



User Manuals

ACU

Version 1.5.2

苏州柔触机器人科技有限公司

Suzhou Rochu Robotics Co., Ltd



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Perface

Thank you for choosing rochu soft gripper control unit which developed by Suzhou Rochu Robotics.



ACU
Rochu Active Control Unit

Rochu control unit is the special controller for rochu soft gripper. It integrates everything of controlling the rochu soft gripper, and uses an open source control mode which can communicate with any manipulator. User can easily and efficiently control the rochu soft gripper by writing the program of the manipulator.

What's In the Box

When you book a complete set of rochu soft gripper, you will receive two boxes. One with a rochu soft gripper, one with the following:

- rochu control unit
- remote control
- power adapter
- signal communication cable
- fittings
- certificate

- handbook

Important Safety Instructions

Rochu control unit is the important and unique accessory to complete the specified action and ensure the lifetime of rochu soft gripper. Therefore, every time when install rochu soft gripper and control unit, user must strictly execute the safety instructions in Chapter II and III.

Where Can Find More Information

Our company website (www.rorobot.cc) has an electronic version of this handbook, and the following information is provided:

- all models of rochu soft gripper
- all models of rochu control unit
- catalogue
- case video
- the latest news of Rochu
- contact and address



I Selection Instructions

Rochu Control Unit Selection Rules

● Type

Mark	Content
P	Passive
A	Active
iP	Integrated Passive

● Functional Characteristics

Mark	Content	Type		
		P	A	iP
M	Mobile, built in air pump and lithium battery		●	
S	Standard, adjustable speed for grabbing and opening of the gripper	●		●
H	High-speed, driving efficiency of the gripper is 170% of the standard type	●		●
L	Light, small size, light weight, two-way opening and closing		●	●

[NOTE] All types of control units except L series have feedback function and wireless remote control function.

● Leak Alarm

Mark	Content	Functional Characteristics			
		M	S	H	L
N	Null		●	●	
L	Valid		●	●	

[NOTE] Gripper leakage and leakage alarm input and output function.

● Air Pressure Regulation Mode

Mark	Content	Functional Characteristics			
		M	S	H	L
N	Constant air pressure	●			
M	Manual air pressure regulation	●	●	●	●
V	Electronic air pressure regulation, input signal 0-10V	●	●	●	
A	Electronic air pressure regulation, input signal 4-20mA	●	●	●	

Rochu Control Unit Common Model Functions and Parameters

Control Unit		Function														Postive Pressure Flow [L/min]	Negative Pressure Flow [L/min]
Model	Package Shell	Intergration	Grabbing Postive Pressure	Opening Negative Pressure	Manual Regulation	Electronic Regulation	Wireless Remote Control	Posture Feedback	Speed Regulation	High Speed Vacuum	Leak Alarm	Working Mode	Postive Pressure Flow [L/min]	Negative Pressure Flow [L/min]			
Standard Model ^[NOTE2]	ACU-MMN	●	●	●	●		●	●				C ^[NOTE1]	8	8			
	ACU-LNN	●		●								C	2	2			
	PCU-SMN	●		●	●	●	●	●	●			C	140	25			
	iPCU-SMN		●	●	●	●	●	●				C	200	45			
Non-standard Model ^[NOTE3]	ACU-LMN		●	●	●	●	●	●				C	100	25			
	ACU-MVN	●		●	●		●	●				C	8	8			
	PCU-HMN	●		●	●	●	●	●		●		C	200	40			
	PCU-SML	●		●	●	●	●	●			●	C	120	25			
	PCU-HML	●		●	●	●	●	●		●	●	C	160	55			
	PCU-SVN	●		●	●		●	●				C	140	25			
	PCU-HVN	●		●	●		●	●		●		C	200	65			
	PCU-SVL	●		●	●		●	●			●	C	130	35			
	PCU-HVL	●		●	●		●	●		●	●	C	160	55			
	iPCU-HMN		●	●	●	●		●	●			C	210	70			
	iPCU-SVN		●	●	●		●	●	●			C	230	50			
	iPCU-HVN		●	●	●		●	●	●		●	C	140	70			

[NOTE1] C-Continuous mode: Control unit continuous to drive the Rochu Soft Gripper during receiving the control signal.

[NOTE2] Standard model: Standing stock.

[NOTE3] Non-standard model: Please consult local dealer for the delivery date.

