

Delto Gripper - 3F

User Manual

English

Ver. 1.6.2



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INFORMATION

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Notice of revision

The contents of this document are subject to change for technical improvement.

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Chapter 1 General Information

1.1 User Manual Information

- This document provides information for the safe and proper use of Delto Gripper-3F.
- This document must be accessible to the user at all times as it contains integrated information, including safety guidelines for safe operation of Delto Gripper-3F.
- Images are used in this document to help the user understand the design of parts that are different from the actual product and complicated parts.
- This also applies to the guidelines contained in the documents listed in Section 1.1.2.

1.1.1. Danger and warning signs

- The following signs and labels are used for safety warnings.



Danger!

Be careful about human casualties!

Danger of death when safety precautions are not followed



Warning!

Be careful about injuries!

Danger of death and serious injuries when safety precautions are not followed



Caution!

Be careful about injuries!

Danger of injuries when safety precautions are not followed



Caution!

Be careful about component damage!

Component damage warning

1.1.2. Documents provided by TESOLLO

- TESOLLO product catalog data sheet
- 3D modeling & 2D drawing
- User Manual for the product
- Other product-related information

* These documents can be downloaded from www.tesollo.com.

1.2. Target Model for this Document

- Delto Gripper-3F

1.3. Warranty

- One-year warranty is provided from the delivery date of the gripper, if it is used for its intended purposes while complying with the following regulations.
 - A. Compliance with the operating limits
 - B. Compliance with operating environment and working conditions
[See 3.1. Delto Gripper-3F Basic Information]
- Components in contact with target objects and worn-out components are excluded from the warranty.

1.4. Products Provided

- The products provided include the following.
 - A. Delto Gripper series
 - B. User manual
 - C. Package of components

1.5. Additional Devices

- Additional devices for Delto Gripper-3F operation are as follows, and some of them are available for purchase independently.
 - A. EtherNET communication cable
 - B. USB to RS485 converter
 - C. 24 V power supply
(supply of 5 A or higher is required)
- See product catalog datasheet for information on the additional devices.

Chapter 2 Basic Safety Precautions

2.1. Applications for Delto Gripper-3F

- Delto Gripper-3F is developed to hold or fix a target object. Its specific applications are as follows.

A. Pick and Place

D. Assembly

B. Bin Picking

E. Fastening

C. Machine Tending

F. A service robot that mixes various tasks

- Delto Gripper-3F can be used only for the performances listed in the technical information.
- Delto Gripper-3F can be linked with all collaborative robots.
- Delto Gripper-3F is produced for industrial, service, and research purposes.
- Guidelines for proper use of Delto Gripper-3F are included in this document.

2.2 Improper Application of Delto Gripper-3F

- The use of Delto Gripper-3F beyond its performance limit is regarded as improper use.
[See 3.1. Delto Gripper-3F Basic Information]

2.3. Structural Modification

When structural modifications are attempted

- Converting, changing or reworking equipment components, such as additional threads, holes, and safety devices, may cause product failure or damage.
- Structural modifications must be approved by TESOLLO in advance.

2.4. Replacement Parts

When unauthentic replacement parts are used

- The use of unauthentic replacement parts may cause human casualties or equipment failure during work. Therefore, only genuine and authentic replacement parts approved by TESOLLO must be used.

2.5. Operating Environment and Working Conditions

Operating environment and working conditions requirements

- Improper operating environment or working conditions may cause problems with equipment safety, leading to serious injuries to the user or serious defects in the equipment, such as a reduction in the service life.
- Therefore, the suitable environment described in **3.1. Delto Gripper-3F Basic Information** must be maintained.

2.6. Recommended User Qualification

Unqualified users

- Unqualified users may cause serious injuries to themselves or damage to the equipment. Therefore, the following regulations must be followed.
 - A. All tasks must be performed by verified users
 - B. Users must familiarize themselves with the assembly of the equipment and study the user manual before they use the equipment.
 - C. They must comply with domestic and general safety regulations.

Recommended users

- Users with extensive experience and knowledge through technical training can perform machine or system-related tasks. They should have the ability to perceive and prevent risks in advance based on guidelines and safety regulations.

2.7. Wearing Protective Gear

Wearing personal protective gear

- Wearing personal protective gear can protect users by shielding them from harmful environments and preventing harms of the accidents.
 - A. Be aware of regulations for safety and accident prevention and wear protective gear recommended for the work environment.
 - B. Wear goggles, safety suit, and helmets when around moving machinery and environment exposed to toxic chemicals.
 - C. Wear protective gloves while working with sharp objects.
 - D. Wear heat-resistant gloves while working with hot objects.

2.8. Cautions for Safe Use of Equipment

Improper use by the user

- Improper adjustment or assembly may degrade the safety of equipment and cause serious injuries and equipment damage depending on the severity. Thus, the listed guidelines must be complied with.
 - A. Completely block the sources of interferences with work.
 - B. Use equipment for its original purpose.
 - C. Comply with safety precautions and assembly regulations.
 - D. Avoid being exposed to environment with corrosive materials
 - E. Comply with regulations for equipment management and maintenance
 - F. Comply with regulations for safety, accident prevention, and environmental protection according to the equipment operation environment.

2.9. Cautions During Operation

Cautions during equipment operation

- Improper handling of equipment during operation may damage product safety and cause serious injuries or product damage.
- When the object held by equipment falls or equipment parts are abnormally released, serious injuries or equipment damage can be caused.
- Therefore, it is necessary to identify and specify dangerous zones in safe ways.
- Entry into the dangerous areas during equipment operation must be prohibited.

2.10. Cautions in Case of Equipment Failure

- After removing the equipment from the work line, report the failure to the department or person in charge.
- Perform the maintenance and repair of the equipment through TESOLLO.
- Do not use the equipment until the maintenance is completed.

2.11. Cautions During Disposal

Disposal

- Improper disposal of equipment components can cause serious injuries to the user or equipment defects depending on the degree of harm to parts or environment
- Disposal must be performed properly by complying with local regulations or through decomposition and recycling of equipment components.

2.12. Cautions for Safety at Work

- Follow the recommended safety distance.
- Do not deactivate safety devices.
- Identify dangerous areas and wear protective gear before work.
- Perform equipment installation, modification, maintenance, and calibration in power off mode.
- Do not approach the equipment when the power supply is switched on.
- Do not enter the equipment workspace.
- Ensure that the emergency off (EMO) button is accessible at all times.

2.12.1. Cautions while handling the equipment

Improper handling

- Improper handling causes defects in equipment safety and may lead to serious injuries to the user or component defects.
 - A. All tasks must be performed by qualified users.
 - B. The equipment and user must be protected from dangerous work.
 - C. Relevant regulations to prevent accidents must be followed.
 - D. Precautions for moving machinery and collision prevention and the use of appropriate transport equipment are required.

