Catalog No.CN-0005

G+® 吉嘉

PRODUCT CATALOGUE

Hollow Rotary Actuator

OS Type Open Loop Stepper Motor

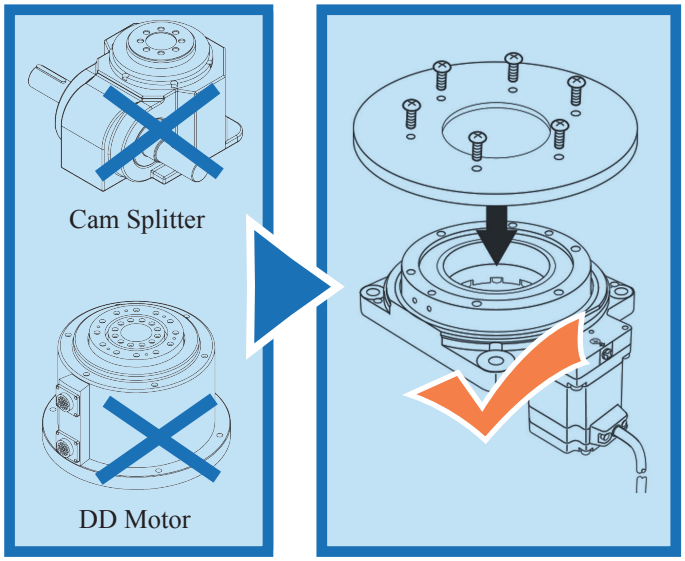
HOLLOW ROTARY ACTUATOR

Revolutionary New Solution for Rotary Motion Control

OS Type Open Loop Stepper Motor Hollow Rotary Actuators

The OS type of GIGAGER Hollow Rotary Actuator is a line of products that combine a high rigidity hollow rotary table with a dedicated open loop stepper motor and driver package. It retains the ease of use of a stepper motor, while also allowing for highly accurate positioning of large inertia loads.

- Integrated actuator and stepper motor makes design easier
- Large-diameter hollow output table
- Economic choice for automation device



- **Improve Reliability and Reduce Cost Through Direct Connections**
  Equipment table and the robot arm can be directly installed on the rotating platform. Compared with the use of mechanical parts such as pulleys and belt, it can reduce the time and cost of mechanical design, parts deployment, belt state adjustment and other aspects.

- **Motor Configuration**
  Can freely equip with Stepper Motor or Servo Motor
  *GSN series Stepper Motor Excluded

- High Precision Positioning without Backlash
  No backlash, positioning accuracy ≦ 2 arc min, repeat positioning accuracy up to ±5 arc seconds.

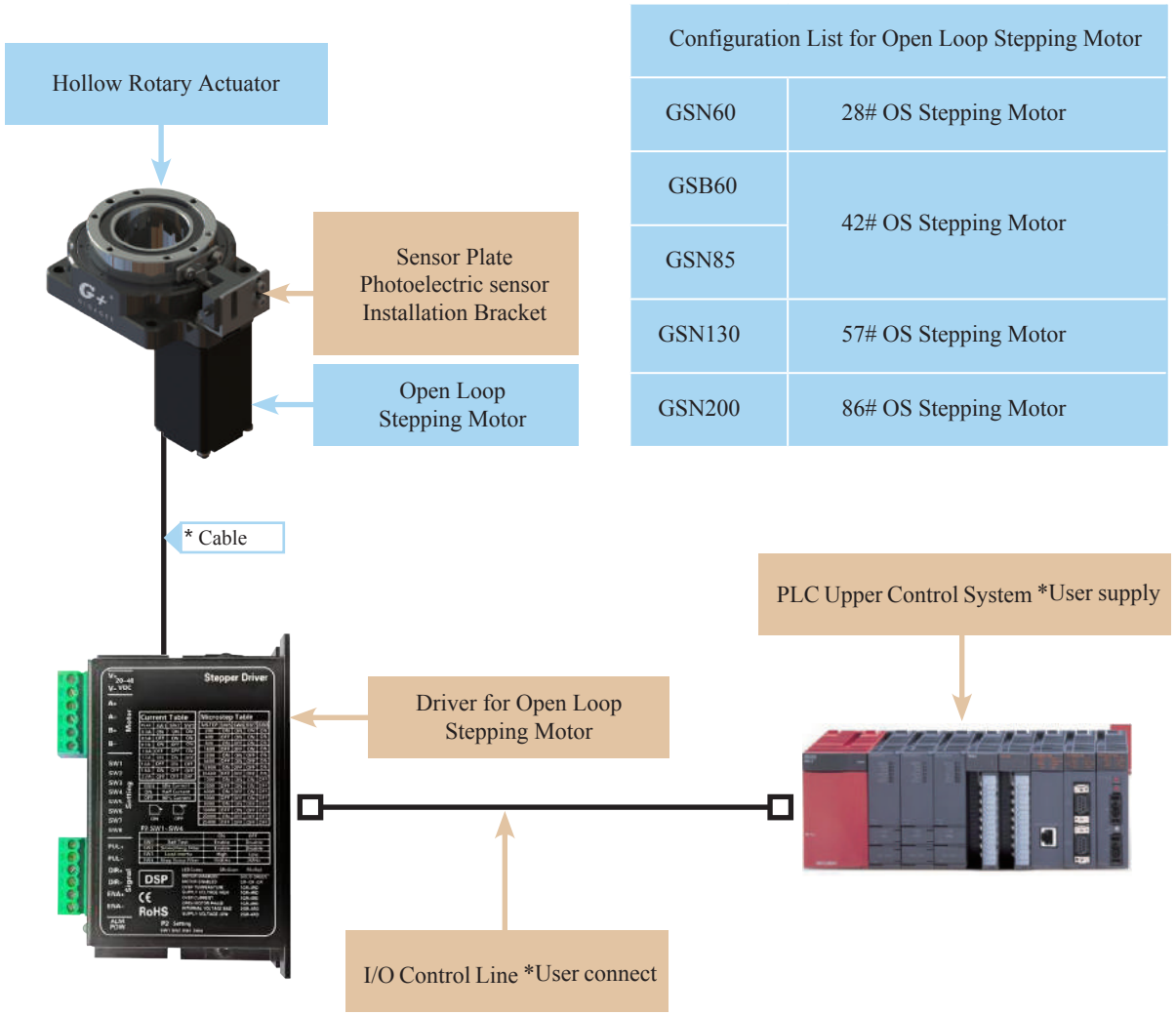
- Large Diameter Hollow Structure
  Wiring and piping are more convenient and simple, and the advantages of this feature are particularly prominent in complicated wiring and piping environments.