II Using Guidelines

After you get the Rochu products, please follow the following general steps to install and use, each series of drives slightly different, please pay attention to the step description.

Confirm Application Environment

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- Application environment: avoid a lot of dust, oil pollution and corrosion.
- Control terminal: I/O mode, output port 2, input port 2.
Modbus mode, TCP port or RTU-485 serial port.
(Input port is used to receive drive feedback signal, which can be replaced by time delay)

Installation Circuit

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1. ACU has built-in lithium batteries. Users can press the start button and directly power on.
2. In the continuous use environment, the 25.2V charging adapter in the fittings can be used to connect to the control unit's power outlet, and power the control unit.
3. Check whether the central value of the digital meters on the operation panel is zero. If not, please check zero. Refer to Chapter V.

Installation Gas Circuit

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1. Please using 6mm pipe to connect the rochu soft gripper to the air input of PCU.

Basic Function Debugging

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1. Use the wireless remote control in fittings to verify the function of the control unit. The upper key control gripper positive pressure posture, the middle key control gripper relaxation posture, and the lower key control gripper negative pressure posture. Because the control unit has the function of keeping the gripper posture, the gripper can not be restored to the relaxation posture immediately.
The Rochu beak products are in opposite positive and negative pressure States, that is, the upper key is pressed and the Rochu beak is open, the medium key is pressed and the soft beak is relaxed, and the lower key is negative.
Rochu soft finger series products, positive pressure for grabbing posture, negative pressure for opening posture.
Rochu soft beak series products, positive pressure for opening posture, negative pressure for grabbing posture.
Check whether the opening and grabbing function of the gripper is normal.
2. After pressing the upper key on the remote controller, by adjusting grabbing force regulator on the operation panel of the control unit, users can real-time adjust the pressure of the gripper positive pressure posture. The pressure value is displayed on the output pressure digital display meter.
The grabbing force regulator of ACU-MVN requires external input analog signals. Please refer to Chapter IV.
Press the lower button of the remote control and the negative pressure posture can not be adjusted.

Application Debugging

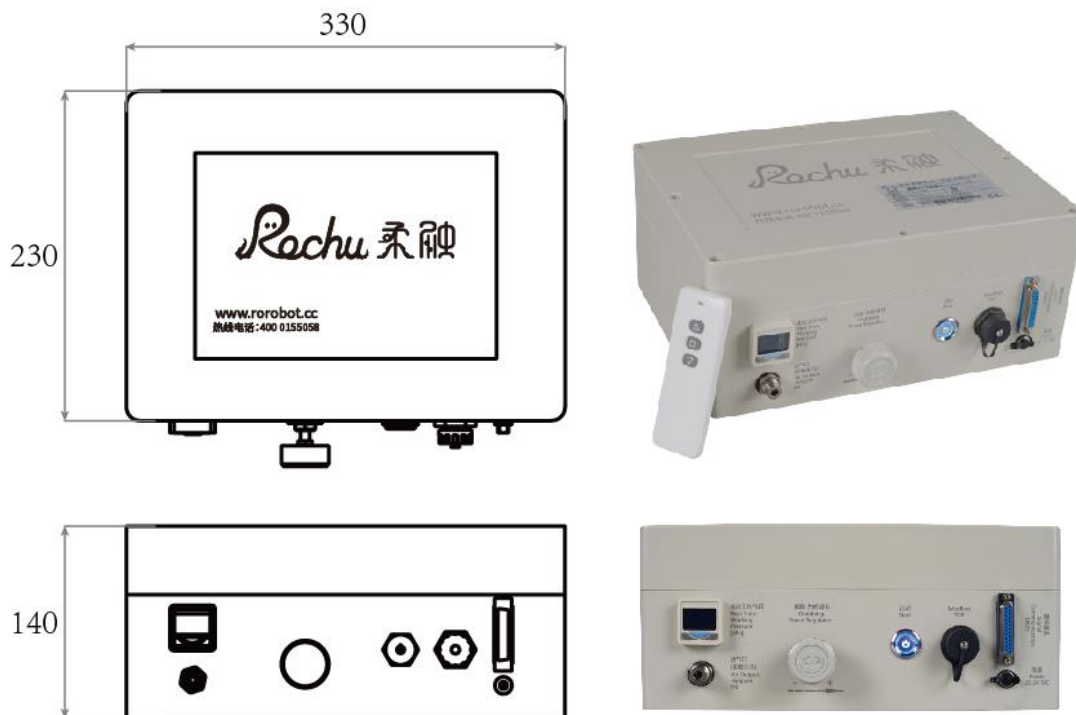
ACU

1. Familiar with the functions of each part of the control unit's operation panel, please refer to the contents of chapter III.
2. Confirm the type of signal communication and connect the application terminal device with the signal communication cables in the fittings. Refer to Chapter IV for detailed wiring.
3. To confirm the application conditions, debug feedback, MODBUS, modify the threshold, set parameters and other operations, please refer to the contents of Chapter V.

