



JQA-1494
JQA-EM0378
Japanese
goods factory

ELECTROMAGNETIC ACTUATORS

BI-STABLE ROTARY SOLENOIDS
DRIVER BOARD FOR BI-STABLE ROTARY SOLENOIDS
STEP ROTARY SOLENOIDS
LATCHING SOLENOIDS
COMPACT 2-WAY/3-WAY SOLENOID VALVES FOR CHEMICAL LIQUIDS
GENERIC 2-WAY/3-WAY SOLENOID VALVES
PINCH VALVES
BI-STABLE ROTARY OPTICAL SHUTTERS
LINEAR OPTICAL SHUTTER
ELECTROMAGNETS



TAKANO CO., LTD.

Vol.8

INTRODUCTION

Here at Takano Company, we pursue the development, manufacturing, and marketing of our products under the guiding concept of “Magnetism”. Our high-quality, high-performance products and services have always made Takano an “opinion leader”, earning the trust of clients across a wide range of industries. Our automated components may be found in ATMs and banking terminals, in conveyor systems and mail sorting machines, in optical and medical equipment, and in industrial machinery of all kinds.

In the years to come, we plan to keep enhancing our entire lineup of solenoids, including our bi-stable rotary solenoid models, as we further realize our goal to make “Practical Magnetic Products”.

We also accept orders for custom-made specifications that fit your specific needs. We are confident that Takano products and services have what it takes to satisfy your requirements.

Furthermore, to meet the demand from our customers for a variety of automation and labor-saving services, we also offer custom systems design and assembly, utilizing our in-house image processing and factory automation technologies. We would be happy to discuss your specific requests, so please feel free to ask !

Our motto at Takano Company is, “Turning today’s customers into tomorrow’s fans”. We do our utmost each day to attain this goal.



Checksheet

To help us select a model that is economical and best suited to your needs, please fill in the following information.

We will decide the appropriate model and specifications upon conferral with you.

Working Voltage	_____ V DC \pm _____ %
Max Voltage	_____ V DC, _____ A or lower
Conditions of Use:	<input type="checkbox"/> Continuous current <input type="checkbox"/> Intermittent current ON time: _____ ms OFF time: _____ ms
Required Torque or Suction:	_____ N·m or _____ N
Operating Angle or Stroke Length:	_____ ° or _____ mm
Moment of Inertia or Mass of Load:	_____ g·cm ² or _____ gf
Response Speed	_____ ms or lower
Environmental Conditions:	Temperature: _____ °C \sim _____ °C Humidity: _____ % \sim _____ %
Temperature Rise Maximum:	Surface temp _____ °C or lower
Life Expectancy:	_____ cycles or more
Expected Quantity:	_____ units per year
Target Price:	\$ _____ per unit
Expected Date of Production:	_____ (mo.) _____ (yr)
Other Requests (shaft changes, etc.):	_____

* For improvements and other purposes, the items listed in this catalog may change at any-time, without advance notice.

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 RSR14/10-CAB0 RSR14/10-PAP0-G015 RSR14/20-CT2 RSR14/20-CBB0-N032A
 RSR20/10-CAB0 RSR20/20-CAB0 RSR20/40-CAB0-N036 RSR80/80-CAB0

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TMH-3015 TMH-3029A

BI-STABLE ROTARY SOLENOIDS

Featuring Models with Built-In Stops

Made with materials carefully selected to reduce impact noise and maximize durability.

Featuring Models with Return Springs

- Simplified driver board
- Failsafe capabilities

Plenty of Variations

Select the model best suited to your application, whatever it may be!

Specialized Compact Models

Aspiring to make the world's smallest solenoids, we cut no corners in our manufacturing.



FEATURES

1 Bi-stable Driving Force

Our models work without springs, reciprocating instead on the change of electrical current. For this reason, they maintain a stable response speed with no variation in torque upon activation.

Even when current is cut off, the solenoid stays in its position using the holding force of a permanent magnet.

2 High Durability

Since our models have no sliding parts except for the bearings, they have a long life cycle.

〈Target durability〉

with ball-bearings: 30,000,000 cycles

with oil-retaining bearings: 10,000,000 cycles

* Depending on load and environmental conditions. In all cases we recommend that you confirm operation of the solenoid with its load attached.

3 No Axial Stroke

Our rotary solenoids are driven by magnetic attraction and repulsion, so the shaft does not move forward or backward: it just rotates.

4 A Wide Range of Operating Angles

By setting up external stops, you can set the angle of rotation to your liking within a range of 90°. (With the exception of our built-in stop models, external stops will be required. See

4 INSTRUCTIONS for information on how to set up external stops)

APPLICATIONS

1. Light Control

can be used to block or polarize light, to switch between lights, and to change the color or amount of light.

2. Sorting/Screening

can be used to sort or screen (mail, etc.).

3. Locking/Positioning

can be used for electric locking or halting (of moving items on a conveyor belt, etc.).

4. Valves

can be used to rapidly redirect the course of flow, or to open and close plumbing and tubing by means of a clamp.

1

STRUCTURE AND OPERATING PRINCIPLES

The structural advantage of this model lies in the very small air gap between its yoke and its rotor; moreover, the rotor has been coupled with a permanent magnet.

The magnetic flux of the permanent magnet flows in the direction of the dotted arrow.

When the coil is energized as in Fig.1, the magnetic flux induced by the coil current flows in the direction of the dot-and-dash arrow.

The rotational torque operates in a clockwise direction as the two magnetic fluxes increase in air gap g_a and decrease in air gap g_b .

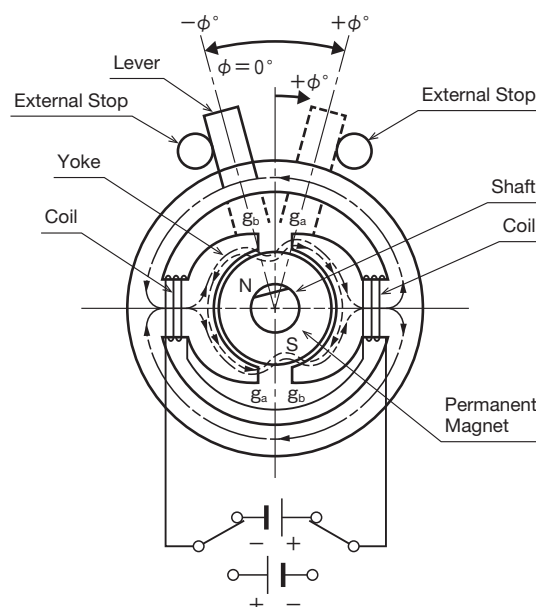


Fig.1 Operating Principles

2

INSTRUCTIONS AND PRECAUTIONS FOR USE

◆ Torque Characteristics

The solid line shows the torque generated when rotating in the direction of $(-\phi)$ to $(+\phi)$ when voltage is applied. When the $(+)$ and $(-)$ lead lines are reversed, it rotates from $(+\phi)$ to $(-\phi)$, as shown by the dotted line. These solid and dotted curves are symmetrical with the line passing through the $\phi = 0^\circ$ position of the rotation angle.

The 0 W curve shows the holding force of the permanent magnet when the solenoid is not being powered. It generates this force even when the shaft rotates in the $(-\phi)$ direction.

The torque characteristics of each of our products were measured by means of in-house instruments in a standard testing environment, with the shafts in a horizontal position.

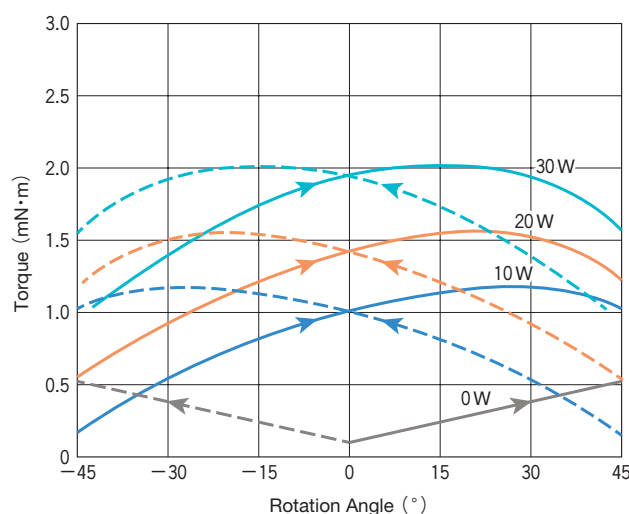


Fig.2 Torque Characteristics (at 20 °C)

◆ Response Characteristics

Each product page displays the time elapsed between power-on and when the load reaches its final position. The response characteristics of each of our products were measured in a standard testing environment with their shafts in a horizontal position; we measured the current waveform while the product was stabilized in a heat sink. The axial moment of inertia differs from model to model, so please refer to the specific Response Characteristics note on each product page.

Standard Testing Environment ··· Ambient Temp $20 \pm 15^\circ\text{C}$, Relative Humidity $65 \pm 20\%$,
Air Pressure $860 \sim 1060\text{ hPA}$
Heat Sink ··· 80 mm square, 3 mm thick, aluminum

◆ Duty Cycle

As shown in Fig.3 (a), when current is flowing at time t_{on} and stops at t_{off} , and this operation repeats continuously over time, the duty cycle may be calculated like so:

$$\frac{1}{f} = \frac{t_{\text{on}}}{t_{\text{on}} + t_{\text{off}}} \dots\dots\dots (1)$$

As shown in Fig.3 (b), when the magnet exerts insufficient holding force and the shaft is held in place for time t_h with wattage W_h , and this operation repeats continuously over time, the duty cycle may be calculated like so:

$$\frac{1}{f} = \frac{W_w \cdot t_w + W_h \cdot t_h}{W_w(t_w + t_h)} \dots\dots\dots (2)$$

When operation is irregular and cannot be expressed with equations (1) and (2), the number of operations n , over a sufficiently long interval of time t , can be expressed as follows:

$$\frac{1}{f} = \frac{n \times t_{\text{on}}}{t} \dots\dots\dots (3)$$

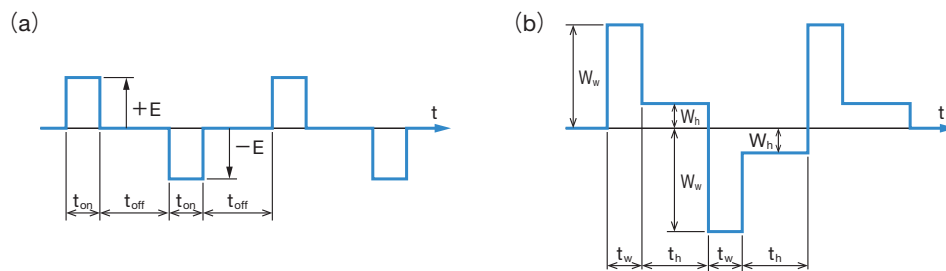


Fig.3 Explanation of Duty Cycle

◆ Temperature Change Over Short Periods of Time

The temperature rise $\Delta\theta$ at time t after energization is expressed by formula (4):

$$\Delta\theta = \Delta\theta(1 - e^{-\frac{t}{\tau}}) \doteq \Delta\theta \cdot t/\tau \quad (t/\tau \ll 1) \dots\dots\dots (4)$$

e = base of natural logarithm

Then, when the temperature rise reaches $\Delta\theta$ and the solenoid is deenergized, the temperature θ' at time t after de-energization can be expressed by formula (5):

$$\theta' = (\Delta\theta) - \frac{t}{\tau} \dots\dots\dots (5)$$

Therefore, if we define the rate of temperature drop during this duration as $\Delta\theta'$, it can be obtained as follows, in a manner similar to formula (4) :

$$\Delta\theta = \Delta\theta(1 - e^{-\frac{t}{\tau}}) \doteq \Delta\theta \cdot t/\tau \quad (t/\tau \ll 1)$$

The relation between $(1 - e^{-\frac{t}{\tau}})$ and t/τ is shown in Fig.4:

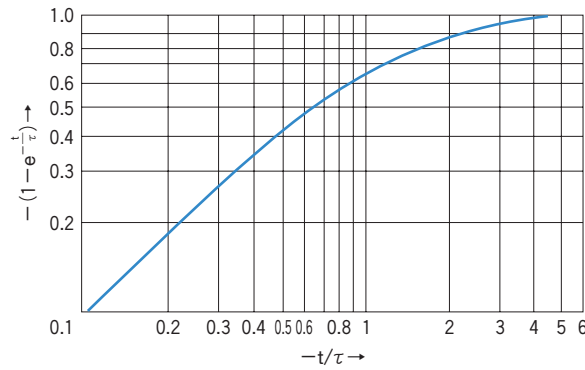


Fig.4 Relation between $(1 - e^{-\frac{t}{\tau}})$ and t/τ

◆ Coil Saturation Temperature Rise

Each of our products has a proportionality constant (k) which represents the rise in saturation temperature of the coil, per Watt. Please carefully consider the applied voltage, duty cycle, heat sink, environmental conditions etc., so that the combination of the ambient temperature and coil saturation temperature rise does not exceed the unit's heat-resistant class.

(Ex.) If our RSR 20/20 model, whose proportionality constant is $k \doteq 7^\circ\text{C}/\text{W}$, is continuously powered at 10 W, the coil saturation temperature rise will be:

$$\Delta\theta_s = 7.0 \times 10 = 70(^\circ\text{C})$$

With the duty cycle $1/f$ factored in, it looks like this:

$$\Delta\theta_s \doteq 7.0 \times W \times 1/f$$

So the duty cycle for 10 ms ON/OFF operation at 10 W will be:

$$1/f = \text{ON time} / (\text{ON time} + \text{OFF time}) = 10 / (10 + 10) = 1/2$$

Accordingly, the coil saturation temperature rise for these intermittent energizations will be:

$$\Delta\theta_s \doteq 7.0 \times 10 \times 1/2 = 35(^\circ\text{C})$$

Let's say that the ambient temperature is 40°C . Since the RSR 20/20 has a heat class of 120°C , when we subtract the ambient temperature from the unit's heat class, we are left with a value of 80°C . Thus we can conclude that in this case, there will be no problems.

On the contrary, because the coil saturation temperature rise for this unit is 70°C , you could even keep it powered continuously without any issues.

3

WHEN SELECTING YOUR PRODUCT

① Duty Cycle

Please calculate the Duty Cycle from the time ON after current starts and the time OFF when the current stops. (See ②: ◆Duty Cycle) However, please be cautious, as each of our products has a maximum ON time when energization is possible. (See ②: ◆Temperature Change Over Short Periods of Time)

② Rotation Angle

Please decide the angle of rotation you will use, and install your external stops. (For our built-in stop models, please choose the angle of rotation)

③ Working Voltage

Please refer to the coil data and decide the working voltage you will use. If you cannot find the applicable voltage in the coil data, please select the resistance for the nearest approximate voltage.

④ Bearings

Our products use ball bearings or oil-retaining metal bearings. Since each of our products has different standard specifications, please select the model which best fits your application, required durability, etc.

⑤ Shaft

The D-cut shaft is our standard; however, we offer custom options such as keyway shafts, tapped shafts, and shafts with changeable shape.

⑥ Terminal Processing

We use UL-certified products. Since each of our products has different standard specifications, please select the model which best fits your requirements.

⑦ Heat-Resistant Class

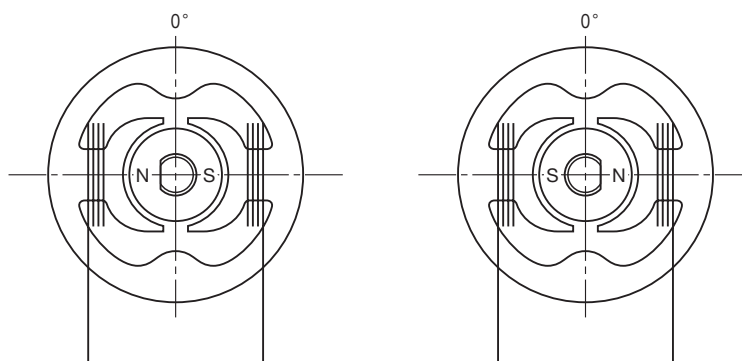
Class E (120°C) is the standard for our products. We also offer specialized options such as Class H (180°C).

4

INSTRUCTIONS [for models without built-in stops:]

① When you receive your

Takano bi-stable rotary solenoids, the relative positions of the magnet and the D-cut shaft will be as shown in the two figures below, in a stable and magnetically balanced state.



② Before using our prod-

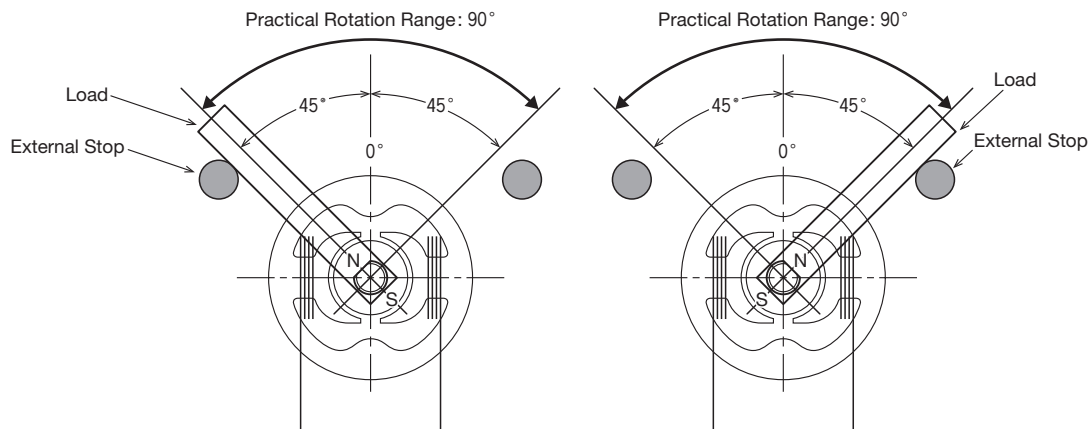
uct, turn the D-cut shaft from the as-delivered stable position and set the external stops.

The midpoint between stops and the central point of rotation are both set to 0°, as shown in the “External Dimensions” diagram for each model.

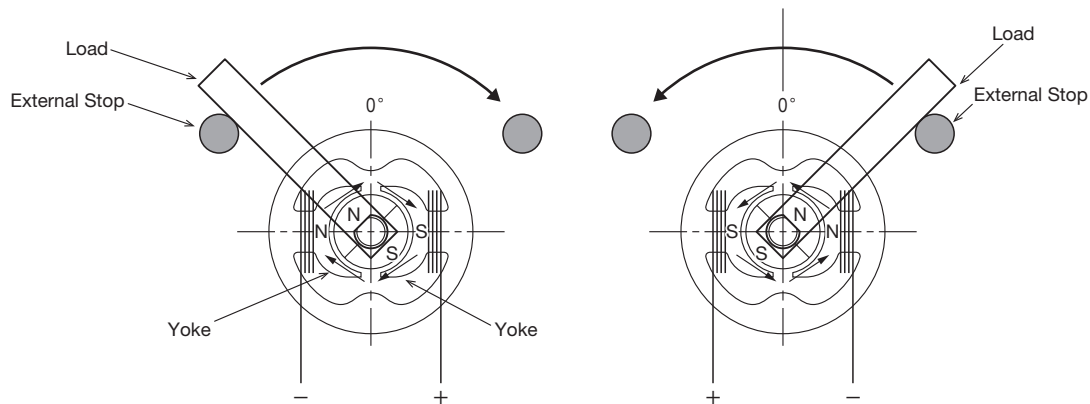
Takano products have as their standard a practical rotation range of up to $\pm 45^\circ$ from the center point (a total travel angle of up to 90°). Please set the external stops at your discretion

within this range.

Metal stops will have a strong impact on contact with a metal load, which could result in failure of the solenoid. For this reason, please use rubber or a similar buffer material for the stops.



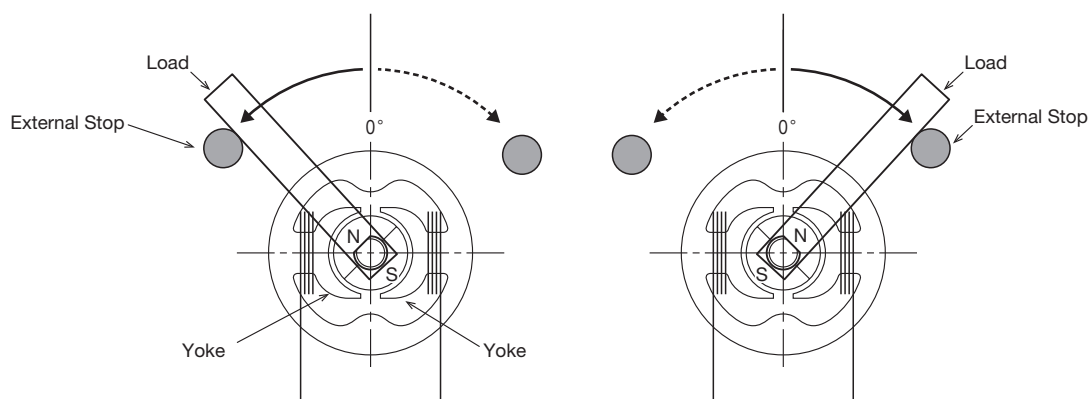
- ③ When the stops are set and power is supplied to the solenoid, electric current flows through the coil and the yoke becomes polarized, as shown in the figure below. The shaft will rotate due to the mutual repulsion of N-N and S-S in the magnet and yoke, and the attraction between N and S poles. When the polarity of the current is reversed, the polarity of the yoke changes as well, and the shaft will rotate in the opposite direction.



- ④ When power is turned off, the electric current ceases to polarize the coil.

At the same time, the permanent magnet will generate force, and will try to return the load to its factory default position (i.e. its position before stops were set, as in ① above).

This is referred to as the magnet's holding force.



