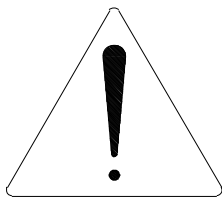


Instruction Manual for SN Cylinder

Head Office Y-Design-13

Version: Second Edition



Precautions on Safety

- Be sure to read the Instruction Manual carefully before using and use the product properly.
- Before installing or servicing the product, be sure to turn off the power, completely cut off the hydraulic power source, and release the residual pressure.
- Be sure to use the cylinder at the nominal pressure or less.
- Be careful of sudden movement of the load mounting part due to hydraulic pressure supply from the timing when there is no pressure applied.
- Do not touch the cushion plug, air vent plug, or check plug during operation.

Enactment / Revision History

Document Name: Instruction Manual for SN Cylinder						
Item	Date	Revised Page	Revision Content / Reason	Approval	Verification	Preparation
Enactment	October 11, 2005			Nishide	Tuji	Niiya
1 st Edition	October 3, 2007	Pages 8-17	Modification due to change of controller model	Nishide	Tuji	Niiya
2 nd Edition	August 28, 2013	Many Pages	Modification and editing due to change of controller model			

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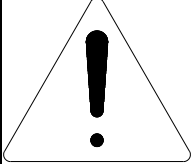
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*Please note that the contents are subject to change without notice.

 Warning	<p>Be sure to read this instruction manual before use.</p> <p>Use under the application, load current, voltage, temperature, shock, environment, etc. outside the scope of specifications could cause damage or malfunction. Use the product properly within the scope of the specifications.</p> <p>Never use the product in an atmosphere of explosive gas. The sensor does not have an explosion-proof structure. Never use it in an atmosphere of explosive gas because it could also lead to an explosion disaster.</p> <p>Before installing or servicing the hydraulic cylinder, turn off the hydraulic power source, turn off the power, and release the residual pressure.</p> <p>When connecting the lead wires, be sure to turn off the power to the electric circuit on the connecting side before wiring. Doing work with the power on could result in electric shock or accidents due to unexpected movement.</p>
-----------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

— Precautions for Use —

- Precautions for Use of Cylinder

- ① Refer to the instruction manual for hydraulic cylinder.

- Precautions on Design

- ① If the sensor fails and the output becomes unstable, either design so that the entire system works toward the safe side or provide a safety circuit.
- ② If the sensor output becomes unstable due to abnormalities in magnets, cables, power supplies, etc., noise, vibration, shock, etc., either design so that the entire system works toward the safe side or provide a safety circuit.
- ③ The sensor is not designed for applications that require extremely high reliability (medical devices, vehicles, aerospace, nuclear power control, etc.).

- Precautions for Use of Sensor

- ① Use exceeding the rated specifications could cause a malfunction or a failure.
- ② Be sure to turn off the power before mounting the sensor, wiring, or connecting / disconnecting the connector. Connecting / disconnecting the connector while the power is on could cause a failure.
- ③ Connecting / disconnecting the connector while it is wet due to rain or other causes could cause a failure. Before connecting / disconnecting the connector, dry it sufficiently.
- ④ Connecting a power supply with a different rating or incorrect wiring could cause a fire or a malfunction. Be sure to check before turning on the power.
- ⑤ Be sure to check the terminals and connectors for looseness before turning on the power.
- ⑥ Be careful not to let foreign matter, such as cutting chips or wiring debris, enter the controller through the gaps in the case. It could cause a fire or a malfunction.
- ⑦ Do not touch the terminals directly. It could cause an electric shock or a malfunction.
- ⑧ If the cables between the sensor and controller, power supply cables, and output cables are

bundled with electric power / motive power cables etc., they may be affected by noise. Keep an appropriate distance or protect with a conduit etc.

- ⑨ The controller does not have a drip-proof structure. Do not use the controller where it gets wet or where water or oil is splashed.
- ⑩ This product is not an explosion-proof device. Do not use it in places with explosive gas.
- ⑪ Never change specifications, disassemble, or modify the product. It could cause a fire or a malfunction.

1. Operating Principle

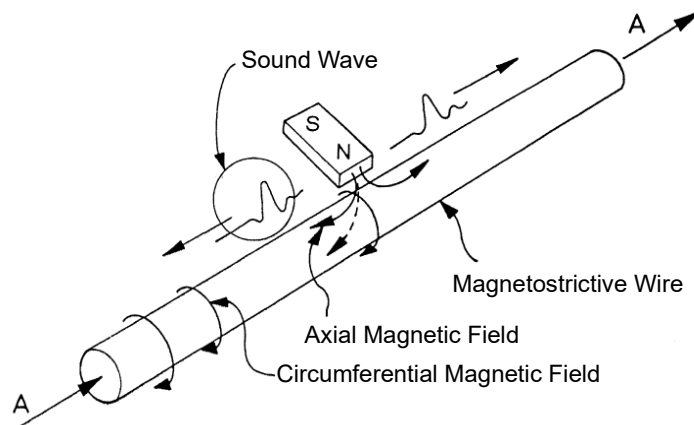
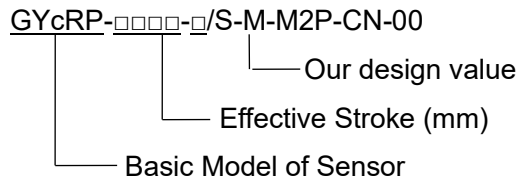


Fig. 1

Fig. 1 shows the basic principle of magnetostrictive linear displacement. When a current pulse signal is applied to a special magnetostrictive wire in the direction of arrow A, a magnetic field in the circumferential direction is generated around the magnetostrictive wire. On the other hand, if a magnet is placed on the magnetostrictive wire as shown in Fig. 1, an axial magnetic field is applied to that part and an oblique magnetic field is generated as shown by the dotted line. This effect causes a local torsional strain on the magnetostrictive wire. This phenomenon is called the Wiedemann Effect. This torsional strain is a kind of vibration and propagates at a sonic velocity on a magnetostrictive wire that is a metal. The GY sensor detects the position with high accuracy by measuring the propagation time of this ultrasonic wave.

2. GYcRP Sensor

1) Model



2) External Dimensions of GYcRP Sensor

① Connector Connection Type

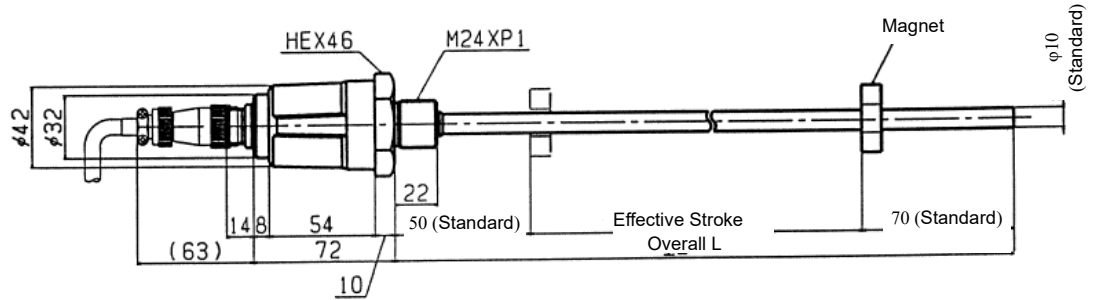


Fig. 2 Outline Drawing of Connector Connection Type

② Pigtail Type (optional)

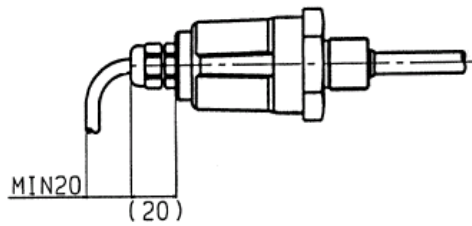


Fig. 3 Outline Drawing of Pigtail Type

3. GYFC2 Controller

1) Name of Each Part

- ① Alarm LED
- ② Power LED
- ③ Zero-Point Adjustment Trimmer
- ④ Span Adjustment Trimmer
- ⑤ Power Supply / Output Connector
- ⑥ Sensor Connector
- ⑦ Rear Mounting Hole
- ⑧ Side Mounting Hole