III Parameters and Functions

Before using the rochu products, please be aware of the type of the rochu control unit you purchased, and check the safety instructions that should be paid attention to according to the model.

ACU-Rochu Active Control Unit

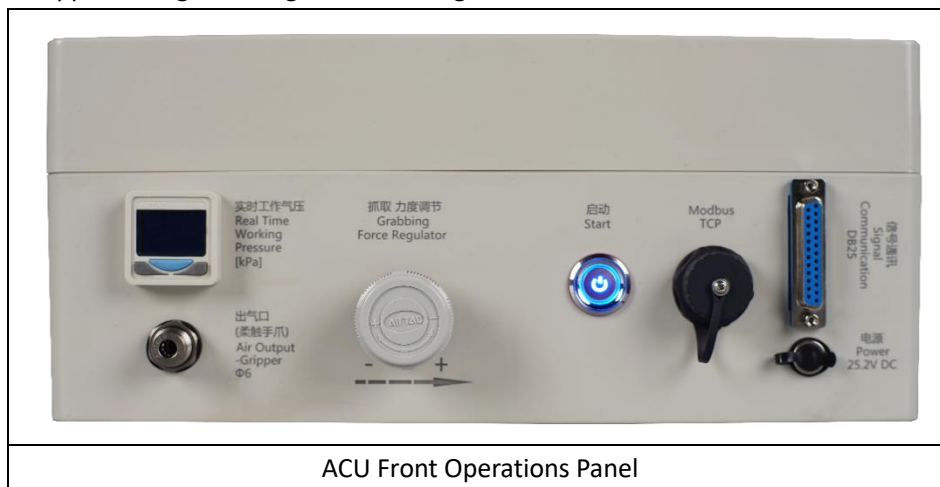


ACU Parameters:

Parameter	Range
Fuselage Shell	ABS waterproof plastic
Rated Voltage	24VDC±10%
Rated Current	2000mA
Charge Voltage	25.2VDC
Output Air Pressure	-70~120kPa
Control Mode	a. Wireless remote control, 315M RF b. Signal cable, I/O, 12~24VDC level signal Modbus, TCP/RTU-485
Feedback Mode	Signal cable, I/O, switch signal

Modbus, TCP/RTU-485	
Work Mode	Continuous mode ^{Note1}
Cooling Mode	Natural cooling
Application Environment	Avoid a lot of dust, oil and corrosion
Net Weight[kg]	4.7
Size[mm]	330*230*140
Protection Grade	IP53

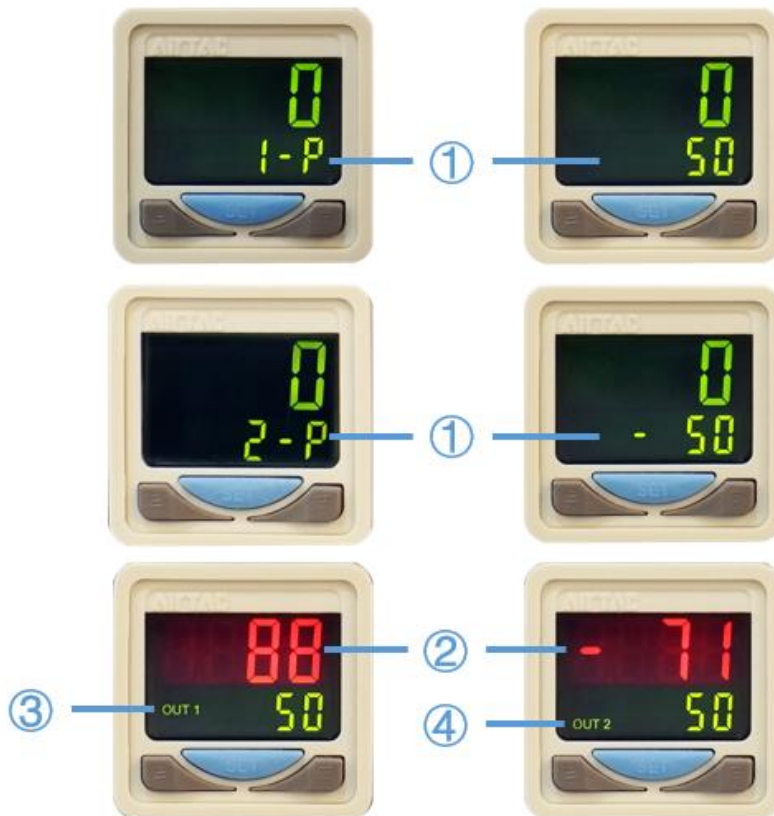
【Note1】 Continuous mode: Control unit continuous to drive the Rochu Soft Gripper during receiving the control signal.



