

Solenoid Gripper **GRS**



Small, affordable, easy to operate! The new Solenoid Gripper

1 Small size

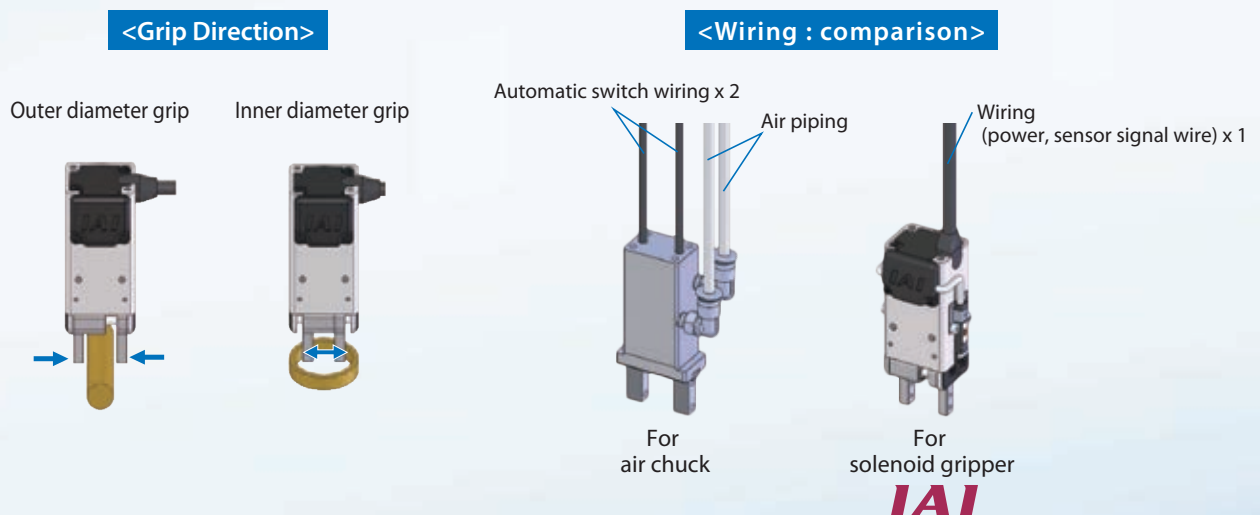
Compact and lightweight electric gripper that fits in the palm of the hand.

2 Low price

The price is as low as an air chuck.
The motorization also contributes to energy saving.

3 ON/OFF control with a single wire

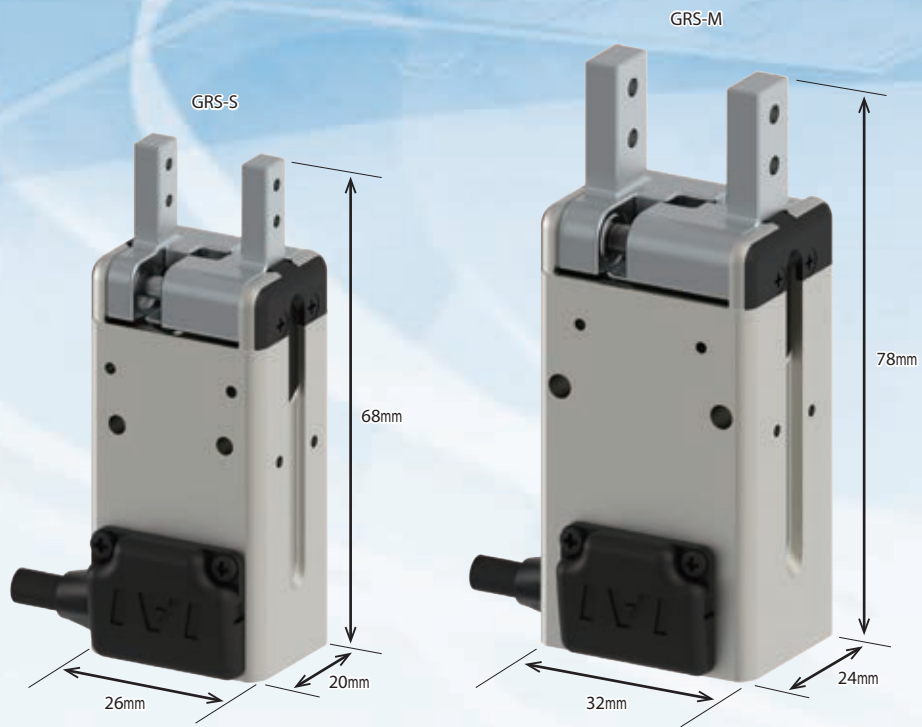
Opening and closing of the fingers are operated simply by ON/OFF signals. Continuous retention is possible while still in the gripping or release state. With just a single wire, wiring is easy too.