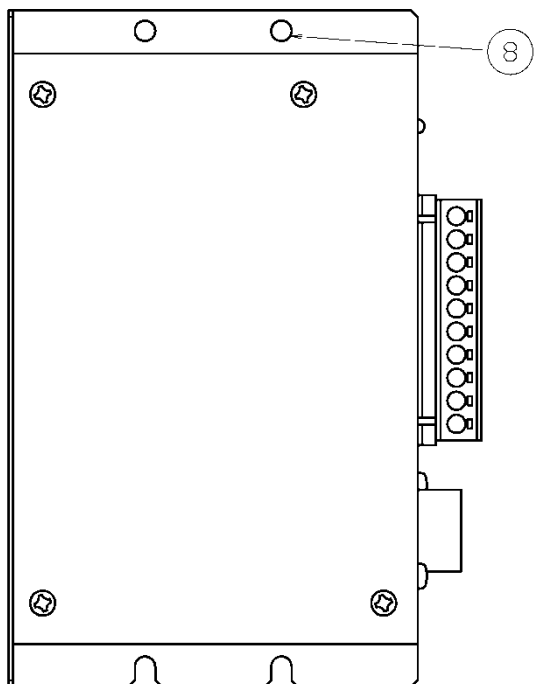


Fig. 4 Body Left Side View

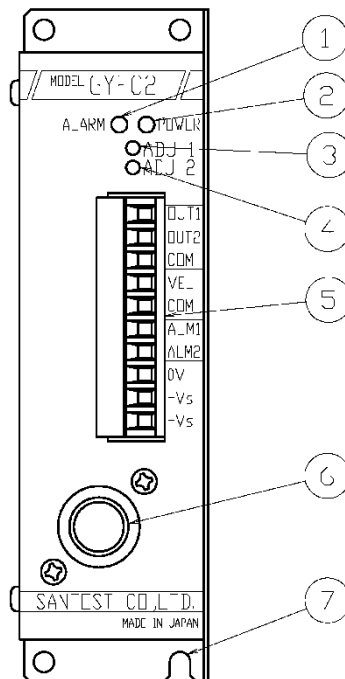
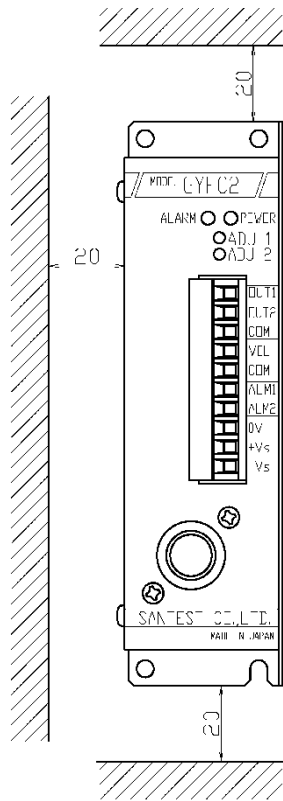


Fig. 5 Body Front View

2) Notes on Installation



- Mount the body vertically as shown in the left figure.
- Leave a space of 20 mm or more above and below and on the left side of the body.
- Leave 120 mm or more on the front of the body so that the connector can be connected.
- Do not put anything on top of the product.
- Do not install the product in places with dust or oil mist.
- Do not install the product in locations with corrosive gas / combustible gas / explosive gas.

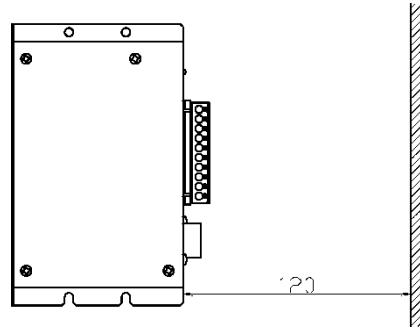


Fig. 6 Installation Diagram of the Body

3) Installation Method

Install the product using its mounting holes on the back or right side.
Refer to the figure below for processing the mounting board.

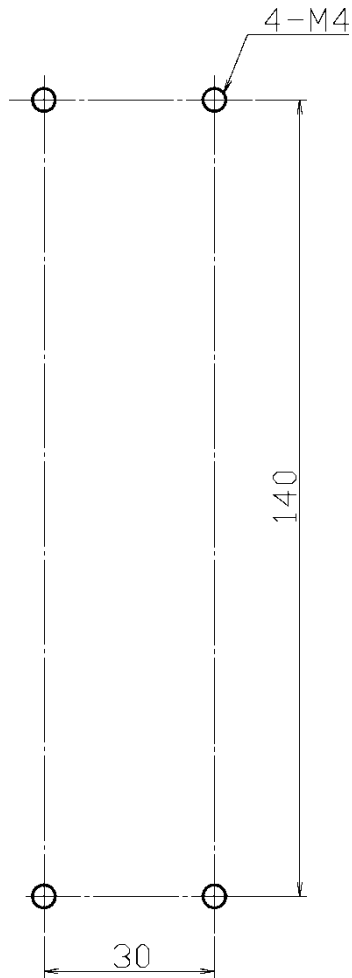


Fig. 7 Mounting Dimensional Drawing

4) Compatible Wire Size

The recommended wire size for Power Supply / Output Connector is 0.2 to 2.5 [mm²] (equivalent to AWG24 to 12). Peel off the coating 7 mm from the end of the wire as shown below (L = 7 [mm]).

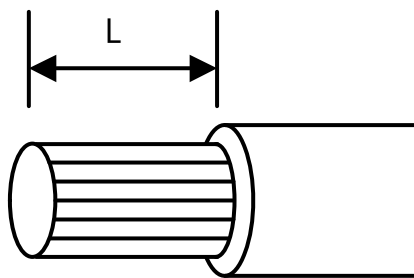


Fig. 8 Tip Treatment for Wire

5) Connection of Power Supply / Output Connector

Power Supply / Output Connector is a two-piece screw type connector.

(MSTB2,5 / 10-ST-5,08 manufactured by Phoenix Contact Co., Ltd.)

Screw Tightening Torque: 0.5 [Nm] (maximum 1.0 Nm), Driver Width: 3 mm or less

- Terminal Arrangement for Power Supply / Output Connector

The terminal arrangement is as follows.

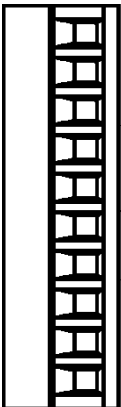
	OUT1	Position Output 1 of the Sensor
	OUT2	Position Output 2 of the Sensor
	COM	Output Common
	VEL	Speed Output of the Sensor (optional)
	COM	Output Common
	ALM1	Alarm Output
	ALM2	
	0V	0 V Input Terminal of Power Supply
	+Vs	+ Power Supply Input Terminal
	-Vs	- Power Supply Input Terminal (use only for the ± 15 V DC model)

Fig. 9 Terminal Arrangement for Power Supply / Output Connector

Note 1) COMs are internally connected.

Note 2) For + 24 V DC model, COM and 0 V are insulated.

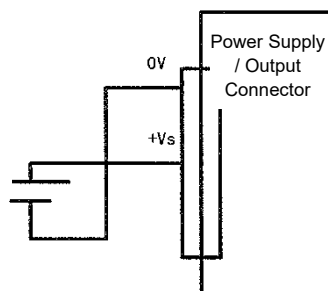
Note 3) For ± 15 V DC model, COM and 0 V are internally connected.

6) Connection of Power Supply

The connection of power supply varies depending on the specifications. Check the model and wire correctly. For the power supply, supply a regulated DC power supply.

- + 24 V DC model

+ 24 V DC model



* Do not connect anything to -Vs.

Fig. 10 Power Supply Connection Diagram for + 24 V specification

- ±15 V DC model

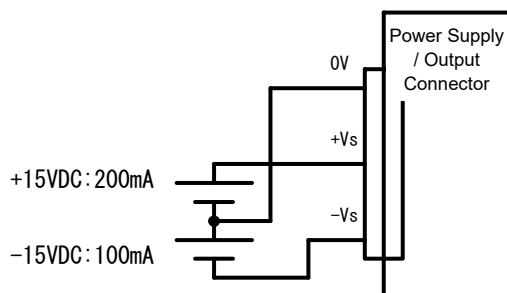


Fig. 11 Power Supply Connection Diagram for ± 15 V specification

7) Connection of Analog Output

A voltage / current output proportional to the magnet position can be obtained between OUT1-COM and between OUT2-COM. The output of OUT1 and OUT2 differs depending on the model. For details, refer to 11).

A voltage output proportional to the speed of the magnet can be obtained between VEL-COM. (Optional)

The load resistance of voltage output shall be 2 k Ω or more, and the load resistance of current output shall be 500 Ω or less.

8) Connection of Alarm Output

Alarm signals, such as a cable disconnection or magnetic anomaly can be obtained between ALM1-ALM2.

The output circuit diagram for the alarm signal is as shown below.

For details on the alarm signal, refer to 9).