ACU Front Operations Panel

ACU operating panel instruction :

- **Start**
Self-locking button.
Used to start the control unit and the blue light is on. If the indicator light is not on, please use the charging adapter in the fittings to connect to the power interface for charging.
- **Air output**
6mm diameter quick insertion interface.
Check the tightness to ensure no air leakage.
- **Output Air Pressure**
After the air path is properly installed, the digital display meter real-time displays the air pressure value of the 'Air output' of the rochu control unit. Please confirm that the digital display is shown below. *(the default unit is kPa, 1 MPa = 1000 kPa).*



- Among them, ① is the threshold of the rochu soft gripper's two postures. [1-P] for the grabbing posture feedback threshold, default 50, [2-P] for the opening posture feedback threshold, default -50. The 2 thresholds can be displayed and switched by the middle 'SET' button.
- ② is the real-time air pressure value of the air output of the rochu control unit, that is, the working air pressure of the rochu soft gripper. When the working air pressure exceeds the feedback threshold, the value turns red. The working air pressure value refers to the recommended pressure value given by the engineer according to the model, quantity and operating conditions of the rochu soft gripper you use.
- ③ is grabbing posture feedback signal display. No display in standby state, and signal 'OUT 1' display in grabbing posture working state.
- ④ is opening posture feedback signal display. No display in standby state, and signal 'OUT 2' display in opening posture working state.

In addition, the ACU has built-in safety air pressure limit, the maximum air pressure is 120 +10kPa, that is, the positive pressure of the rochu soft gripper must be controlled below 130kPa, otherwise the control unit will stop working.

If the positive pressure is too high due to misoperation and the control unit stops working, the normal working state can be restored as long as the positive pressure is adjusted back to the safe range.

Please refer to the contents of Chapter V for the parameters adjustment of the air pressure display meter.

- **Gripping Force Regulator**

ACU-MMN: After the correct installation of the air path, the positive pressure of the 'Air Output' can be adjusted, that is, the working pressure of the positive pressure posture of the rochu soft gripper.

In the positive pressure posture of the rochu soft gripper, it is real-time displayed by the 'Output Air Pressure' digital display meter. This function can adjust the positive pressure posture of the rochu soft gripper.

If the value exceeds the set safety air pressure threshold, the control unit stops working and can resume work after lowering the air pressure.

ACU-MVN: The positive pressure posture adjustment of the electronic pressure regulating control unit is controlled by the external analog voltage signal. Please refer to the content in Chapter IV.

- **Modbus TCP**

TCP network interface.

Modbus protocol communication Address, please refer to Chapter IV.

There is also a Modbus RTU mode based on RS-485 interface in the signal communication cable.

- **Signal Communication**

DB25 serial port.

I/O Control, please refer to Chapter IV.

- **Power**

5.5X2.1mm interface.

Charge the control unit with built-in lithium batteries by using the charging adapter in the fittings.

- Users can use the remote control to check the above functions.

If the control is not sensitive, please focus on the control unit for remote control.

At the same time, check the remote control key indicator light, if the signal light is weak, please replace the battery.

IV Signal Communication Instructions

Before accessing the signal cable, please check the model of input and output signals of the manipulator or other control end that you are using.
For detailed cable connection, please refer to the following.

