JQA-1494
JQA-EM0378
Japanese
goods factory

ELECTROMAGNETIC ACTUATORS

BI-STABLE ROTARY SOLENOIDS
DRIVER BOARD FOR BI-STABLE ROTARY SOLENOIDS
BI-STABLE ROTARY OPTICAL SHUTTERS
MULTI LIGHT SHUTTERS
STEP ROTARY SOLENOIDS
LATCHING SOLENOIDS
LATCHING SOLENOID VALVES
GENERAL PURPOSE SOLENOID VALVES
COMPACT 2-WAY/3-WAY SOLENOID VALVES FOR CHEMICAL LIQUIDS
PINCH VALVES
PROPORTIONAL SOLENOID VALVES
COMPACT MASS FLOW CONTROLLERS
ELECTROMAGNETS

TAKANO CO., LTD.

Vol.11

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.

TAKANO TAKANO CO., LTD.

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 ± ____ %
Max Voltage	_____ V DC, ____ A or lower
Conditions of Use:	☐ Continuous current ☐ Intermittent current ON time: _____ msec OFF time: _____ msec
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	_____ msec or lower
Environmental Conditions:	Temperature: ____ ℃～____ ℃ Humidity: ____ %～____ %
Temperature Rise Maximum:	Surface temp _____ ℃ 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 anytime, without advance notice.

TABLE OF CONTENTS

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 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.

3 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.

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.

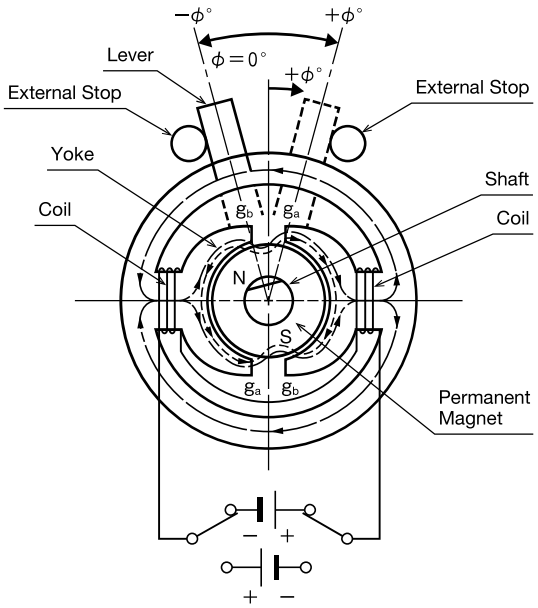


Fig.1 Operating Principles

2 INSTRUCTIONS AND PRECAUTIONS FOR USE

◆Torque Characteristics

The solid line shows the torque generated when rotating in the direction of (−ϕ) to (+ϕ) when voltage is applied. When the (+) and (−) lead lines are reversed, it rotates from (+ϕ) to (−ϕ), as shown by the dotted line. These solid and dotted curves are symmetrical with the line passing through the ϕ = 0° 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 (−ϕ) 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.

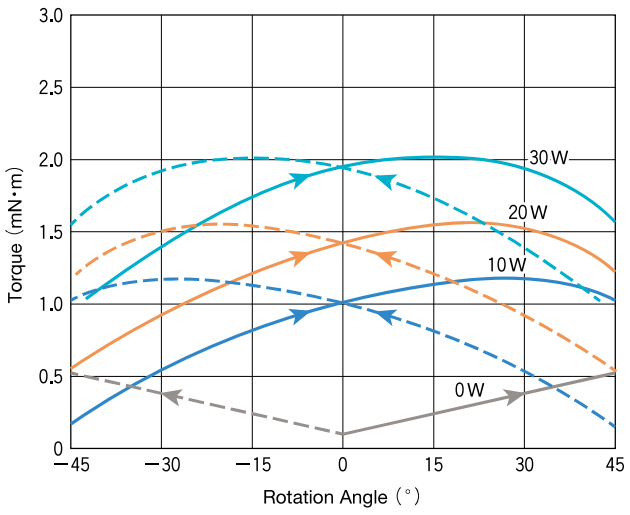


Fig.2 Torque Characteristics (at 20 ℃)

◆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±15℃, Relative Humidity 65±20%,
Air Pressure 860～1060hPA
Heat Sink····80mm square, 3mm 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:

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

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:

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

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:

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

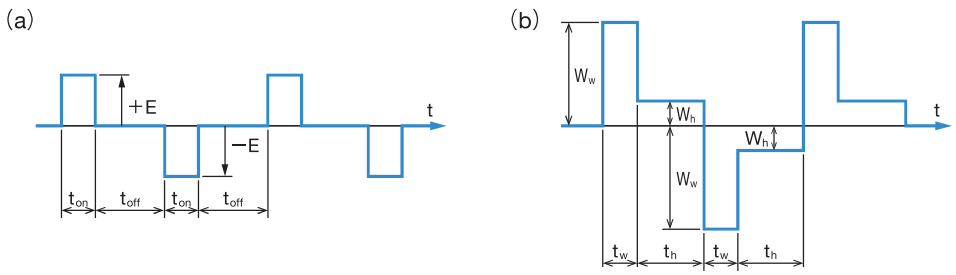


Fig.3 Explanation of Duty Cycle

◆Temperature Change Over Short Periods of Time

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

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

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):

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

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):

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

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

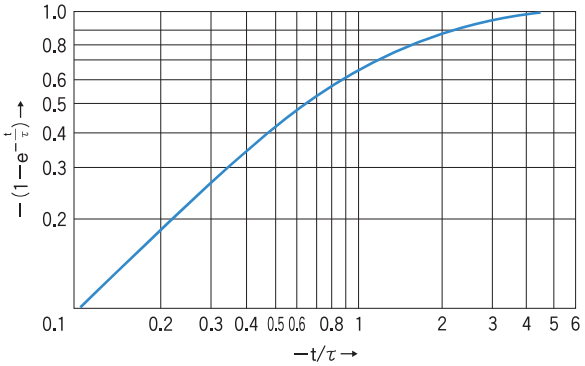


Fig.4 Relation between $(1-e^{-\frac{t}{\tau}})$ and t/τ

◆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 ≒ 7 ℃/W, is continuously powered at 10 W, the coil saturation temperature rise will be:

$$\Delta\theta_s = 7.0 \times 10 = 70(℃)$$

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

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

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:

$$\Delta\theta_s \fallingdotseq 7.0 \times 10 \times 1/2 = 35(℃)$$

Let's say that the ambient temperature is 40 ℃. Since the RSR 20/20 has a heat class of 120 ℃, when we subtract the ambient temperature from the unit's heat class, we are left with a value of 80 ℃. 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 ℃, you could even keep it powered continuously without any issues.

3 WHEN SELECTING YOUR PRODUCT

❶ 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)

❷ 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)

❸ 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.

❹ 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.

❺ Shaft

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

❻ Terminal Processing

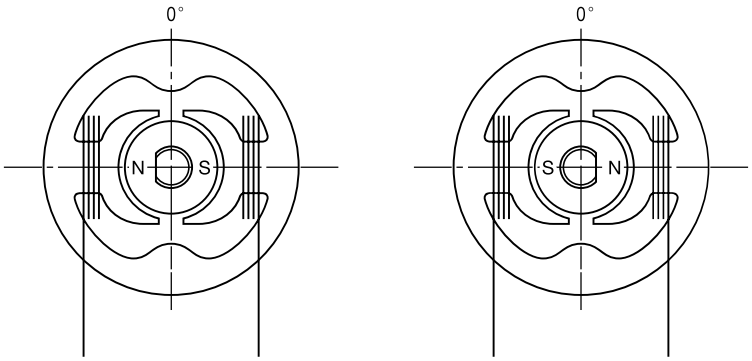
We use UL-certified products. Since each of our products has different standard specifications, please select the model which best fits your requirements.

❼ Heat-Resistant Class

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

4 INSTRUCTIONS [for models without built-in stops:]

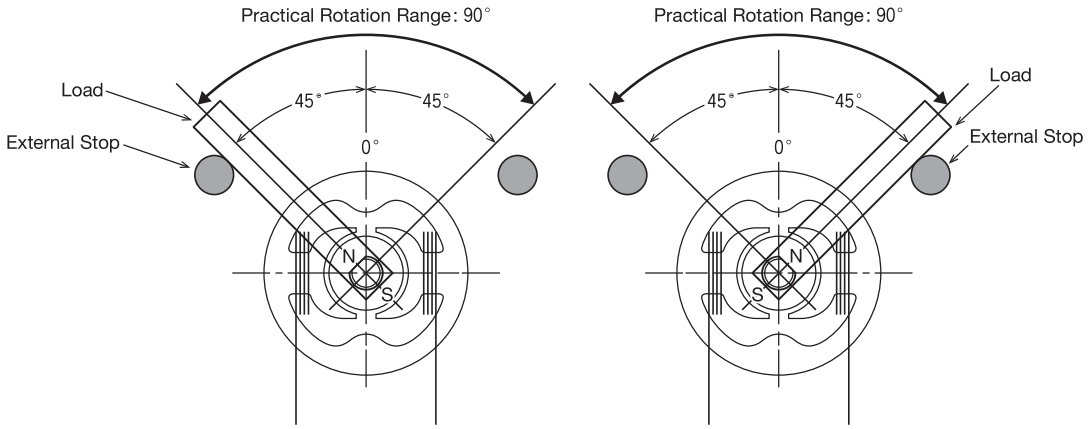
❶ When you receive your Takano bi-stable rotary solenoids, the relative positions of the magnet and the D-cut shaft will be as shown in the two figures below, in a stable and magnetically balanced state.



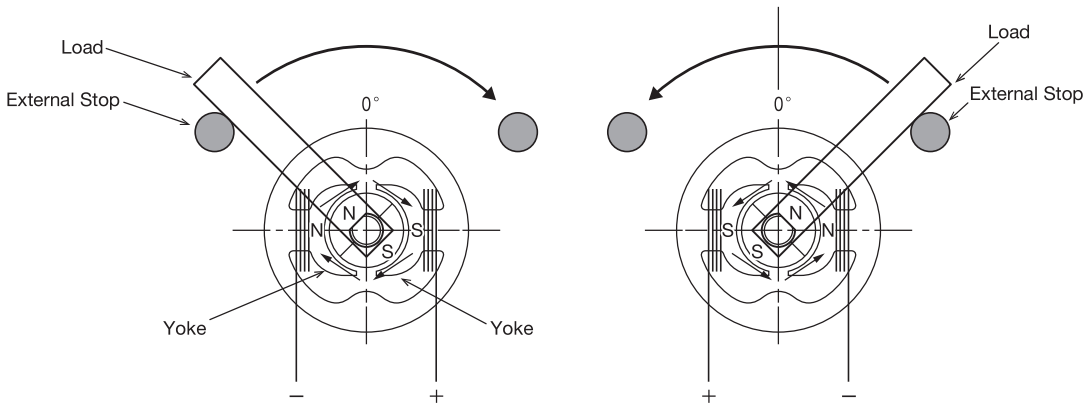
❷ Before using our product, turn the D-cut shaft from the as-delivered stable position and set the external stops. The midpoint between stops and the central point of rotation are both set to 0°, as shown in the "External Dimensions" diagram for each model.

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

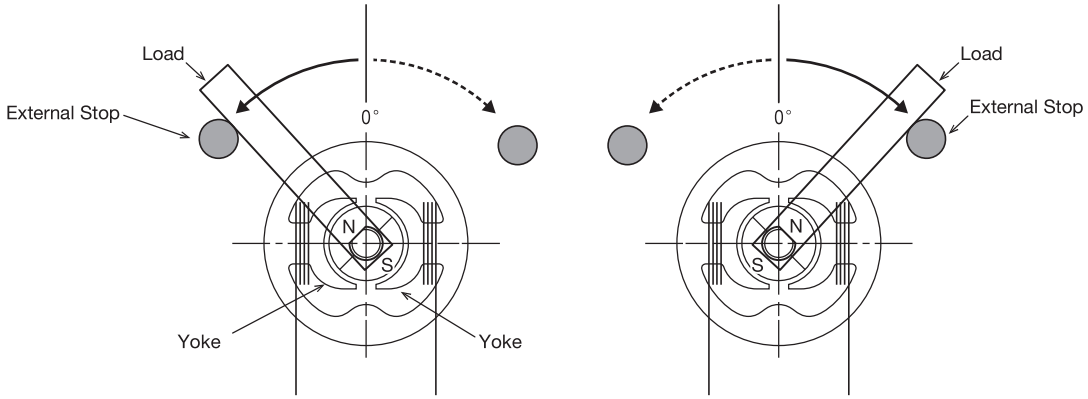
within this range.
Metal stops will have a strong impact on contact with a metal load, which could result in failure of the solenoid. For this reason, please use rubber or a similar buffer material for the stops.



❸ 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.



❹ 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 ❶ above).
This is referred to as the magnet's holding force.



RSR7/10-T010

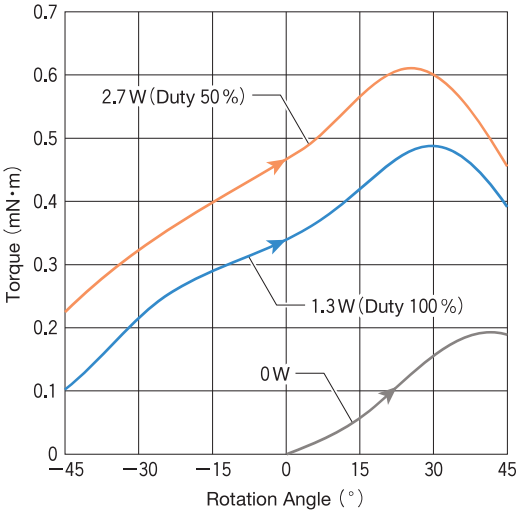
◆Main Specifications

Heat-Resistant Class	Class E (120℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 59 \times W$ (℃) $K \fallingdotseq 59$ (℃/watt)
Temperature Rise Time Constant τ	1 (minutes)
Insulation Resistance	500 V DC MEGA, 5 MΩ 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

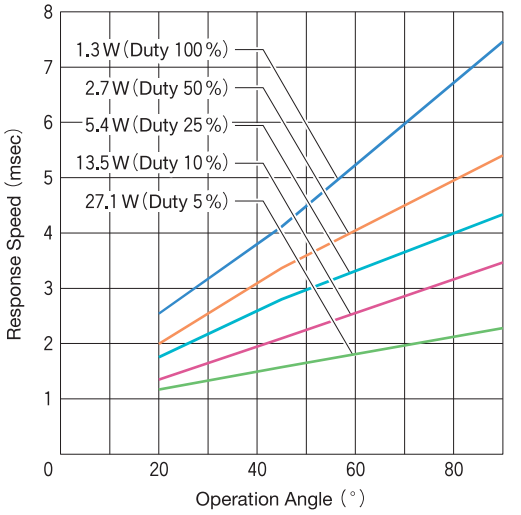
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	30.1	15.0	6.0	3.0
Power at 20℃ [W]	1.3	2.7	5.4	13.5	27.1
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
9.5 〈standard〉	3.5	5.0	7.1	11.3	16.0
12.0	3.9	5.6	8.0	12.7	18.0
15.2	4.4	6.4	9.0	14.3	20.2

◆Torque Data

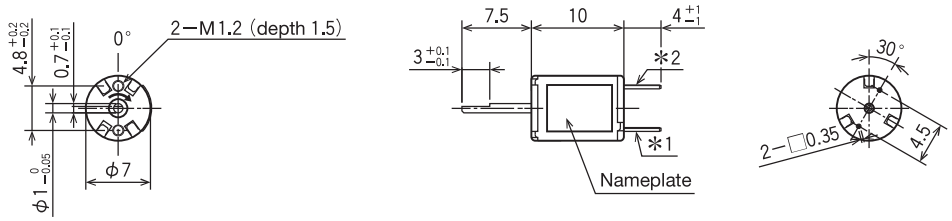


◆Response Data

(Load Inertia : 0.27 g·mm^2)



◆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).

RSR 10/15-S

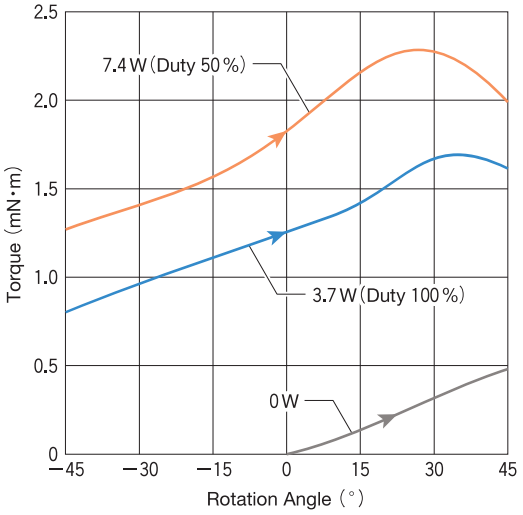
◆Main Specifications

Heat-Resistant Class	Class E (120℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 21.5 \times W$ (℃) $K \fallingdotseq 21.5$ (℃/watt)
Temperature Rise Time Constant τ	0.5 (minutes)
Insulation Resistance	500 V DC MEGA, 100 MΩ or more
Dielectric Strength	500 V AC, 50/60 Hz, 1 minute
Rotor Inertia	0.017 (g·cm²)
Mass	8 (g)

◆Coil Data

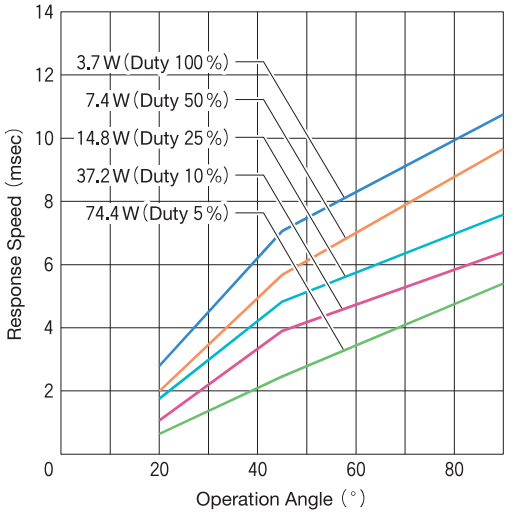
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	15.0	7.5	3.0	1.5
Power at 20℃ [W]	3.7	7.4	14.8	37.2	74.4
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
13.0 〈standard〉	6.9	9.8	13.8	21.9	31.0
39.0	12.0	16.9	24.0	38.0	53.8

◆Torque Data

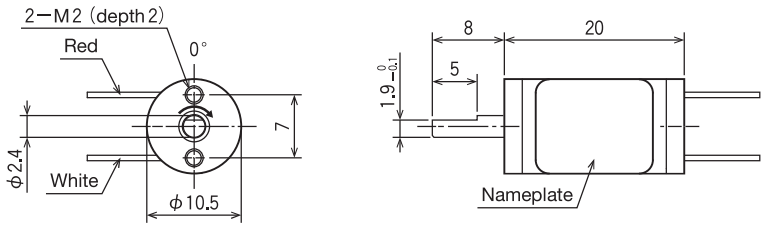


◆Response Data

(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).