Recommended user

- Work on objects with excessive loads may lead to serious injuries or death.
 - A. Install work zone fences and prohibit entry of persons.
 - B. Do not work in the absence of the manager.
 - C. Do not leave the object held in the equipment unattended.

2.12.2. Cautions for dangerous operation

Abnormal operation

- Equipment malfunctions may cause serious injuries to the user. Malfunctions mainly occur in the following situations and emergency power off is required.
 - A. The power supply is terminated, but the equipment is reactivated by residual power.
 - B. The equipment is operated by an improperly connected drive.
 - C. Operational mistakes, wrong parameters, and software errors occur.

2.12.3. Cautions against electric shock

When electronic equipment is in operation

- The following items must be followed because parts in contact with electric current may lead to fatal electric shocks in severe cases.
 - A. Work with electronic equipment must be performed by qualified electrical and mechanical technicians.
 - B. Electrical wires must be connected or disconnected only in power-off state and safety is secured.
 - C. Check the equipment cover and protective devices. Do not touch active parts.
 - D. Do not touch equipment terminals in power-on state.

Cautions against static electricity

- Equipment parts or connected elements may cause static electricity. Touching static charges may cause a shock and injury.
 - A. The equipment manager must check whether these elements comply with safety regulations.
 - B. They must be tested by an electrical technician in the same environment as the actual work conditions.
 - C. Safety must be ensured through regular inspections.

2.12.4. Cautions for magnetic and electromagnetic fields

During work in magnetic and electromagnetic fields

- Work in magnetic and electromagnetic fields may cause serious injuries.
 - A. Persons with metal implants or hearing aids should not enter the zones without the consent of a doctor.
 - B. Do not use high-frequency or wireless devices near the zones.
 - C. Control systems and drive systems are operated at different intervals
 - D. In the presence of high risk in the work zone, the EMC test for environmental verification is required.

2.13. Other Danger and Warning Items



Danger!

Electric shock danger during wiring work!

- ☐ Touching parts with electric current can prove fatal
- A. Check the termination of the power supply before assembly, adjustment, and maintenance of the equipment.
- B. Only verified electrical technicians may install electrical equipment or perform electrical work.
- C. Check electric current safety when the power is completely turned off.
- D. No entry or contact for anyone except operators.



Danger!

Risk of serious injuries by the fall of the object held by the equipment

- ☐ The fall of the object can lead to serious injuries or death.
- A. Do not exceed the maximum grasping capacity of the equipment and do not enter its work zone.
- B. No work in the absence of the manager.
- C. Do not leave the object held by the equipment unattended.
- D. Wear protective gear.



Warning!

Risk of injuries due to equipment malfunctions

- ☐ The malfunctions caused by residual power, software errors, and component defects may cause serious injuries.
- A. After turning off the power supply to the equipment, check residual power before working on it.



Warning!

Risk of injuries due to falling and released objects

- ☐ Falling or released objects may lead to serious injuries or death.
- A. Identify and manage dangerous areas properly.



Warning!

Risk of injuries and equipment damage due to collision accidents

- ☐ The fingers of the gripper may get destroyed or disassembled, leading to serious injuries.
- A. Wear protective gear
- B. Do not enter the work zone of the equipment.



Warning!

Falling object due to lack of energy supply

- ☐ Decreased gripper force caused by poor energy supply from the power supply
- ☐ Decreased gripper force can lead to unexpected falling of gripped objects.
- A. Identify and manage dangerous areas properly.

Chapter 3 Technical Information

3.1. Delto Gripper-3F Basic Information

No.	Content	Delto Gripper-3F
-----	---------	------------------

Machine drive information

1	Weight per finger [g]	210
2	Total weight [g]	1000
3	Gripper maximum grasping capacity (Pinching) [kg]	2.5
4	Gripper g maximum rasping capacity (Envelop) [kg]	10
5	Delto Gripper-3F degree of freedom (finger degree of freedom)	12(4)

Electricity drive information

1	Motor type	DC Motor
2	Rated voltage [V]	24
3	Current consumption [A]	0.3 ~ 10
4	No load speed of each joint [rpm]	65
5	Rated torque of each joint [kg-cm]	6.5
6	Absolute encoder resolution [bit, deg]	12, 0.1