System of Hollow Rotary Actuator • OS

Standard Configuration	Actuator ×1 set
	Open Loop Stepping Motor ×1 set
	Open Loop Stepping Motor Driver × 1 set

Optional Accessories	Sensor Plate × 1 pcs (See P32)
	Photoelectric sensor × 1 set
	Sensor Bracket × 1 set (See P32)

System Diagram



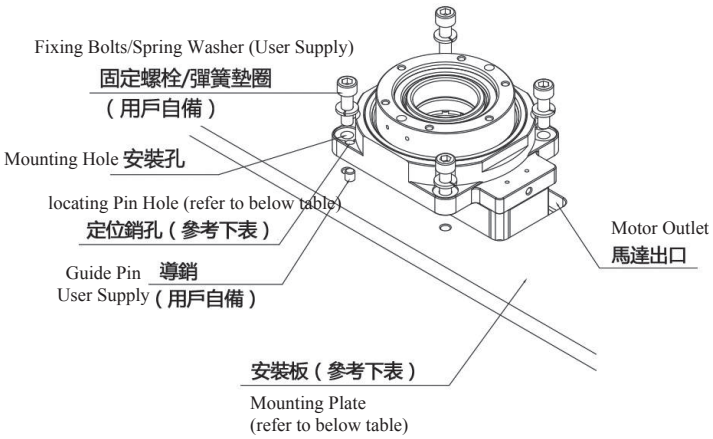
Configuration List for Open Loop Stepping Motor	
GSN60	28# OS Stepping Motor
GSB60	42# OS Stepping Motor
GSN85	
GSN130	57# OS Stepping Motor
GSN200	86# OS Stepping Motor

* Accessories Options：the above Accessories Options are for user's reference only, user can purchase as per the requirement.

Installation Instruction of Hollow Rotary Actuator

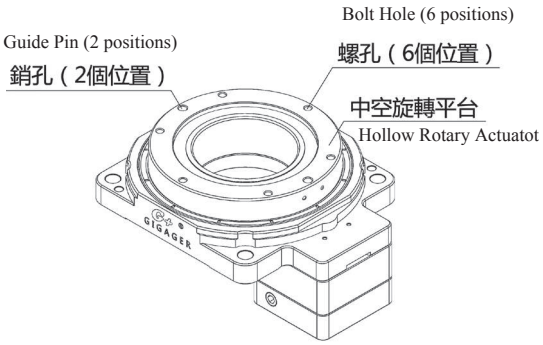
How to install a hollow rotating actuator?

Leave a motor outlet on the machine mounting plate to expose the motor. Use the two locating pin holes (the locating pin holes in GSB60 and GSN60 are common to the mounting holes) and mount the hollow rotating actuator to the machine mounting plate shown below. These mounting holes are used to accurately position the hollow rotating actuator on the machine, making sure to secure the locating pins to the mounting plate.



How to install a load on a hollow rotating actuator

Install the load using the 6 mounting holes on the hollow rotating actuator. There are 2 pin holes for mounting the load on the hollow rotating actuator, which can be used to determine the position of the load. Be sure to fix the positioning pin firmly on the load.



Locating pin hole size

Actuator Model	Diameter (mm)	Depth (mm)	Quantity
GSN85	Ø5 $+^{0.012}_{0}$ (H7)	9.5 (THRU)	2
GSN130		14.5 (THRU)	2
GSN200	Ø8 $+^{0.015}_{0}$(H7)	16 (THRU)	2
GSB100	Ø4 $+^{0.012}_{0}$(H7)	13 (THRU)	2
GSB130	Ø6 $+^{0.015}_{0}$(H7)	15 (THRU)	2
GSB200	Ø8 $+^{0.015}_{0}$(H7)	23 (THRU)	2

Mounting plate thickness

Actuator Model	Thickness
GSN60	More than 5mm
GSB60	
GSN85	More than 8mm
GSB100	
GSN130	More than 10mm
GSB130	
GSN200	
GSB200	

Installation Precautions

Before installation, read the following installation precautions and install as follows。

- Indoor (area not directly in contact with sunlight)
- Area without heat radiation
- Working environment temperature: 0~+50°C
- Temperature below the origin sensor: 0~+40°C
- Working environment humidity: less than 85%
- There is no flammable or explosive acid gas
- Place to block dust, oil and splashes
- Place without direct shock or excessive impact

Calculation Reference of Hollow Rotary Actuator

■Load Calculation / Loads Moment of Inertia (J_W)

The moment of inertia of the load shall be less than 30 times the moment of inertia of the transmission.

■Calculate the Acceleration Torque (T_a) . Refer to below fomula.

Acceleration Torque $Ta[N \cdot m]=(J_M+J_A+J_W) * \frac{\pi}{30} * \frac{(N_2-N_1)}{t_1}$

J_M : Motor Moment of Inertia [kg· m^2]

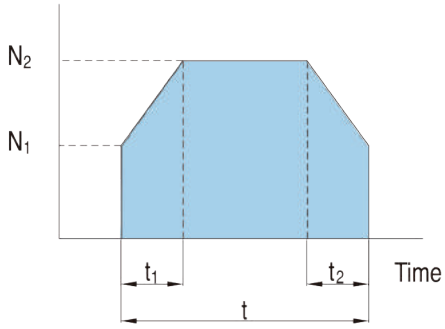
J_A : Mechanism Moment of Inertia [kg· m^2]

J_W : Load Moment of Inertia [kg· m^2]

N_2 : Working Speed [r/min]

N_1 : Starting Speed [r/min]

t_1 : Acceleration (deceleration) Time [S]



■Calculate the Required Torque

The required torque is calculated by multiplying the sum of the load torque caused by the frictional resistance and the acceleration torque caused by the moment of inertia by the safety factor.