Signal communication cable instructions

Serial Number	Color	Instruction	Function	serial port number
1	yellow + orange	level input A+	control grabbing posture	1
2	yellow + red	level input A-		14
3	yellow	level input B+	control opening posture	2
4	green	level input B-		15
5	grey	level input C+	release leak alarm.	3
6	white	level input C-		16
7	blue	level input D+	input reserved port	4
8	purple	level input D-		17
9	yellow + brown	switch output A	grabbing posture feedback	5
10	yellow + black	switch output A		18
11	turquoise	switch output B	opening posture feedback	6
12	cyan	switch output B		19
13	red	switch output C	leak alarm output	7
14	orange	switch output C		20
15	black	switch output D	output reserved port	8
16	brown	switch output D		21
17	white + red	RS485-A	Modbus RTU	9
18	white + brown	RS485-B		22
19	white + purple	analog output A+	analog input port	10
20	white + grey	analog input A+	analog output port	23
21	white + orange	analog output B+	analog input reserved port	11
22	grey + black	analog input B+	analog output reserved port	24
23	light purple	analog common port M-	analog common negative port	12
24	white + blue	power for		25



		signal conversion P+	power port for signal conversion (spare)	
25	white + green	power for signal conversion P-		13

[NOTE] The line order is based on the number and the color is used as a reference.

Control Section

- The output signal of the mechanical arm or other control end is **24V PNP** signal.
Assuming that the digital port for controlling the positive pressure grabbing posture of the rochu soft gripper is DO1 and the digital port for the negative pressure opening posture is DO2, then DO1 is connected to Line 1, DO2 is connected to Line 3, and Lines 2 and 4 are connected together to common 0V port.
- The output signal of the mechanical arm or other control end is **24V NPN** signal.
Assuming that the digital port for controlling the positive pressure grabbing posture of the rochu soft gripper is DO1 and the digital port for the negative pressure opening posture is DO2, then DO1 is connected to Line 2, DO2 is connected to Line 4, and Lines 1 and 3 are connected together to common 24V port.

Feedback Section

- The input signal of the mechanical arm or other control end is **PNP** signal.
Assuming that the digital port for receiving the positive pressure grabbing posture feedback of the rochu soft gripper is DI1 and the digital port for the negative pressure opening posture feedback is DI2, then DI1 is connected to Line 9, DI2 is connected to Line 11, and Lines 10 and 12 are connected together to common 24V port.
- The input signal of the mechanical arm or other control end is **NPN** signal.
Assuming that the digital port for receiving the positive pressure grabbing posture feedback of the rochu soft gripper is DI1 and the digital port for the negative pressure opening posture feedback is DI2, then DI1 is connected to Line 9, DI2 is connected to Line 11, and Lines 10 and 12 are connected together to common 0V port.

Electronic Pressure Regulation Section

- The analog output signal of the mechanical arm or other control end is **0-10V voltage** signal.

Assuming that the analog output port for controlling the grabbing force of the rochu soft gripper is AO1, AO1 is connected to Line 19 and 0V is connected to Line 23.

Analog 0-10V signal corresponds to pressure regulation range 0.0 - 0.5 MPa

$$\text{Then, } \frac{0.5-0.0}{10} = 0.05 \text{ MPa/V}$$

That is, 1V voltage signal corresponds to 0.05 MPa = 50 kPa

The analog voltage adjustment range corresponding to the working pressure range of the Rochu soft gripper 0-120 kPa is 0 - 2.4 V.

- The analog output signal of the mechanical arm or other control end is **4-20mA current** signal.

Assuming that the analog output port for controlling the grabbing force of the rochu soft gripper is AO1, AO1 is connected to Line 19 and 0V is connected to Line 23.

Analog 4-20mA signal corresponds to pressure regulation range 0.0 - 0.5 MPa

$$\text{Then, } \frac{0.5-0.0}{16} = 0.03125 \text{ MPa/mA}$$

That is, 1mA current signal corresponds to 0.03125 MPa = 31.25 kPa

The analog current adjustment range corresponding to the working pressure range of the Rochu soft gripper 0-120 kPa is 4 - 8.1 mA.

Modbus Communication Address Section

- Modbus RTU

The default slave address is: 1.

The address is allocated by physical dialing of the control unit's internal control board.

- Modbus TCP

IP: 192.168.1.200

Port number: 502

The address is allocated by the control unit's internal Ethernet module configuration.

