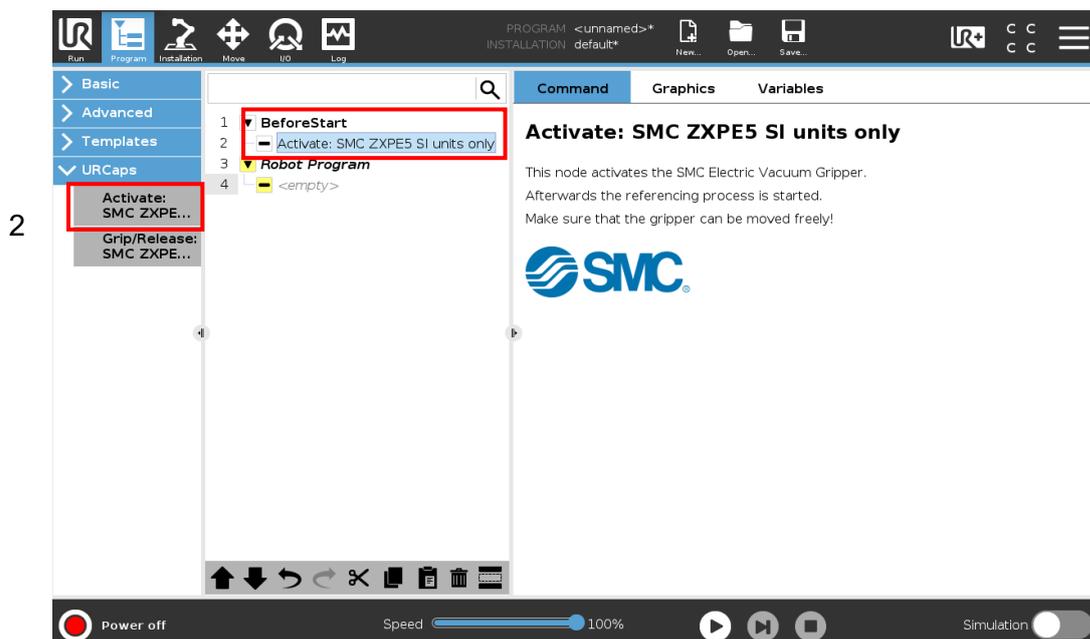
6.2. GRIP command

From the "URCaps" menu in the "Program" tab, tap "Grip/Release: SMC ZXPE5 SI units only". Select "GRIP" in "Select operation" to add "GRIP: SMC ZXPE5 SI units only" command to the "Robot Program".