Main Specifications

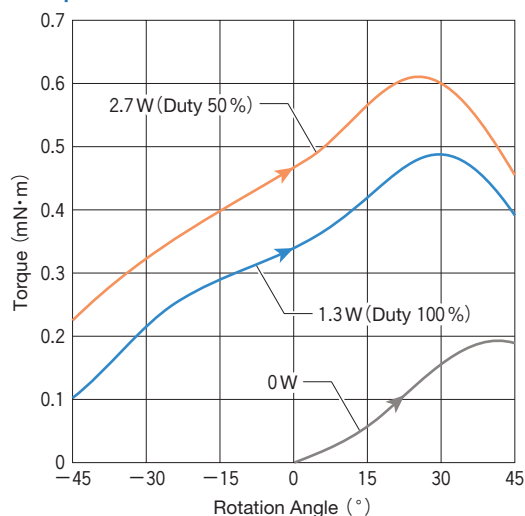
Heat-Resistant Class	Class E (120°C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \div 59 \times W$ (°C) $K \div 59$ (°C/watt)
Temperature Rise Time Constant τ	1 (minutes)
Insulation Resistance	500 V DC MEGA, 5 M Ω or more
Dielectric Strength	250 V AC, 50/60 Hz, 1 second
Rotor Inertia	0.0015 (g·cm ²)
Mass	1.5 (g)

Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	30.1	15.0	6.0	3.0
Power at 20°C [W]	1.3	2.7	5.4	13.5	27.1
Resistance at 20°C [Ω]	Voltage [V _{DC}]				
9.5 (standard)	3.5	5.0	7.1	11.3	16.0
12.0	3.9	5.6	8.0	12.7	18.0
15.2	4.4	6.4	9.0	14.3	20.2

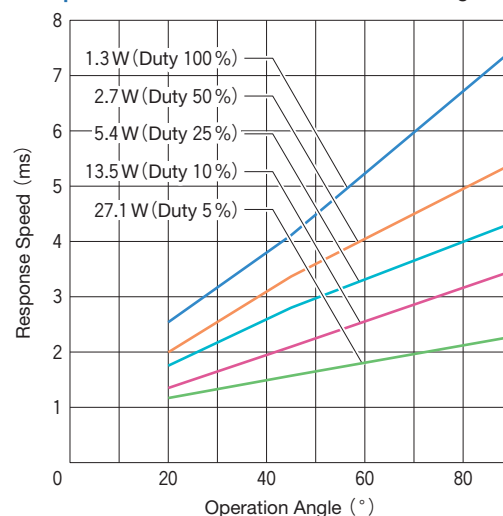


Torque Data

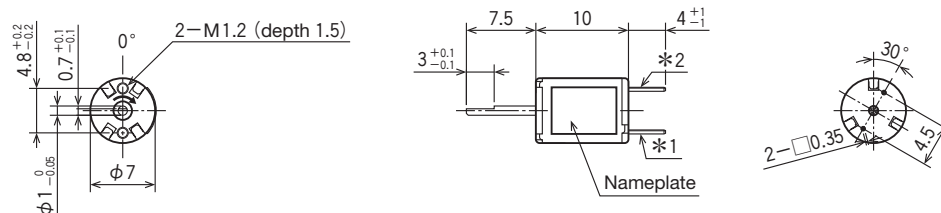


Response Data

(Load Inertia : 0.27 g·mm²)



External Dimensions (mm)



The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to *1 and a negative electrode (-) to *2, the shaft rotates clockwise (in the direction shown by the arrow).

◆ Main Specifications

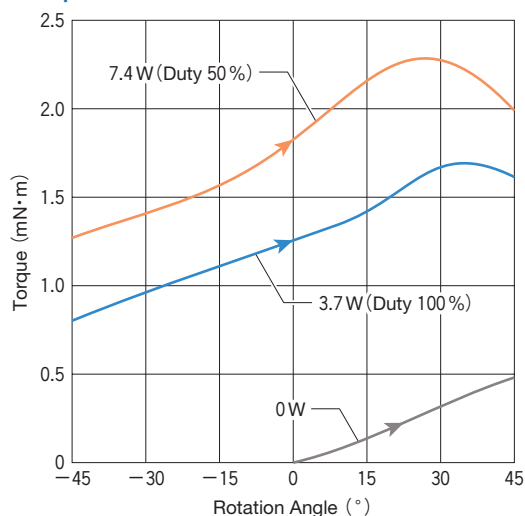
Heat-Resistant Class	Class E (120°C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \doteq 21.5 \times W$ (°C) $K \doteq 21.5$ (°C/watt)
Temperature Rise Time Constant τ	0.5 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	500 V AC, 50/60 Hz, 1 minute
Rotor Inertia	0.017 (g·cm ²)
Mass	8 (g)

◆ Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	15.0	7.5	3.0	1.5
Power at 20°C [W]	3.7	7.4	14.8	37.2	74.4
Resistance at 20°C [Ω]	Voltage [V_{DC}]				
13.0 (standard)	6.9	9.8	13.8	21.9	31.0
39.0	12.0	16.9	24.0	38.0	53.8

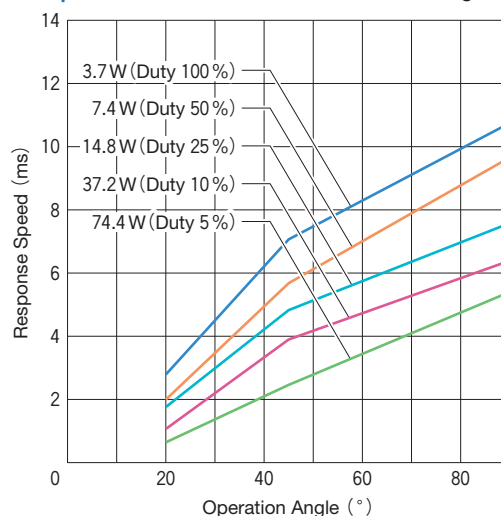


◆ Torque Data

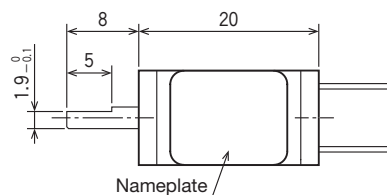
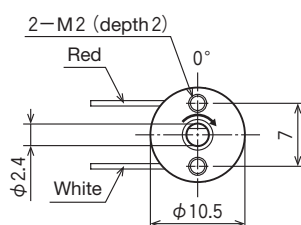


◆ Response Data

(Load Inertia : 0.45 g·cm²)



◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 320
AWG Size : 26

The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

Main Specifications

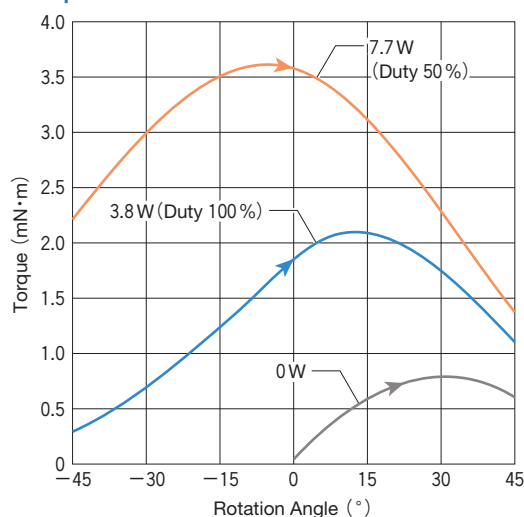
Heat-Resistant Class	Class H (180°C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \div 36 \times W$ (°C) $K \div 36$ (°C/watt)
Temperature Rise Time Constant τ	6 (minutes)
Insulation Resistance	500 V DC MEGA, 100 MΩ or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	0.07 (g·cm ²)
Mass	20 (g)

Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	181.8	90.3	36.0	18.0
Power at 20°C [W]	3.8	7.7	15.5	38.8	77.7
Resistance at 20°C [Ω]	Voltage [V _{DC}]				
13.0	7.0	10.0	14.1	22.4	31.7
35.0 (standard)	11.5	16.4	23.2	36.8	52.1

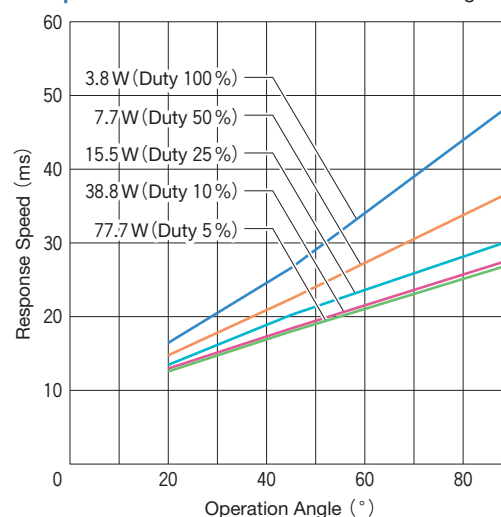


Torque Data

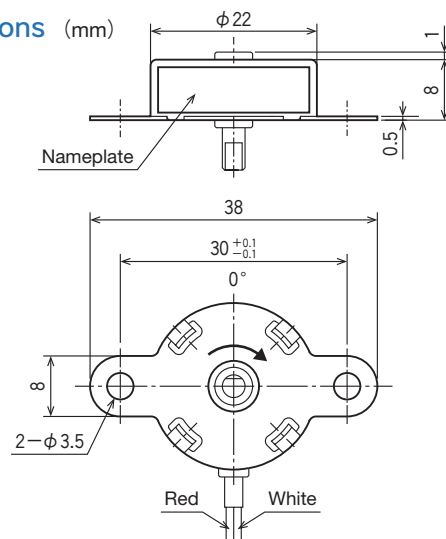


Response Data

(Load Inertia : 10.21 g·cm²)

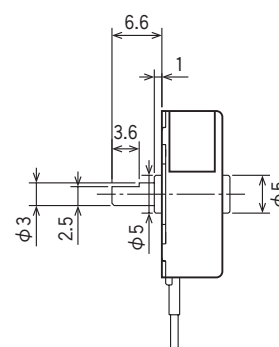


External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 320
AWG Size : 28



The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (-) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

RSR28/17-CAB0-N008

Bi-stable Rotary Solenoids

◆ Main Specifications

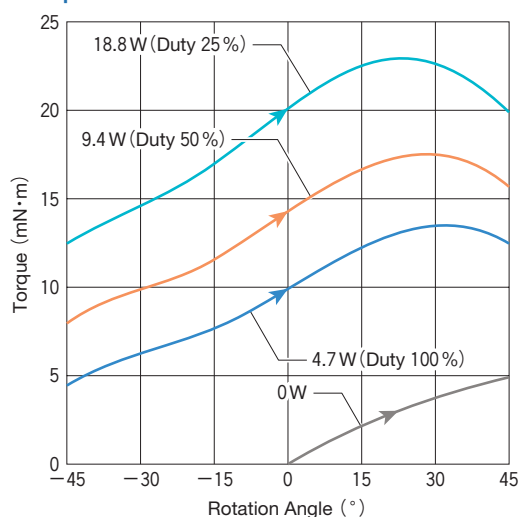
Heat-Resistant Class	Class E (120°C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \div 17 \times W$ (°C) $K \div 17$ (°C/watt)
Temperature Rise Time Constant τ	5 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	1.8 (g·cm ²)
Mass	50 (g)

◆ Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	150.1	75.0	30.0	15.0
Power at 20°C [W]	4.7	9.4	18.8	47.0	94.1
Resistance at 20°C [Ω]	Voltage [V _{DC}]				
8.0 (standard)	6.1	8.6	12.2	19.3	27.4
27.5	11.3	16.0	22.7	35.9	50.8
53.0	15.7	22.3	31.5	49.9	70.6
110.0	22.7	32.1	45.4	71.9	101.7

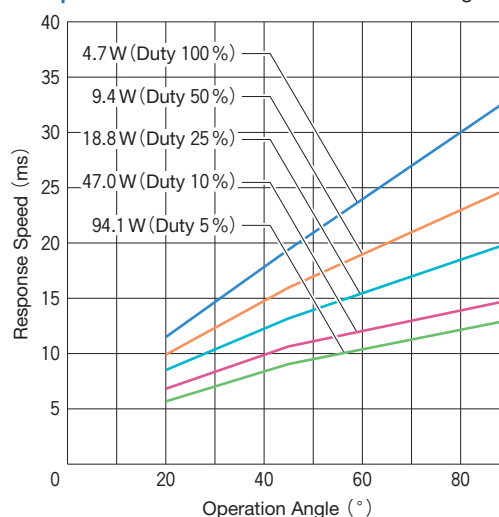


◆ Torque Data

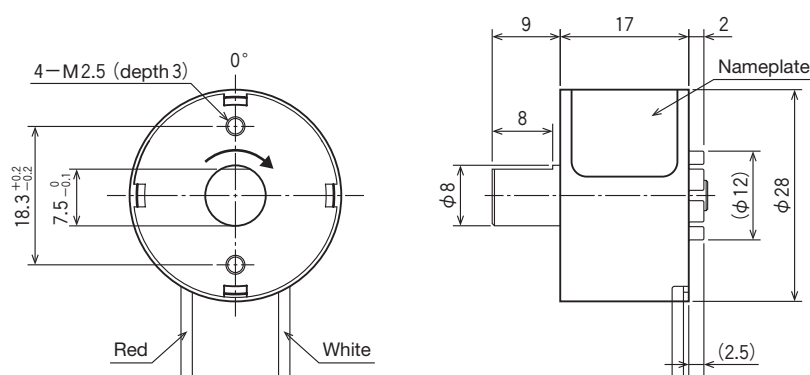


◆ Response Data

(Load Inertia : 10.73 g·cm²)



◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 300
AWG Size : 26

The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

Regarding
Your Order

Bi-stable
Rotary
Solenoids

Driver Board for
Bi-stable Rotary
Solenoids

Step Rotary
Solenoids

Latching
Solenoids

Compact 2-Way/
3-Way Solenoid
Valves for
Chemical Liquids

Generic 2-Way/
3-Way
Solenoid Valves

Pinch Valves

Bi-stable Rotary
Optical
Shutters

Linear
Optical
Shutter

Electro-
magnets

◆ Main Specifications

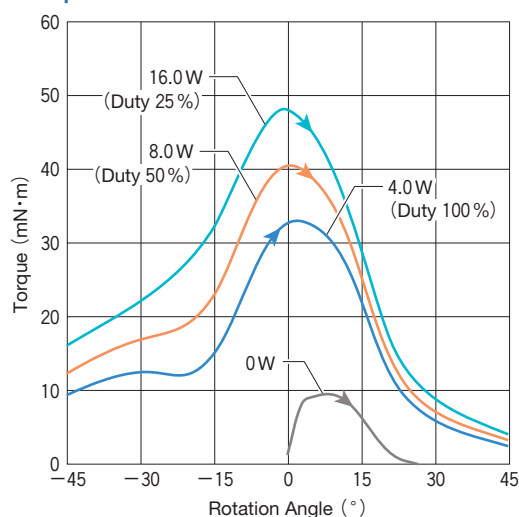
Heat-Resistant Class	Class E (120 °C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 °C)	$\Delta\theta_s \approx 20 \times W$ (°C) $K \approx 20$ (°C/watt)
Temperature Rise Time Constant τ	5 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	1.3 (g·cm ²)
Mass	70 (g)

◆ Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	150.0	75.0	30.0	15.0
Power at 20 °C [W]	4.0	8.0	16.0	40.0	80.0
Resistance at 20 °C [Ω]	Voltage [V_{DC}]				
13.5	7.3	10.3	14.6	23.2	32.8
60.0	15.4	21.9	30.9	48.9	69.2
115.0 (standard)	21.4	30.3	42.8	67.8	95.9
140.0	23.6	33.4	47.3	74.8	105.8

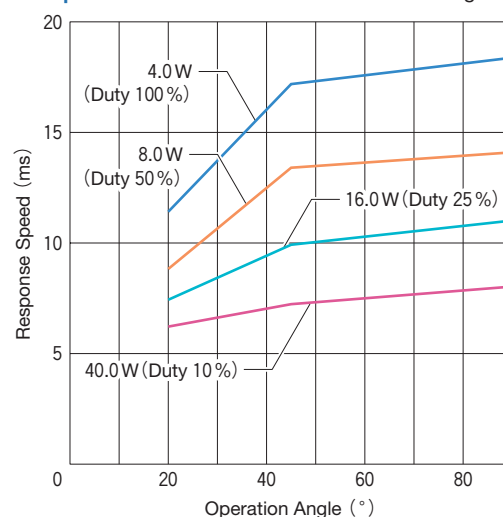


◆ Torque Data

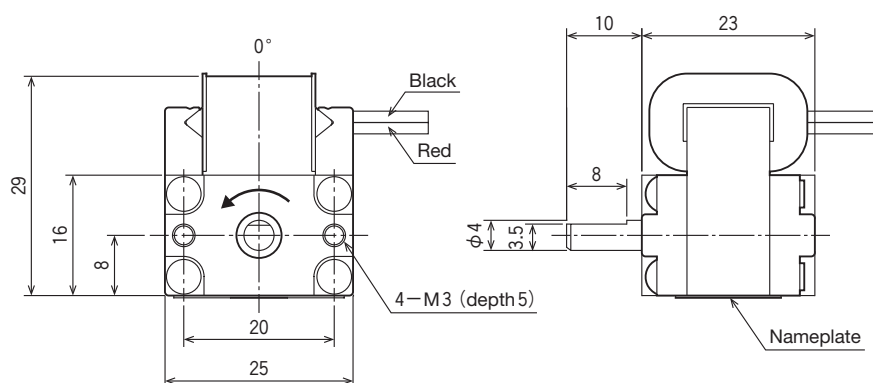


◆ Response Data

(Load Inertia : 12.89 g·cm²)



◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 200
AWG Size : 26

The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the Black lead wire, the shaft rotates counter clockwise (in the direction shown by the arrow).

◆ Main Specifications

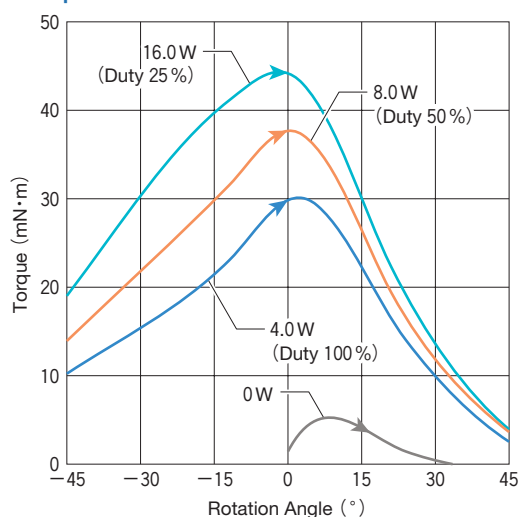
Heat-Resistant Class	Class E (120°C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \div 20 \times W$ (°C) $K \div 20$ (°C/watt)
Temperature Rise Time Constant τ	5 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	1.3 (g·cm ²)
Mass	70 (g)

◆ Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	150.0	75.0	30.0	15.0
Power at 20°C [W]	4.0	8.0	16.0	40.0	80.0
Resistance at 20°C [Ω]	Voltage [V _{DC}]				
13.5	7.3	10.3	14.6	23.2	32.8
60.0	15.4	21.9	30.9	48.9	69.2
115.0 <standard>	21.4	30.3	42.8	67.8	95.9
140.0	23.6	33.4	47.3	74.8	105.8

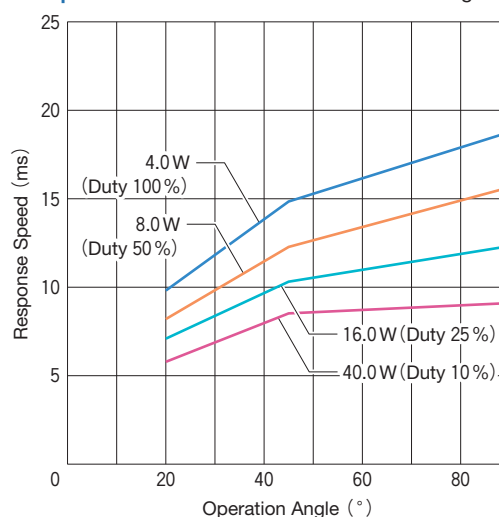


◆ Torque Data

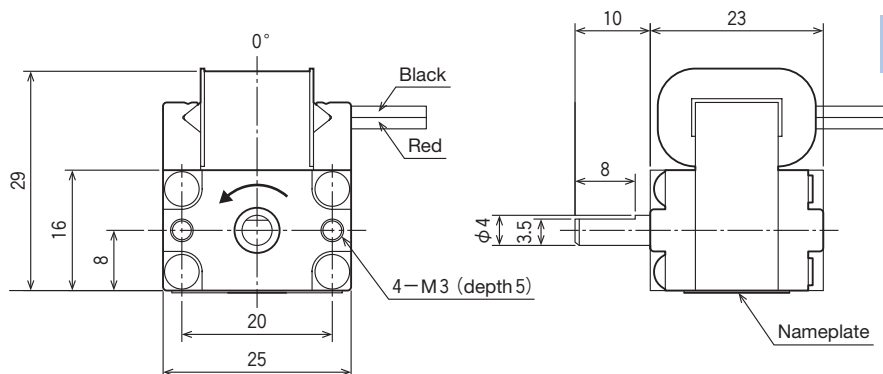


◆ Response Data

(Load Inertia : 12.89 g·cm²)



◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 200
AWG Size : 26

The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the Black lead wire, the shaft rotates counter clockwise (in the direction shown by the arrow).