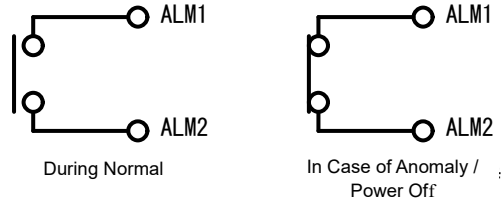


Fig. 12 Output Circuit for Alarm

Output Method	b contact output
Maximum Applied Voltage	30[V]
Maximum Current	1[A]

9) Anomaly Detection

When an anomaly is detected, this controller outputs an alarm signal and the alarm LED lights up. Anomalies that are detected are as follows:

- Falling off of the sensor magnet and damage to the sensor magnet
- Disconnection and incorrect wiring of the sensor cable

The lighting of the alarm LED differs as follows, depending on the content of the anomaly.

When multiple anomalies are detected at the same time, the lighting method with higher priority will be used.

The alarm signal will remain on regardless of the content of the anomaly.

Priority	State of Alarm LED Lighting	Content of Anomaly / Countermeasures
Low	Flashing	Anomaly of the Sensor Magnet <ul style="list-style-type: none"> • Check if the magnet is within the range of the effective stroke (or not falling off). • Check if the magnet is damaged. • Confirm that there is no ferromagnet in the non-ferromagnetic region (depending on sensor specifications).
High	Lit	Anomaly of the Sensor Cable <ul style="list-style-type: none"> • Check if there is any incorrect wiring of the sensor cable. • Check if there is any disconnection of the sensor cable.

10) Adjustment on the Analog Output

OUT1 or OUT2 is capable of zero-point / span adjustment.

OUT1 and OUT2 cannot be adjusted individually.

Zero-point adjustments move the output in parallel, and span adjustments change the gradient of the output.

The adjustment range is $\pm 3\%$ FS for each of the zero-point and span.

Do not conduct the adjustment before about 15 minutes has passed after turning the power on because of the warm up.

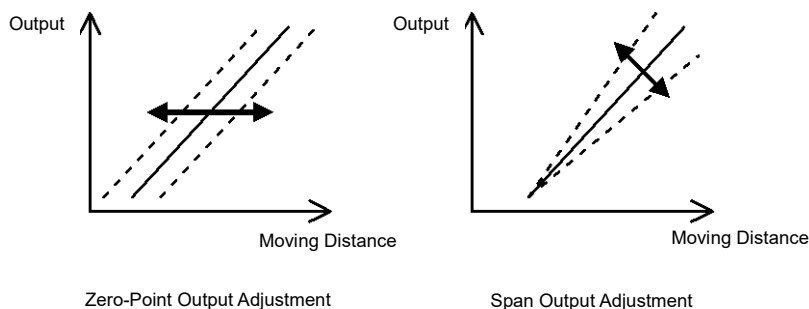


Fig. 13 Zero-Point / Span Adjustment

• Adjustment Method on Unipolar Output

- ① Fix the piston (magnet) at the zero point (backward end of the cylinder).
- ② Turn the zero-point adjustment trimmer (ADJ1) to adjust the output.
- ③ Fix the piston (magnet) at the full-scale point (forward end of the cylinder).
- ④ Turn the span adjustment trimmer (ADJ2) to adjust the output.

Note) The zero position of the inverted output is 10 V (or 20 mA).

• Adjustment Method on Bipolar Output

- ① Fix the piston (magnet) in the middle of the zero point and full-scale point.
- ② Turn the zero-point adjustment trimmer (ADJ1) to adjust the output.
- ③ Fix the piston (magnet) at the full-scale point (forward end or backward end of the cylinder).
- ④ Turn the span adjustment trimmer (ADJ2) to adjust the output.

11) Model

GYFC2-[①]-[②]-Z[③]-[④]-[⑤]-M2P-[⑥]

① Probe Model

RP: GYcRP Probe

② Effective Stroke (mm)

③ Root Dead Zone Dimension (mm)

④ Position Output

Symbol	Output 1 (OUT1)	Output 2 (OUT2)
	[Z]-[F]	[Z]-[F]
A	0-10 V	10-0 V
BD	0-10 V	4-20 mA
BR	10-0 V	20-4 mA

*[Z]= Zero-Point (Root) Output [F]= Full-Scale Point (Tip) Output

⑤ Supply Voltage

24S: +24 V DC

15 W: ±15 V DC

⑥ Option Symbol (No option if blank)

V []: Speed Output, Maximum speed (mm/s) is entered in [].

12) General Specifications

Item		Specifications
Model		GYFC2
Input Power	+24 V DC Model	24 V DC ($\pm 5\%$) 350 mA
	± 15 V DC Model	+ 15 V DC ($\pm 5\%$) 200 mA – 15 V DC ($\pm 5\%$) 100 mA
Operating Temperature Range		0°C to +65°C
Storage Temperature Range		-20°C to +85°C
Operating Humidity Range		20% to 90% RH (No condensation)
Operating Atmosphere		No corrosive gas / No heavy dust
Cooling Method		Self-Cooling System
External Dimensions		42W x 149H x 90D (Excluding protrusion)
Mass		600 g or less

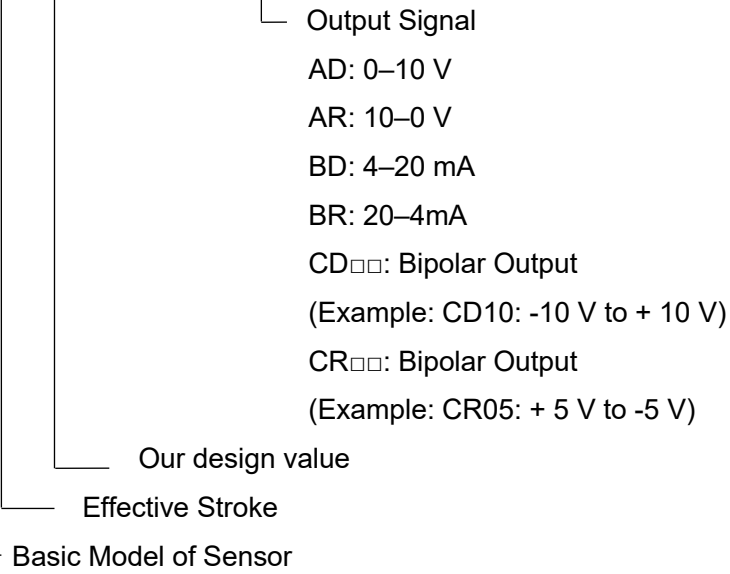
13) Performance Specifications

Item		Specifications
Output	Voltage Output	0–10 V or 10–0 V Load Current: Max 5 mA Load Resistance: Min 2 k Ω
	Current Output	4–20 mA or 20–4 mA Load Resistance: Max 500 Ω
	Alarm Output	Dry b contact 1 A 30 V DC
	Speed Output	± 10 V (Speed Resolution: 1% FS) (Optional)
Scanning Frequency		1 kHz (Differs depending on the effective stroke)
Temperature Characteristics (Controller only)		20 ppm FS/°C or less

4. GYcAT Sensor

1) Model

GYcAT-□□□□-□/S-M-M2P-CN-□□



2) External Dimensions of GYcAT Sensor

① Connector Connection Type

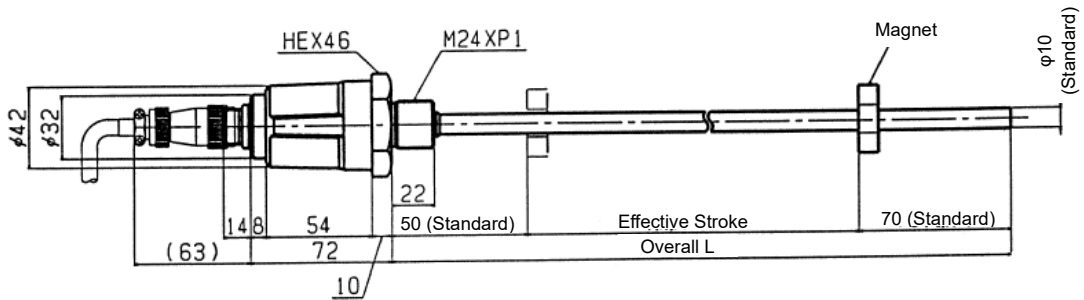


Fig. 15 Outline Drawing of Connector Connection Type

② Pigtail Type (optional)

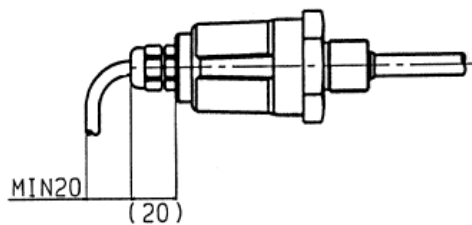


Fig. 16 Outline Drawing of Pigtail Type

3) Output

3)-1 Voltage Output

The circuit for voltage output is shown in Fig. 17. Although the maximum output current is 10 mA, it is recommended that the input impedance of the user-side connected device be 5 k Ω or more. If the input impedance is less than 5 k Ω , the voltage drop in the cable may affect the accuracy.