Required Torque T = (Load torque [N.m]+ Acceleration torque [N.m]) x Safety factor

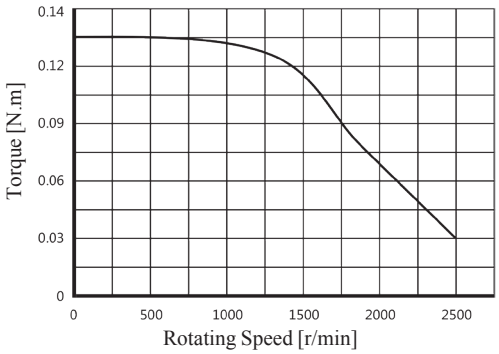
= (T_L+T_a) x S

Safety factor S more than 1.5。

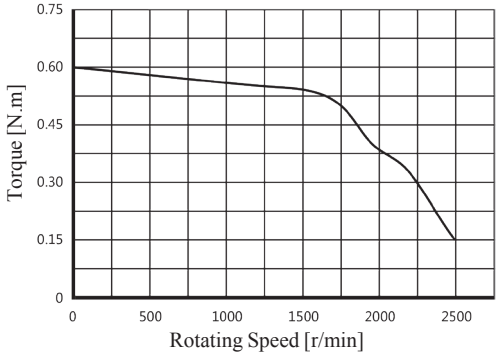
■The torque required of the selected motor T must be within the scope of speed - torque

Stepping Motor Speed Torque Characteristic Curve

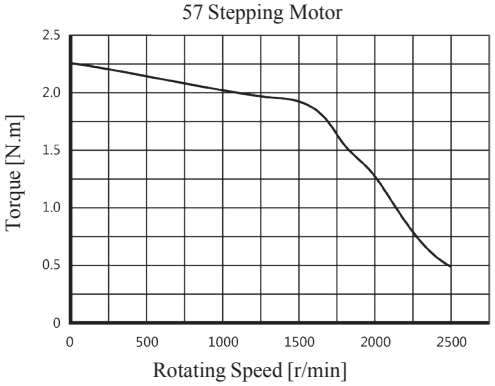
28 Stepping Motor



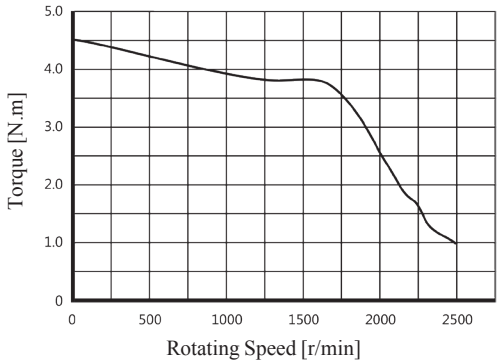
42 Stepping Motor



57 Stepping Motor

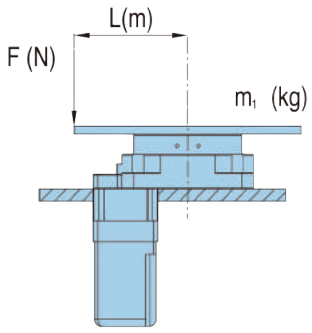


86 Stepping Motor



Axial Load, Calculation of Inertia Moment Load

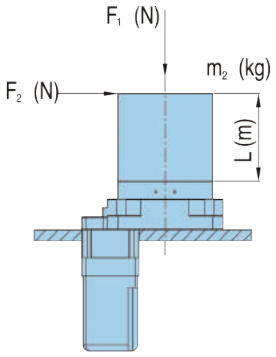
When applying the load on the hollow rotating actuator as shown below, be sure to calculate that the axial load and the moment of inertia load are within the specified range of calculation of the following formula.



Axial Load [N]：$F_t=F+m_1xg$

Inertia Moment Load [N.m]：M=FxL

g：Gravity Acceleration 9.807[m/s^2]



Axial Load [N]：$F_t=F_1+m_2xg$

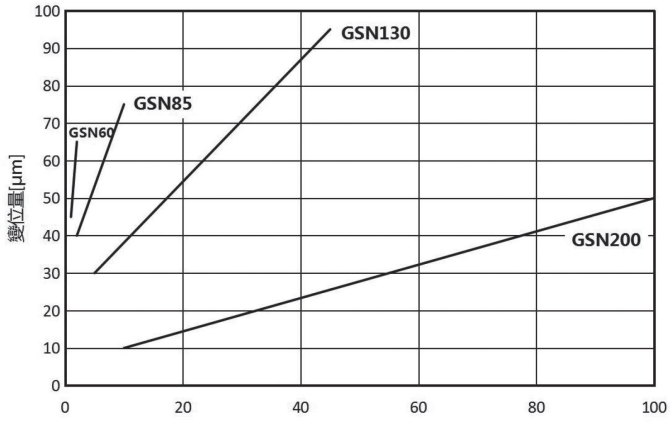
Inertia Moment Load [N.m]：$M=F_2x$（L+A）

g：Gravity Acceleration 9.807[m/s^2]

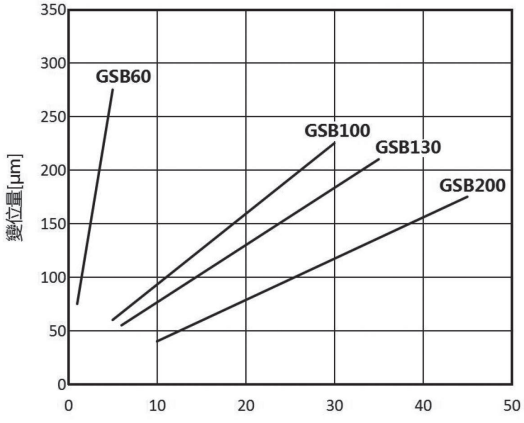
Model	A
GSN60	0.010
GSB60	0.010
GSN85	0.015
GSB100	0.015
GSN130	0.017
GSB130	0.017
GSN200	0.033
GSB200	0.033

Actuator Rigid Reference

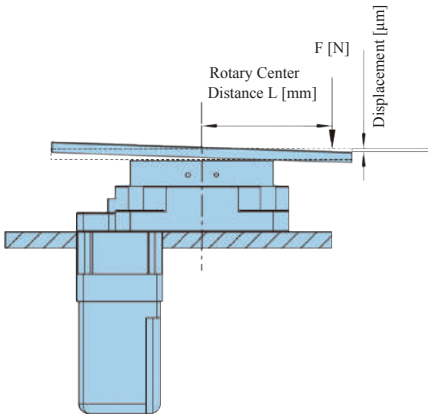
Different types of rotating actuators use different types of support bearings, which have a certain influence on the Permissible Moment of Inertia Load of the rotating platform, that is, the larger the model, the greater the permissible moment of inertia load. However, the amount of displacement for the moment of inertia load will be smaller. For details, refer to the following chart (L = 200mm).



