

Z-ERG-20-100

Product Manual

Industrial Robot / Collaborative Robot / Electric Gripper/
Intelligent Actuator / Automation Solution



Rotary Electric Gripper Z-ERG-20-100

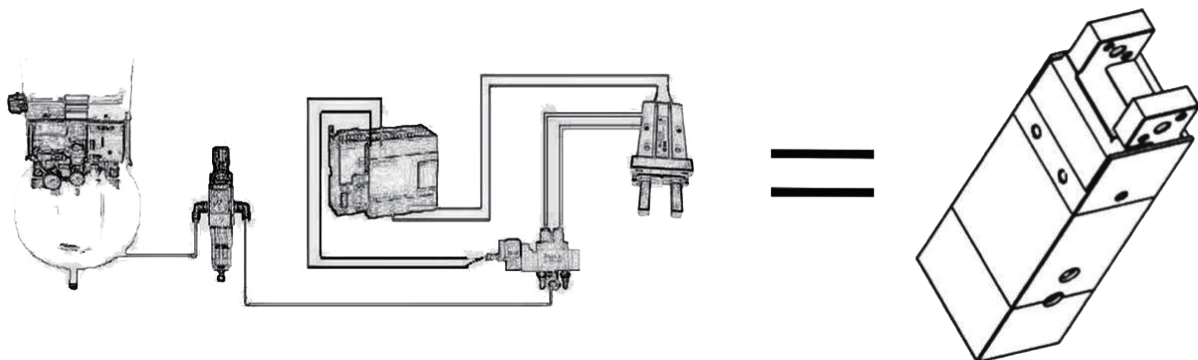
Promoting a revolution in the replacement of pneumatic grippers by electric grippers
First electric gripper with integrated servo system in China



Product Features

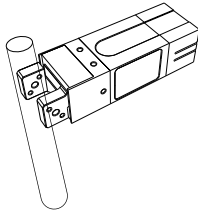
- Support infinite rotation and relative rotation, no slip ring, low maintenance cost
- Rotation and gripping force, position and speed can be precisely controlled
- Long service life, multiple cycles, better performance than pneumatic gripper
- Built-in controller: small space occupation and easy to integrate
- Control mode: support Modbus bus control and I/O control
- Gripping force up to 100N; Rotating torque up to 1.5Nm

Highly Integrated

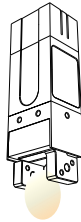


- Perfect replacement for air compressor + filter + solenoid valve + throttle valve + pneumatic gripper
- Multiple cycles service life, consistent with the traditional Japanese cylinder

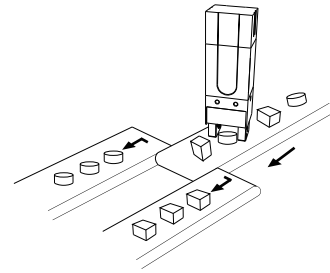
Application Scenes



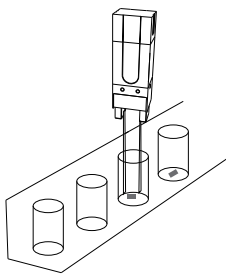
Fragile scene (e.g.test tube)



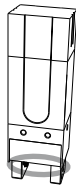
Fragile scene (e.g.eggs)



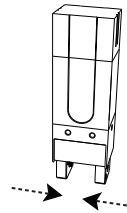
Sorting out things that are arranged in a mess



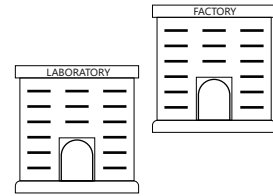
Gripping in narrow scene



Deformable scene (e.g.rings)



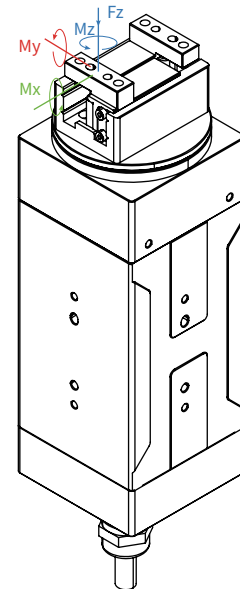
Gripping fragile items at high frequency



Medical, new retail, 3C industry, etc.