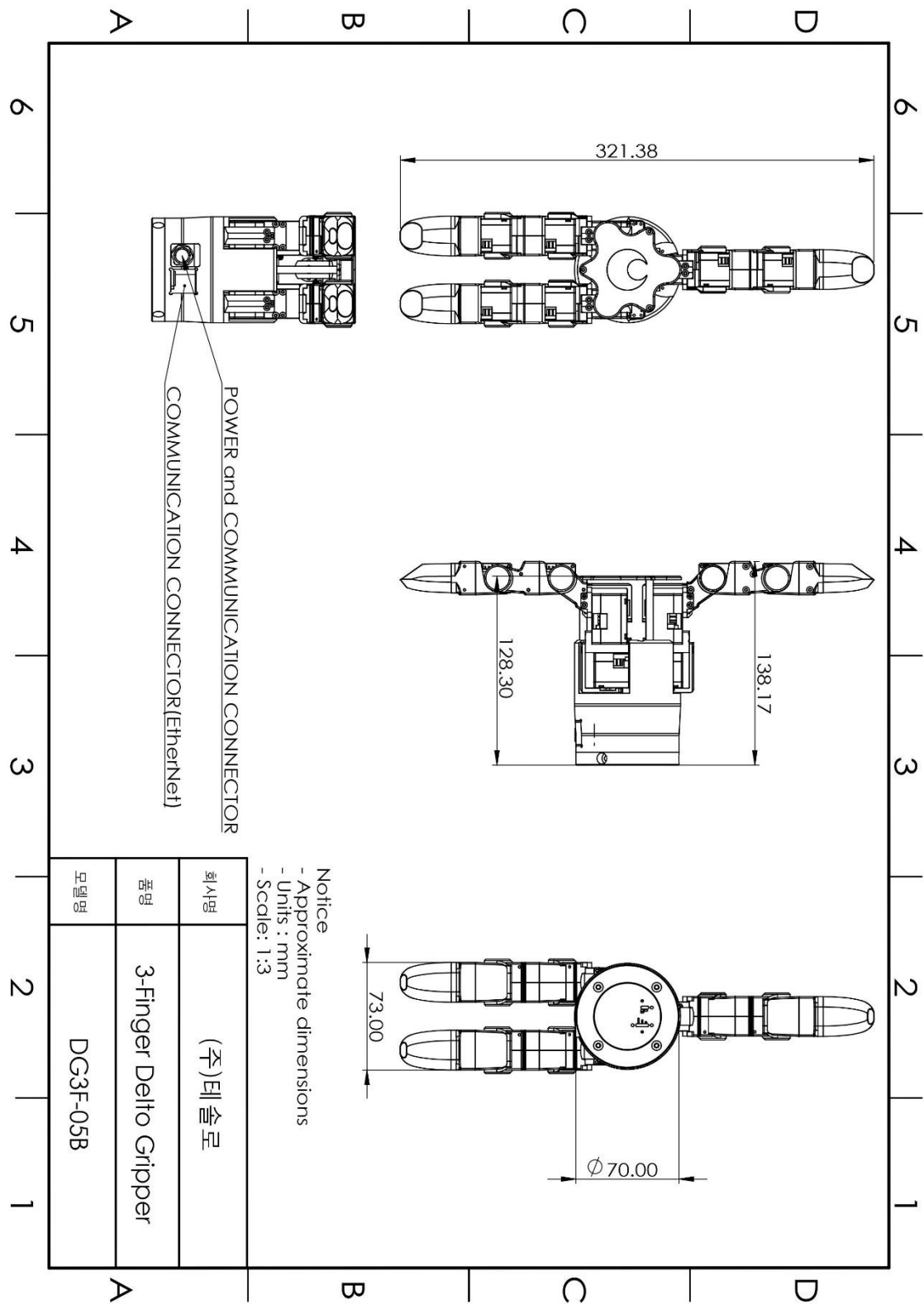
Communication

1	Communication method	EtherNET RS485 I/O
2	Control period [Hz] *May differ depending on the control environment	400

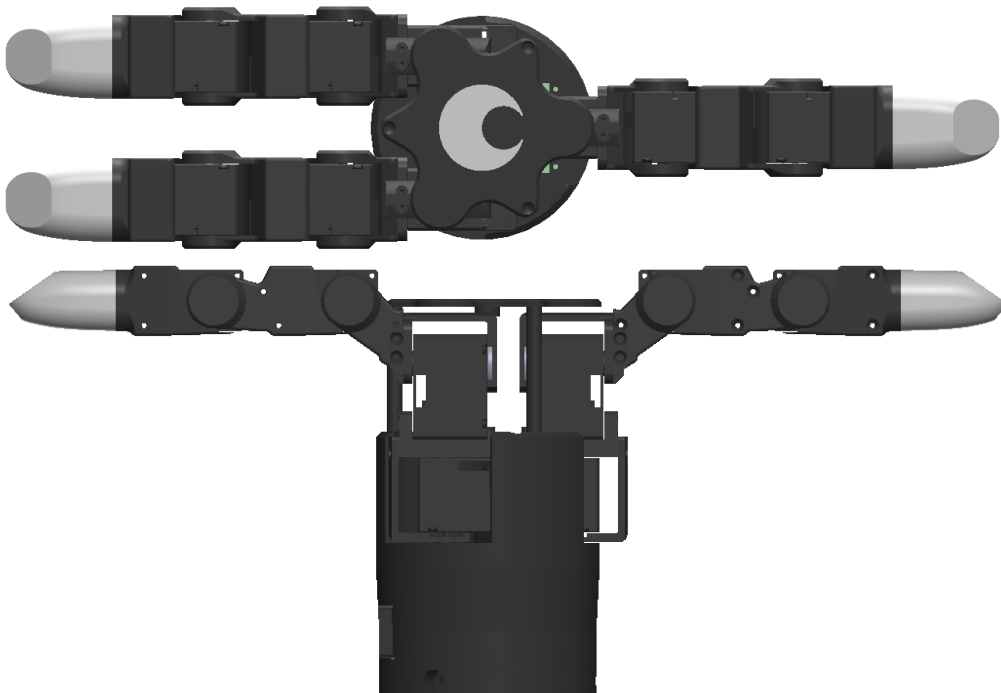
Others

1	Warranty period [months]	12
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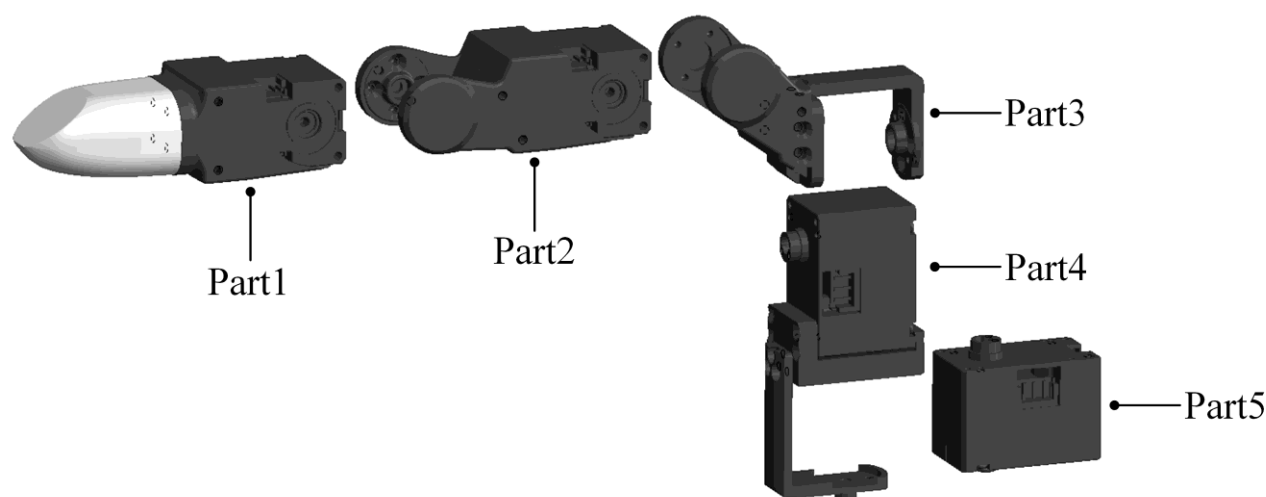
3.1.1. Delto Gripper-3F dimensions



● **Delto Gripper-3F Zero Position**



3.1.2. Weight for each joint link

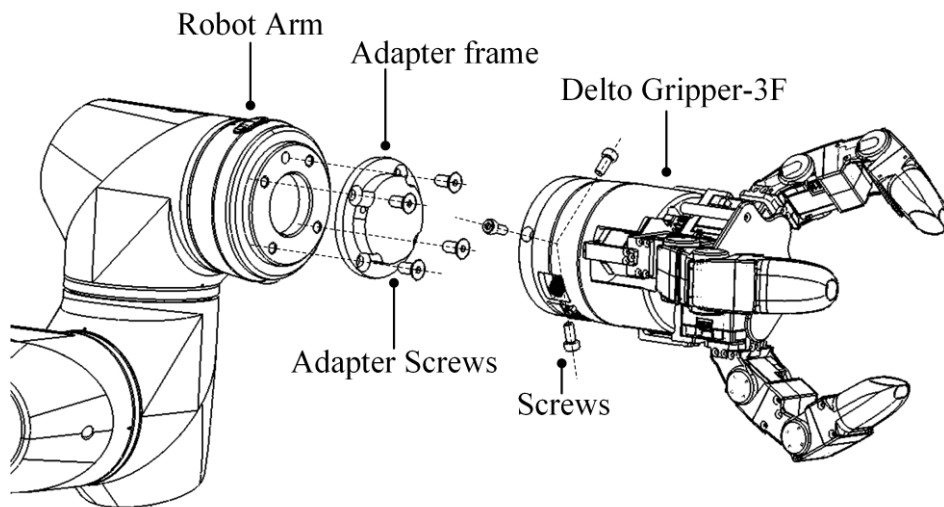


No.	1	2	3	4	Per finger	Fixed frame	Total
Weight	73 g	51 g	25 g	61 g	210 g	370 g	1000 g