1. "Settings"
    The parameters can be set for each command.
    Gripper operation mode: The operation mode set in "5.4. Pump Settings" is selected as default.
                    The operation mode can be changed here.
    Grip error detection time: Can set the time to determine that gripping is failed. If the vacuum
                    pressure does not reach the value at which the gripping success
                    signal is output within the detection time after the GRIP command
                    starts, the gripping failure signal is output.
                    Setting time range: 500 to 5,000 ms.
                    *Note that if the set time is too short, energy-saving operation may not
                    be possible depending on the cups. In this case, adjust the set time so
                    that the gripper can save energy.
    P1 to H2 (only when manual mode is selected): The values set in "5.4. Pump Settings" are entered
                    as default. The values can be changed here.
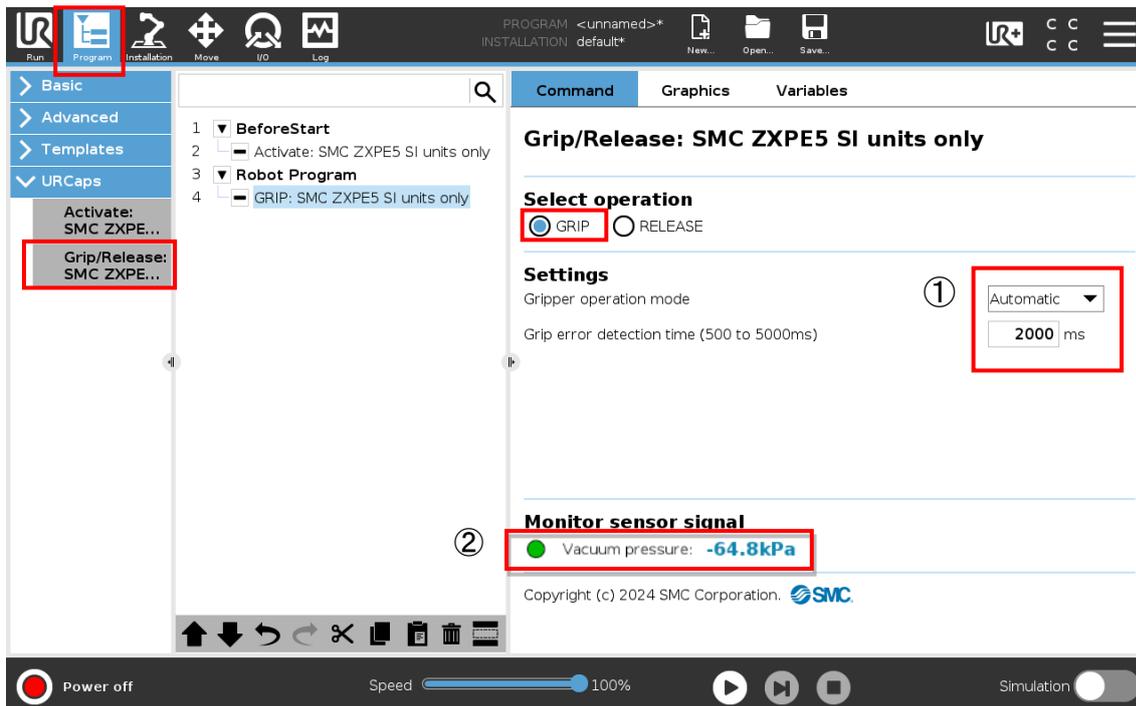
2. "Monitor sensor signal"
    Can monitor the gripper status and vacuum pressure.
    - 🟢 Green: Gripping success
    - 🔴 Red: Gripping failure, Workpiece drop detection, or Release failure
    - ⚪ Grey: Idle
    "-kPa" is displayed when the wiring or communication is disconnected.

-12-

When "Manual" is selected in "Gripper operation mode", the screen displays as follows.
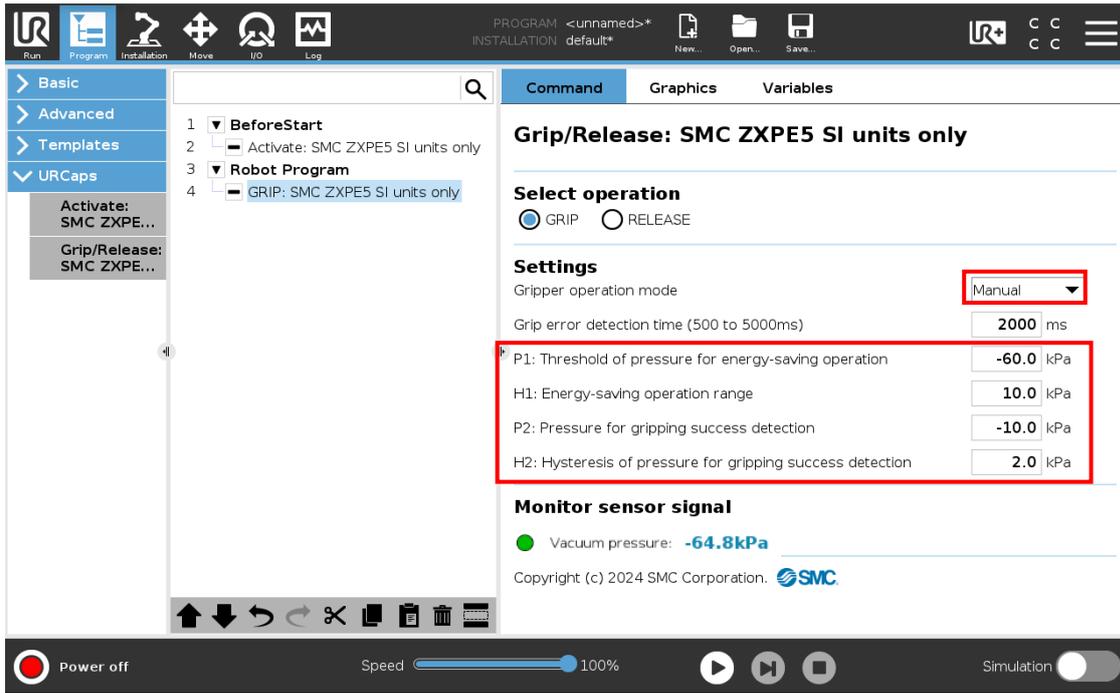
6.3. RELEASE command

