

Operation Manual

PRODUCT NAME

Electric Vacuum Gripper

MODEL / Series / Product Number

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

-Software (URCap)-

SMC Corporation

Contents

1. Software overview	2
2. How to Download Software	3
3. Install	4
4. Basic settings	6
5. Command settings	10
6. Commissioning	14
7. List of setting items	15
8. Troubleshooting	

1. Software overview

This plug-in software is exclusively for the UR Robot e series and is controlled via RS485 communication. The following shows the operation flow with the software.



2. How to Download Software

Download the relevant plugin software from the SMC website (https://www.smcworld.com) and copy it to a USB memory. Search the product number (ZXPE) on the TOP page and proceed to the detail page to download the software.

Please note that the plugin software is different depending on the gripper to be used.

Table 1. Plugin software

Part No.	Plugin software
ZXPE5*011P-*-* C *	SMC-ElectricVacuumGripper-x.x.x.urcap
ZXPE5*011P-*-* M *	SMC-ElectricVacuumGripperSI-x.x.x.urcap

*The following description is in case that "SI units only" is selected.

3. Install

The plugin software is compatible with a UR robot Polyscope version 5.9.1 or later. Before installing the plugin software, update the Polyscope to the 5.9.1 or later version if it is prior to 5.9.1.

- 1. Go to "Setting" from the menu on the top right of the screen and tap "URCaps" from "System".
- 2. Insert the USB memory with a copy of the URCap into the teaching pad and tap the "+" button.

			Settings	
<u>\</u>	D	Active LIBCaps	Inactive LIBCaps	
>			Remote TCP & Toolpath	
>	Password			
\sim	System			
	System Backup			
j	Robot Registration			
1	URCaps	UBCap Information		
1	Remote Control			
	Constrained Freedrive			
	Network			
	Update			
>	Security			
		2		
	Exit	+ -		Restart

3. Select "SMC-ElectricVacuumGripperSI-x.x.x.urcap" from "Files" and tap the "Open" button.

Rur	Program Installation Move V0 Log	PROGRAM <unnamed> INSTALLATION default</unnamed>	New Open	Save	
		Select URCap to install			
	New Cut Copy Paste Delete Rename				eess Backup
	SMC-ElectricVacuumGripper-0.5.4.urcap				
3	SMC-ElectricVacuumGripperSI-0.5.4.urcap				
	Filename:	Filter: URCap Files			
					Open Cancel
		1 001	0.4		
C	Power off Speed	100%			Simulation

4. Tap the "Restart" button to restart the robot.

-
4 ~

<u>//</u>Caution

URCap which is installed on "Active URCaps" must be "SMC Electric Vauum Gripper SI units only" only and uninstall any other URCaps. It causes communication failure, and it may not go online when more than one URCaps are installed.

4. Basic settings

4.1. Tool I/O

After restarting the robot, press "Installation" to open 'Tool I/O' from "General'. Then, select "SMC Electric Vacuum Gripper SI units only" from the "Controlled by" drop down list.

Run Program Installation		PROGRAM <unnam< b=""> INSTALLATION default*</unnam<>	ned> 📮 🗂 🔚 New Open Save			
✓ General	I/O Interface Control					
TCP	Select how the Tool I/O interfa	erface is controlled. If a URCap controls the interface, user defined options will be overridden.				
Payload						
Mounting	Controlled by	SMC Electric Vacuum Gr 🔻				
I/O Setup		User				
Tool I/O	Analog Inputs - Communica	at SMC Corporation.	Putput Mode			
Variables	Analog Inputs	SMC Electric Vacuum Gripper SI	units only _p tal Output mode is o	defined based on the tool attached		
Startup	analog_in[2]	Voltage				
Smooth	analog_in[3]	Voltage 🔹	Tool Output Voltage	24.		
Transition			Setting the tool voltage to 24V may damage attached equipment			
Home		2	If it is only configured to 12V Dual Pin Power			
Conveyor Tracking	The Tool Communication with the tool without exte	Interface allows communication ernal wiring				
Screwdriving	Baud Rate	115200 💌				
> Safety	Parity	None 💌	Standard Output			
> Features	Stop Bits	One 💌	Digital Output 0	Sourcing (PNP) 🔻		
Fieldbus	RX Idle Chars	1.5	Digital Output 1	Sourcing (PNP) 🔻		
VIRCaps	TX Idle Chars	3.5				
	Cos	and (
Power off	Spe	100%		Simulation		

"Analog Inputs - Communication Interface" and "Digital Output Mode" will be set automatically.

4.2. General Settings

Open "General Settings" from the "URCaps" menu in the "Installation" tab.