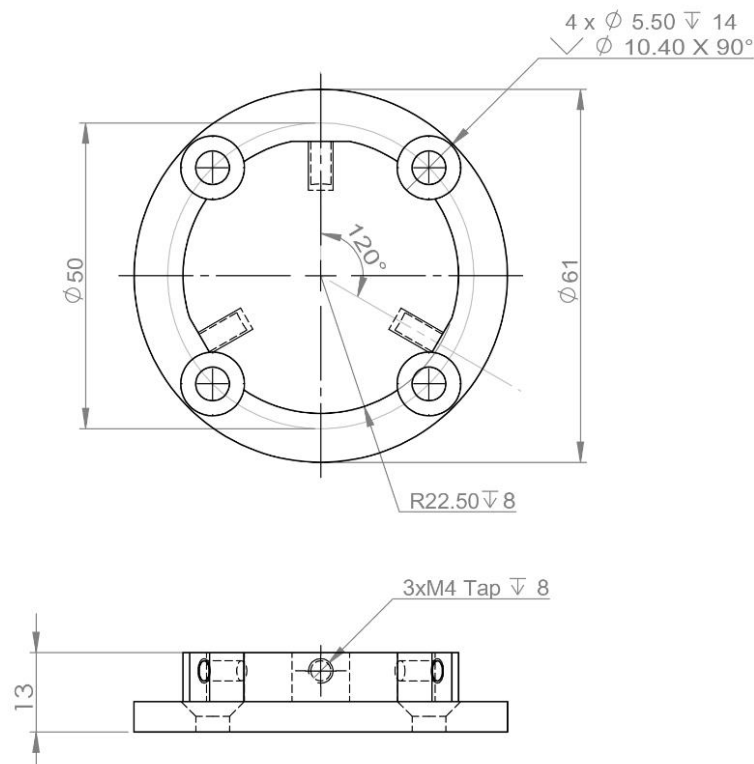
3.2. Technical Information of Delto Gripper-3F for Linkage with a Collaborative Robot

3.2.1. How to link

- ① Attach the provided adapter frame to the end of the collaborative robot.
*Collaborative robots compatible with the adapter frame: UR3, UR5, RB3, RB5, and AUBO etc.
- ② Fix the adapter frame and Delto Gripper-3F as shown in the figure below.