RSF 22/08-O 035

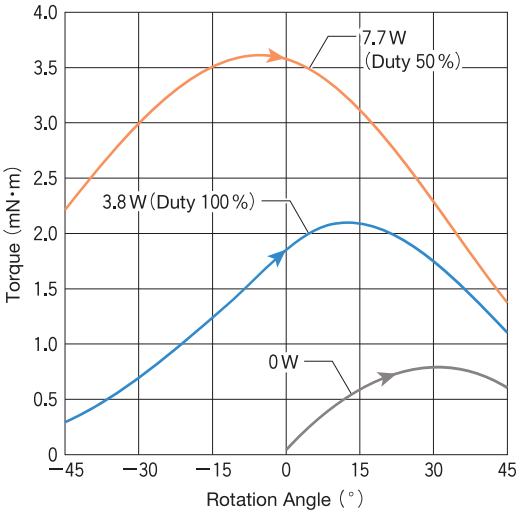
◆Main Specifications

Heat-Resistant Class	Class H (180℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 36 \times W$ (℃) $K \fallingdotseq 36$ (℃/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·cm²)
Mass	20 (g)

◆Coil Data

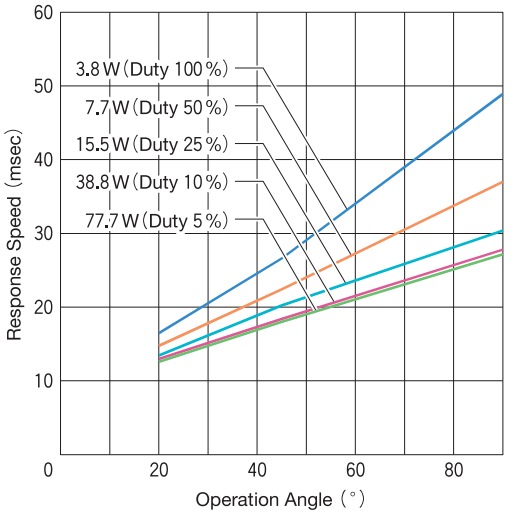
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	181.8	90.3	36.0	18.0
Power at 20℃ [W]	3.8	7.7	15.5	38.8	77.7
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
13.0	7.0	10.0	14.1	22.4	31.7
35.0 〈standard〉	11.5	16.4	23.2	36.8	52.1

◆Torque Data

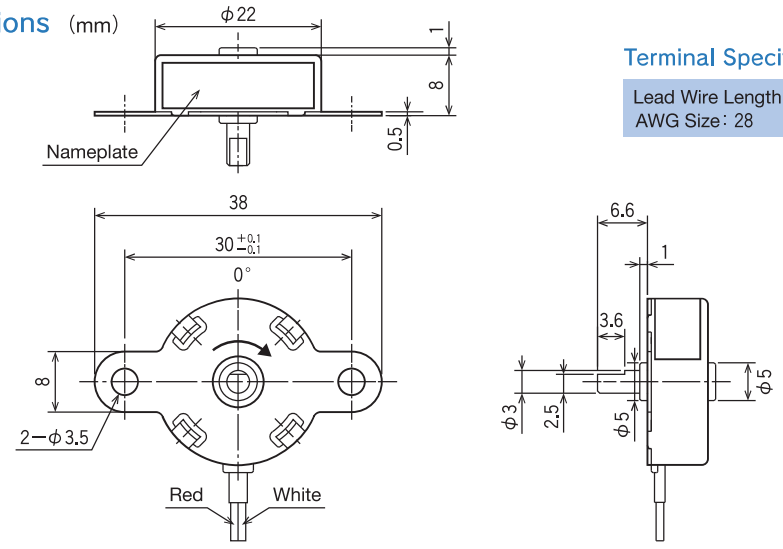


◆Response Data

(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 Series

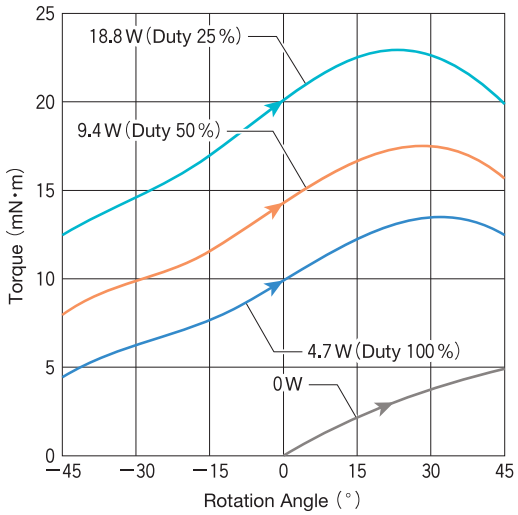
◆Main Specifications

Model Number	RSR28/17-CAB0-N008	RSR28/17-CAB0-N110
DC Resistance	8 (Ω)	110 (Ω)
Heat-Resistant Class	Class E (120℃)	
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 17 \times W$ (℃) $K \fallingdotseq 17$ (℃/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)	

◆Coil Data

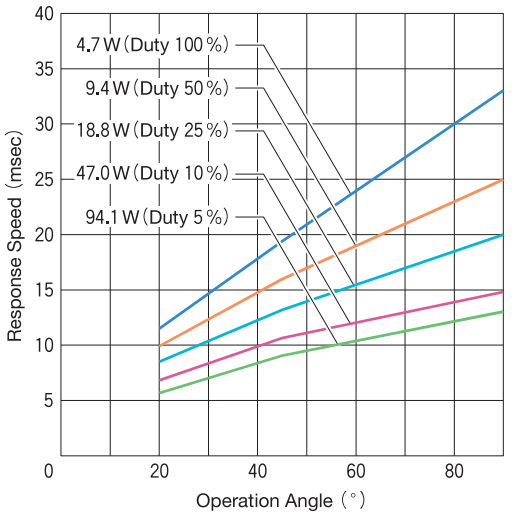
Duty Cycle	100%	50%	25%	10%	5%
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	150.1	75.0	30.0	15.0
Power at 20℃ [W]	4.7	9.4	18.8	47.0	94.1
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
8.0 〈standard〉	6.1	8.6	12.2	19.3	27.4
27.5	11.3	16.0	22.7	35.9	50.8
53.0	15.7	22.3	31.5	49.9	70.6
110.0 〈standard〉	22.7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

◆Torque Data

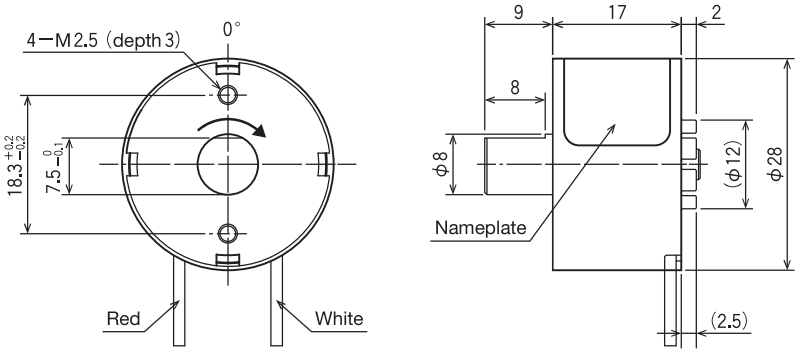


◆Response Data

(Load Inertia : 10.73 g·cm^2)



◆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).

RSU 14/10-SAP 1-T 115

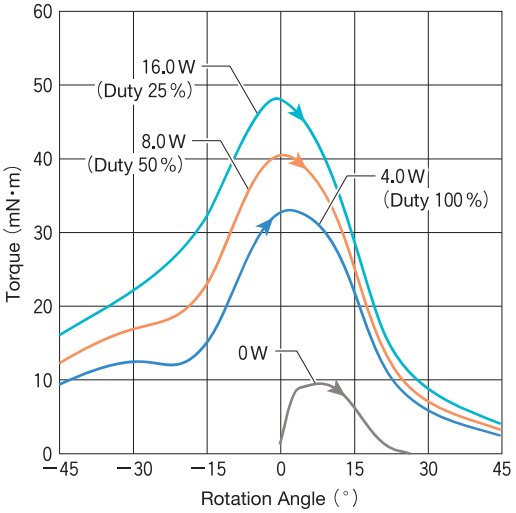
◆Main Specifications

Heat-Resistant Class	Class E (120℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 20 \times W$ (℃) $K \fallingdotseq 20$ (℃/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	1.3 (g·cm^2)
Mass	70 (g)

◆Coil Data

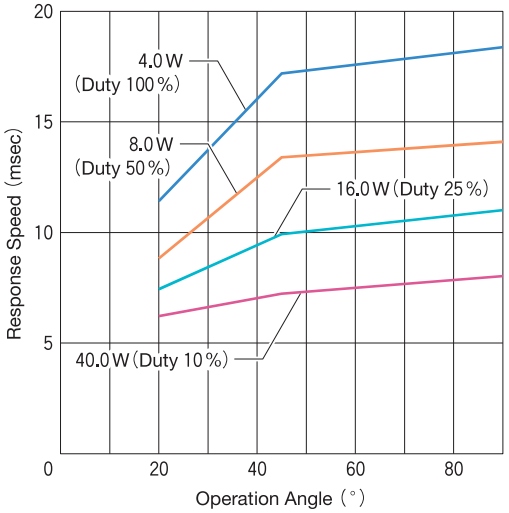
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	150.0	75.0	30.0	15.0
Power at 20℃ [W]	4.0	8.0	16.0	40.0	80.0
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
13.5	7.3	10.3	14.6	23.2	32.8
60.0	15.4	21.9	30.9	48.9	69.2
115.0 〈standard〉	21.4	30.3	42.8	67.8	95.9
140.0	23.6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

◆Torque Data

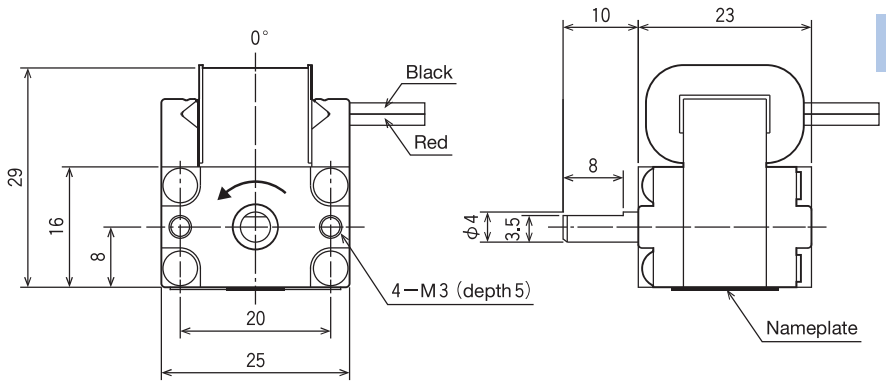


◆Response Data

(Load Inertia : 12.89 g·cm^2)



◆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).

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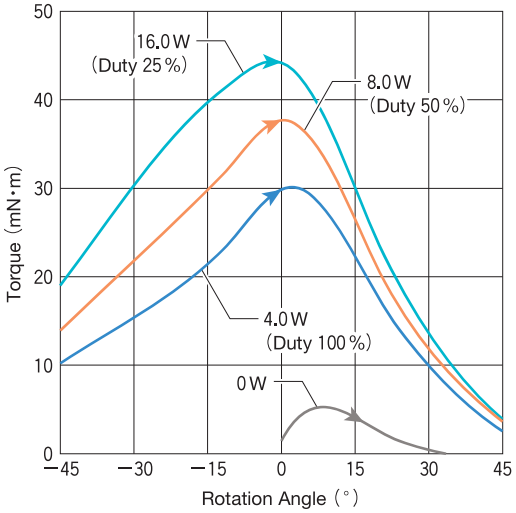
◆Main Specifications

Heat-Resistant Class	Class E (120℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 20 \times W$ (℃) $K \fallingdotseq 20$ (℃/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	1.3 (g·cm^2)
Mass	70 (g)

◆Coil Data

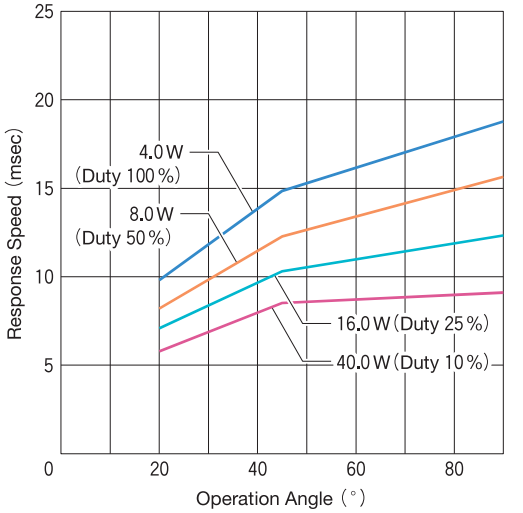
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	150.0	75.0	30.0	15.0
Power at 20℃ [W]	4.0	8.0	16.0	40.0	80.0
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
13.5	7.3	10.3	14.6	23.2	32.8
60.0	15.4	21.9	30.9	48.9	69.2
115.0 〈standard〉	21.4	30.3	42.8	67.8	95.9
140.0	23.6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

◆Torque Data

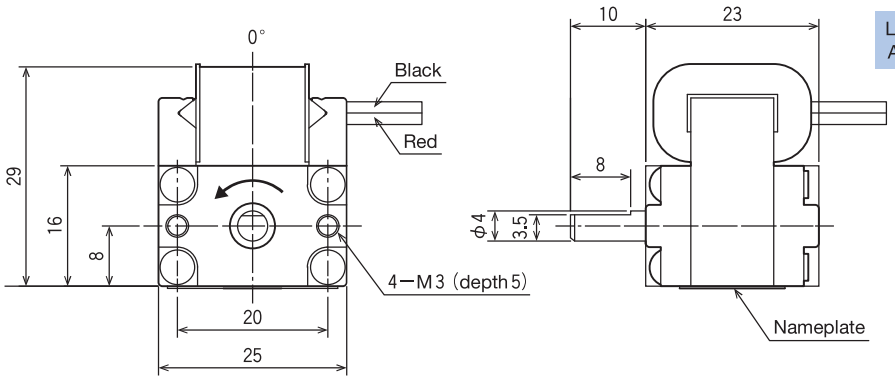


◆Response Data

(Load Inertia : 12.89 g·cm^2)



◆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).

RSR14/10-CAB0

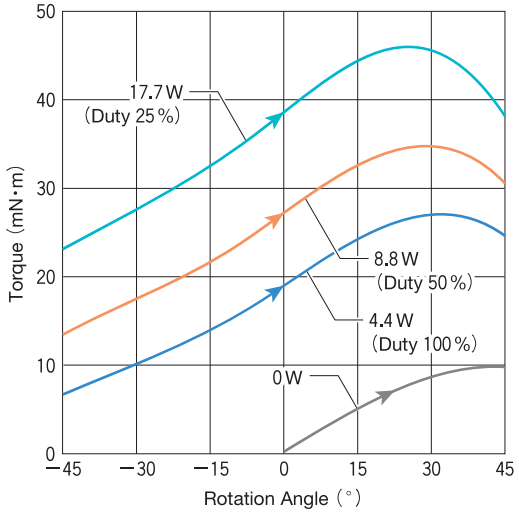
◆Main Specifications

Heat-Resistant Class	Class E (120℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 18 \times W$ (℃) $K \fallingdotseq 18$ (℃/watt)
Temperature Rise Time Constant τ	7 (minutes)
Insulation Resistance	500 V DC MEGA, 100 MΩ or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	2.1 (g·cm²)
Mass	70 (g)

◆Coil Data

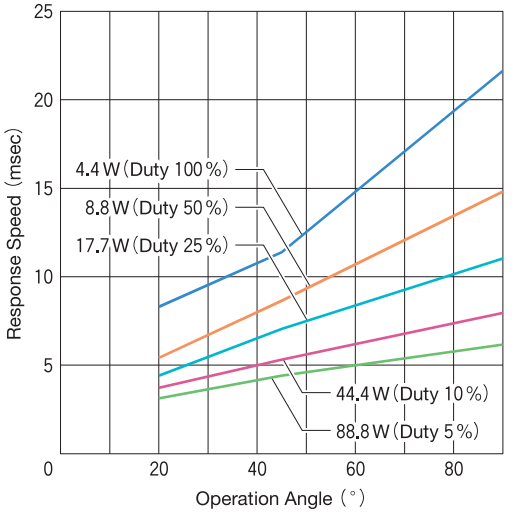
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	212.1	105.4	42.0	21.0
Power at 20℃ [W]	4.4	8.8	17.7	44.4	88.8
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
3.2	3.7	5.3	7.5	11.9	16.8
15.6 〈standard〉	8.2	11.7	16.6	26.3	37.2
60.0	16.2	22.9	32.5	51.6	72.9
125.0	23.4	33.1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

◆Torque Data

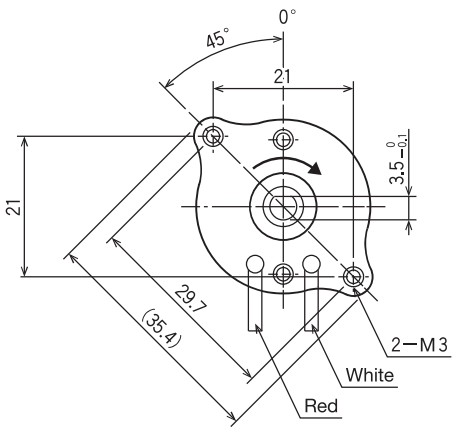


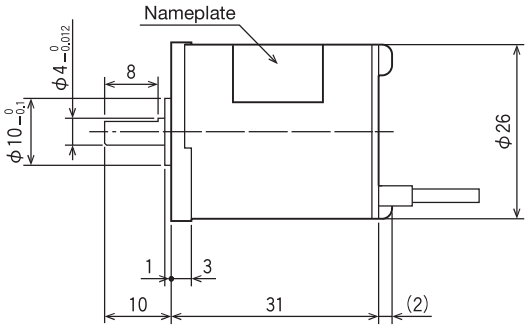
◆Response Data

(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).

RSR14/10-PAP0-G015

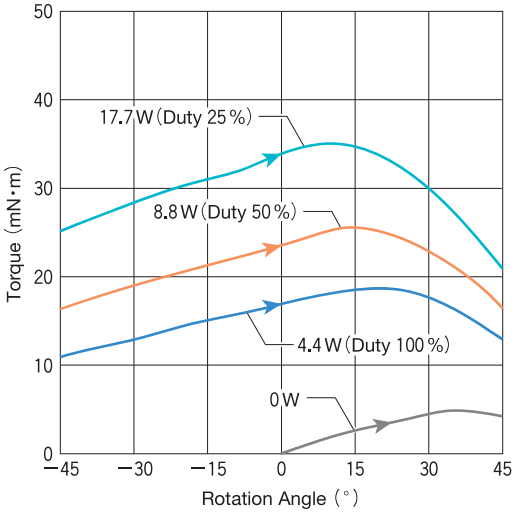
◆Main Specifications

Heat-Resistant Class	Class E (120℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 18 \times W$ (℃) $K \fallingdotseq 18$ (℃/watt)
Temperature Rise Time Constant τ	7 (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	70 (g)

◆Coil Data

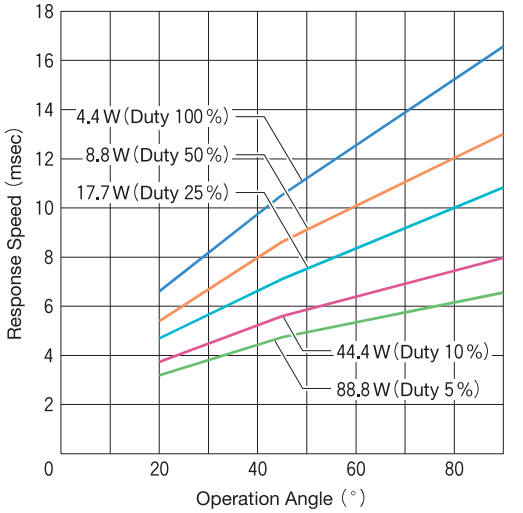
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	212.1	105.4	42.0	21.0
Power at 20℃ [W]	4.4	8.8	17.7	44.4	88.8
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
3.2	3.7	5.3	7.5	11.9	16.8
15.6 〈standard〉	8.2	11.7	16.6	26.3	37.2
60.0	16.2	22.9	32.5	51.6	72.9
125.0	23.4	33.1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

◆Torque Data

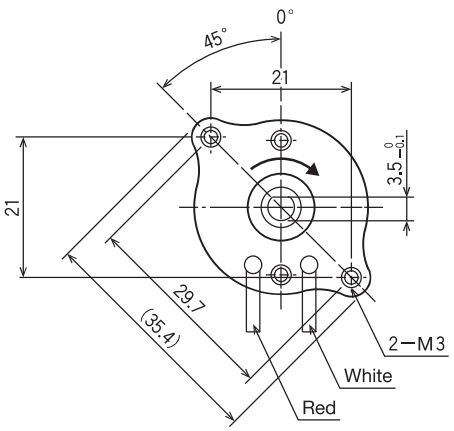


◆Response Data

(Load Inertia : 3.97 g·cm^2)

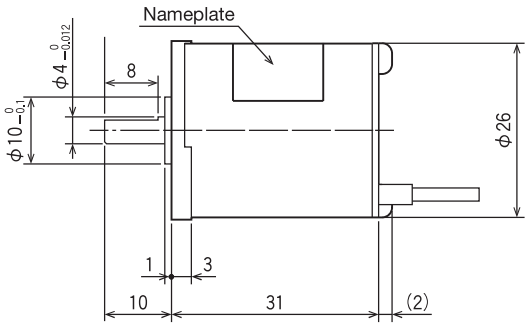


◆External Dimensions (mm)



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).

