

DC Solenoids

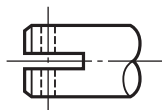


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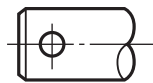
Features

- The desired attraction force can be provided.
The attraction force matching to the actual load can be provided by changing the shapes of the mating sections of the movable and stationary iron cores.
- The exciting current is constant regardless of the stroke.
The exciting current of an AC solenoid varies depending on the stroke. With a DC solenoid, however, the exciting current is determined by DC resistance only and is constant regardless of the stroke.
- Operation noise is reduced.
If there is a clearance between the movable and stationary iron cores of an AC solenoid, the coil may be burnt. In the case of a DC solenoid, its exciting current is constant regardless of the clearance of the movable and stationary iron cores. Therefore, a shock-absorbing material can be provided between the movable and stationary iron cores to reduce operation noises.
- No buzzing noise is generated.
DC solenoids do not generate the buzzing noise AC solenoids generate due to the pulsating attraction force.
- Constant operation time.
The operation time of the DC solenoid is constant regardless of the frequency. This is because it is driven by direct current.
- Long life is ensured.
The service life of the solenoid depends greatly on the amount of mechanical wear between the movable iron core and the guide (pipe). The sliding section of the guide is specially treated to extend its service life.

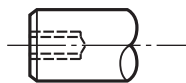
Item		Standard	Optional
Coil	Connection Method	Terminals, Lead Wires or Lead Wires With Connectors	—
	Insulation Class	Class A (105°C)	Class E, Class B, Class F, Class H
	Safety Standards	—	Materials Conforming to the UL and CSA Standards
	Accessories	—	Temperature Fuse, Diode, etc
	Winding	Single Winding	Double-Winding
	Bobbin	With Pipe or Without Pipe	—
Movable Iron Core	Joint Method	Methods Shown below or other Methods	—
	Surface Treatment	Nickel-Plated, Galvanized, MoS ₂ Coating or Teflon Coating	—
Pipe	Inner Surface Treatment	—	MoS ₂ Coating, Teflon Coating
Life	—	50,000 to 300,000 Operations	(Contact Us.)
Construction	Attraction Method	Pull Type	Push Type
	Silent	E-ring Rubber, Silencing Rubber (Except for Self-Sustaining Models)	—



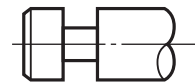
Slit



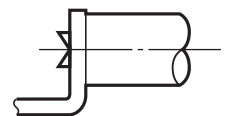
Single hole



Tapped hole

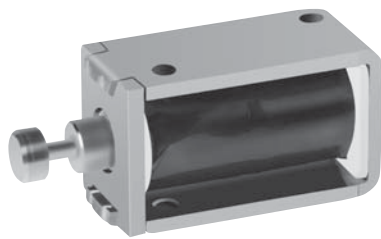


Groove

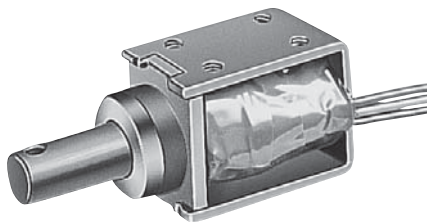


Caulking

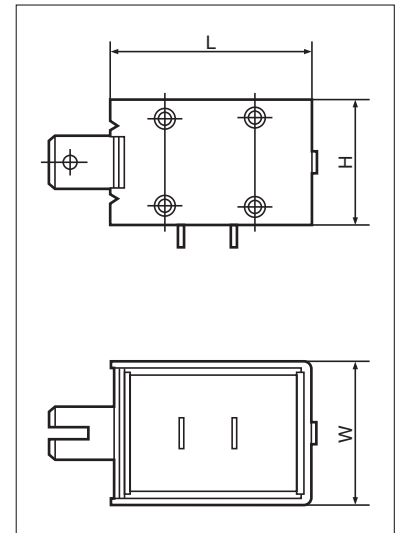
Type		Item	Model No.	Dimensions (W) × (H) × (L) mm
DC Solenoid		PM Type	JPM1316	12 × 9.5 × 21
Self-sustaining Solenoid (SELMAG)		with External Permanent Magnet	JSM5011	16 × 14 × 26.5



PM Type



Self-Sustaining Solenoid
(with External Permanent)



Before using this catalog, please pay special attention to the following items so that you may select the most economical and effective model for your application.