GSN Series Inertia Moment Load [N.m]



GSB Series Inertia Moment Load [N.m]



Terminology of Hollow Rotary Actuator

Motor Type	Rotating actuator adaptable motor type
Rotary Actuator Bearing	The type of bearing used for Rotary Actuator.
Permissible Torque Note 1	The mechanical strength thresholds of the speed reduction mechanism, including the acceleration torque and the load inertia, must be used within this Permissible Torque range.
Permissible Speed	The table surface speed allowed by the mechanical strength of the speed reduction mechanism.
Moment of Inertia	The sum of values of Moment of inertia of the motor rotor + the inertia of the deceleration mechanism on the rotating actuator.
Permissible Axial Load	Allowable value of axial load applied to the axis of the rotating platform.
Permissible Moment of Inertia Load	The load is applied at a position deviating from the center of the rotating platform, so that the force of the tilting of the rotating platform will occur when the center of the eccentricity × the load is calculated as the allowable value of the inertia moment load.
Positioning Accuracy	The error between the theoretical rotation angle and the actual rotation angle when the rotary platform is positioned at any point within 360°.
Repetitive Positioning Accuracy	Indicates the error value generated when the same position is repeatedly positioned from the same direction.
Platform Flatness	Operating amplitude of the table surface.
Platform Concentricity	Concentricity error value of inner and outer diameter of rotating platform without load.
Permissible Input Speed	The allowable input speed of the mechanical strength of the reducer structure.
Backlash	Refers to the gear clearance of the rotating platform after fixing the motor shaft.
Destructive Torque	When the reducer is subjected to this torque, the structure will be destroyed.
Precision Lifespan	Designed life span that maintains accuracy under normal use of the reducer.
Ingress Protection Note 3	For the protection structure of machines based on IEC529 and EN60034-5 (= IEC60034-5), it can be classified according to the degree of dustproof and waterproof.

Note 1：Unit Exchange of Torque

Torque Unit	1 N.m	1 N.cm	1 kgf.m	1 kgf.cm	1 lbf.ft	1 lbf.in
1 N.m	1	10^{2}	0.10197	10.197	0.7376	8.8509
1 N.cm	10^{-2}	1	1.0197×10^{-3}	0.10197	7.376×10^{-3}	8.8509×10^{-2}
1 kgf.m	9.8066	980.665	1	10^{2}	7.233	86.79
1 kgf.cm	9.8066×10^{-2}	9.8066	10^{-2}	1	7.233×10^{-2}	0.8680
1 lbf.ft	1.356	1.356×10^{2}	0.1383	13.83	1	12
1 lbf.in	0.113	11.3	1.152×10^{-2}	1.152	8.333×10^{-2}	1

Note 2：Angle Units

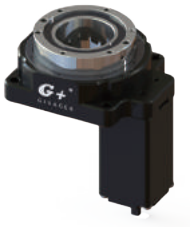
Angle Units	Value	Symbol	Shorthand
Degree	1/360 Circle	°	Deg
Arc minute	1/60 degree	’ (prime number)	arcmin,amin,MOA
Arc-second	1/60 arcmin	” (Double prime number)	arcsec
1/1000 Arc Second	1/1000 arcsec		mas

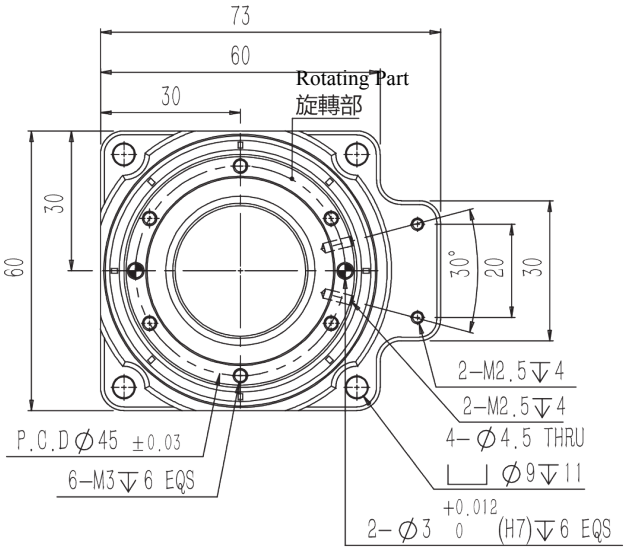
Note 3：IP Ingress Protection

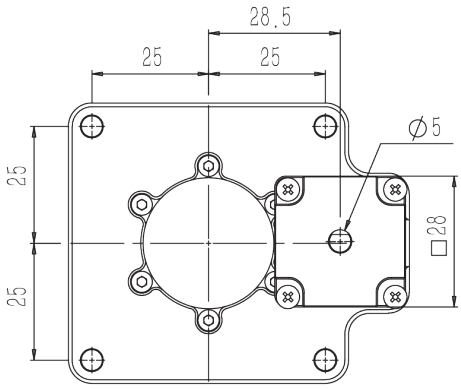
IP No.	Dustproof (first number)
IP 0 X	No special protection
IP 1 X	Objects over 50mm in diameter cannot enter
IP 2 X	Objects over 80mm in length and over 12mm in diameter cannot enter
IP 3 X	Objects with a diameter or thickness exceeding 2.5 mm and a diameter exceeding 2.5 mm cannot enter
IP 4 X	Objects with a thickness exceeding 1.0 mm and a diameter exceeding 1.0 mm cannot enter
IP 5 X	Prevent incoming dust from affecting equipment operation
IP 6 X	Completely prevent dust from entering

