

# Electric Gripper

User Manual



Original Instruction



**TAIWAN**  
EXCELLENCE 2017





## Multi-Axis Robot

- Pick-and-Place / Assembly / Array and Packaging / Semiconductor / Electro-Optical Industry / Automotive Industry / Food Industry
- Articulated Robot
  - Delta Robot
  - SCARA Robot
  - Wafer Robot
  - Electric Gripper
  - Integrated Electric Gripper
  - Rotary Joint



## Single-Axis Robot

- Precision / Semiconductor / Medical / FPD
- KK, SK
  - KS, KA
  - KU, KE, KC



## Torque Motor

### Rotary Table

- Aerospace / Medical / Automotive Industry / Machine Tools / Machinery Industry
- RAB Series
  - RAS Series
  - RCV Series
  - RCH Series



## Ballscrew

- Precision Ground / Rolled
- Super S Series
  - Super T Series
  - Mini Roller
  - Ecological & Economical Lubrication Module E2
  - Rotating Nut (R1)
  - Energy-Saving & Thermal-Controlling (Cool Type)
  - Heavy Load Series (RD)
  - Ball Spline



## Linear Guideway

- Automation / Semiconductor / Medical
- Ball Type--HG, EG, WE, MG, CG
  - Quiet Type--QH, QE, QW, QR
  - Other--RG, E2, PG, SE, RC



## Bearing

- Machine Tools / Robot
- Crossed Roller Bearing
  - Ballscrew Bearing
  - Linear Bearing
  - Support Unit



## DATORKER® Robot Reducer

- Robot / Automation Equipment / Semiconductor Equipment / Machine Tools
- WUT-PO Type
  - WUI-CO Type
  - WTI-PH Type
  - WTI-AH Type



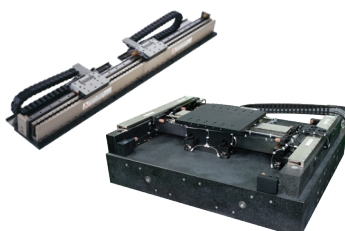
## AC Servo Motor & Drive

- Semiconductor / Packaging Machine / SMT / Food Industry / LCD
- Drives--D1, D1-N, D2T/D2T-LM
  - Motors--50W-2000W



## Medical Equipment

- Hospital / Rehabilitation Centers / Nursing Homes
- Robotic Gait Training System
  - Hygiene System
  - Robotic Endoscope Holder



## Linear Motor

- Automated Transport / AOI Application / Precision / Semiconductor
- Iron-core Linear Motor
  - Coreless Linear Motor
  - Linear Turbo Motor LMT
  - Planar Servo Motor
  - Air Bearing Platform
  - X-Y Stage
  - Gantry Systems



## Torque Motor & Direct Drive Motor




- Machine Tools
- Torque Motor--TMRW, TMRI Series
- Inspection / Testing Equipment / Robot
- Direct Drive Motor--TMS, TMY, TMN Series

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# 1. Precautions(Be sure to read before handling.)

## 1.1 Safety Specifications

 <b>Danger :</b>	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 <b>Warning :</b>	Indicates a potentially hazardous situation which could result in death or serious injury, if the equipment is operated incorrectly.
 <b>Caution :</b>	Indicates a potentially hazardous situation which may result in injury and machine damage, if the equipment is operated incorrectly.

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Danger,” “Warning” , or “Caution.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)[Note 1], Japanese Industrial Standards (JIS)[Note 2]and other safety regulations[Note 3].

[Note 1] ISO 10218: Robots and robotics devices - Safety requirement for industrial robots

IEC 60204-1: Safety of machinery – Electrical equipment of machine (Part1: General requirement)

[Note 2] JIS B 9960-1: Safety of machinery – Electrical equipment of machine (Part1: General requirement)

JIS B 8433 : Manipulating industrial robots - Safety

[Note 3] Labor Safety and Health Act .....etc.

- ◎ This product is designed and manufactured as a component for using in general industrial machinery.
- ◎ Please make sure to acquire the product specifications from the system designer or someone who has sufficient knowledge and experience. In addition, please read the details of the “Technical Manual” and “Software Operating Manual” carefully and take the educational training for related safety prior to operating this product.
- ◎ If the gripper is integrated in a system (machine, robot, etc.), the system needs to meet the regulations and standards for safety measures. Check if the system satisfies the regulations and standards first. If so, properly handle the product in accordance with the regulations and standards.
- ◎ All situations are not covered by the “Danger” , “Warning” , and “Caution” safety signs. For more details, be sure to read the instruction manuals thoroughly before operation.

### **Danger**

- ◎ Do not use the product outside specifications. It may cause the product to fail, stop functioning or sustain damage. It may also significantly reduce the service life of the product.
- ◎ If the machine will stop in the event of system problem such as emergency stop or power failure, design a safety circuit or other device to prevent equipment damage or injury.
- ◎ Do not use this product in a place exposed to ignitable, inflammable or explosive substances.
- It may explode or ignite, resulting in product damage or injury. Hot swapping is forbidden.
- ◎ Please follow the instruction manual when wiring the product. For plug in/plug out of the wire, connect to the terminal quickly and reliably.
- ◎ Please do not use the product with water and oil to avoid electric shock or fire.
- ◎ Before supplying power and operating the product, always check the operation area of the

equipment to ensure safety. When operating or adjusting the gripper, be sure to observe safety measures for the system.

⊙ Please do not disassemble, or modify the product to avoid personal accident, electric shock, fire or damage.

### Warning

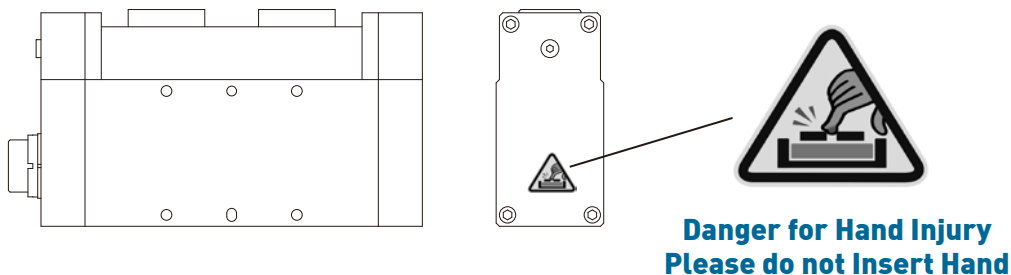
- ⊙ Do not expose the product to radiant heat generated from a heat source, and use the product within the ambient temperature range of 5°C to 45°C .
- ⊙ Use the product in humidity range of 35% to 85% (without dew condensation).
- ⊙ Please use the product below altitude of 1000 meters.
- ⊙ Please use when environmental illumination is greater than 500 lux.
- ⊙ Do not use the product in an atmosphere of corrosive gases (sulfuric acid or hydrochloric acid). Rust may form and reduce the structural strength of the product.
- ⊙ Do not use the product in a place exposed to dust, or iron powder. If dust enters the product through small openings and gaps, the product may suffer damage.
- ⊙ Please do not use the product near severe vibration.
- ⊙ Please do not use the product near strong electromagnetic waves, locations that may generate high current, welding operations which may generate electric arc, locations that may generate interference due to static electricity to avoid the abnormal operation of product.
- ⊙ Please mount the product and jaws with adequate screw tightening torque.
- ⊙ Please do not approach or touch the product while the product is operating.
- ⊙ When a person is accidentally caught into the machine, please turn off the power supply immediately or push the emergency stop button of external safety loop device, and then adjust the jaws position or remove the jaws manually for disengagement.
- ⊙ Do not touch the connectors or exposed terminals of the controller. Doing so may result in electric shock.
- ⊙ Turn off the power to the product in the event of power failure. Failure to do so may cause the product to suddenly start moving when the power is restored, resulting in injury or product damage.
- ⊙ If the product is generating heat, smoke, a strange smell or continual noise, turn off power immediately. Continuing to use the product may result in product damage or fire.
- ⊙ When the product gripping workpiece loses the position coordinate, or the original point return (RESET) cannot be performed due to the product gripping workpiece after starting the product, please move the product to the safe area first, and then set the parameters of the software interface [XEG-W1]. In the JOG mode, or in the reverse direction GRIP operation, after confirming that the workpiece is released, then performed the origin return.
- ⊙ If the product does not activate while gripping a workpiece, please cut off the power immediately. Remove the workpiece by adjusting the jaws position or removing the jaws manually. After the abnormal state is corrected restart the power.
- ⊙ Please do not grip live or hazardous objects.
- ⊙ Prevent load from applying force to one jaw when gripping a workpiece.
- ⊙ When the product is activated, please do not apply any external force on the gripper.
- ⊙ After the product output the HOLD signal, if the GRIP command is executed, it is necessary to confirm that the gripping stroke and whether the motor are out of step, causing the workpiece to fall.

## Caution

- ⦿ Do not hold moving parts of the product or its cables during installation. It may result in injury.
- ⦿ Do not insert a finger or object in the openings in the product. It may cause fire, electric shock, or injury.
- ⦿ The motor generates a large amount of heat during operation, and the product surface temperature is high. Ensure this will not affect a workpiece near the gripper.
- ⦿ The actuator cables with the product are flexible, but do not store the cables in a movable cable duct that bends more than the specified bending radius. ( $R_b \geq 63\text{mm}$ )
- ⦿ Do not scratch the actuator cables. Please perform periodic inspections monthly. Scratching, forcible bending, straining, winding, and pinching may cause short circuit and insulation failure, which results in electric shock and malfunction.
- ⦿ When the product is unusable and scrapped, please follow the local waste disposal regulations for handling.
- ⦿ When using this product, please wear safety shoes or the related protective equipment.
- ⦿ The mounting face has holes and slots for positioning. Make use of them if necessary.
- ⦿ Design the jaws to be lightweight and minimum length.
- ⦿ Mass of a workpiece that the jaws can grip greatly differs depending on the material quality, shape, and gripping surface condition of the jaws.
- ⦿ Use speed and parameters appropriate with the product to avoid making a great impact to the jaws.
- ⦿ Please assure there is sufficient space for maintenance and inspection, and perform regular maintenance every six (6) months or after activating the product 500,000 times.
- ⦿ Please perform maintenance of transmission components in manual mode. After adjusting the gripper to the maximum opening position, please use the greasing device to replenish the grease or apply the grease on the screw shaft and both sides of groove.
- ⦿ The measured result of actual noise level for product is 61.2 dB. (Conditions: distance from the product is 1 meter, height from the ground is 1.6 meters, maximum speed is 80% operating). If the noise level is over 80dB(A) during operation, personal protective equipment is required.

## 1.2 Warning Sign Location & Description

The warning sign shown below will be on the product to ensure the proper and safe operation.



## 1.3 Warranty Coverage

The warranty period for the product is 12 months or 5 million operations (whichever comes first), but it does not include any of the following causes of failure:

- ⊙ Beyond the operation method, operating environment and storage specifications defined in the product manual.
- ⊙ The damage caused by installation place movement, change of working environment, or improper transfer after being installed by a professional installer.
- ⊙ Product damaged due to collision or accident caused by improper operation or installation.

The following conditions are not covered by the warranty.

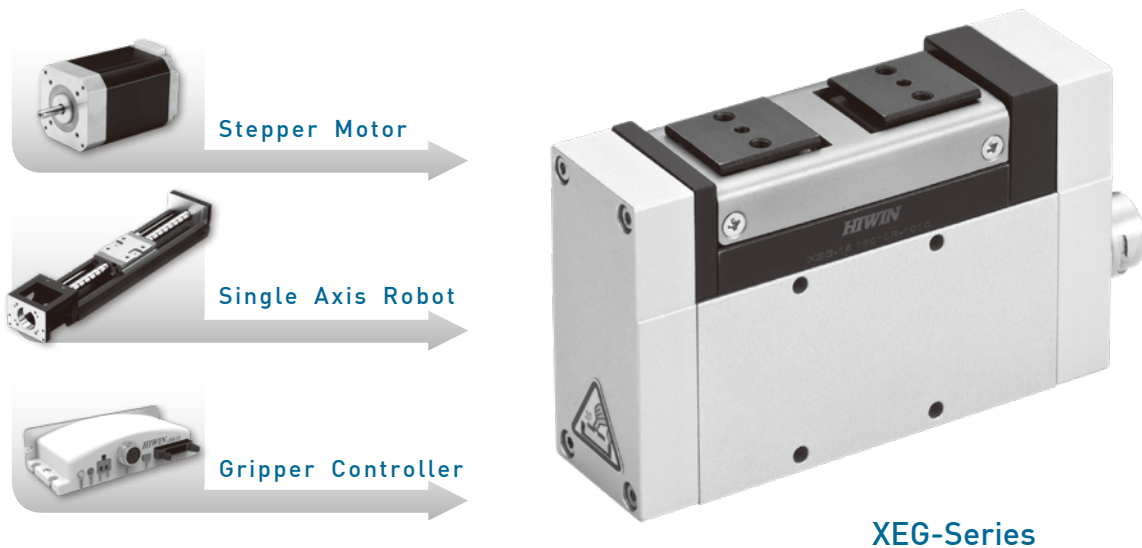
- ⊙ Product serial number or date of production(month and year) can not be verified.
- ⊙ Gripper body and control components using non-Hiwin original products.
- ⊙ Adding or removing any element into/out the gripper or the controller.
- ⊙ Modifying the wire or the cables between the gripper body and the controller.
- ⊙ Any modification of the appearance of the gripper or controller; removal of the components inside the gripper or the controller. e.g., demolition of the outer covering,product drilling or cutting.
- ⊙ Damage caused by any natural disaster. i.e., fire, earthquake, tsunami, lightning, windstorms, floods etc.