RSR 14/20-CT 2

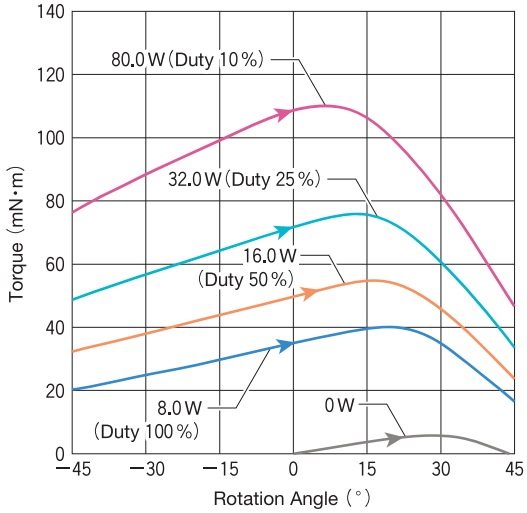
◆Main Specifications

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

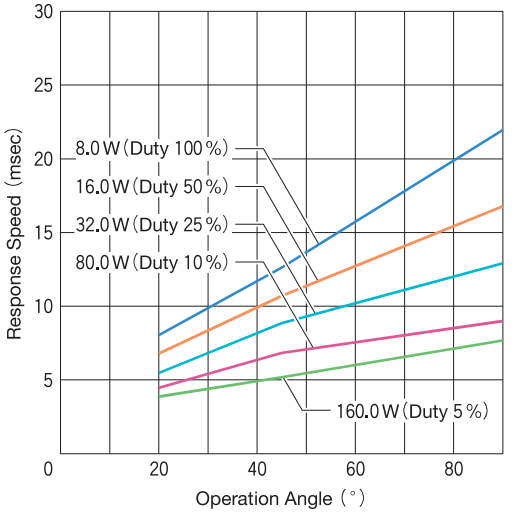
◆Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	270.0	135.0	54.0	27.0
Power at 20℃ [W]	8.0	16.0	32.0	80.0	160.0
Resistance at 20℃ [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

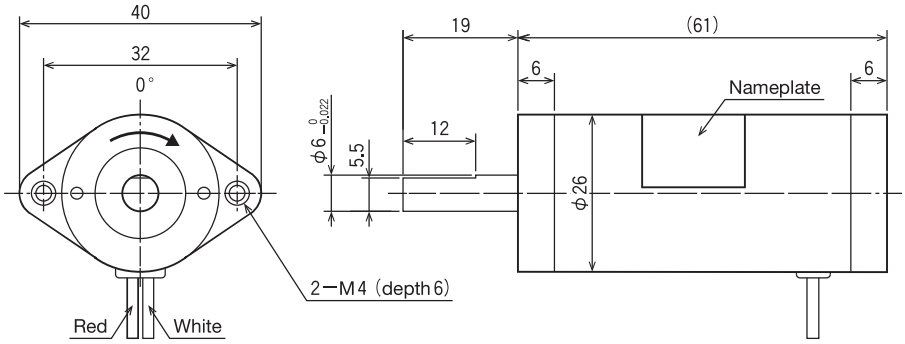
◆Torque Data



◆Response Data (Load Inertia : 10.94 g·cm^2)



◆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).

RSR14/20-CBB0-N032A

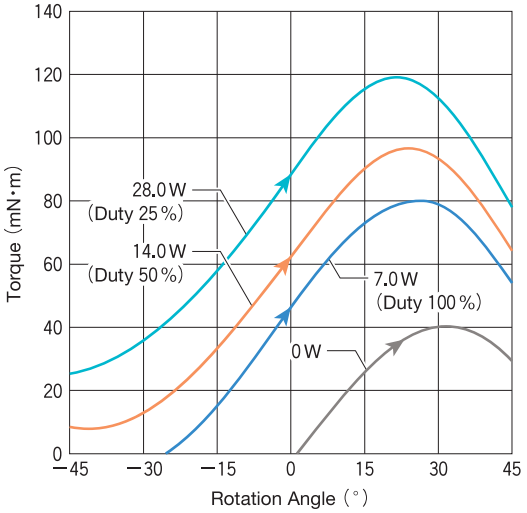
◆Main Specifications

Heat-Resistant Class	Class H (180℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 20 \times W$ (℃) $K \fallingdotseq 20$ (℃/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	2.1 (g·cm²)
Mass	80 (g)

◆Coil Data

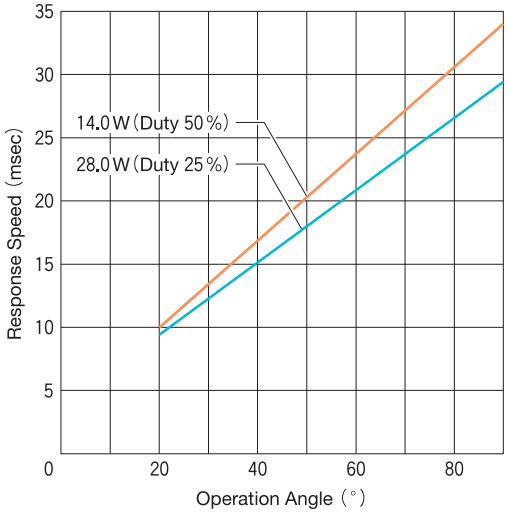
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	150.0	75.0	30.0	15.0
Power at 20℃ [W]	7.0	14.0	28.0	70.0	140.0
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
10	8.3	11.8	16.7	26.4	37.4
20	11.8	16.7	23.6	37.4	52.9
30	14.4	20.4	28.9	45.8	64.8
32 〈standard〉	14.9	21.1	29.9	47.3	66.9

◆Torque Data

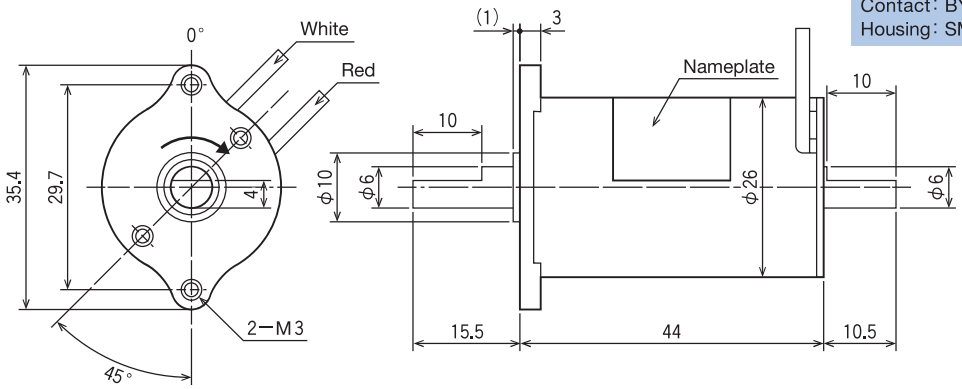


◆Response Data

(Load Inertia : 3.97 g·cm²)



◆External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 70
Contact : BYM-001T-0.6 (JST)
Housing : SMR-02V-B (JST)

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).

RSR20/10-CAB0

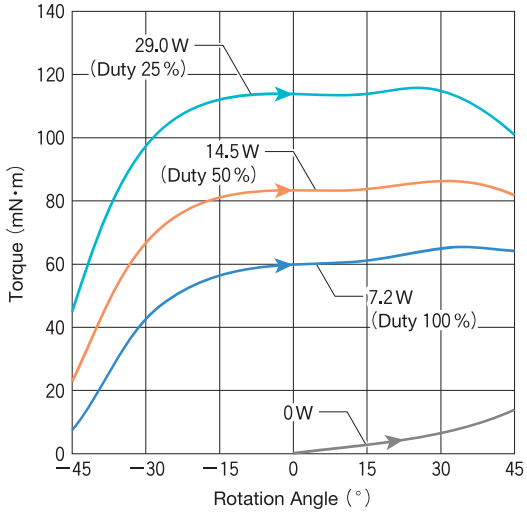
◆Main Specifications

Heat-Resistant Class	Class E (120℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 11 \times W$ (℃) $K \fallingdotseq 11$ (℃/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	9 (g·cm^2)
Mass	185 (g)

◆Coil Data

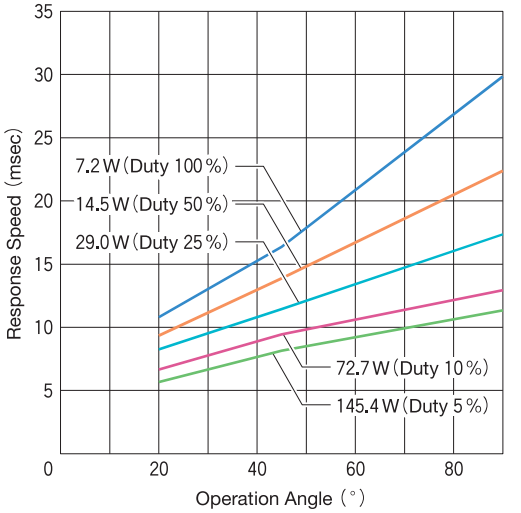
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	180.5	90.2	36.0	18.0
Power at 20℃ [W]	7.2	14.5	29.0	72.7	145.4
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
5.6	6.3	9.0	12.7	20.1	28.5
15.0 〈standard〉	10.3	14.7	20.8	33.0	46.7
23.0	12.8	18.2	25.8	40.8	57.8
58.0	20.4	29.0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

◆Torque Data

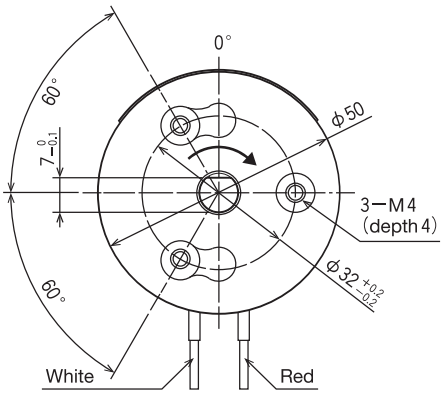


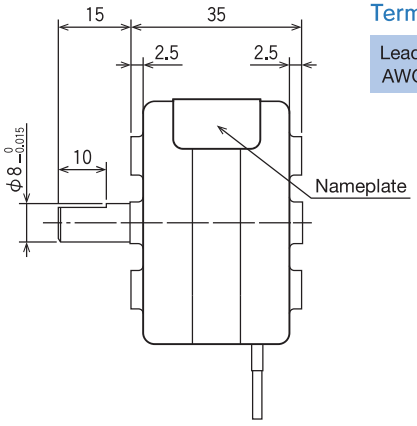
◆Response Data

(Load Inertia : 35.01 g·cm^2)



◆External Dimensions (mm)





Terminal Specifications

Lead Wire Length (mm) : 280
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).

RSR 20/20-CAB 0

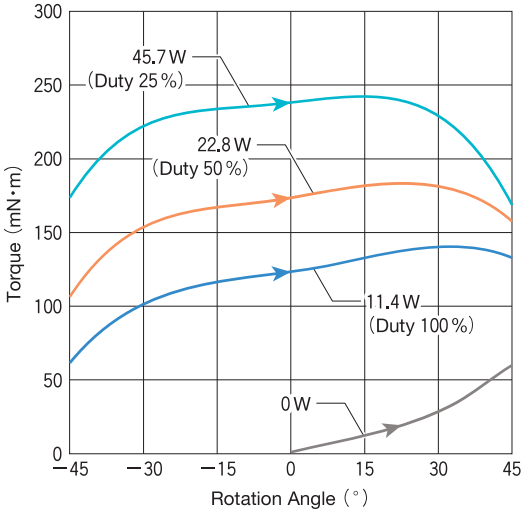
◆Main Specifications

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

◆Coil Data

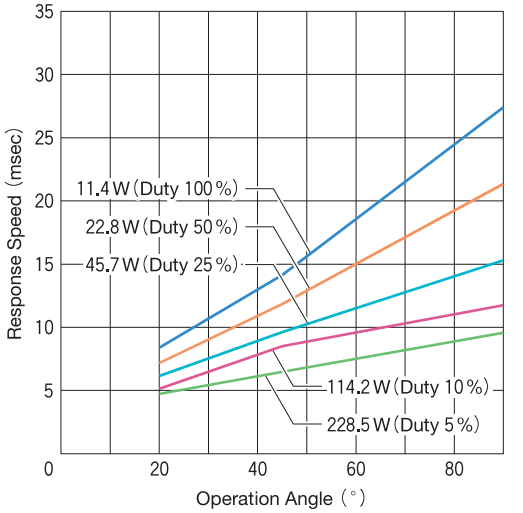
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	210.5	105.0	42.0	21.0
Power at 20℃ [W]	11.4	22.8	45.7	114.2	228.5
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
6.2 〈standard〉	8.4	11.8	16.8	26.6	37.6
12.0	11.6	16.5	23.4	37.0	52.3
25.0	16.8	23.8	33.8	53.4	75.5
44.0	22.3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

◆Torque Data

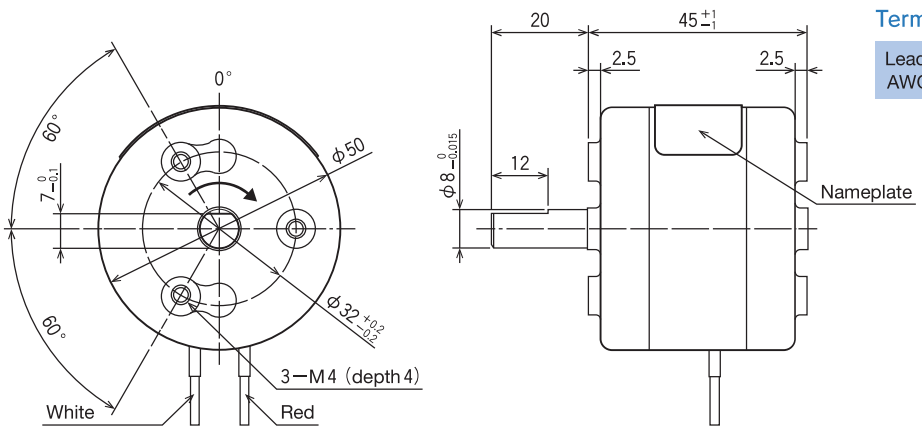


◆Response Data

(Load Inertia : 35.01 g·cm^2)



◆External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 280
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).

RSR 20/40-CAB0-N036

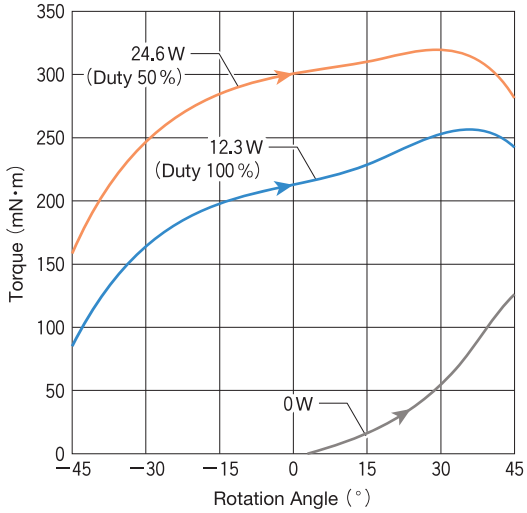
◆Main Specifications

Heat-Resistant Class	Class E (120℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 6.5 \times W$ (℃) $K \fallingdotseq 6.5$ (℃/watt)
Temperature Rise Time Constant τ	8 (minutes)
Insulation Resistance	500 V DC MEGA, 100 MΩ or more
Dielectric Strength	100 V AC, 50/60 Hz, 1 minute
Rotor Inertia	36 (g·cm²)
Mass	500 (g)

◆Coil Data

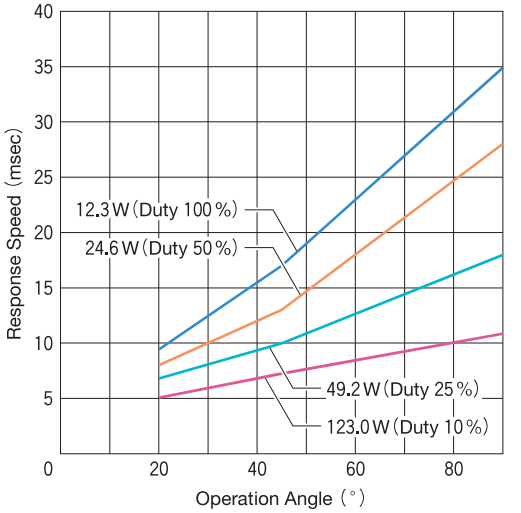
Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	240.1	120.0	48.0	24.0
Power at 20℃ [W]	12.3	24.6	49.2	123.0	246.1
Resistance at 20℃ [Ω]	Voltage [V_{DC}]				
9.0	10.5	14.8	21.0	33.2	47.0
18.0	14.8	21.0	29.7	47.0	66.5
29.0	18.8	26.7	37.7	59.7	84.4
36.0 〈standard〉	21.0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

◆Torque Data

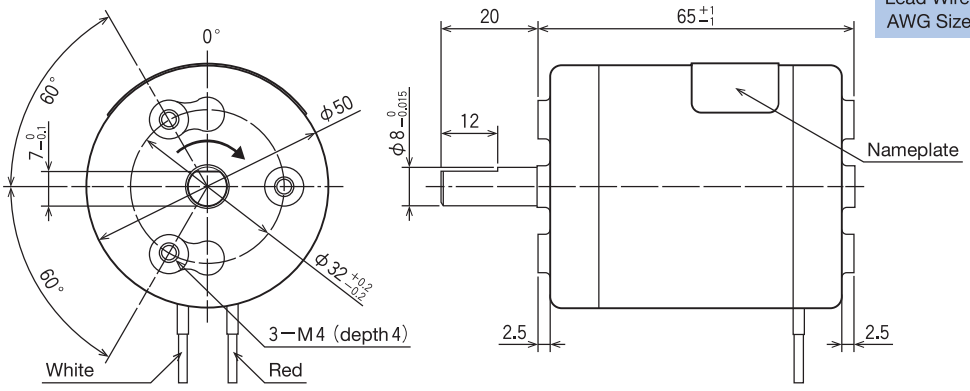


◆Response Data

(Load Inertia : 35.01 g·cm²)



◆External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 280
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

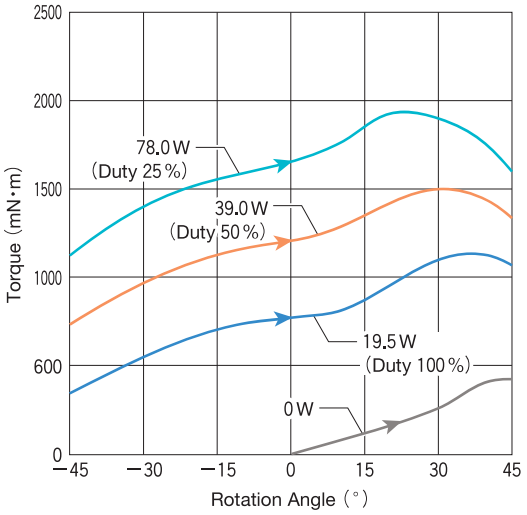
◆Main Specifications

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

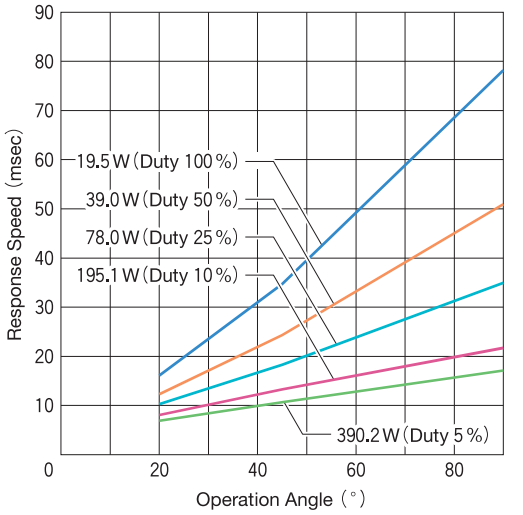
◆Coil Data

Duty Cycle	100 %	50 %	25 %	10 %	5 %
	Continuous	Intermittent			
Max. ON Time [sec.]	∞	330.2	165.1	66.0	33.0
Power at 20℃ [W]	19.5	39.0	78.0	195.1	390.2
Resistance at 20℃ [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

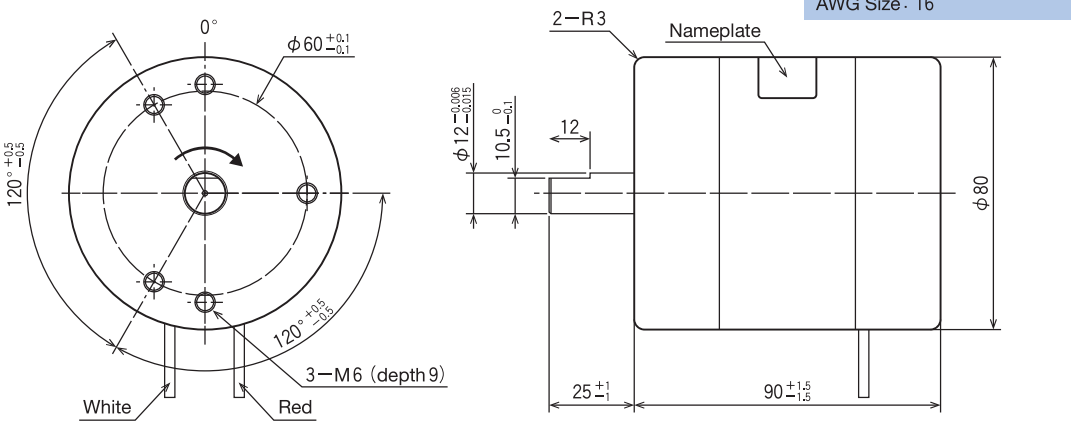
◆Torque Data



◆Response Data (Load Inertia : 425.41 g·cm^2)



◆External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 230
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 Series

◆Main Specifications

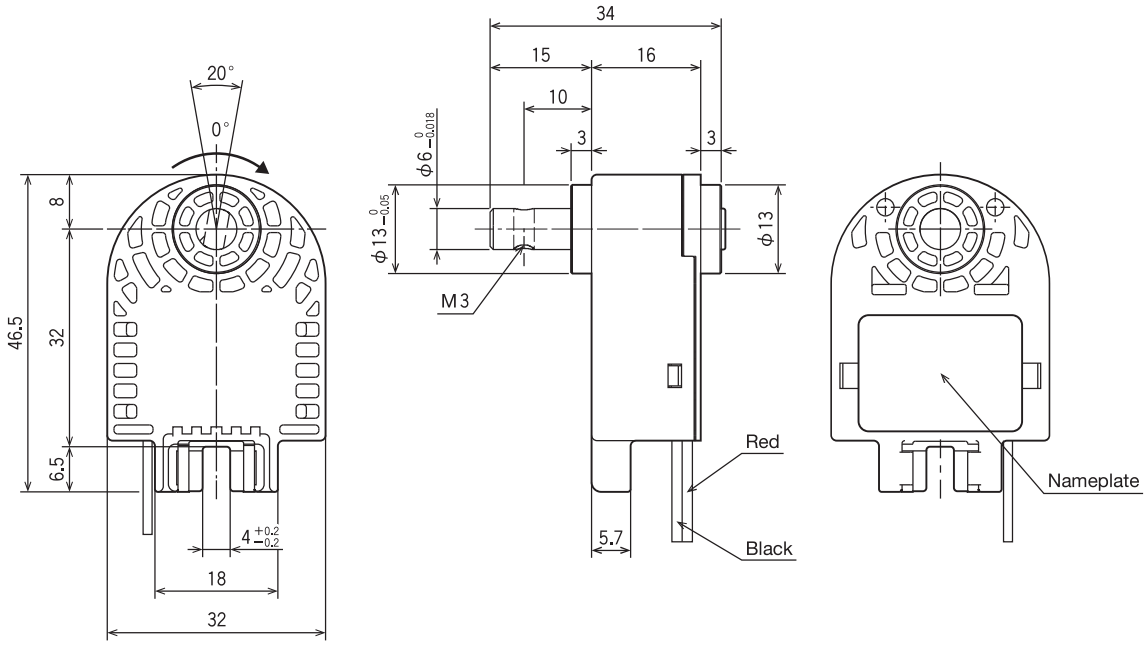
Model Number	RSE32/47-C020	RSE32/47-D038
Working Voltage	24 (V DC)	
DC Resistance	20 (Ω)	38 (Ω)
Duty Cycle	20 (%) or less	
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 18 \times W$ (℃) $K \fallingdotseq 18$ (℃/watt)	
Heat-Resistant Class	Class F (155℃)	
Insulation Resistance	500 V DC MEGA, 100 MΩ 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 (msec) or less	12 (msec) 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 inerta 30 g·cm^2, 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 inerta 30 g·cm^2, 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℃



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).