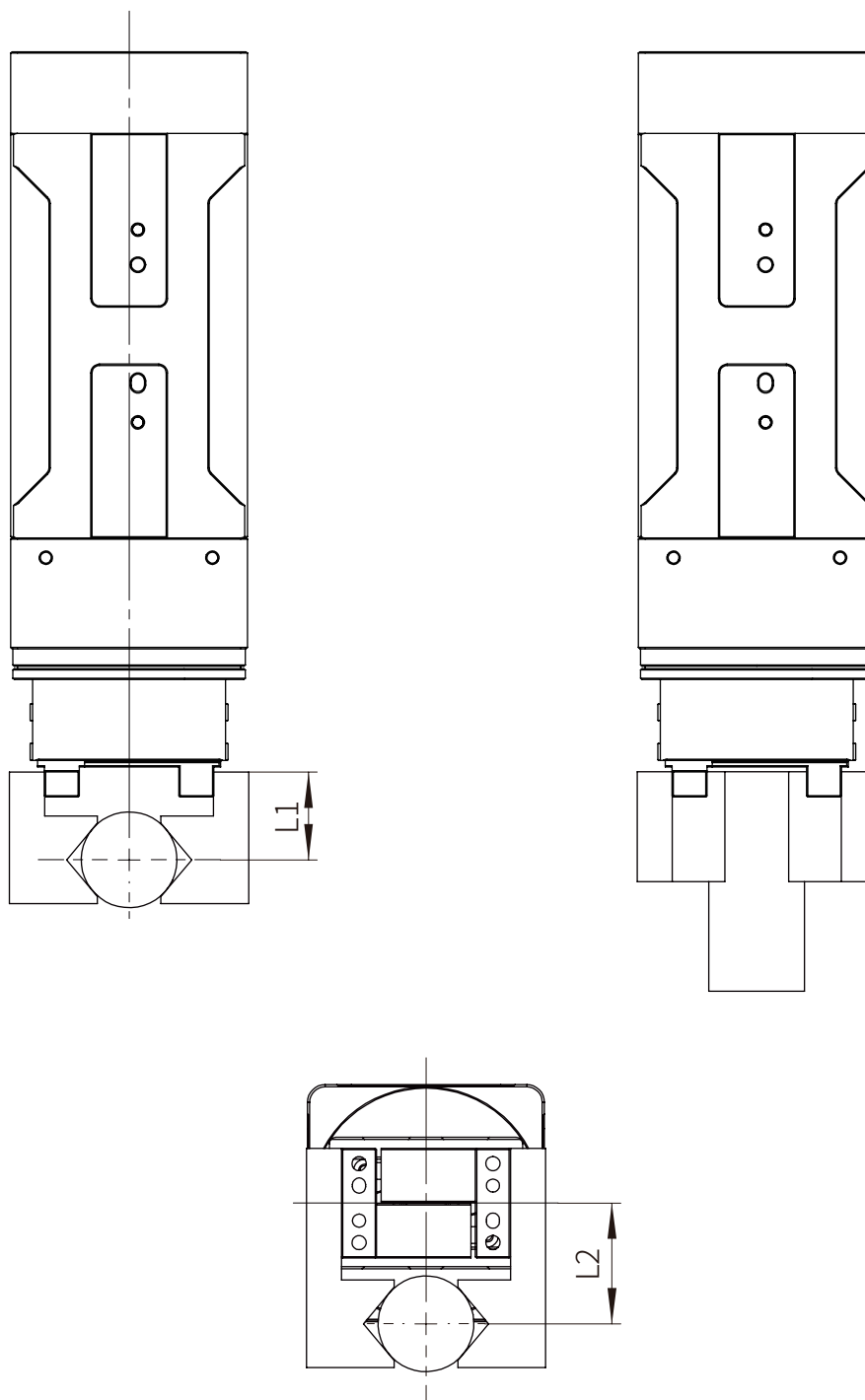
Specification

Model No. Z-ERG-20-100	Parameter
Total stroke	20mm adjustable
Gripping force	30-100N adjustable
Repeatability	±0.2mm
Recommended gripping weight	≤1.0kg
Transmission mode	Gear rack + linear guide
Grease replenishment of moving components	Every six months or 1 million movements / time
One-way stroke motion time	0.30s
Rotating maximum torque	1.5Nm
Rotating maximum speed	180RPM