■Continuous operation and intermittent operation

DC solenoid is used continuously or intermittently depending on the application. Power consumption is determined by the duty cycle and operation time (maximum power ON time) for each cycle.

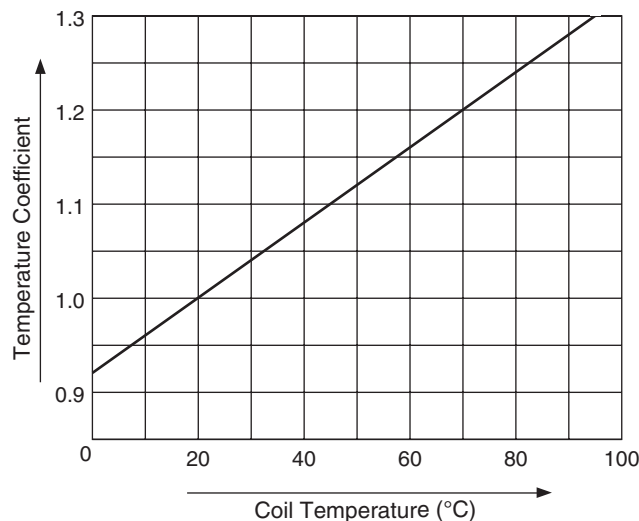
$$\text{Duty cycle} = \frac{\text{ON time}}{\text{ON time} + \text{OFF time}} \times 100\%$$

If the maximum power ON time in one cycle exceeds three minutes, the operation is regarded as continuous.

This judgement differs slightly depending on the shape of the solenoid.

■Change in attraction force in relation to temperature

The attraction force drops as the temperature rises. This is because the coil resistance increases due to temperature rise and the ampere turn (AT) decreases. The coil resistance changes in relation to the coil temperature according to the coefficient as shown below.



■Change in attraction force depending on the voltage

As the power voltage changes, the ampere turn (AT) and attraction force changes. This must be remembered when you set the attraction force.

■Special featured solenoid

In addition to the standard products described in this catalog, Hosiden can offer many optional products. They include a silencing model that reduces metallic noise generated when the movable iron core bumps the stationary iron core during attraction. There is also a model equipped with a thermal fuse to prevent the coil from burning and causing a fire due to external factors such as environmental condition. If the temperature exceeds the safety limit, the power to the coil is cut off and the safety of the equipments shall be secured. Push-pull and long-life models are also available. Contact us for details regarding these optional products. Hosiden is ready to respond to custom design based on customer needs.

■Insulation class

Allowable maximum temperature values for the corresponding insulation classes are determined as shown in the table below according to JIS C 4003 (Electric equipment insulation class). Solenoids must comply with this standard. Normally, solenoids are categorized as insulation class A. In this class, the continuous rating of the exciting power is determined under the condition of the allowable coil temperature rise 65°C at the ambient temperature 40°C. Contact us if a different ambient temperature or insulation class would be required.

Insulation Class	Y	A	E	B	F	H	C
Allowable Maximum Temperature	90	105	120	130	155	180	More than 180

■Measurement of rise in temperature

The resistance method and the thermometer method are usually used to measure the rise in temperature of electric devices. The rise in temperature of the coil may not be accurately monitored by measuring the outside temperature, since the temperature gradient between the inside and the outside of the solenoid coil is considerably high. Therefore the mean temperature of the coil is usually monitored utilizing the resistance coefficient of copper by the resistance method.