RSF 26/20-CS 38-G 020

◆Main Specifications

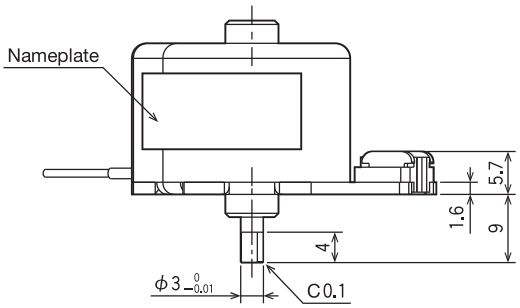
Working Voltage	24 (V DC)
DC Resistance	20 (Ω)
Duty Cycle	20 (%) or less
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 18 \times W$ (℃) $K \fallingdotseq 18$ (℃/watt)
Heat-Resistant Class	Class F (155℃)
Insulation Resistance	500 V DC MEGA, 100 MΩ or more
Dielectric 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 (msec) or less

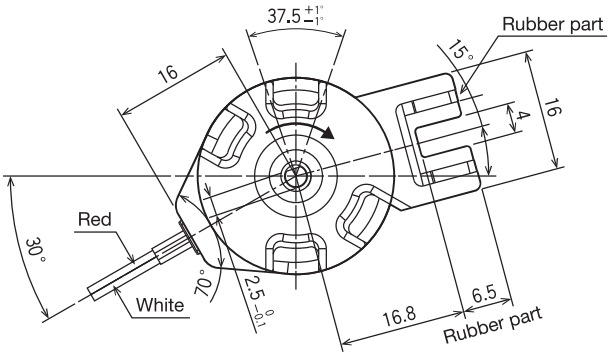
*1: when applied voltage = 24 V DC.
*2: durability conditions: measured by Takano Co. in a standard testing environment, with a load of inerta 4.2 g·cm^2, shaft in a horizontal position, duty cycle 20 %, applied voltage 24 V DC, using a Takano driver.
*3: measurement conditions: measured by Takano Co. in a standard testing environment, with a load of inerta 4.2 g·cm^2, shaft in a horizontal position, applied voltage 24 V DC.

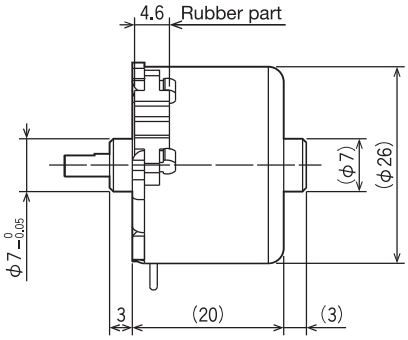
◆External Dimensions (mm)

Terminal Specifications

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







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).

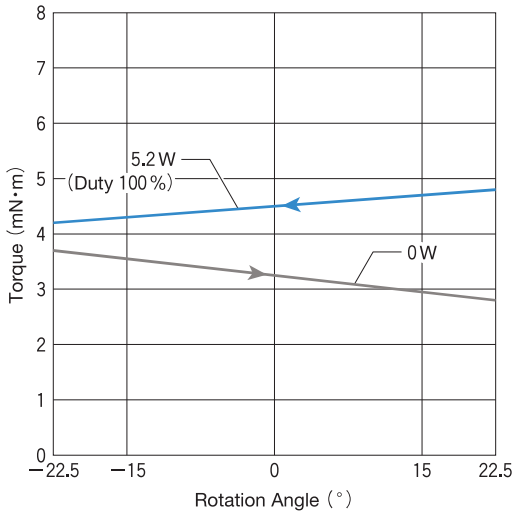
RSR 28/17-SR Series

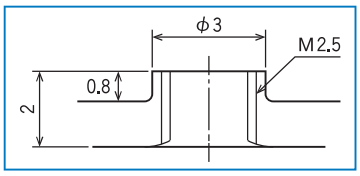
◆Main Specifications

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℃)	
Direction of Plate Rotation	Clockwise (when power is on)	
Operating Angle	25 (°)/35 (°)/45 (°)	
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 17 \times W$ (℃) $K \fallingdotseq 17$ (℃/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 (msec) 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.

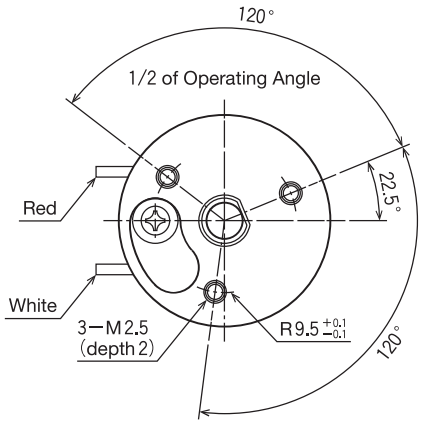
◆Torque Data

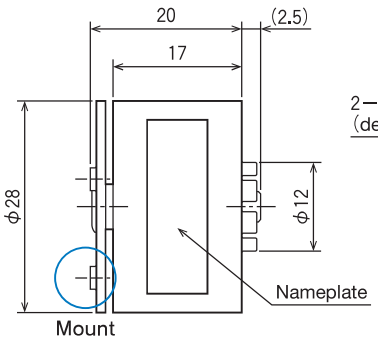


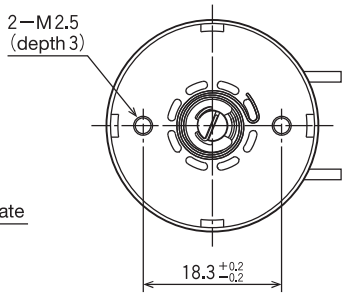


Mount Detail (mm)

◆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.

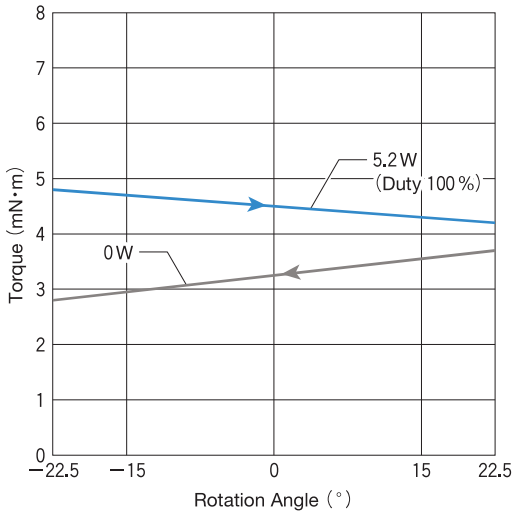
RSR 28/17-SL Series

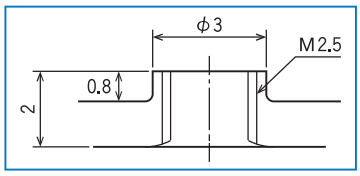
◆Main Specifications

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℃)	
Direction of Plate Rotation	Counter-clockwise (when power is on)	
Operating Angle	25 (°)/35 (°)/45 (°)	
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 17 \times W$ (℃) $K \fallingdotseq 17$ (℃/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 (msec) 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.

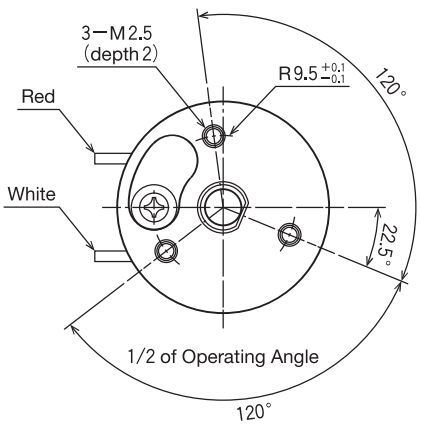
◆Torque Data

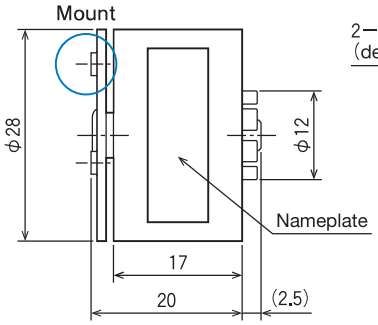


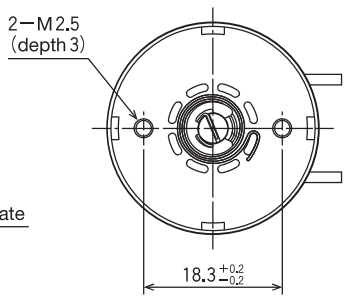


Mount Detail (mm)

◆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 1 msec steps for clockwise and counterclockwise rotation. The factory settings have T1 and T2 both set at 14 msec.

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.

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

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

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

❶ 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 %

❷ 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 = 5.0 V DC]
Trigger Input Current: 7.5 mA DC (Typ) [when VIH = 48 V DC]

❸ Operating Voltage

Trigger Input Voltage IN+ − IN− :
High Level Input Voltage VIH : 12 V DC ~ 48 V DC,
Low Level Input Voltage VIL : 0 V DC ~ 1.2 V DC

❹ Insulation Resistance

250 V DC MEGA, over 5 MΩ
between (V1, V2, GND 1) and (VCC, GND 2), between (IN+, IN−) and (VCC, GND 2)
between (IN+, IN−) and (V1, V2, GND 1)

❺ Dielectric Strength

1000 V AC 50/60 Hz 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)

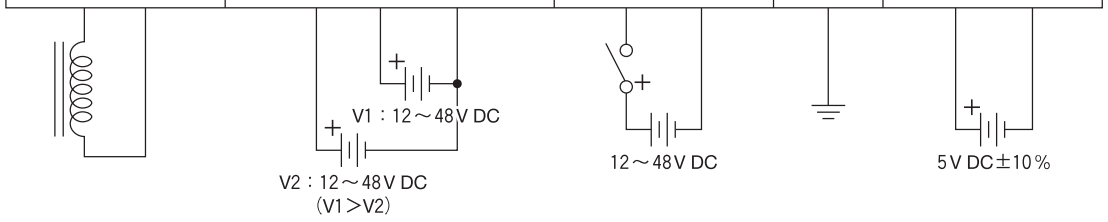
◆How To Set Pulse Duration

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 (SW 1, SW 2)									Note
	9	8	7	6	5	4	3	2	1	
1 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	
2 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	OFF (0)	
3 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	
4 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	OFF (0)	OFF (0)	
5 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	OFF (0)	ON (1)	
6 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	OFF (0)	
7 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	ON (1)	
⋮										
13 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	OFF (0)	ON (1)	
14 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	ON (1)	OFF (0)	(standard)
15 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	ON (1)	ON (1)	ON (1)	
16 msec	OFF (0)	OFF (0)	OFF (0)	OFF (0)	ON (1)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	
⋮										
200 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	OFF (0)	OFF (0)	OFF (0)	
201 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	OFF (0)	OFF (0)	ON (1)	
202 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	OFF (0)	ON (1)	OFF (0)	
203 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	OFF (0)	ON (1)	ON (1)	
204 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	
205 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	ON (1)	OFF (0)	ON (1)	
206 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	ON (1)	ON (1)	OFF (0)	
207 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	OFF (0)	ON (1)	ON (1)	ON (1)	ON (1)	
208 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	ON (1)	OFF (0)	OFF (0)	OFF (0)	OFF (0)	
209 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	ON (1)	OFF (0)	OFF (0)	OFF (0)	ON (1)	
210 msec	OFF (0)	ON (1)	ON (1)	OFF (0)	ON (1)	OFF (0)	OFF (0)	ON (1)	OFF (0)	
⋮										
510 msec	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	OFF (0)	
511 msec	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	ON (1)	

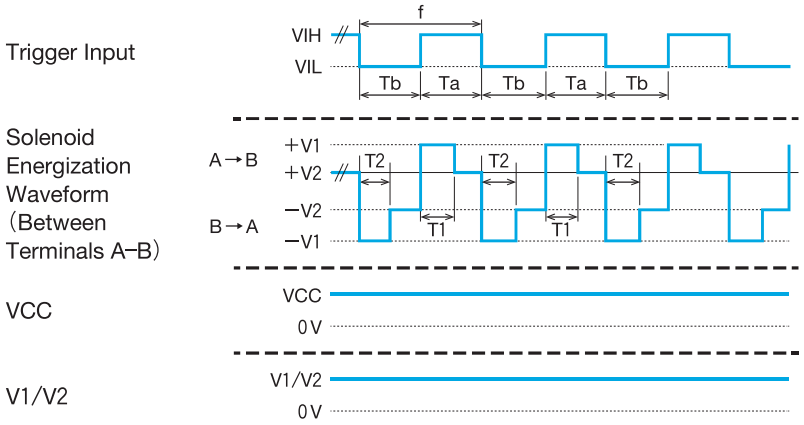
◆How to Connect

1	2	3	4	5	6	7	8	9	10
A	B	V2	V1	GND	INT＋	INT－	FG	VCC	GND
SOL		Solenoid Power Supply			Trigger Input			Circuit Power Supply	

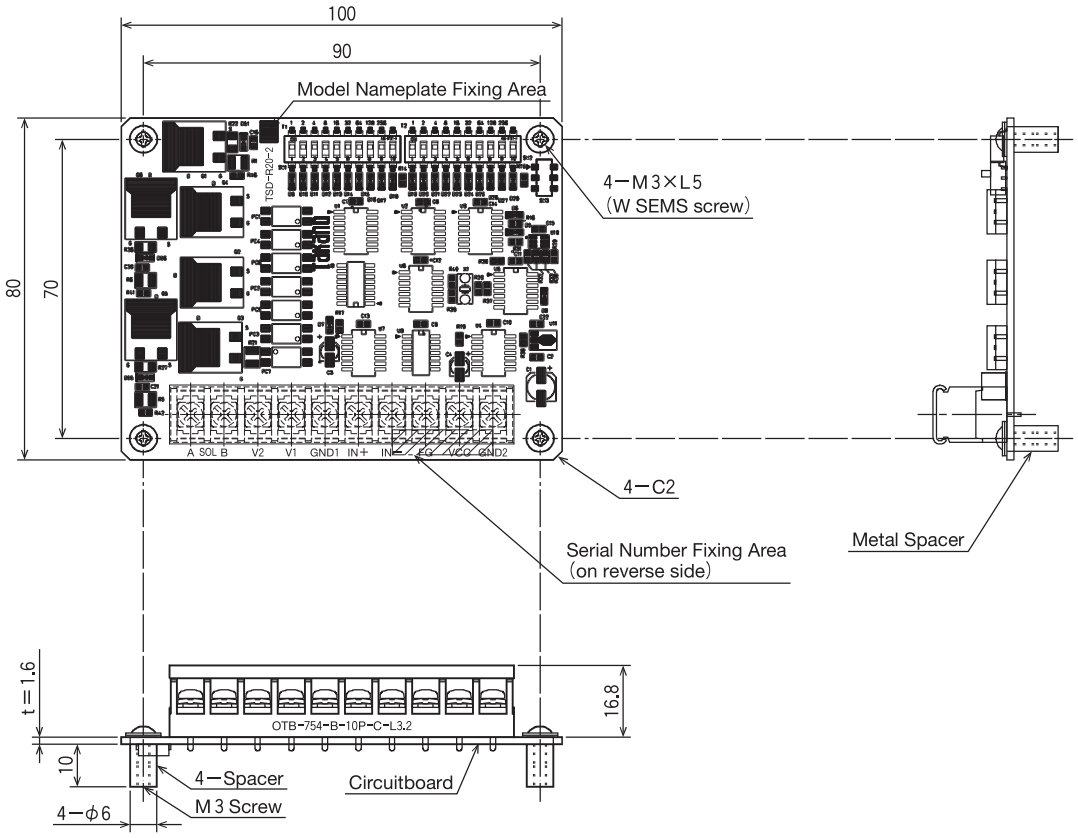


＊Terminal Block：OTB-754-B-10P（OSADA Co., Ltd.）

◆Operation Timing



◆External Dimensions （mm）



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 (Excluding BOS5-8-T)

＊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 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.

3 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.