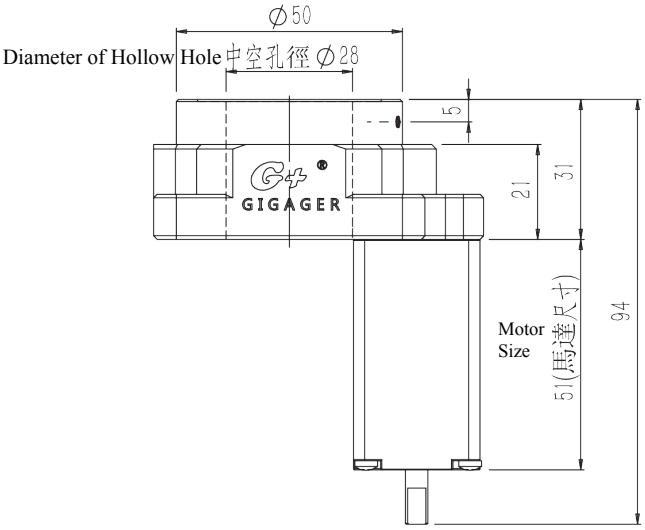
IP No.	Waterproof (second number)
IP X 0	No special protection
IP X 1	Drops falling vertically will not cause damage to the appliance
IP X 2	Prevents water droplets from immersing when tilted 15 degrees
IP X 3	In the range of 60° from the vertical direction, the sprayed water spray is not damaged.
IP X 4	Spilled by water in any direction without damage
IP X 5	Directly affected by water spray in any direction without damage
IP X 6	Impact water in any direction directly subjected to strong currents does not enter the interior
IP X 7	Underwater immersion can still be used normally under certain conditions
IP X 8	Can be used underwater

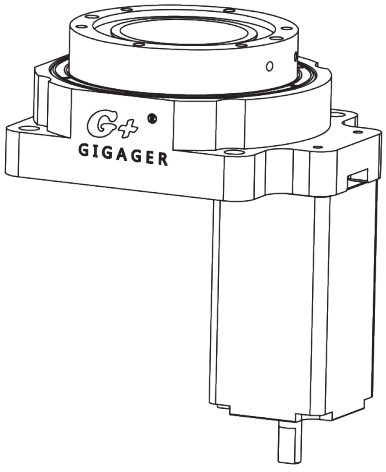
■ GSN60-18K-OS











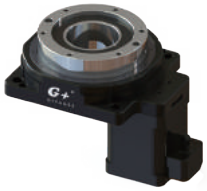
Parameter		
Motor Type		Dedicated Open Loop Stepper Motor
Rotary Platform Bearing		Cross Roller Bearing
Permissible Torque	N.m	1.2
Permissible Speed	rpm	40 (Table Surface)
Gear Ratio		1:18
Moment of Inertia	$kg.m^2$	4324×10^{-7}
Permissible Axial Load	N	250
Permissible Moment of Inertia Load	N.m	5
Positioning Accuracy	min	≦2
Repeatability	sec	±5 (0.001°)
Platform Flatness	mm	±0.005
Platform Concentricity	mm	±0.01
Ingress Protection	IP	40
Precision Lifespan	H	20000
Weight	kg	0.6 (including motor)

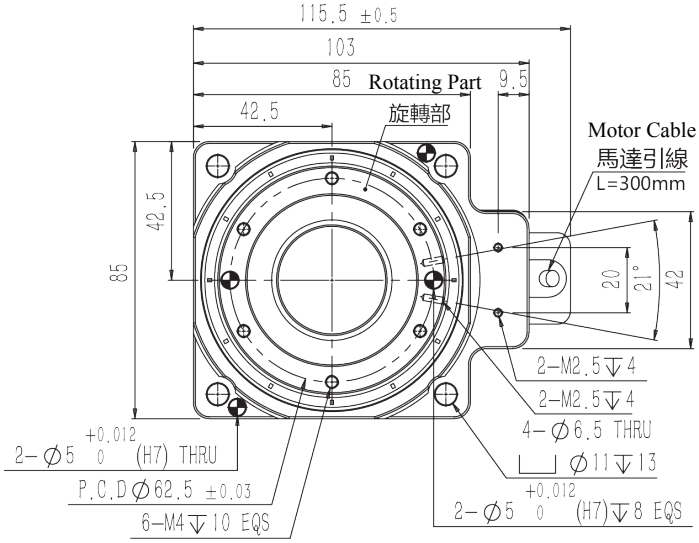
Motor Parameter		
Dimension	mm	28
Rated Voltage	V/phase	3.6
Rated Current	A/phase	1.2
Coil Impedance	Ω/phase	3.0
Coil Inductance	mh	2.2
Holding Torque	N.m	0.14
Moment of Inertia	$g.cm^2$	18
Motor Length	mm	63
Ingress Protection	IP	20
Step Angle		1.8°
Lead		4

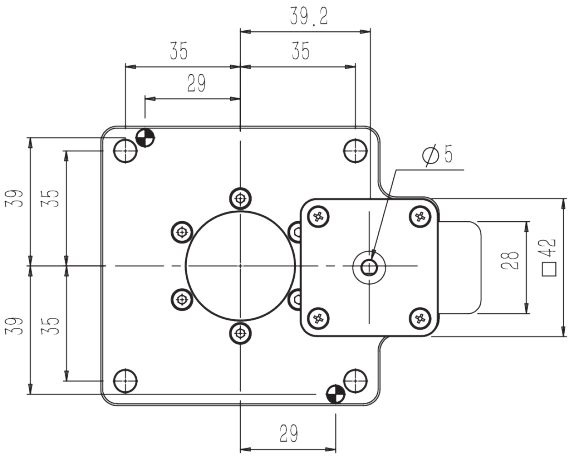
Driver	
Input Voltage	DC24V
Command Input	Pulse + Direction DC5V

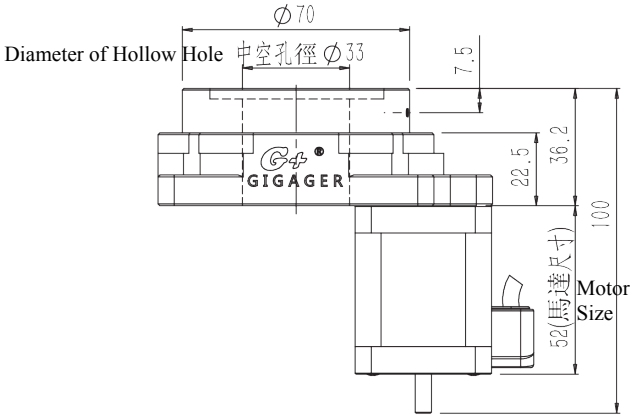
* Customers can configure the driver by themselves.