● Calculation formulas for the resistance method

$$\theta = \left(\frac{R_2}{R_1} - 1 \right) (234.5+t_1) \pm \Delta t$$

t_1 : Temperature before the solenoid is energized (°C)

t_2 : Temperature after the solenoid is energized (°C)

R_1 : Resistance before the solenoid is energized (Ω)

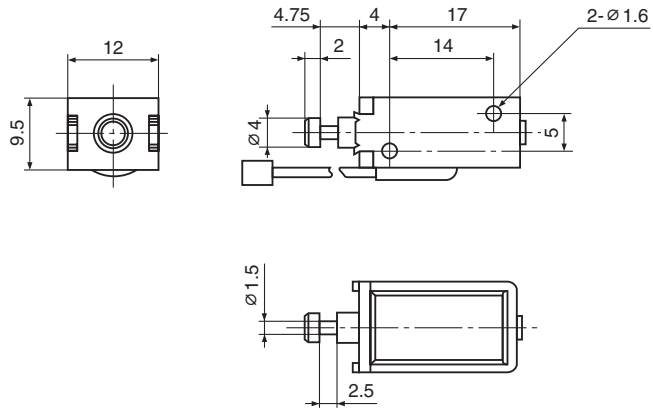
R_2 : Resistance after the solenoid is energized (Ω)

Δt : Change in ambient temperature from the time before the solenoid is energized to the time following the temperature rise.

(Add Δt if the ambient temperature rises.

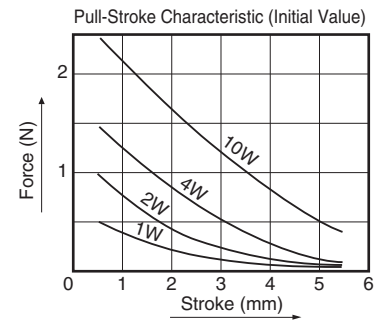
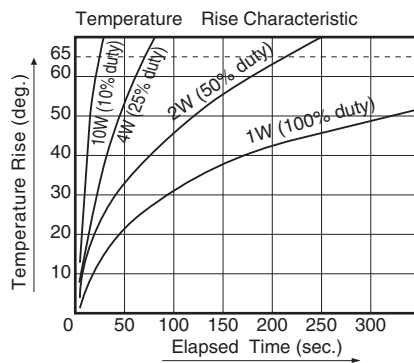
Subtract Δt if the ambient temperature drops.)

JPM1316



Continuous Duty : 1W

Voltage (V)	Resistance (Ω)	Current (mA)
6	36	167
12	145	83
24	576	42



Features

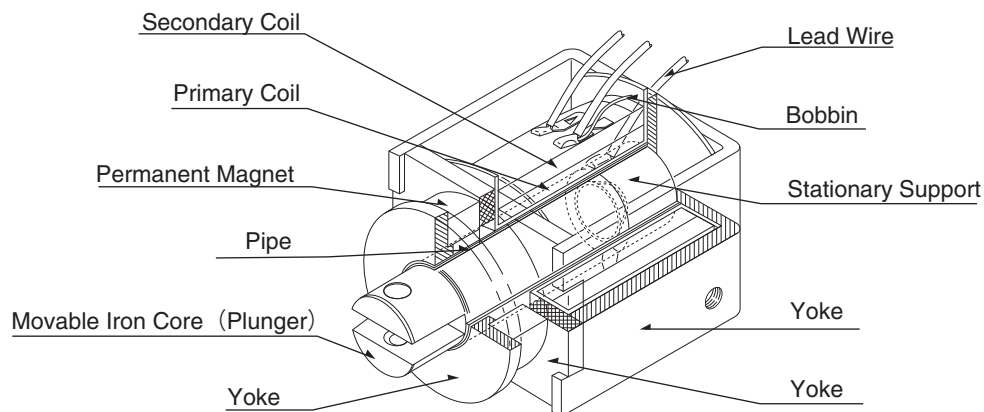
- The plunger is attracted by electrical pulses. The attraction continues after the power is turned off. Even if the sustain condition is maintained for many hours, no electric power is consumed and the temperature does not rise.
- The magnetic energy of the magnet allows the solenoid to be powered by a very weak current.
- The plunger is returned to its original position by the minimal force applied by the return coil with pulse current.
- The permanent magnet is hardly affected by the reverse magnetic field generated in the return process. This prevents deterioration of the solenoid performance.