Main Specifications

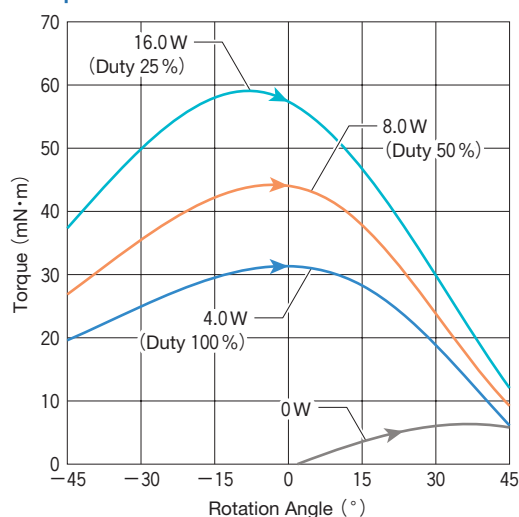
Heat-Resistant Class	Class E (120 °C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 °C)	$\Delta\theta_s \approx 20 \times W$ (°C) $K \approx 20$ (°C/watt)
Temperature Rise Time Constant τ	5 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	2.1 (g·cm ²)
Mass	80 (g)

Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	150.0	75.0	30.0	15.0
Power at 20 °C [W]	4.0	8.0	16.0	40.0	80.0
Resistance at 20 °C [Ω]	Voltage [V_{DC}]				
13.5 (standard)	7.3	10.3	14.6	23.2	32.8
60.0	15.4	21.9	30.9	48.9	69.2
115.0	21.4	30.3	42.8	67.8	95.9
140.0	23.6	33.4	47.3	74.8	105.8

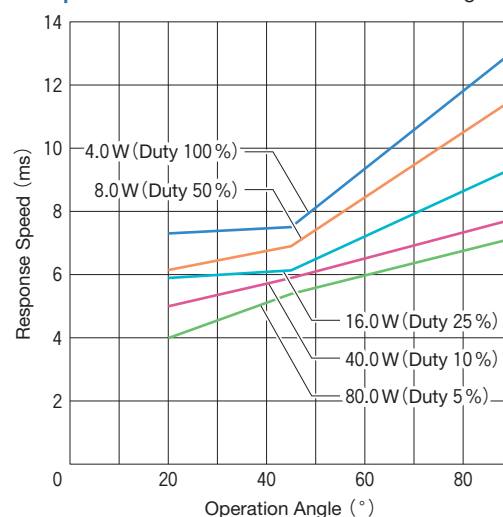


Torque Data

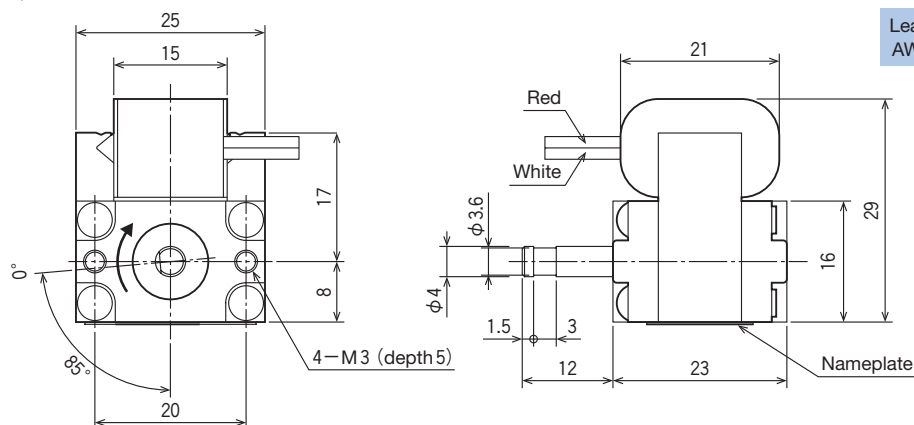


Response Data

(Load Inertia : 12.89 g·cm²)



External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 200
AWG Size: 26

The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

◆ Main Specifications

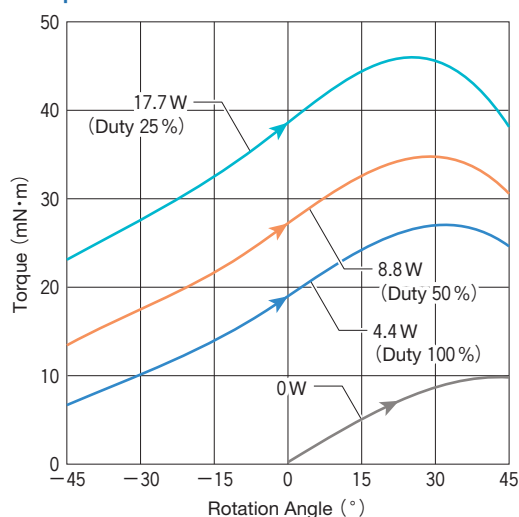
Heat-Resistant Class	Class E (120°C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \div 18 \times W$ (°C) $K \div 18$ (°C/watt)
Temperature Rise Time Constant τ	7 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	2.1 (g·cm ²)
Mass	70 (g)

◆ Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	212.1	105.4	42.0	21.0
Power at 20°C [W]	4.4	8.8	17.7	44.4	88.8
Resistance at 20°C [Ω]	Voltage [V _{DC}]				
3.2	3.7	5.3	7.5	11.9	16.8
15.6 (standard)	8.2	11.7	16.6	26.3	37.2
60.0	16.2	22.9	32.5	51.6	72.9
125.0	23.4	33.1	47.0	74.4	105.3

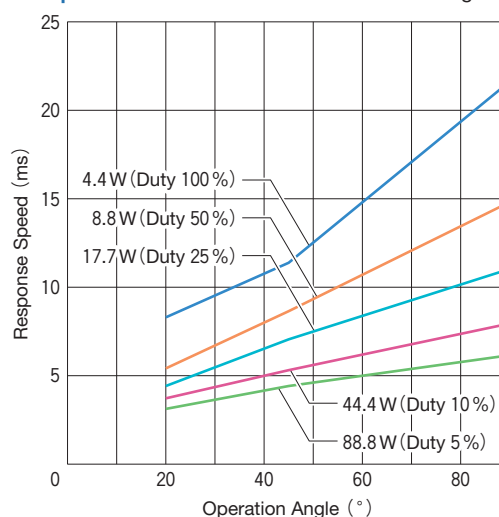


◆ Torque Data

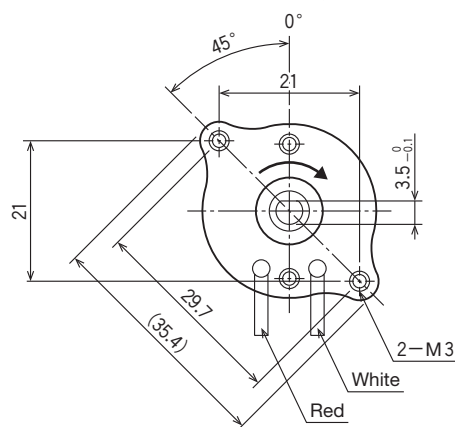


◆ Response Data

(Load Inertia : 3.97 g·cm²)

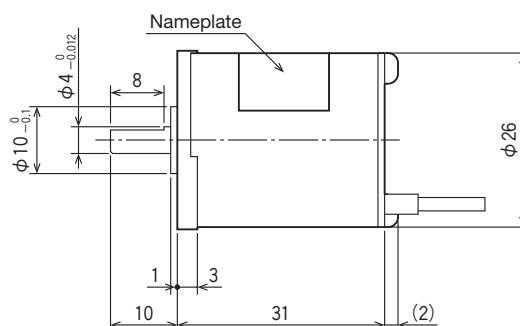


◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 300
AWG Size: 26



The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

Main Specifications

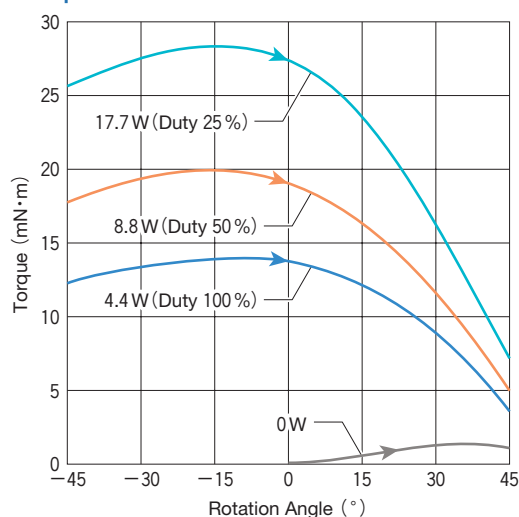
Heat-Resistant Class	Class E (120 °C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 °C)	$\Delta\theta_s \div 18 \times W$ (°C) $K \div 18$ (°C/watt)
Temperature Rise Time Constant τ	7 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	1.8 (g·cm ²)
Mass	70 (g)

Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	212.1	105.4	42.0	21.0
Power at 20 °C [W]	4.4	8.8	17.7	44.4	88.8
Resistance at 20 °C [Ω]	Voltage [V _{DC}]				
3.2	3.7	5.3	7.5	11.9	16.8
15.6 (standard)	8.2	11.7	16.6	26.3	37.2
60.0	16.2	22.9	32.5	51.6	72.9
125.0	23.4	33.1	47.0	74.4	105.3

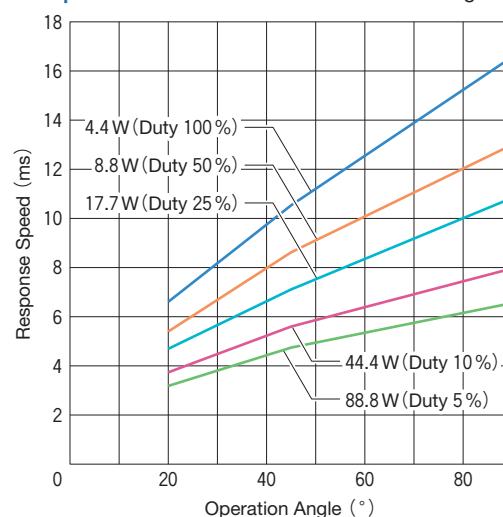


Torque Data

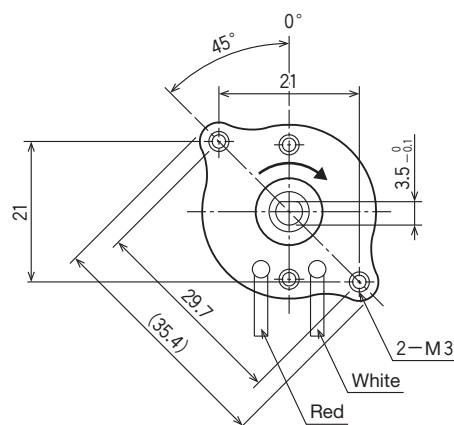


Response Data

(Load Inertia : 3.97 g·cm²)

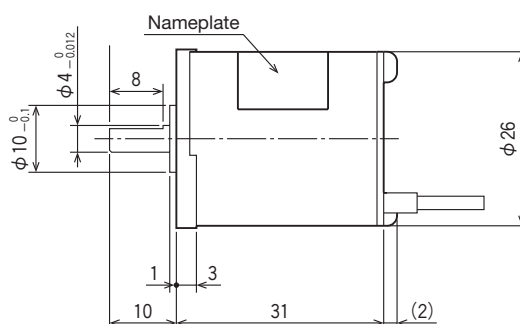


External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 300
AWG Size: 26



The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

◆ Main Specifications

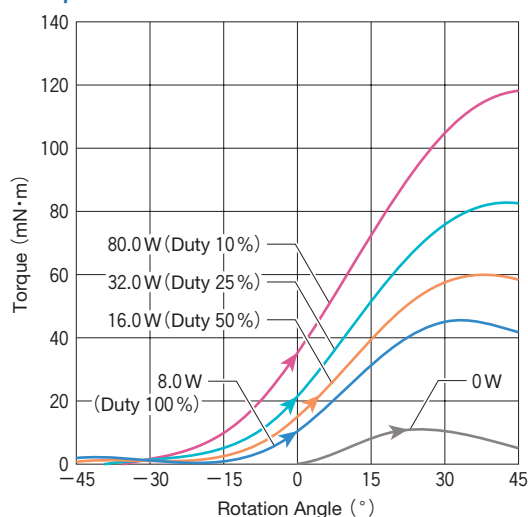
Heat-Resistant Class	Class E (120°C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \div 10 \times W$ (°C) $K \div 10$ (°C/watt)
Temperature Rise Time Constant τ	9 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	6.2 (g·cm ²)
Mass	135 (g)

◆ Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	270.0	135.0	54.0	27.0
Power at 20°C [W]	8.0	16.0	32.0	80.0	160.0
Resistance at 20°C [Ω]	Voltage [V _{DC}]				
10	8.9	12.6	17.8	28.2	40.0
20 <standard>	12.6	17.8	25.2	40.0	56.5
30	15.4	21.9	30.9	48.9	69.2
32	16.0	22.6	32.0	50.5	71.5

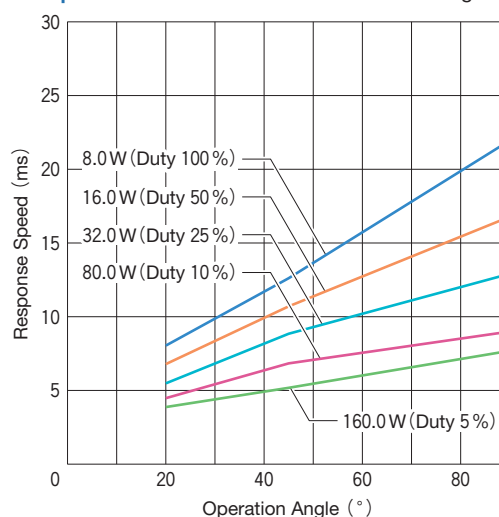


◆ Torque Data

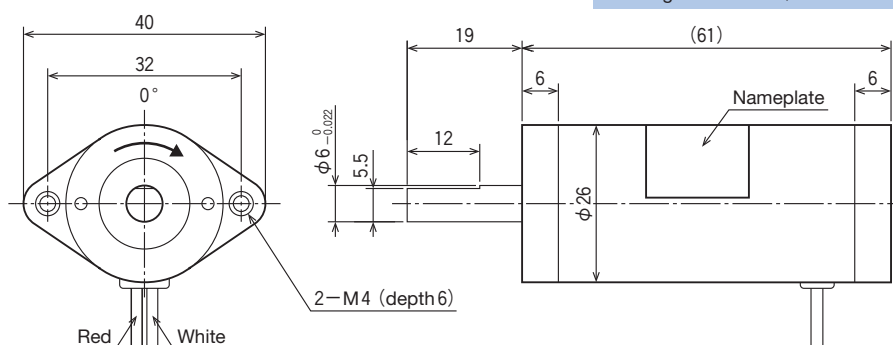


◆ Response Data

(Load Inertia : 10.94 g·cm²)



◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 300
Contact : 8230-4282 (Sumitomo Wiring Systems, Ltd.)
Housing : 6090-1031 (Sumitomo Wiring Systems, Ltd.)

The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

◆ Main Specifications

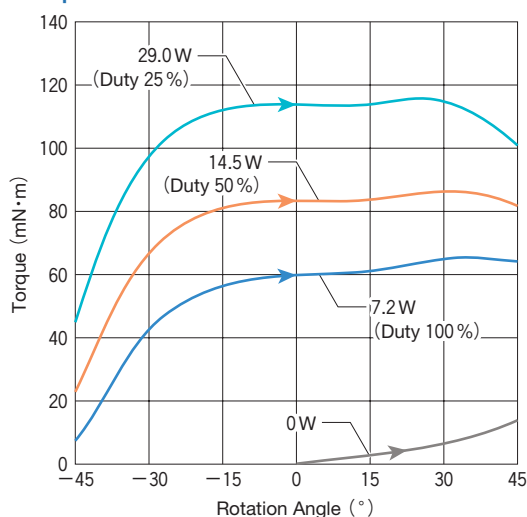
Heat-Resistant Class	Class E (120°C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \div 11 \times W$ (°C) $K \div 11$ (°C/watt)
Temperature Rise Time Constant τ	6 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	9 (g·cm ²)
Mass	185 (g)

◆ Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	180.5	90.2	36.0	18.0
Power at 20°C [W]	7.2	14.5	29.0	72.7	145.4
Resistance at 20°C [Ω]	Voltage [V _{DC}]				
5.6	6.3	9.0	12.7	20.1	28.5
15.0 (standard)	10.3	14.7	20.8	33.0	46.7
23.0	12.8	18.2	25.8	40.8	57.8
58.0	20.4	29.0	41.0	64.9	91.8

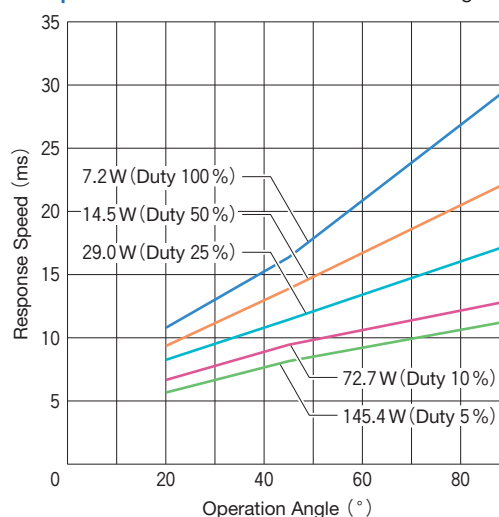


◆ Torque Data

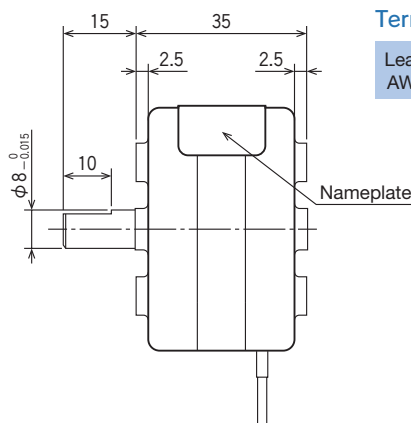
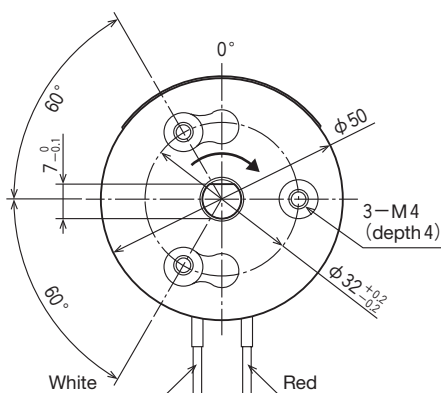


◆ Response Data

(Load Inertia : 35.01 g·cm²)



◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 270
AWG Size : 22

The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

Main Specifications

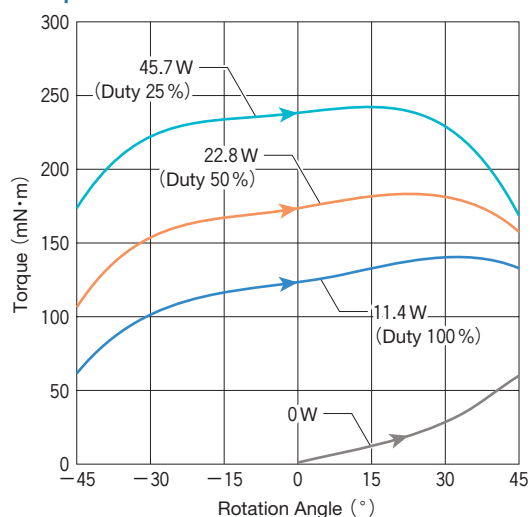
Heat-Resistant Class	Class E (120 °C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 °C)	$\Delta\theta_s \approx 7.0 \times W$ (°C) $K \approx 7.0$ (°C/watt)
Temperature Rise Time Constant τ	7 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	18 (g·cm ²)
Mass	280 (g)

Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	210.5	105.0	42.0	21.0
Power at 20 °C [W]	11.4	22.8	45.7	114.2	228.5
Resistance at 20 °C [Ω]	Voltage [V _{DC}]				
6.2 (standard)	8.4	11.8	16.8	26.6	37.6
12.0	11.6	16.5	23.4	37.0	52.3
25.0	16.8	23.8	33.8	53.4	75.5
44.0	22.3	31.6	44.8	70.8	100.2

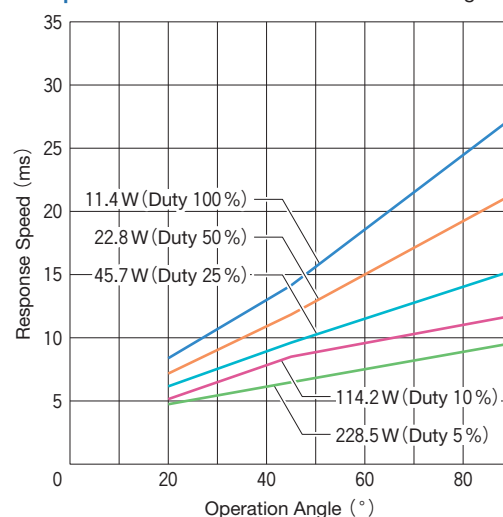


Torque Data

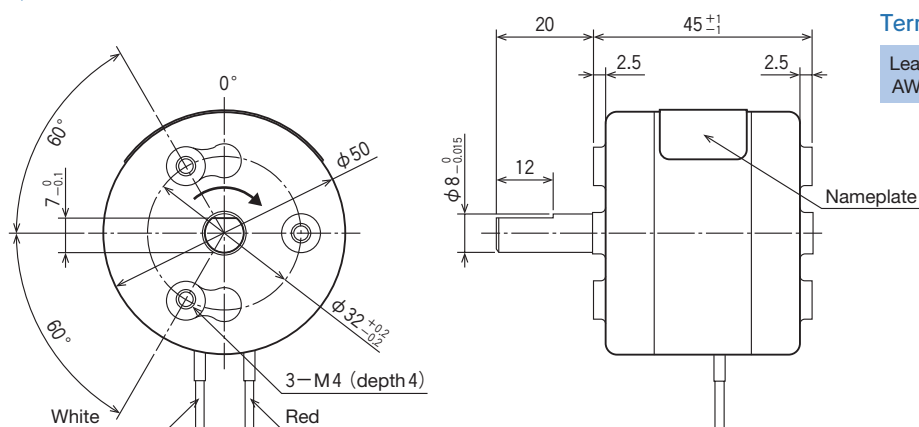


Response Data

(Load Inertia : 35.01 g·cm²)



External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 270
AWG Size : 22

The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

◆ Main Specifications

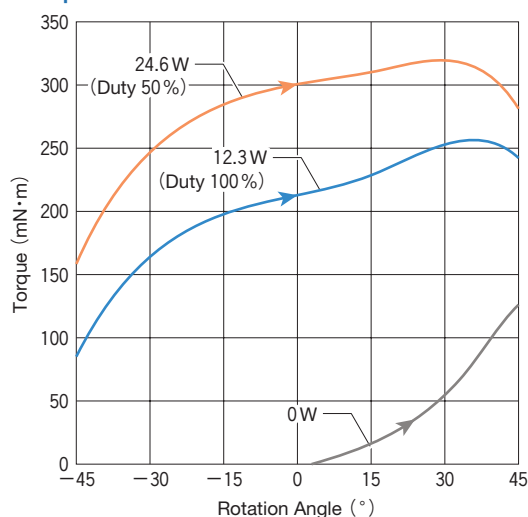
Heat-Resistant Class	Class E (120°C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \approx 6.5 \times W$ (°C) $K \approx 6.5$ (°C/watt)
Temperature Rise Time Constant τ	8 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	100 V AC, 50/60 Hz, 1 minute
Rotor Inertia	36 (g·cm ²)
Mass	500 (g)

◆ Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	240.1	120.0	48.0	24.0
Power at 20°C [W]	12.3	24.6	49.2	123.0	246.1
Resistance at 20°C [Ω]	Voltage [V _{DC}]				
9.0	10.5	14.8	21.0	33.2	47.0
18.0	14.8	21.0	29.7	47.0	66.5
29.0	18.8	26.7	37.7	59.7	84.4
36.0 (standard)	21.0	29.7	42.0	66.5	94.1