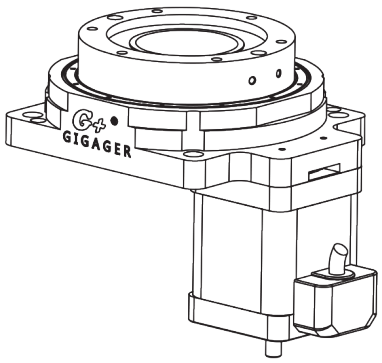
■ GSN85-18K-OS











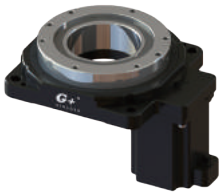
Parameter		
Motor Type		Dedicated Open Loop Stepper Motor
Rotary Platform Bearing		Cross Roller Bearing
Permissible Torque	N.m	3.2
Permissible Speed	rpm	60 (Table Surface)
Gear Ratio		1:18
Moment of Inertia	$kg.m^2$	2534×10^{-6}
Permissible Axial Load	N	500
Permissible Moment of Inertia Load	N.m	10
Positioning Accuracy	min	≦2
Repeatability	sec	±5 (0.001°)
Platform Flatness	mm	±0.005
Platform Concentricity	mm	±0.01
Ingress Protection	IP	40
Precision Lifespan	H	20000
Weight	kg	1.2 (including motor)

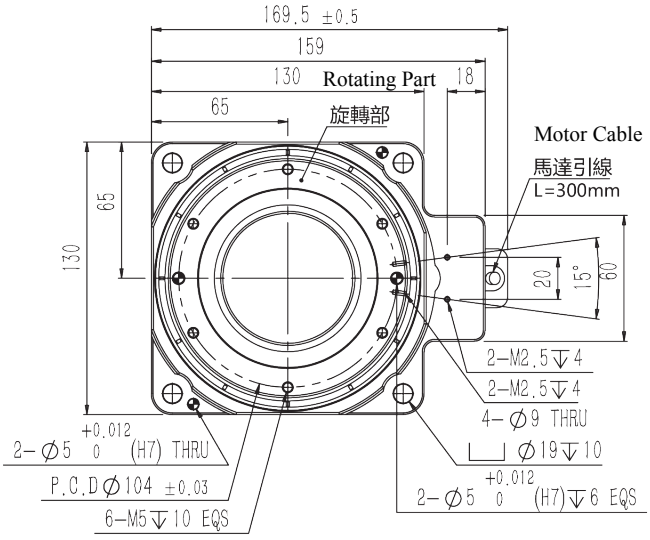
Motor Parameter		
Dimension	mm	42
Rated Voltage V/phase		3.25
Rated Current A/phase		1.3
Coil Impedance Ω/phase		2.5
Coil Inductance	mh	6.0
Holding Torque	N.m	0.6
Moment of Inertia	$g.cm^2$	82
Motor Length	mm	64
Ingress Protection	IP	20
Step Angle		1.8°
Lead		4

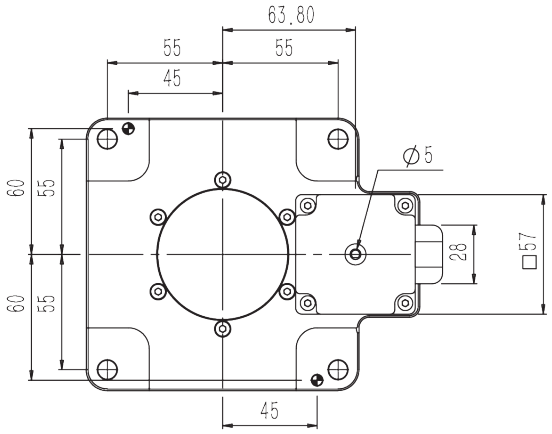
Driver	
Input Voltage	DC24V
Command Input	Pulse + Direction DC5V

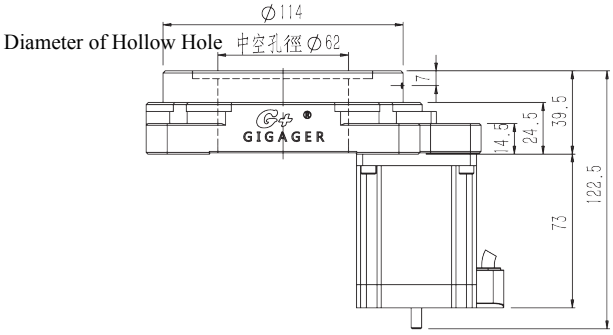
* Customers can configure the driver by themselves.

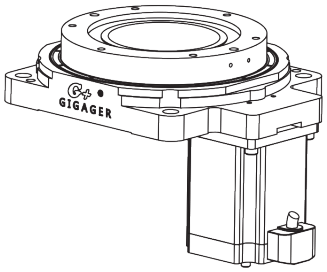
■ GSN130-18K-OS











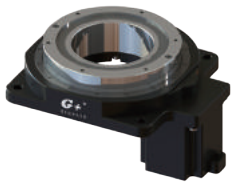
Parameter		
Motor Type		Dedicated Open Loop Stepper Motor
Rotary Platform Bearing		Cross Roller Bearing
Permissible Torque	N.m	20
Permissible Speed	rpm	40 (Table Surface)
Gear Ratio		1:18
Moment of Inertia	kg.m^2	15874×10^{-6}
Permissible Axial Load	N	2000
Permissible Moment of Inertia Load	N.m	50
Positioning Accuracy	min	≦2
Repeatability	sec	±5 (0.001°)
Platform Flatness	mm	±0.005
Platform Concentricity	mm	±0.01
Ingress Protection	IP	40
Precision Lifespan	H	20000
Weight	kg	3.1 (including motor)