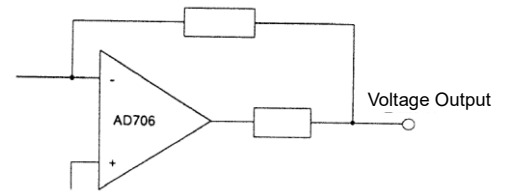


Fig. 17 Voltage Output

3)-2 Current Output (optional)

The circuit for current output is shown in Fig. 18. The maximum load resistance is 500 Ω . In the case of current output, voltage output is converted to current, so both of voltage and current can be used.

However, since the shipping adjustment is performed with the current output, the voltage output would contain some errors.

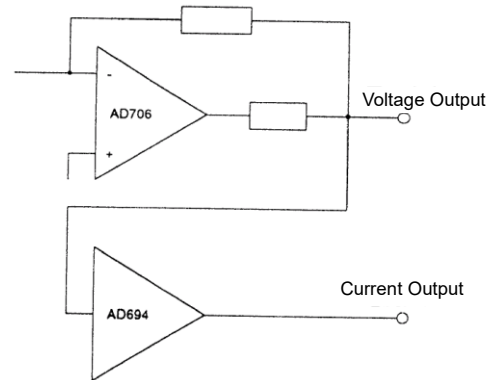


Fig. 18 Current Output

3)-3 Alarm Output

The circuit for alarm output is shown in Fig. 19. The transistor turns on when the magnetostrictive signal is no longer detected. A diode for absorbing back electromotive force is mounted. When driving an inductive load, be sure to install a surge absorption element on the load side as well. An alarm will be output in the following cases.

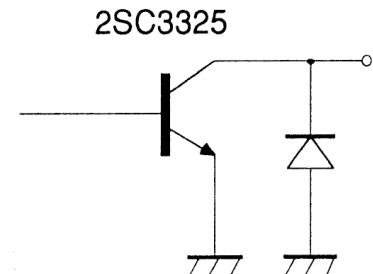


Fig. 19 Alarm Output

- ① The magnet is not installed properly.
- ② The magnet is outside the effective stroke.
- ③ There is an influence due to a strong magnetic field.
- ④ The sensor is out of order.

3)-4 Adjustment

The GYcAT is shipped with the sensor adjusted for the stroke when shipped from the factory. When changing the adjustment on the user side, use the zero-point / span adjustment of the input stage of the connected equipment or prepare an instrumentation amplifier etc. separately.

4) Handling

4)-1 Pin Layout

The table below shows the pin arrangement of the connector.

Connector Pin No.	Cable Color	Function
1	Red	24 V DC
2	Yellow	NC
3	White	0 V
4	Green	SIG COM
5	Black	Voltage Output
6	Blue	Current Output (optional)
7	Brown	Alarm Output

*Use SIG COM for the output signal common.

The alarm signal common is common with 0 V.

4)-2 Cable

Be sure to use a shielded multi-core cable, and the shield shall be connected to 0 V by the customer. Also, when laying the cable, keep it separate from the cables of other electric power devices etc. to minimize the influence of noise.

The maximum allowable cable length is 100 m when using the 0.5 mm² power supply line and the 0.3 mm² or more signal line. If the power supply line is 0.3 mm², use multiple lines with two lines each. When the cable is long and used with voltage output, the accuracy may deteriorate because of a voltage drop depending on the load. In such a case, we recommend that the cable be used with current output.

In addition, the cable shall be arranged by the customer. Only the connector is supplied.

4)-3 Power Supply

Supply a regulated DC 24 V to the power input terminal. The allowable voltage range is 22 V to 26 V, but when the cable length becomes long, the voltage may not be within the allowable range because of a voltage drop. Be sure to check the voltage with the connector pin of the sensor.

Be careful not to mistake the polarity when connecting, even though a diode for reverse connection protection is mounted on the power input.

5) Representative Performance

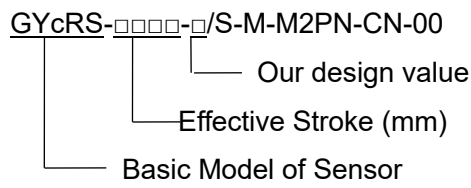
Accuracy	Linearity	±0.05% FS or less TYP
	Resolution	0.01% FS or less
	Repeatability	±0.01% FS or less
	Temperature Characteristics	±40 ppm FS/°C
Output	Voltage Output	0–10 V DC or 10–0 V DC Load Current: Max 5 mA Load Resistance: Min 2 kΩ
	Current Output (optional)	4–20 mA or 20–4 mA Load Resistance: Max 500 Ω
	Alarm Output	Open Collector 30 V 0.1 A (Note 2)
Frequency Characteristics	Scanning Frequency	1 kHz (depending on stroke)
Power Supply / Current Consumption		+24 V DC ±2 V 0.1 A
Environmental Resistance	Pressure Resistance	Rod Portion of Sensor: 35 MPa
	Operating Temperature Range	-20°C to + 80°C
	Vibration Resistance	6 G (or 40 Hz 2 mmp)
	Shock Resistance	50 G (2 ms)
	Protection Standard	IP-67 (10 kPa, 30 min)

Note 1) The above accuracy applies to sensors with an effective stroke of 300 mm or more.

Note 2) The output current in the case of current output is included.

5. GYcRS Sensor

1) Model



2) External Dimensions of GYcRS Sensor

① Connector Connection Type

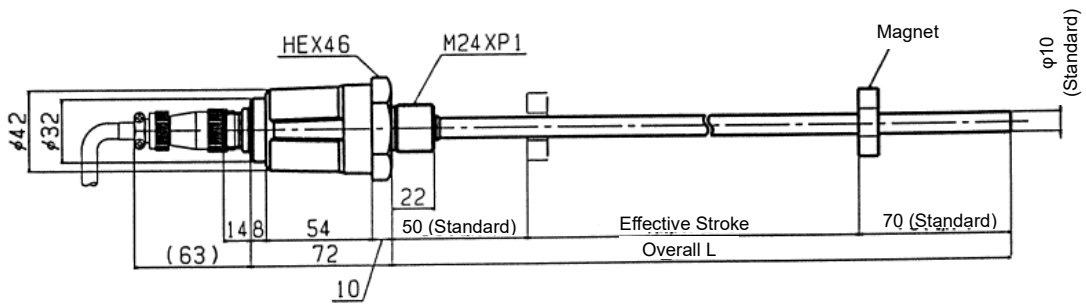


Fig. 20 Outline Drawing of Connector Connection Type

② Pigtail Type (optional)

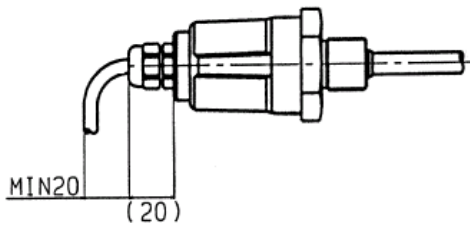


Fig. 21 Outline Drawing of Pigtail Type

6. GYDC-05 Controller

1. Name of Each Part

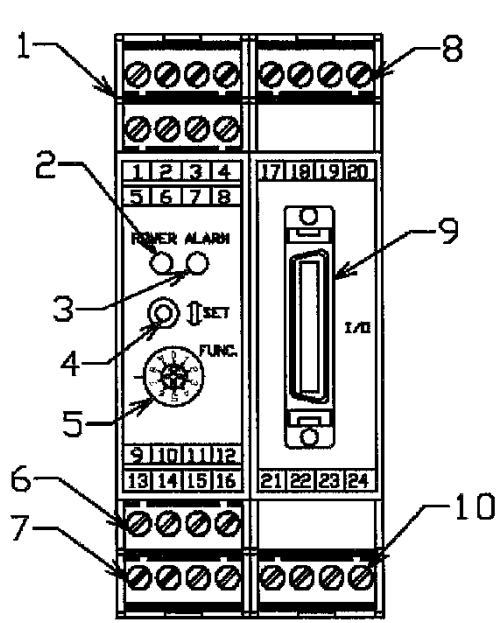


Fig. 22 Body Front View

1. Sensor Connector
2. Power Supply LED
3. Alarm LED
4. Adjustment Toggle Switch
5. Mode Switch
6. Analog Output Connector
7. Power Supply / Alarm Connector
8. SSI Output Connector
9. Parallel Input / Output Connector
10. Incremental Output Connector
11. Model / Terminal Arrangement Sticker
12. DIN 35 mm Rail Mounting Hook (FG terminal)