4 Long life

Excellent durability, enabling operation of 30 million times or more.*

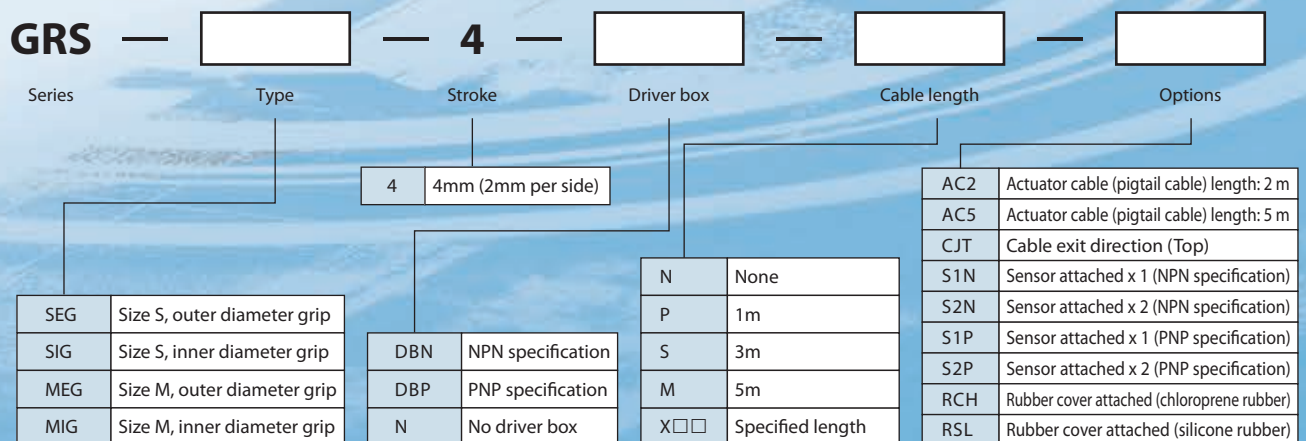
* Results of durability testing at IAI.
Life under the user's operating conditions is not guaranteed.



■ GRS Series List

Model	Size S		Size M	
	Outer diameter grip	Inner diameter grip	Outer diameter grip	Inner diameter grip
Model	GRS-SEG	GRS-SIG	GRS-MEG	GRS-MIG
Outer dimensions [mm]	W26×D20×H68		W32×D24×H78	
Weight [kg]	0.16		0.27	
Opening/closing stroke [mm]	4 (2 per side)		4 (2 per side)	
Max grip force [N]	10 (5 per side)		20 (10 per side)	
Opening/closing time	0.03s or less		0.03s or less	
Operation frequency	120CPM* *Cycle per minute		120CPM* *Cycle per minute	
Reference page	P. 3		P. 5	

■ Model Specification Items



GRS-SEG/SIG

Simple Dustproof

Small 2-Finger Gripper

Finger Slide Guide

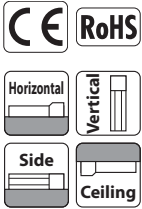
O.D. Grip I.D. Grip

Body Width **26 mm**

24v DC Solenoid

Model Specification Items

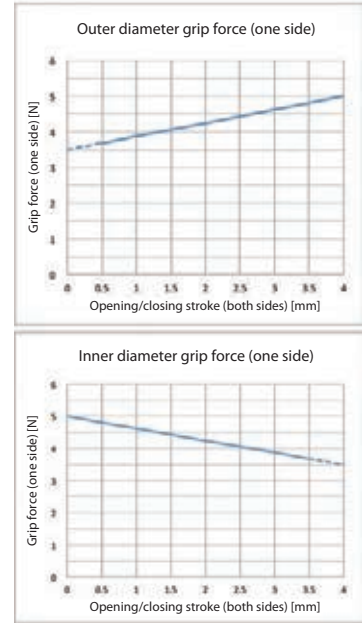
GRS		4			
Series	Type	Stroke	Driver Box	Cable Length	Options
	SEG: Outer Diameter Grip SIG: Inner Diameter Grip	4: 4mm (2mm per side)	DBN: Driver Box (NPN specification) DBP: Driver Box (PNP specification) N: No Driver Box	N: None P: 1m S: 3m M: 5m X□□: Specified Length	Please refer to the options table below.



- POINT Selection Notes**

 - (1) For outer diameter grip, it opens when conductive and closes when not conducting (normally closed). For inner diameter grip, it closes when conductive and opens when not conducting (normally open).
 - (2) Since a spring is used for the grip mechanism, the grip force changes depending on the open/closing stroke of the fingers.
 - (3) To operate the solenoid gripper, a driver box is essential. Please refer to P.8 for specification details.
 - (4) Please refer to P.9 for gripper selection.

Correlation Diagram of Grip Force and Opening/Closing Stroke



(Note) The grip force changes depending on the open/closing stroke of the fingers.

Actuator Specifications

Model	Grip direction	Max grip force (N)	Stroke (mm)
GRS-SEG-4-①-②-③	Outer diameter	10	4
GRS-SIG-4-①-②-③	Inner diameter	(5 per side)	(2 per side)

Legend ① Driver box ② Cable length ③ Option

Stroke and Operation Time/Frequency

Stroke (mm)	Operation time [Open/close] (s)	Operation frequency (CPM*)
4	0.03 or less	120

*CPM: Cycle per minute

Cable Length

Type	Cable code
Standard type	P(1m)
	S(3m)
	M(5m)
Specified length	X06 (6m) ~ X10 (10m)
	X11 (11m) ~ X15 (15m)

Actuator Specifications

Item	Description
Drive system	Grip mechanism (chuck): Compression spring + cam mechanism Release mechanism (unchuck): Solenoid electromagnetism + cam mechanism
Positioning repeatability	±0.1mm
Backlash	0.5mm or less per side
Finger guide	Slide guide
Mass	0.16kg
Ambient operating temp. & humidity	0 to 40°C, 85% RH or less (Non-condensing)
Degree of protection	IP20
Vibration resistance / shock resistance	4.9m/s ² 100Hz or less
Compliant international standards	CE marking, RoHS Directive

Options

Name	Option code	Reference page
Actuator cable (pigtail cable) length: 2 m	AC2	See P.7
Actuator cable (pigtail cable) length: 5 m	AC5	
Cable exit direction (Top)	CJT	
Sensor attached x 1 (NPN specification) (*1)	S1N	
Sensor attached x 2 (NPN specification) (*1)	S2N	
Sensor attached x 1 (PNP specification) (*2)	S1P	
Sensor attached x 2 (PNP specification) (*2)	S2P	
Rubber cover attached (chloroprene rubber)	RCH	
Rubber cover attached (silicone rubber)	RSL	