SERIES COMPARATIVE TABLE

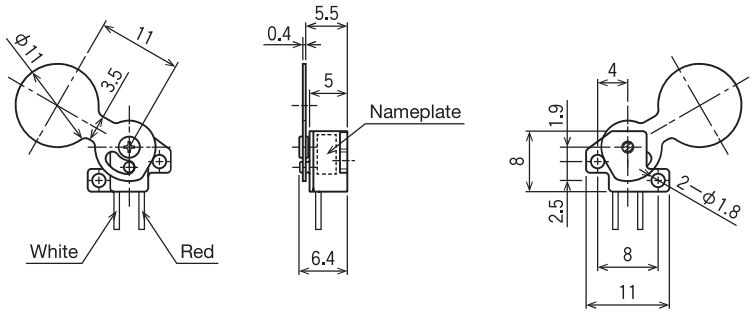
Series	Rated Voltage	Angle of Rotation	Response Speed	Rotary Solenoid Dimensions (mm)	Shutter Dimensions (mm)
BOS5-8-T	3V DC	60°	3V DC：＜50msec	8×11×5	φ11
BOS7/10-T010	3V DC	50°	3V DC：＜18msec, 5V DC：＜13msec	φ7×10	12.3×10.3
BOS10/15-S	5V DC	50°	5V DC：＜13msec, 12V DC：＜8msec	φ10×20	φ10.2
BOS22/08-O035	12V DC	50°	12V DC：＜15msec	φ22×8	φ15.2

BOS 5-8-T

◆Main Specifications

Heat-Resistant Class		Class F (155℃)
Working Voltage		3 (V DC) (Duty Cycle 35 (%) or less) 5 (V DC) (Duty Cycle 12 (%) or less)
DC Resistance		5 (Ω)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)		$\Delta\theta_s \fallingdotseq 170 \times W$ (℃) K ≒ 170 (℃/watt)
Temperature Rise Time Constant τ		0.5 minute
Mass		0.8 (g)
Shutter Dimensions		ϕ11 (mm)
Operating Angle		60 (°)
Life Cycle/Durability		500,000 (cycles)
Response Speed	with Applied Voltage 3V DC	50 (msec) or less
	with Applied Voltage 5V DC	—
	with Applied Voltage 12V DC	—

◆External Dimensions (mm)

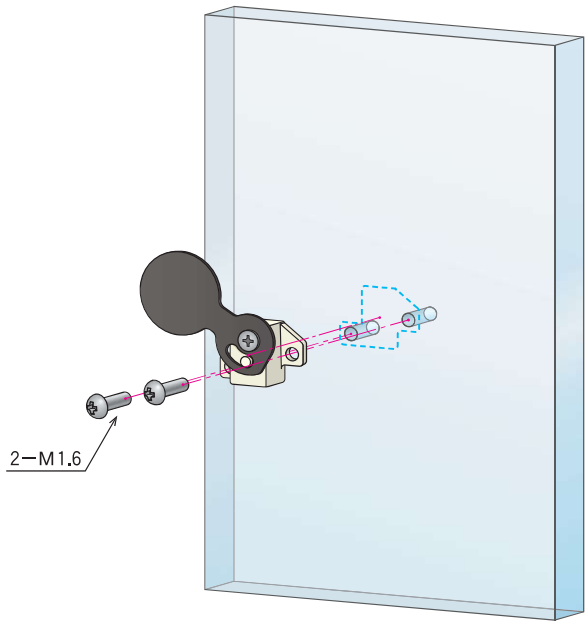


Terminal Specifications

Lead Wire Length (mm) : 195
AWG Size : 30

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

◆How to Mount

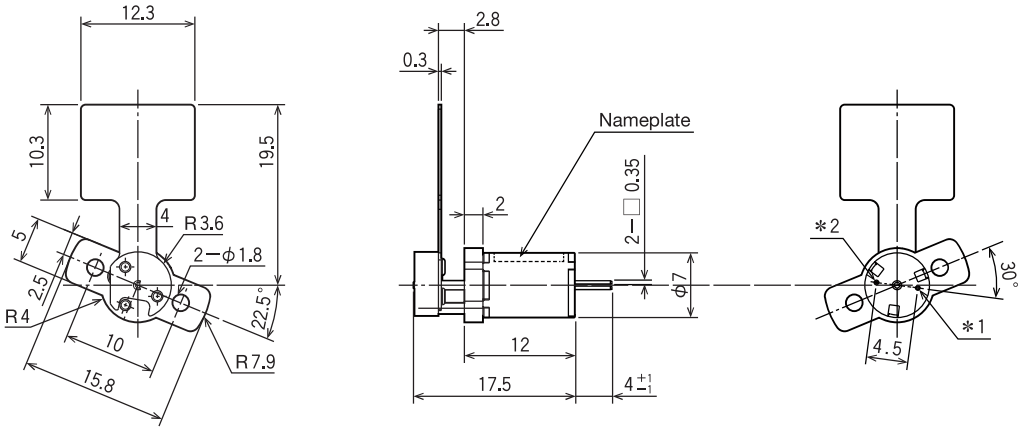


BOS 7/10-T010

◆Main Specifications

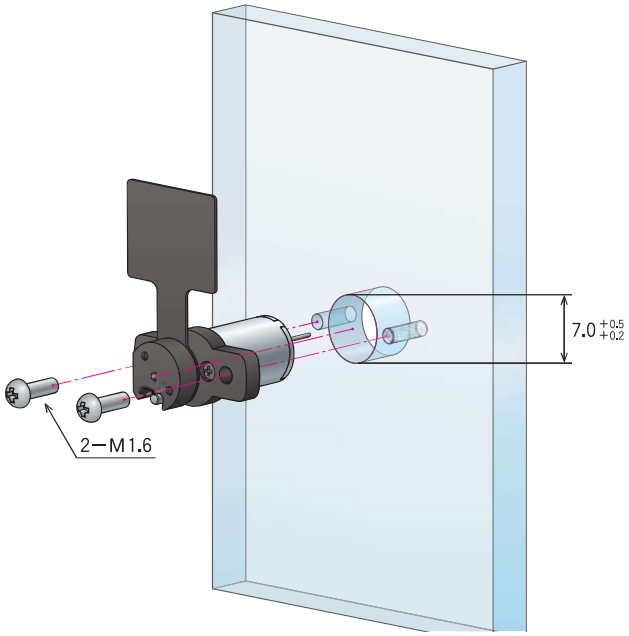
Heat-Resistant Class		Class E (120℃)
Rated Voltage		3 (V DC)
DC Resistance		9.5 (Ω)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)		$\Delta\theta_s \fallingdotseq 59 \times W$ (℃) $K \fallingdotseq 59$ (℃/watt)
Temperature Rise Time Constant τ		1 minute
Mass		4 (g)
Shutter Dimensions		12.3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

◆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

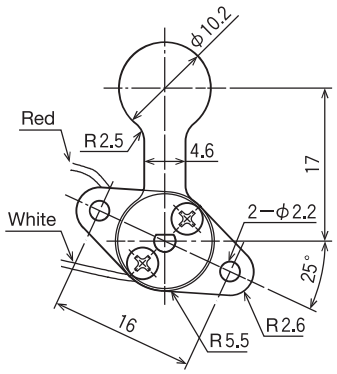


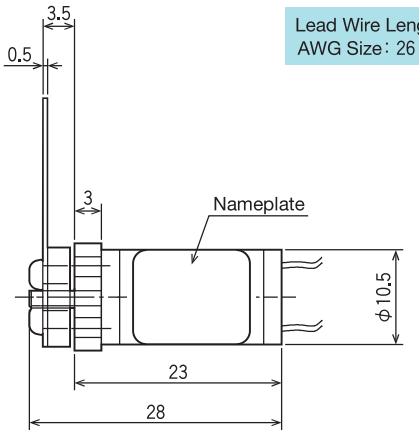
BOS 10/15-S

◆Main Specifications

Heat-Resistant Class		Class E (120℃)
Rated Voltage		5 (V DC)
DC Resistance		13 (Ω)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)		$\Delta\theta_s \fallingdotseq 21.5 \times W$ (℃) $K \fallingdotseq 21.5$ (℃/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 (msec) or less
	with Applied Voltage 12V DC	8 (msec) or less

◆External Dimensions (mm)



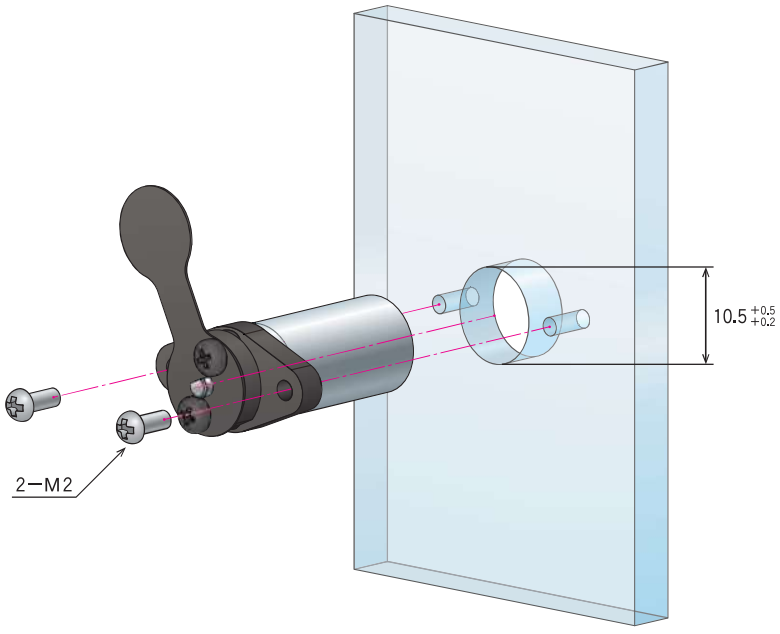


Terminal Specifications

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

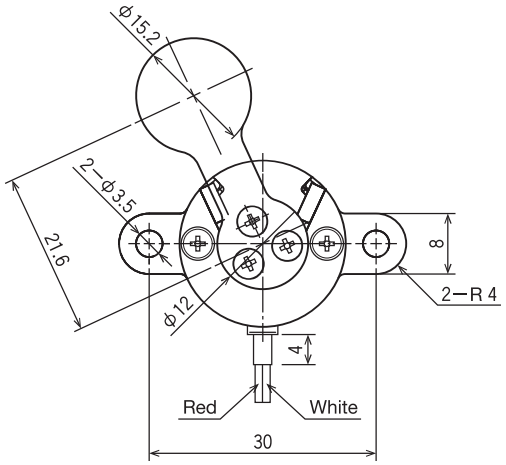


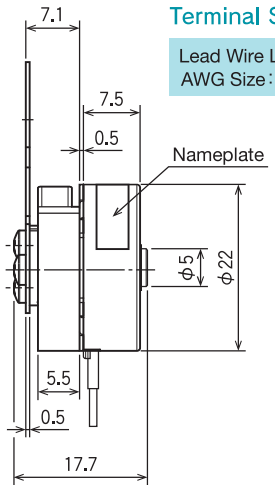
BOS 22/08-O 035

◆Main Specifications

Heat-Resistant Class		Class H (180℃)
Rated Voltage		12 (V DC)
DC Resistance		35 (Ω)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)		$\Delta\theta_s \fallingdotseq 36 \times W$ (℃) $K \fallingdotseq 36$ (℃/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 (msec) or less

◆External Dimensions (mm)



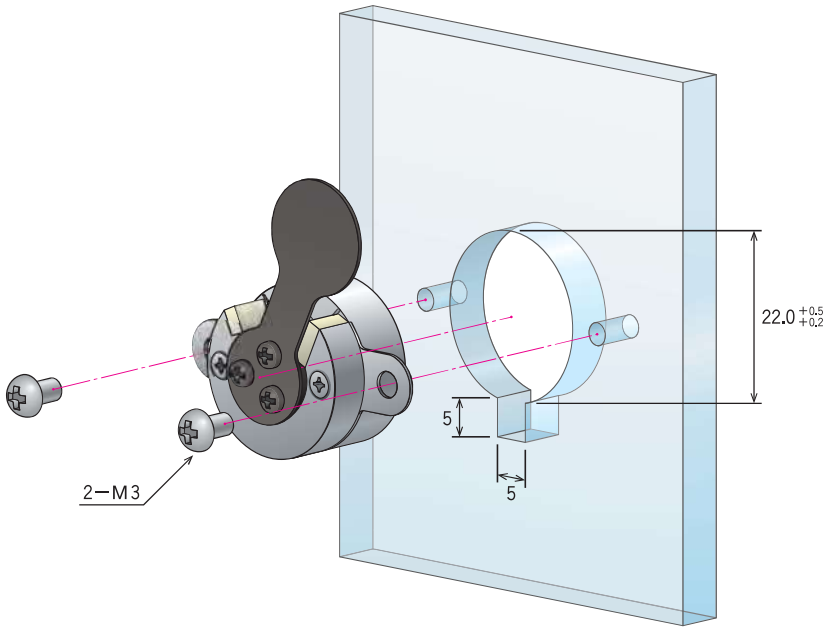


Terminal Specifications

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



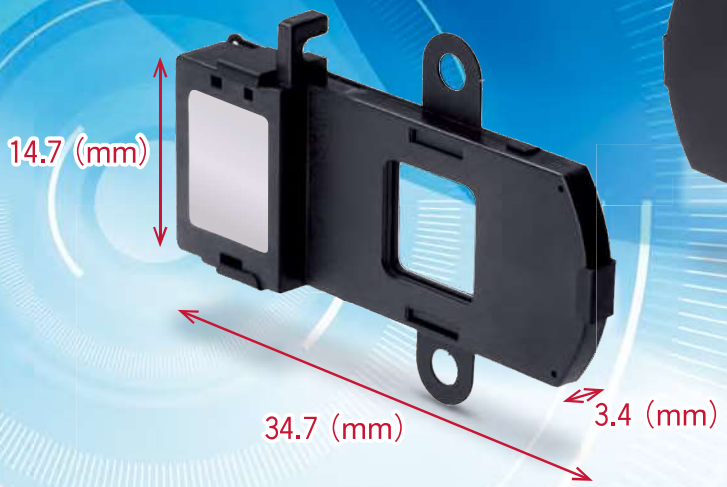
MULTI LIGHT SHUTTERS

Slim/Lightweight

- 14.7×34.7×3.4mm
- 2.5g

Battery-Powered Capabilities

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



Economical

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

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.

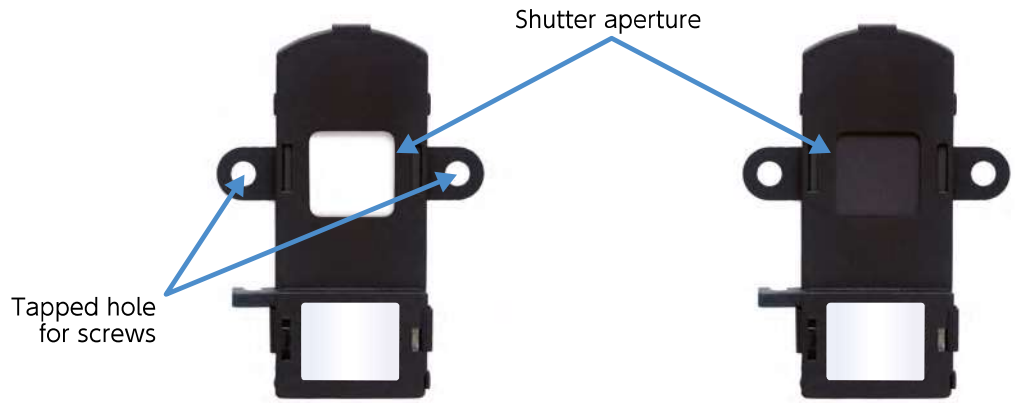
2 Power-Saving

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 8×8mm square aperture. Since its mounting surface is flat, the shutter can be installed easily with two M2 screws.

〈when open:〉 〈when closed:〉

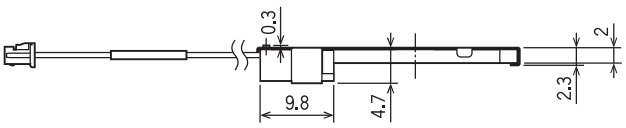


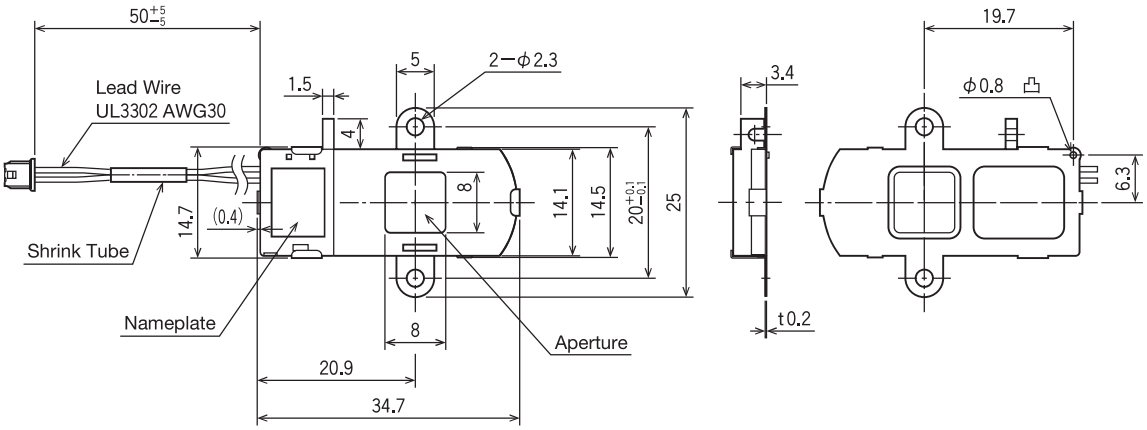
MLS-0808

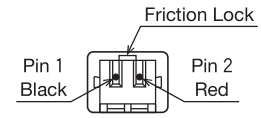
◆Main Specifications

Aperture Size	8×8 (mm)
Shutter Plate Material	PET Anti-Reflection Treatment
Drive Voltage	5.0 (V DC) ±10 (%)
Resistance Value	40 (Ω) ±10% at 25 (℃)
Duty Cycle	25 (%) or less
Input Valve Width	50～500 (msec)
Heat-Resistant Class	Class Y (90℃)
Response Time	50 (msec) or less
Environmental Conditions	−10～50 (℃) 10～85 (%)
Storing Environment	−20～70 (℃) 10～85 (%)
Life Cycle/Durability	100,000 (cycles) 1 cycle of opening and closing

◆External Dimensions (mm)







Pin-Output
Housing: 51021-0200
Terminal: 50058-8000
＊Molex Equivalent

	Pin 1 Black	Pin 2 Red	Shutter Operation
Polarity	(+)	(−)	Open
	(−)	(+)	Close

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 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.

3 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.

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

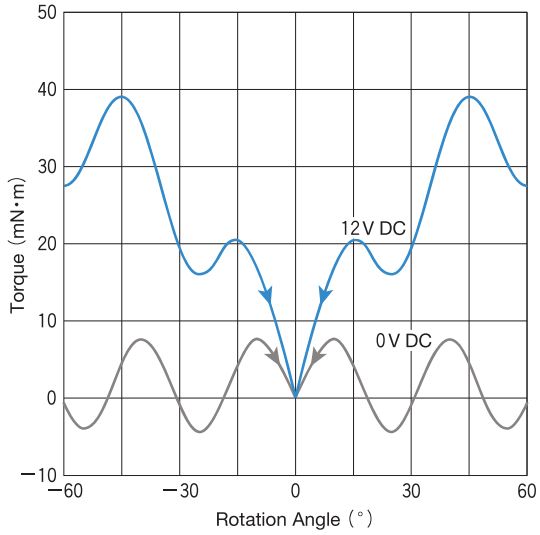
1. **Light Control**
   can be used to block or polarize light, to switch between lights, and to change the color or amount of light.
2. **Sorting/Screening**
   can be used to sort or screen (mail, etc.).
3. **Locking/Positioning**
   can be used for electric locking or halting (of moving items on a 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.

RSS 14/10-CAB0

◆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 12 W)	0.02 (N·m)
DC Resistance	12 (Ω)
Heat-Resistant Class	Class E (120 ℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20 ℃)	$\Delta\theta_s \fallingdotseq 12 \times W$ (℃) $K \fallingdotseq 12$ (℃/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

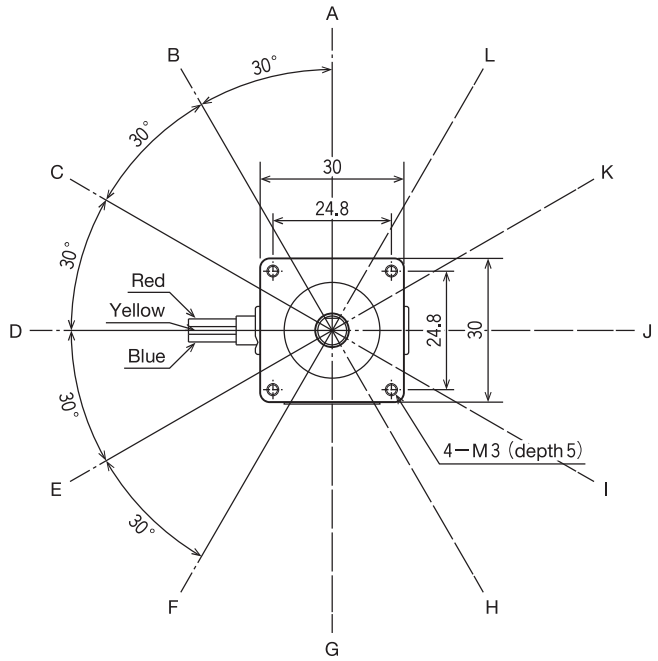
30° Steps (0 = unplugged)

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)

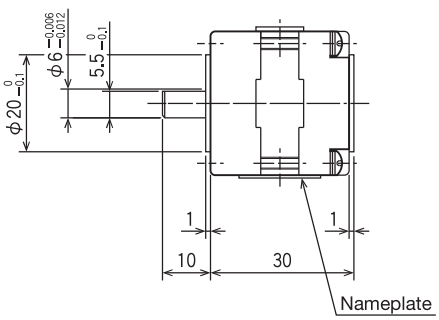
Position \ Lead Line Color	Red	Yellow	Blue
A	(+)	(−)	0
C	0	(+)	(−)
E	(−)	0	(+)
G	(+)	(−)	0
I	0	(+)	(−)
K	(−)	0	(+)

◆External Dimensions (mm)



Terminal Specifications

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

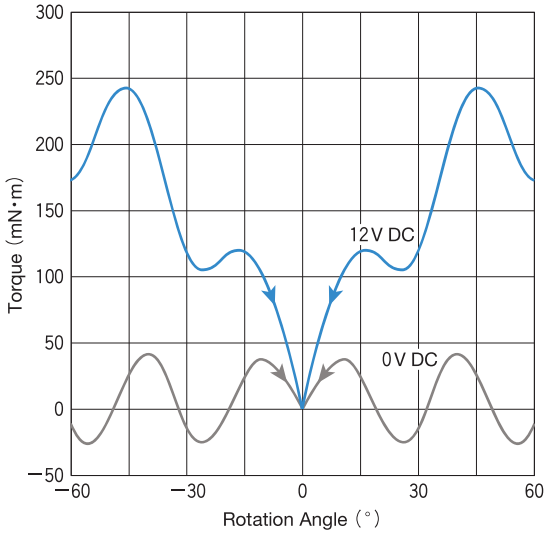


RSS 20/20-T008

◆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 12 W)	0.088 (N·m)
DC Resistance	8 (Ω)
Heat-Resistant Class	Class E (120℃)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 6.5 \times W$ (℃) $K \fallingdotseq 6.5$ (℃/watt)
Insulation Resistance	500 V DC MEGA, 100 MΩ or more
Dielectric Strength	1000 V AC, 50/60 Hz, 1 minute
Rotor Inertia	20 (g·cm²)
Mass	350 (g)

◆Torque Data



◆Hard-Wiring Pattern Control Chart

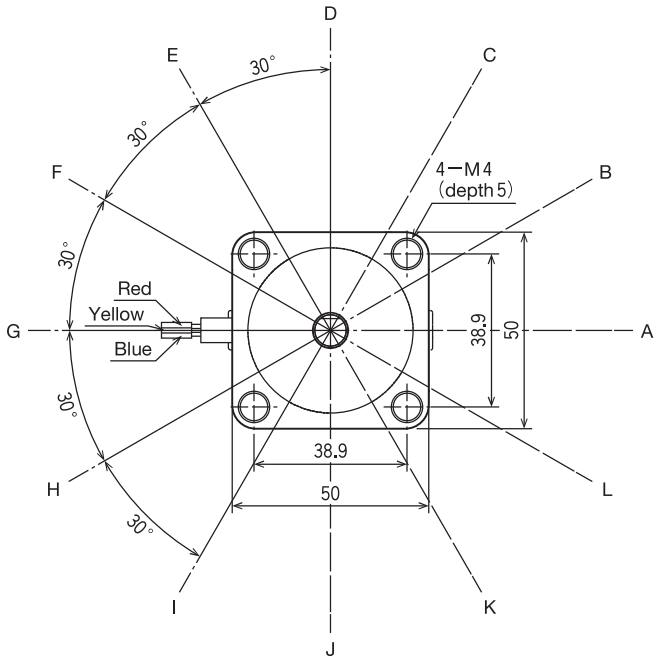
30° Steps (0 = unplugged)

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)

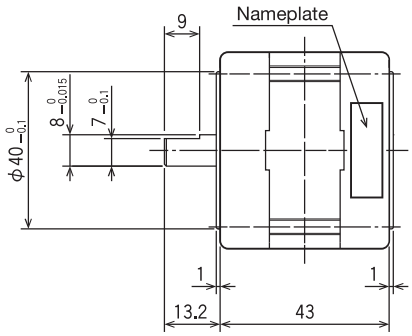
Position \ Lead Line Color	Red	Yellow	Blue
A	(+)	(−)	0
C	0	(+)	(−)
E	(−)	0	(+)
G	(+)	(−)	0
I	0	(+)	(−)
K	(−)	0	(+)

◆External Dimensions (mm)



Terminal Specifications

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



LATCHING SOLENOIDS

Featuring Long-Stroke Specifications

- 10 mm (ordinarily 5 mm)

TSB-LS
(Low-Noise Model)

- Suppresses operating noise.