HIWIN does not provide any warranty or compensation to all the damage caused by above-mentioned circumstances unless the user can prove that the product is defective.

For more information towards warranty terms and conditions, please contact the technician or the dealer who you purchased with.

## 2. Electric Gripper

### 2.1 Features



- The whole series adopts stepper motor with encoder, which has signal output such as status return, abnormal alarm and object identification.
- The use of a miniature both-hand linear module to achieve the advantages of high speed, high precision, high rigidity, high efficiency and small size.
- Provide with intelligent functions such as origin return and gripping force model establishment, adaptive capture and model adjustment, energy saving and temperature measurement.
- Direction of movement, stroke, gripping force and speed etc. can be set, and the operating software has the function of using history record.
- Support serial and I/O signal communication, more flexible and convenient to use.
- All series achieve RoHS, uses lowest water pollution level(WGK1) grease and environmentally friendly packaging materials(NBSK).
- In 2017, we won the Good Design Award in Japan and Taiwan Excellence Award.

#### Function Setting:

- **Gripping force control**

- The gripping force can be set by increments of 1% in the range of 40 to 100%.
- Gently apply gripping force to components that are susceptible to deformation or damage.

- **Position control**

- The position setting and measurement can be adjusted by a minimum value of 0.01mm.
- Gripping position will be checked by the HOLD signal output to verify if the gripper is in the set range.

- **Speed control**

- Motion speed can range from 1 to 100 mm/s by increments of 1 mm/s.
- Applies to fast tact times and low impacts.



- **Multi-point position control**

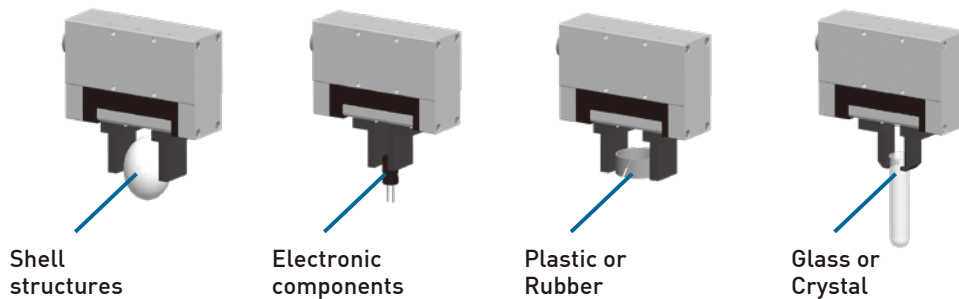
- I/O signal communication mode: 30+1(original point)group of action mode can be stored; Serial communication mode: No limit for action group

- **Identifying by position detection**

- In I/O signal communication mode, provided 3 kinds of work object of the external size detection and identification; In serial communication mode, the number of work object is not limited and also the measurement size value can be fed back.

## 2.2 Applications

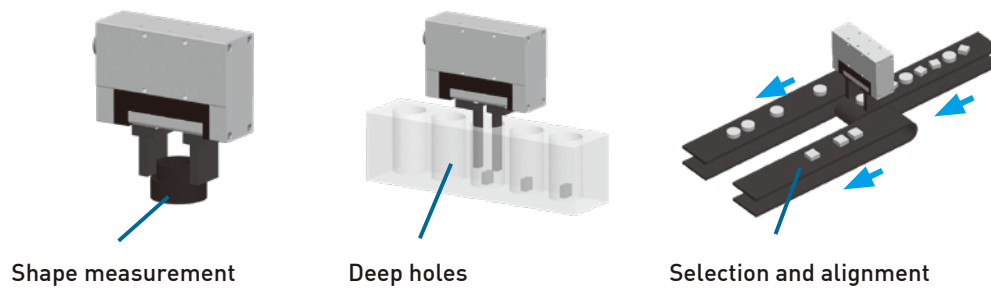
Gripping of parts that are easily deformed or damaged.



Measurement

Gripping in a narrow space

Detection / Identification



## 2.3 Specifications

Model		XEG-16	XEG-32	XEG-64	
Electric gripper	Stroke [both sides] (mm)	16 ±0.5	32 ±0.5	64 ±0.5	
	Gripping Force (N)	25~50	60~150	180~450	
	Speed (mm/s)	Motion	1~60	1~80	1~100
		Gripping[Note2]	1~10	1~20	1~20
	Repeatability (mm)	±0.01	±0.01	±0.02	
	Drive Device	Single axis robot			
	Grease Supply of Drive Device[Note3]	500,000 cycles or 6 months			
	Impact /Vibration Resistance (m/s <sup>2</sup> )	150 / 30			
	Operating Temperature Range (°C)	5 ~ 45			
	Operating Humidity Range (%)	RH 35~85 (No condensing)			
	IP Class	IP20			
Weight (kg)	0.4	0.7	1.9		
Controller	Motor Type	Stepper motor			
	Motor Size (mm)	□ 20	□ 28	□ 42	
	Power Supply (V)	DC 24 ± 10%			
	Total Current (A)	0.5A			
	Weight (Kg)	0.15			

[Note 1] The weight of workpiece(kg) \* acceleration of gravity 9.81(m/s<sup>2</sup>) should be 1/10~1/20 of the gripping force(N).If the gripper holding a workpiece moves or turns with high-acceleration/ deceleration, choose the model with higher force allowance.

[Note 2] Set the parameters and operation mode to avoid application of excessive impact force to the attachments (fingers) during operation.

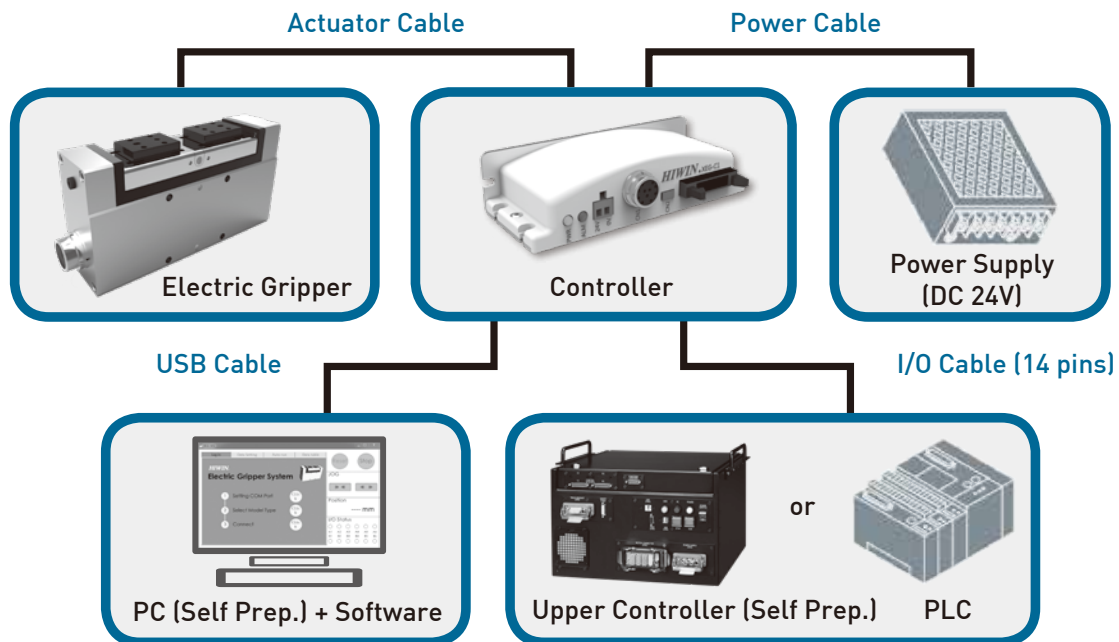
[Note 3] Apply proper amount of grease to the grease hole of single axis robot by a grease supply device or on the surface of ball screws with brushes.

[Note 4] Mass of a workpiece that the attachments (fingers) can grip greatly differs depending on the material quality, shape, and gripping surface condition of the attachments (fingers). Design the attachments (fingers) to be lightweight and minimum length.

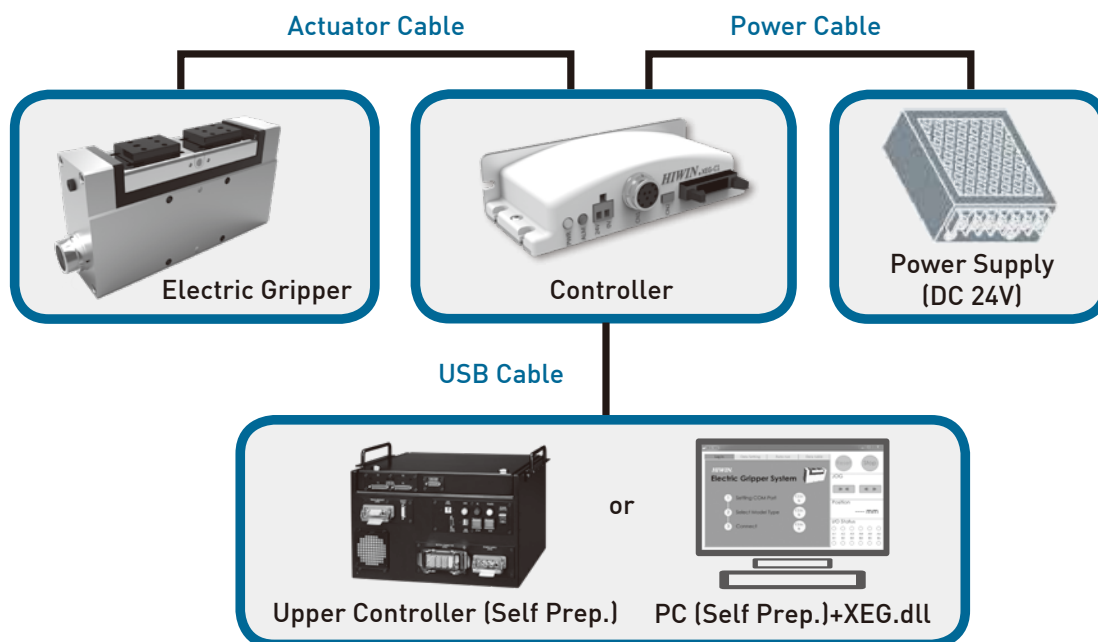
[Note 5] The gripping force of the specification sheet is measured at a speed of 2mm/s and a gripping point(L) of 20mm. The accuracy of the maximum gripping force is XEG-16 : ±30%、XEG-32 : ±16.6%、XEG-64 : ±13.3%.

## 2.4 System Construction

- Communication method : I/O signal



- Communication method : Serial Communication RS232



[Note 1] Actuator cable length: 1.5m (standard), 3m, 5m.

[Note 2] I/O cable length: 1.5m (standard), 3m, 5m or produced upon receipt of order.

[Note 3] Communication cable length: 1.5m (standard)

[Note 4] Power supply plug only.

[Note 5] XEG Dynamic-Link Library (.dll) and user manual, please visit HIWIN official website to download.

## 2.5 Specification Illustration

The model number of Electric Gripper series contains the type, size, other kinds of cable length or special order, etc..

### **XEG - 16 - C1 10 1 - W1 - S**

A      B      C      D      E      F      G

Code	Item	Illustration
A	Type	XEG : 2-finger type
B	Model	16 : total stroke is 16 mm
		32 : total stroke is 32 mm
		64 : total stroke is 64 mm
C	Controller	C1 : controller
D	Actuator Cable Length and Connector Type [Note1]	10 : 1.5M (Standard)
		1L : 1.5M-Right Angle type
		30 : 3.0M
		3L : 3.0M-Right Angle type
		50 : 5.0M
		5L : 5.0M-Right Angle type
E	I/O Cable Length	1 : 1.5 M (standard)
		3 : 3 M
		5 : 5 M
F	Controller Setting Kit	W1 : software
G	Note	S : Customized order
		TM : TM Plug & Play Version [Note2]
		UR : UR+ Solutions [Note 3]

[Note1] Left side connector of the actuator cable connects to the electric gripper, and right side connector of the actuator cable connects to the controller.

[Note2] Please refer to HIWIN official website "TM quick installation guide".

[https://www.hiwin.tw/download/tech\\_doc/ee/TM\\_Plug&Play\\_Version.pdf](https://www.hiwin.tw/download/tech_doc/ee/TM_Plug&Play_Version.pdf)

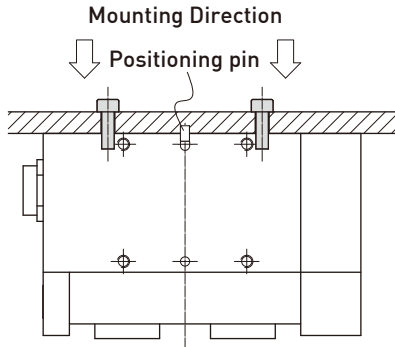
[Note 3] Please refer to HIWIN official website "UR+ Technical Manual Guide".