Rotation range	Infinite rotation
Rotating backlash	±1°
Weight	1.20kg
Dimensions	54*54*170mm
Operating voltage	24V ± 10%
Rated current	2A
Maximum current	4A
Power	50W
Protection class	IP20
Motor type	Servo motor
Operating temperature range	5-55°C
Operating humidity range	RH35-80 (No frost)



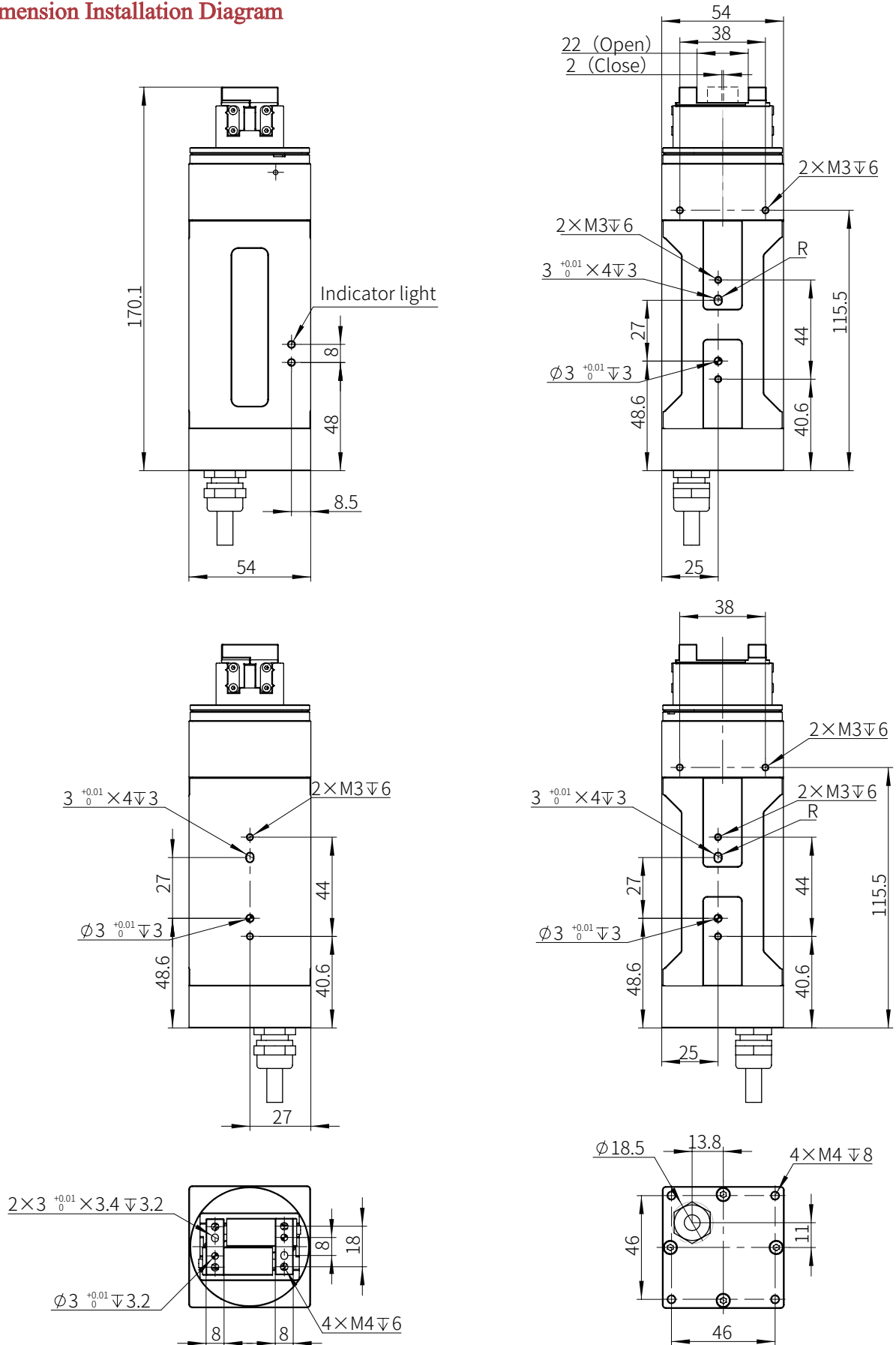
Permissible static load in vertical direction	
Fz:	150 N
Permissible torque	
Mx:	1.6 N.m
My:	1.8 N.m
Mz:	1.8 N.m