 Select the display pressure unit: allows the user to change the measurement unit and set the pressure unit displayed on the URCap as well as the pressure unit displayed on the gripper's pressure monitor. Selecting the pressure unit in the pull-down menu and tapping "APPLY" opens a window asking whether the unit is to change. When "OK" is selected, the unit of indicated and set pressure will be changed. Refer to "<u>7. List of setting items</u>" for details.

Change the measurement unit before programming.

- If it is changed after programming, the parameter threshold value within the program may cause a conversion difference, resulting in malfunction. If the measurement unit is changed after programming, review all pressure set values in the existing program and test run the gripper before starting full operation.

Change the measurement unit by URCap.

- Unit switching by the pressure monitor button is not retained and will return to the original unit when the gripper power is cycled.

2. Popup a message window and stop operation in error: allows the user to select whether a popup window should appear and the program should be stopped when a failure (gripping or release failure) occurs.

This option is set to I Popup message window and stop operation in error by default.

3. Various status signal output to digital output port: allows the user to select whether to enable or disable the output ports. 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 one port. When an output port is not used, select "Disable".

This option is set to "Enable" by default.

The default port numbers are as follows:

success signal - digital_out[5] failure signal - digital_out[6]

workpiece drop detection signal - digital_out[7]

	PROGRAM <unnamed></unnamed>	New Open Save	
> General	SMC Electric Vacuum Gripper		
Safety Eestures	General Settings Pump Settings		
 Fieldbus URCaps SMC Electric Vacuum Gri 	Installation Settings Please perform unit conversion before programming. Select the display pressure unit. Popup a message window and stop operation in error Various status signal output to digital output port • Select digital output port to output success signal • Select digital output port to output failure signal	APPLY ■ Enable ● Disable digital_out[5] ▼ digital_out[6] ▼	
	Select digital output port to output workpiece drop detection signal Factory reset Reset to factory defaults. Notes By navigating to the General menu - Tool IO set the "Controlled by" to a Ginera	digital_out[7] ▼ APPLY SMC Electric Vacuum	
Power off	Copyright (c) 2024 SMC Corporation. Speed 100%	• • •	Simulation



4. Factory reset: Allows the user to reset the gripper to the factory settings if the current settings are uncertain. Tapping "APPLY" opens a window asking whether "Factory reset" is to perform. When "OK" is selected, the settings of the gripper and on the URCap will be reset to default. For the default values, refer to "7. List of setting items".

	PROGRAM <unnamed></unnamed>	New Open Save	
🔪 General	SMC Electric Vacuum Gripper		
> Safety	General Settings Pump Settings		
	Installation Settings		
	Please perform unit conversion before programming.		
SMC Electric	Select the display pressure unit. kPa 🔹	APPLY	
Vacuum Gri	🐨 Popup a message window and stop operation in error		
	Various status signal output to digital output port	🔘 Enable 🔿 Disable	
	Select digital output port to output success signal	digital_out[5] 🔻	
	 Select digital output port to output failure signal 	digital_out[6] 🔻	
	Select digital output port to output workpiece drop detection signal	digital_out[7] 🔻	
	Factory reset 4		
	Reset to factory defaults.	APPLY	
	Notes		
	By navigating to the General menu - Tool IO set the "Controlled by" to Gripper.	o SMC Electric Vacuum	
	Copyright (c) 2024 SMC Corporation. 🔗 SMC,		
Power off	Speed		Simulation

4.3. Pump Settings

Open "Pump Settings" from the "URCaps" menu in the "Installation" tab.

1. Default mode:

Allows the user to change the default gripper operation mode on the program and commissioning windows. Refer to operation manual of Electric vacuum gripper ZXPE5 for details of the operation modes.

- The gripper has three operation modes: "Automatic" (default), "Manual" and "Continuous".
- 2. Default pump settings:

Allows the user to change each of the parameter threshold values if "Manual" has been selected on the program or commissioning window. For the adjustable range of the threshold values, refer to "<u>7. List of setting items</u>".

- "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 default values of each parameter.

Run Program Installation		PRO INSTALL	GRAM <unnamed></unnamed> ATION default*	New Open	Save	I R+ 2	
🔪 General	SMC Electric Vacuum G	ripper					
> Safety	General Settings	Pump Settings					
Features Fieldbus URCaps SMC Electric	Default Mode Default gripper operation Default pump set	mode 1 tings 2		Automatic 🔻	•		
Vacuum Gri	Default settings when ma • P1: Threshold of press • H1: Energy-saving oper • P2: Pressure for grippin • H2: Hysteresis of press Notes	nual mode is selected in ure for energy-saving ope ation range ng success detection sure for gripping success	program node. eration : detection	-60.0 kPa 10.0 kPa -10.0 kPa 2.0 kPa			
	Initial value of parameters Copyright (c) 2024 SMC (:: P1=-60.0kPa, H1=10.C	кРа, Р2=-10.0кРа,	H2=2.0kPa			
Power off		Speed	100%		0	Simulati	on

5. Command settings

This product has two program commands: "GRIP" and "RELEASE".