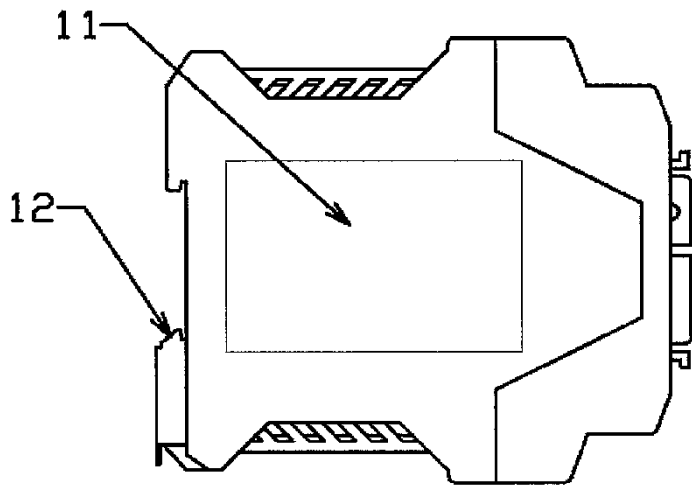


Fig. 23 Body Left Side View

2) Notes on Installation

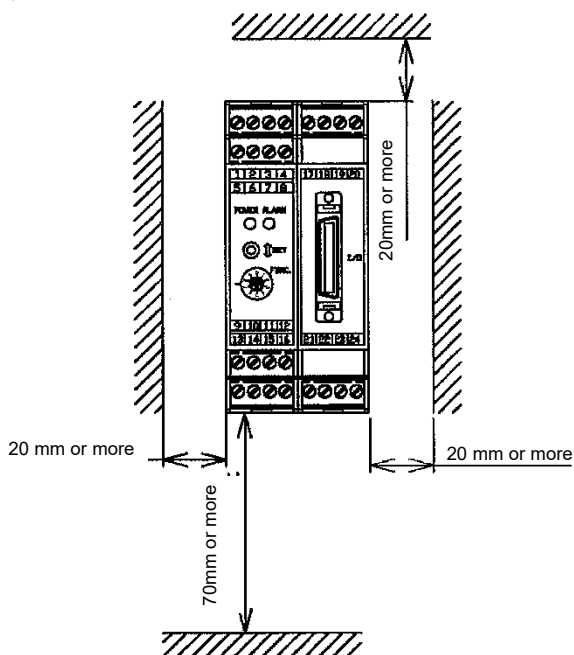


Fig. 24 Installation Diagram of the Body

- Mount the body vertically as shown in the left figure.
- Leave a space of 20 mm or more on the top and left / right of the body.
- Leave a space of 70 mm or more at the bottom of the body to allow access to the DIN rail lock fittings.
- Do not put anything on top of the product.
- Do not install the product in places with dust or oil mist.
- Do not install the product in locations with corrosive gas / combustible gas / explosive gas.

3) Attaching / Detaching Method

● Attaching Method

Attach the hook of the bottom of the body to the rail as shown in the figure below and push the body in to lock it.

● Detaching Method

Push down the lock fittings with the use of a flat-blade screwdriver etc. and pull up the body.

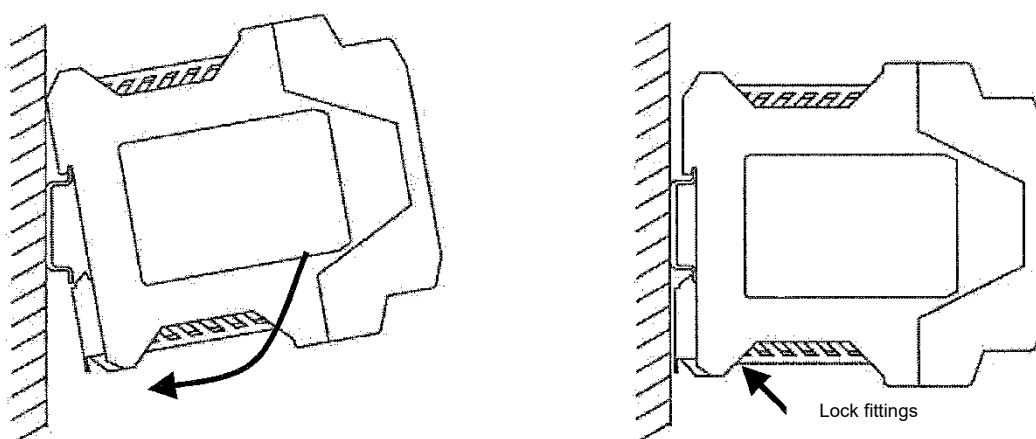


Fig. 25 Attaching / Detaching of the Body

4) Compatible Wire Size

The recommended wire size for Power Supply / Output Connector is 0.2 to 2.5 [mm²] (equivalent to AWG24 to 12).

Peel off the coating 7 mm from the end of the wire as shown below (L = 7 [mm]).

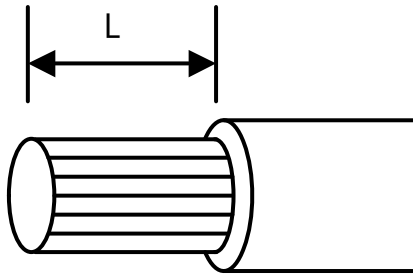


Fig. 26 Tip Treatment for Wire

5) Connection

5)-1 Connection Method

The connector for this controller is a two-piece screw type. The connector is attached to the body.

Connect the wires as shown in the figure below.

Screw Tightening Torque: 0.5 [Nm] (max. 1.0 [Nm])

Width of Driver: 3 mm or less

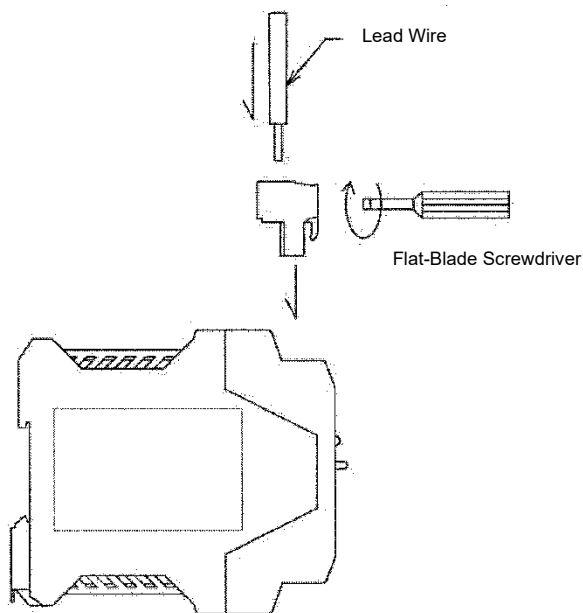


Fig. 27 Wiring to Connector ①

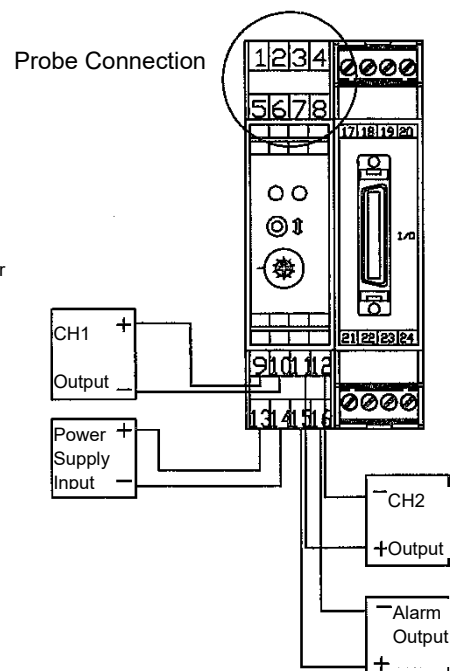


Fig. 28 Wiring to Connector ②

5)-2 Connection of Probe

Refer to the table below for connection between this controller and the probe.