Comparison with DC Solenoid models

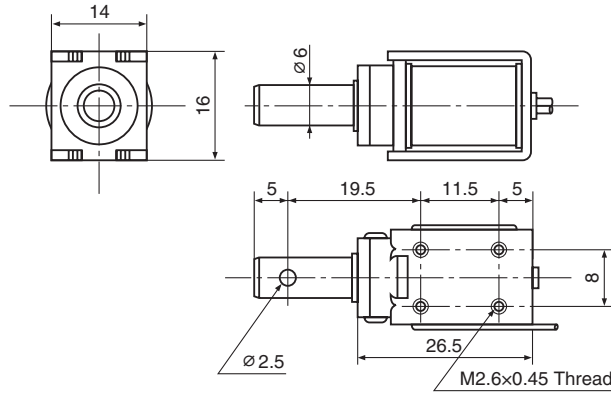
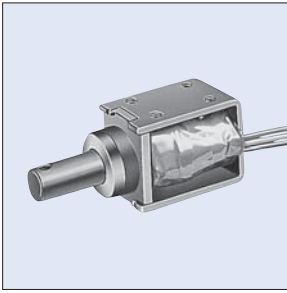
(Condition : the drive power is constant.)

- Size : about 23% smaller
- Weight : about 25% less
- Power Consumption : Reduced since no power is required during sustain.
- Rise In Temperature : No heat generation
- Drive Circuit :

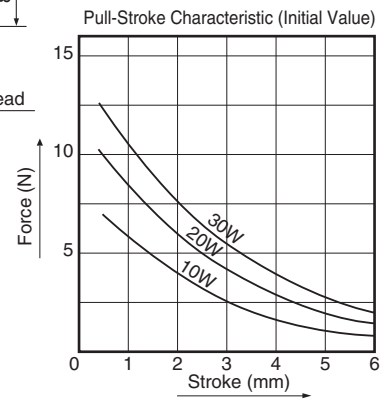
	Return Circuit	Sustaining Circuit
Self sustaining model	Required	Not required
DC Solenoid model	Not required	Required



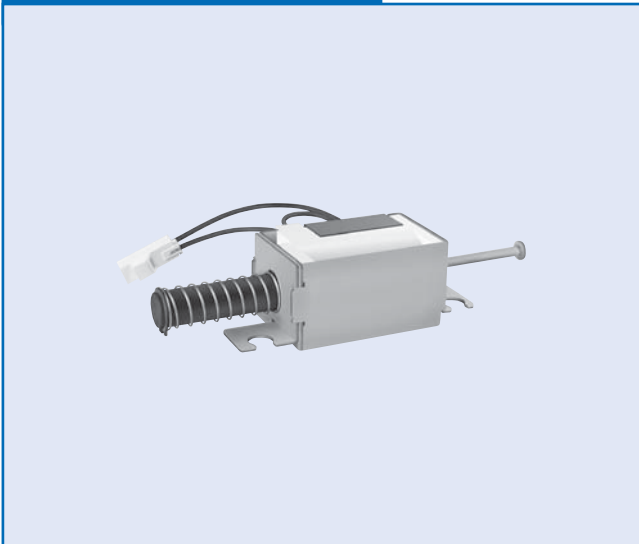
JSM5011



Self Holding Force	7.84N min.
Force for Release	1.96N min.
Minimum on Time of Power Supply	100ms min.



JPM1535



DC Solenoid

Application	For opening the refrigerator door
Feature	High torque with push type

JPM1562

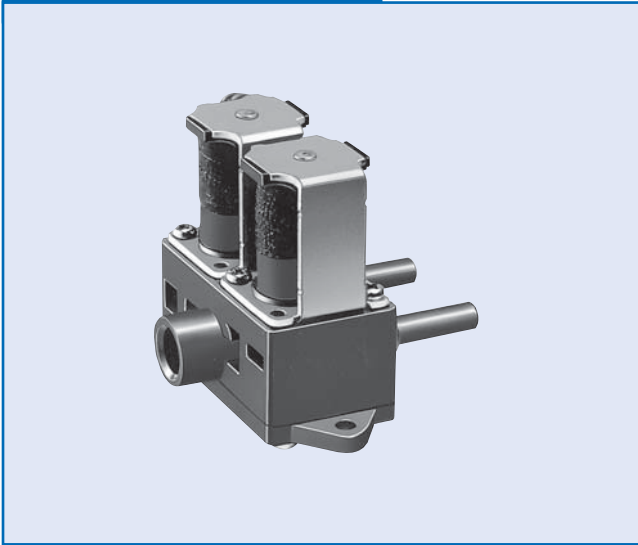


DC Solenoid

Application	For releasing the shift lever lock
Feature	Silent type

Exhibited with thanks to customers.