High Durability

- 500,000 cycles

* (as tested by Takano Co. in a standard testing environment)

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.)

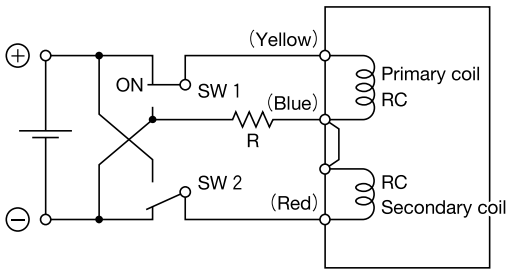
APPLICATIONS

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.

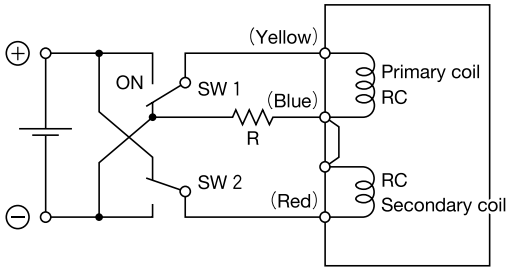
1 OPERATING PRINCIPLES

◆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.

2 INSTRUCTIONS AND PRECAUTIONS FOR USE

◆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±15℃, Relative Humidity 65±20%,
Air Pressure 860～1060hPA
Heat Sink····80mm square, 3mm 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.

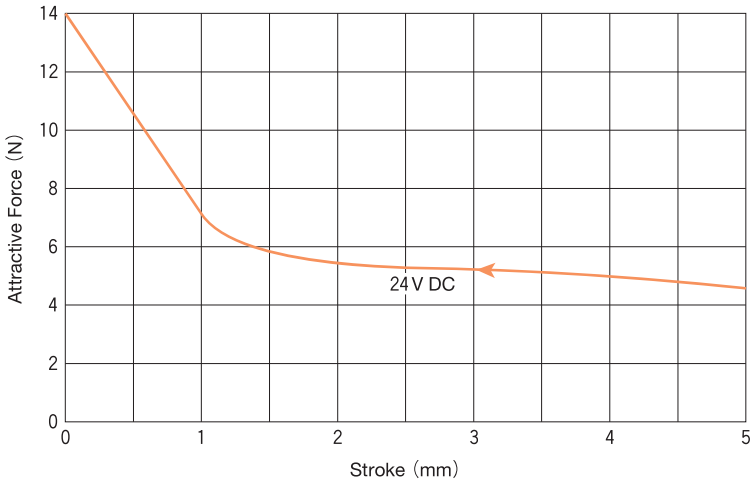
TSB-0705

◆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 (msec)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 17 \times W$ (℃) $K \fallingdotseq 17$ (℃/watt)
Temperature Rise Time Constant τ	4.5 (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	45 (g)
Non-Excited Holding Force	3 (N) or more
Response Speed *1	9 (msec)

*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.

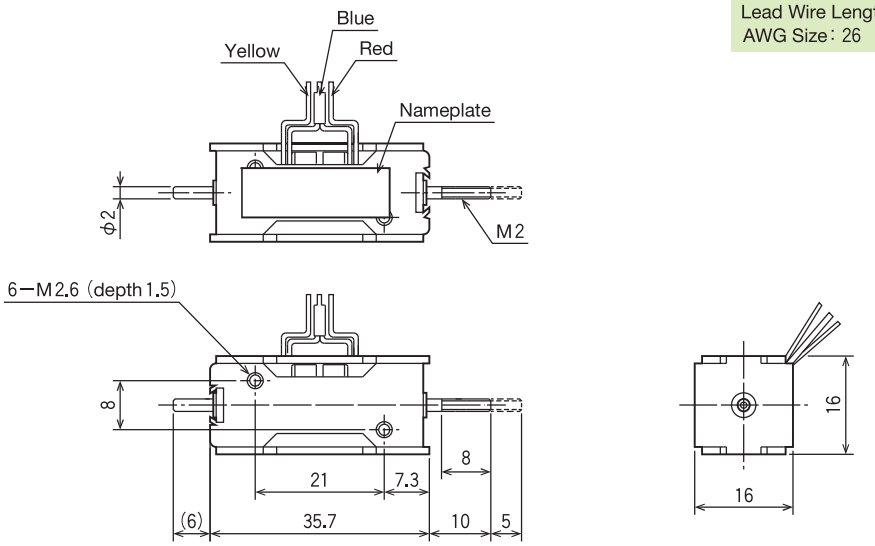
◆Attractive Force Data



◆External Dimensions (mm)

Terminal Specifications

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



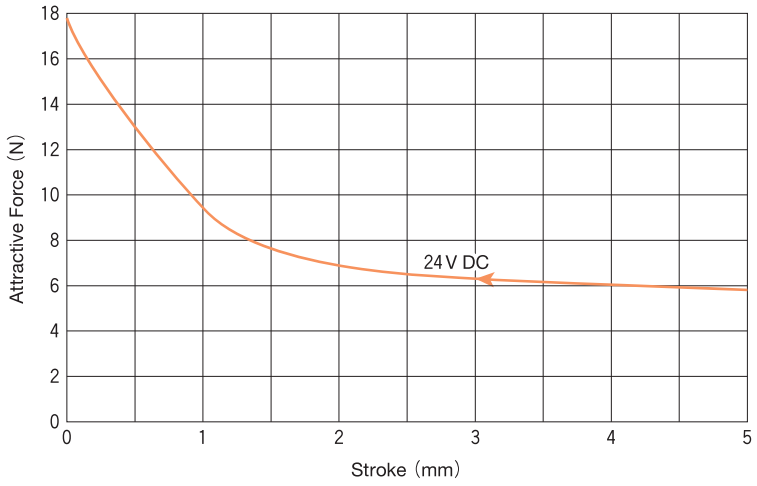
TSB-0805

◆Main Specifications

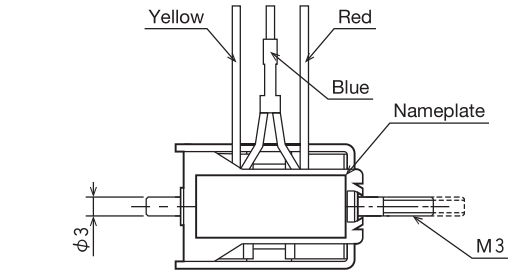
Working Voltage	24 (V DC)
DC Resistance	7.5 (Ω)
External Resistance	1 (Ω) 〈7 (W) or more〉
Duty Cycle	4 (%) or less
Max ON Time	100 (msec)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 17 \times W$ (℃) $K \fallingdotseq 17$ (℃/watt)
Temperature Rise Time Constant τ	5 (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	65 (g)
Non-Excited Holding Force	5 (N) or more
Response Speed *1	7 (msec)

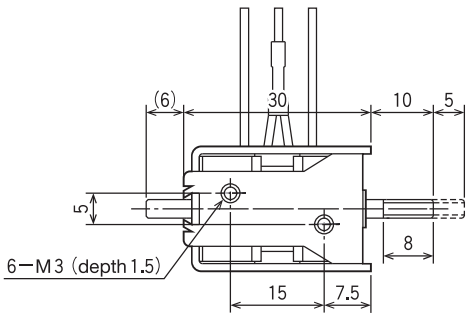
*1: measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage 24 V DC.

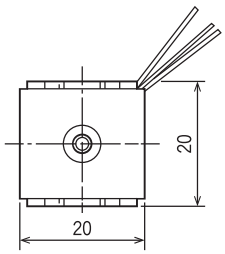
◆Attractive Force Data



◆External Dimensions (mm)







Terminal Specifications

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

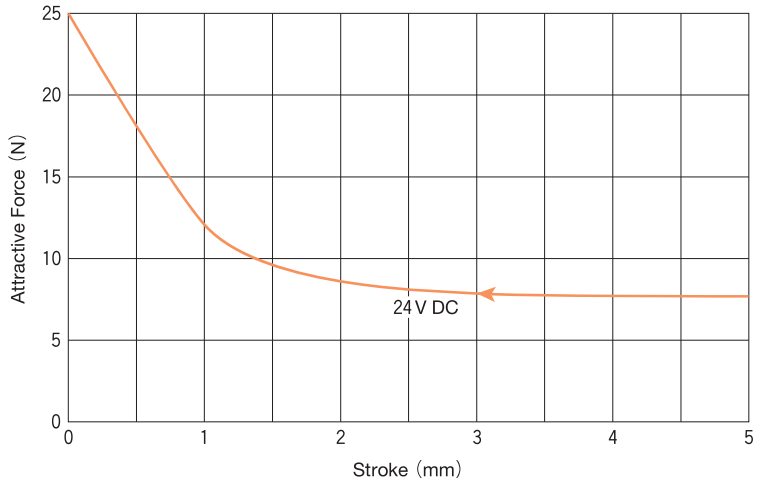
TSB-1005

◆Main Specifications

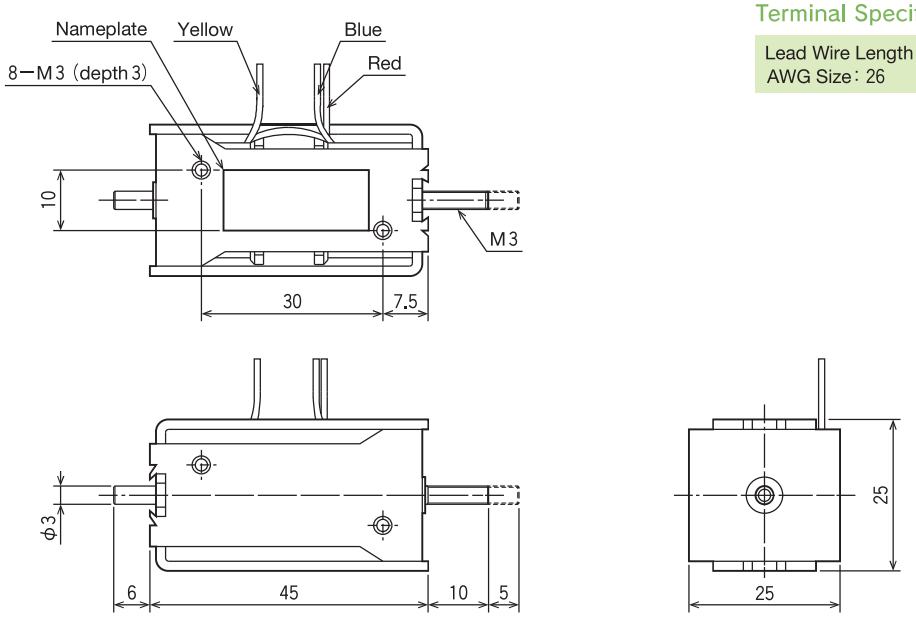
Working Voltage	24 (V DC)
DC Resistance	20 (Ω)
External Resistance	10 (Ω) 〈4 (W) or more〉
Duty Cycle	20 (%) or less
Max ON Time	40 (msec)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 12 \times W$ (℃) $K \fallingdotseq 12$ (℃/watt)
Temperature Rise Time Constant 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 (msec)

*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

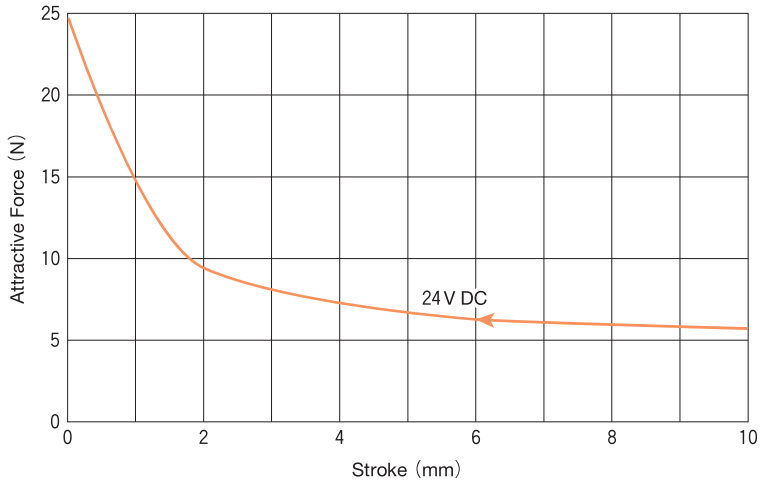
TSB-1010

◆Main Specifications

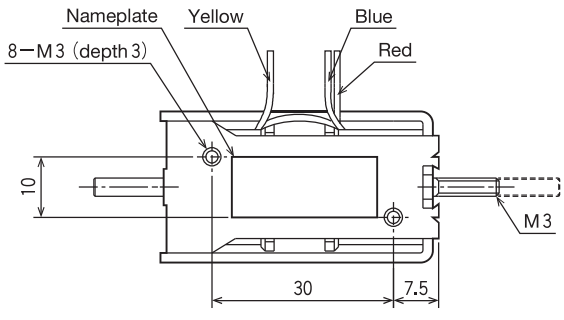
Working Voltage	24 (V DC)
DC Resistance	20 (Ω)
External Resistance	15 (Ω) 〈4 (W) or more〉
Duty Cycle	20 (%) or less
Max ON Time	40 (msec)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 12 \times W$ (℃) $K \fallingdotseq 12$ (℃/watt)
Temperature Rise Time Constant 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	120 (g)
Non-Excited Holding Force	10 (N) or more
Response Speed *1	20 (msec)

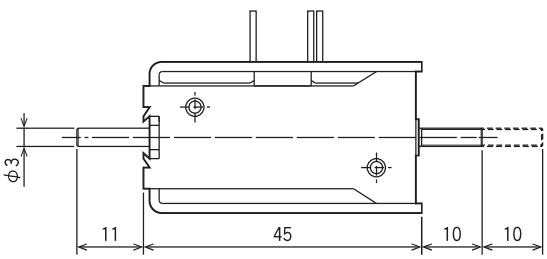
*1: measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage 24 V DC.

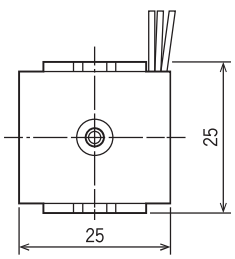
◆Attractive Force Data



◆External Dimensions (mm)







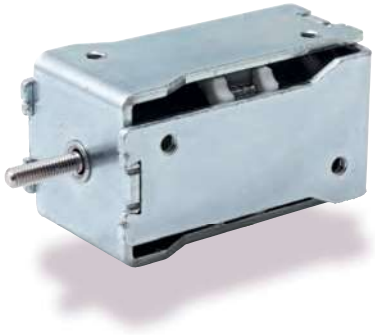
Terminal Specifications

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

TSB-LS (Low-Noise Model)

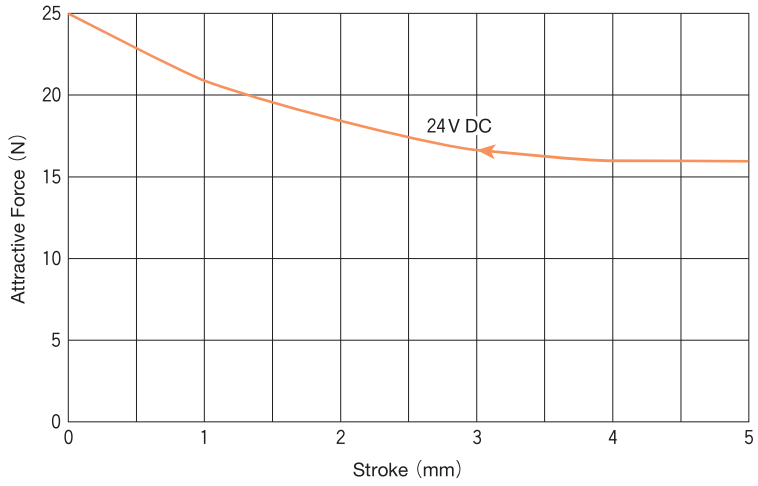
◆Main Specifications

Working Voltage	24 (V DC)
DC Resistance	5 (Ω)
External Resistance	1 (Ω) 〈12 (W) or more〉
Duty Cycle	5 (%) or less
Max ON Time	40 (msec)
Coil Saturation Temperature Rise $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 12 \times W$ (℃) $K \fallingdotseq 12$ (℃/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	120 (g)
Non-Excited Holding Force	2 (N) or more
Response Speed *1	6 (msec)

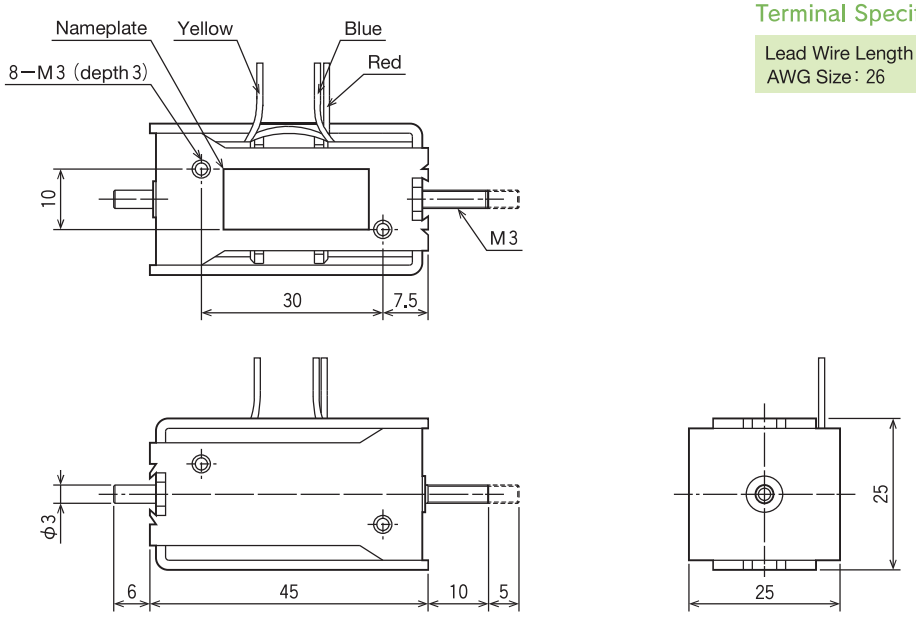


*1: measurement conditions: measured by Takano Co. in a standard testing environment, with no load, shaft in a horizontal position, applied voltage 24 V DC.

◆Attractive Force Data



◆External Dimensions (mm)



Terminal Specifications

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

LATCHING SOLENOID VALVES

Power-Saving

- Power is supplied only when operating.

Low Heat

- Keeps the valve open and closed after it moves.