5.1. GRIP command

From the "URCaps" menu in the "Program" tab, tap "SMC Electric Vacuum Gripper. Select "Grip" in "Select operation" to add "Grip: SMC Electric Vacuum Gripper" command to the "Robot Program".

 Settings: Allows the user to set the parameters for each command. Gripper operation mode: Shows the operation mode set according to "<u>4.3. Pump Settings</u>". The user can also change the mode here.

Grip error detection time: Sets the time to determine that gripping has failed. If, after the start of gripping, the vacuum pressure at which the gripping success signal is sent, is not reached within the set duration of time, the gripping failed signal is sent.

The time can be set between 500 to 5000 msec.

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): Shows the values set according "<u>4.3. Pump</u> <u>Settings</u>". The user can also change the values here.

- 2. Monitor sensor signal: Allows the user to check the status of the gripper and vacuum pressure.
 - Green: Gripping success
 - Red: Gripping failed, workpiece drop detection, or release failed
 - Grey: Idle

"-kPa" is shown when no wiring has been made.



5.2. RELEASE command

From the "URCaps" menu, tap "SMC Electric Vacuum Gripper". Select "RELEASE" in "Select operation" to add the "Release: SMC Electric Vacuum Gripper" command to the "Robot Program".

- 1. Settings: Allows the user to set the parameters for each command. Atmospheric release time: Sets the duration of time for a valve to release air to atmosphere. The time can be set between 200 to 5000 msec.
- 2. Monitor sensor signal: Same as the gripping motion.

		OGRAM <unnamed>* 😭 LIATION default* New</unnamed>	Oper Save	☞ ;; =
> Basic	Q	Command Graphics	Variables	
> Advanced	1 V Robot Program			
> Templates	2 - GRIP: SMC Electric Vacuum Gripper	SMC Electric Vac	uum Gripper	
✔ URCaps	3 RELEASE : SMC Electric Vacuum Grip	Coloct energian		
SMC Electric Vacuum Gri				
		Settings Atmospheric release time (20	0 to 5000ms) 1	2000 ms
) (
	2	Monitor cencor cign	<u>al</u>	
		Vacuum pressure: -64.1	вкра	
	< >	Copyright (c) 2023 SMC Corp	oration. 🏈 SMC.	
	▲ ♥ ♡ ♂ ₭ ₫ 箇 面 🚍			
	R Speed 🥌	100%		Simulation

5.3. Illustration of the gripper status while the program is running

5.3.1. Pressure monitor display

After the electric vacuum gripper is energized, the sub screen (left) of the pressure monitor shows 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 mode set by the last command will continue to be displayed.

Table 2. Gripper operation modes and r	pressure monitor	display
--	------------------	---------

······································					
Gripper operation mode	Automatic mode	Manual mode	Continuous mode		
Pressure monitor sub screen (left)	<u>, an</u> Jau <u>ko</u> s		JEopt 2		

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 take care when creating the program.

5.3.2. URCap display

The UR+ icon on the top right of the interface allows the user to check the status of the gripper while the program is running.

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 and operating normally.
 - offline (yellow): The gripper is not connected with the robot.
 - "Error message" (red): An alarm has occurred. Refer to "<u>8. Troubleshooting</u>" for details.



5.3.3. Electric vacuum gripper status and output signals

While the program is running, a signal according to the status of the gripper (success, failed or occurrence of an alarm) is sent, and the program continues or stops.

		Program	operation Note 2	
Gripper status	Output status signal Note 1	Popup message 🗹	Popup message 🗆	Note
Grip success	"success signal"	Continue	Continue	
Grip failed	"failure signal"	Pause and Popup a message appears	Continue	When "Stop program" is selected on popup, the program stops.When "Continue" is selected on popup, the program resumes from this command.Note 4
Work 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 appears	Continue	When "Stop program" is selected on popup, the program stops. When "Continue" is selected on popup, the program resumes from this command.
Alarm Note 3	-	Continue	Continue	The program can be stopped by using the "if" command.