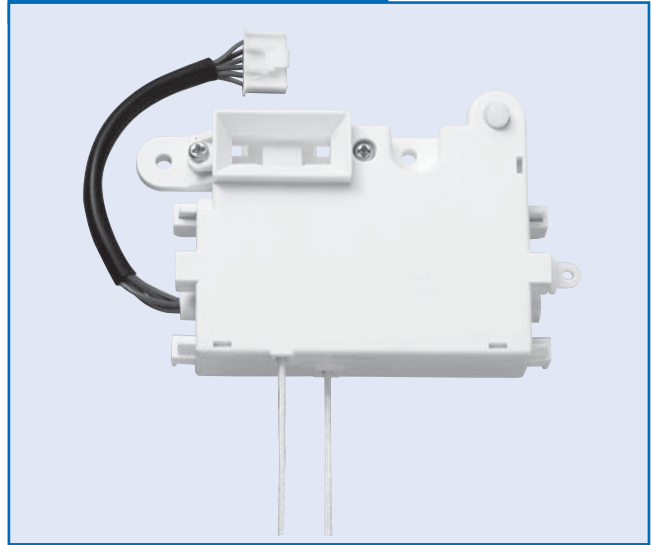
JPM1455



Solenoid Valve

Application	For switching the warm water flow of washing toilet
Feature	Water-resistant type

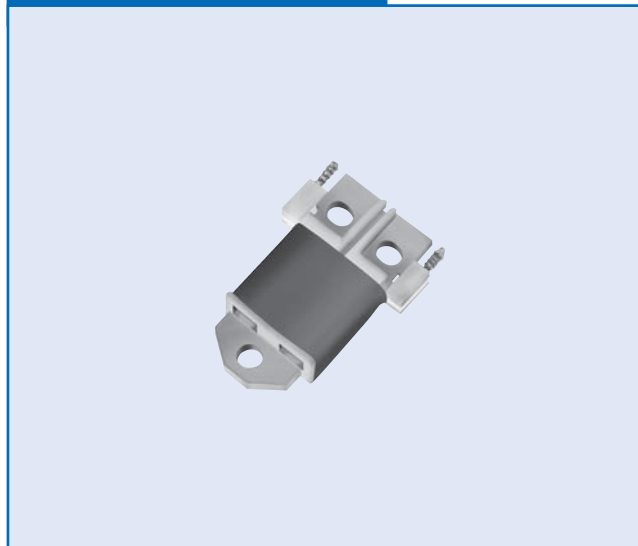
JPM1643



Door Lock Solenoid

Application	For locking the door of washing machine
Feature	Power saving type

JTM5009



Latch Magnet

Application	For driving the camera shutter
Feature	Self-sustaining type

Exhibited with thanks to customers.

Please specify the following items when making an inquiry or order.
Please feel free to contact with us about custom design.

- (1) **Working Voltage :**
 _____ V DC (Min. _____ V DC, Max. _____ V DC)
 (Also tell us the kind of the power supply used.)

- (2) **Rating :** Continuous Duty
 Intermittent Duty
 In the case of intermittent Duty
 Duty cycle _____ %
 ON time _____ minutes (seconds)

- (3) **Attraction Force**
 Initial value at _____ V DC applied
 After temperature rise at _____ V DC applied
 Stroke _____ mm _____ N _____ mm _____ N
 _____ mm _____ N _____ mm _____ N

- (4) **Conditions of Attraction Force Measurement**
 - Ambient temperature _____ °C
 - A cycle comprised of an ON time of _____ minutes (seconds) and an OFF time of _____ minutes (seconds) is repeated _____ times.
 The force is then measured at _____ V DC.
 - Voltage _____ V DC is applied during measurement.