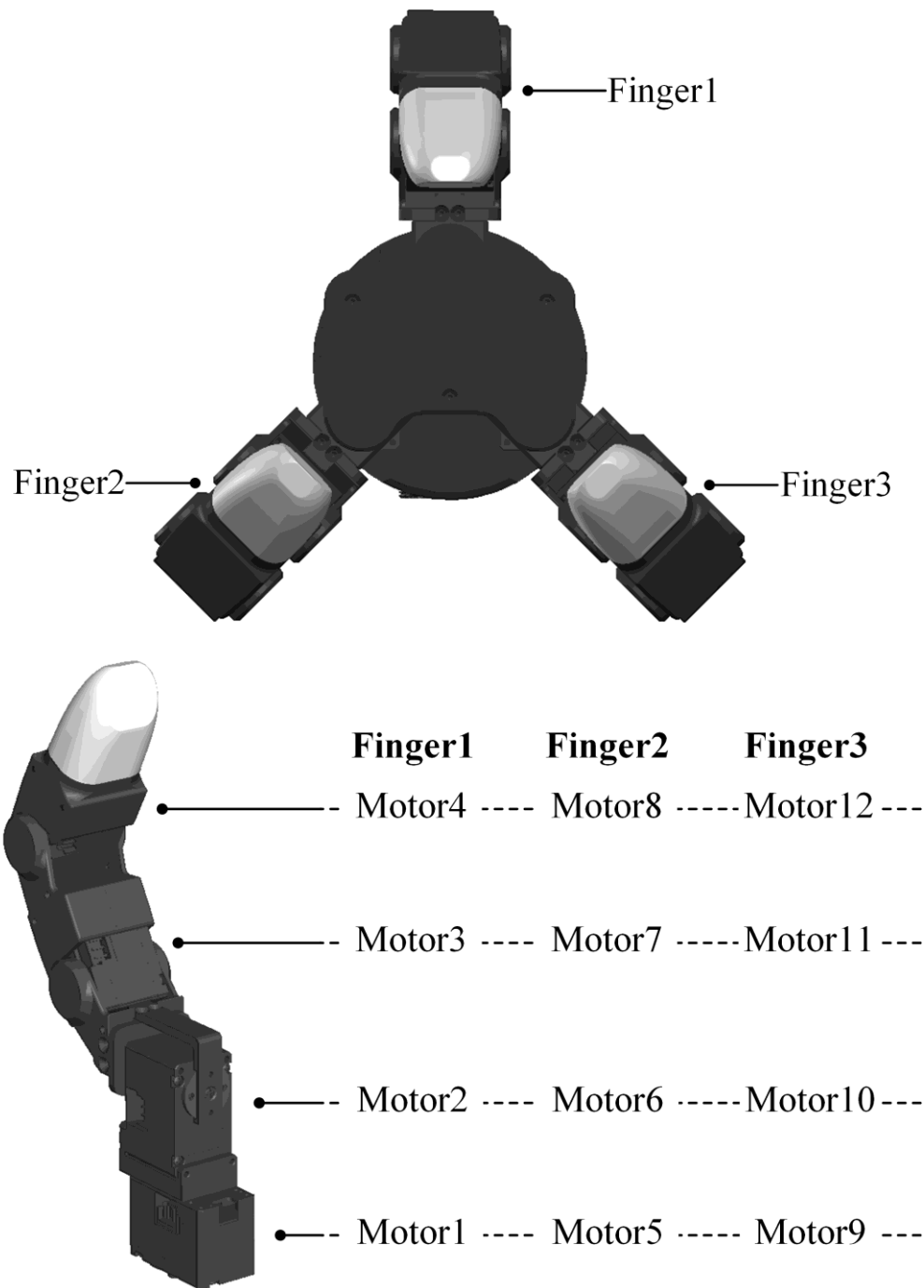


3.2.2. Adaptive frame dimensions

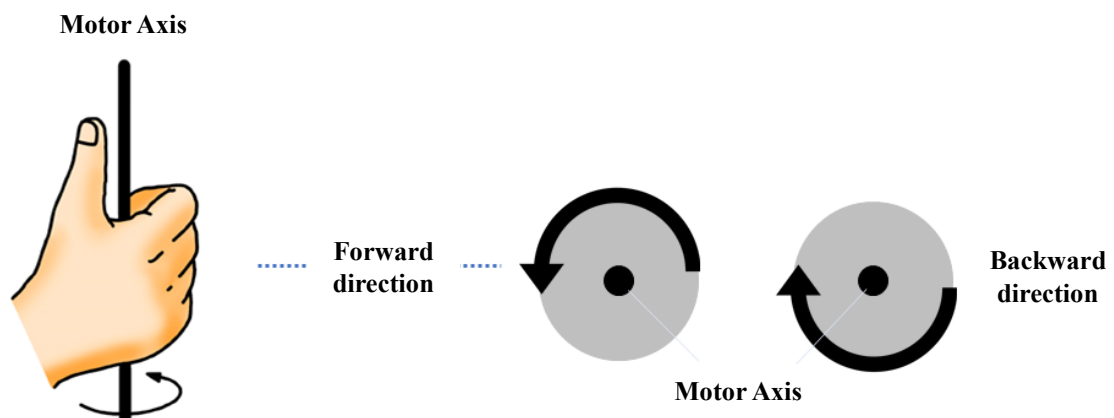
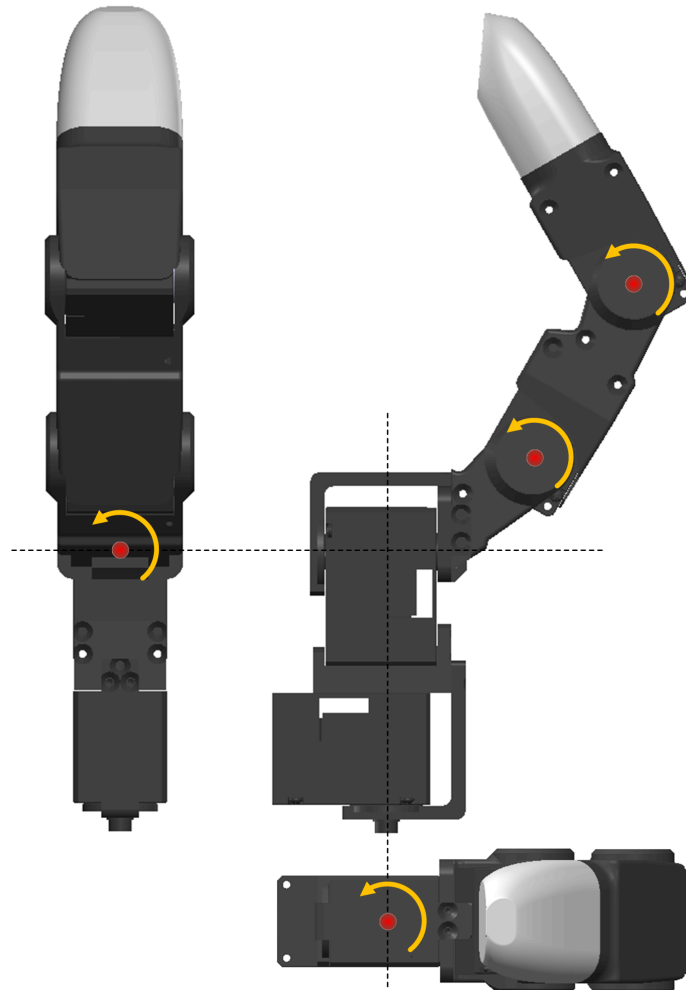


3.3. Basic Information about Motors

3.3.1. Motor sequence



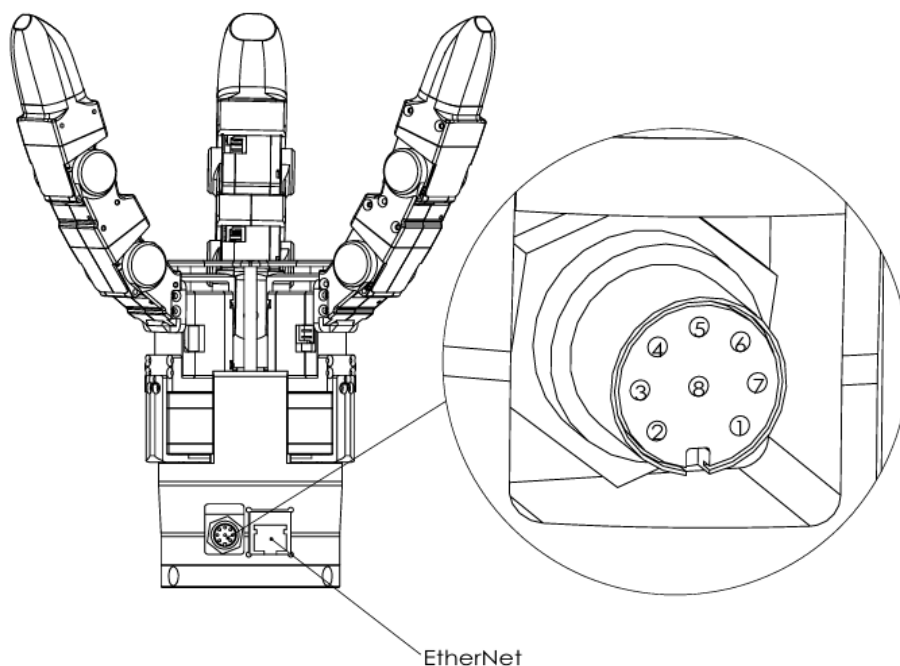
3.3.2. Motor directions



- When the motor axis direction is aligned with the direction of the thumb of the right hand, the direction of the remaining fingers is defined as the forward direction and the opposite direction as the backward direction.

