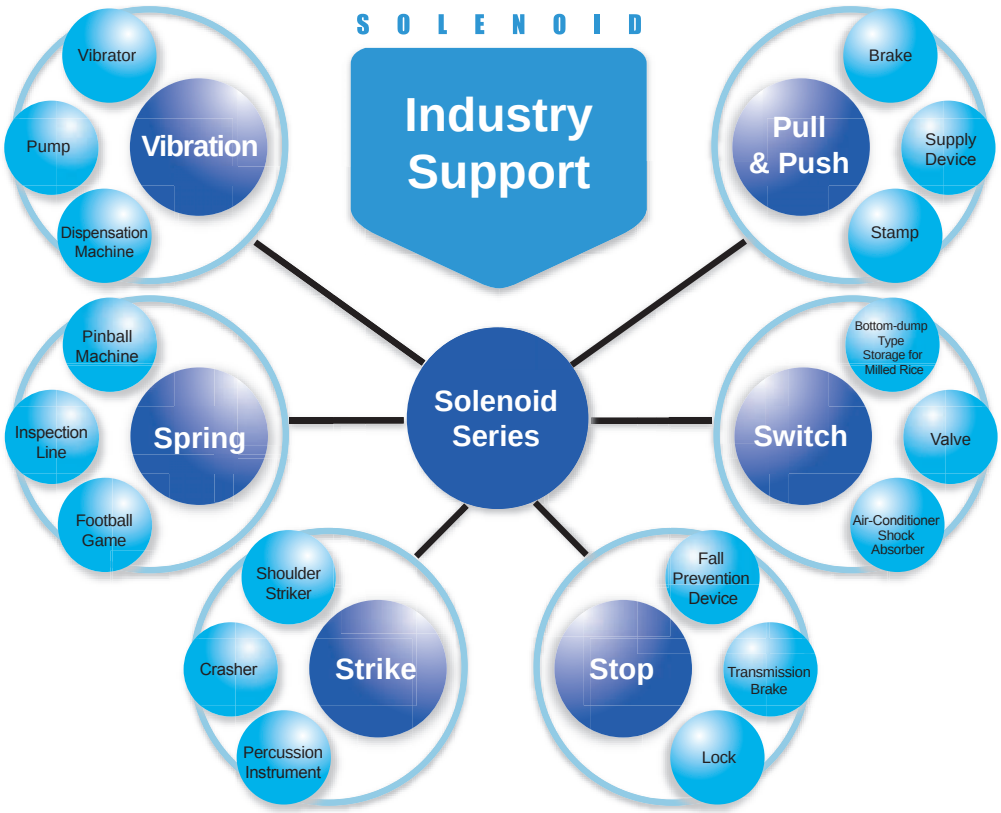
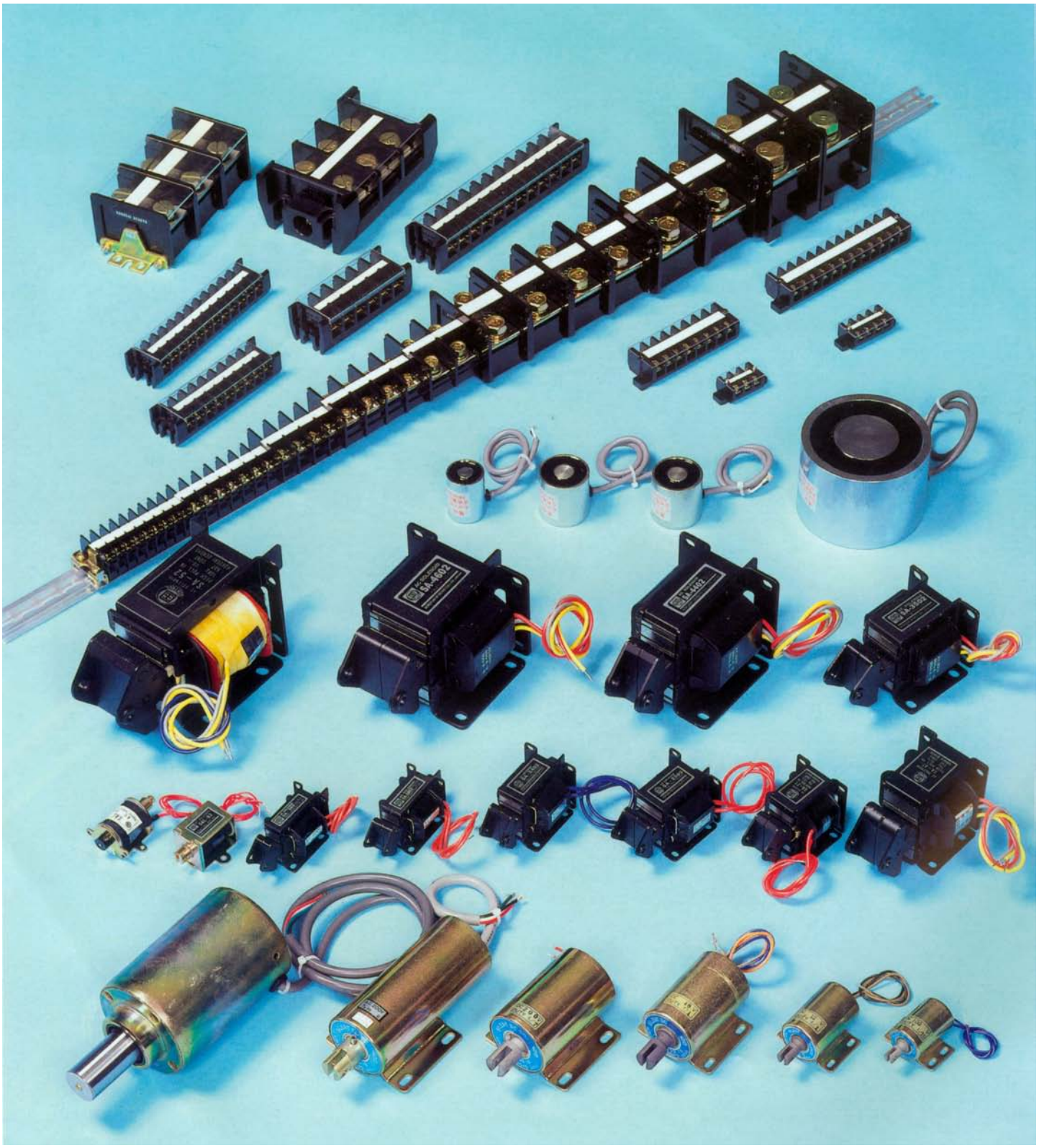
CREATION OF SOLENOID APPLICATION SOFTWARE