[https://www.hiwin.tw/download/tech\\_doc/ee/UR\\_Plus\\_Technical\\_Manual\\_Guide.pdf](https://www.hiwin.tw/download/tech_doc/ee/UR_Plus_Technical_Manual_Guide.pdf)

10		1L	
30		3L	
50		5L	

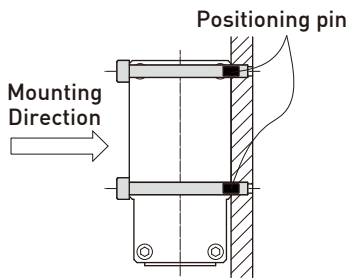
## 2.6 Mounting Method

### A. When using the thread on the body



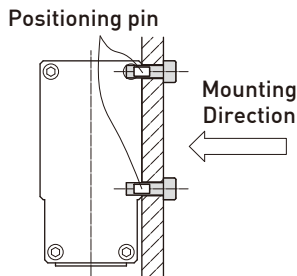
Model	Bolt	Recommended tightening torque (N*m)	Effective depth (mm)
XEG-16	M3x0.5P	0.6~0.8	3.5
XEG-32	M4x0.7P	1.2~1.6	4.5
XEG-64	M6x1P	4.6~5.2	8

### B. When using the thread on the mounting plate



Model	Bolt	Recommended tightening torque (N*m)
XEG-16	M2.5x0.45P	0.4~0.6
XEG-32	M3x0.5P	0.6~0.8
XEG-64	M5x0.8P	2.8~3.4

### C. When using the thread on the back of the body



Model	Bolt	Recommended tightening torque (N*m)	Effective depth (mm)
XEG-16	M3x0.5P	0.6~0.8	8
XEG-32	M4x0.7P	1.2~1.6	10
XEG-64	M6x1P	4.6~5.2	12

[Note 1] Do not drop or hit the gripper when mounting to avoid scratches and dents. It might cause the deterioration of accuracy and operation failure.

[Note 2] Tighten the mounting screw of the products with the specified torque.

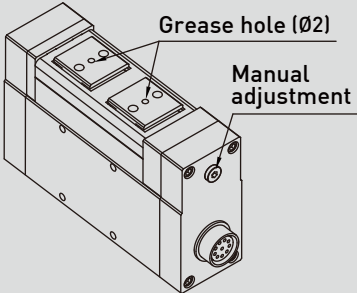
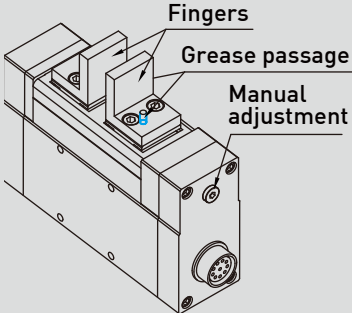
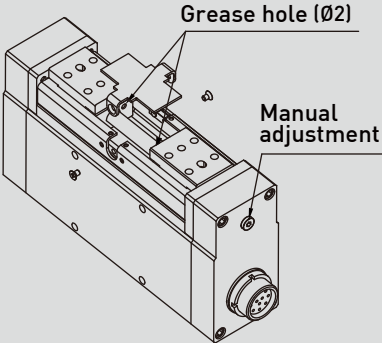
[Note 3] Tighten the mounting screw of the attachments (fingers) with the specified torque as below table.

[Note 4] The mounting face has holes and slots for positioning. Make use of them if necessary.

Model	Bolt	Recommended tightening torque (N*m)	Effective depth (mm)
XEG-16	M3x0.5P	0.6~0.8	5
XEG-32	M3x0.5P	0.6~0.8	4
XEG-64	M4x0.7P	1.2~1.6	8

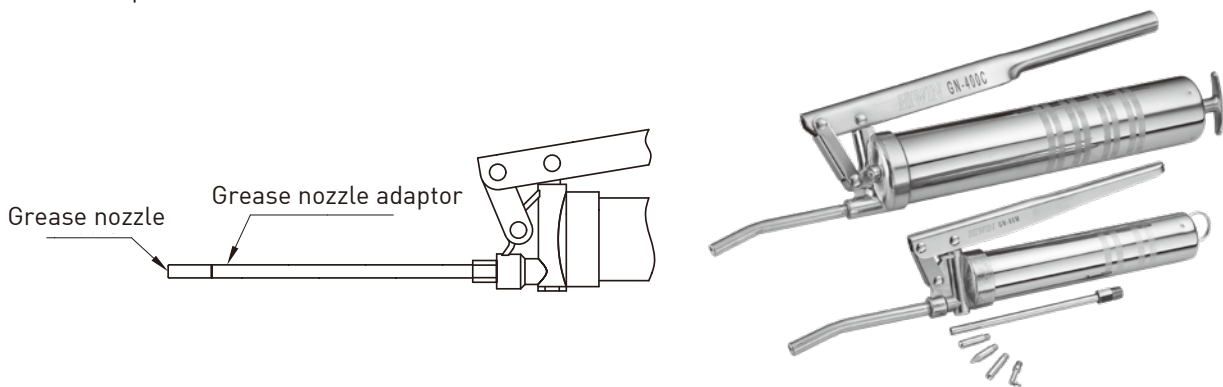
## 2.7 Maintenance

### 2.7.1 Applying Grease to Single Axis Robot

XEG-16	XEG-32, XEG-64
<p>⊙ Apply proper amount of grease to the grease hole of single axis robot with a grease supply device or on the surface of ball screws with brushes.</p>  <p>⊙ When mounting the fingers, a grease passage on the fingers may be necessary.</p> 	<p>⊙ Turn off power supply after adjusting the gripper to the maximum opening position; or under the power off condition, adjusting the gripper to the maximum opening position manually after removing the bolt on the manual adjustment part.</p> <p>⊙ After removing the bolts on the dust cover, align the nozzle of greasing device to the grease holes shown in the figure below, and then proceed the lubrication maintenance.</p> 

### 2.7.2 Greasing Device for Electric Gripper

The greasing device for electric gripper includes grease gun, grease nozzle adaptor, grease nozzle and lubricating grease which are available for customers to select based on their usage requirements.



• Grease Gun (Optional Item)

Model no.	GN-80M	GN-400C
Dimensions		
Spec.	<ol style="list-style-type: none"> <li>Working pressure: 15 MPa</li> <li>Output: 0.5~0.6 c.c./Stroke</li> <li>Weight: 520 g (grease excluded)</li> <li>Grease reload: 70 g flexible tube or 120 ml bulk loading</li> </ol>	<ol style="list-style-type: none"> <li>Working pressure: 15 MPa</li> <li>Output: 0.8~0.9 c.c./Stroke</li> <li>Weight: 1150 g (grease excluded)</li> <li>Grease reload: 14 o.z. cartridge pipe or 400 ml bulk loading</li> </ol>

• Grease Nozzle Adaptor (Standard Item)

Model no.	Dimensions
GT-PT1/8-M5	

• Grease Nozzle (Standard Item)

Model no.	Dimensions	Lubricating Type
GNZ-L-M5		Minimized grease hole
GNZ-C1-M5		Nipple (M3 Thread)

• Lubricating Grease for Electric Gripper (Optional Item)

It is recommended that lubricating grease used for the electric gripper have high wear resistance, low friction resistance and water resistance such as HIWIN G04 or other lubricating grease with similar features.

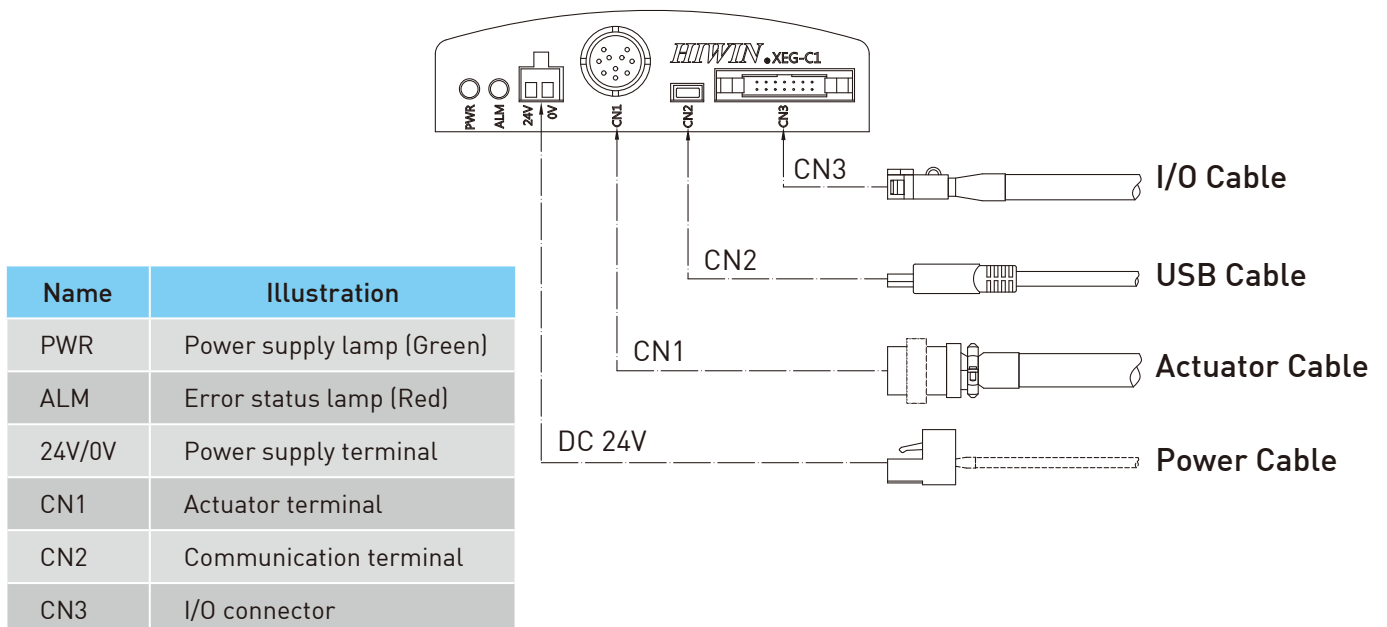
Grease	HIWIN G04	
Color	Cream	
Base Oil	Lipid/PAO	
Thickener	Lithium Soap Based	
Applicable Temperature(°C)	35~120	
Dropping Point(°C)	> 225	
Penetration (0.1mm)	260-280	
Viscosity(cst)	40°C	25
	100°C	6
4 ball test (ASTM D2266)	418 m	

## 3. Electric Gripper Controller

### 3.1 Controller Specifications

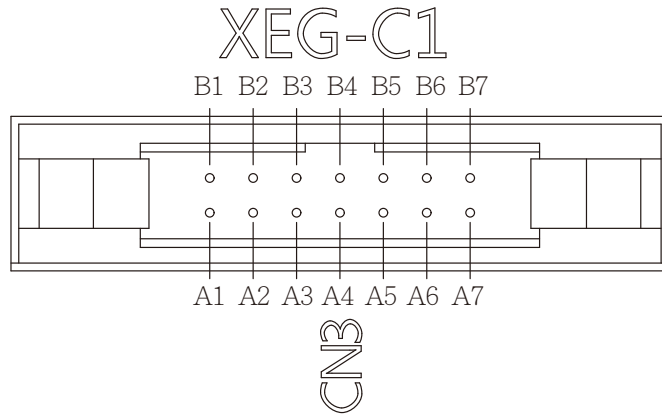
Item		Specifications
Compatible Motor		Stepper motor
Compatible Encoder		Optical rotary encoder
Min. Setting Position (mm)		0.01
Number of Points	External I/O	30 points + original point
	Serial Communication	Not limited
External I/O	Input	5 points: Command point setting 1 point: Command input
	Output	6 points: Control output
Serial Communication		RS232
LED indicator		Power supply lamp: (PWR: green)
		Error status lamp: (ALM: red)
Power Supply (V)		DC 24 ± 10%
Total Current (A)		0.5A
Operating Temperature Range (°C)		5 ~ 45
Operating Humidity Range (%)		RH 35~85 (No condensing)
Insulation Resistance (MΩ)		10 (DC500V)
Weight (kg)		0.15
IP Classification		IP20

### 3.2 Names and Functions of Parts





### 3.3 I/O connector Illustration



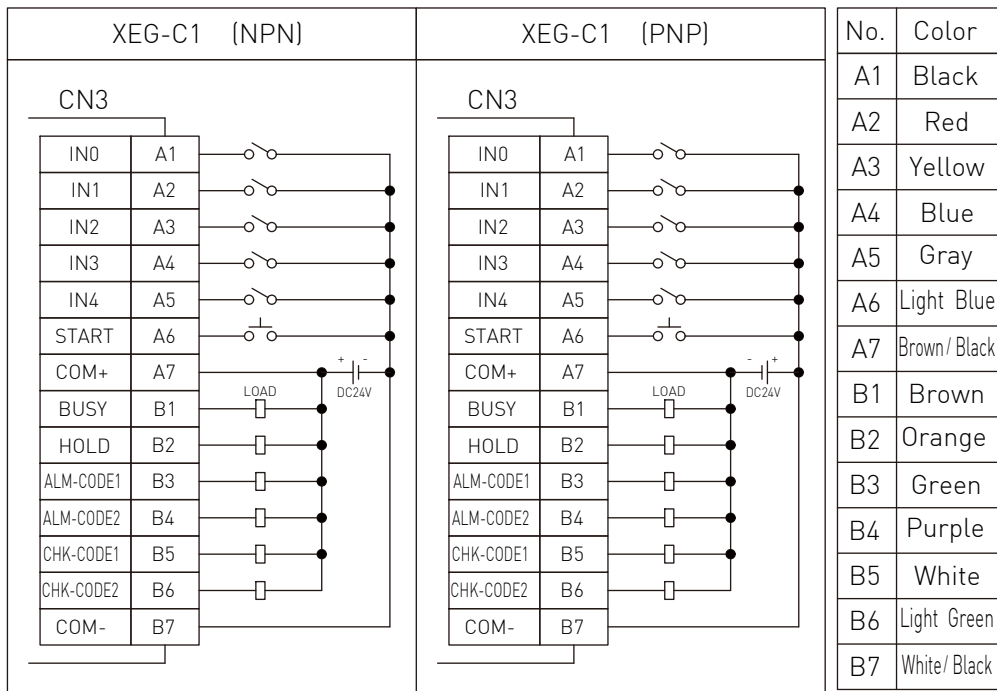
No.	I/O	Symbol	Function
A1	Input	IN0	Position data bit0
A2		IN1	Position data bit1
A3		IN2	Position data bit2
A4		IN3	Position data bit3
A5		IN4	Position data bit4
A6		START	Command input
A7		COM+	Common ground(+)
B1	output	BUSY	Executing command
B2		HOLD	Gripping range check
B3		ALM-CODE1	Error status number
B4		ALM-CODE2	
B5		CHK-CODE1	Identification number
B6		CHK-CODE2	
B7		COM-	Common ground(-)

[Note 1] After the controller firmware version is V2.0.16(inclusive), when the pins of A6,A7 and B7 are connected to 0V,24V and 0V respectively, the firmware version update mode is entered, and the controller status abnormality indicator is displayed. (ALM) will continue to flash. For more details, please refer to the "XEG-C1 Firmware Update User's Manual".