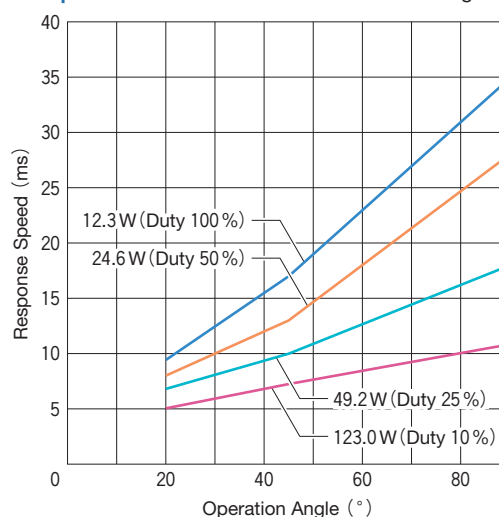


◆ Torque Data

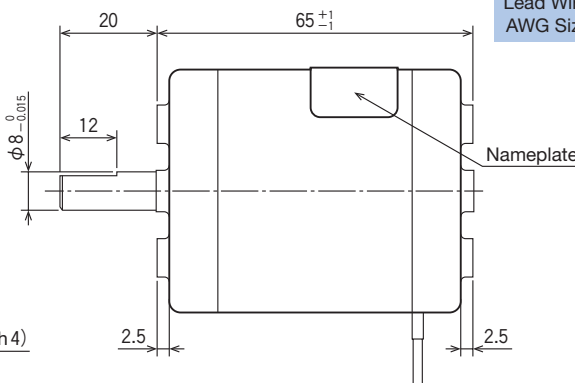
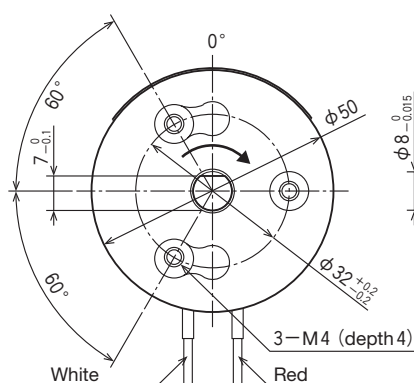


◆ Response Data

(Load Inertia : 35.01 g·cm²)



◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 270
AWG Size: 22

The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (−) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

RSR80/80-CAB0

Bi-stable Rotary Solenoids

Main Specifications

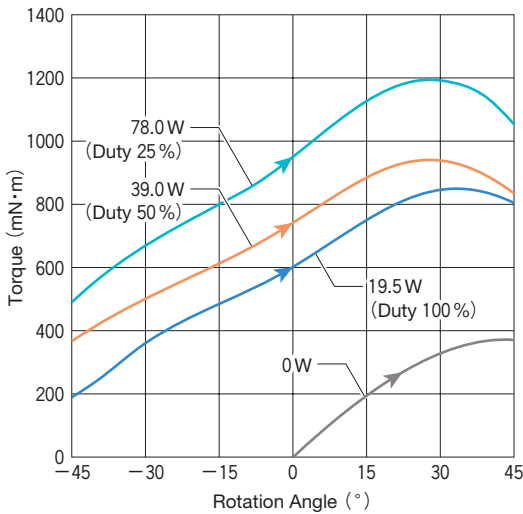
Heat-Resistant Class	Class E (120 °C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 °C)	$\Delta\theta_s \doteq 4.1 \times W$ (°C) $K \doteq 4.1$ (°C/watt)
Temperature Rise Time Constant τ	11 (minutes)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	350 (g·cm ²)
Mass	1,700 (g)

Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	330.2	165.1	66.0	33.0
Power at 20 °C [W]	19.5	39.0	78.0	195.1	390.2
Resistance at 20 °C [Ω]	Voltage [V _{DC}]				
3.0	7.6	10.8	15.2	24.1	34.2
6.0 <standard>	10.8	15.2	21.6	34.2	48.3

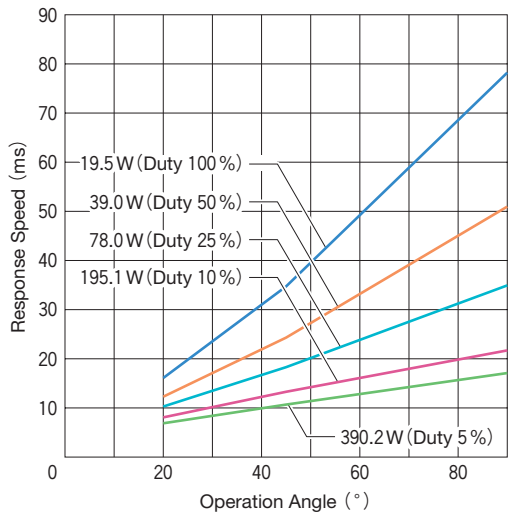


Torque Data

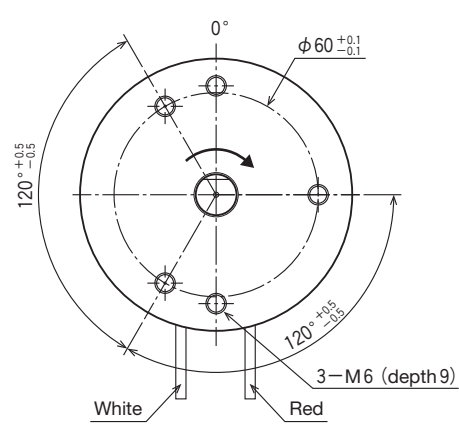


Response Data

(Load Inertia : 425.41 g·cm²)

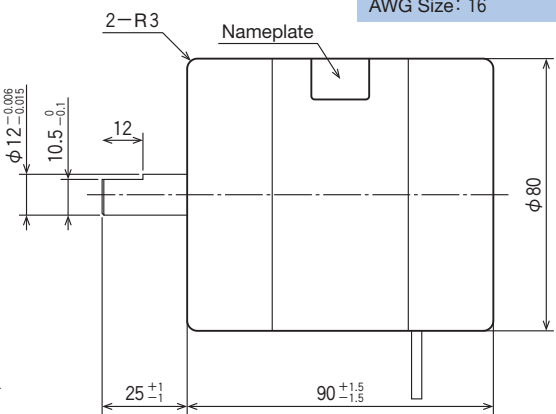


External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 240
AWG Size : 16



The above drawing shows the rotary shaft positioned in the center (0°) of its rotation range.
When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (-) to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

RSE32/47-C Series Rotary Solenoids with Built-In Stops

◆ Main Specifications

Model Number	RSE32/47-C020	RSE32/47-C038
Working Voltage	24 (V DC)	
DC Resistance	20 (Ω)	38 (Ω)
Duty Cycle	20 (%) or less	
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 °C)	$\Delta\theta_s \div 18 \times W$ (°C) $K \div 18$ (°C/watt)	
Heat-Resistant Class	Class F (155 °C)	
Insulation Resistance	500 V DC MEGA, 100 M Ω or more	
Dielectric Strength	600 V AC, 50/60 Hz, 1 second	
Mass	50 (g)	
Operating Angle	20 (°)	
Non-Excited Holding Force	0.015 (N·m)	
Starting Torque ^{*1}	0.02 (N·m)	
Life Cycle/Durability ^{*2}	10,000,000 (cycles)	
Response Speed ^{*3}	10 (ms) or less	12 (ms) or less

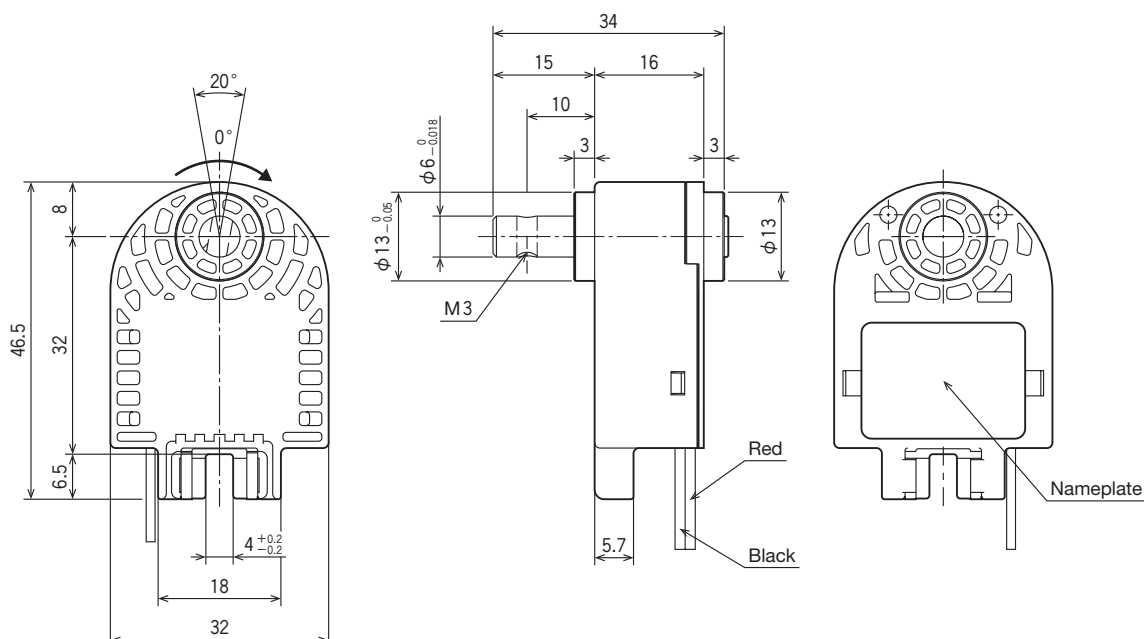
* 1: when applied voltage = 24 V DC.

* 2: durability conditions: measured by Takano Co. in a standard testing environment, with a load of inertia 30 g·cm², shaft in a horizontal position, duty cycle 20 %, applied voltage 24 V DC, using a Takano driver.

* 3: measurement conditions: measured by Takano Co. in a standard testing environment, with a load of inertia 30 g·cm², shaft in a horizontal position, applied voltage 24 V DC.



◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 200
AWG Size: 26
Thermal Fuse: Nominal Operating Temperature: 145 °C

When a positive electrode (+) is connected to the Red lead wire, and a negative (−) electrode to the Black lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

Regarding
Your Order

Bi-stable
Rotary
Solenoids

Driver Board for
Bi-stable Rotary
Solenoids

Step Rotary
Solenoids

Latching
Solenoids

Compact 2-Way/
3-Way Solenoid
Valves for
Chemical Liquids

Generic 2-Way/
3-Way
Solenoid Valves

Pinch Valves

Bi-stable Rotary
Optical
Shutters

Linear
Optical
Shutter

Electro-
magnets

◆ Main Specifications

Working Voltage	24 (V DC)
DC Resistance	20 (Ω)
Duty Cycle	20 (%) or less
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 °C)	$\Delta\theta_s \div 18 \times W$ (°C) $K \div 18$ (°C/watt)
Heat-Resistant Class	Class F (155 °C)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	600 V AC, 50/60 Hz, 1 second
Mass	60 (g)
Operating Angle	37.5 (°)
Non-Excited Holding Force	0.01 (N·m)
Starting Torque *1	0.002 (N·m)
Life Cycle/Durability *2	10,000,000 (cycles)
Response Speed *3	15 (ms) or less

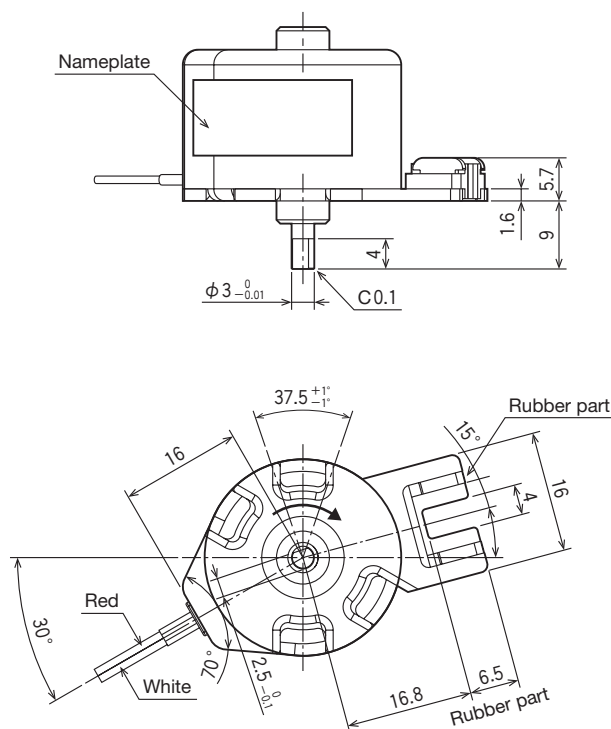
*1 : when applied voltage = 24 V DC.

*2 : durability conditions: measured by Takano Co. in a standard testing environment, with a load of inertia 4.2 g·cm², shaft in a horizontal position, duty cycle 20 %, applied voltage 24 V DC, using a Takano driver.

*3 : measurement conditions: measured by Takano Co. in a standard testing environment, with a load of inertia 4.2 g·cm², shaft in a horizontal position, applied voltage 24 V DC.

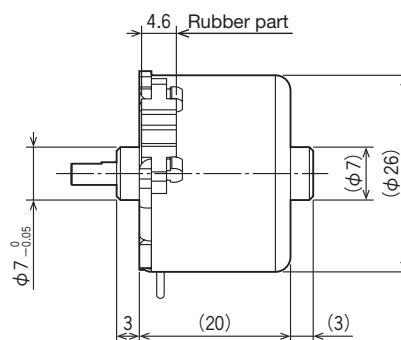


◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 300
AWG Size: 26
Thermal Fuse: Nominal Operating Temperature: 145 °C



When a positive electrode (+) is connected to the Red lead wire, and a negative (−) electrode to the White lead wire, the shaft rotates clockwise (in the direction shown by the arrow).

RSR28/17-SR Series Rotary Solenoids with Return Spring

◆ Main Specifications

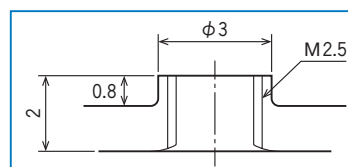
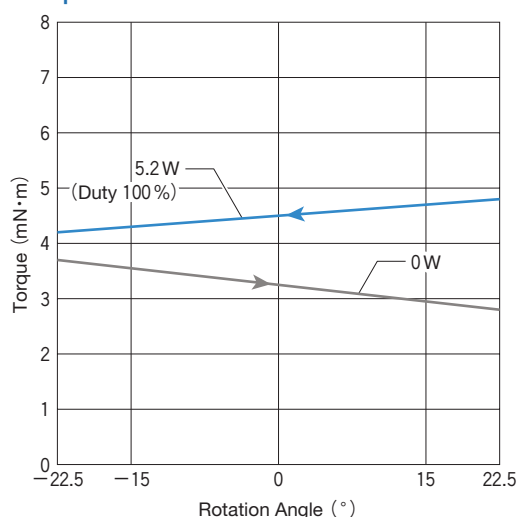
Model Number *1	RSR 28/17-SR XX-27.5	RSR 28/17-SR XX-110
Rated Voltage	12 (V DC)	24 (V DC)
DC Resistance	27.5 (Ω)	110 (Ω)
Heat-Resistant Class	Class E (120 °C)	
Direction of Plate Rotation	Clockwise (when power is on)	
Operating Angle	25 (°)/35 (°)/45 (°)	
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 °C)	$\Delta\theta_s \div 17 \times W$ (°C) $K \div 17$ (°C/watt)	
Temperature Rise Time Constant τ	5 (minutes)	
Insulation Resistance	500 V DC MEGA, 100 MΩ or more	
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute	
Rotor Inertia	1.8 (g·cm ²)	
Mass	50 (g)	
Response Speed *2	25 (ms) or less	

* 1: the "XX" portion represents the operating angle. You may choose 25°, 35°, or 45°.

* 2: measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage at the rated voltage amount.

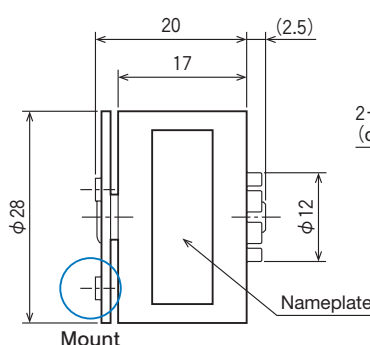
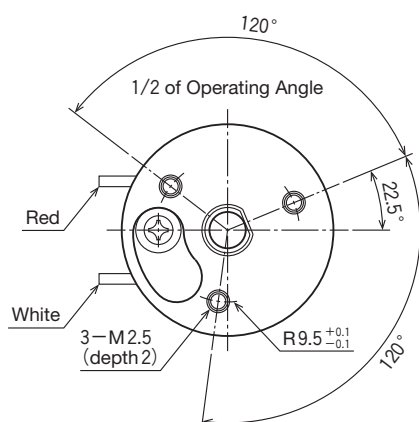


◆ Torque Data



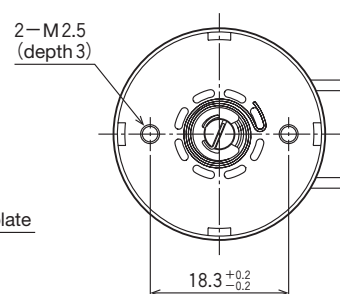
Mount Detail (mm)

◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 295
AWG Size : 26



When a positive electrode (+) is connected to the Red lead wire, and a negative electrode (-) to the White, the plate will rotate; when power is cut off, the plate will return to its original position by means of a spring.

Regarding
Your Order

Bi-stable
Rotary
Solenoids

Driver Board for
Bi-stable Rotary
Solenoids

Step Rotary
Solenoids

Latching
Solenoids

Compact 2-Way/
3-Way Solenoid
Valves for
Chemical Liquids

Generic 2-Way/
3-Way
Solenoid Valves

Pinch Valves

Bi-stable Rotary
Optical
Shutters

Linear
Optical
Shutter

Electro-
magnets

RSR28/17-SL Series Rotary Solenoids with Return Spring

◆ Main Specifications

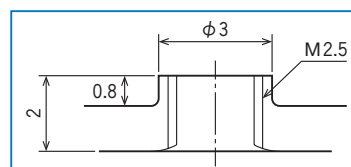
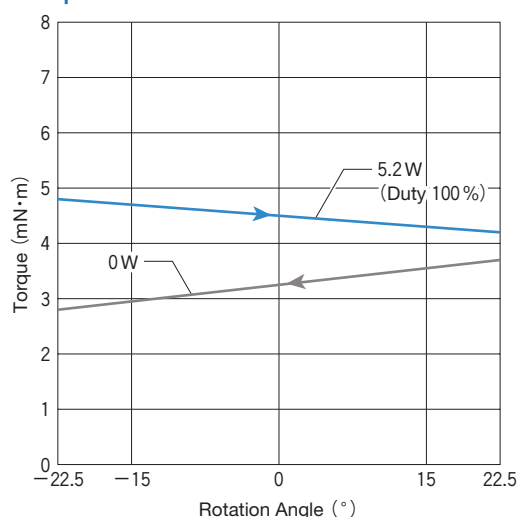
Model Number* ¹	RSR 28/17-SL XX-27.5	RSR 28/17-SL XX-110
Rated Voltage	12 (V DC)	24 (V DC)
DC Resistance	27.5 (Ω)	110 (Ω)
Heat-Resistant Class	Class E (120 °C)	
Direction of Plate Rotation	Counter-clockwise (when power is on)	
Operating Angle	25 (°)/35 (°)/45 (°)	
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 °C)	$\Delta\theta_s \div 17 \times W$ (°C) $K \div 17$ (°C/watt)	
Temperature Rise Time Constant τ	5 (minutes)	
Insulation Resistance	500 V DC MEGA, 100 MΩ or more	
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute	
Rotor Inertia	1.8 (g·cm ²)	
Mass	50 (g)	
Response Speed* ²	25 (ms) or less	



* 1: the "XX" portion represents the operating angle. You may choose 25°, 35°, or 45°.

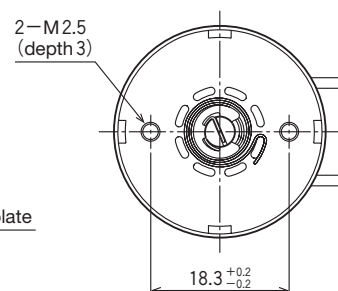
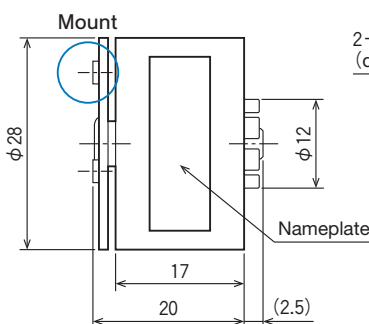
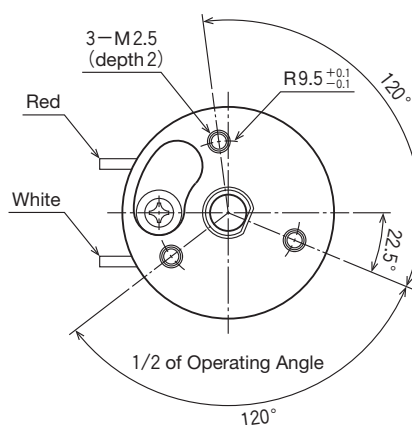
* 2: measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage at the rated voltage amount.

◆ Torque Data



Mount Detail (mm)

◆ External Dimensions (mm)

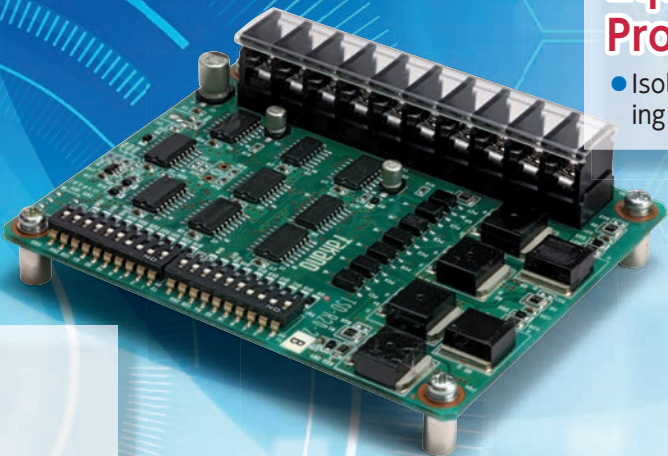


Terminal Specifications

Lead Wire Length (mm) : 295
AWG Size: 26

When a positive electrode (—) is connected to the Red lead wire, and a negative electrode (+) to the White, the plate will rotate; when power is cut off, the plate will return to its original position by means of a spring.