- (5) **Self Holding Force**
 _____ N (Only Self-sustaining Solenoid)

- (6) **Load**
 Horizontal, vertical and circular motions

- (7) **Rated Current**
 _____ A (_____ V DC) at 20°C

- (8) **DC resistance**
 _____ Ω ± _____ % at 20°C

- (9) **Rise in Temperature**
 Coil _____ °C or less (resistance method)
 Frame _____ °C or less (thermometer method)
 at ambient temperature _____ °C

- (10) **Residual Magnetism** _____ N or less

- (11) **Insulation Class** Class _____

Class Y	Class A	Class E	Class B
90°C	105°C	120°C	130°C

- (12) **Life** _____ operations or more
 Each cycle is comprised of an ON time of _____ seconds and an OFF time of _____ seconds (minutes).

Model No. Table

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Hosiden Corporation

<http://www.hosiden.com>

Head Office

4-33, Kitakyuhoji 1-chome, Yao-city, Osaka 581-0071, Japan
Phone : +81-72-993-1010 Fax : +81-72-994-5101

Japan	Overseas Division : 4-33, Kitakyuhoji 1-chome, Yao-city, Osaka 581-0071, Japan Phone : +81-72-993-1010 Fax : +81-72-924-8937
China	Hosiden Electronics(Shanghai) Co., Ltd. Room 802,Kirin Plaza,No.666 Gu Bei Road,Changning District,Shanghai P.R.China Phone : +86-21-5208-1488 Fax : +86-21-5208-1480 Hosiden (Shenzhen) Co., Ltd. Room2716, Changping Commercial Building, 99 Honghua Road, Futian Free Trade Zone, Shenzhen, China Phone : +86-755-8348-0952 Fax : +86-755-8359-7722
Hong Kong	Hong Kong Hosiden Ltd. Units 1101-02, 11/F., SIELUX House, 698 Prince Edward Road East, San Po Kong, Kowloon, Hong Kong Phone : +852-23238181 Fax : +852-23520425
Taiwan	Taiwan Hosiden Co., Ltd. 7F., No.237, Songjiang Road., Zhongshan Dist., Taipei City 104, Taiwan Phone : +886-2-2503-5611 Fax : +886-2-2517-8573
Singapore	Hosiden Singapore Pte. Ltd. 28, Genting, Lane, #04-07, Platinum 28, Singapore 349585 Phone : +65-6296-8100 Fax : +65-6296-8200
Malaysia	Hosiden Corporation(M)Sdn. Bhd. Lot1,Jalan P/1A,Bangi,Industrial Estate,43650 Bander Baru Bangi, Selangor Darul Ehsan,Malaysia Phone : +60-3-8925-8655 Fax : +60-3-8926-6122
Thailand	Hosiden (Thailand) Co., Ltd. 889 THAI CC TOWER, 21 Floor, Room 212, South Sathorn Road., Kwaeng Yannawa, Khet Sathorn, Bangkok 10120, Thailand Phone : +66-2-673-9760, 9761 Fax : +66-2-673-9762
Germany	Hosiden Europe GmbH Head Office Graf-Recke-Straße 82, 40239 Düsseldorf, Germany Phone : +49-211-96493-0 Fax : +49-211-96493-90
France	Branch office Paris 13, rue Camille Desmoulins 92441 Issy Les Moulineaux, France Phone : +33-1-5804-2484 Fax : +33-1-5804-2300
U.K.	Hosiden Besson Ltd. 12 St. Joseph's Trading Estate St. Joseph's Close, Hove, East Sussex, BN3 7EZ, United Kingdom Phone : +44-1273-860000 Fax : +44-1273-777501
U.S.A.	Hosiden America Corp. Head Office 120 East State Parkway, Schaumburg, IL, 60173, U.S.A. Phone : +1-847-885-8870 Fax : +1-847-885-0063 San Jose Sales Office 550 South Winchester Boulevard, Suite 320, San Jose, CA 95128, U.S.A. Phone : +1-408-985-8780 Fax : +1-408-985-8785 Detroit Sales Office 28970 Cabot Drive, Suite 600, Novi, MI 48377, U.S.A. Phone : +1-248-489-0174 Fax : +1-248-489-1154

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- Every product in this catalog is compliant to RoHS directive.

CAUTION FOR SAFETY

Please use our products properly based on our
Drawing and Specification.