From the "URCaps" menu in the "Program" tab, tap "Grip/Release: SMC ZXPE5 SI units only". Select "RELEASE" in "Select operation" to add "RELEASE: SMC ZXPE5 SI units only" command to the "Robot Program".

1. "Settings"
   The parameters can be set for each command.
   Atmospheric release time: Can set the time for atmospheric release valve to open.
                       Setting time range: 200 to 5,000 ms.

2. "Monitor sensor signal"
   Same as the [GRIP command].

No. DOC1075117

6.4. Gripper status while the program is running
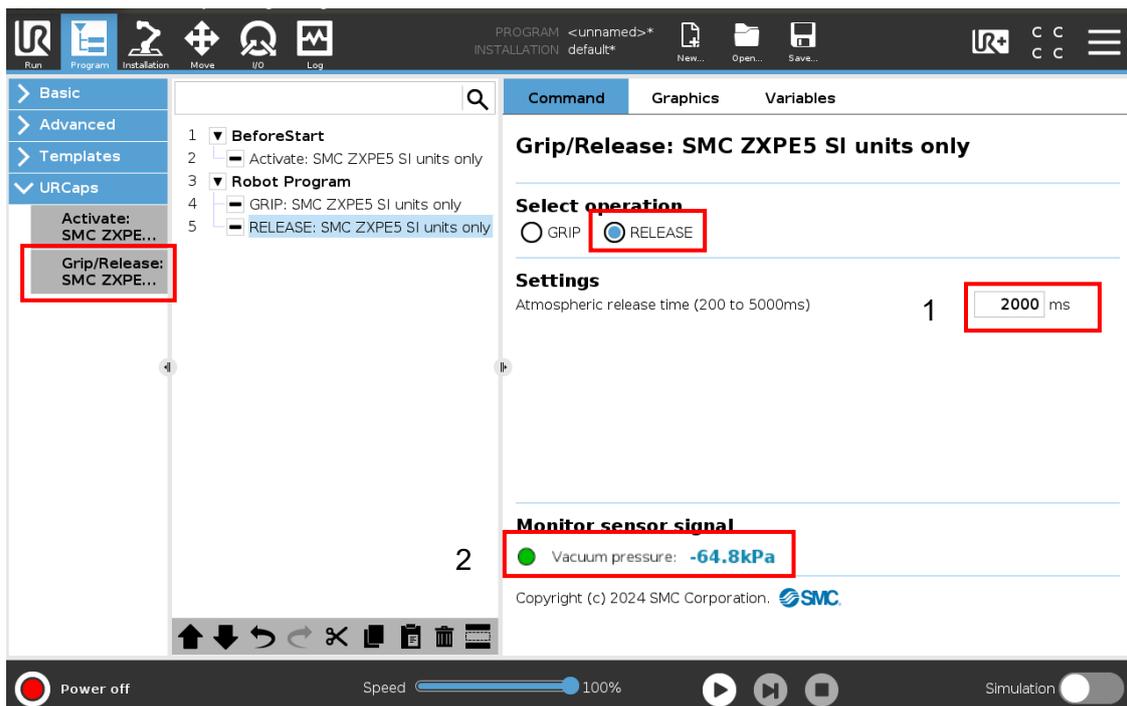
6.4.1. Pressure monitor display

When the electric vacuum gripper is energized, the sub screen (left) of the pressure monitor displays the gripper operation mode set by the DIP switch. While the program is running, the gripper operation mode set by each GRIP command is displayed. When the program ends, the gripper operation mode set by the last command will continue to be displayed.