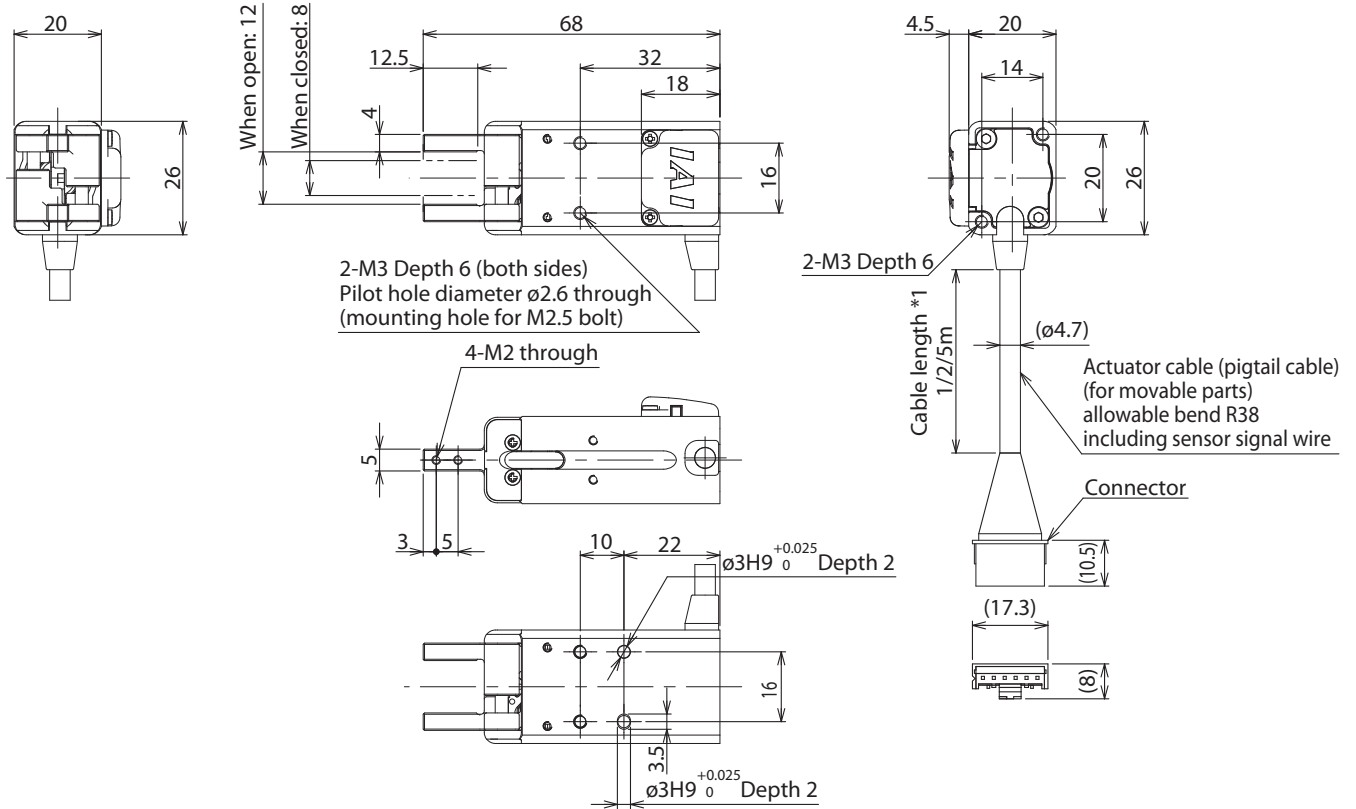
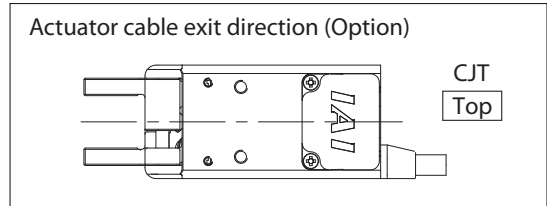
(*1) S1N and S2N can only be selected for DBN driver box.
(*2) S1P and S2P can only be selected for DBP driver box.

Dimensions

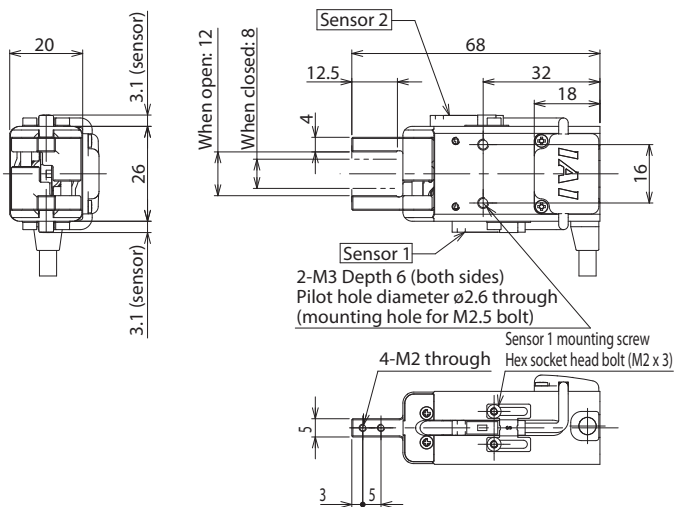
CAD drawings can be downloaded from our website.
www.robocylinder.de