### 3.4 Error Status / Identification Number Illustration

CODE1	CODE2	Error status	Identification
0	0	-	-
1	0	Position fault	Workpiece 1
0	1	Over travel	Workpiece 2
1	1	Original point fault	Workpiece 3

### 3.5 External Wiring Diagram



### 3.6 Description of Motion Signal

Input signal Motion No.	A1	A2	A3	A4	A5
No.1	1	0	0	0	0
No.2	0	1	0	0	0
No.3	1	1	0	0	0
No.4	0	0	1	0	0
No.5	1	0	1	0	0
No.6	0	1	1	0	0
No.7	1	1	1	0	0
No.8	0	0	0	1	0
No.9	1	0	0	1	0
No.10	0	1	0	1	0
No.11	1	1	0	1	0
No.12	0	0	1	1	0
No.13	1	0	1	1	0
No.14	0	1	1	1	0
No.15	1	1	1	1	0
No.16	0	0	0	0	1
No.17	1	0	0	0	1
No.18	0	1	0	0	1
No.19	1	1	0	0	1
No.20	0	0	1	0	1
No.21	1	0	1	0	1
No.22	0	1	1	0	1
No.23	1	1	1	0	1
No.24	0	0	0	1	1
No.25	1	0	0	1	1
No.26	0	1	0	1	1
No.27	1	1	0	1	1
No.28	0	0	1	1	1
No.29	1	0	1	1	1
No.30	0	1	1	1	1
No.31	1	1	1	1	1

[Note 1] Motion No. selection is based on the combined input signal A1~A5 in binary format. (1: ON, 0: OFF)

[Note 2] Motion No. 31 is preset to RESET.

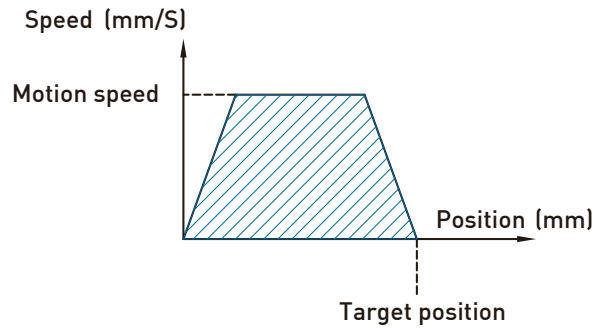
### 3.7 Operation Modes

Mode	Speed	Direction	Function	Diagram
Movement	Acceleration & deceleration	Absolute position	Fast motion	
Gripping	Constant speed	Relative position	Gripping unknown shape of workpiece	
	Acceleration & deceleration		Gripping of workpiece with fast tact and low impact	
Detection	Constant speed	Relative position	Judgment of acceptability of gripping size	
	Acceleration & deceleration			
Identification	Constant speed	Relative position	Identification of gripping size	

## 3.8 Parameter Setting

### 3.8.1 Fast move

- Moving with the specified motion speed to the target position.



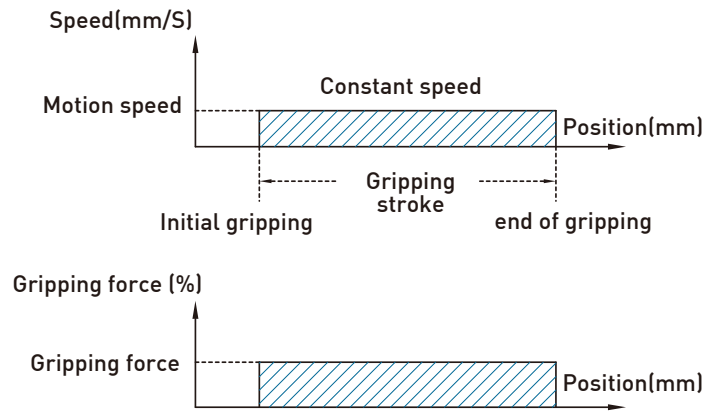
- Parameters setting

Item	Description
Move position	Move to the target position.
Move speed	Transfer speed to the target position.[Note 1]

[Note 1] If the move speed is excess of the allowance, the system will set the fastest speed according to the position and acceleration.

### 3.8.2 Unknown workpiece size gripping / identifying by position detection

- Use specified gripping speed and gripping force to grip workpiece from the initial gripping position until workpiece is gripped or the end of gripping position is reached.

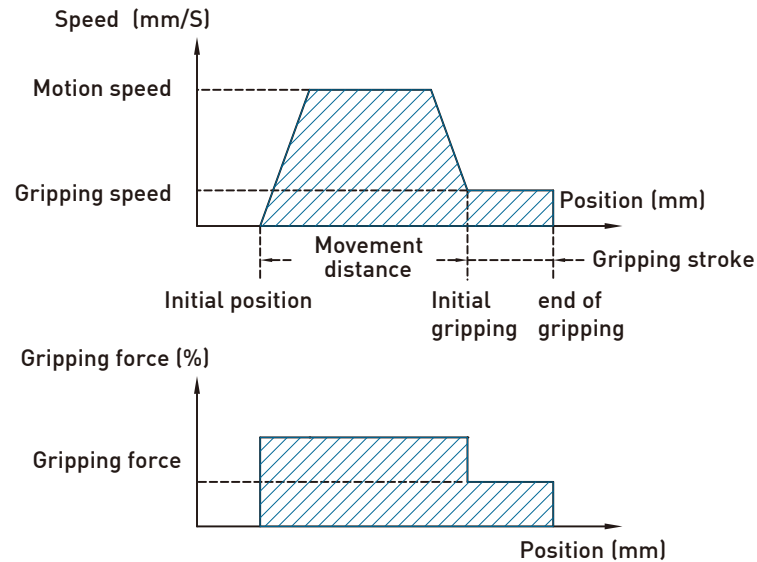


- Parameters setting

Item	Description
Direction	The relative position is required, set "open" or "close" .
Gripping stroke	From the initial gripping position to the end of gripping position.
Gripping speed	Constant speed to the end of gripping position.[ref. ch4-5]
Gripping force	The setting range differs depending on the electric gripper type. [ref. ch4-3]

### 3.8.3 Fast move gripping of known workpiece size

- Move with the specified gripping speed from the initial position to the initial gripping position first and grip workpiece with the specified gripping speed and gripping force in the gripping stroke.



- **Parameters setting**

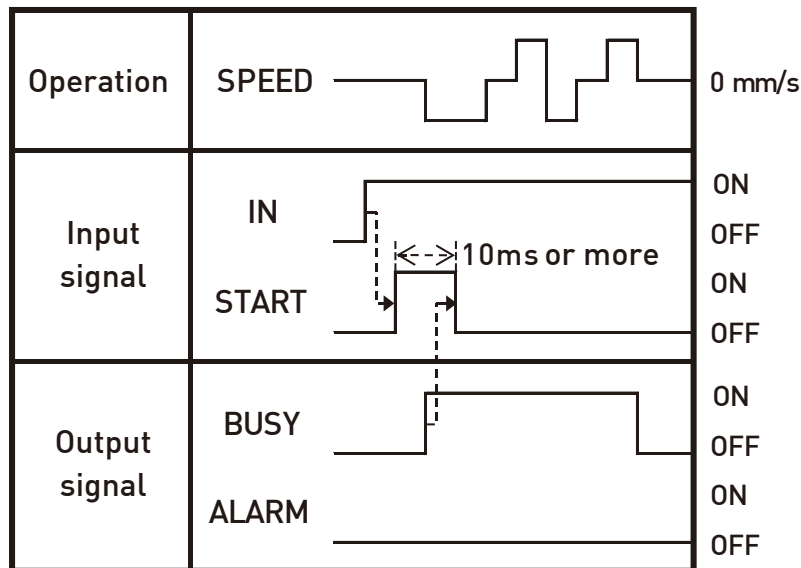
Item	Description
Direction	The relative position is required, set "open" or "close" .
Move position	From the initial position to the initial gripping position.
Move speed	Transfer speed to the initial gripping position. [Note 1]
Gripping stroke	From the initial gripping position to the end of gripping position.
Gripping speed	Constant speed to the end of gripping position.[ref. ch4-5]
Gripping force	The setting range differs depending on the electric gripper type. [ref. ch4-3]

[Note 1] If the move speed is excess of the allowance, the system will set the fastest speed according to the position and acceleration.

### 3.9 I / O Signal Setting

#### 3.9.1 I/O signal setting of original point return (Initial position must be established after turning on power.)

- **Motion description:** Moving from the initial position toward the original position with constant speed after confirming the original position and complete the gripping force model, it will move to the maximum travel position.



[Description 1] After turning on the power, encoder will confirm the original position through the reversionary motion of origin.

[Description 2] The built-in reversion of origin is the opening of IN0 \ IN1 \ IN2 \ IN3 \ IN4. It can also be set up by the user separately.

[Description 3] It is necessary that the timing of opening the input signal START is to be the time of opening the input signal IN afterward.

[Description 4] It is necessary that the timing of ending the input signal START is to be the time of opening the output signal BUSY afterward, and recommended that is to be pending over 10ms after opening the output signal START.

[Description 5] After ending the output signal BUSY, it indicates that the motion is ended.

[Description 6] If the abnormal state appears during the motion process or after the ending of motion, the output signal ALARM will be opened.

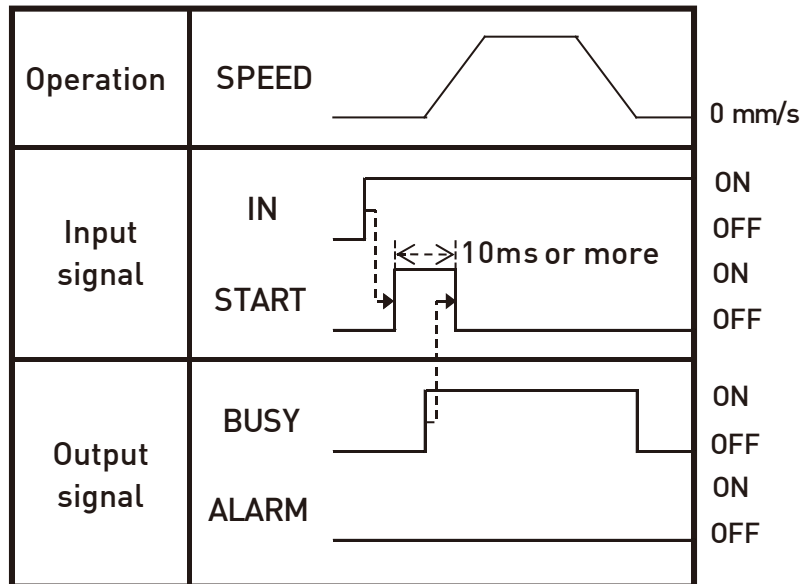
[Description 7] If the output signal ALARM is opened, please confirm if there is any foreign matter during operation, or overtravel due to interference from the attachments (fingers) etc., please re-operate and return to original point as necessary.

[Description 8] When the product gripping workpiece loses the position coordinate, or the original point return (RESET) cannot be performed due to the product gripping workpiece after starting the product, please move the product to the safe area first, and then set the parameters of the software interface (XEG-W1). In the JOG mode, or in the reverse direction (GRIP) operation, after confirming that the workpiece is released, then performed the origin return.



### 3.9.2 I/O signal setting of fast move

- **Motion description: Moving with the specified motion speed to the target position.**



[Description 1] It is necessary that the timing of opening the input signal START is to be the time of opening the input signal IN afterward.