Table 2. Gripper operation modes and pressure monitor display

Gripper operation mode	Automatic mode	Manual mode	Continuous mode
Pressure monitor sub screen (left)	0.0 Auto	0.0 MAnU	0.0 Cont

⚠ **Caution**

> Changing the gripper operation mode requires the processing time. If the mode is changed during program operation, a waiting time of 0.5 sec is provided. There is a time difference from the operation without mode change. Please note this when creating the program.

6.4.2. URCap display

While the program is running, the gripper status can be monitored on the toolbar displayed by tapping UR+ icon at the top right of the screen. Refer to "7. Manual operation" for details.

6.4.3. Electric vacuum gripper status and output signals

While the program is running, signals according to the gripper status (success, failure or alarm) are output and the program continues or stops.

Table 3. Status signals and program operations

Gripper status	Status signal Note 1	Program operation Note 2		Note
		Popup message ☑	Popup message ☐	
Grip success	"success signal"	Continue	Continue	
Grip failure	"failure signal"	Pause and Popup a message	Continue	When "Stop program" is selected on a popup message, the program stops. When "Continue" is selected on a popup message, the program resumes from this command. Note 4
Workpiece drop detection	"workpiece drop detection signal"	Continue	Continue	The program can be stopped by using the "if" command.
Release success	"success signal"	Continue	Continue	
Release failed	"failure signal"	Pause and Popup a message	Continue	When "Stop program" is selected on a popup message, the program stops. When "Continue" is selected on a popup message, the program resumes from this command. Note 4
Alarm Note 3	-	Continue	Continue	The program can be stopped by using the "if" command.

Note 1: Each status signal outputs to the port number set in "5.3. General settings".
Note 2: The program operation differs depending on the setting for a popup message set in "5.3. General settings".
Note 3: Alarms may occur not only while the program is running but also while the gripper is being energized. The generated alarms are shown on the "Gripper status" on the toolbar.
Note 4: The following popup messages are displayed when grip or release fails.

Manual operation of the gripper can be performed on the toolbar displayed by tapping the "UR+" icon at the top right of the screen.

Tap [GRIP] or [RELEASE] to perform the grip or release operation. The gripper status and vacuum pressure can be monitored during manual operation.

Note) The status signals set in "5.3. General settings" do not output during manual operation.

1. "Gripper Control"
   Can connect and disconnect the communication connection between the electric vacuum gripper and the robot. Refer to "5.2. Communication connection" for details.

2. "Commissioning"
   Can set the gripper operation mode and thresholds for each parameter for manual operation.

3. "Monitor sensor signal"
   Can monitor the gripper status while the program is running from the UR+ icon at the top right of the screen.