Load center of gravity offset

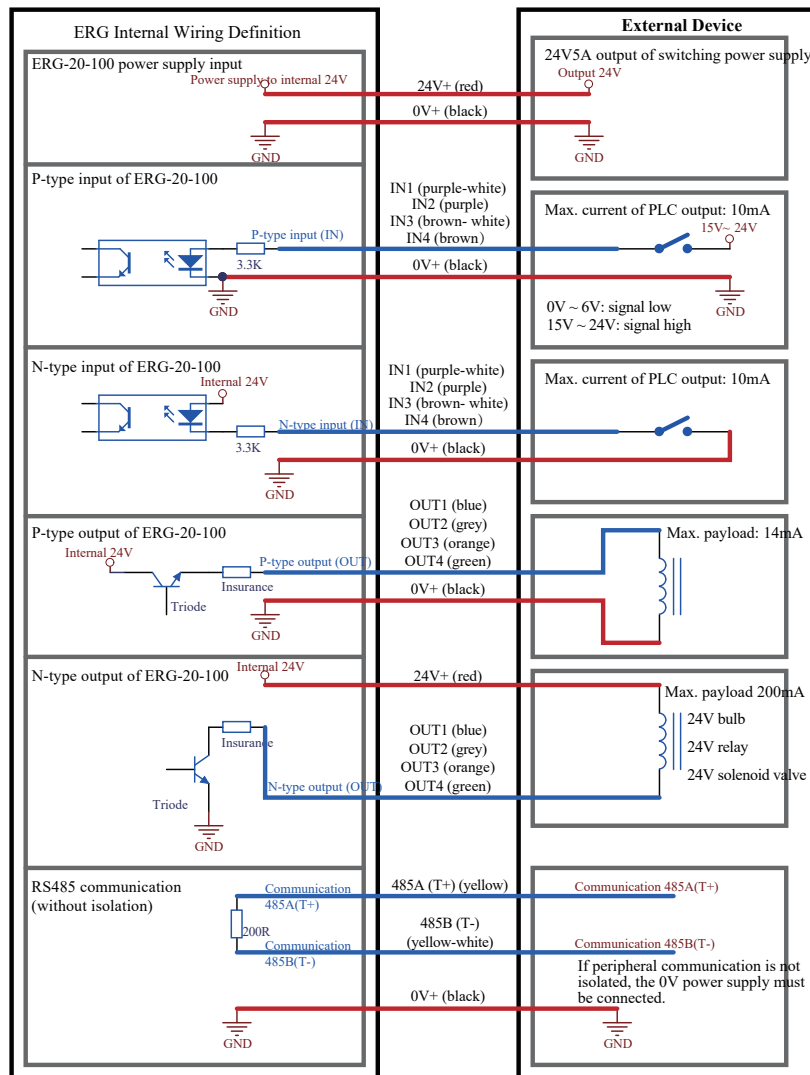


L1 range	0~50mm
L2 range	0~30mm

Dimension Installation Diagram



Wire Sequence Description



Notice:

1. Please make sure the positive and negative poles of the power cable is correct and the 485 communication line and I/O line is correctly wired, as the burning due to incorrect wiring is not covered by the normal warranty.
2. 485 and 24V gripper are not isolated internally, if isolation is needed, users need to use other equipments for isolation.

RS485 Communication

The RS485 communication of Z-ERG-20-100 uses Modbus RTU protocol and the supports function codes including: 0x03, 0x06, 0x10, the default communication parameters are as follows.

Baud Rate	115200
ID	1
Data bits	8
Stop bits	1
Check	No

Communication Protocols

ERG-20 series electric grippers use Modbus RTU protocol, and three function codes are used for control:

- (1) Function code 03: read multiple registers (used when reading status);
- (2) Function code 06: write single register (write data to the corresponding single register to complete the control of the gripper);
- (3) Function code 10: write multiple registers (write data to the corresponding multiple registers to complete the control of the gripper).

Function category	Address	Function	Read-write property	Default value (Data type)	Description
Control	0x0000	Initialization	R/W	0 (int)	1. Single direction calibration (calibration direction can be set)
	0x0001	(Reserved)	R/W	0 (int)	
	0x0002	Gripping position	R/W	Maximum value (float)	Unit: mm, Value range: 0~20
	0x0004	Gripping speed	R/W	Maximum value (float)	Unit: mm/s, Value range: 1~100
	0x0006	Gripping current	R/W	0.4 (float)	Unit: A, Value range: 0.15~0.5
	0x000A	Rotation angle	R/W	0 (float)	Unit: degree, Value range: -3600000~3600000
	0x000E	Rotation speed	R/W	Maximum value (float)	Unit: degree/s, Value range: 1~1440
	0x0010	Rotation current	R/W	1.6 (float)	Unit: A, Value range: 0.2~1.0
	0x0014	Relative rotation Angle	R/W	0 (float)	Unit: degree, Value range: -36000~36000. The setting relative rotation angle will accumulate to the rotation angle, and this value will become zero after the setting is successful.
	0x0016	Enable motor	R/W	1 (int)	Write 0 to turn off the motor output, write 1 to enable the motor
	0x0017	Gripping point control point	R/W	0 (int)	Use gripping point position mode to control parameter, select the communication trigger point, the range of values: 1~8
	0x0018	Rotation point control point	R/W	0 (int)	Use rotation point position mode to control parameter, select the communication trigger point, the value range: 1~8
State Feedback	0X0040	Initialization state feedback	R	0 (int)	0: Uninitialized, 5: Initialization completed, Others: Initializing
	0X0041	Gripping state feedback	R	0 (int)	00: in place, 1: operating 2: gripping, 3: drop
	0X0042	Gripping position feedback	R	Maximum value (float)	Unit: mm
	0X0044	Gripping speed feedback	R	(float)	Unit: mm/s
	0X0046	Gripping current feedback	R	0 (float)	Unit: A
	0X0048	Rotation state feedback	R	0 (int)	0: in place, 1: opearting, 2: screwing up, 3: drop, 4: locked rotor
	0x004A	Rotation angle feedback	R	0 (float)	Unit: degree
	0x004C	Rotation speed feedback	R	(float)	Unit: degree/s
	0x004E	Rotating current feedback	R	0 (float)	Unit: A
	0x0050	Error warning notification (reserved)	R	0 (int32)	