[Description 2] It is necessary that the timing of ending the input signal START is to be the time of opening the output signal BUSY afterward, and recommended that is to be pending over 10ms after opening the output signal START.

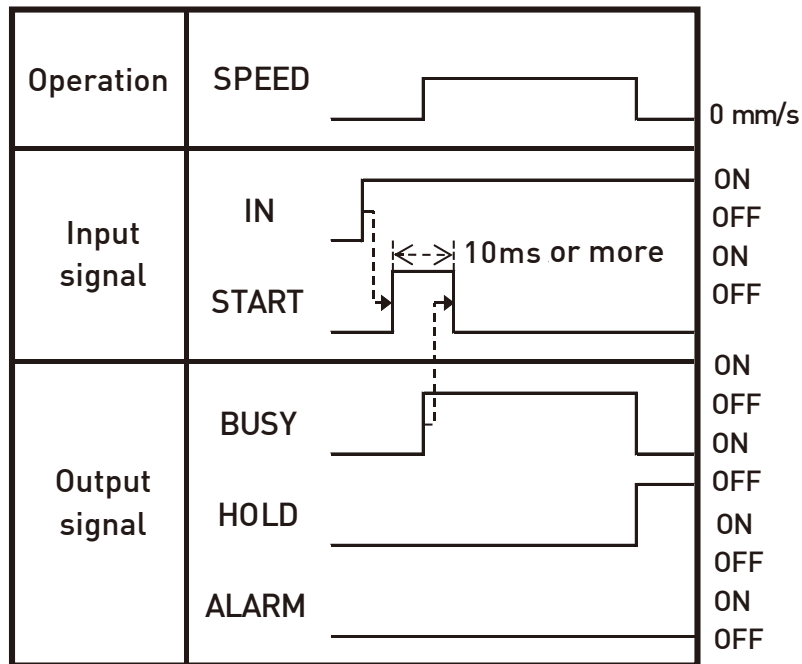
[Description 3] After ending the output signal BUSY, it indicates that the motion is ended.

[Description 4] If the abnormal state appears during the motion process or after the ending of motion, the output signal ALARM will be opened.

[Description 5] If the output signal ALARM is opened, please follow the abnormal state instructions of output signal ALM-CODE for troubleshooting.

### 3.9.3 I/O signal setting of gripping irregular workpiece

- **Motion description:** Using the specified gripping speed and gripping force to grip the workpiece from the initial gripping position until the workpiece is gripped or the end of gripping position is reached.



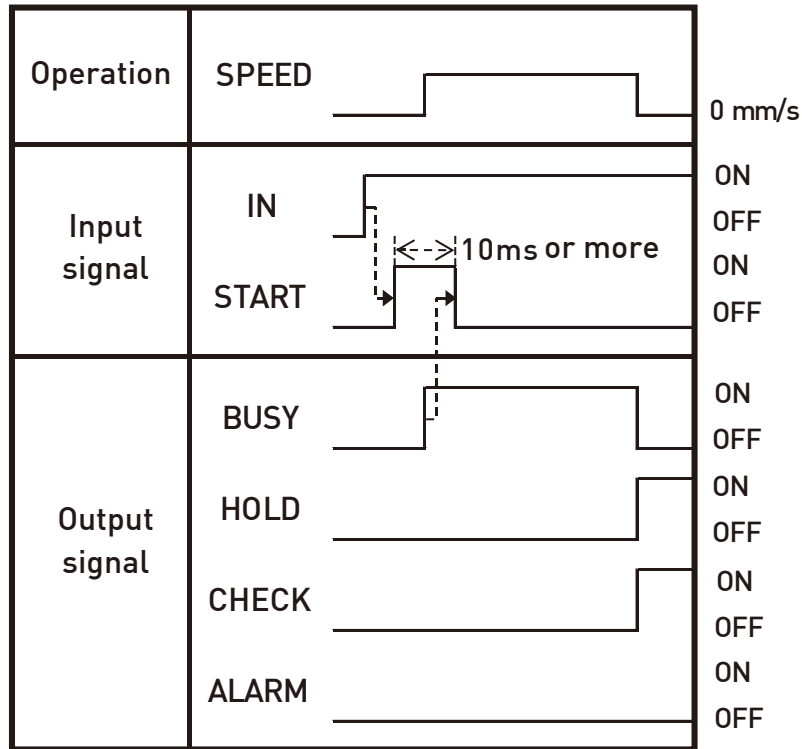
[Description 1] It is necessary that the timing of opening the input signal START is to be the time of opening the input signal IN afterward.

[Description 2] It is necessary that the timing of ending the input signal START is to be the time of opening the output signal BUSY afterward, and recommended to be pending over 10ms after opening the output signal START.

[Description 3] After ending the output signal BUSY, it indicates that the motion is ended and the output signal HOLD is also opened indicating that the gripping motion is completed. If the output signal HOLD is not opened, it indicates that the gripped motion is not completed.

### 3.9.4 I/O signal setting of workpiece recognition or size detection

- **Motion description:** Using the specified gripping speed and gripping force to grip the workpiece from the initial gripping position until the workpiece is gripped or the end of gripping position is reached.



[Description 1] It is necessary that the timing of opening the input signal START is to be the time of opening the input signal IN afterward.

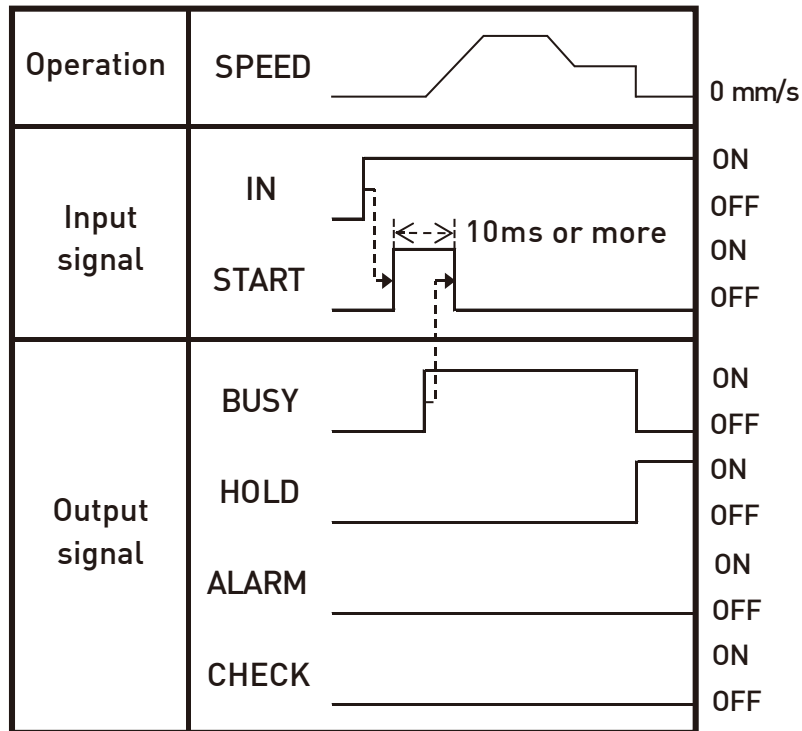
[Description 2] It is necessary that the timing of ending the input signal START is to be the time of opening the output signal BUSY afterward, and recommended to be pending over 10ms after opening the output signal START.

[Description 3] After ending the output signal BUSY, it indicates that the motion is ended and the output signal HOLD is also opened indicating that the gripping motion is completed. If the output signal HOLD is not opened, it indicates that the gripped motion is not completed.

[Description 4] If workpiece recognition and size detection are performed, after opening the output signal HOLD, output signal CHECK will also be opened. Please follow the output signal CHK-CODE to perform workpiece recognition and size detection.

### 3.9.5 I/O signal setting for fast move gripping of known workpiece size

- **Motion description:** After moving fast from the initial position to the gripping position, using the specified gripping force and gripping speed to grip the workpiece until the end of gripping position is reached.



[Description 1] It is necessary that the timing of opening the input signal START is to be the time of opening the input signal IN afterward.

[Description 2] It is necessary that the timing of ending the input signal START is to be the time of opening the output signal BUSY afterward, and recommended to be pending over 10ms after opening the output signal START.

[Description 3] After ending the output signal BUSY, it indicates that the motion is ended and the output signal HOLD is also opened indicating that the gripping motion is completed. If the output signal HOLD is not opened, it indicates that the gripped motion is not completed.

[Description 4] If an abnormal state appears during the motion process or after the ending of motion, the output signal ALARM will be opened.

[Description 5] If the output signal ALARM is opened, please follow the abnormal state instructions of output signal CHECK for troubleshooting.

## 4. Process for Model Selection

### 4.1 Example of Model Selection

If the weight of gripped workpiece is 0.3kg, distance of gripping point is 35mm, gripping speed is 5mm/s and pitch moment (Mp) of a static load  $f = 10$  (N) is applied on the gripping point. What is the model to be selected?

- **Process for Model Selection**

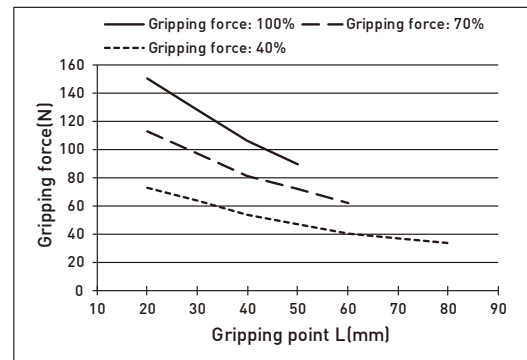


- **Step 1: Confirm gripping force (Section 4-2, 4-3)**

According to Section 4-2, the recommended gripping force to be selected shall be 10-20 times of workpiece weight. Therefore, the recommended gripping force will be over 58.8(N).

$$(F=0.3\text{kg} \times 20 \times 9.8 \text{ m/s}^2 = 58.8\text{N})$$

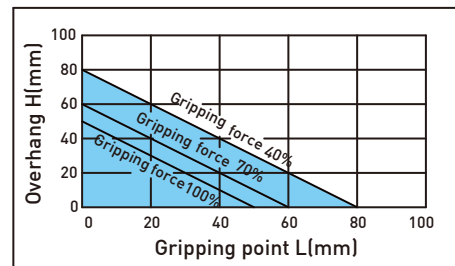
If the model of XEG-32 electric gripper is selected, from both of the cross point of gripping distance  $L=35\text{mm}$  and gripping force 100%, the gripping force will all be 118N.



- **Step 2: Confirm gripping point & overhang (Section 4-4)**

According to the cross point of gripping point  $L=35$  and overhang  $H=0$ , the usage range of gripping force 100% can be acquired.

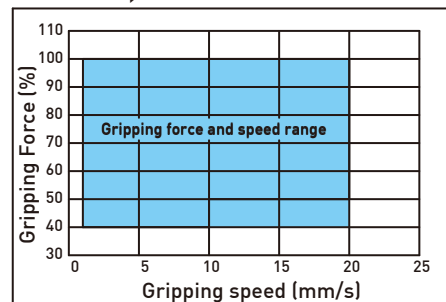
**XEG-32**



- **Step 3: Confirm gripping speed (Section 4-5)**

According to the cross point of gripping force 100% and gripping speed 5 mm/s, the satisfaction condition of gripping speed can be acquired.

**XEG-32, XEG-64**



• Step 4: Confirm external load (Section 4.6)

According to Section 4.6, the pitch moment (Mp) of XEG-32 is 7.72 (N-m). Based on the following calculation result, the allowable external load that can be withstood is 220(N). Therefore, it can be applied.

$$\text{Allowable Load } F(\text{N}) = \frac{\text{Static Allowable Moment } M(\text{N-m})}{L(\text{m})} = \frac{7.72}{0.035} = 220 > 10 \text{ (External Load)}$$

## 4.2 Calculation of Gripping Force

(Gripping force at least 10 to 20 times of the workspace weight)

When gripping a workpiece as in the figure:

$F$  : Gripping force (N)

$W$  : Workpiece weight (N)

$\mu$  : Coefficient of friction

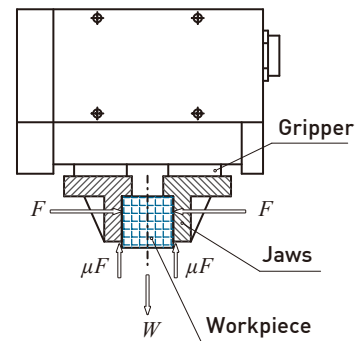
The conditions under which the workpiece will not drop are:

$$2 \times \mu F > W \text{ (Number of jaws)} \rightarrow F > \frac{W}{2 \times \mu}$$

With “Sc” representing the extra margin, “F” is determined by the following formula :

$$F = \frac{Sc \times W}{2 \times \mu}$$

The “10 to 20 times or more of the workpiece weight” is calculated with a safety margin of  $Sc = 4$ , which allows for impacts that occur during normal transportation.



When $\mu = 0.1$	$F = 4 \times \frac{W}{2 \times 0.1} = 20 \times W$
When $\mu = 0.2$	$F = 4 \times \frac{W}{2 \times 0.2} = 10 \times W$

〈Reference〉 Coefficient of friction  $\mu$

Coefficient of friction $\mu$	Fingers-Material of workpiece (guideline)
0.1	Metal(surface roughness Rz3.2 or less)
0.2	Metal
over 0.2	Rubber, Resin, etc.