   Monitor sensor signal
   ● Vacuum pressure: Same as the program window
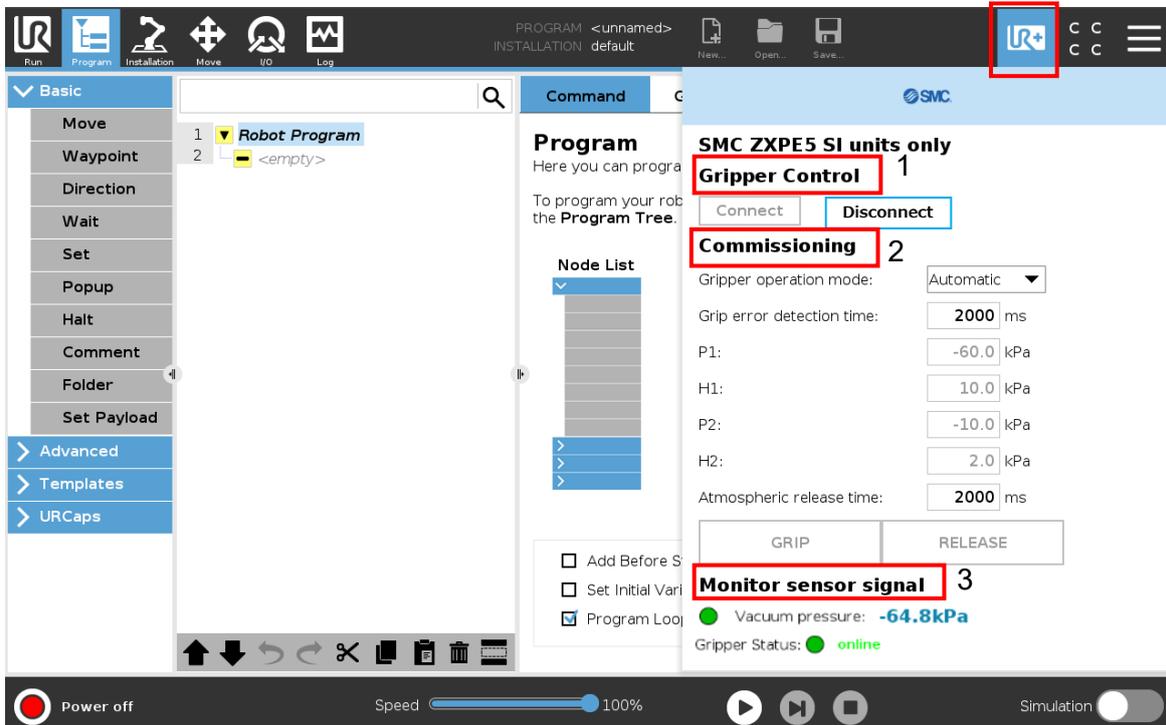   Gripper status: Displays the status of the gripper.
   ● online (green): The gripper is connected with the robot.
   ● offline (yellow): The gripper is disconnected with the robot.
   ● "Error message" (red): An alarm has occurred.
   Refer to "9. Troubleshooting" for details.

SMC

No. DOC1075117

8. List of setting items

Table 4. Setting items

Setting items	Factory default	Setting range	Note
Gripper operation mode	Automatic	Automatic, Manual, Continuous	
Display pressure unit	kPa	Refer to #Table 5.	
P1: Threshold of pressure for energy-saving operation	-60.0	-40.0 to -70.0	Values when display unit kPa is selected. For values when other units are selected, refer to #Table 6.
H1: Energy-saving operation range	10.0	0.0 to 10.0	
P2 : Pressure for gripping success detection	-10.0	-10.0 to -30.0	
H2 : Hysteresis of pressure for gripping success detection	2.0	0.0 to 10.0	
Grip error detection time	2000ms	500 to 5000	
Atmospheric release time	2000ms	200 to 5000	

Table 5. Selectable unit

Part No.	Selectable unit
ZXPE5∗011P-∗-∗**C**∗	kPa(Factory default), MPa, kgf/cm^2, bar, psi, InHg, mmHg
ZXPE5∗011P-∗-∗**M**∗	kPa(Factory default), MPa

Table 6. Factory default and setting range of each parameter

		kPa	MPa	kgf/cm^2	bar	psi	InHg	mmHg
P1	Factory default	-60.0	-0.060	-0.612	-0.600	-8.70	-17.7	-450
	Max.	-70.0	-0.070	-0.714	-0.700	-10.15	-20.7	-525
	Min.	-40.0	-0.040	-0.408	-0.400	-5.80	-11.8	-300
H1	Factory default	10.0	0.010	0.102	0.100	1.45	3.0	75
	Max.	10.0	0.010	0.102	0.100	1.45	3.0	75
	Min.	0.0	0.000	0.000	0.000	0.00	0.0	0
P2	Factory default	-10.0	-0.010	-0.102	-0.100	-1.45	-3.0	-75
	Max.	-30.0	-0.030	-0.306	-0.300	-4.35	-8.9	-225
	Min.	-10.0	-0.010	-0.102	-0.100	-1.45	-3.0	-75
H2	Factory default	2.0	0.002	0.020	0.020	0.29	0.6	15
	Max.	10.0	0.010	0.102	0.100	1.45	3.0	75
	Min.	0.0	0.000	0.000	0.000	0.00	0.0	0