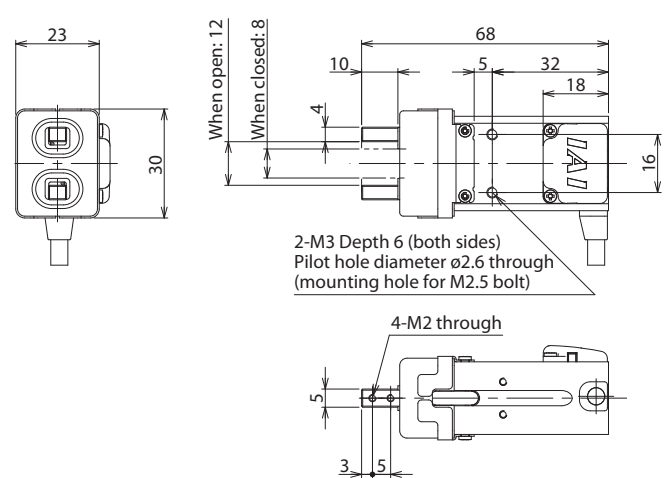
*1 The actuator cable (pigtail cable) is a robot cable.
The actuator cable (pigtail cable) standard length is 1m.
Can be changed to 2m or 5m as an option (model: AC2/AC5).



Sensor attached (option)



Rubber cover attached (option)



GRS-MEG/MIG

Simple Dustproof

Medium 2-Finger Gripper

Finger Slide Guide

O.D. Grip I.D. Grip

Body Width **32 mm**

24v DC Solenoid

Model Specification Items

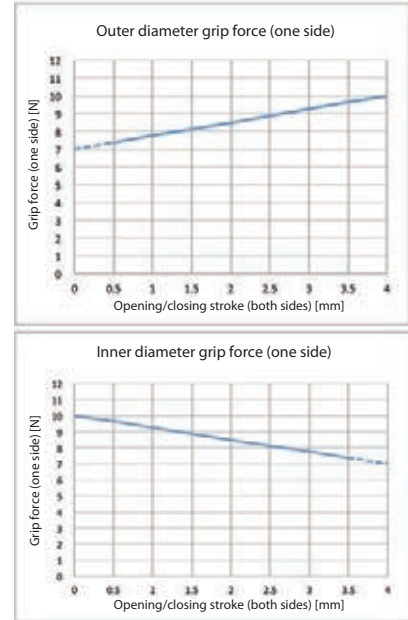
GRS		4			
Series	Type	Stroke	Driver Box	Cable Length	Options
	MEG: Outer Diameter Grip MIG: Inner Diameter Grip	4: 4mm (2mm per side)	DBN: Driver Box (NPN specification) DBP: Driver Box (PNP specification) N: No Driver Box	N: None P: 1m S: 3m M: 5m X□□: Specified Length	Please refer to the options table below.



- POINT Selection Notes**

 - (1) For outer diameter grip, it opens when conductive and closes when not conducting (normally closed). For inner diameter grip, it closes when conductive and opens when not conducting (normally open).
 - (2) Since a spring is used for the grip mechanism, the grip force changes depending on the open/closing stroke of the fingers.
 - (3) To operate the solenoid gripper, a driver box is essential. Please refer to P.8 for specification details.
 - (4) Please refer to P.9 for gripper selection.

Correlation Diagram of Grip Force and Opening/Closing Stroke



(Note) The grip force changes depending on the open/closing stroke of the fingers.

Actuator Specifications

Model	Grip direction	Max grip force (N)	Stroke (mm)
GRS-MEG-4-①-②-③	Outer diameter	20 (10 per side)	4 (2 per side)
GRS-MIG-4-①-②-③	Inner diameter		

Legend ① Driver box ② Cable length ③ Option

Stroke and Operation Time/Frequency

Stroke (mm)	Operation time [Open/close] (s)	Operation frequency (CPM*)
4	0.03 or less	120

*CPM: Cycle per minute

Cable Length

Type	Cable code
Standard type	P(1m)
	S(3m)
	M(5m)
Specified length	X06 (6m) ~ X10 (10m)
	X11 (11m) ~ X15 (15m)

Actuator Specifications

Item	Description
Drive system	Grip mechanism (chuck): Compression spring + cam mechanism Release mechanism (unchuck): Solenoid electromagnetism + cam mechanism
Positioning repeatability	±0.1mm
Backlash	0.5mm or less per side
Finger guide	Slide guide
Mass	0.27kg
Ambient operating temp. & humidity	0 to 40°C, 85% RH or less (Non-condensing)
Degree of protection	IP20
Vibration resistance / shock resistance	4.9m/s ² 100Hz or less
Compliant international standards	CE marking, RoHS Directive

Options

Name	Option code	Reference page
Actuator cable (pigtail cable) length: 2 m	AC2	See P.7
Actuator cable (pigtail cable) length: 5 m	AC5	
Cable exit direction (Top)	CJT	
Sensor attached x 1 (NPN specification) (*1)	S1N	
Sensor attached x 2 (NPN specification) (*1)	S2N	
Sensor attached x 1 (PNP specification) (*2)	S1P	
Sensor attached x 2 (PNP specification) (*2)	S2P	
Rubber cover attached (chloroprene rubber)	RCH	
Rubber cover attached (silicone rubber)	RSL	