Chapter 4 Connector, Switch, LED Information

4.1 Connector Information

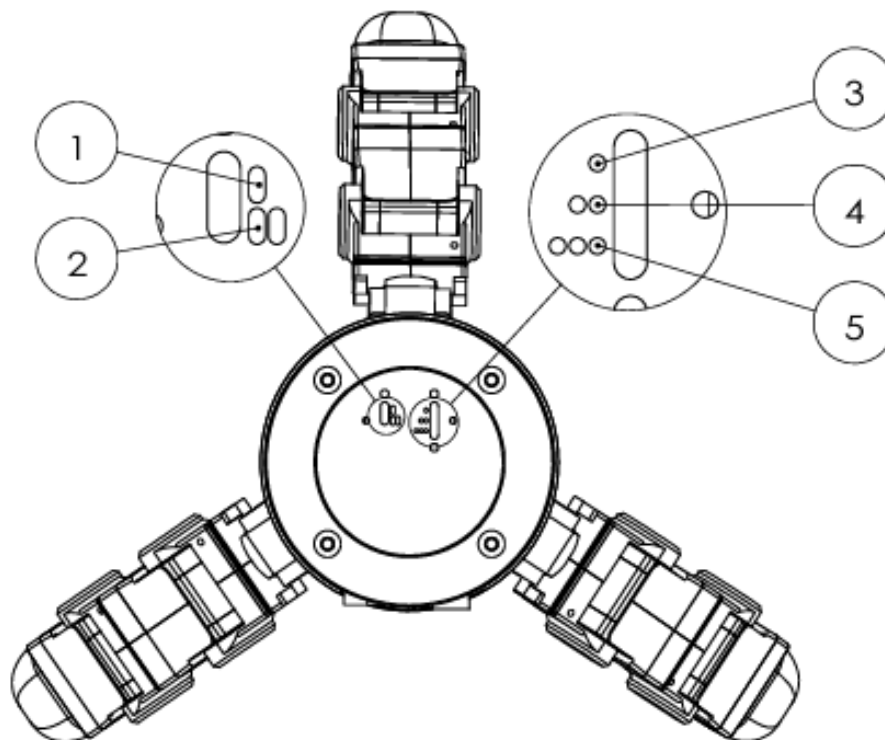


No.	Color	Connection
1	White	RS485 A
2	Brown	RS485 B
3	Green	DI1 (Gripper Output)
4	Yellow	DI0 (Gripper Output)
5	Gray	GND
6	Pink	DO1 (Gripper Input)
7	Blue	DO0 (Gripper Input)
8	Red	24V DC

*** Power supply above 5 A is required.**

*** Input power DC 24 V**

4.2 Switch, LED Information



No.	Control mode	
①	Internal control	x 1 All LEDs blink once
②	External control	x 2 All LEDs blink twice
No.	Communication mode	
③	RS485	Yellow LED on
④	EtherNET	Socket Connect : Blue LED on Socket Disconnect : Blue LED blink
⑤	I/O	Yellow and blue LED on

* When the power is turned on, the control mode LED blinks and then the communication mode LED operates

* Red LED blinks when there is a problem with the switch or communication.

* Only EtherNET communication is possible for external control.

Chapter 5 External Control

5.1 EtherNET

5.1.1 Specifications

IP address ⁽¹⁾	169.254.186.72
Subnet mask	255.255.255.0
Basic gateway	192.168.1.1
Port number	502

(1) It can be changed through the IP setting [see 5.1.2.3 IP address setting] function.

5.1.2 Protocol

5.1.2.1 Request for motor position and current values

* The motor position value is composed of two bytes. It has a value of 0° at the robot zero position [see 3.3.2. Motor directions]. The value increases (+) during the rotation in the forward direction and decreases (-) during the rotation in the backward direction.

[Send] 01 05 EE D2 DC

- * Request for the position and current values of 12 fingers
- * Position value unit: degree
- * Current value unit: mA

CMD	Length	ID	CRC L	CRC H
0x01	0x05	0xEE	0xD2	0xDC

- * CMD: Position value and current value request command
- * Length: The total number of bytes of the packet
- * CRC: CRC-16, CMD byte to CRC byte

[Return] 01 40 01 [Motor1 Data] 02 [Motor2 Data] ... 0C [Motor12 Data] CRCL CRCH

* Return of the position and current values of 12 fingers

* Position value unit : 0.1 degree

* Current value unit : 1 mA

CMD	Length	ID 1	Data 1	Data 2	Data 3	Data 4	...
0x01	0x40	0x01	-	-	-	-	...
ID 12	Data 1	Data 2	Data 3	Data 4	CRC L	CRC H	
0x0C	-	-	-		-	-	

* IDx: ID of motor x

* Data1: Upper byte of the position value of motor x

* Data2: Lower byte of the position value of motor x

* Data3: Upper byte of the current value of motor x

* Data4: Lower byte of the current value of motor x

* CRC : CRC-16/ARC, from CMD byte to ID byte

5.1.2.2 Motor duty setting

[Send] 03 28 01 [Motor1 duty] 02 [Motor2 duty] ... 0C [Motor12 duty] CRCL CRCH

* Duty range: -1000 to 1000

CMD	Length	ID 1	Data 1	Data 2	ID 2	Data 1	Data 2
0x03	0x28	0x01	-	-	0x02	-	-
...	ID 12	Data 1	Data 2	CRC L	CRC H		
...	0x0C	-	-		-		

* IDx: ID of motor x

* Data1: Upper byte of the duty of motor x

* Data2: Lower byte of the duty of motor x

* CRC : CRC-16/ARC, from CMD byte to ID byte

5.1.2.3 IP address setting

[Send] 04 08 [ip address] CRCL CRCH

CMD	Length	IP 1	IP 2	IP 3	IP 4	CRC L	CRC H
0x04	0x08	-	-	-	-	-	-

* Example: 04 08 A9 FE BA 48 D3 7F ➔ IP address: 169.254.186.72

* CRC : CRC-16/ARC, from CMD byte to ID byte

Chapter 6 Internal Control

6.1 Modbus

Supported Function	Read Coil (FC 01)
	Read Holding Register (FC 03)
	Read Input Register (FC 04)
	Write Single Coil (FC 05)
	Write Single Register (FC 06)
	Diagnostics (FC 08)
	Write Multiple Coil (FC 15)
	Write Multiple Register (FC 16)
Slave ID⁽¹⁾	1
Start Address	0

(1) It can be changed through the Modbus Write (internal control) function.

6.1.1 RTU

Physical Interface	RS-485
Baud rate⁽¹⁾	115,200 bps
Data bits	8 bit
Parity bits	None
Stop bits	1 bit
Flow control	None
CRC	CRC-16 (Modbus)

(1) It can be changed through the Modbus Write (internal control) function.

6.1.2 TCP

IP address⁽¹⁾	169.254.186.72
Subnet mask⁽¹⁾	255.255.255.0
Basic gateway⁽¹⁾	192.168.1.1
Port number⁽¹⁾	502

(1) It can be changed through the Modbus Write (internal control) function.