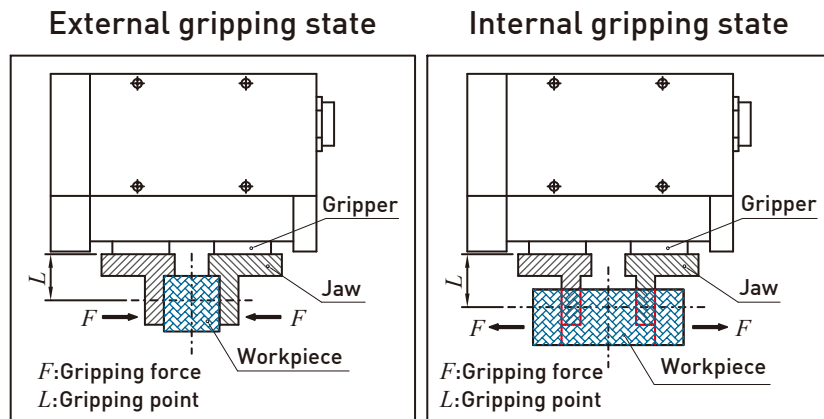
[Note 1] Mass of a workpiece that the jaws can grip depends on the operating environment, contact pressure, etc.

[Note 2] Even in cases where the coefficient of friction is greater than  $\mu = 0.2$ , for reasons of safety, select a gripping force which is at least 10~20 times greater than the workspace weight.

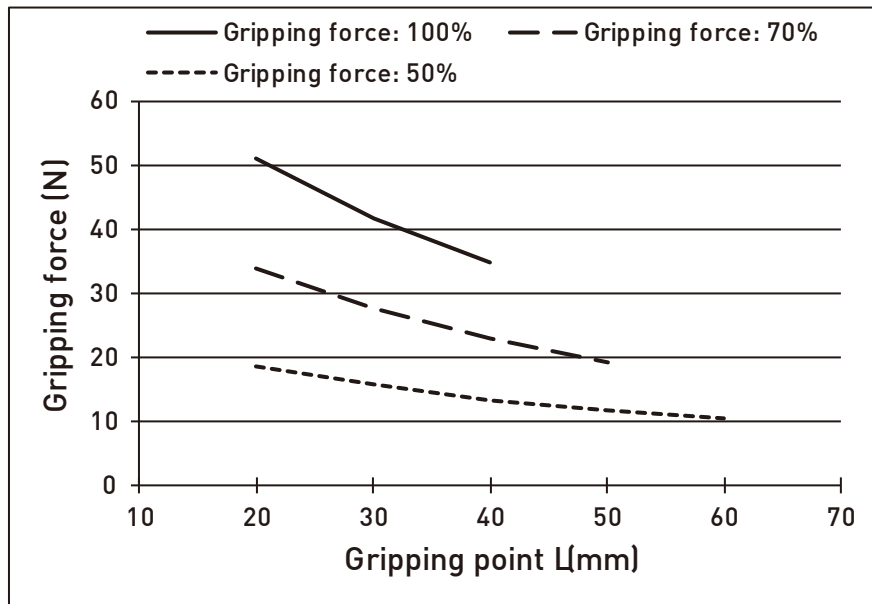
[Note 3] If high acceleration or impact forces are encouraged during motion, a further margin of safety should be considered.

### 4.3 Confirmation of Gripping Force

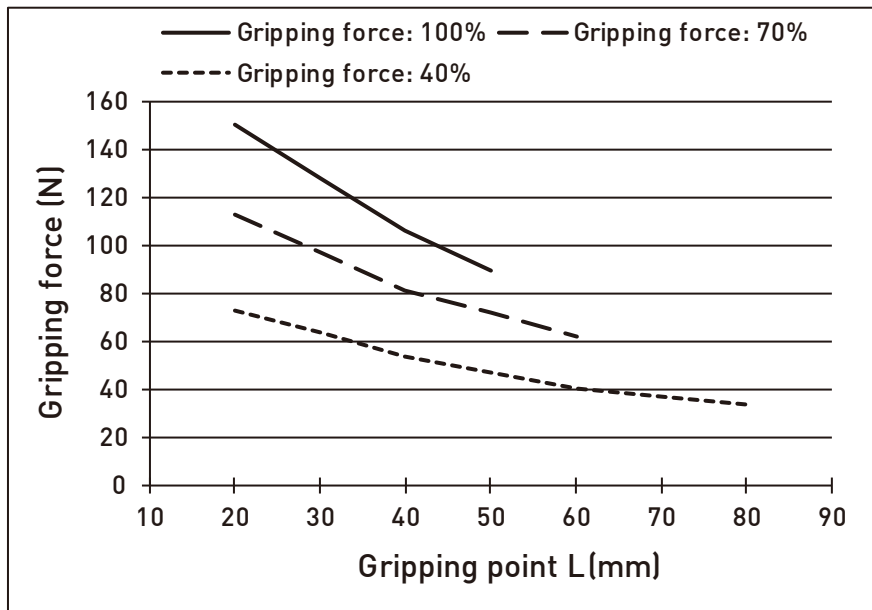
- Gripping force ( $F$ ) shown in the figure below is the thrust of one jaw, when both jaws are in full contact with the workpiece as shown in the figure below.
- Set the workpiece gripping point ( $L$ ) so that it is within the range shown in the figure below.



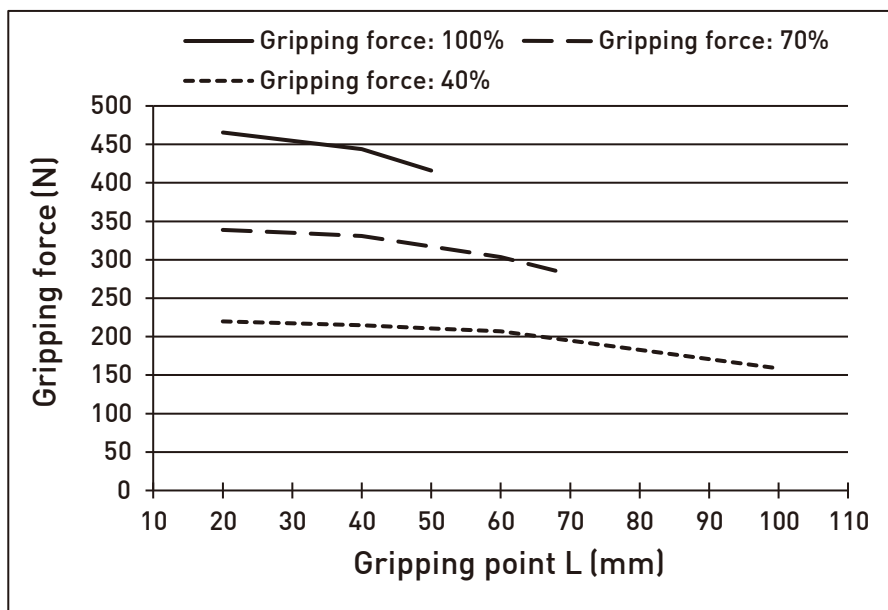
- XEG-16 relationship between gripping force & gripping point:



- XEG-32 relationship between gripping force & gripping point:



- XEG-64 relationship between gripping force & gripping point:



[Note 1] The gripping force will vary according to the material, arm length, shape and gripping area of fixture.

[Note 2] Due to the slight difference of operational efficiency between various kinds of stepping motor and transmission module, there will be a slight deviation in the actual gripping force.

[Note 3] Please select the model with greater buffering capacity in terms of gripping force with respect to workpiece weight.

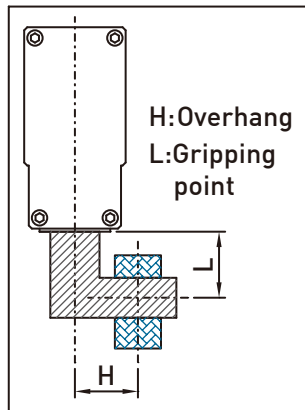
[Note 4] The relationship between the grip point and the gripping force in the above chart is measured at a speed of 2 mm/s.



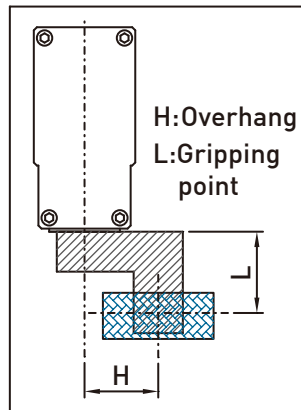
## 4.4 Confirmation of Gripping Point and Overhang

- Decide the gripping position of the workpiece so that the amount of overhang (H) stays within the range shown in the figure below.
- If the gripping position is out of the limit, it may shorten the life expectancy of the electric gripper.

External gripping state

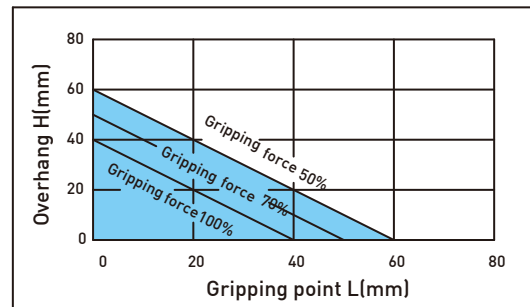


Internal gripping state



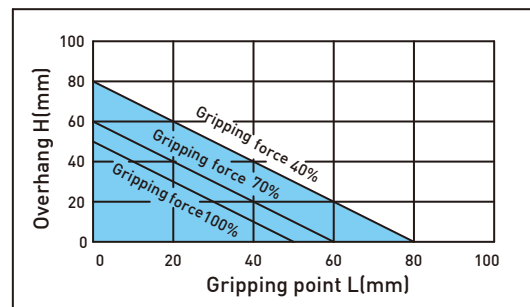
- XEG-16 relationship between gripping point & overhang:

XEG-16



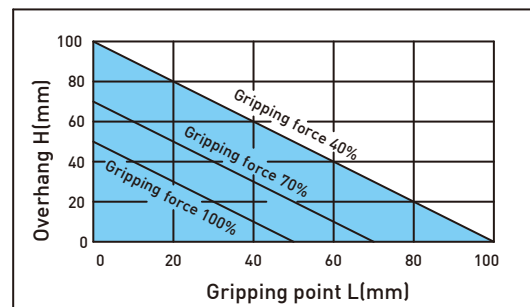
- XEG-32 relationship between gripping point & overhang:

XEG-32



- XEG-64 relationship between gripping point & overhang:

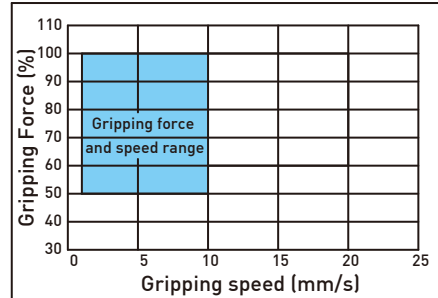
XEG-64



## 4.5 Confirmation of Gripping Speed

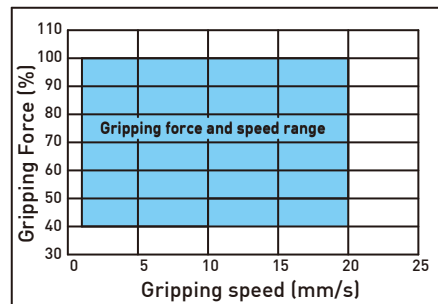
- Set the gripping speed and gripping force (%) within the range shown in the figure below.
- Please verify if the high-speed movement causes excessive vibration or resonance, which may lead to abnormal function.
- XEG-16 relationship between gripping speed & gripping force:

XEG-16



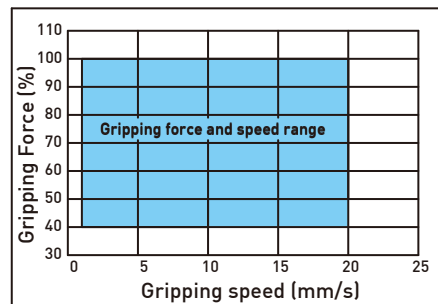
- XEG-32 relationship between gripping speed & gripping force:

XEG-32

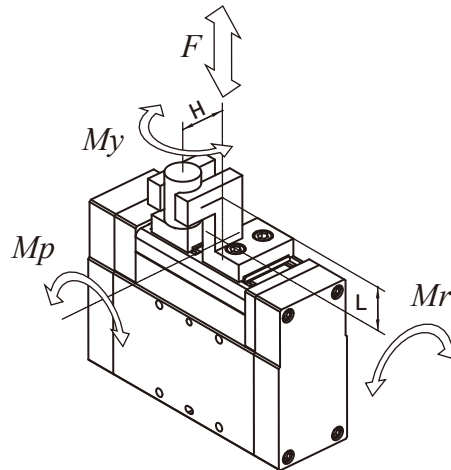


- XEG-64 relationship between gripping speed & gripping force:

XEG-64



## 4.6 Allowable Load-Carrying Momentum



Model	Allowable Load F (N)	Allowable Moment		
		[Pitching] Mp (N-m)	[Yawing] My (N-m)	[Rolling] Mr (N-m)
XEG-16	167.7	1.66	1.66	6.40
XEG-32	430.7	7.72	7.72	20.37
XEG-64	763.0	20.36	20.36	42.93

[Note 1] Values for load in the table indicate static values.