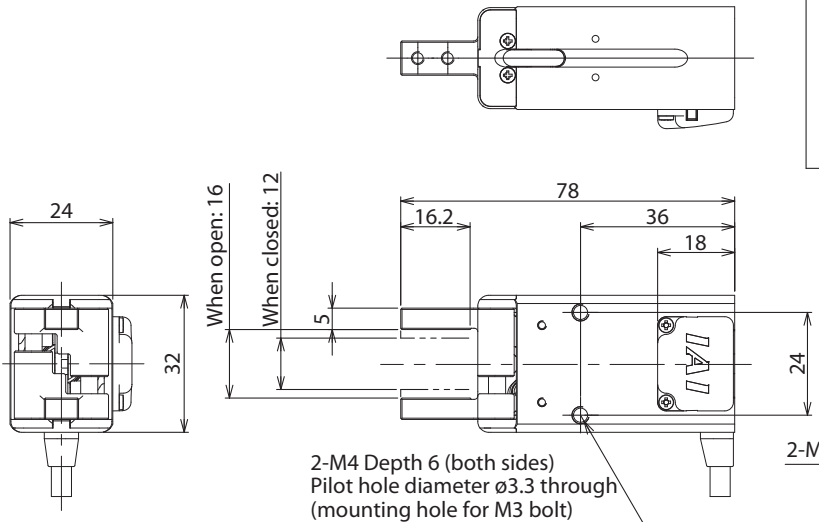
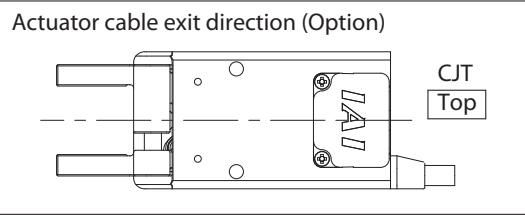
(*1) S1N and S2N can only be selected for DBN driver box.
(*2) S1P and S2P can only be selected for DBP driver box.

Dimensions

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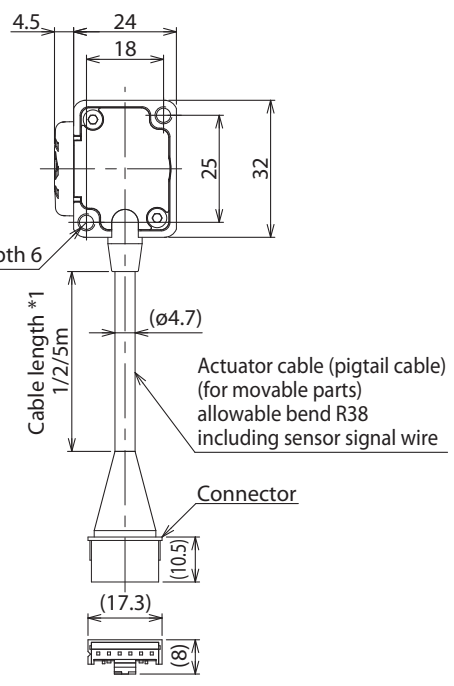
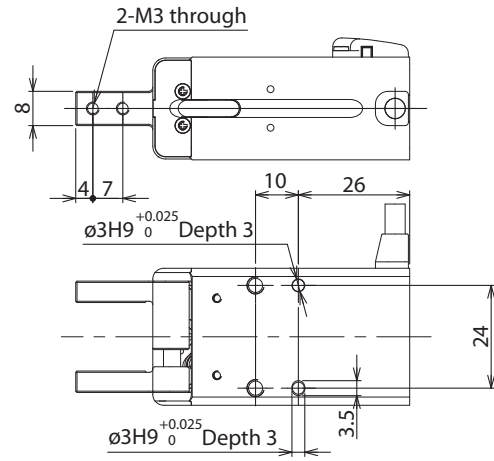


*1 The actuator cable (pigtail cable) is a robot cable.
The actuator cable (pigtail cable) standard length is 1m.
Can be changed to 2m or 5m as an option (model: AC2/AC5).

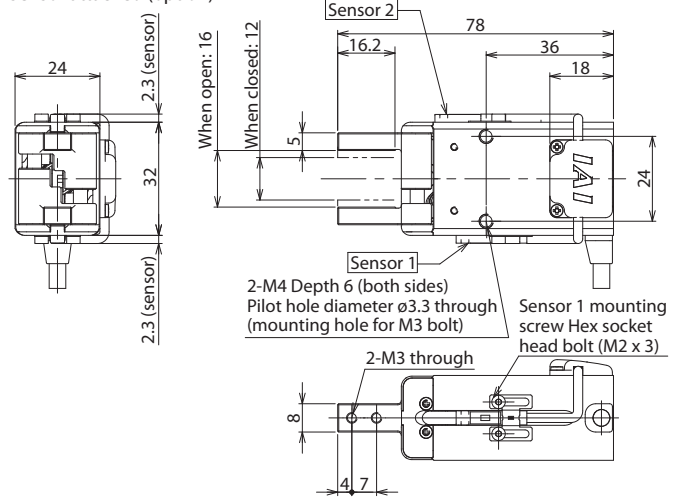


2-M4 Depth 6 (both sides)
Pilot hole diameter ø3.3 through
(mounting hole for M3 bolt)

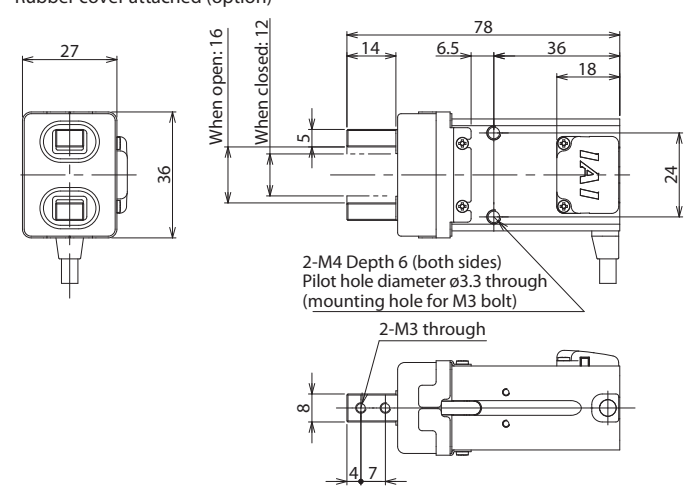
2-M4 Depth 6



Sensor attached (option)



Rubber cover attached (option)



Options

Actuator's pigtail cable specification

Model AC2/AC5

Description Although the standard length of the actuator's pigtail cable is 1m, it can be changed to 2m/5m as an option.