DRIVER BOARD FOR BI-STABLE ROTARY SOLENOIDS



Equipped with a Protective Cover

- Isolates the wire-connecting terminal of the board.

Dip Switch Functionality

- Set the duration of each pulse with just the flip of a switch!

FEATURES

1 User-Specified Conduction Time

You can set the duration of energization from 1 to 511 milliseconds in 1ms steps for clockwise and counterclockwise rotation. The factory settings have T1 and T2 both set at 14ms.

3 Humidity-Resistant/Impact-Resistant/Vibration-Resistant

The board is fully coated from front to back with acrylic coating.

2 Easy Interface With Exterior Equipment

Since the input trigger circuit is insulated by a photocoupler, and since the solenoid power supply (V1 & V2) is independent of the circuit-board power supply, interfacing with exterior equipment is simple and easy.

4 Power-Saving

Since we use CMOS integrated circuit technology in the logic and counter circuits, the driver board is energy-efficient. It can obtain a large noise margin, and takes a wide range of power supplies.

PRODUCT SPECIFICATIONS

◆ Electrical Characteristics

① Rated Voltage

Solenoid Power Supply Voltage: (High) V1 – GND 1: 12 V DC ~ 48 V DC
(Low) V2 – GND 1: 12 V DC ~ 48 V DC

[please keep the voltage of V2 lower than that of V1]

Circuit Power Supply Voltage: VCC – GND 2: 5 V DC ± 10 %

Regarding
Your Order

Bi-stable
Rotary
Solenoids

Driver Board for
Bi-stable Rotary
Solenoids

Step Rotary
Solenoids

Latching
Solenoids

Compact 2-Way/
3-Way Solenoid
Valves for
Chemical Liquids

Generic 2-Way/
3-Way
Solenoid Valves

Pinch Valves —

Bi-stable Rotary
Optical
Shutters

Linear
Optical
Shutter

Electro-
magnets

2 Rated Current

Solenoid Output Current
(when operating with continuous pulse) :

V1, V2 Voltage (V DC)	Trigger Pulse Frequency f (Hz)	Current (A)		
		2	5	8
12 ≤ V1 ≤ 24 12 ≤ V2 < 24 (V1 > V2)	f < 1	○	○	○
	1 ≤ f < 5	○	○	×
	f ≥ 5	○	○	×
24 < V1 ≤ 48 12 < V2 < 48 (V1 > V2)	f < 1	○	○	×
	1 ≤ f < 5	○	○	×
	f ≥ 5	○	×	×
Duty Cycle		Max 80 %	Max 50 %	Max 20 %

Circuit Power Supply Current: under 30 mA (Vcc-GND 2) [when VCC = 5.0V DC]
Trigger Input Current: 7.5 mA DC (Typ) [when VIH = 48V DC]

3 Operating Voltage Trigger Input Voltage IN+ — IN- :

High Level Input Voltage VIH : 12V DC ~ 48V DC,

Low Level Input Voltage VIL : 0V DC ~ 1.2V DC

4 Insulation Resistance 250V DC MEGA, over 5MΩ

between (V1, V2, GND 1) and (VCC, GND 2), between (IN+, IN-) and (VCC, GND 2)

between (IN+, IN-) and (V1, V2, GND 1)

5 Dielectric Strength 1000V AC 50/60Hz 1 minute

between (V1, V2, GND 1) and (VCC, GND 2), between (IN+, IN-) and (VCC, GND 2)

between (IN+, IN-) and (V1, V2, GND 1)

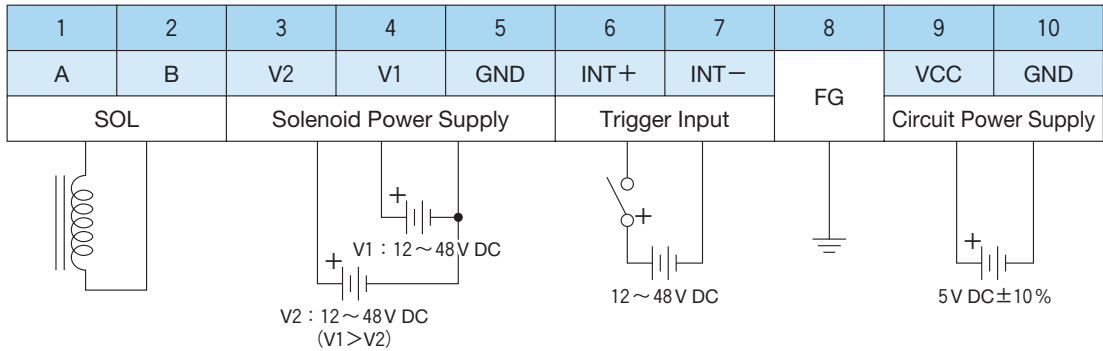
◆ How To Set Pulse Duration

By setting the ON-OFF switches on the 9-bit dip switches, you can set the duration of current supply according to the pattern shown in the table below.

Dipswitch SW 1 controls clockwise rotation, and SW 2 controls counterclockwise rotation.

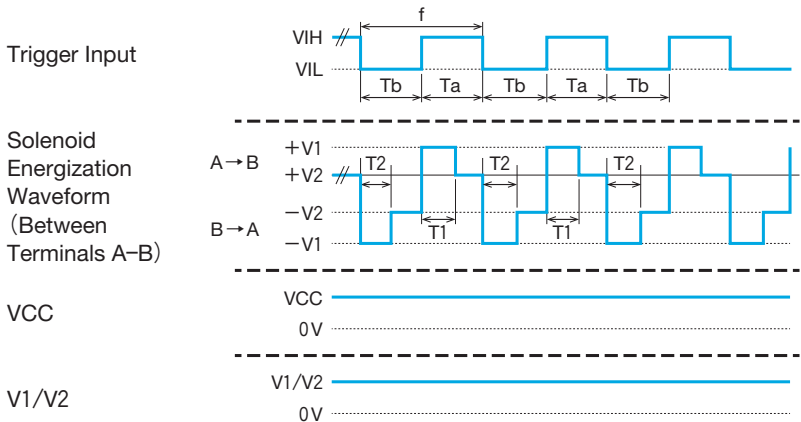
Duration of current supply	Dipswitch (SW1, SW2)									Note
	9	8	7	6	5	4	3	2	1	
1 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	
2 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	OFF (0)	
3 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	
4 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	OFF (0)	OFF (0)	
5 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	OFF (0)	ON (1)	
6 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	OFF (0)	
7 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	ON (1)	
:										
13 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	OFF (0)	ON (1)	
14 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	ON (1)	OFF (0)	(standard)
15 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	ON (1)	ON (1)	
16 ms	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	
:										
200 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	OFF (0)	OFF (0)	OFF (0)	
201 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	OFF (0)	OFF (0)	ON (1)	
202 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	OFF (0)	ON (1)	OFF (0)	
203 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	OFF (0)	ON (1)	ON (1)	
204 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	
205 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	ON (1)	OFF (0)	ON (1)	
206 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	ON (1)	ON (1)	OFF (0)	
207 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	ON (1)	ON (1)	ON (1)	
208 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	ON (1)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	
209 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	ON (1)	OFF (0)	OFF (0)	OFF (0)	ON (1)	
210 ms	OFF (0)	ON (1)	ON (1)	OFF (0)	ON (1)	OFF (0)	OFF (0)	ON (1)	OFF (0)	
:										
510 ms	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	OFF (0)	
511 ms	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	

◆ How to Connect

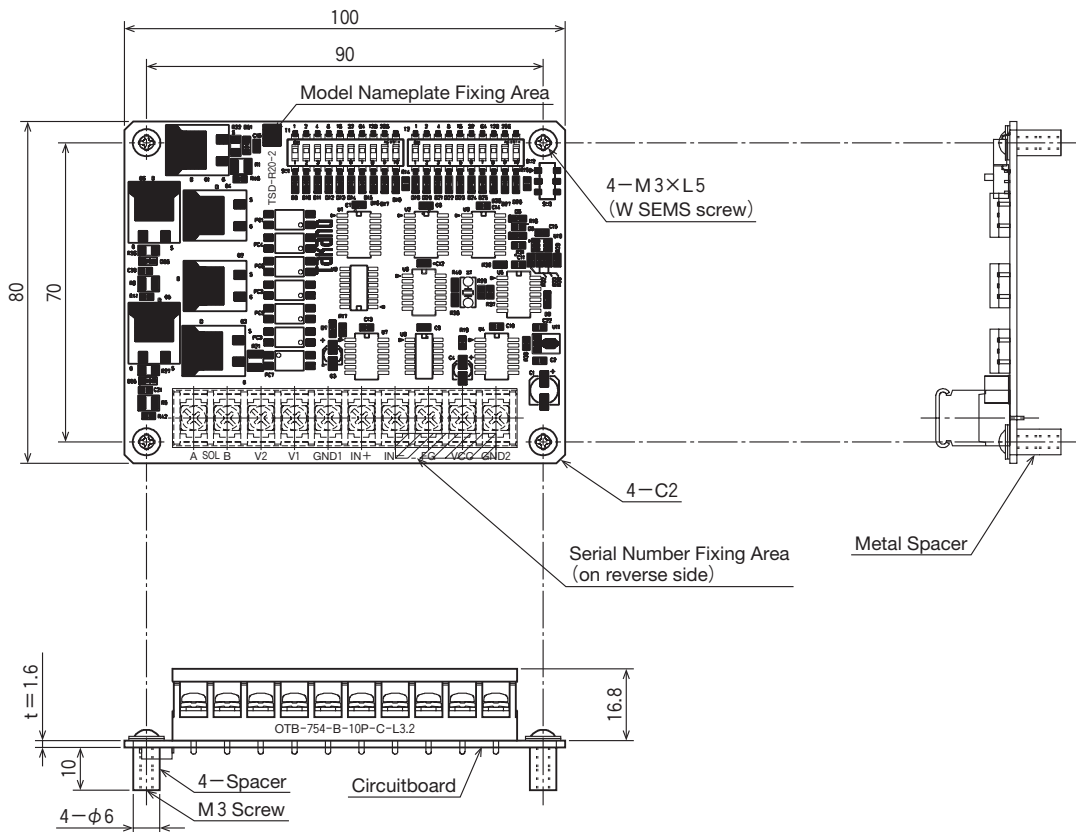


* Terminal Block : OTB-754-B-10P (OSADA Co., Ltd.)

◆ Operation Timing



◆ External Dimensions (mm)



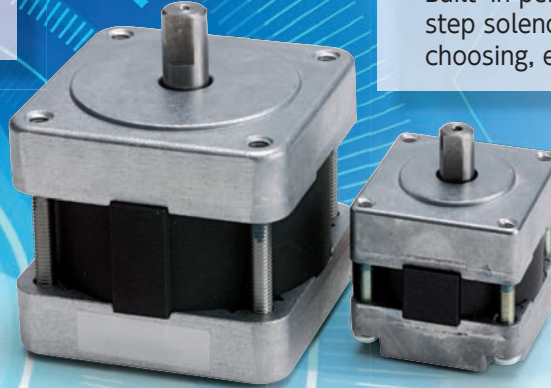
STEP ROTARY SOLENOIDS

Noiseless

- Stopless structure allows for silent operation.

Power-Saving

- Built-in permanent magnet holds our step solenoids in the position of your choosing, even when power is turned off.



No Need for Stops

- The six NS magnetic poles in the solenoid's structure eliminate the need for external stops.

FEATURES

1 Multi-Positional Control Capabilities

Set the device in up to 12 positions in increments of 30°, or up to 6 positions in increments of 60° (depending on the lead line connection pattern).

2 High Durability

Because there are no sliding parts apart from the ball-bearing, our step solenoids are highly reliable with a long life cycle.

〈Target durability〉

with ball-bearings: 30,000,000 cycles

with oil-retaining bearings: 10,000,000 cycles

* Depending on load and environmental conditions. In all cases we recommend that you confirm operation of the solenoid with its load attached.

2 Absolute Positional Control

Our step rotary solenoids have absolute positional control: you don't have to deal with the step-out or desynchronism seen in such devices as stepper motors.

4 Ease of Control

Since control is carried out solely by switching the hard-wiring pattern of 3 output lead lines, it is simple and easy to control the solenoid.

APPLICATIONS

1. Light Control

can be used to block or polarize light, to switch between lights, and to change the color or amount of light.

2. Sorting/Screening

can be used to sort or screen (mail, etc.).

3. Locking/Positioning

can be used for electric locking or halting (of moving items on a conveyor belt, etc.).

4. Valves

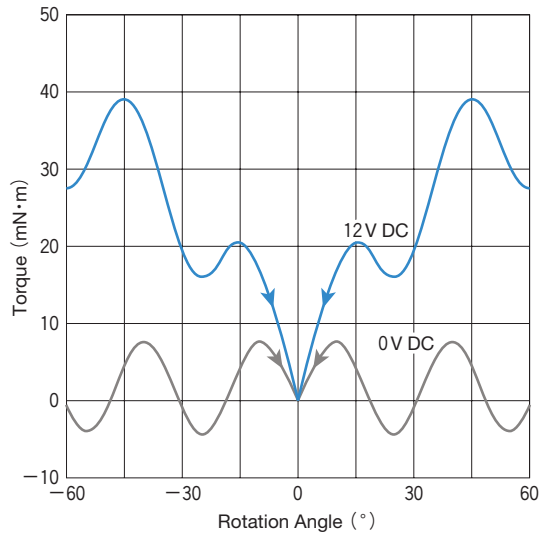
can be used to rapidly redirect the course of flow, or to open and close plumbing and tubing by means of a clamp.

◆ Main Specifications

Operating Angle	1 step = 30° or 60°
Working Voltage	12 (V DC)
Non-Excited Holding Force	0.008 (N·m)
Torque when Excited (at 12W)	0.02 (N·m)
DC Resistance	12 (Ω)
Heat-Resistant Class	Class E (120℃)
Coil Saturation Temperature Rise Δθ _s (at 20℃)	Δθ _s ≐ 12 × W (℃) K ≐ 12 (℃/watt)
Insulation Resistance	500 V DC MEGA, 100 MΩ or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	2.9 (g·cm ²)
Mass	80 (g)



◆ Torque Data



◆ Hard-Wiring Pattern Control Chart

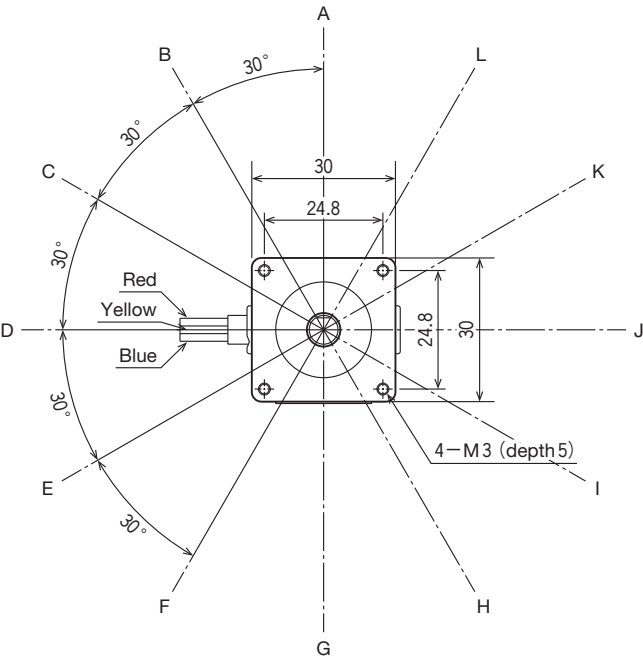
30° Steps (0 = unplugged)

Lead Line Color Position	Red	Yellow	Blue
A	(+)	(-)	0
B	(+)	0	(-)
C	0	(+)	(-)
D	(-)	(+)	0
E	(-)	0	(+)
F	0	(-)	(+)
G	(+)	(-)	0
H	(+)	0	(-)
I	0	(+)	(-)
J	(-)	(+)	0
K	(-)	0	(+)
L	0	(-)	(+)

60° Steps (0 = unplugged)

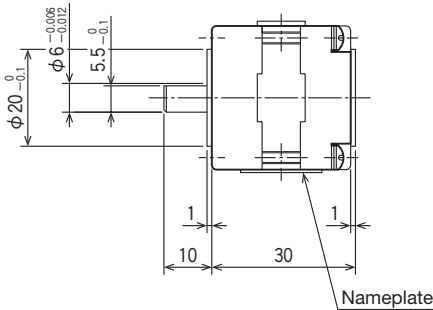
Lead Line Color Position	Red	Yellow	Blue
A	(+)	(-)	0
C	0	(+)	(-)
E	(-)	0	(+)
G	(+)	(-)	0
I	0	(+)	(-)
K	(-)	0	(+)

◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 195
AWG Size : 26



Regarding
Your Order

Bi-stable
Rotary
Solenoids

Driver Board for
Bi-stable Rotary
Solenoids

Step Rotary
Solenoids

Latching
Solenoids

Compact 2-Way/
3-Way Solenoid
Valves for
Chemical Liquids

Generic 2-Way/
3-Way
Solenoid Valves

Pinch Valves
—

Bi-stable Rotary
Optical
Shutters

Linear
Optical
Shutter

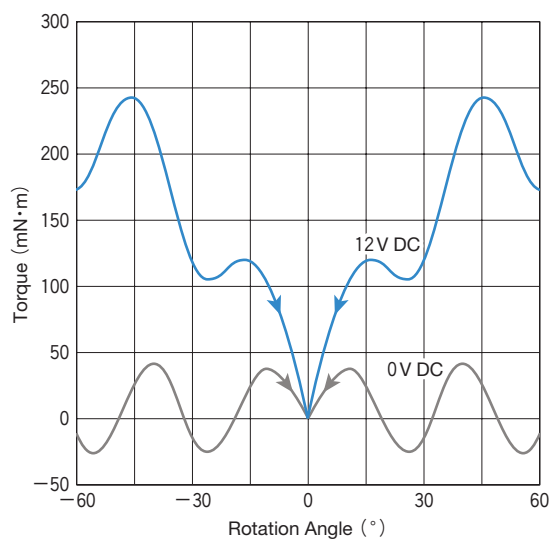
Electro-
magnets

◆ Main Specifications

Operating Angle	1 step = 30° or 60°
Working Voltage	12 (V DC)
Non-Excited Holding Force	0.025 (N·m)
Torque when Excited (at 12W)	0.088 (N·m)
DC Resistance	8 (Ω)
Heat-Resistant Class	Class E (120°C)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \div 6.5 \times W$ (°C) $K \div 6.5$ (°C/watt)
Insulation Resistance	500V DC MEGA, 100 MΩ or more
Dielectric Strength	1000V AC, 50/60 Hz, 1 minute
Rotor Inertia	20 (g·cm ²)
Mass	350 (g)



◆ Torque Data



◆ Hard-Wiring Pattern Control Chart

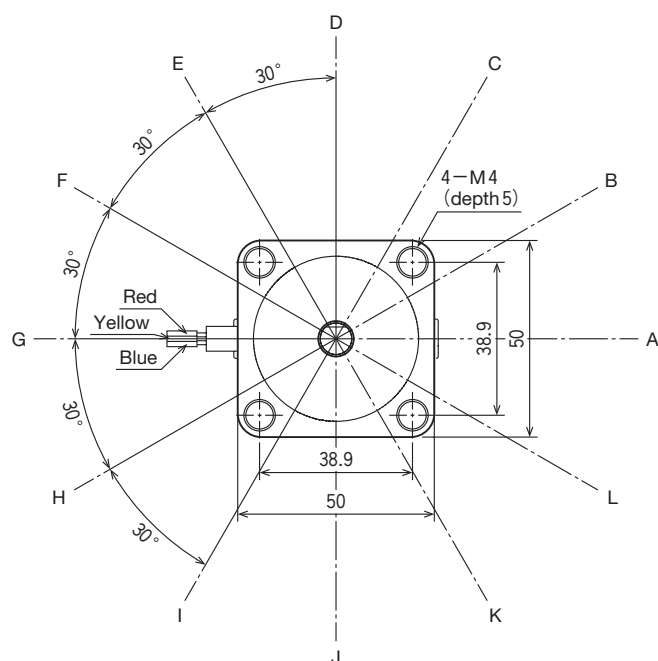
30° Steps (0 = unplugged)

Position	Lead Line Color	Red	Yellow	Blue
A		(+)	(-)	0
B		(+)	0	(-)
C		0	(+)	(-)
D		(-)	(+)	0
E		(-)	0	(+)
F		0	(-)	(+)
G		(+)	(-)	0
H		(+)	0	(-)
I		0	(+)	(-)
J		(-)	(+)	0
K		(-)	0	(+)
L		0	(-)	(+)

60° Steps (0 = unplugged)

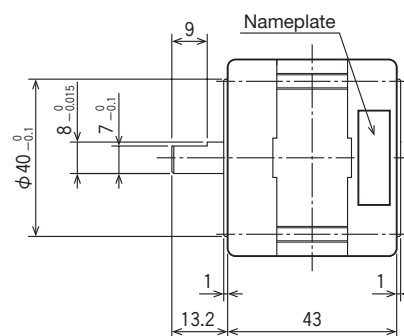
Position	Lead Line Color	Red	Yellow	Blue
A		(+)	(-)	0
C		0	(+)	(-)
E		(-)	0	(+)
G		(+)	(-)	0
I		0	(+)	(-)
K		(-)	0	(+)

◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 180
 Contact: DF 11-2428 SCFA (Hirose)
 Housing: DF 11-8 DS 2C (Hirose)
 Thermal Fuse: Nominal Operating Temperature: 115°C



LATCHING SOLENOIDS

Featuring Long-Stroke Specifications

- 10 mm (ordinarily 5 mm)

High Durability

- 500,000 cycles
- * (as tested by Takano Co. in a standard testing environment)



TSBP-09BN1 (Single-Sided Latching Model)

- Capable of maintaining position in only one direction.
- * (This model requires separate return springs to maintain position in 2 directions)

TSB-LS (Low-Noise Model)

- Suppresses operating noise.