- Modbus functional address

Serial	Function	Function Code	Address	Default	Parameter Description
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Number		Write	Read	Hexadecimal	Decimal	Value	
1	control positive pressure posture	0x05	0x01	0x0100	256		
2	control negative pressure posture	0x05	0x01	0x0101	257		
3	remove leak alarm	0x05	0x01	0x0102	258		
4	positive pressure feedback	/	0x02	0x0200	512		
5	negative pressure feedback	/	0x02	0x0201	513		
6	leakage alarm status	/	0x02	0x0202	514		
7	leakage alarm mode	0x06	0x03	0x0300	768	2	1: parametric mode 2: automatic mode
8	mode 1 feedback timeout	0x06	0x03	0x0301	769	1000	set range:0-9999ms
9	mode 1 detection delay time	0x06	0x03	0x0302	770	500	set range:0-9999ms
10	mode 1 detection duration	0x06	0x03	0x0303	771	500	set range:0-9999ms
11	mode 1 alarm threshold	0x06	0x03	0x0304	772	3000	set range:0-9999ms
12	mode2 alarm flow coefficient	0x06	0x03	0x0305	773	120	set range:100%-9999%
13	mode 2 alarm number	0x06	0x03	0x0306	774	4	set range:1-9999
14	positive pressure value of electronic pressure regulator	0x06	0x03	0x0307	775	0	set range:0-9999mV

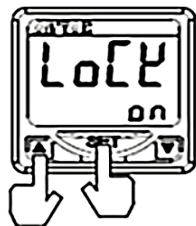
- Modbus networking configuration
If need more than one control unit, please contact our engineer and assign the address in advance.
The maximum number of control units in Modbus RTU mode is 16.

V Debugging Istructions

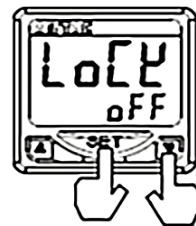
If you need to modify the parameters of the safety pressure limit, feedback function, and leakage alarm function, please refer to the following operation.


Unlock and Lock

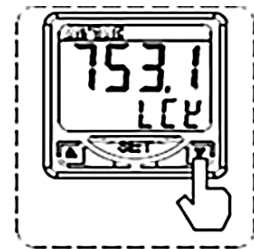
In measurement mode, press  + set key. When the set value column shows ON, the key locked.




press up and down key at the same time  + Set key



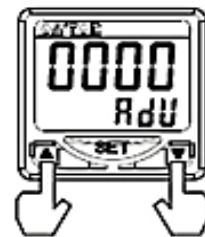
press up and down key at the same time  + Set key





In measurement mode, press  + set key. When the set value column shows OFF, the key unlocked. When the key locked, the set value column shows the set value. In this state, LCK will appear when any key is pressed.

Zero Calibration

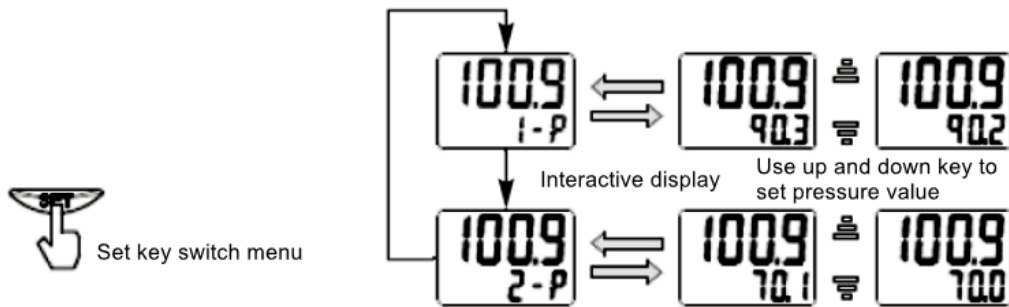
In measurement mode, press up and down key at the same time. The picture on the right is zero operation. Releasing the key means completion of zero operation.



press up and down key at the same time  

Modify Threshold

Easy mode air pressure value setting interface



- Reset the gripper posture feedback threshold

ACU: The default setting is easy mode. [1-P] is 50, [2-P] is -50.

To reset, it need to adjust the output pressure digital display meter. Modify the positive pressure posture feedback threshold under the [1-P] parameter, and modify the negative pressure posture feedback threshold under the [2-P] parameter.

If you need to modify the other advanced functions of the digital display meter, please contact our technician.