Cable exit direction (Top)

Model CJT

Description Although the standard outlet direction of the actuator's pigtail cable is on the side, it can be changed to the top outlet direction as an option.

Sensor

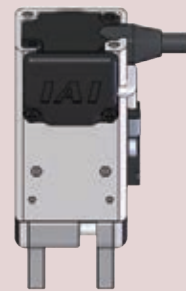
Model S1N/S2N/S1P/S2P

Description One or two sensors can be attached.

Applicable models	Sensor specification	Number of sensors	Single product model number
GRS-SEG/SIG	NPN	1	GRS-S1N-S
		2	GRS-S2N-S
	PNP	1	GRS-S1P-S
		2	GRS-S2P-S
GRS-MEG/MIG	NPN	1	GRS-S1N-M
		2	GRS-S2N-M
	PNP	1	GRS-S1P-M
		2	GRS-S2P-M

(When ordering by single product model number, a mounting bracket and bolts will also be included)

Sensor 1 pc.



Sensor 2 pcs.



Rubber cover attached

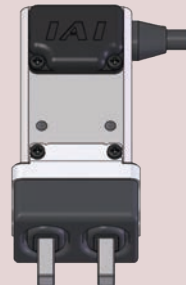
Model RCH/RSL

Description Rubber cover can be added to opening/closing part of the chuck.

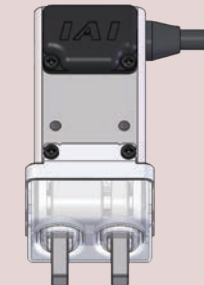
Applicable models	Rubber cover material	Single product model number
GRS-SEG/SIG	RCH (Chloroprene rubber)	GRS-RCH-S
GRS-MEG/MIG		GRS-RCH-M
GRS-SEG/SIG	RSL (Silicone rubber)	GRS-RSL-S
GRS-MEG/MIG		GRS-RSL-M

(When ordering by single product model number, a mounting bracket and screws will also be included)

RCH (chloroprene rubber)



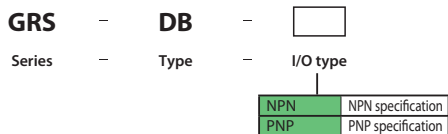
RSL (silicone rubber)



Driver Box

The driver box allows the solenoid gripper to operate by following ON/OFF signals from an external control device, and controlling the current to suppress solenoid gripper heat generation.

Model Configuration



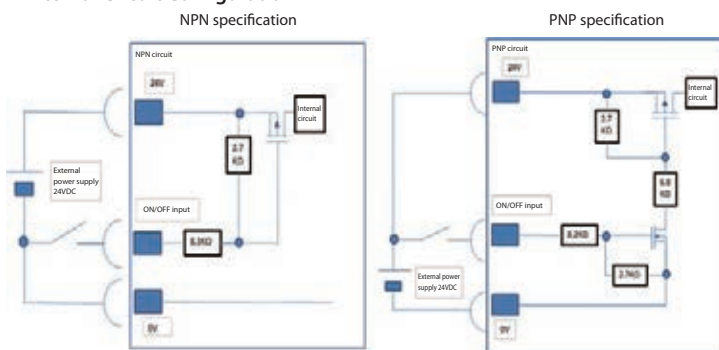
Specifications

Item	Description	
Control target	GRS-S	GRS-M
Control method	PWM current control	
Power supply voltage	24VDC ± 10%	
Maximum output current (Release initial instantaneous 40ms)	2.8A	3.7A
Maximum power consumption (Release initial instantaneous 40ms)	74W	97W
Power consumption for release retention (Release status retained)	2.0W	2.1W
Power consumption for grip status	0W	0W
Open/close signal input	Signal input dedicated for 24VDC (NPN/PNP selection)	
Position sensor signal output	Signal output dedicated for 24VDC (NPN/PNP selection)	
Indicator light	LED during release operation: Light ON (green) LED during gripping operation: Light OFF	
Manual switch	OFF during normal operation Manual switch ON is enabled only when open/close signal input is OFF	
Ambient operating temperature	0 to 40°C	
Ambient operating humidity	85% RH or less (non-condensing)	
Operating ambience	No corrosive gas	
Ambient storage humidity	-10 to 65°C	
Ambient storage temperature	90% RH or less (non-condensing)	
Degree of protection	IP20	
Mass	22g	
External dimensions	58mm (W) x 58.1mm (H) x 16mm (T)	

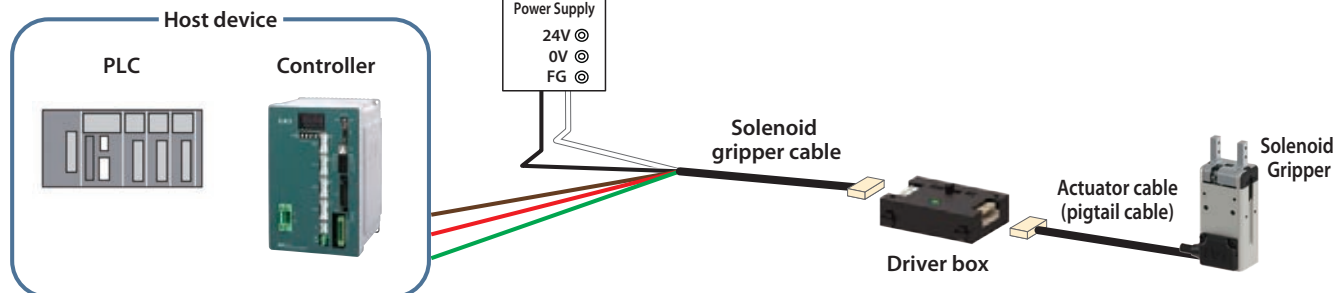
Open/close Signal Input Specification

Item	NPN specification	PNP specification
Input voltage	24V ± 10%	24V ± 10%
Input current	2mA	2mA
Leakage current	0.25mA max.	0.25mA max.
Operating voltage	ON voltage: 6.0V or less	ON voltage: 18.0V or more
	OFF voltage: Input voltage - 3.0V or more	OFF voltage: Input voltage 3.0V or less
Isolation method	Non-isolated	Non-isolated