6.1.3 Registers

* (x10): Indicates that Write/Read the data multiplied by 10 for the application of the decimal point.
(Applicable to some values in the table below)

* Green shadow: EEPROM area

Block	Type	Address		Description	Initial value	
		DEC	HEX		DEC	HEX
Coil	R/W	0	0x00	Moving Average Filter [0~1] 0 = Disable 1 = Enable	0	0x00
		1	0x01	Grasp [0~1] 0 = Disable 1 = Enable	0	0x00
		2	0x02	Joint Custom Mode [0~1] The function that allows the user to directly create motion by releasing the control of the joints 0 = Disable 1 = Enable	0	0x00
		3	0x03	EEPROM Write [1] Save green shadow data to non-volatile memory. After saving the data, the data value is changed to zero. 1 = Writing	0	0x00
Holding Registers	R/W	0	0x00	RS-485 Baud rate [1~4] 1 = 9600 2 = 57600 3 = 115200 4 = 1000000	3	0x0003
		1	0x01	Modbus Slave ID [0~255]	1	0x0001
		2	0x02	EtherNET IP address 1 [0~255]	169	0x00A9
		3	0x03	EtherNET IP address 2 [0~255]	254	0x00FE
		4	0x04	EtherNET IP address 3 [0~255]	186	0x00BA
		5	0x05	EtherNET IP address 4 [0~255]	72	0x0048
		6	0x06	EtherNET subnet mask address 1 [0~255]	255	0x00FF
		7	0x07	EtherNET subnet mask address 2 [0~255]	255	0x00FF
		8	0x08	EtherNET subnet mask address 3 [0~255]	255	0x00FF
		9	0x09	EtherNET subnet mask address 4 [0~255]	0	0x0000
		10	0x0A	EtherNET basic gateway address 1 [0~255]	192	0x00C0
		11	0x0B	EtherNET basic gateway address 2 [0~255]	168	0x00A8
		12	0x0C	EtherNET basic gateway address 3 [0~255]	1	0x0001
		13	0x0D	EtherNET basic gateway address 4 [0~255]	1	0x0001
		14	0x0E	EtherNET Port [1~32767]	502	0x01F6
		15	0x0F	Motor 1 P Gain (x10) [0~32767]	10	0x000A

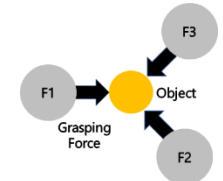
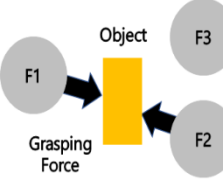
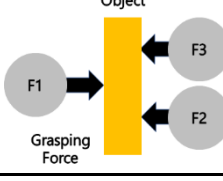
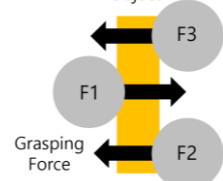
Holding Registers	R/W		(x10): data 10 ➡ actually applied value 1.0		
		16	0x10 Motor 2 P Gain (x10) [0~32767]	10	0x000A
		17	0x11 Motor 3 P Gain (x10) [0~32767]	10	0x000A
		18	0x12 Motor 4 P Gain (x10) [0~32767]	10	0x000A
		19	0x13 Motor 5 P Gain (x10) [0~32767]	10	0x000A
		20	0x14 Motor 6 P Gain (x10) [0~32767]	10	0x000A
		21	0x15 Motor 7 P Gain (x10) [0~32767]	10	0x000A
		22	0x16 Motor 8 P Gain (x10) [0~32767]	10	0x000A
		23	0x17 Motor 9 P Gain (x10) [0~32767]	10	0x000A
		24	0x18 Motor 10 P Gain (x10) [0~32767]	10	0x000A
		25	0x19 Motor 11 P Gain (x10) [0~32767]	10	0x000A
		26	0x1A Motor 12 P Gain (x10) [0~32767]	10	0x000A
		27	0x1B Motor 1 D Gain (x10) [0~32767] (x10): data 32 ➡ actually applied value 3.2	32	0x0020
		28	0x1C Motor 2 D Gain (x10) [0~32767]	32	0x0020
		29	0x1D Motor 3 D Gain (x10) [0~32767]	32	0x0020
		30	0x1E Motor 4 D Gain (x10) [0~32767]	32	0x0020
		31	0x1F Motor 5 D Gain (x10) [0~32767]	32	0x0020
		32	0x20 Motor 6 D Gain (x10) [0~32767]	32	0x0020
		33	0x21 Motor 7 D Gain (x10) [0~32767]	32	0x0020
		34	0x22 Motor 8 D Gain (x10) [0~32767]	32	0x0020
		35	0x23 Motor 9 D Gain (x10) [0~32767]	32	0x0020
		36	0x24 Motor 10 D Gain (x10) [0~32767]	32	0x0020
		37	0x25 Motor 11 D Gain (x10) [0~32767]	32	0x0020
		38	0x26 Motor 12 D Gain (x10) [0~32767]	32	0x0020
		...	...	...	...
		51	0x33 Motor 1 Offset (x10) [-3600~3600] (x10): data 1234 ➡ actually applied value 123.4°	0	0x0000
		52	0x34 Motor 2 Offset (x10) [-3600~3600]	0	0x0000
		53	0x35 Motor 3 Offset (x10) [-3600~3600]	0	0x0000
		54	0x36 Motor 4 Offset (x10) [-3600~3600]	0	0x0000
		55	0x37 Motor 5 Offset (x10) [-3600~3600]	0	0x0000
		56	0x38 Motor 6 Offset (x10) [-3600~3600]	0	0x0000
		57	0x39 Motor 7 Offset (x10) [-3600~3600]	0	0x0000
		58	0x3A Motor 8 Offset (x10) [-3600~3600]	0	0x0000
		59	0x3B Motor 9 Offset (x10) [-3600~3600]	0	0x0000
		60	0x3C Motor 10 Offset (x10) [-3600~3600]	0	0x0000

Holding Registers	R/W	61	0x3D	Motor 11 Offset (x10) [-3600~3600]	0	0x0000
		62	0x3E	Motor 12 Offset (x10) [-3600~3600]	0	0x0000
		63	0x3F	Initial start motion setting [1~30] Selection from the saved motions [refer to Holding Register Address 70]	1	0x0001
		64	0x40	Operation step [1~10000] Saved motion is imported, or the operation is divided by the step value during position control.	300	0x012C
		65	0x41	I/O Low Torque [0~100] The Low Torque value is set during operation in the I/O mode [see 6.2 I/O mode]	50	0x0032
		66	0x42	I/O High Torque [101~200] The High Torque value is set during operation in the I/O mode [see 6.2 I/O mode]	150	0x0096
		67	0x43	Grasp Mode [1~6] 1 = A grip algorithm implemented to point the forces of three finger tips toward the center of the target object 2 = A grip algorithm implemented to point the forces of two finger tips toward the center of the target object (finger 1 & 2) 3 = A grip algorithm implemented to point the forces of two finger tips toward the center of the target object (finger 1 & 3) 4 = A grip algorithm implemented to point the forces of two finger tips toward the center of the target object (finger 2 & 3) 5 = A grip algorithm implemented to make the forces of the second and third finger tips parallel 6 = A grip algorithm implemented to grasp objects	1	0x0001
		68	0x44	Grasp Torque (x10) [0~200] The magnitude of force during grip operation is set. (x10): data 50 → actually applied value 5.0	50	0x0032
		69	0x45	Moving Average Filter Window [1~100] The magnitude of the moving average filter is set.	10	0x000A
		70	0x46	The current motion is saved [1~30] The current position value of the gripper is saved.	0	0x0000
		71	0x47	Saved motion is imported [1~30]	0	0x0000
		72	0x48	Target position value of motor 1 (x10) [-3600~3600] (x10): data 200 → actually applied value 20.0° Initial value: data of the initial start motion [refer to Holding Registers Address 63]	-	-
		73	0x49	Target position value of motor 2 (x10) [-3600~3600]	-	-
		74	0x4A	Target position value of motor 3 (x10) [-3600~3600]	-	-
		75	0x4B	Target position value of motor 4 (x10) [-3600~3600]	-	-