Controller Side Pin No. of Connector	Cable Color	Probe Side Pin No. of Connector
1	Red	1
2	Yellow	2
3	White	3
4	Shield	Shield
5	Green	4
6	Black	5
7	Blue	6
8	Brown	7

5)-3 Connection of Power Supply

The connection voltage for this controller is 24 [V] ($\pm 5\%$) / 160 [mA].

Supply a regulated DC current between terminal numbers 13 (+) and 14 (0 V).

5)-4 Connection of Analog Output

A voltage / current output proportional to the magnet position or speed can be obtained between terminal numbers 9 (+) and 10 (COM) and between terminal numbers 11 (+) and 12 (COM).

The load resistance for voltage output shall be 2 k Ω or more, and the load resistance for current output shall be 500 Ω or less.

5)-5 Connection of Alarm Output

An alarm signal such as a cable disconnection or a magnetic anomaly can be obtained between terminal numbers 15 and 16 (COM).

The output circuit diagram for alarm signal is shown in the figure below.

Refer to 7) "Adjustment / Maintenance" for details on alarm signals.

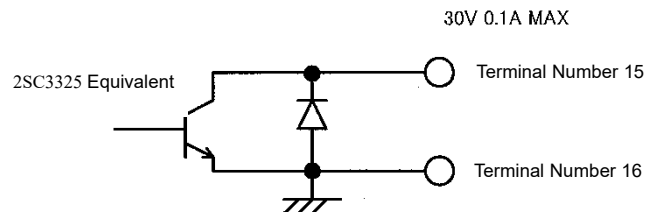


Fig. 29 Output Circuit for Alarm

Maximum Applied Voltage	30 [V]
Maximum Current	100 [mA]
Vce Saturation Voltage	< 0.4 [V] (Ic = 100 [mA])

5)-6 Connection of Parallel Input / Output

Use the parallel input / output connector for parallel input / output wiring.

Connector for Body Side: Sumitomo 3M 10236-5212PL

Mating Connector (supplied): Sumitomo 3M 10136-3000PE

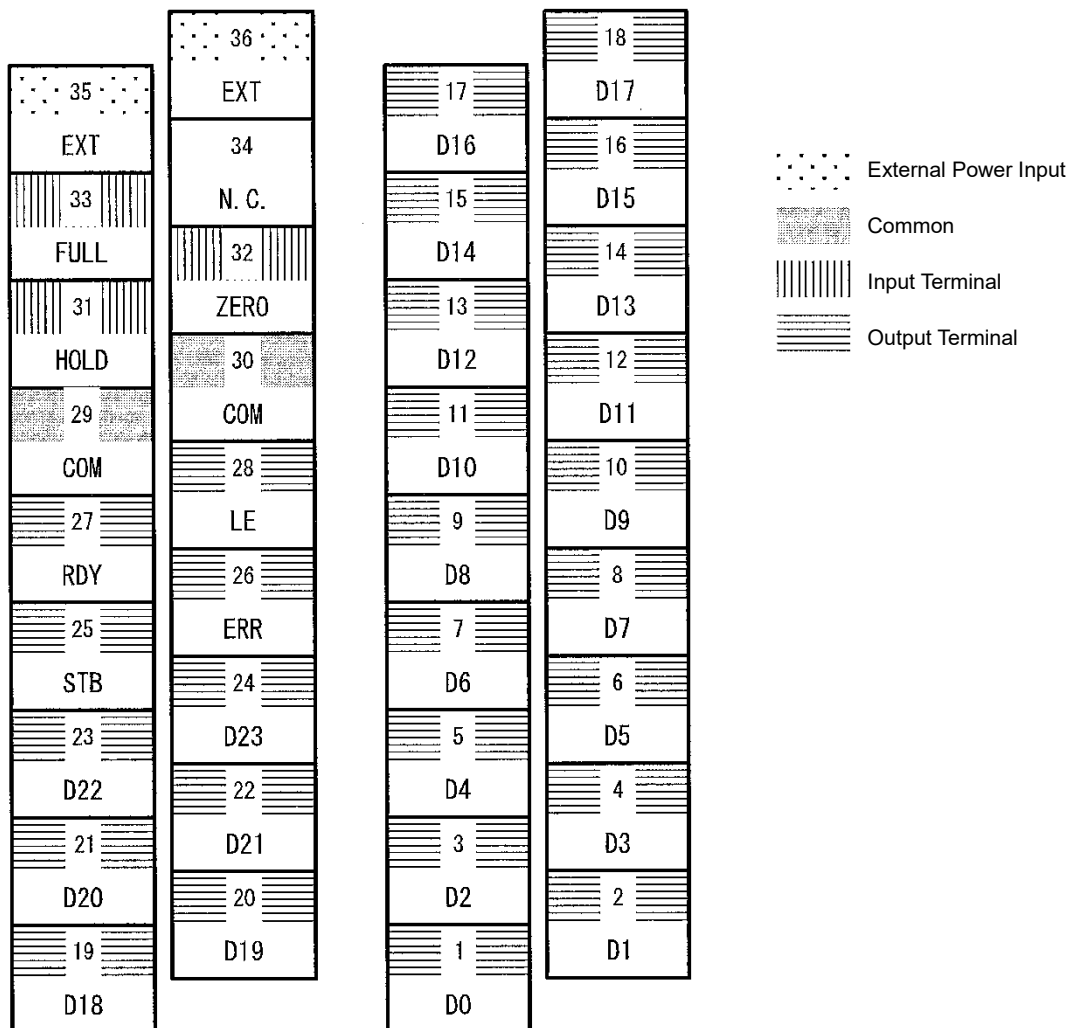


Fig. 30 Terminal Arrangement for Parallel Input / Output Connector

6) Interface for Parallel Input / Output

6)-1 Data Format

The parallel data D0 to D23 can be output with binary or gray code and negative logic or positive logic. The standard is set to output with the negative logic of the binary code. Refer to 7)-4 "Change of Digital Output Code" to change the output code and 7)-5 "Change of Digital Output Polarity" to change the logic polarity.

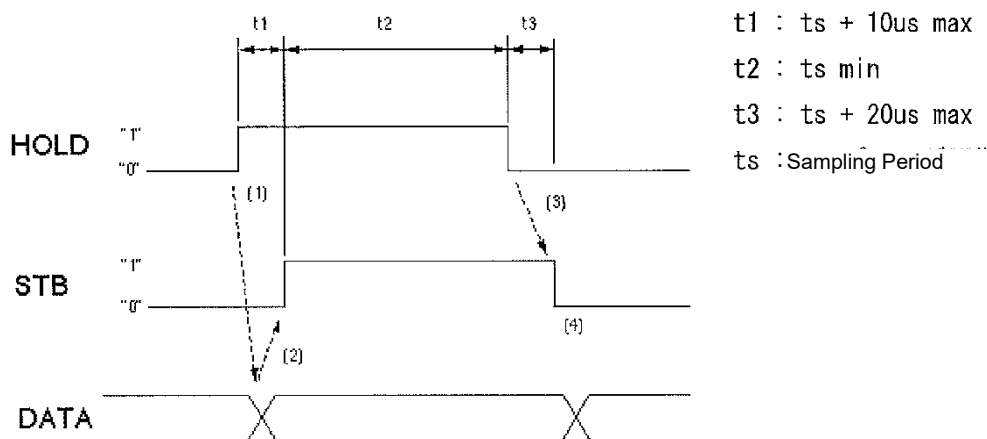
6)-2 Timing

Generally, a low-pass filter is inserted in the input circuit of PLC to reduce the influence of noise. Because of this, if only the data signals D0 to D23 are connected and read, the data may not be read correctly. Therefore, be sure to read the data using one of the following methods.

- Handshake Method

The HOLD signal and STB signal are used. The HOLD signal is a signal to fix the data, and the STB signal is a signal to inform the user that the data is fixed. Use these to read the data in the following sequence.

- ① Turn on the HOLD signal with the device on the user side.
- ② After the data has been fixed, the STB signal turns ON.
- ③ The device on the user side shall read the data signals D0 to D23 at the rising edge of the STB signal.
- ④ Turn off the HOLD signal.



7) Adjustment / Maintenance

7)-1 Anomaly Detection

When an anomaly is detected, this controller outputs an alarm signal and turns on the alarm LED. An anomaly that is detected is as follows.