FEATURES

1 Bi-stable Driving Force

Since our models carry out reciprocating motion without the use of springs, operating instead on the change of electrical current, our models maintain a stable response speed with no variation in torque upon activation. Even when current is cut off, the solenoid stays in its position using the holding force of a permanent magnet.

2 Power-Saving/Low-Heat

Since current is only required when driving the solenoid, no holding current is required. This makes the device both energy-efficient and free from problems caused by coil temperature rise or heat generation. (This is because the shaft stays in position using the magnetic force of a permanent magnet, even after the coil is de-energized.)

APPLICATIONS

1. Light Control

can be used to block or polarize light, to switch between lights, and to change the color or amount of light.

2. Sorting/Screening

can be used to sort or screen (mail, etc.).

3. Locking/Positioning

can be used for electric locking or halting (of moving items on a conveyor belt, etc.).

4. Valves

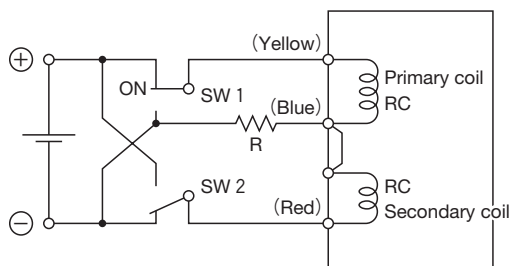
can be used to open and close plumbing or tubing by means of a clamp.

1

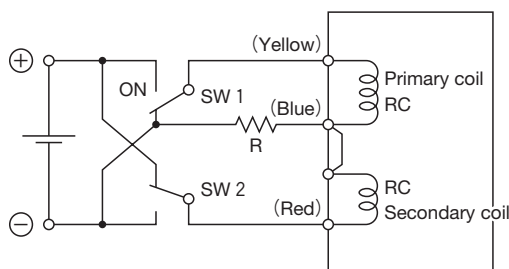
OPERATING PRINCIPLES

◆ TSB Series

When switch SW 1 is turned on (with SW 2 off), the shaft is pulled to the primary coil side. Even if switch SW 1 is reset the shaft stays in position.



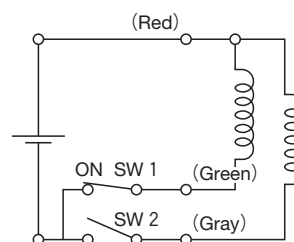
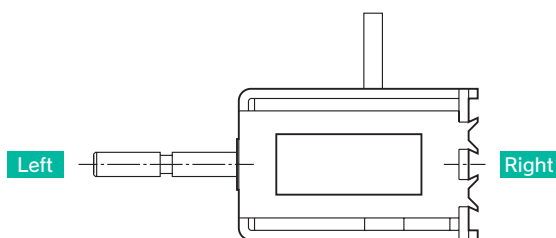
When switch SW 2 is turned on (with SW 1 off), the shaft is pulled to the secondary coil side. Even if switch SW 2 is reset the shaft maintains its position.



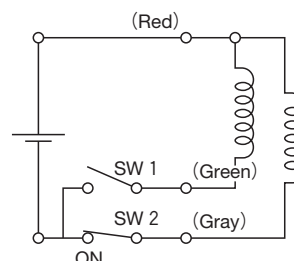
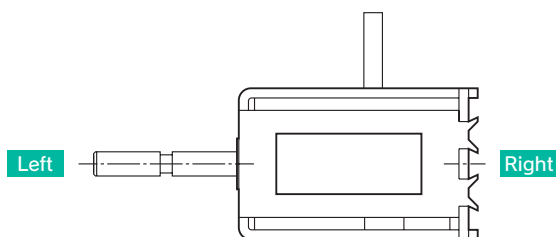
In either case, in order to cancel out the holding power of the permanent magnet on both coils (not just on the holding side), it is necessary to insert an external resistor (R) for degaussing. Thus, the unit operates on a two-loop structure.

◆ TSBP-09BN1 (Single-Sided Latching Model)

When switch SW 1 is turned on (with SW 2 off), the shaft is pulled from right to left. Even if switch SW 1 is reset the shaft stays in position.



When switch SW 2 is turned on (with SW 1 off), the switch is pulled from left to right.



◆ Attractive Force Data

The attractive force data of each of our products were measured by means of a load-testing device in a standard testing environment, with no load and with the shafts in a vertical position. Since we are able to adjust the stroke and attractive force to best match your intended load, please feel free to consult with us.

◆ Response Characteristics

The response characteristics of each of our products were measured in a standard testing environment with no load and with the shafts in a horizontal position; we measured the current waveform while the product was stabilized in a heat sink.

Standard Testing Environment ··· Ambient Temp $20 \pm 15^{\circ}\text{C}$, Relative Humidity $65 \pm 20\%$,
Air Pressure $860 \sim 1060 \text{ hPA}$

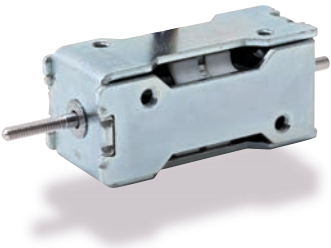
Heat Sink ··· 80 mm square, 3 mm thick, aluminum

◆ Duty Cycle/Temperature Change Over Short Periods of Time/ Coil Saturation Temperature Rise

You can consider these factors as similar to those of our bi-stable rotary solenoids. Please refer to **BI-STABLE ROTARY SOLENOIDS** **2** INSTRUCTIONS AND PRECAUTIONS FOR USE, pp.6 ~ 7.

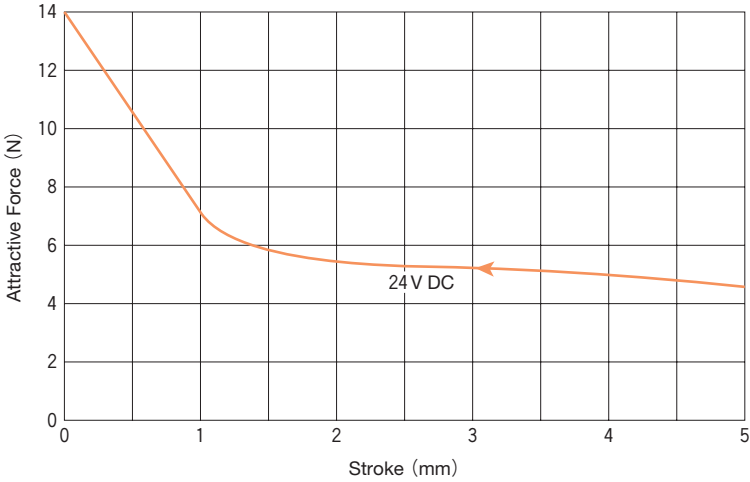
Main Specifications

Working Voltage	24 (V DC)
DC Resistance	10 (Ω)
External Resistance	1.5 (Ω) <6 (W) or more>
Duty Cycle	8 (%) or less
Max ON Time	50 (ms)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \doteq 17 \times W$ (°C) $K \doteq 17$ (°C/watt)
Temperature Rise Time Constant τ	4.5 (minutes)
Heat-Resistant Class	Class E (120°C)
Insulation Resistance	500V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Mass	45 (g)
Non-Excited Holding Force	3 (N) or more
Response Speed *1	9 (ms)

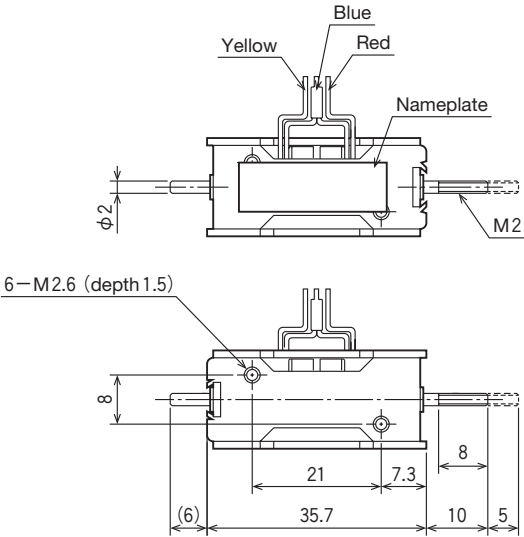


* 1 : measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage 24 V DC.

Attractive Force Data



External Dimensions (mm)

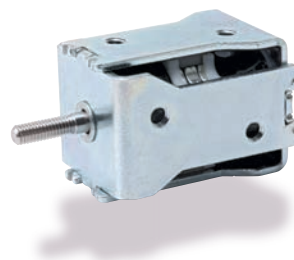


Terminal Specifications

Lead Wire Length (mm) : 200
AWG Size: 26

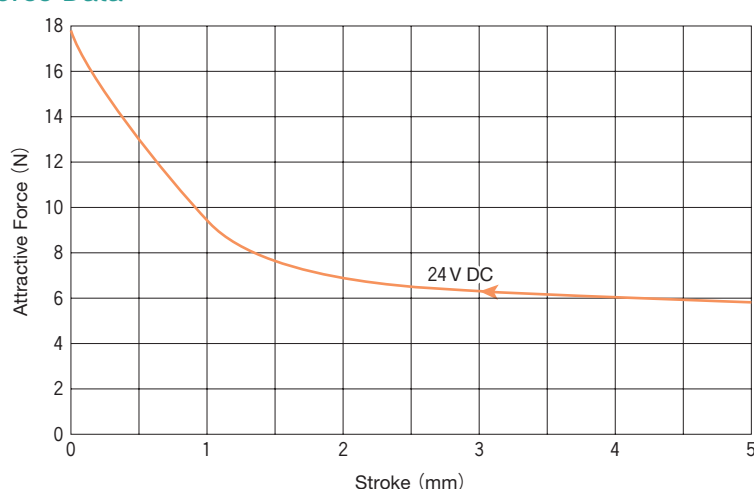
◆ Main Specifications

Working Voltage	24 (V DC)
DC Resistance	7.5 (Ω)
External Resistance	1 (Ω) <7 (W) or more>
Duty Cycle	4 (%) or less
Max ON Time	100 (ms)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \doteq 17 \times W$ (°C) $K \doteq 17$ (°C/watt)
Temperature Rise Time Constant τ	5 (minutes)
Heat-Resistant Class	Class E (120 °C)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Mass	65 (g)
Non-Excited Holding Force	5 (N) or more
Response Speed * 1	7 (ms)

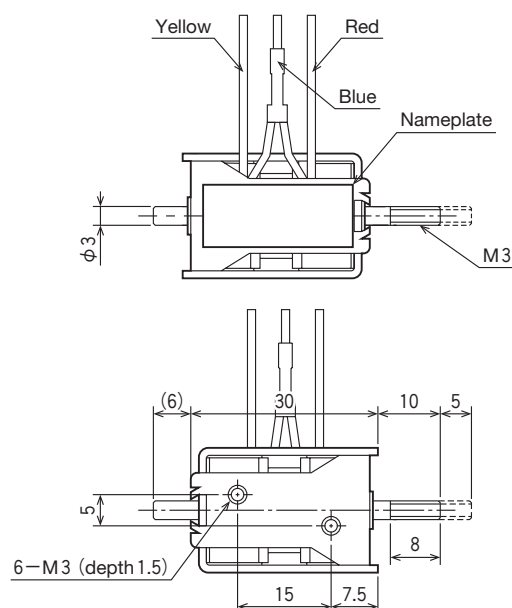


* 1 : measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage 24V DC.

◆ Attractive Force Data

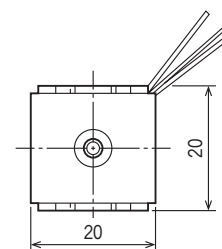


◆ External Dimensions (mm)



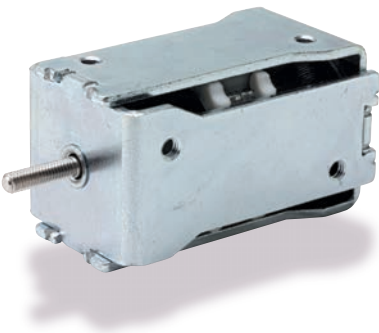
Terminal Specifications

Lead Wire Length (mm) : 210
AWG Size: 26



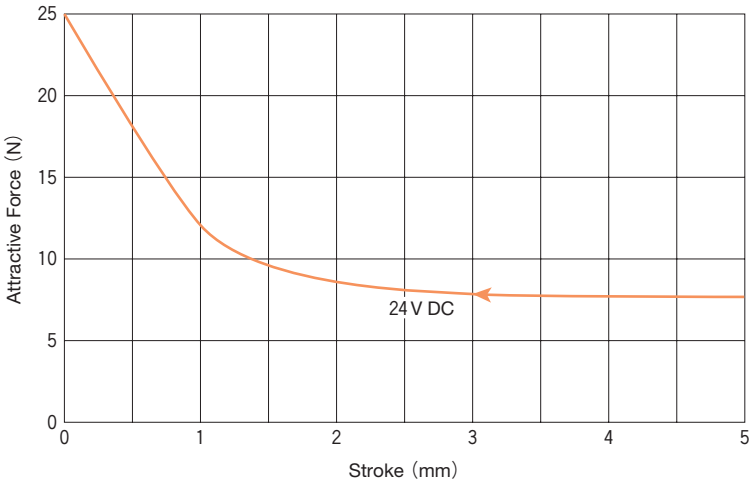
Main Specifications

Working Voltage	24 (V DC)
DC Resistance	20 (Ω)
External Resistance	10 (Ω) <4 (W) or more>
Duty Cycle	20 (%) or less
Max ON Time	40 (ms)
Coil Saturation Temperature Rise Δθ _s (at 20℃)	Δθ _s ≒ 12 × W (℃) K ≒ 12 (℃/watt)
Temperature Rise Time Constant τ	9 (minutes)
Heat-Resistant Class	Class E (120℃)
Insulation Resistance	500 V DC MEGA, 100 MΩ or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Mass	140 (g)
Non-Excited Holding Force	15 (N) or more
Response Speed *1	15 (ms)

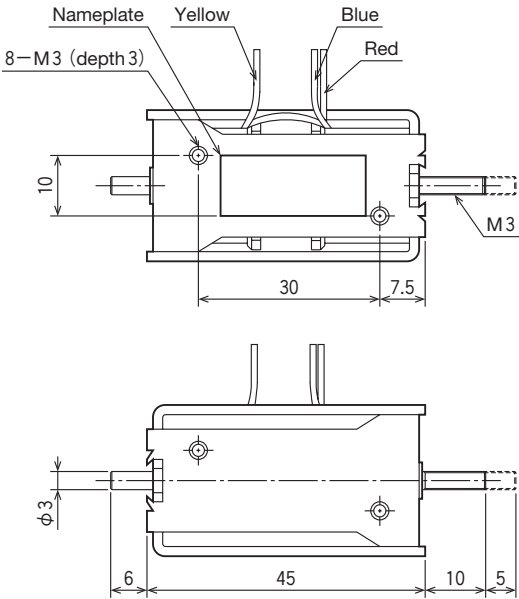


* 1 : measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage 24 V DC.

Attractive Force Data



External Dimensions (mm)

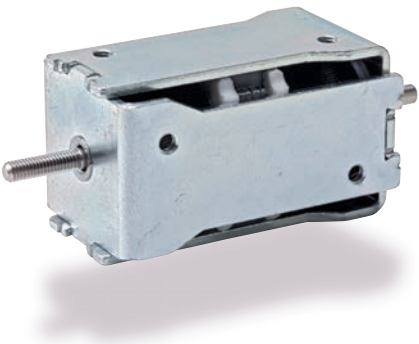


Terminal Specifications

Lead Wire Length (mm) : 210
AWG Size: 26

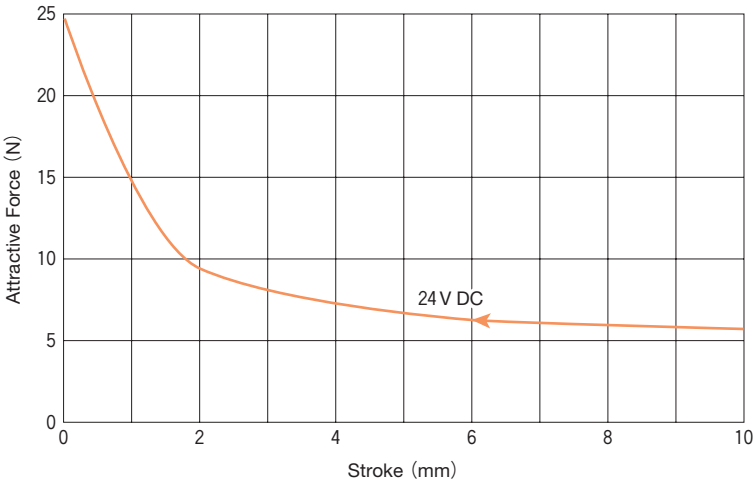
Main Specifications

Working Voltage	24 (V DC)
DC Resistance	20 (Ω)
External Resistance	15 (Ω) <4 (W) or more>
Duty Cycle	20 (%) or less
Max ON Time	40 (ms)
Coil Saturation Temperature Rise Δθ _s (at 20°C)	Δθ _s ≐ 12 × W (°C) K ≐ 12 (°C/watt)
Temperature Rise Time Constant τ	9 (minutes)
Heat-Resistant Class	Class E (120°C)
Insulation Resistance	500 V DC MEGA, 100 MΩ or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Mass	120 (g)
Non-Excited Holding Force	10 (N) or more
Response Speed *1	20 (ms)

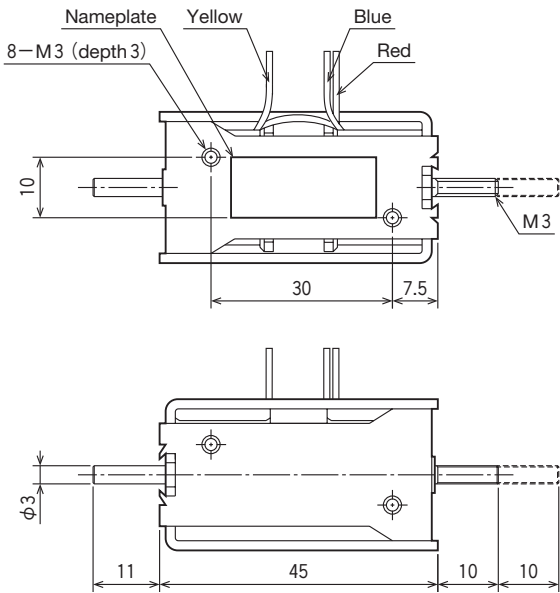


* 1 : measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage 24V DC.

Attractive Force Data

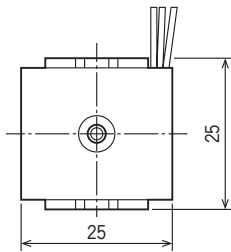


External Dimensions (mm)



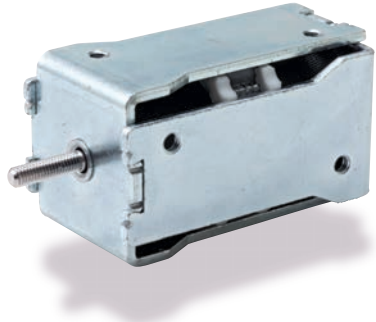
Terminal Specifications

Lead Wire Length (mm) : 210
AWG Size : 26



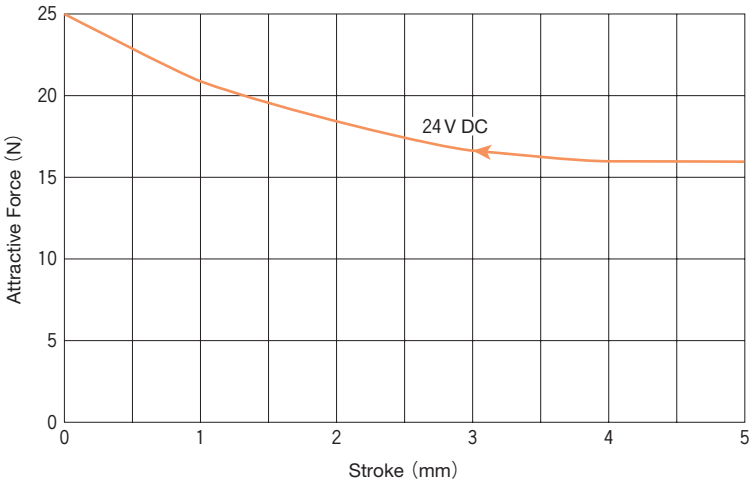
Main Specifications

Working Voltage	24 (V DC)
DC Resistance	5 (Ω)
External Resistance	1 (Ω) \langle 12 (W) or more \rangle
Duty Cycle	5 (%) or less
Max ON Time	40 (ms)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20°C)	$\Delta\theta_s \doteq 12 \times W$ (°C) $K \doteq 12$ (°C/watt)
Temperature Rise Time Constant τ	9 (minutes)
Heat-Resistant Class	Class E (120°C)
Insulation Resistance	500 V DC MEGA, 100 M Ω or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Mass	120 (g)
Non-Excited Holding Force	2 (N) or more
Response Speed ^{*1}	6 (ms)

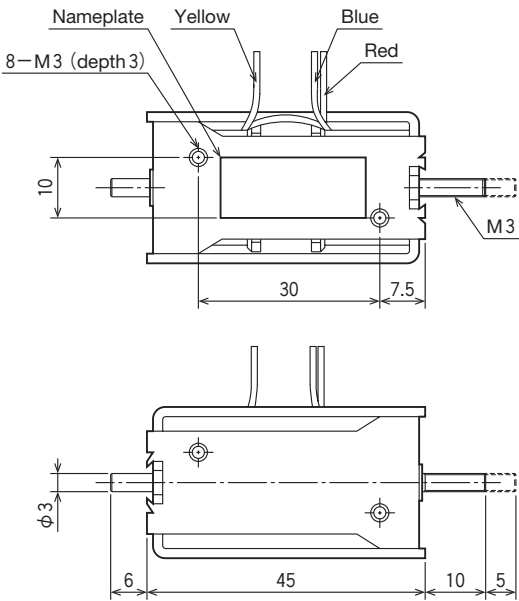


* 1 : measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage 24 V DC.