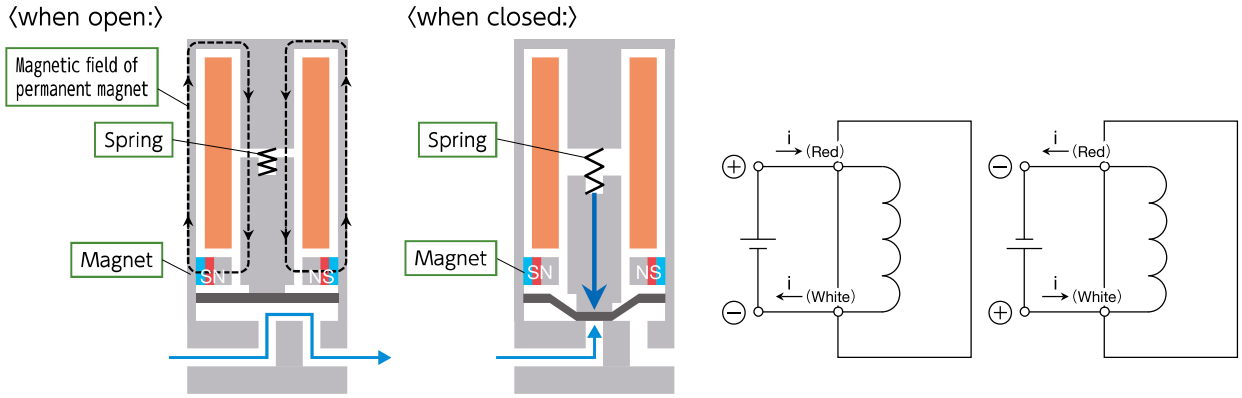
High Chemical Resistance

- Body: SUS
- Diaphragm: FKM

FEATURES

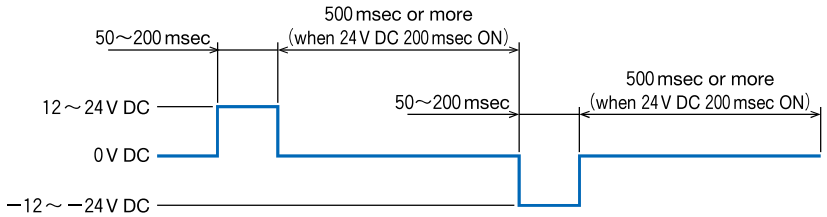
1 Product Characteristics

Open: While the valve is open, the magnetic field of the permanent magnet rotates in the direction of the dotted line in the figure below to maintain its closed state.
Close: While the valve is closed, a spring inside the operating iron core maintains the deviation state.



2 Operation

Red lead wire (Voltage +), White lead wire (Voltage 0 V DC) : (valve open)
Red lead wire (Voltage 0 V DC), White lead wire (Voltage +) : (valve open)



TSBV-0801

◆Main Specifications

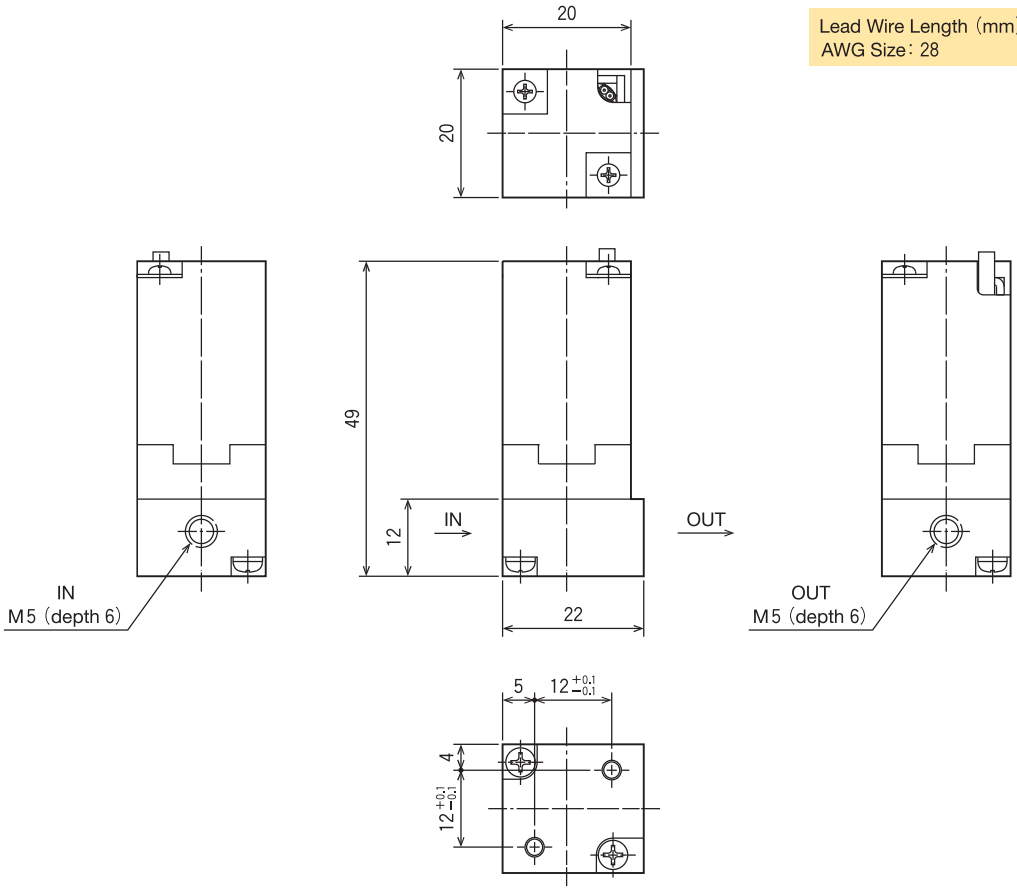
Valve Type	Diaphragm Type Direct Operated Poppet
Fluid	Gas: Air, Nitrogen, Oxygen, Argon, etc.*1
	Liquid: Water, Pure Water, Chemicals*1
Operating Pressure Range	0～500 (kPa)
Connection Bore Diameter	M5
Proof Pressure	1.0 (MPa)
Fluid Temperature	Gas: 0～50 (℃)
	Liquid: 5～50 (℃)
Ambient Temperature	0～50 (℃)
Ambient Humidity	30～90 (%)
Flow Factor Cv	0.06
Orifice Diameter	1.1 (mm)
Mass	106 (g)
Life Cycle/Durability	100,000 (cycles)
Material of Contact Area	Body: SUS
	Diaphragm: FKM
Material of Gas Contact Area	SUS316, Electromagnetic SUS, FKM
Response Speed*2	30 (msec) or less
Electrical Specifications	
Working Voltage	12～24 (V DC)
DC Resistance	25 (Ω)
Heat-Resistant Class	Class E (120℃)

*1: The fluid does not corrode materials in the contact area.
*2: Measurement conditions Standard test environment: Vertical drive state, 12 (V DC) Application.

◆External Dimensions (mm)

Terminal Specifications

Lead Wire Length (mm): 275
AWG Size: 28



GENERAL PURPOSE SOLENOID VALVES

Voltage Power/ High Speed

- Drives 0.7 (MPa) for 5.5 (msec)

Power-Saving

- Power saving by switching to holding voltage.

High Durability

- 200 million cycles

*(as tested by Takano Co. in a standard testing environment)

FEATURES

1 Voltage Power/High Speed

Drives 0.7 (MPa) for 5.5 msec.

3 Power-Saving

Capable of holding valve closed by low voltage.

2 High Durability

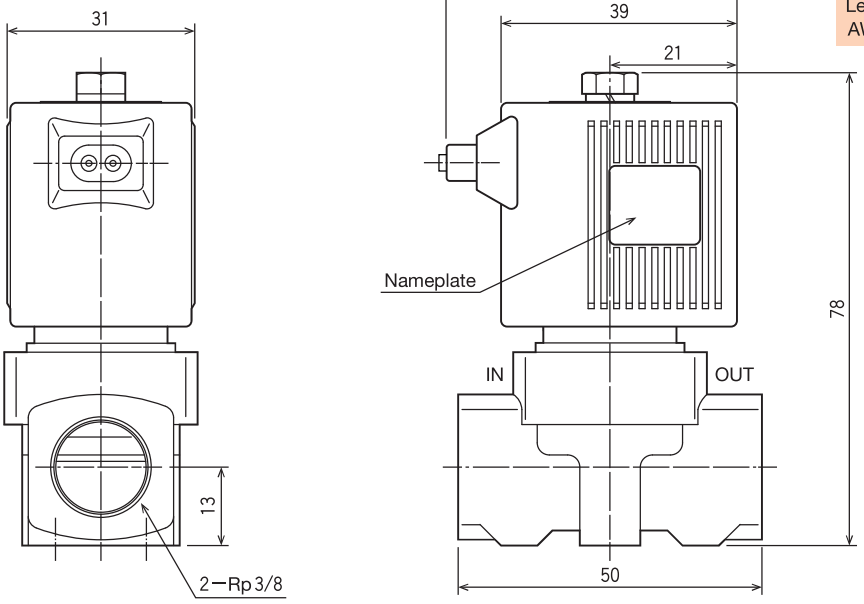
Durability 200 million cycles (600 million cycles with parts maintenance).

◆Main Specifications

Valve Type	Direct Operated Poppet
Valve Operation	NC type
Fluid	Air, Nitrogen, Argon *1
Operating Pressure Range	0～0.7 (MPa)
Connection Bore Diameter	Rp 3/8
Proof Pressure	1.05 (MPa)
Fluid Temperature	5～60 (℃)
Ambient Temperature	5～50 (℃)
Ambient Humidity	60～90 (%)
Flow Factor Cv	1.7
Orifice Diameter	14.0 (mm)
Valve Effective Cross Section	30 (mm^2)
Leakage *2	120 (cc/min) *3
Mounting Orientation	at will
Mass	300 (g)
Life Cycle/Durability *4	200 million (cycles)
Material of Contact Area	Body: Aluminium (ADC 12)
	Seal: Nitrile rubber (H-NBR)
Electrical Specifications	
Working Voltage	48 (V DC)
Holding Voltage	8 (V DC)
Allowable Voltage Fluctuation	±10 (%)
Duty Cycle	50 (%) or less
DC Resistance	30 (Ω)
Heat-Resistant Class	Class B (130℃)

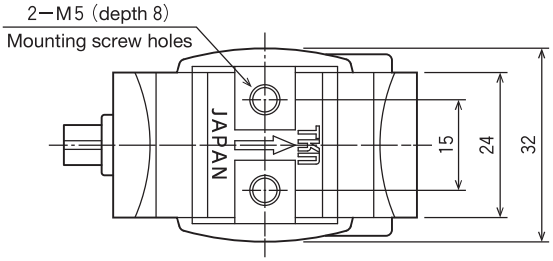
*1: Use a non-corrosive liquid as a contact material.
*2: Leakage is the sum of internal and external leakage.
*3: Subject to a primary measuring pressure of 0.5 MPa.
*4: Based on Takano's standard test environment.

◆External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm): 300
AWG Size: 20

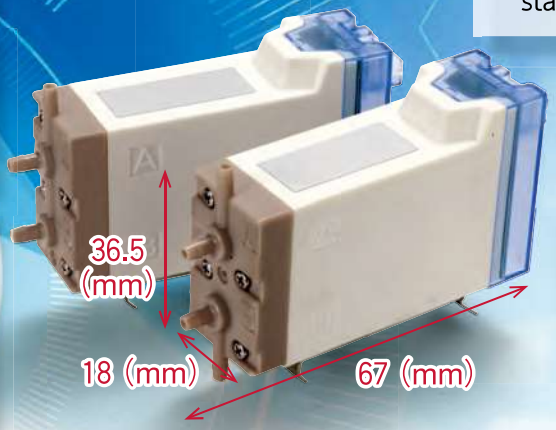


COMPACT 2-WAY/3-WAY SOLENOID VALVES FOR CHEMICAL LIQUIDS

High Flow Rate
- Orifice Diameter: ϕ1.3 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$\mu\ell$ 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.

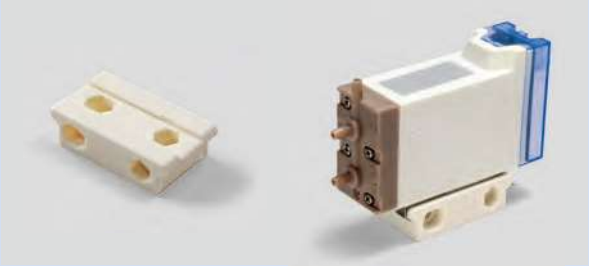
2 Barbed Tube Fitting
Designed to be able to withstand −75 ~ 250 kPa, so tubing will not be detached under high-pressure loads. (Compatible with tubes of diameter ϕ2 mm)

3 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.

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)

◆Main Specifications

Model Number *1	2×2-Way	3-Way
	W13X-XXX	
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 (℃)	
Ambient Temperature	0～50 (℃)	
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℃)	

◆Model Number Key

W | 13 | X | - | X | XX

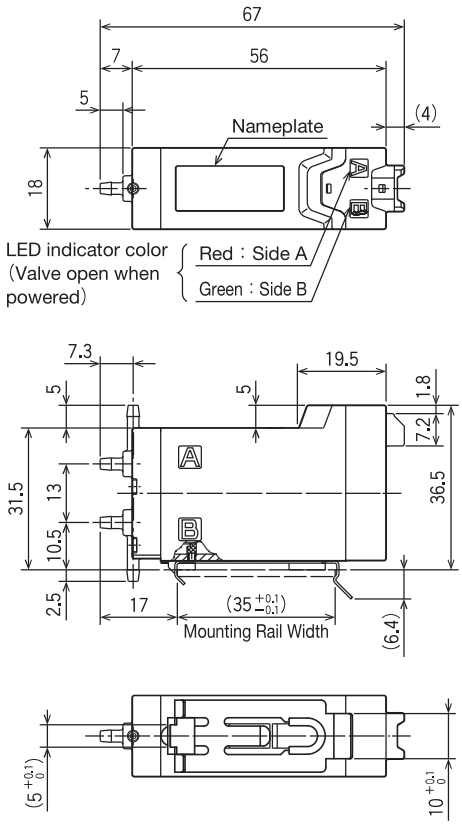
Standard Code

Code	Meaning
①Orifice Diameter	
13	φ1.3mm
②Mounting Variations	
A	DIN Rail (t＝1.5)
B	Resin Attachment
③Number of Ports	
2	2-Way
3	3-Way
④Working Voltage	
5A	24V DC
6A	12V DC

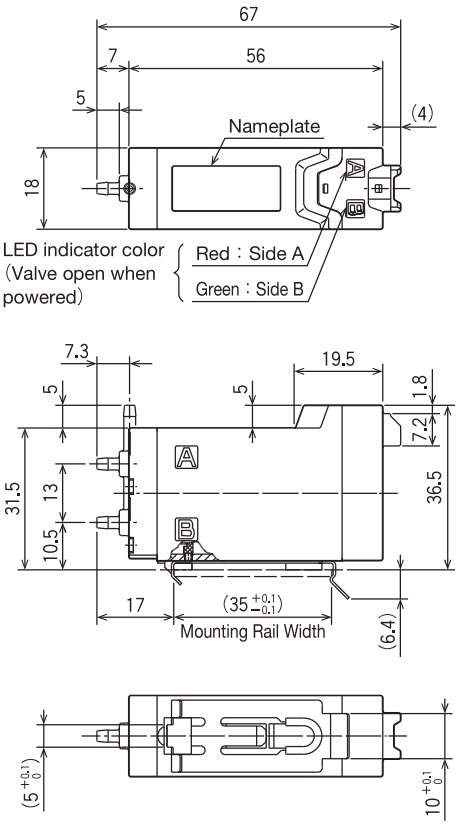
＊1: the "X" portion represents this model's installation variations. Please choose between A or B (see previous page).
＊2: please use chemicals that do not corrode the materials used in the wetted part of the valve.
＊3: measured by Takano Co. in a standard testing environment.

◆External Dimensions (mm)

〈W13A-25A〉



〈W13A-35A〉



Terminal Specifications

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

PINCH VALVES

High Durability

- 2,000,000 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.

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.

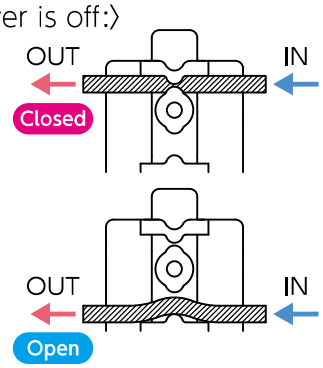
*as tested by Takano Co. in a standard testing environment

FEATURES

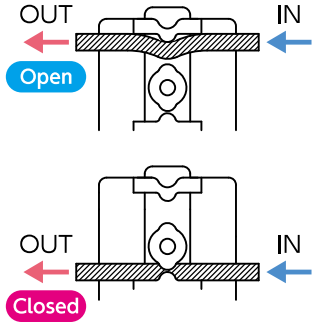
1 Multi-Purpose

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

〈when power is off:〉

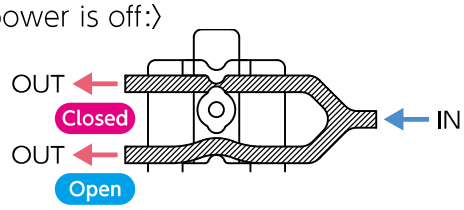


〈when power is on:〉

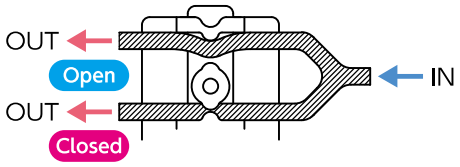


When used with two tubes and the assistance of a Y-pipe, it can function as a 3-way valve to divert fluids.

〈when power is off:〉

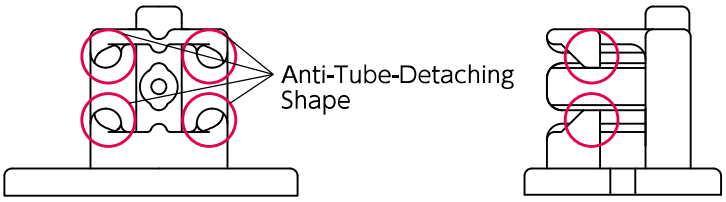


〈when power is on:〉



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.



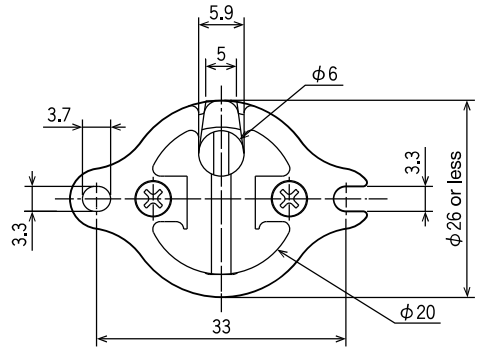
TPV Series

◆Main Specifications

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 (℃)	
Ambient Temperature	0～50 (℃)	
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℃)	

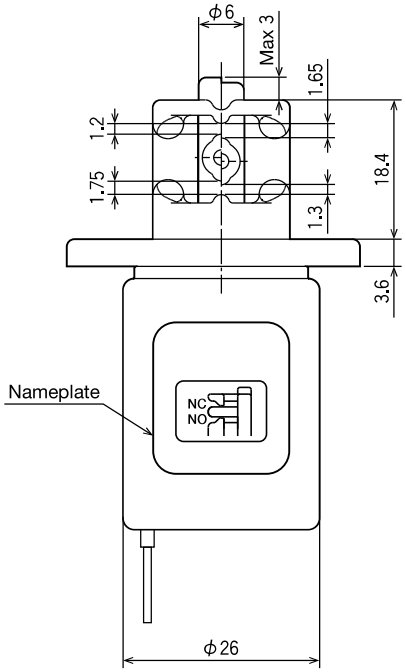
*1: please use chemicals that do not corrode the materials used in the wetted part of the valve.
*2: PharMed is a registered trademark of Saint-Gobain Performance Plastics Corporation.
*3: measurement conditions: measured by Takano Co. in a standard testing environment.

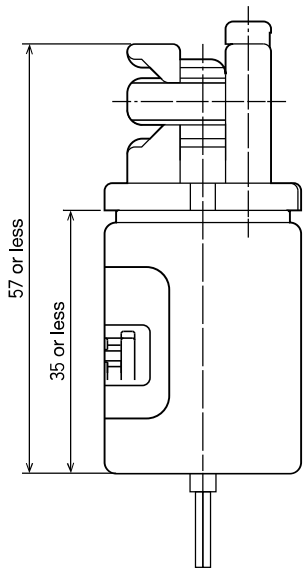
◆External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm): 550
AWG Size: 28





PROPORTIONAL SOLENOID VALVES

High-Precision

- High resolution of control current values.

Produced in a Clean Room

- Low particle count with oil-free treatment.

Customized

- Desired shape and characteristics.

FEATURES

1 High Precision

High resolution of control current value and Highly accurate flow rate adjustment.