9.Troubleshooting

Troubles and countermeasures

Trouble	Cause	Countermeasure
Gripper Status goes offline.	Wrong connection to robot or damaged wire	Check that the pin assignments of the robot and gripper are correctly connected. Also check that the robot connector cable and other wiring are no problem.
	Communication connection is not executed.	Before starting the program, execute the "5.2. Communication connection" or "6.1. Activate command".
Plugin software does not work properly.	Multiple plugin software are installed.	It may not communicate properly when multiple plugin software are installed. Uninstall any plugin software other than this product.
	Software version of the robot is not supported.	This plugin software is validated with UR robot PolyScope version 5.9.1. If PolyScope version is lower than 5.9.1, update the PolyScope to the latest version before installing plugin software. Also confirm that your PolyScope version is compatible with 5.9.1. Refer to update information about compatibility listed in note on download page for operation manual. Note that **PolyScopeX** is not supported.
Initial gripping problem (During trial run)	P2 value (pressure for gripping success detection) is too high compared with vacuum pressure when gripping.	Set a suitable P2 value depending on the workpiece and cup conditions.
	Unsuitable settings for gripper operation mode and set values.	Perform a trial run with the actual workpiece to determine suitable settings. Continuous mode is recommended for breathable workpieces.
Slow gripping time	Cup shape	Response time differs depending on cup shape or piping condition. Check the appropriate grip error detection time according to "7. Manual operation". Select cups and piping conditions that can grip a workpiece within 5,000 ms (max. grip error detection time).
Workpiece can't be released.	Atmospheric release time is too short.	Short atmospheric release time results in unsuccessful release. Check the appropriate atmospheric release time according to "7. Manual operation". Select cups and piping conditions that allow release within a maximum value of 5,000 ms.
The display units cannot be changed.	Incorrect product part number (Product with unit switching function must be ordered.)	Check the part number indicated on the product and confirm that it has a unit switching function. If the part number is the SI unit only type, the unit cannot be changed (except for kPa and MPa).

SMC

Alarms

When an alarm occurs, the LED light on the gripper and the toolbar on the Teach pendant inform you.
(Refer to "7. Manual operation".)

Table 7. Alarms

Alarm	Product status	Message	Countermeasure
Temporary pressure monitor error	LED: Red flashing Pressure monitor: "HHH" or "LLL" is displayed.	Pressure monitor recoverable fault	The applied pressure exceeds the upper or lower limit that can be displayed on the pressure monitor. Release the applied pressure so that the pressure will be within the display range.
Overcurrent error in internal part	LED: Red flashing	Over current error "----"	The load current on the internal part exceeds the maximum value. Turn the power off, confirm that the wiring is correct, and then turn the power on. Check the operating environment to ensure that there is no strong magnetic field near the product.
Communication error	LED: Red flashing	Pressure monitor communication error	
Internal error in pressure monitor	LED: Red flashing Pressure monitor: An error code is displayed. (Er 0/4/6/7/8/9)	Pressure monitor internal error	An internal error occurs. Turn the power off and then turn it on again.
System error	LED: Red flashing	System error	

Note) If the above countermeasures do not resolve the troubles, or if alarms other than the above, please contact SMC.

SMC

No. DOC1075117

Revision history
Rev.1: Contents revised due to URCap version update [July 2025]

SMC Corporation

Tel: + 81 3 5207 8249 Fax: +81 3 5298 5362
URL https://www.smcworld.com

No. DOC1075117