Parameter Configuration	0x0080	ID	R/W	1 (int)	Value range: 1~247 Valid for restart after saving parameters
	0x0081	Baud rate	R/W	4 (115200) (int)	0~8: baud9600, baud19200, baud38400, baud57600, baud115200, baud153600, baud256000, baud460800, baud921600 Valid for restart
	0x0082	Initialization direction	R/W	0 (int)	Set position calibration direction. 0: open calibration, 1: Close calibration.
	0x0083	Automatic initialization setting	R/W	0 (int)	Set position calibration mode. 0: automatic calibration after power-on, 1: manual control calibration Valid for restart after saving parameters
	0x0084	Save parameters	R/W	0 (int)	Write 1 to save the parameters. Note: Do not use this command during real-time control. Use only for configuration parameters before actual use
	0x0085	Restore default parameters	R/W	0 (int)	Write 1 to restore default parameters
	0x0089	Big endian and little endian setting	R/W	0 (int)	Endian setting. 1: little endian mode, 0: big endian mode. Valid for restart after saving parameters
	0x008F	Reset multi-turn rotation value	R/W	0 (int)	Write 1 to reset the rotation angle within $\pm 360^\circ$. If the current angle is bigger than 0° , reset to 0-360 If smaller than 0° , reset to -360 - 0
	0x0090	I/O mode switch	R/W	0 (int)	0: close I/O mode, 1: open I/O mode
	0x009E	Rotation, locked-rotor, stalled enable	R/W	1 (int)	0: 0: not enable, 1: enable, the function is enabled by default
	0x009F	Sensitivity of locked rotor	R/W	10 (int)	0-100, the larger the number, the better the sensitivity
	0x00A0	Input NPN or PNP setting	R/W	0 (int)	0 for NPN, 1 for PNP
	0x00A1	Output NPN or PNP setting	R/W	0 (int)	0 for NPN, 1 for PNP
Point Configuration	0x0100	1# clamping point distance	R/W	(float)	Set the position of 1# clamping point, unit: mm
	0x0102	1# clamping point speed	R/W	(float)	Set the speed of 1# clamping point, unit: mm/s
	0x0104	1# clamping point acceleration	R/W	(float)	Set the acceleration of 1# clamping point, unit: mm/s ²
	0x0106	1# clamping point deceleration	R/W	(float)	Set the deceleration of 1# clamping point, unit: mm/s ²
	0x0108	1# clamping point current	R/W	(float)	Set the current of 1# clamping point, unit: A
	0x010A	2# clamping point distance	R/W	(float)	Set the position of 2# clamping point, unit: mm
	...	...	...	...	...
	0x0114	3# clamping point distance	R/W	(float)	Set the position of 3# clamping point, unit: mm
	...	...	...	...	...
	0x011E	4# clamping point distance	R/W	(float)	Set the position of 4# clamping point, unit: mm
	...	...	...	...	...
	0x0180	1#rotation point angle	R/W	(float)	Set the angle of 1#rotation point, unit: degree
	0x0182	1# rotation point angular velocity	R/W	(float)	Set the angular velocity of 1#rotation point, unit: degree/s
	0x0184	1# rotation point angular acceleration	R/W	(float)	Set the angular acceleration of 1#rotation point, unit: degree/s ²
	0x0186	1# rotation point angular deceleration	R/W	(float)	Set the angular deceleration of 1#rotation point, unit: degree/s ²

0x0188	1# rotation point current	R/W	(float)	Set the current of 1#rotation point, unit: A
0x018A	2# rotation point angle	R/W	(float)	Set the angle of 2#rotation point, unit: degree
...	...	...	...	...
0x194	3# rotation point angle	R/W	(float)	Set the angle of 3#rotation point, unit: degree
...	...	...	...	...
0x19E	4# rotation point angle	R/W	(float)	Set the angle of 4#rotation point, unit: degree
...	...	...	...	...