Table 3	Status	einnal	outpute	and	program actions	
Table 5.	Sidius	Signai	oulpuls	anu	program actions	2

Note 1: The status signal output for each action is made to the port number set according to "<u>4.2. General settings</u>". Note 2: The gripper's operation differs depending on how settings are made in "<u>4.2. General settings</u>", such as a

popup window and program stop.

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 popup is displayed in case of operation failure as follows.

Warning_Controller	Warning_Controller
🗜 Can not grip.	Can not release.
Stop Program Continue	Stop Program Continue

6. Commissioning

The "UR+" icon on the top right of the interface can be used to check the manual operation of the gripper.

Tap GRIP or RELEASE to perform the gripper's grip or release operation and see status,

and vacuum pressure. Note that the status signals set according to "4.2. General settings" are not sent during commissioning.

- 1. Commissioning: Sets the gripper operation mode and threshold values of each parameter during commissioning.
- 2. Monitor sensor signal: Refer to "<u>5.3.2. URCap display</u>" display.

Basic	٩	Command G	0	SMC.
Advanced	1 V Robot Program	SMC Electric	SMC Electric Vacuum	Crinner
Templates	2 - GRIP: SMC Electric Vacuum Gripper		Commissioning 1	Gripper
URCaps	3 – RELEASE : SMC Electric Vacuum Grip	Select operati	Gripper operation mode:	Automatic 💌
SMC Electric Vacuum Gri			Grip error detection time:	2000 ms
		Settings	P1:	-60.0 kPa
		Gripper operation mo	H1:	10.0 kPa
		Grip error detection t	P2:	-10.0 kPa
•	0	·	H2:	2.0 kPa
			Atmospheric release time:	2000 ms
			GRIP	RELEASE
			Monitor sensor signa	1 2
		Monitor senso	Vacuum pressure: -64	.8kPa
		🔵 Vacuum Pressu	Gripper Status: 🔵 online	
	< >	Copyright (c) 2023 S		

7. List of setting items

Table 4. List of setting items

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

Table 5. Adjustable unit

Part No.	Adjustable 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 settable 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
LI1	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
Do	Factory default	-10.0	-0.010	-0.102	-0.100	-1.45	-3.0	-75
F2	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
110	Factory default	2.0	0.002	0.020	0.020	0.29	0.6	15
ΠZ	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

8.Troubleshooting

List of problems and countermeasures

Problem	Cause	Countermeasure		
Gripper Status goes offline.	Multiple plugin software is installed.	There may be interference from plugin software. Uninstall any plugin software other than this product.		
Initial gripping	High P2 set value (pressure at which grip is judged to have failed)	Set a suitable pressure for the workpiece and cup conditions.		
problem (During commissioning)	Unsuitable settings for gripper operation mode and set values.	Perform a test run with the actual workpiece to determine suitable settings. Continuous mode is recommended for breathable workpieces.		
Slow response	Cup shape	Response time differs by cup shape or piping condition. Check the appropriate suction error detection time in commissioning. Select a cup under conditions that allow suction within a maximum value of 5.0 sec.		
Workpiece is not Insufficiently short atmospheric released.		If the exposure time is short, the release may not be successful. Check the appropriate suction atmospheric release time in commissioning. Select piping conditions that allow release within a maximum value of 5.0 sec.		
The display units cannot be changed.	Incorrect model (no measurement unit change function is available)	Check the part number if it indicates that the product has the measurement unit selection function. If the model has only the SI unit, the unit cannot be changed (except for between kPa and MPa).		

Alarms

When an alarm occurs, the LED lamp on the gripper and the toolbar on the teaching pendant inform you. (Refer to 5.3.2. URCap display.)

Table 7. List of alarms

Alarm	Product status	Message	Countermeasure
Temporary pressure monitor error	LED: flashes red Pressure monitor: shows "HHH" or "LLL"	Pressure monitor recoverable fault	A pressure outside of the upper or lower limit of the pressure monitor display has been applied. Adjust the pressure to fall within the display range.
Internal part overcurrent error	LED: flashes red	Over current error ""	The load current on an internal part exceeds the maximum value. Turn the power off and check that the wiring is correct. After ensuring the wiring is correct, power on again. Check the operating environment if strong magnetic field has been generated.
Communication error	LED: flashes red	Pressure monitor communication error	
Pressure monitor internal error	LED: flashes red Pressure monitor: shows an error code (Er 0/4/6/7/8/9)	Pressure monitor internal error	An internal error has occurred. Turn the power off and on again.
System error	LED: flashes red	System error	

If the error cannot be reset after the above measures are taken, or errors other than above are displayed, please contact SMC.

Revision history

SMC Corporation

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

Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer. © SMC Corporation All Rights Reserved