2 Produced in a Clean Room

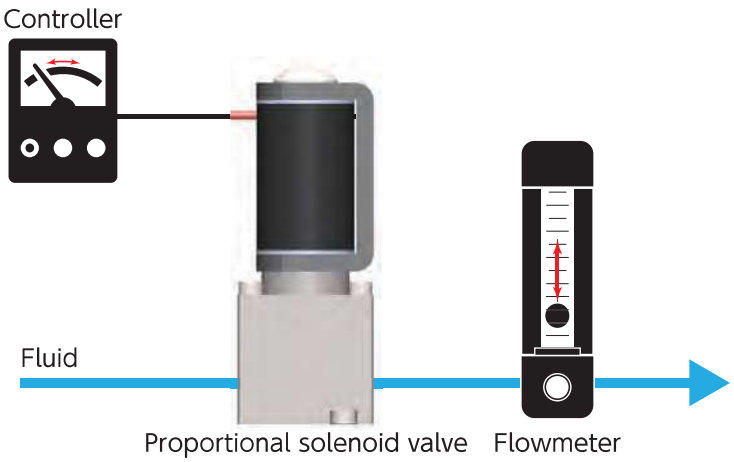
Long life without flow turbulence due to the non-slip structure of the drive parts including the valve plug.

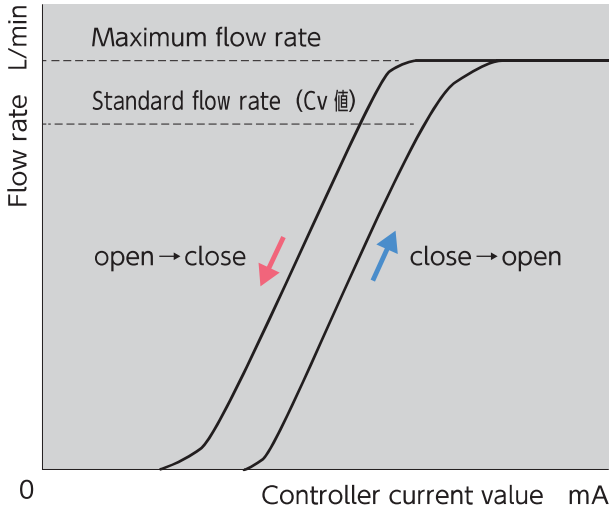
3 Customized

preferred design in terms of Plumbing Fittings, shape, characteristics, etc.

◆Outputs flow proportional to current

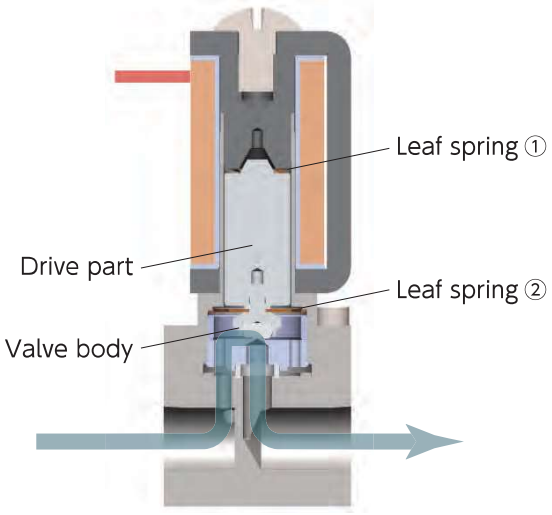
Cv value is calculated at standard flow rate, and the volve itself can output up to “maximum flow rate”, which is more than the standard flow rate, so that output flow rate does not decrease during continuous use.





◆High-precision, longer-lasting structure with no sliding drive unit

The drive unit, including the valve disc, is supported vertically by the plate springs ① and ②, which eliminates sliding parts.
Long lifetime due to less wobble and flow rate variation during control and no deterioration caused by sliding.
Stable proportional characteristics are ensured by incorporating a high suction force structure, allowing a small solenoid to control a large flow rate.
The valve body is made of PIFE material, which is highly corrosion resistant and prevents sticking of the valve body and seat, which occurs with rubber valve bodies.



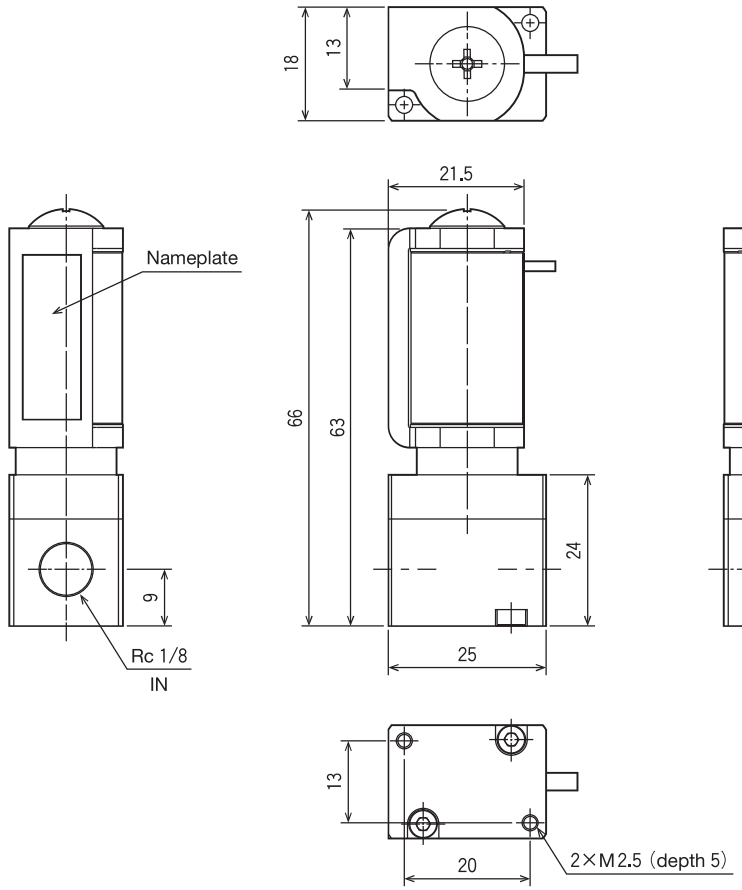
PSV-03TB Series

◆Main Specifications

Model Number	PSV-03TB-002	PSV-03TB-005	PSV-03TB-030
Control Flow Range	0.04～2 (L/min)	0.1～5 (L/min)	0.6～30 (L/min)
Maximum Output Current	2.4 (L/min)	6 (L/min)	36 (L/min)
Valve Type	Direct Operated Poppet		
Valve Operation	NC type		
Fluid	Air, Oxygen, nitrogen, hydrogen, helium, carbon dioxide, methane, etc.*1		
Operating Pressure Differential Range	0.05～0.5 (MPa)	0.05～0.5 (MPa)	0.1～0.3 (MPa)
Connection Bore Diameter	Rc1/8		
Proof Pressure	1.0 (MPa)		
Fluid Temperature	5～50 (℃)		
Ambient Temperature	5～50 (℃)		
Ambient Humidity	30～85 (%)		
Flow Factor Cv	0.007	0.018	0.109
Orifice Diameter	0.7 (mm)	1.5 (mm)	3.6 (mm)
Leakage*2	1 (cc/min) or less*2		
Mounting Orientation	at will*3		
Mass	140 (g)		
Life Cycle/Durability*4	2,500,000 (cycle)		
Material of Contact Area	Body: SUS		
	Seal: PTFE		
Material of Gas Contact Area	SUS316, PTFE, Electromagnetic SUS, FKM		
Electrical Specifications			
Rated Voltage	24 (V DC)		
Control Voltage Range	0～160 (mA)		
Heat-Resistant Class	Class A (105℃)		

＊1: Use a non-corrosive liquid as a contact material.
＊2: Leakage is the sum of internal and external leakage.
＊3: Subject to a primary measuring pressure of 0.5 MPa.
＊4: Based on Takano's standard test environment.

◆External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm): 110
AWG Size: 28

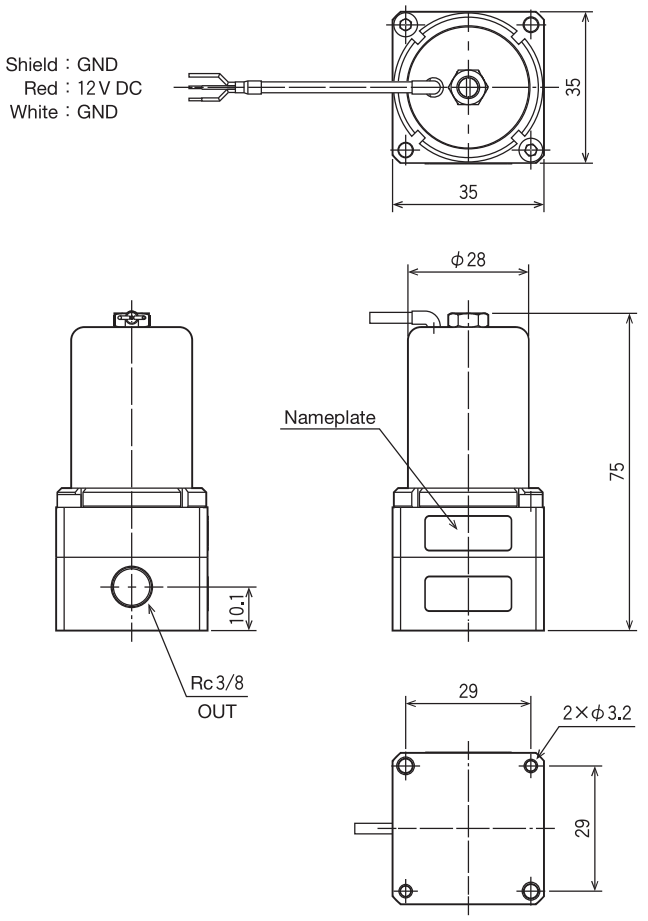
PSV-212T

◆Main Specifications

Control Flow Range	2～150 (L/min)
Maximum Output Current	180 (L/min)
Valve Type	Direct Operated Poppet
Valve Operation	NC type
Fluid	Air, Oxygen, nitrogen, hydrogen, helium, carbon dioxide, methane, etc.*1
Operating Pressure Differential Range	0.2～0.5 (MPa)
Connection Bore Diameter	Rc 3/8
Proof Pressure	1.0 (MPa)
Fluid Temperature	5～50 (℃)
Ambient Temperature	5～50 (℃)
Ambient Humidity	30～85 (%)
Flow Factor Cv	0.26
Orifice Diameter	7.4 (mm)
Leakage*2	100 (cc/min) or less*2
Mounting Orientation	at will*3
Mass	420 (g)
Life Cycle/Durability*4	2,500,000 (cycle)
Material of Contact Area	SUS
	FKM
Material of Gas Contact Area	SUS 316, Electromagnetic SUS, FKM
Electrical Specifications	
Rated Voltage	12 (V DC)
Control Voltage Range	0～110 (mA)
Heat-Resistant Class	Class A (105℃)

*1: Use a non-corrosive liquid as a contact material.
*2: Leakage is the sum of internal and external leakage.
*3: Subject to a primary measuring pressure of 0.5 MPa.
*4: Based on Takano's standard test environment.

◆External Dimensions (mm)



Terminal Specifications

Lead Wire Length (mm) : 255
AWG Size : 28

COMPACT MASS FLOW CONTROLLERS

Low Cost
- All-in-one valve, sensor, and controller.

Lightweight/Compact
- Compact (200 g)

High Speed/High Precision
- within 2 seconds (±5% F.S.)

FEATURES

1 Low Cost

Proportional solenoid valve with flow sensor measurement and controller for high reliability and low cost.

2 Lightweight/Compact

incorporates a small proportional solenoid valve, flow sensor, and controller, making it lightweight (200 g) and compact compared to separate installations.

3 High Speed/High Precision

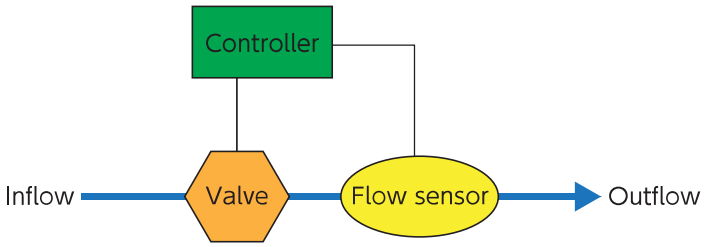
uses a built-in proportional solenoid valve and flow sensor to provide stable flow control within 2 seconds over the entire flow range.

4 Customized

Create the desired piping joint, shape and characteristics.

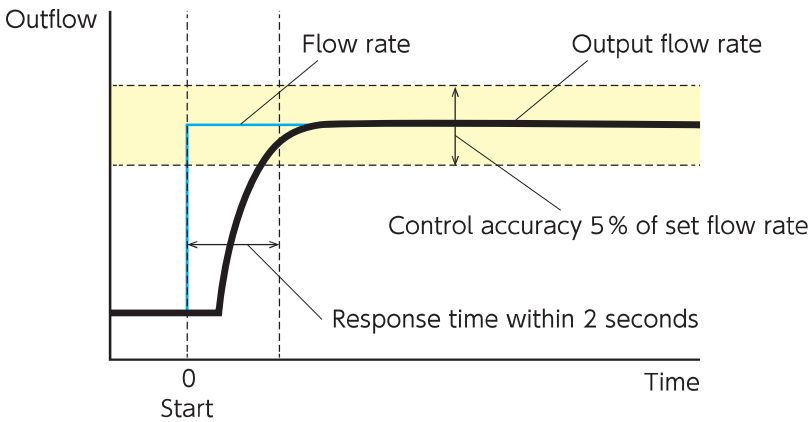
◆All-in-one valve, sensor, and controller

Compact solenoid valve with integrated flow sensor and controller, weighing only 200 g, lighter and more compact than when installed separately and can be custom made at an even lower cost.



◆Flow Control

By inputting the set flow rate, the output is matched to that flow rate.
Response time to arrive at the set flow rate is within 2 seconds, and control accuracy of output flow rate is within ±5% of the set flow rate.
Output flow rate can be maintained even with changes in pressure and temperature, making it ideal for applications where the same flow rate is to be applied for extended periods of time or where gradual changes in flow rate are desired.

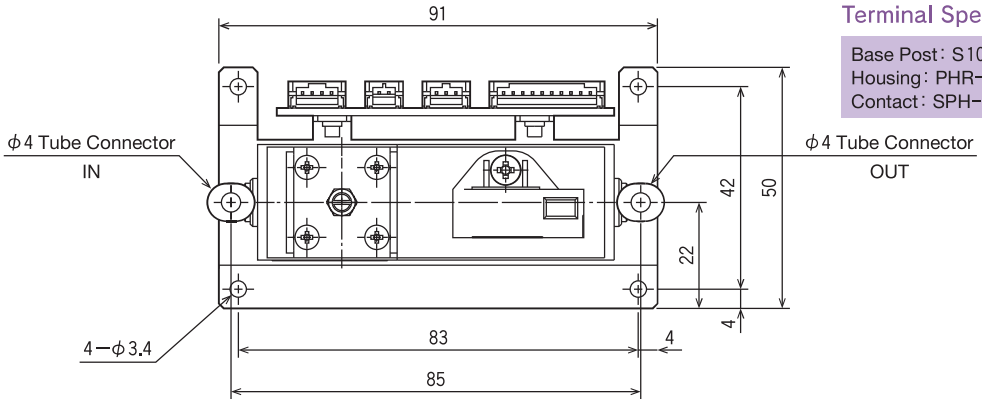


◆Main Specifications

Model Number		SMFC-0005	SMFC-0020
Full Scale Flow Rate		5 (L/min)	20 (L/min)
Control Flow Range	Control Range	4～100 (%) F.S. (0.2～5 L/min)	2～100 (%) F.S. (0.4～20 L/min)
	Response Speed	Set flow rateSet flow rate ±5 %, within 2 seconds	
	Flow Control Accuracy	±5.0 (%) R.D. (2＜Q≦5 L/min) ±3.0 (%) F.S. (0.2＜Q≦2 L/min)	±5.0 (%) R.D. (10＜Q≦20 L/min) ±3.0 (%) F.S. (0.4＜Q≦10 L/min)
	Reproducibility	±1.5 (%) F.S.	
Valve Type		Direct Operated Poppet	
Valve Operation		NC Type	
Fluid		Air, oxygen, nitrogen *1	
Operating Pressure Differential Range		0.05～0.2 (MPa)	0.15～0.3 (MPa)
Connection Port		IN: φ4 Tube Connector	
		OUT: φ4 Tube Connector	
Proof Pressure		0.3 (MPa) *2	
Fluid Temperature		0～50 (℃)	
Ambient Temperature		5～50 (℃)	
Ambient Humidity		30～85 (%) RH (No condensation)	
Mounting Orientation		at will	
Mass		200 (g)	
Material of Gas Contact Area		PPS, Stainless Steel, Fluoroelastomer, Brass, Silicon (sensor part)	
Rated Voltage		12 (V DC)	
Flow Rate		Analog Inputs: Input range 1～5 (V DC)	
		Serial Singal: RS232C	
		Setting Resolution: 0.01 (L/min)	

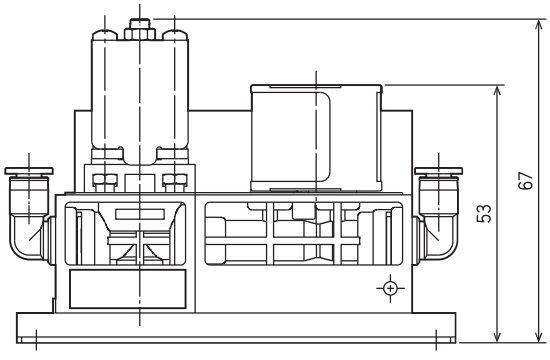
＊1: Use a non-corrosive liquid as a contact material.
＊2: The sensor part should be 0.05 (MPa).

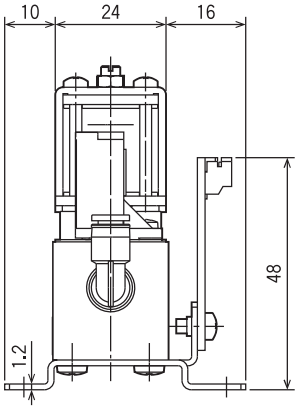
◆External Dimensions (mm)



Terminal Specifications

Base Post: S10B-PH (JST)
Housing: PHR-10 (JST)
Contact: SPH-002T-P0.5 (JST)





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.

2 Low Residual Magnetism

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

3 Custom Design Solutions

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

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.

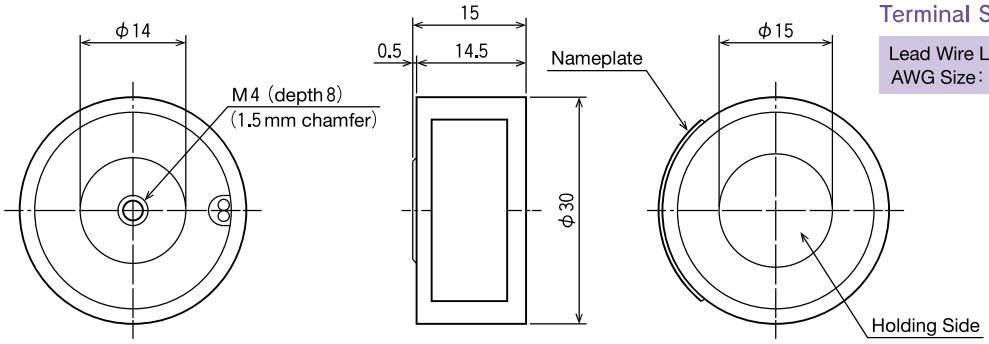
TMH-3015

◆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 $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 22 \times W$ (℃) $K \fallingdotseq 22$ (℃/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): 300
AWG Size: 28

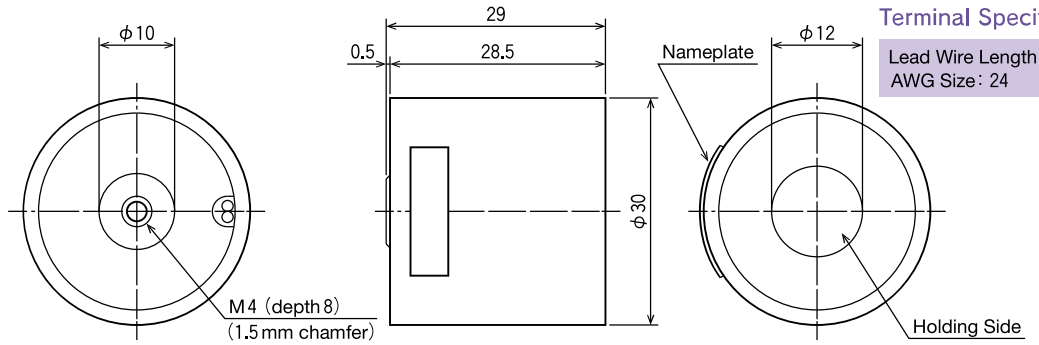
TMH-3029A

◆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 $\Delta\theta_s$ (at 20℃)	$\Delta\theta_s \fallingdotseq 19 \times W$ (℃) $K \fallingdotseq 19$ (℃/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	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): 200
AWG Size: 24

ELECTROMAGNETIC ACTUATORS Vol.11

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