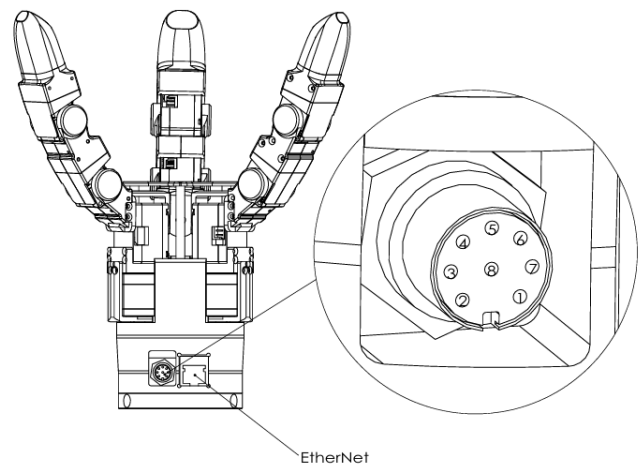
		76	0x4C	Target position value of motor 5 (x10) [-3600~3600]	-	-
		77	0x4D	Target position value of motor 6 (x10) [-3600~3600]	-	-
		78	0x4E	Target position value of motor 7 (x10) [-3600~3600]	-	-
		79	0x4F	Target position value of motor 8 (x10) [-3600~3600]	-	-
		80	0x50	Target position value of motor 9 (x10) [-3600~3600]	-	-
		81	0x51	Target position value of motor 10 (x10) [-3600~3600]	-	-
		82	0x52	Target position value of motor 11 (x10) [-3600~3600]	-	-
		83	0x53	Target position value of motor 12 (x10) [-3600~3600]	-	-
		...	...	...	...	...
		96	0x60	Fixed position of Motor1 during grasping [0~1] 1 = When grasping, the position of motor 1 is fixed to the target value. [refer to Holding Registers Address 72]	0	0x0000
		97	0x61	Fixed position of Motor2 during grasping [0~1]	0	0x0000
		98	0x62	Fixed position of Motor3 during grasping [0~1]	0	0x0000
		99	0x63	Fixed position of Motor4 during grasping [0~1]	0	0x0000
		100	0x64	Fixed position of Motor5 during grasping [0~1]	0	0x0000
		101	0x65	Fixed position of Motor6 during grasping [0~1]	0	0x0000
		102	0x66	Fixed position of Motor7 during grasping [0~1]	0	0x0000
		103	0x67	Fixed position of Motor8 during grasping [0~1]	0	0x0000
		104	0x68	Fixed position of Motor9 during grasping [0~1]	0	0x0000
		105	0x69	Fixed position of Motor10 during grasping [0~1]	0	0x0000
		106	0x6A	Fixed position of Motor11 during grasping [0~1]	0	0x0000
		107	0x6B	Fixed position of Motor12 during grasping [0~1]	0	0x0000
		108	0x6C	The target position value is saved [1~30] The target position value of the gripper is saved.	0	0x0000
		109	0x6D	Torque limit [0~100] Limit gripper torque to 0%~100%.	100	0x0064
Input Registers	R	0	0x00	Product ID	2328	0x0918
		1	0x01	Firmware Version	-	-
		2	0x02	Position value of motor 1 at present (x10) (x10): data 213 → actual position value 21.3°	-	-
		3	0x03	Position value of motor 2 at present (x10)	-	-
		4	0x04	Position value of motor 3 at present (x10)	-	-
		5	0x05	Position value of motor 4 at present (x10)	-	-
		6	0x06	Position value of motor 5 at present (x10)	-	-
		7	0x07	Position value of motor 6 at present (x10)	-	-

Input Registers	R	8	0x08	Position value of motor 7 at present (x10)	-	-
		9	0x09	Position value of motor 8 at present (x10)	-	-
		10	0x0A	Position value of motor 9 at present (x10)	-	-
		11	0x0B	Position value of motor 10 at present (x10)	-	-
		12	0x0C	Position value of motor 11 at present (x10)	-	-
		13	0x0D	Position value of motor 12 at present (x10)	-	-
		14	0x0E	Current value of motor 1 at present Unit: mA	-	-
		15	0x0F	Current value of motor 2 at present	-	-
		16	0x10	Current value of motor 3 at present	-	-
		17	0x11	Current value of motor 4 at present	-	-
		18	0x12	Current value of motor 5 at present	-	-
		19	0x13	Current value of motor 6 at present	-	-
		20	0x14	Current value of motor 7 at present	-	-
		21	0x15	Current value of motor 8 at present	-	-
		22	0x16	Current value of motor 9 at present	-	-
		23	0x17	Current value of motor 10 at present	-	-
		24	0x18	Current value of motor 11 at present	-	-
		25	0x19	Current value of motor 12 at present	-	-
		...	...	...	...	...
		38	0x26	Moving 0 = Stop 1 = Moving	-	-

6.1.3.1 Grasp mode

1		A grip algorithm implemented to point the forces of three finger tips toward the center of the target object
2 3 4		A grip algorithm implemented to point the forces of two finger tips toward the center of the target object
5		A grip algorithm implemented to make the forces of the second and third finger tips parallel
6		A grip algorithm implemented to grasp objects

6.2 I/O mode



Pin	Wire	Connection
1	White	RS485 A
2	Brown	RS485 B
3	Green	Digital Output 1
4	Yellow	Digital Output 0
5	Gray	GND
6	Pink	Digital Output 1
7	Blue	Digital Output 0
8	Red	24V DC

Pin	Signal		Description
	1 (24V)	0	
Digital Input 0	Close Gripper	Open Gripper	Grasping ON / OFF
Digital Input 1	Low Torque	High Torque	Intensity of the gripper torque [refer to Holding Registers Address 65,66]