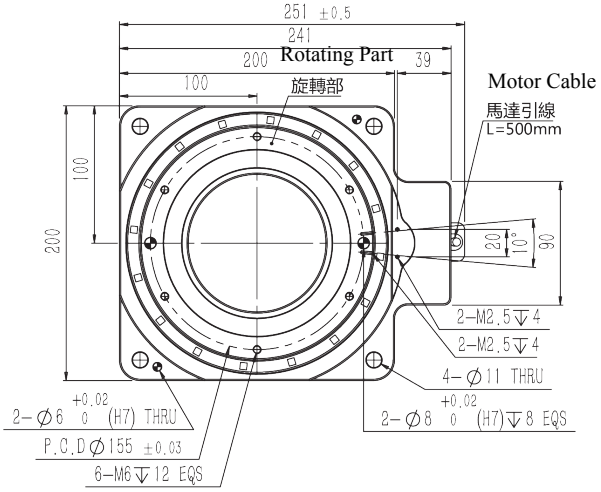
Motor Parameter		
Dimension	mm	57
Rated Voltage	V/phase	3.6
Rated Current	A/phase	3.0
Coil Impedance	Ω/phase	1.2
Coil Inductance	mh	4.2
Holding Torque	N.m	2.2
Moment of Inertia	g.cm^2	460
Motor Length	mm	83
Ingress Protection	IP	20
Step Angle		1.8°
Lead		4

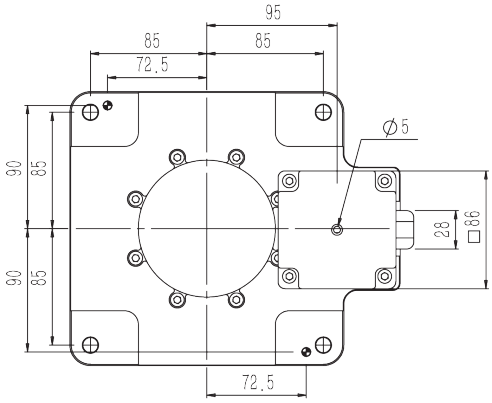
Driver	
Input Voltage	DC24V
Command Input	Pulse + Direction DC5V

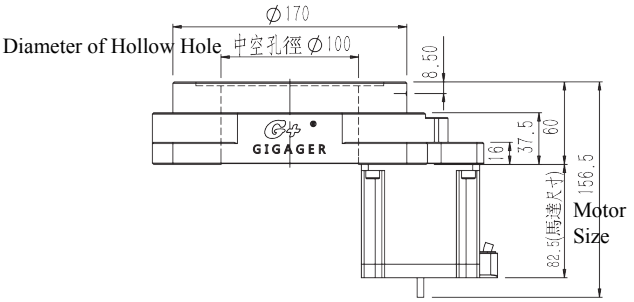
* Customers can configure the driver by themselves.

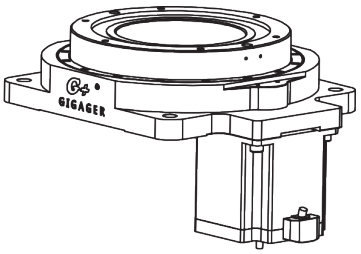
■ GSN200-18K-OS











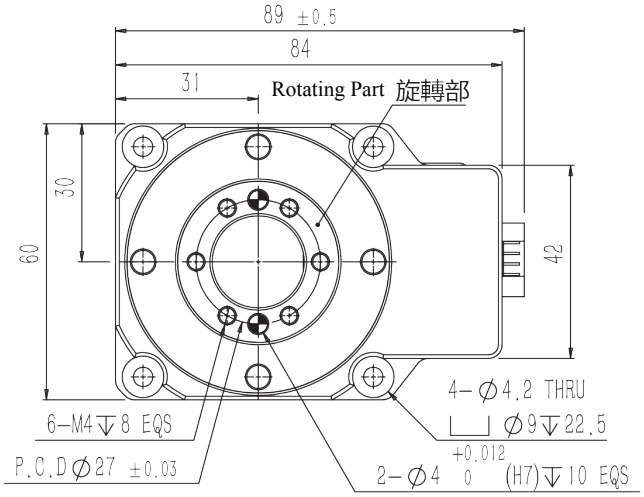
Parameter		
Motor Type		Dedicated Open Loop Stepper Motor
Rotary Platform Bearing		Cross Roller Bearing
Permissible Torque	N.m	50
Permissible Speed	rpm	40 (Table Surface)
Gear Ratio		1:18
Moment of Inertia	$kg.m^2$	108160×10^{-6}
Permissible Axial Load	N	4000
Permissible Moment of Inertia Load	N.m	100
Positioning Accuracy	min	≦2
Repeatability	sec	±5 (0.001°)
Platform Flatness	mm	±0.005
Platform Concentricity	mm	±0.01
Ingress Protection	IP	40
Precision Lifespan	H	20000
Weight	kg	9.5 (including motor)

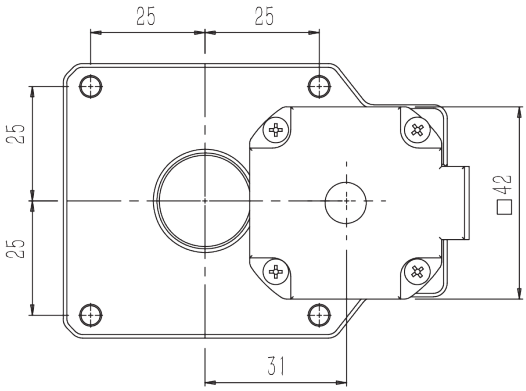
Motor Parameter		
Dimension	mm	86
Rated Voltage	V/phase	3.36
Rated Current	A/phase	5.6
Coil Impedance	Ω/phase	0.6
Coil Inductance	mh	5.2
Holding Torque	N.m	9.5
Moment of Inertia	$g.cm^2$	2500
Motor Length	mm	96.5
Ingress Protection	IP	20
Step Angle		1.8°
Lead		4

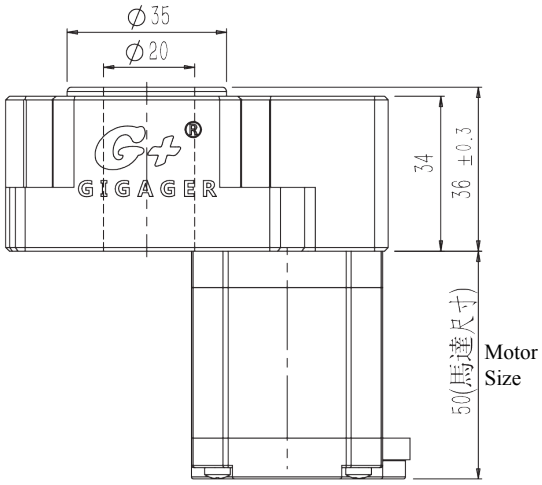
Driver	
Input Voltage	DC48V
Command Input	Pulse + Direction DC5V

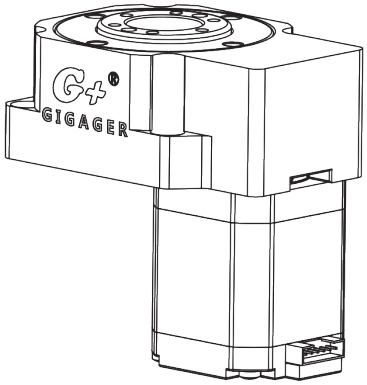
* Customers can configure the driver by themselves.