Indicator Light Definition

The rotating gripper has two indicator lights, respectively indicating the state of gripping and rotation with the gripper finger facing up.

Description of gripping state	Status displayed by host computer	0x0041 clamping status register value	Color of indicator light
Uninitialized	N/A	N/A	Red light is always on
Unobstructed and grip in place	In place	0x0000	Green light is always on
Gripping without hindrance	Moving	0x0001	Green light flashing
Gripping with hindrance	Gripping	0x0002	Blue light is always on
Gripping obstructed but movement in place	Drop	0x0003	Blue light flashing

Description of gripping state	Status displayed by host computer	0x0041 clamping status register value	Color of indicator light
Uninitialized	N/A	N/A	Red light is always on
Unobstructed and rotate in place	In place	0x0000	Green light is always on
Rotating without hindrance	Rotating	0x0001	Green light flashing
Rotating with hindrance	Screwing up	0x0002	Blue light is always on
Rotating obstructed but movement in place*	Drop	0x0003	Blue light flashing
Rotation blocked and actively stops*	Stop the skid	0x0004	Blue light flashing

*The state of "Unobstructed and rotate in place" and "Rotation blocked and actively stops" are mutually exclusive, and the specific state feedback and action of the gripper can be set via the "5. rotation blocking settings" in this manual or the modbus register 0x009E.

Working Process

1. When the gripper is powered on, it will be initialized automatically, and after the gripper is opened outward, initialization process is completed.

Manual initialization instructions:

Device address	Function code	Register start address	Register content	CRC check code
01	06 (HEX)	00 00	00 01 (Initialization)	48 0A

Reply: 01 06 00 00 00 01 48 0A

Note: When initializing, please make sure that there is no object blocking the finger to prevent the zero position from being recognized incorrectly, and you can set whether to automatically initialize through 0x0083 after power-on.

2. Now you can control the gripping and rotation of the gripper by command.

Close the gripper:

Device address	Function code	Register start address	Register length	Number of bytes	Register content	CRC check code
01	10 (HEX)	00 02	00 02	04	00 00 00 00 (0 (float))	72 76

Reply: 01 10 00 02 00 02 E0 08

Rotate to 90 degree:

Device address	Function code	Register start address	Register length	Number of bytes	Register content	CRC check code
01	10 (HEX)	00 0A	00 02	04	42 B4 00 00 (90(float))	27 8E

Reply: 01 10 00 0A 00 02 61 CA

Set the gripping speed to 50:

Device address	Function code	Register start address	Register length	Number of bytes	Register content	CRC check code
01	10 (HEX)	00 04	00 02	04	42 48 00 00 (50(float))	66 32

Reply: 01 10 00 04 00 02 00 09

Set the gripping current to 0.2:

Device address	Function code	Register start address	Register length	Number of bytes	Register content	CRC check code
01	10 (HEX)	00 06	00 02	04	3E 4C CC CC (0.2 (float))	EF EA

Reply: 01 10 00 06 00 02 A1 C9

Set the rotation speed to 720:

Device address	Function code	Register start address	Register length	Number of bytes	Register content	CRC check code
01	10 (HEX)	00 0E	00 02	04	44 34 00 00 (720 (float))	27 1D

Reply: 01 10 00 0E 00 02 20 0B

Set the rotation current to 0.8:

Device address	Function code	Register start address	Register length	Number of bytes	Register content	CRC check code
01	10 (HEX)	00 10	00 02	04	3F 4C CC CC (0.8 (float))	6A 35

Reply: 01 10 00 10 00 02 40 0D

Set the relative rotation to 360 degree:

Device address	Function code	Register start address	Register length	Number of bytes	Register content	CRC check code
01	10 (HEX)	00 14	00 02	04	43 B4 00 00 (360 (float))	A6 F2

Reply: 01 10 00 14 00 02 01 CC

Read gripping state:

Device address	Function code	Register start address	Register content	CRC check code
01	03 (HEX)	00 41	00 01	D4 1E

Reply: 01 03 02 00 00 B8 44 (00 00 means in place, 0: in place, 1, in motion 2: grip, 3, drop)

I/O Function

1.Pin Mapping for Position Control

In addition, the I/O can be set as NPN type or PNP type through registers 0x00A0 and 0x00A1.