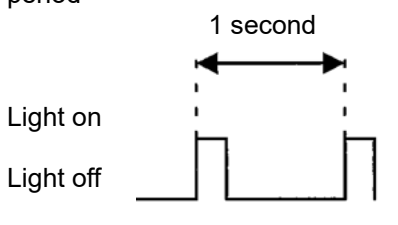
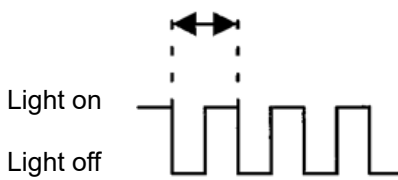
- Falling off of the sensor magnet and damage to the sensor magnet
- Disconnection and incorrect wiring of the sensor cable
- System anomaly (corruption of internal data)

The lighting of the alarm LED differs as follows, depending on the details of the

anomaly.

When multiple anomalies are detected at the same time, the anomaly with higher priority will be indicated.

The alarm signal will remain on regardless of the details of the anomaly.

Priority	State of Alarm LED Lighting	Details of Anomaly / Countermeasures
Low	Lighting every second for a short period  Light on Light off	Anomaly of the Sensor Magnet <ul style="list-style-type: none"> ◆ Check if the magnet is within the range of the effective stroke (or not falling off). ◆ Check if the magnet is damaged. ◆ Confirm that there is no ferromagnet in the non-ferromagnetic region (depending on the probe specifications).
Middle	Flashing every 0.4 seconds 0.4 seconds  Light on Light off	Anomaly of the Sensor Cable <ul style="list-style-type: none"> ◆ Check if there is any incorrect wiring of the sensor cable. ◆ Check if there is any disconnection of the sensor cable.
High	Lit	System Anomaly <ul style="list-style-type: none"> ◆ Return the setting to the factory default. (Refer to Section 0 for details.)

Note) Immediately after the power is turned on, the alarm LED lights for about 0.5 seconds.

7)-2 Adjustment on Analog Output

Each of analog output 1 and analog output 2 is capable of zero / full-scale adjustment. The adjustment range is $\pm 3\%$ FS for each of zero and full scale.

Do not conduct the adjustment before about 15 minutes has passed after turning the power on because of the warm up.

The zero point is the point near the sensor head regardless of the output, and the full-scale point is the rod tip side.

Note) Zero-point output of inverted output is 10 V (or 20 mA).

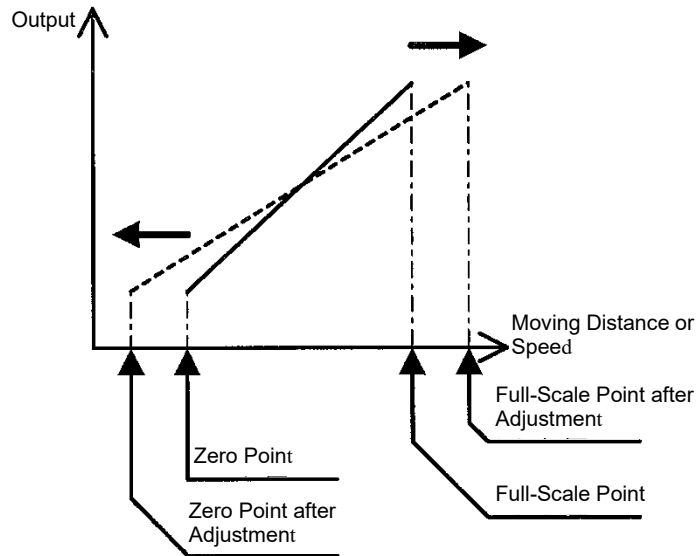


Fig. 31 Zero / Full-Scale Adjustment

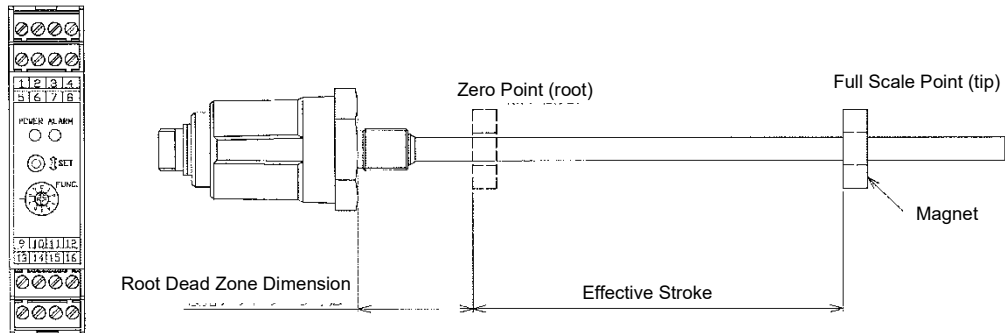


Fig. 32 Zero Point and Full-Scale Point

7)-2-1 Adjustment on Zero-Point Output

● Position Output Type

- ① Fix the piston (magnet) in the zero position.
- ② To adjust output 1, set the Mode Switch to No. 1. To adjust output 2, set the Mode Switch to No. 3.
- ③ Tilt the adjustment toggle switch up and down to set the output to the desired value. The amount of adjustment will increase while the adjustment toggle switch is tilted.
- ④ Once the adjustment has been done, return the Mode Switch to No. 0.

- Speed Output Type

- ① Fix the piston (magnet) in a position within the stroke range.
- ② To adjust output 1, set the Mode Switch to No. 1. To adjust output 2, set the Mode Switch to No. 3.
- ③ Tilt the adjustment toggle switch up and down to set the output to the desired value. The amount of adjustment will increase while the adjustment toggle switch is tilted.
- ④ Once the adjustment has been done, return the Mode Switch to No. 0.

7)-2-2 Adjustment on Full-Scale Point Output

- Position Output Type

- ① Fix the piston (magnet) in the full-scale position.
- ② To adjust output 1, set the Mode Switch to No. 2. To adjust output 2, set the Mode Switch to No. 4.
- ③ Tilt the adjustment toggle switch up and down to set the output to the desired value. The amount of adjustment will increase while the adjustment toggle switch is tilted.
- ④ Once the adjustment has been done, return the Mode Switch to No. 0.

- Speed Output Type

- ① Fix the piston (magnet) in a position within the stroke range.
- ② To adjust output 1, set the Mode Switch to No. 2. To adjust output 2, set the Mode Switch to No. 4.
- ③ Tilt the adjustment toggle switch up and down to set the output to the desired value. The amount of adjustment will increase while the adjustment toggle switch is tilted.
- ④ Once the adjustment has been done, return the Mode Switch to No. 0.

7)-3 Change of Alarm Output Polarity

- ① Set the Mode Switch to No. 5.
- ② To turn on the internal transistor when an alarm occurs, tilt the adjustment toggle switch up for 2 seconds or more. On the other hand, to turn off the internal transistor when an alarm occurs, tilt the adjustment toggle switch down for 2 seconds or more. (The green LED turns off when the change is accepted.)
- ③ When the switch is released, the green LED lights up.
- ④ Return the Mode Switch to No. 0.

7)-4 Change of Digital Output Code

- ① Set the Mode Switch to No. 6.
- ② To make the digital output code binary code, tilt the adjustment toggle switch up for 2 seconds or more. To make the digital output code gray code, tilt the adjustment toggle switch down for 2 seconds or more. (The green LED turns off when the change is accepted.)
- ③ When the switch is released, the green LED lights up.
- ④ Return the Mode Switch to No. 0.

7)-5 Change of Digital Output Polarity

- ① Set the Mode Switch to No. 7.
- ② To make the digital output negative logic, tilt the adjustment toggle switch up for 2 seconds or more. To make the digital output positive logic, tilt the adjustment toggle switch down for 2 seconds or more. (The green LED turns off when the change is accepted.)
- ③ When the switch is released, the green LED lights up.
- ④ Return the Mode Switch to No. 0.

7)-6 Back to the Original Settings

- ① Set the Mode Switch to No. 9.
- ② If the Adjustment Toggle Switch is tilted up for 2 seconds or more, all settings will return to their original settings. (The green LED turns off when the change is accepted.)
- ③ Return the Mode Switch to No. 0.
- ④ When the switch is released, the green LED lights up.
- ⑤ Turn the power supply on again.

7)-7 Digital Zero / Full Scale Setting

The zero / full-scale settings make it possible to individually set the current position of the piston (magnet) to zero / full scale.

*The input of the zero scale changes the current position of the piston (magnet) to zero output, and the output at full scale is offset.

*The input of the full scale changes the current position of the piston (magnet) to full-scale output. The output at zero scale does not change.

(Caution) Note that when the full scale is input, 1 bit of the output data will not match the resolution.

These settings can be back to the original by the operation of 7)-6 "Back to the Original Settings."

☆ For zero / full-scale settings, turn on each of ZERO / FULL input of the parallel input for 0.5 seconds or more. The zero / full scale settings are set at the rising edge.