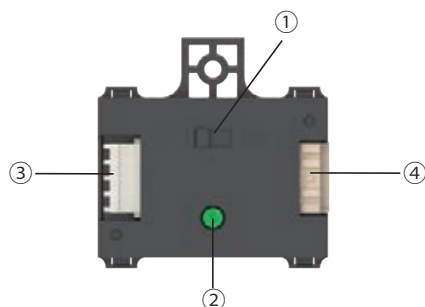
Internal Circuit Configuration



System Configuration

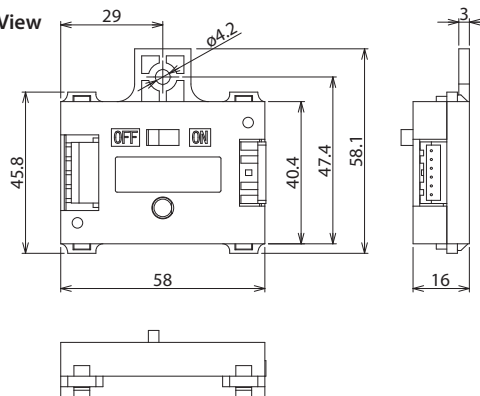


Names of Each Part



- ① Slide switch
For manual grip/release.
(Enabled only when open/close signal from external device is OFF)
- ② LED display
Light turns ON via signals from the external control device.
Light is also ON during forced ON via slide switch.
- ③ Power/control device side connector
Cables from power supply and host devices to be connected.
- ④ Gripper side connector
For solenoid gripper connection.

External View



Signal Names (power/control device side)

Wire color	Signal name	Description
White	24V	24VDC ±10% power input for driver box, solenoid gripper sensor
Black	0V	0V(GND)
Brown	ON/OFF	Open/close signal input of solenoid gripper
Red	Sensor 1	Output of solenoid gripper sensor 1
Green	Sensor 2	Output of solenoid gripper sensor 2

Gripper Selection Method

Slide type

Step 1

Check the required grip force and allowable workpiece mass



Step 2

Check the gripping point distance



Step 3

Check external force applied to fingers

Step 1

Check the required grip force and allowable workpiece mass

When gripping the workpiece with frictional grip force, calculate the required grip force as follows.

(1) For normal transfer

F : Grip force (N) ... Total sum of push forces of both fingers
μ : Static friction coefficient between the finger attachment and the workpiece
m : Workpiece mass (kg)
g : Gravitational acceleration (= 9.8m/s²)

- The conditions under which the workpiece remains statically gripped without dropping are as follows:

$$F \mu > W \quad F > \frac{mg}{\mu}$$

- Assuming a recommended safety factor of 2 for normal transfer, the required gripping force is calculated as follows:

$$F > \frac{mg}{\mu} \times 2 \text{ (safety factor)}$$

- When the friction coefficient is μ0.1 ~ 0.2

$$F > \frac{mg}{0.1\sim0.2} \times 2 = (10\sim20) \times mg$$

For ordinary workpiece transferring

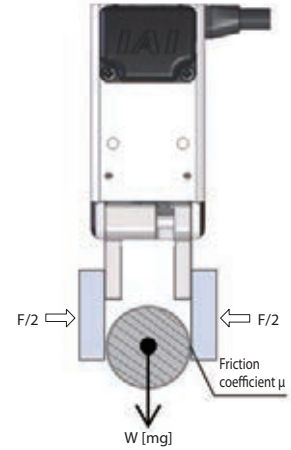
Required grip force: ▶ **10~20 times or more the workpiece mass**
 Max. allowable mass: ▶ **Not more than 1/10th to 1/20th the gripping force**

(2) When considerable acceleration, deceleration, or impact force is applied during transfer of the workpiece

In addition to gravity, a greater inertial force is applied to the workpiece. In this case, select a model with an even higher safety factor.

When large acceleration, deceleration, or shock is applied

Required grip force: ▶ **30~50 times or more the workpiece mass**
 Max. allowable mass: ▶ **Not more than 1/30th to 1/50th the gripping force**



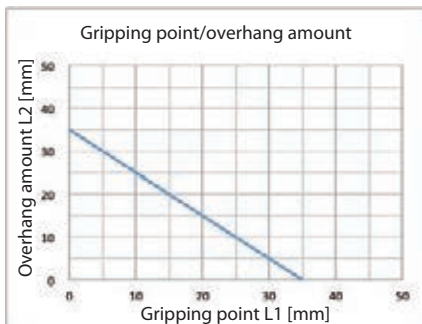
* The greater the coefficient of static friction, the greater the maximum allowable workpiece mass. However, select a model that can generate a gripping force of at least 10 to 20 times this workpiece mass to ensure safety.