Attractive Force Data

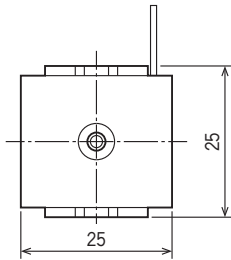


External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 210
AWG Size: 26



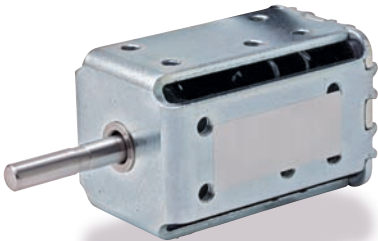
TSBP-09BN1 (Single-Sided Latching Model)

Latching Solenoids

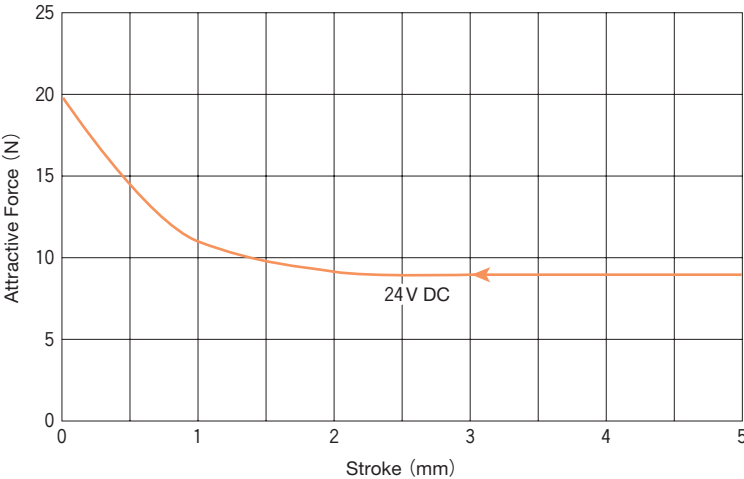
Main Specifications

Working Voltage	24 (V DC)
DC Resistance	Pulling Side 10.5 (Ω), Return Side 14 (Ω)
Coil Saturation Temperature Rise Δθ _s (at 20°C)	Δθ _s ≐ 12 × W (°C) K ≐ 12 (°C/watt)
Temperature Rise Time Constant τ	5 (minutes)
Heat-Resistant Class	Class E (120 °C)
Insulation Resistance	500 V DC MEGA, 100 MΩ or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Mass	100 (g)
Non-Excited Holding Force	20 (N) or more
Response Speed *1	6 (ms)

* 1 : measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage 24 V DC.

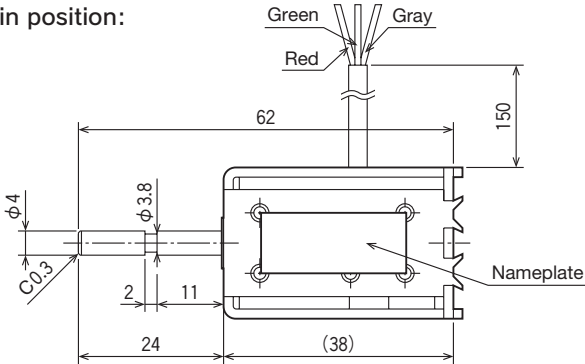


Attractive Force Data



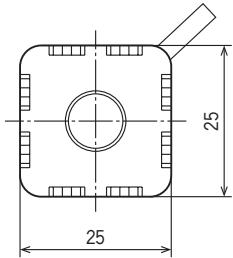
External Dimensions (mm)

With shaft held in position:

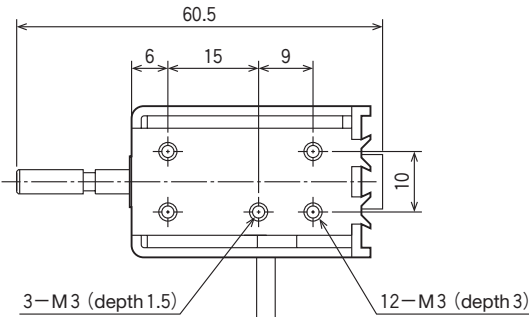


Terminal Specifications

Lead Wire Length (mm) : 300
AWG Size : 26



With shaft released:



Regarding Your Order	Bi-stable Rotary Solenoids	Driver Board for Bi-stable Rotary Solenoids	Step Rotary Solenoids	Latching Solenoids	Compact 2-Way/3-Way Solenoid Valves for Chemical Liquids	Generic 2-Way/3-Way Solenoid Valves	Pinch Valves	Bi-stable Rotary Optical Shutters	Linear Optical Shutter	Electro-magnets
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COMPACT 2-WAY/3-WAY SOLENOID VALVES FOR CHEMICAL LIQUIDS

High Flow Rate

- Orifice Diameter: $\phi 1.3$ mm
- Flow Capacity Cv: 0.03

High Chemical Resistance

- Body: PEEK
- Diaphragm: FKM

Condition Monitoring

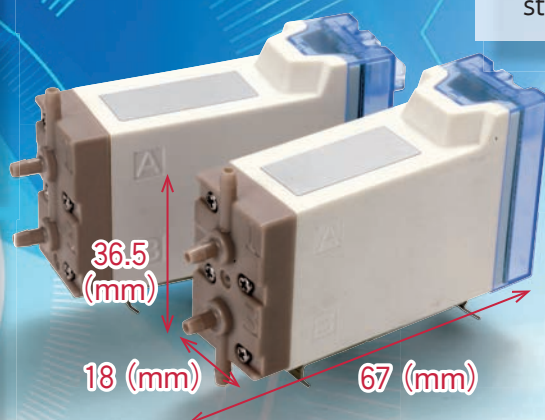
- Observe the status of the valve with just a glance, thanks to the built-in red/green LED's.

High Durability

- 10,000,000 cycles
- * (as tested by Takano Co. in a standard testing environment)

Power-Saving (Standard configuration incorporates a power-saving circuit)

- At startup: 3 W
- Regular operation: 1 W



FEATURES

1 Low Pumping Volume

Because the internal capacity of the valve holds $20\mu\text{l}$ or less, its "pumping volume" (i.e. the excess fluid displaced by the diaphragm when the valve closes) is significantly less than that of other valves.

2 No Screws Required for Assembly

Can be attached and detached to and from a DIN rail with one touch. Also incorporates a frame ground (FG) structure, which cuts down on noise.

3 Barbed Tube Fitting

Designed to be able to withstand $-75 \sim 250$ kPa, so tubing will not be detached under high-pressure loads. (Compatible with tubes of diameter $\phi 2$ mm)

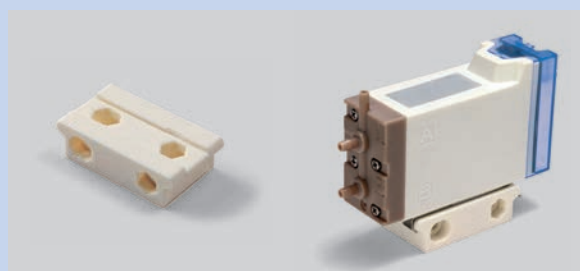
4 Independent Control

Since the coil is housed in a single unit, and each unit can be operated individually, you can use our valves for many possible applications.

INSTALLATION VARIATIONS



- Parallel layered mounting on a DIN rail (board thickness: $1.5^{+0.1}_{-0.1}$ mm)



- Install in a custom setup of your choosing by using resin attachment (sold separately)

W13 Series

Compact 2-Way/3-Way Solenoid Valves for Chemical Liquids

◆ Main Specifications

Model Number* ¹	2×2-Way	3-Way
	W 13X-25A	W 13X-35A
Valve Type	Diaphragm Type Direct Operated Poppet	
Valve Operation	NC (Normally Closed)	
Fluid	Water, Pure Water, Chemicals* ²	
Operating Pressure Range	−75 ~ 250 (kPa)	
Compatible Tube Diameter	2 (mm)	
Proof Pressure	375 (kPaG)	
Fluid Temperature	0 ~ 50 (°C)	
Ambient Temperature	0 ~ 50 (°C)	
Ambient Humidity	30 ~ 85 (%)	
Flow Factor Cv	0.03	
Orifice Diameter	1.3 (mm)	
Volume of Valve Chamber	20 (μℓ)	
Enclosure	IP 40 or equivalent	
Mounting Orientation	at will	
Mass	85 (g)	
Operating Noise	60 (dB)	
Life Cycle/Durability* ³	10,000,000 (cycles)	
Material for Wetted Parts	Body: PEEK	
	Diaphragm: FKM	
Electrical Specifications		
Working Voltage	24 (V DC)	12 (V DC)
Allowable Voltage Fluctuation	±10 (%)	
Power Consumption	At Startup: 3 (W)	
	Steady-State: 1 (W)	
Heat-Resistant Class	Class F (155 °C)	

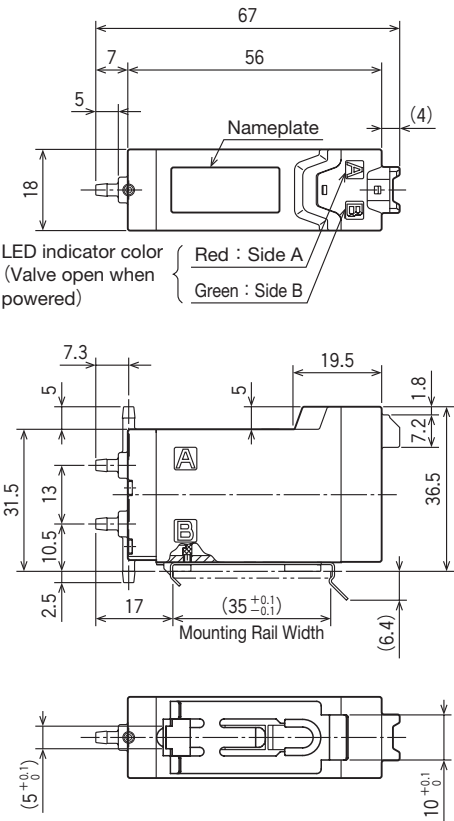
◆ Model Number Key

W	13	A	-	2	5A
Standard Code					
Code		Meaning			
① Orifice Diameter					
13		φ 1.3mm			
② Mounting Variations					
A		DIN Rail (t = 1.5)			
B		Resin Attachment			
③ Number of Ports					
2		2-Way			
3		3-Way			
④ Working Voltage					
5A		24 V DC			

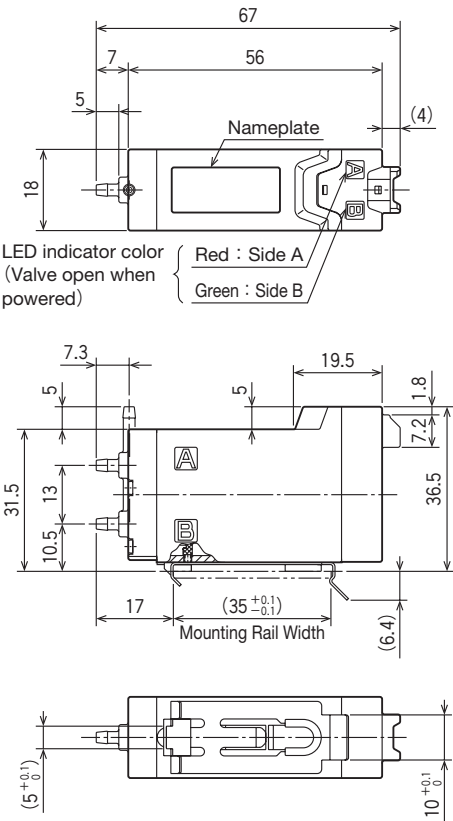
- * 1: the "X" portion represents this model's installation variations. Please choose between A or B (see previous page).
- * 2: please use chemicals that do not corrode the materials used in the wetted part of the valve.
- * 3: measured by Takano Co. in a standard testing environment.

◆ External Dimensions (mm)

〈W 13A-25A〉



〈W 13A-35A〉



Terminal Specifications

Contacts: SXA-001 T-P0.6 (JST)
Housing: XAP-03V-1 (JST)

GENERIC 2-WAY/3-WAY SOLENOID VALVES

High Flow Rate

- Orifice Diameter: $\phi 2.0$ mm
- Flow Capacity Cv: 0.065

High Durability

- 10,000,000 cycles
- * (as tested by Takano Co. in a standard testing environment)



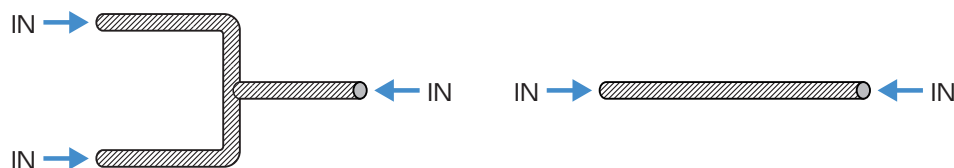
High Chemical Resistance

- Body: PPS
- Diaphragm: EPDM

FEATURES

1 Flexible Tubing Connection

Designed to withstand $-90 \sim 200$ kPa, no matter which port is used (compatible with tubes of diameter $\phi 3$ mm).



2 Cast-Resin Coil

For water-resistance and durability, our coils are cast in a resin mold.

3 Simple Structure

At every stage of the manufacturing process, from design to assembly, this product was crafted with structural simplicity in mind.

Regarding
Your Order

Bi-stable
Rotary
Solenoids

Driver Board for
Bi-stable Rotary
Solenoids

Step Rotary
Solenoids

Latching
Solenoids

Compact 2-Way/
3-Way Solenoid
Valves for
Chemical Liquids

Generic 2-Way/
3-Way
Solenoid Valves

Pinch Valves

Bi-stable Rotary
Optical
Shutters

Linear
Optical
Shutter

Electro-
magnets

◆ Main Specifications

Model Number*1	2-Way		3-Way	
	H 202 U-XXX		H 203 U-XXX	
Valve Type	Diaphragm Type Direct Operated Poppet			
Valve Operation	NC (Normally Closed)		[3] : NO [2] : COM [1] : NC	
Fluid	Air, Water, Pure Water, Chemicals*2			
Operating Pressure Range	-90 ~ 200 (kPa)			
Compatible Tube Diameter	3 (mm)			
Proof Pressure	300 (kPaG)			
Fluid Temperature	5 ~ 50 (°C)			
Ambient Temperature	5 ~ 50 (°C)			
Ambient Humidity	30 ~ 85 (%)			
Flow Factor Cv	0.065			
Orifice Diameter	2.0 (mm)			
Volume of Valve Chamber	38 (μL) or less		99 (μL) or less	
Enclosure	IP 40 or equivalent			
Mounting Orientation	at will			
Mass	82 (g)		84 (g)	
Operating Noise	70 (dB) or less			
Life Cycle/Durability*3	10,000,000 (cycles)			
Material for Wetted Parts	Body: PPS			
	Diaphragm: EPDM			
Electrical Specifications				
Working Voltage	24 (V DC)		12 (V DC)	
Allowable Voltage Fluctuation	±10 (%)			
Power Consumption	3 (W)			
Heat-Resistant Class	Class H (180°C)			

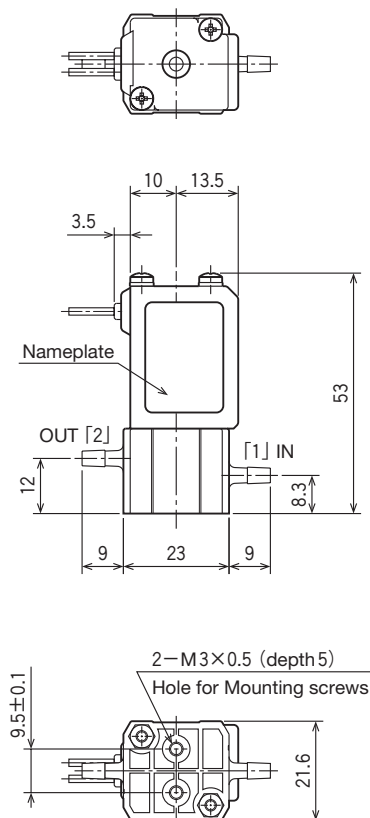
◆ Model number Key

Code	Meaning
① Orifice Diameter	
20	φ 2.0 mm
② Number of Ports	
2U	2-Way
3U	3-Way
③ Voltage	
E5A	24 V DC
E6A	12 V DC

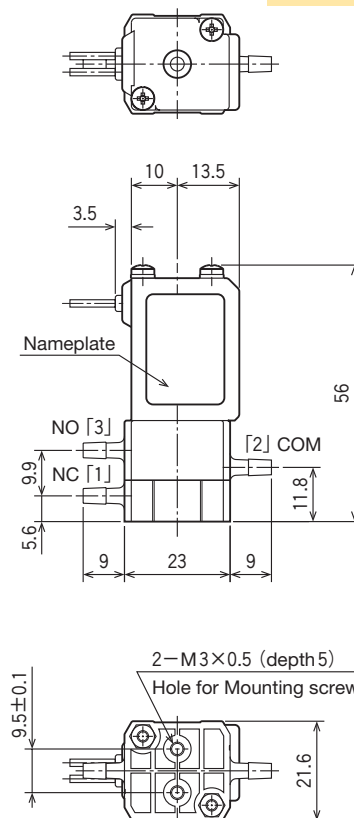
- * 1: the "XXX" portion represents this model's working voltage. Please choose between E5A & E6A.
 * 2: please use chemicals that do not corrode the materials used in the wetted part of the valve.
 * 3: measured by Takano Co. in a standard testing environment.

◆ External Dimensions (mm)

<H 202 U-XXX>



<H 203 U-XXX>



Terminal Specifications

Lead Wire Length (mm) : 495
 AWG Size : 22

PINCH VALVES

High Durability

- 20,000,000 cycles
- *as tested by Takano Co. in a standard testing environment

Unique Bottom-Mounted Lead Line

- No need for complicated mounting treatments: fits easily into narrow spaces.

57 (mm) or less



φ26 (mm)

Low-Heat

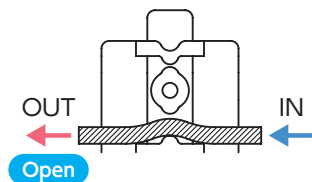
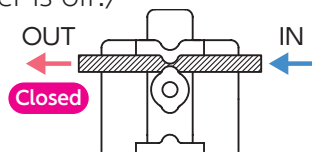
- Featuring a unique magnetic circuit designed to reduce heat generation, the temperature rise of this pinch valve after continuous operation is only 65 °C.
- *as tested by Takano Co. in a standard testing environment

FEATURES

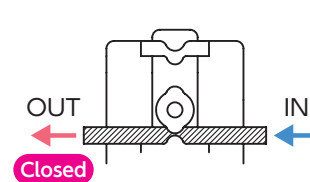
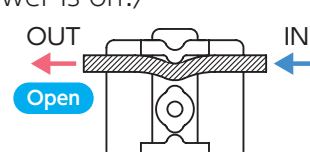
1 Multi-Purpose

When used with one tube inserted into the device, it becomes an ON/OFF valve.

〈when power is off:〉

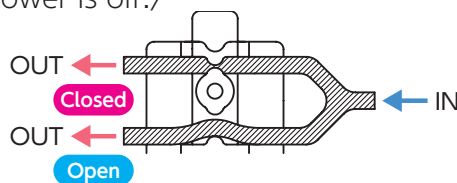


〈when power is on:〉

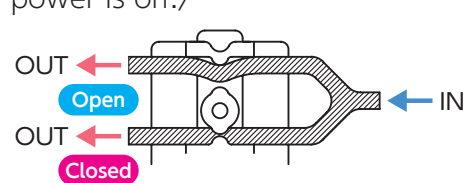


When used with two tubes and the assistance of a Y-pipe, it can function as a 3-way valve to divert fluids.

〈when power is off:〉

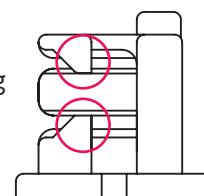
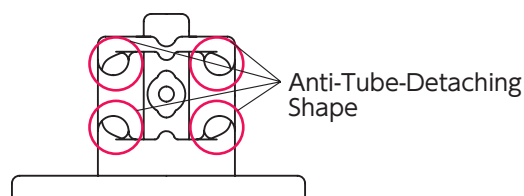


〈when power is on:〉



2 Fitting Shape Prevents Accidental Tube Detachment

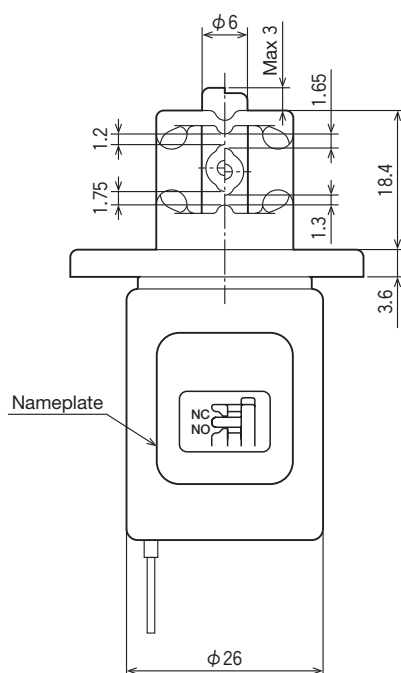
The plastic molding on the pinch mechanism has been specially designed so that the supply tube will not fall off from repeated use.



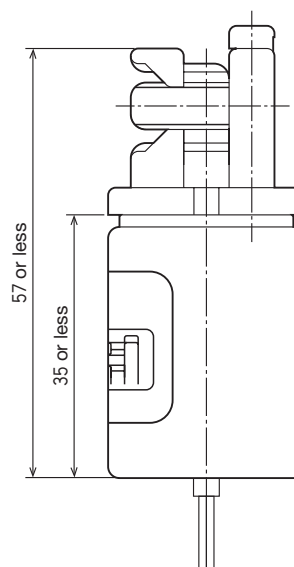
Model Number	TPV-N040	TPV-N160
Fluid	Water, Pure Water, Chemicals * ¹	
Operating Pressure Range	0 ~ 150 (kPa)	
Compatible Tube Diameter	O.D.3/I.D.1 (mm)	
Compatible Tube Types	Silicone Rubber, PharMed * ²	
Fluid Temperature	0 ~ 50 (°C)	
Ambient Temperature	0 ~ 50 (°C)	
Ambient Humidity	30 ~ 90 (%)	
Mounting Orientation	at will	
Mass	115 (g)	
Life Cycle/Durability * ³	2,000,000 (cycles)	
Electrical Specifications		
Working Voltage	12 (V DC)	24 (V DC)
Allowable Voltage Fluctuation	±10 (%)	
Power Consumption	3.6 (W)	
Heat-Resistant Class	Class E (120°C)	

*3: measurement conditions: measured by Takano Co. in a standard testing environment.