The input state and control point position are shown in the following table:

NPN type is effective at 0V, PNP type is effective at 24V.

IN1	IN2	Control the gripping point
Invalid	Invalid	1
Valid	Invalid	2
Invalid	Valid	3
Valid	Valid	4

IN3	IN4	Control the rotation point
Invalid	Invalid	1
Valid	Invalid	2
Invalid	Valid	3
Valid	Valid	4

2. Correspondence between gripper state and pins

The gripper state indicated by the output state is shown in the following table:

NPN type is effective at 0V, PNP type is effective at 24V.

OUT1	OUT2	Gripping state
Invalid	Invalid	In position
Valid	Invalid	In motion
Invalid	Valid	Clamping
Valid	Valid	Drop

OUT3	OUT4	Rotating state
Invalid	Invalid	In position
Valid	Invalid	Rotating
Invalid	Valid	Rotation blocked
Valid	Valid	Locked rotor

FAQ

(1) Instruction of reset multi-turn rotation value

Reset multi-turn rotation value refers to the method of clearing the multi-turn value of the current position after the gripper rotates for multiple turns. For example, the current rotation angle of the gripper is 760° ($2 \times 360^{\circ} + 40^{\circ}$), after clearing multiple turns, the rotation angle becomes 40° (minus 720° of integer turns); the current rotation angle is -600° ($-360^{\circ} - 240^{\circ}$), after clearing multiple turns, the rotation angle becomes -240° (minus -360° of integer turns).

(2) Instruction of locked rotor sensitivity

Locked rotor sensitivity refers to the sensitivity requirement (speed requirement) when the gripper is stalled when the “blocking enable” is on (the gripper will stop rotating after the gripper rotor is locked), value range 0-100. For example, if the set value is 100, the gripper will stop rotating at a higher speed when it encounters an obstacle during the rotation process to protect the gripper and the product being gripped. It is relatively sensitive. If the set value is 10, when an obstacle is encountered during rotation, the stop of the gripper will only be triggered when the rotation speed drops to a lower level.

(3) Calling the point by communication

Call the No. 1 clamping point (calculated from 0, 0x00 represents the No. 1 point)

Device address	Function code	Register starting address	Register content	CRC verification code
01	06	00 17	00 00	39 CE

(4) Instruction for writing and recalling gripping/rotation point parameters

Gripping/rotation point refers to writing and storing a certain amount of gripping and rotation point information inside the rotary gripper, and then you can directly send the serial number of the corresponding point to control the gripper.

Write No. 1 gripping point information (data are all hexadecimal):

Device address	Function code	Register starting address	Register length	Number of bytes	Register content	CRC verification code
01	10	01 00	00 0A	14	41 00 00 00 (position 10) 41 A0 00 00 (speed 20) 44 7A 00 00 (acceleration 1000) 44 7A 00 00 (deceleration 1000) 3E E6 66 66 (current 0.45)	2E BE

The writing and calling of the rotation point information is similar to that of gripping.



M a k i n g A u t o m a t i o n E a s i e r

Huiling-tech Robotic Co.,Ltd.

Tel: 0755-36382405

Hotline: 0086-15220259858

Email: Marketing@hitbot.cc

Website: hitbotrobot.com

Address: 2nd Floor, Building E, Huafeng International Robot Industrial Park,
Hangcheng Ave, Xixiang St, Baoan District, Shenzhen City, Guangdong Province, China

V_2023.07.13