Step 2

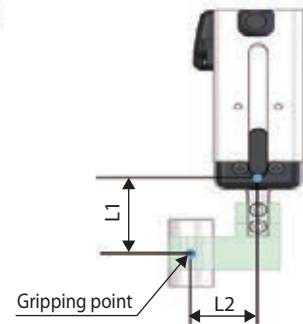
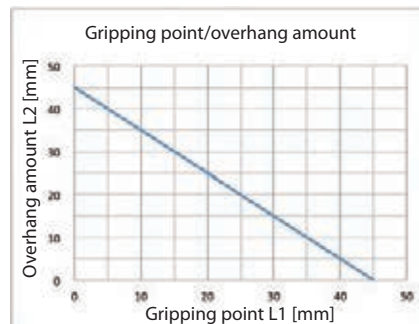
Check the distance to the gripping point

The distances (L1, L2) from the finger mounting surface to the gripping point have to fall in the ranges specified below. If the limits are exceeded, excessive moments may act upon the sliding part of the finger and internal mechanism and it could shorten the service life.

GRS-SEG/SIG



GRS-MEG/MIG



Even if the gripping point distance is within the limit range, keep the finger attachment as small and lightweight as possible. If the fingers are long and large, or if the mass is large, inertial force and bending moment during opening and closing may worsen the performance and adversely affect the guide section.

Gripper Selection Method

Step 3 Check external force applied to fingers

(1) Allowable vertical load

Make sure that the vertical load applied to each finger is less than the allowable load.

(2) Allowable load moment

Calculate M_a and M_c using value of L_1 and L_2 . Make sure the moment applied to each finger is less than the maximum allowable load moment.

● The allowable external force when applying moment load to each claw is

$$\text{Allowable load } F(N) > \frac{M \text{ (Maximum allowable moment (N-m))}}{L(\text{mm}) \times 10^{-3}}$$

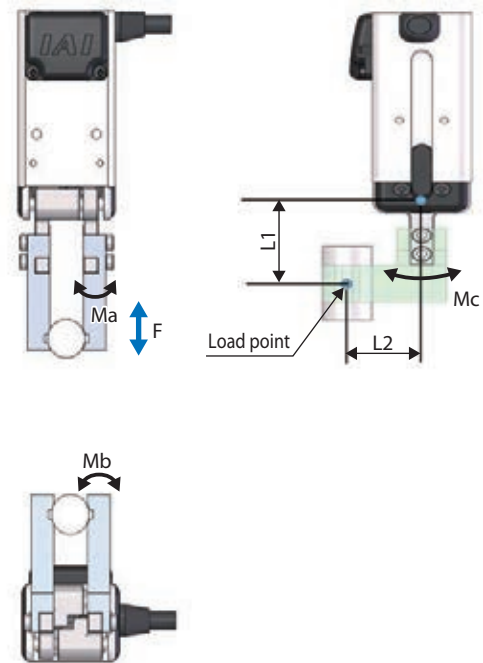
Calculate $F(N)$ using L_1 and L_2 .

Check that the external force applied to the finger is less than the calculated allowable load $F(N)$ (the smaller value of L_1 and L_2).

Model	Allowable vertical load $F(N)$	Maximum allowable load moment (N-m)		
		M_a	M_b	M_c
GRS-SEG/SIG	150	0.62	0.62	0.99
GRS-MEG/MIG	240	1.08	1.08	2.64

1. The allowable value above indicates a static value. 2. Indicates the allowable value per finger.

* The mass of the finger and the workpiece mass are also part of the external force. Other external forces applied to the fingers are the centrifugal force when swiveling the gripper with the workpiece attachment gripped and the inertia force due to acceleration/deceleration during travel.

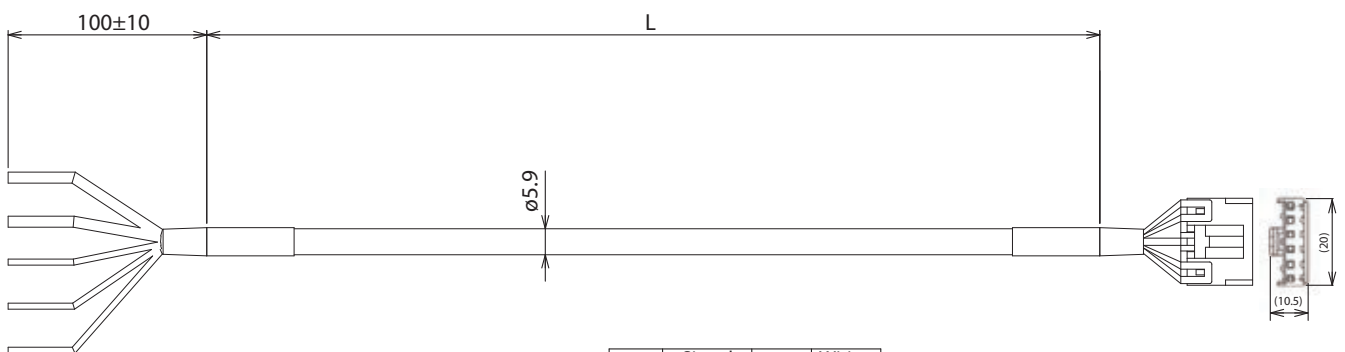


* The load point above indicates the load position on the fingers. The position varies depending on the type of load.
 · Load due to grip force: Gripping point
 · Load due to gravity: Center mass location
 · Inertial force during travel, centrifugal force during swivel: Center mass location
 The load moment is the total value calculated for each type of load.

Maintenance Parts

Model **CB-GRS-PCS** Solenoid gripper cable

* Please indicate the cable length (L) in □□□, (e.g. 050 = 5m), maximum 15m



No.	Signal	Color	Wiring
1	+24V	White	AWG18
2	GND	Black	
3	ON/OFF	Brown	AWG22
4	Sensor 1	Red	
5	Sensor 2	Green	

Wiring layout

**GRS Solenoid Gripper
Catalogue No. 1118-E**



The information contained in this catalog is subject to change without notice for the purpose of product improvement



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