[Note 2] L \ H: Distance to the point at which the load is applied (mm)

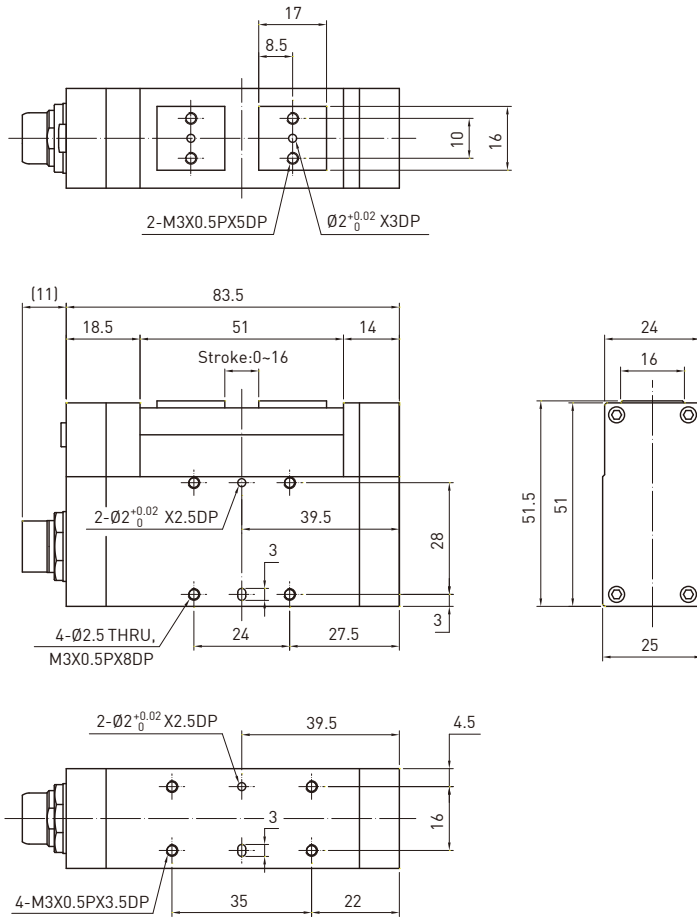
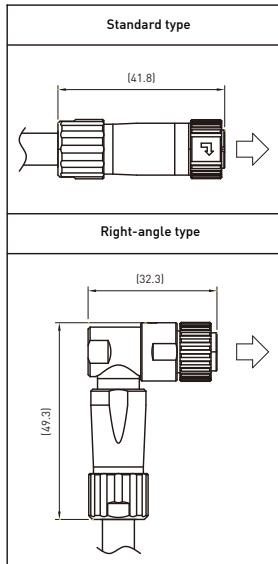
◎ Calculation of allowable external force

<b>Formula</b>	$\text{Allowable load } F(N) = \frac{\text{Static allowable moment } M(N\cdot m)}{L(m)}$
<b>Example</b>	<p>Assume a static load of <math>f=10</math> (N) is operating which applies pitch moment to <math>L=20</math> (mm) from the XEG-16. Can it be used?</p> $\text{Allowable load } F(N) = \frac{1.66}{0.020} = 83 > 10 \text{ (external force)}$ <p>ANS: It can be used.</p>

# 5. Dimensions

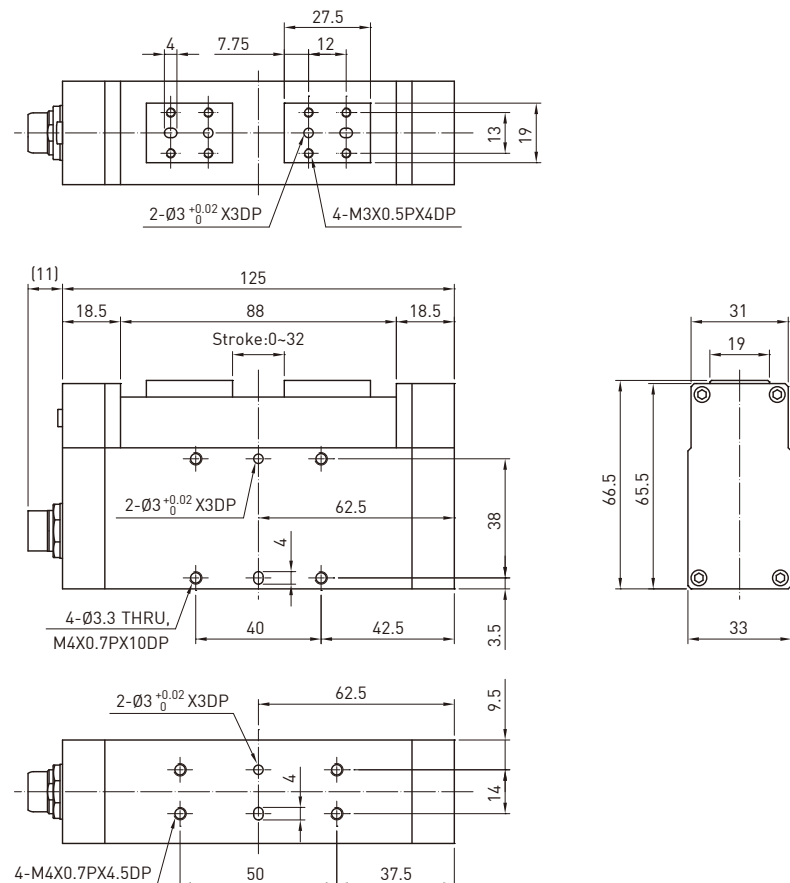
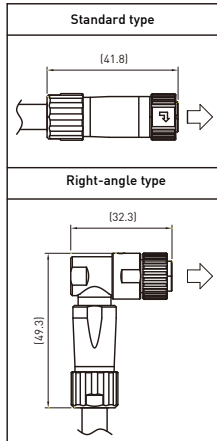
- Model of XEG-16

© XEG-16 Connector



- Model of XEG-32

© XEG-32 Connector



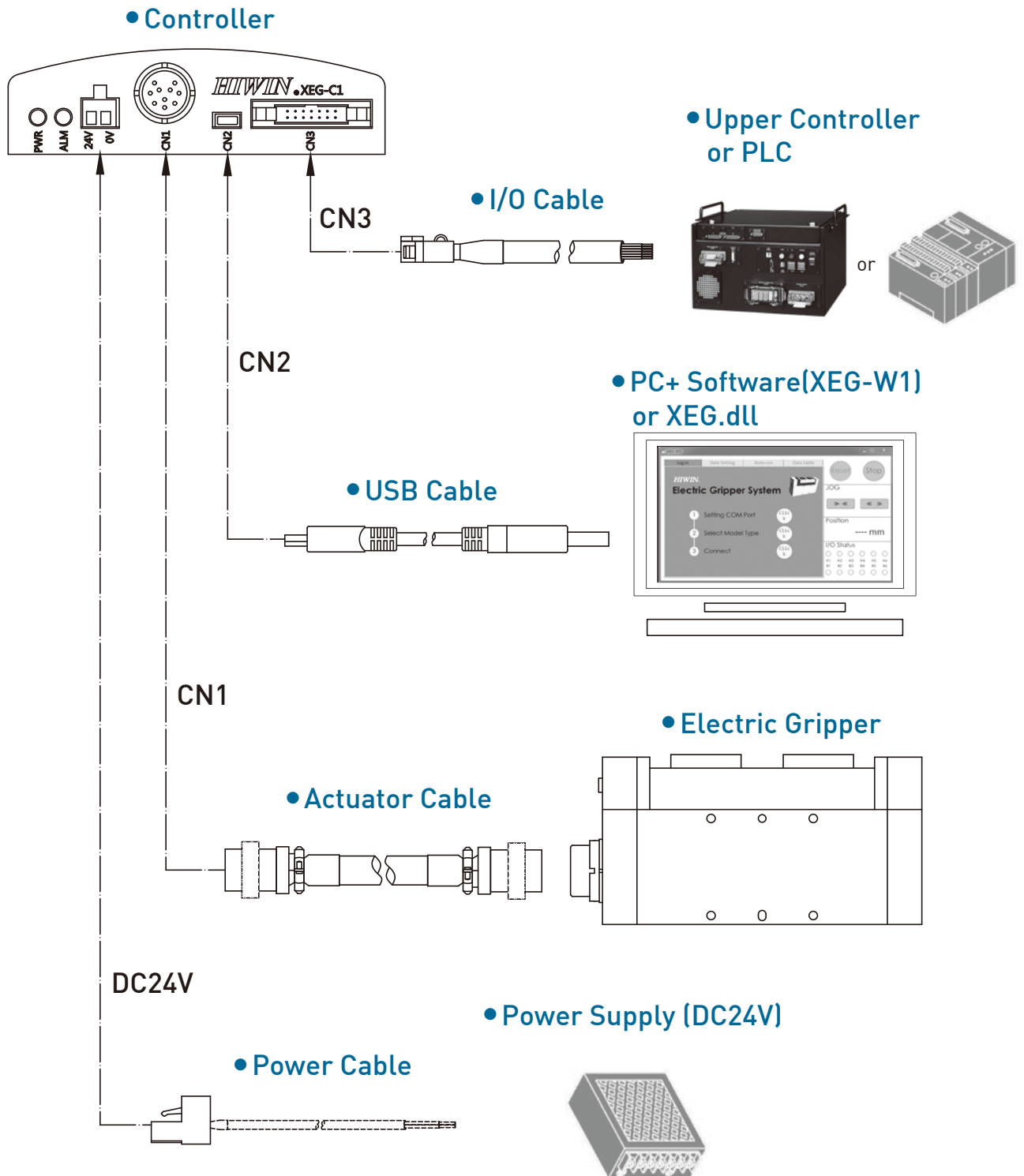


## 6. Safety Certification

CE Compliance	
Machinery Directives	2006/42/EC
Low Voltage Directives (LVD)	2014/35/EU
Safety of Machinery	EN ISO 12100:2010
	EN 60204-1:2006+AC:2010
Electromagnetic Compatibility Directives (EMC)	EN 61000-6-2:2005
	EN 61000-6-4:2007+A1:2011
Hazardous Substances Restriction Directives (RoHS)	2011/65/EU

# 7. Appendix

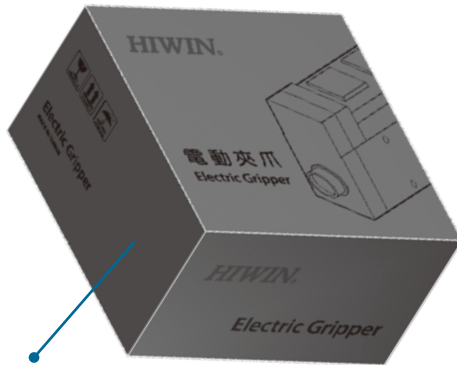
## 7.1 Current Diagram (REGCDC103A2XE)



Name	Illustration
PWR	Power supply lamp (Green)
ALM	Error status lamp (Red)
24V/0V	Power supply terminal
CN1	Actuator terminal
CN2	Communication terminal
CN3	I/O connector

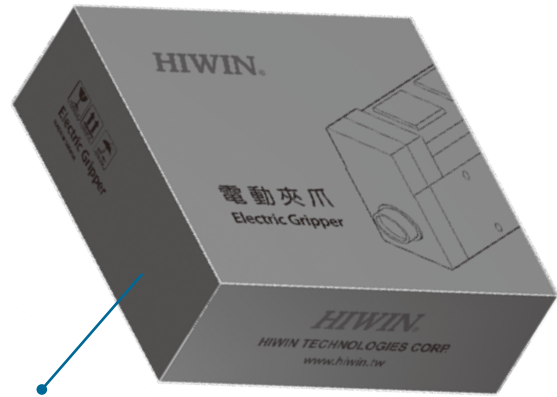
## 7.2 Shipping Items

- XEG-16、32



Product label

- XEG-64



Product label

- Standard shipping items:

1. Electric gripper
2. Electric gripper controller
3. Cable
  - Actuator cable
  - I/O cable
  - USB cable
4. Accessory kit
  - Power connector
  - Pin
  - Grease pipe
  - Grease nozzle

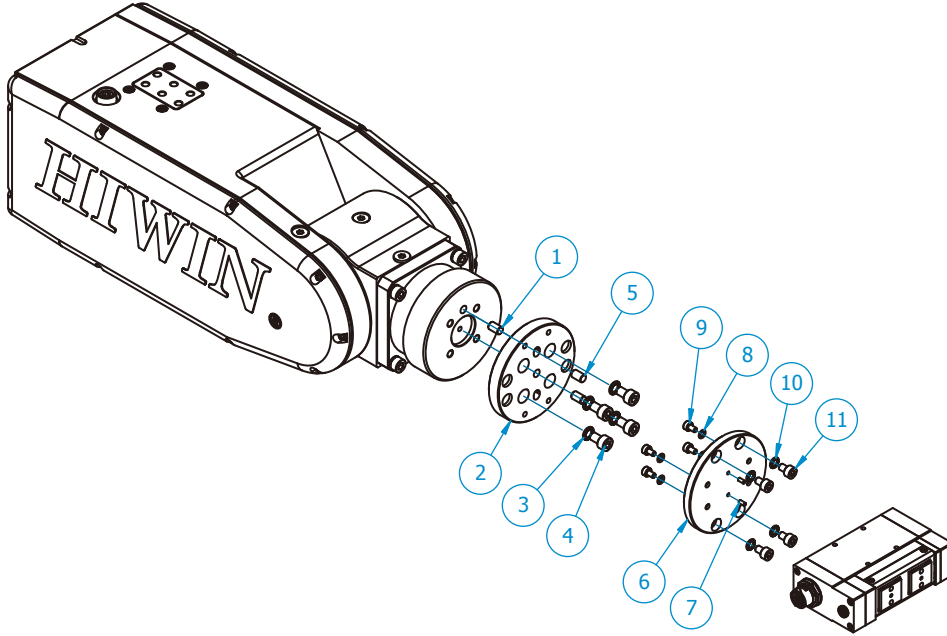
- Product label:





## 7.3 Accessories Assembly Method

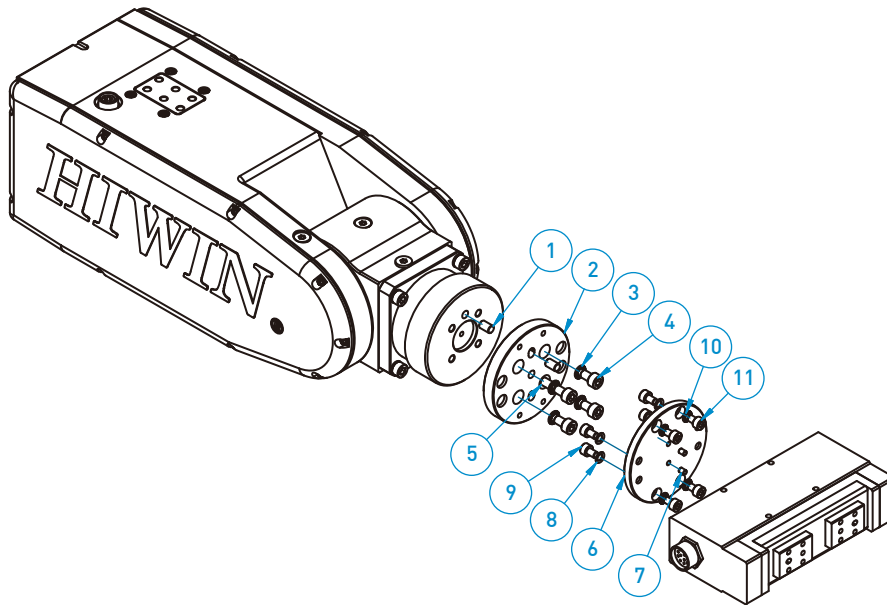
- XEG-16 adapter assembling on RA605 robot arm



XEG16&RA605 assembly flow chart

XEG16-RA605 adapter kits		
Items	Parts	Amount
1	Positioning pin (Ø5X8L)	1
2	XEG16-605 Robot arm adapter	1
3	Spring washer (Ø5 SUS)	4
4	Bolt (M5X0.8PX8L SUS)	4
5	Positioning pin (Ø5X8L)	2
6	Gripper adapter	1
7	Positioning pin (Ø2X4.4L)	2
8	Spring washer (Ø3 SUS)	4
9	Bolt (M3X0.5PX5L SUS)	4
10	Spring washer (Ø4 SUS)	4
11	Bolt (M4X0.7PX6L SUS)	4

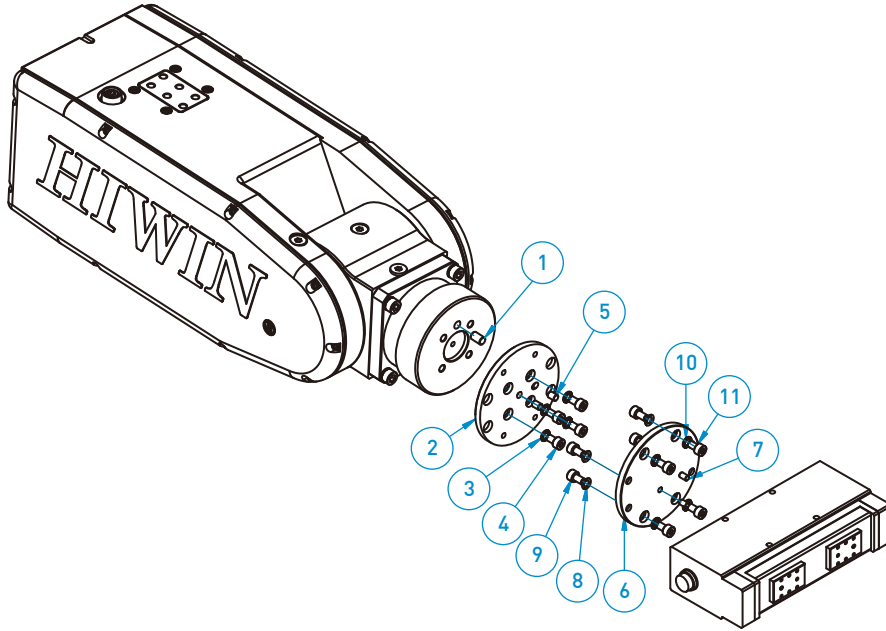
- XEG-32 adapter assembling on RA605 robot arm



XEG32&RA605 assembly flow chart

XEG32-RA605 adapter kits		
Items	Parts	Amount
1	Positioning pin (Ø5X8L)	1
2	XEG32-605 Robot arm adapter	1
3	Spring washer (Ø5 SUS)	4
4	Bolt (M5X0.8PX8L SUS)	4
5	Positioning pin (Ø5X8L)	2
6	Gripper adapter	1
7	Positioning pin (Ø3X4L)	2
8	Spring washer (Ø4 SUS)	4
9	Bolt (M4X0.5PX6L SUS)	4
10	Spring washer (Ø4 SUS)	4
11	Bolt (M4X0.7PX6L SUS)	4

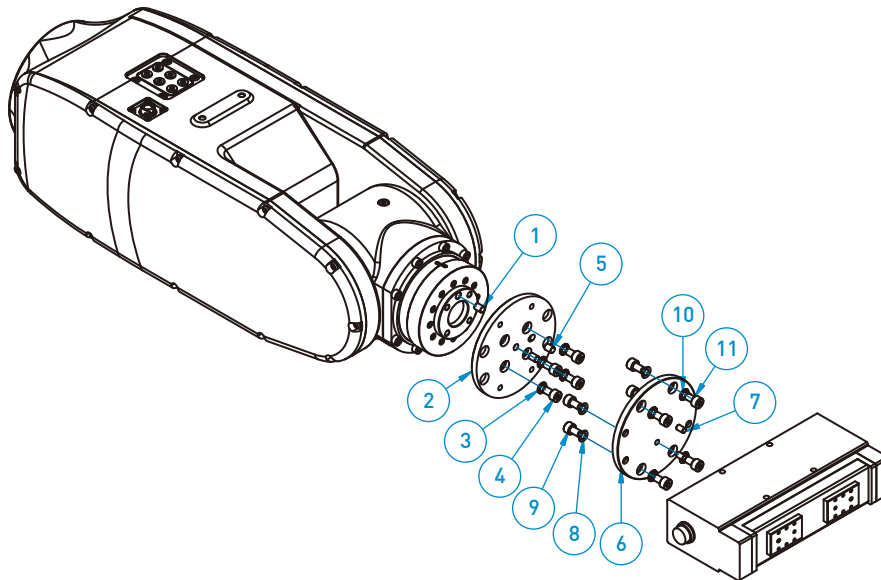
- XEG-64 adapter assembling on RA605 robot arm



XEG64&RA605 assembly flow chart

XEG64-RA605 adapter kits		
Items	Parts	Amount
1	Positioning pin (Ø5X8L)	1
2	XEG64-605 Robot arm adapter	1
3	Spring washer (Ø5 SUS)	4
4	Bolt (M5X0.8PX8L SUS)	4
5	Positioning pin (Ø5X8L)	2
6	Gripper adapter	1
7	Positioning pin (Ø5X8L)	2
8	Spring washer (Ø6 SUS)	4
9	Bolt (M6X1PX8L SUS)	4
10	Spring washer (Ø6 SUS)	4
11	Bolt (M6X1PXL SUS)	4

- XEG-64 adapter assembling on RA620 robot arm



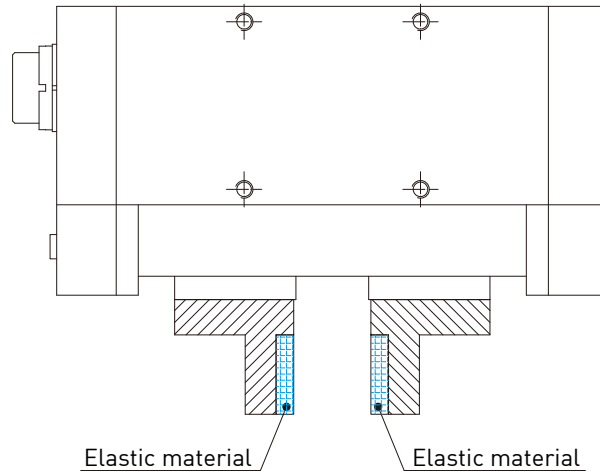
XEG64&RA620 assembly flow chart

XEG64-RA620 adapter kits		
Items	Parts	Amount
1	Positioning pin (Ø6X5.8L)	1
2	XEG64-620 Robot arm adapter	1
3	Spring washer (Ø6 SUS)	4
4	Bolt (M6X1PX10L SUS)	4
5	Positioning pin (Ø6X5.8L)	2
6	Gripper adapter	1
7	Positioning pin (Ø5X8L)	2
8	Spring washer (Ø6 SUS)	4
9	Bolt (M6X1PX10L SUS)	4
10	Spring washer (Ø6 SUS)	4
11	Bolt (M6X1PX10L SUS)	4

## 7.4 Attachments (Fingers) Suggested Design

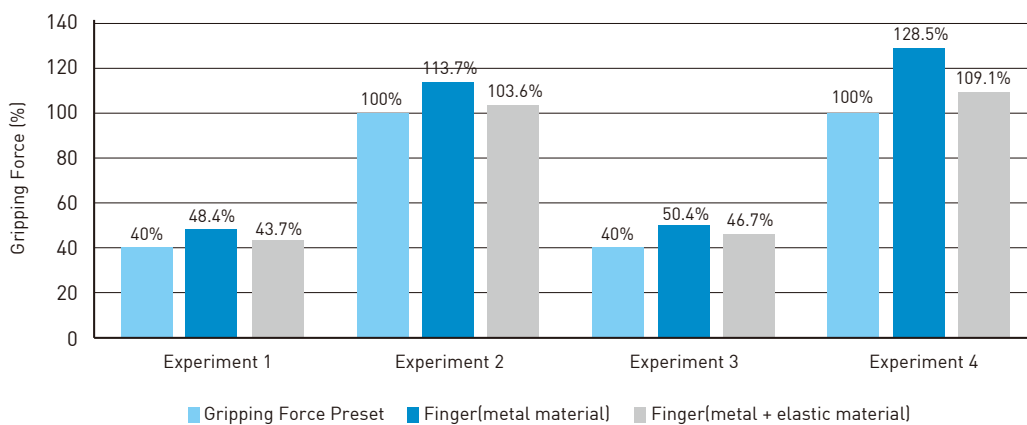
If the finger part is made of metal material, such as steel or aluminum. It is recommended to add elastic material such as rubber or casting polyurethane to the finger part. This not only increase the friction of the gripping but also obtain more precise gripping force.

The following table below uses XEG-32 as an example to test the gripping force of two different finger parts, such as metal material and metal + elastic material.



### • Experimental Planning and Condition Setting

Project	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Type	XEG-32	XEG-32	XEG-32	XEG-32
Gripping Point (L)	20 mm	20 mm	20 mm	20 mm
Gripping Speed	1 mm/s	1 mm/s	10 mm/s	10 mm/s
Gripping Force	40%	100%	40%	100%



According to the experimental results, the gripping force of the finger (metal + elastic material) is more precise and stable than the finger (metal material). However, as the gripping force or gripping speed increases, the difference in gripping force increases.

## 7.5 Electric Gripper Inquiry Form

Customer		Date	
Country		Telephone	
E-Mail		Fax.	
Address			

Stroke (mm)	
Workpiece weight (kg)	
Cycle time (s)	
Workpiece material	
Repeatability (mm)	
Gripping force (N)	
Gripping speed (mm/s)	
Workpiece volume	
Cable length	Connector type of gripper side: <input type="checkbox"/> Standard <input type="checkbox"/> Right-angle type Actuator cable: <input type="checkbox"/> 1.5M <input type="checkbox"/> 3M <input type="checkbox"/> 5M I/O cable: <input type="checkbox"/> 1.5M <input type="checkbox"/> 3M <input type="checkbox"/> 5M
Environment	<input type="checkbox"/> Clean room <input type="checkbox"/> Dust <input type="checkbox"/> Oil <input type="checkbox"/> Water <input type="checkbox"/> Moist <input type="checkbox"/> Vibration <input type="checkbox"/> Special temperature: ___°C <input type="checkbox"/> Corrosive chemicals <input type="checkbox"/> Other: _____
Operating	<input type="checkbox"/> External gripping <input type="checkbox"/> Internal gripping <input type="checkbox"/> Position <input type="checkbox"/> Detection <input type="checkbox"/> Other: _____
Special condition	
Note	

## **Electric Gripper (Original Instruction) User Manual**

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