☆ To set zero / full scale again, turn off each of ZERO / FULL input of the parallel input

once for 0.5 seconds or more.

8) Model

GYDC-051-[①][②]-RS-[③]-Z[④]-[⑤]/[⑥]-M2PN

① Resolution

Symbol	Resolution
D2	0.1 mm
D3	0.05 mm
D4	0.01 mm (Standard)
D5	0.005 mm
D6	0.001 mm

② Output Direction

Symbol	Specification
D	Increase when the cylinder (magnet) moves forward
R	Decrease when the cylinder (magnet) moves forward

③ Effective Stroke [mm]

④ Our design value

⑤ Analog Position Output (OUT1)

Symbol	Position of Piston (Magnet)
AD	0–10 [V] (Standard)
AR	10–0 [V]
BD	4–20 [mA]
BR	20–4 [mA]
CD□□ or CR□□	□□ [V] –□□ [V]
VZ/F	Specified Voltage
IZ/F	Specified Current

*Z: Zero-Point Output

*F: Full-Scale Point Output

⑥ Option: Analog Output (OUT2)

Position Output: Select from ⑤

Speed Output:

Symbol	
VA[]	±10 [V]
WB[]	4–20 [mA]

[] Maximum speed (1.00 to 999 mm/s). Three significant digits shall be specified. The decimal point is R.

3) Specifications

9)-1 General Specifications

Item	Specifications
Model	GYDC-05
Power Supply	24 V DC ($\pm 5\%$) 160 mA (Standard)
Operating Temperature Range	0°C to 65°C
Storage Temperature Range	-20°C to + 75°C
Operating Humidity Range	10% to 90% RH (No condensation)
Operating Atmosphere	No corrosive gas / No heavy dust
Cooling method	Self-Cooling System
External Dimensions	45W × 99H × 114D (Excluding protrusion)
Mass	150 g or less

9)-2 Performance Specifications

Item		Specifications
Output	Voltage Output	0–10 [V] or 10–0 [V] Resolution: 16-bit Load Current: Max 5 mA Load Resistance: Min 2 k Ω
	Current Output	4–20 [mA] or 20–4 [mA] Resolution: 16-bit Load Resistance: Max. 500 Ω
	Alarm Output	Open Collector Output 30 [V] 0.1 [A]
	Digital Output	0.001 mm, 0.005 mm, 0.01 mm 0.05 mm, 0.1 mm
Scanning Frequency	Effective Stroke [mm]	Scanning Frequency[Hz]
	–1000	1000
	1000–2500	500
	2500–	250
Temperature Characteristics (Controller only)	± 10 ppm/°C	
Noise Resistance	500 Vpp, 1 μ s, 25–60 Hz Noise Simulator	

9)-3 External Dimensions

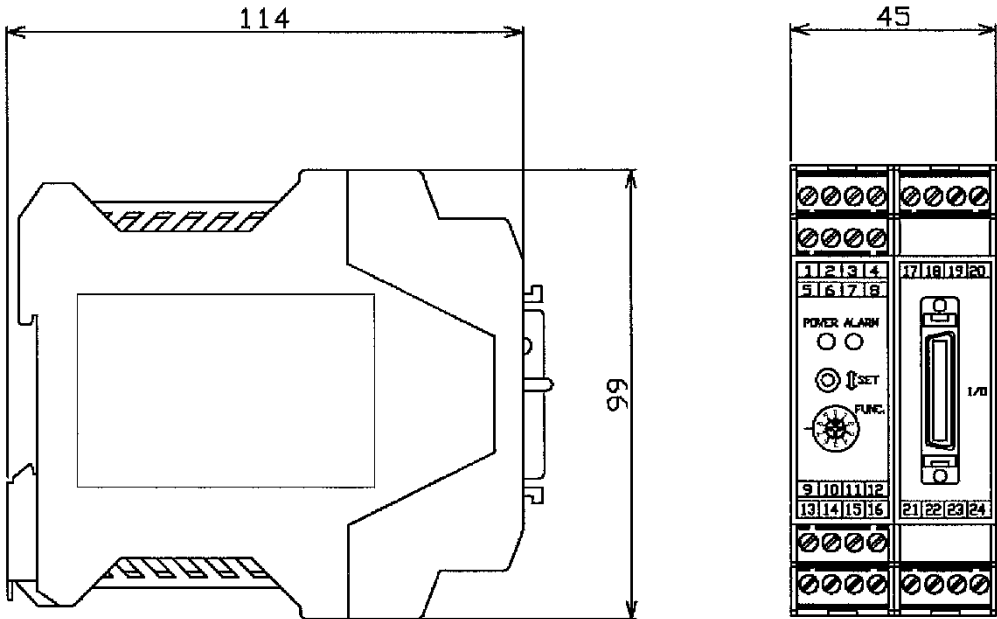


Fig. 33 External Dimensions Drawing

7. Replacement of Packing for the Sensor

This section describes the seal replacement for the sensor.

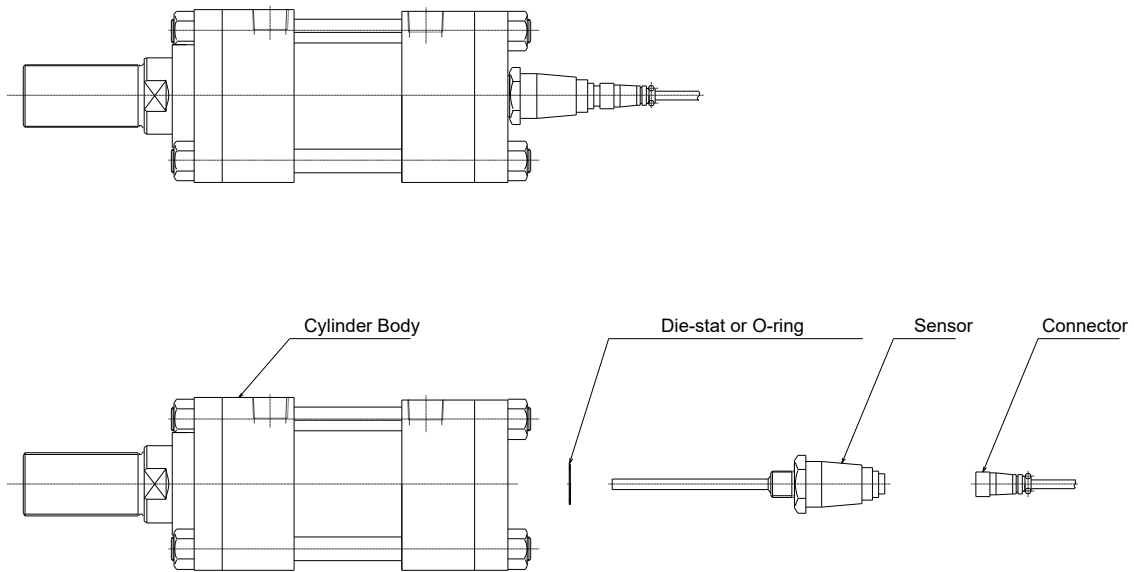


Fig. 33

1) Precautions at Disassembling

- ① Before removing the cylinder, be sure to set the pressure in the circuit to zero and turn off the power.
- ② At the disassembling, a sufficient protection treatment is required to prevent scratches on the rod end screw, port screw, and rod surface. For example, if you hit it forcibly when disassembling it or drop it carelessly, the screw thread may be crushed, and dents may be made on the rod surface, resulting in a defective product. Therefore, pay careful attention to handling.
- ③ Be careful so that the seal does not come into contact with the different types of oil. If the seal comes into contact with another fluid that is different from the fluid used, it will chemically change and swell, making it unusable.
- ④ Oil will come out of the cylinder when the sensor is removed, so prepare an oil pan etc.
- ⑤ For other matters related to the cylinder body, refer to the instruction manual for the hydraulic cylinder.

2) Disassembly

- ① Remove the cable from the sensor body.
Protect the connectors on both ends so that dust etc. does not enter into them.
*For the cable direct out (pigtail type), it is not necessary to be removed.
- ② Remove the sensor from the cylinder body. Turn it counterclockwise to loosen the screw.
*For the cable direct out (pigtail type), be careful not to twist the cable.
- ③ Remove the die-stat or O-ring.

3) Assembly

① Install a new die-stat or new O-ring in the sensor.

② Insert the sensor into the cylinder body and assemble it.

At this time, insert it straight so that the tip of the sensor does not hit.

*For the cable direct out (pigtail type), be careful not to twist the cable.

③ Attach the connector to the sensor.

*For the cable direct out (pigtail type), it is not necessary to attach the connector to the sensor.

-End of Document-