Technical drawing of a mechanical part, likely a valve cover or flange, showing a top view. The part has a central circular feature with a diameter of 5.9, surrounded by a larger circular area with a diameter of 5. The central feature is flanked by two smaller circular features, each with a diameter of 6. The overall width of the part is 33, and the overall height is 26 or less. The drawing includes dimension lines and labels for various features.



Lead Wire Length (mm) : 500
AWG Size: 28



BI-STABLE ROTARY OPTICAL SHUTTERS

High Speed

- Both the shutter shape and the stop structure were designed to handle high-speed operation.

Battery-Powered Capabilities

- The built-in permanent magnet allows for low power consumption, making this solenoid shutter remarkably energy-efficient.

High Durability

- 5,000,000 cycles
- *as tested by Takano Co. in a standard testing environment

Compact/Lightweight

- Select your model from a range of different sizes, designed to fit into applications with limited space.

FEATURES

1 Bi-stable Driving Force

Since our models carry out reciprocal motion without the use of springs, operating instead on the change of electrical current, they maintain a stable response speed with no variation in torque upon activation.

2 Custom Design Solutions

Takano is ready to utilize our expertise to design and develop custom-made models to meet your unique requirements, from the shape of the shutter to the materials that best fit your optics application.

2 No Axial Stroke

Our rotary solenoids are driven by magnetic attraction and repulsion, so the shaft does not move forward or backward: it just rotates.

SERIES COMPARATIVE TABLE

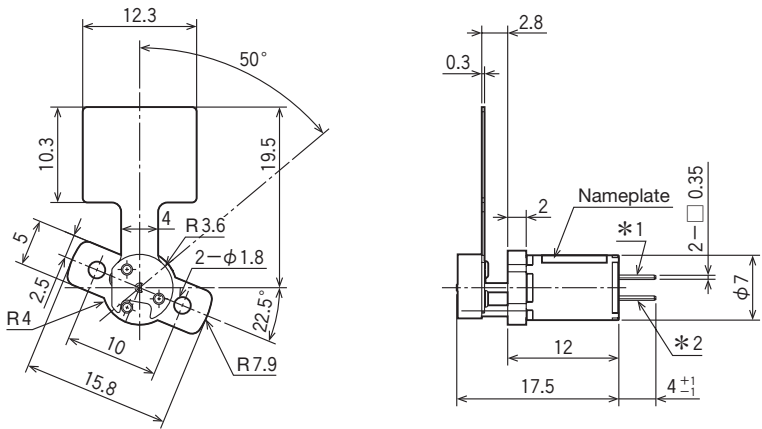
Series	Rated Voltage	Angle of Rotation	Response Speed	Rotary Solenoid Dimensions (mm)	Shutter Dimensions (mm)
BOS 7/10	3V DC	50°	3V DC : < 18msec, 5V DC : < 13msec, 12V DC : < 8msec	φ7×10	12.3×10.3
BOS 10/15	5V DC	50°	5V DC : < 13msec, 12V DC : < 8msec	φ10×20	φ10.2
BOS 22/08	12V DC	50°	12V DC : < 15msec	φ22×8	φ15.2

◆ Main Specifications

Heat-Resistant Class		Class E (120 °C)
Rated Voltage		3 (V DC)
DC Resistance		9.5 (Ω)
Coil Saturation Temperature Rise Δθ _s (at 20 °C)		Δθ _s ≐ 59 × W (°C) K ≐ 59 (°C/watt)
Temperature Rise Time Constant τ		1 minute
Mass		4 (g)
Shutter Dimensions		12.3 × 10.3 (mm)
Operating Angle		50 (°)
Life Cycle/Durability		5,000,000 (cycles)
Response Speed	with Applied Voltage 3V DC	18 (ms) or less
	with Applied Voltage 5V DC	13 (ms) or less
	with Applied Voltage 12V DC	8 (ms) or less

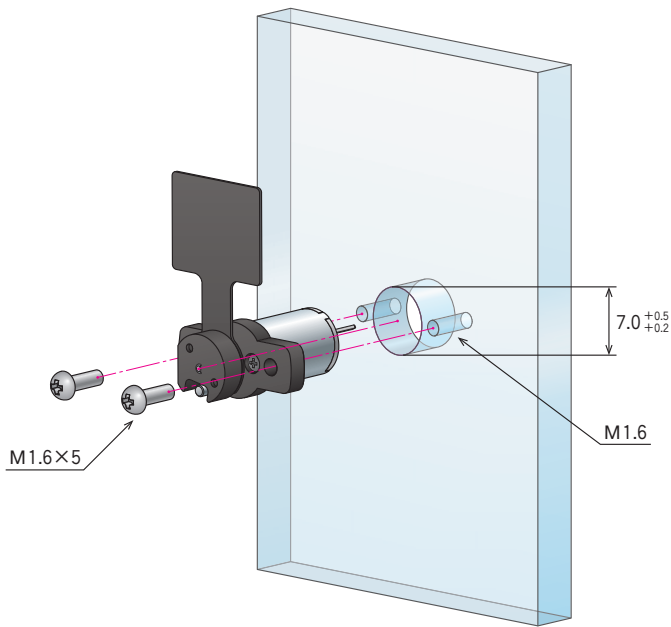


◆ External Dimensions (mm)



- In this diagram, the shutter is shown magnetically latched to the counterclockwise side.
- When a positive electrode is connected to *1 and a negative to *2, the shaft rotates counter-clockwise; when a negative electrode is connected to *1 and a positive to *2, the shaft rotates clockwise.

◆ How to Mount

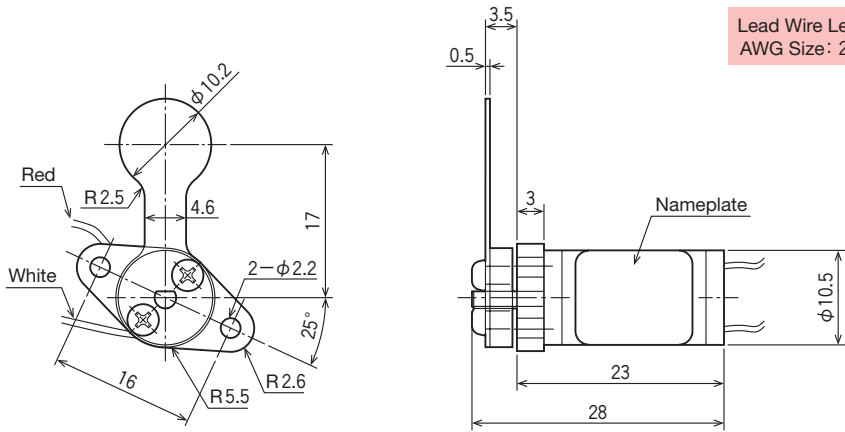


◆ Main Specifications

Heat-Resistant Class		Class E (120 °C)
Rated Voltage		5 (V DC)
DC Resistance		13 (Ω)
Coil Saturation Temperature Rise Δθ _s (at 20 °C)		Δθ _s ≐ 21.5 × W (°C) K ≐ 21.5 (°C/watt)
Temperature Rise Time Constant τ		0.5 (minutes)
Mass		11 (g)
Shutter Dimensions		ϕ10.2 (mm)
Operating Angle		50 (°)
Life Cycle/Durability		5,000,000 (cycles)
Response Speed	with Applied Voltage 3V DC	—
	with Applied Voltage 5V DC	13 (ms) or less
	with Applied Voltage 12V DC	8 (ms) or less



◆ External Dimensions (mm)

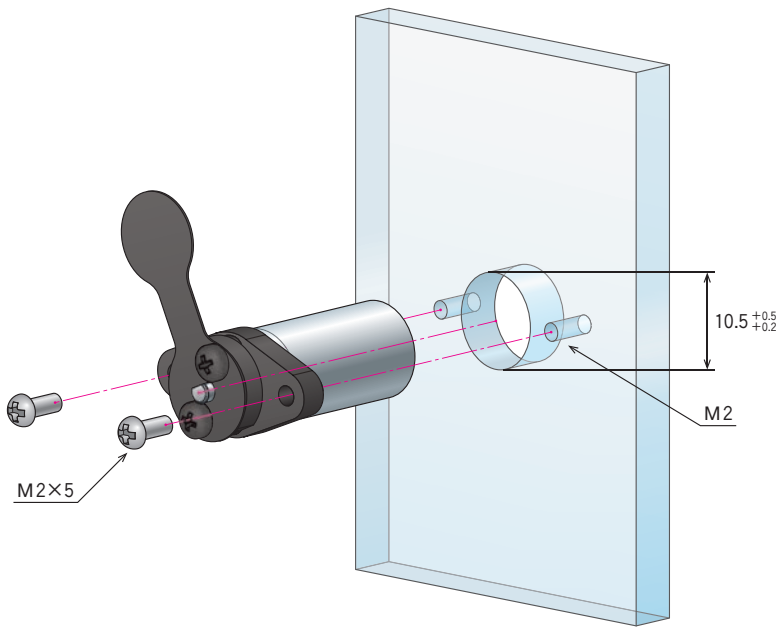


Terminal Specifications

Lead Wire Length (mm) : 320
AWG Size: 26

- In this diagram, the shutter is shown magnetically latched to the counterclockwise side.
- When a positive electrode is connected to the Red lead and a negative to the White, the shaft rotates clockwise; when a negative electrode is connected to the Red lead and a positive to the White, the shaft rotates counter-clockwise.

◆ How to Mount

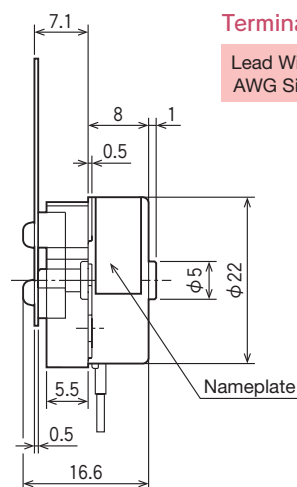
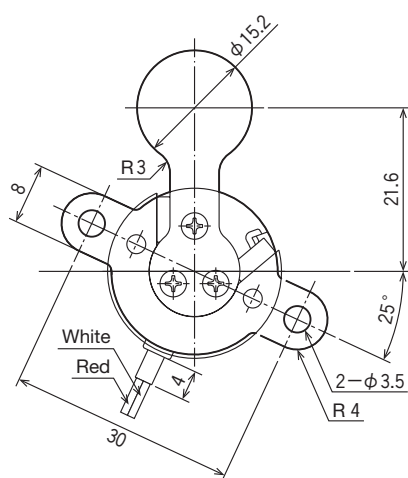


◆ Main Specifications

Heat-Resistant Class		Class H (180 °C)
Rated Voltage		12 (V DC)
DC Resistance		35 (Ω)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 °C)		$\Delta\theta_s \doteq 36 \times W$ (°C) K $\doteq 36$ (°C/watt)
Temperature Rise Time Constant τ		6 (minutes)
Mass		22 (g)
Shutter Dimensions		ϕ15.2 (mm)
Operating Angle		50 (°)
Life Cycle/Durability		5,000,000 (cycles)
Response Speed	with Applied Voltage 3V DC	—
	with Applied Voltage 5V DC	—
	with Applied Voltage 12V DC	15 (ms) or less



◆ External Dimensions (mm)

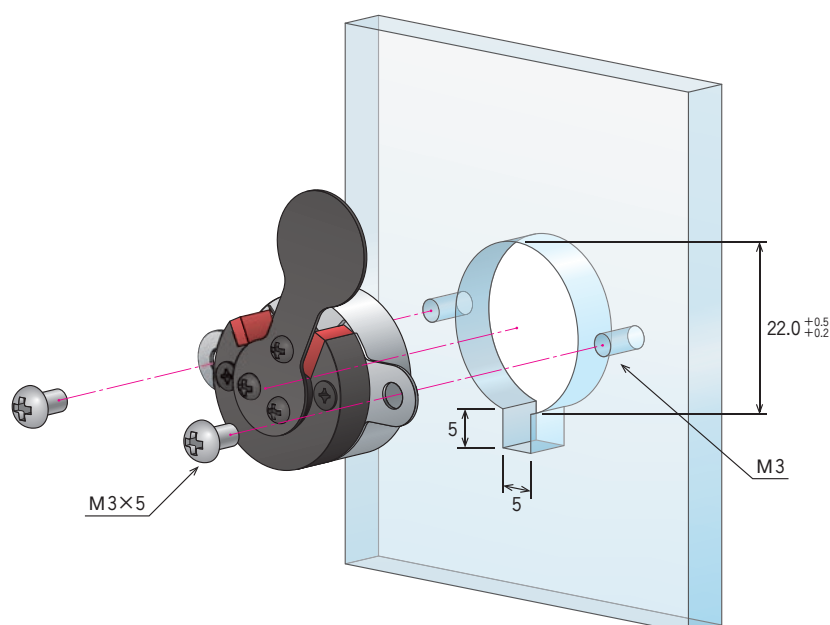


Terminal Specifications

Lead Wire Length (mm) : 320
AWG Size: 28

- In this diagram, the shutter is shown magnetically latched to the counterclockwise side.
- When a positive electrode is connected to the Red lead and a negative to the White, the shaft rotates clockwise; when a negative electrode is connected to the Red lead and a positive to the White, the shaft rotates counter-clockwise.

◆ How to Mount



LINEAR OPTICAL SHUTTER

Slim/Lightweight

- 25.2×31.5×6.3mm
- 7g

High Speed

- Completes its action in 18ms with an applied voltage of 3.3V DC.

Economical

- At every stage of the manufacturing process, from design to assembly, this product was crafted with structural simplicity in mind.

Battery-Powered Capabilities

- The built-in permanent magnet allows for low power consumption and high efficiency.



FEATURES

1 Bi-stable Driving Force

Since our models carry out reciprocal motion without the use of springs, operating instead on the change of electrical current, they maintain a stable response speed with no variation in torque upon activation.

2 Power-Saving

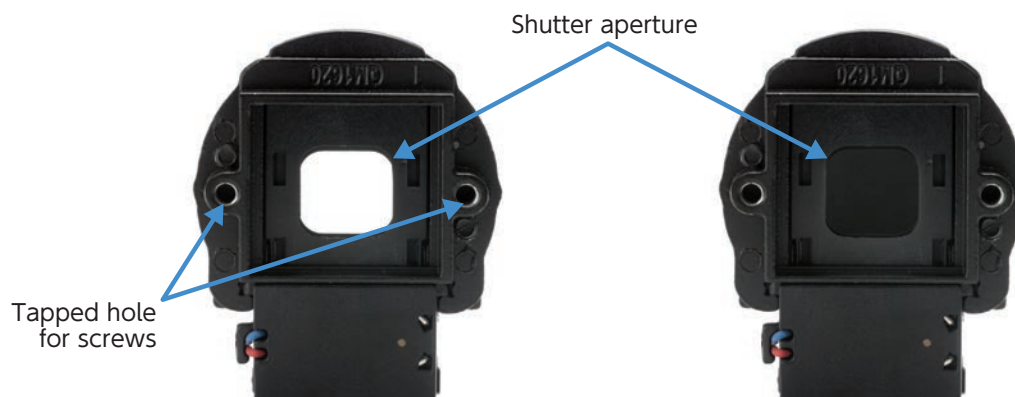
The shutter is held in place by a permanent magnet even after power is cut off, making it remarkably energy-efficient.

STRUCTURE OF SHUTTER APERTURE AND HOW TO ASSEMBLE

The shutter blade moves in and out of a 7×7mm square aperture. Since its mounting surface is flat, the shutter can be installed easily with two M2 screws.

〈when open:〉

〈when closed:〉

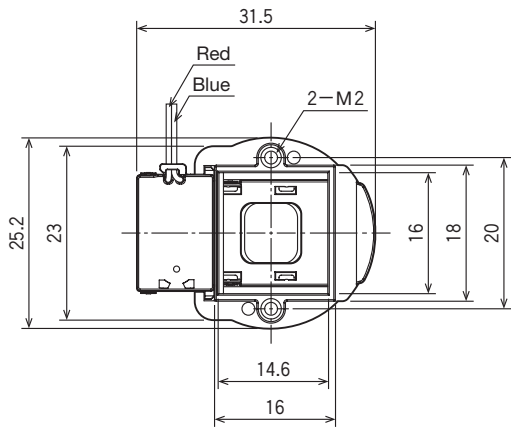
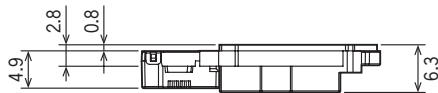


◆ Main Specifications

Rated Voltage	3.3 (V DC)
DC Resistance	40 (Ω)
Mass	7 (g)
Shutter Aperture Dimensions	7×8 (mm)
Life Cycle/Durability	100,000 (cycles)
Response Speed	18 (ms) or less

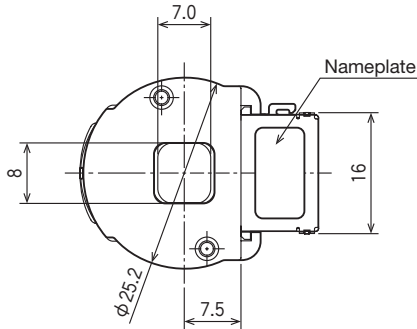


◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 80
Contacts : A1250-TPE-A (Joint Tech)
Housing : A1250H-02P (Joint Tech)



Power Polarity		Aperture
Blue	Red	
+	-	Closed
-	+	Open

ELECTROMAGNETS

High Durability

- Bobbin and case designed for improved mechanical strength.



Economical

- Cost-efficient, simple structure with no moving parts.

FEATURES

1 High Holding Force

A unique circuit design with no magnetic diffusion allowing for high holding force with no air gap.

3 Custom Design Solutions

We also supply custom-made electromagnets to satisfy your unique requirements, such as original dimensions or higher power coil technology.

2 Low Residual Magnetism

Another feature of our unique circuit design is the reduced residual magnetism when power is turned off.

APPLICATIONS

- 1. Metal Fragment Removal**
useful for removing magnetic material.
- 2. Container Transport**
useful for attaching cargo trays to conveyor belts, etc.
- 3. Locking**
useful for electronic locking.

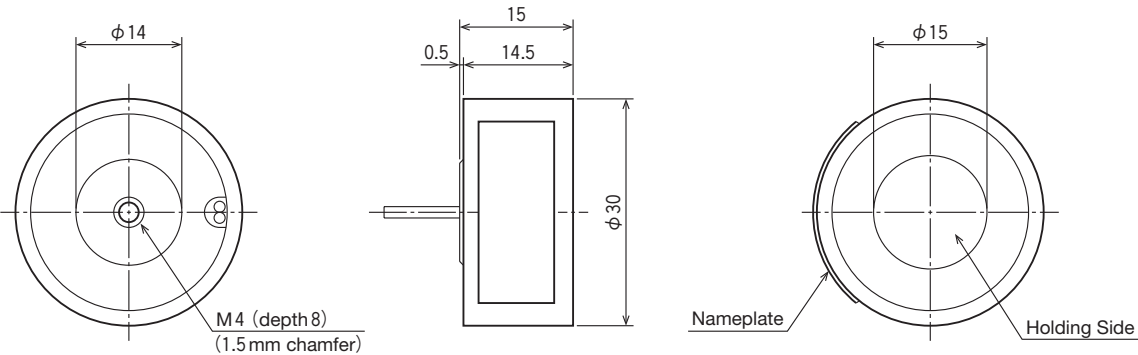
◆ Main Specifications

DC Resistance	56 (Ω)	
Working Voltage	12 (V DC)	24 (V DC)
Duty Cycle	100 (%)	25 (%)
Holding Force *1	90 (N)	170 (N)
Power Consumption	2.0 (W)	8.0 (W)
Coil Saturation Temperature Rise Δθs (at 20℃)	Δθs ≒ 22×W (℃) K ≒ 22 (℃/watt)	
Heat-Resistant Class	Class E (120℃)	
Insulation Resistance	500 V DC MEGA, Over 100 MΩ	
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute	
Mass	60 (g)	

* 1 : measurement conditions: measured by Takano Co. in a standard testing environment, with the holding side facing up, and with an air gap of 0.



◆ External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 295
AWG Size : 28

Regarding Your Order	Bi-stable Rotary Solenoids	Driver Board for Bi-stable Rotary Solenoids	Step Rotary Solenoids	Latching Solenoids	Compact 2-Way/3-Way Solenoid Valves for Chemical Liquids	Generic 2-Way/3-Way Solenoid Valves	Pinch Valves	Bi-stable Rotary Optical Shutters	Linear Optical Shutter	Electro-magnets
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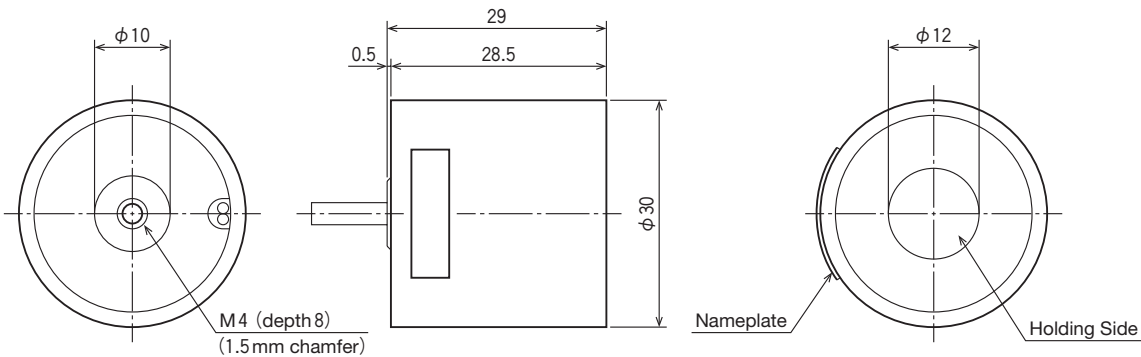
Main Specifications

DC Resistance	56 (Ω)	
Working Voltage	12 (V DC)	24 (V DC)
Duty Cycle	100 (%)	25 (%)
Holding Force *1	50 (N)	60 (N)
Power Consumption	2.4 (W)	9.6 (W)
Coil Saturation Temperature Rise Δθs (at 20 °C)	Δθs ≒ 19×W (°C) K ≒ 19 (°C/watt)	
Heat-Resistant Class	Class E (120 °C)	
Insulation Resistance	500 V DC MEGA, Over 100 MΩ	
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute	
Mass	100 (g)	

* 1 : measurement conditions: measured by Takano Co. in a standard testing environment, with the holding side facing up, and with an air gap of 0.



External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 195
AWG Size: 24

ELECTROMAGNETIC ACTUATORS Vol.8

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