■ GSB60-05K-OS







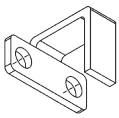


Parameter		
Motor Type		Dedicated Open Loop Stepper Motor
Rotary Platform Bearing		Tapered Roller Bearings
Permissible Torque	N.m	4.9
Permissible Speed	rpm	200 (Table Surface)
Gear Ratio		1:5
Moment of Inertia	kg.m^2	2330×10^{-7}
Permissible Axial Load	N	100
Permissible Moment of Inertia Load	N.m	5
Positioning Accuracy	min	≦2
Repeatability	sec	±5 (0.001°)
Platform Flatness	mm	±0.005
Platform Concentricity	mm	±0.01
Ingress Protection	IP	40
Precision Lifespan	H	20000
Weight	kg	1 (including motor)

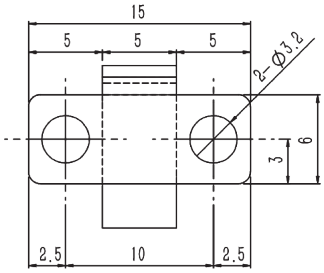
Motor Parameter		
Dimension	mm	42
Rated Voltage	V/phase	3.25
Rated Current	A/phase	1.3
Coil Impedance	Ω/phase	2.5
Coil Inductance	mh	6.0
Holding Torque	N.m	0.6
Moment of Inertia	g.cm^2	82
Motor Length	mm	52
Ingress Protection	IP	20
Step Angle		1.8°
Lead		4

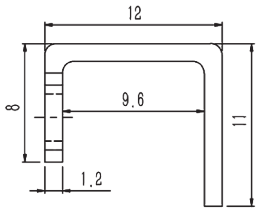
Driver	
Input Voltage	DC24V
Command Input	Pulse + Direction DC5V

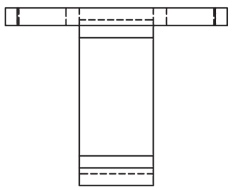
* Customers can configure the driver by themselves.

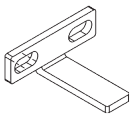


■ B-G1 (GSB series sensor plate)

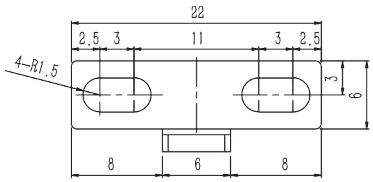


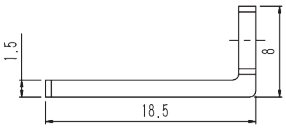


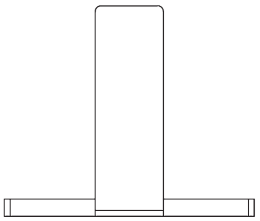


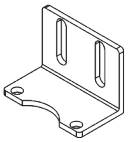


■ N-G1 (GSN series sensor plate)

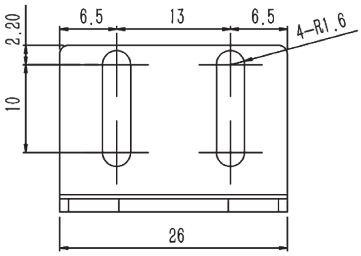


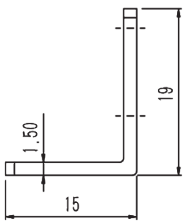


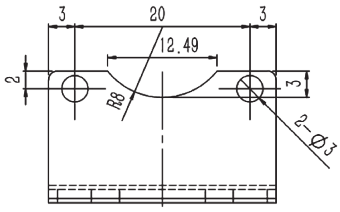




■ N-G2 (GSN series sensor bracket)







- GSB series no need sensor bracket
- Home sensor set：GSB series equipped with OMRON EE-SX672，GSN series equipped with OMRON EE-SX674

Precautions of Using Hollow Rotary Actuator

Be sure to read the precautions described below to avoid damaging the device or causing injury to the user. Failure to read and understand the following precautions may damage the product, related equipment and systems, or cause serious or potential damage.

- Avoid hammering the product with a hammer or dropping the product.
- Be careful when connecting the product to the load side.
- Be careful when handling the edges and key sides of the product.
- Avoid touching the rotating shaft with your hands and other foreign objects when using the product.
- Avoid excessive impact on the product when assembling pulleys, linkages, and mechanical keys.
- Do not exceed Permissible Torque, as this may result in loose, vibrating or damaged bolts.
- Do not disassemble and reassemble the product to avoid damage or affect product performance.
- If the product is abnormal, stop the operation immediately, otherwise it may adversely affect the system.

Warranty

GIGA PRECISION promises to provide customers with lifelong product maintenance service from the date of product sale. For faulty products that are under warranty but do not meet the warranty conditions and products that exceed the warranty period, GIGA PRECISION provides paid repair service. See the detailed provisions below for specific repair services.

Warranty Scope

- The free warranty period will take effect from the date of purchase; it will expire 12 months after the date of purchase. If the product fails during the warranty period, GIGA PRECISION will provide customers with repair or replacement products according to this warranty;
- Free warranty provided by GIGA PRECISION in case of defects in materials or workmanship;
- The failure of the product and its components during the warranty period in accordance with normal operating conditions or conditions specified by GIGA PRECISION.

The following conditions occur during the warranty period, GIGA PRECISION does not provide free warranty service.

- Damage to the product caused by improper handling;
- The faulty product that the customer has dismantled without permission;
- Products that fail to properly use the product for direct damage or accidental damage;
- Damage caused by natural disasters and other accidents.

Guangdong Saini Intelligent Equipment Technology Co., Ltd.
Address: F3,Zhangshen Ave South No.25, Zhangmutou Town, Dongguan,Guangdong,China
Tele: +86 769 87782670 Email: info@gigager.com
Website: www.gigager.net