Safety and Trust

We have been specialized in research and development of automation control parts for more than 50 years. We develop parts such as AD and DC solenoids, terminal blocks and unique electromagnetic machines, substantially improve the quality and reliability of the original management, stabilize supply and make great contributions to automation of the industry and preservation of labor.



Solenoid

The solenoid is a converter to convert electric energy to mechanical energy of rectilinear motion. The fixed iron core is excited by the winding, and the plunger or cylinder movable iron core can move inside. The solenoid includes AC and DC type.

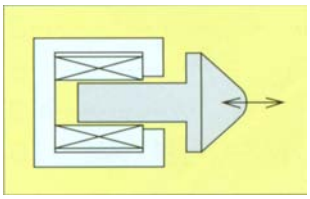
Since solenoids can complete basic functions in automation in a simple and economical manner such as pull, push, stop, strike and bend, they are widely used in industry, life, office, household, vending machine, etc. due to their low cost.

Difference between AC and DC Solenoids

AC solenoid is driven by an AC power, and its movable iron core is mainly plunger iron core, which is made of punched silicon steel sheets fastened by rivets. Therefore, the AC solenoid has good shock, heat and wearing resistance performance.

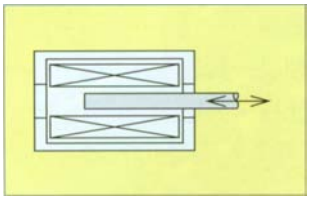
DC solenoid is driven by a DC power, and its movable iron core is mainly cylinder iron core. As magnetic material, the outer framework and the movable iron core are usually made of cold rolled steel plate, quick cutting bar or round steel.

●AC solenoid



Plunger type

●DC solenoid



Framework type

Solenoid Term Explanation

●Solenoid
The plunger type electromagnetic stone that converts electromagnetic energy into mechanical motion via the movable iron core after the AC or DC exciting winding is electrified.

●Rated Stroke
The movement distance of the movable iron core driven by the solenoid.

●Rated Attracting Force
The minimum attracting force in the whole stroke to the rated stroke position when the rated voltage is applied.

●Rated Power Consumption
The power consumed by the winding resistance under the condition that the iron core is attached to the fixed iron core when the rated voltage is applied.

●Retentiveness
The maximum load that the keeps the movable iron core attached to the fixed iron core position without detaching when the rated voltage is applied.

●Holding Current
The exciting current that keeps the movable iron core attached to the fixed iron core position when the rated voltage is applied.

●Starting Current
The exciting current that keeps the iron core at the rated stroke position when the rated voltage is applied.

●Fixed Iron Core
The fixed part of the iron core that forms the electromagnetic loop of the solenoid.

●Movable Iron Core
The iron core attached to by the fixed iron core, also called plunger.

●Continuous Rating
The rating in continuous use under designated condition, which neither exceeds the designated temperature rise limit or deviate from other limits.

●Short–term Rating
The rating in short–term use under designated condition starting from cold state, which neither exceeds the designated temperature rise limit or deviate from other limits.

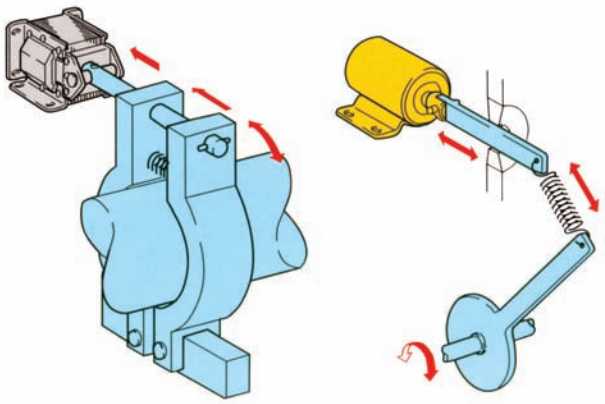
●Duty
The proportion of action time in the aggregate (a cycle) of the action time and stop time of a solenoid, which is calculated according to following formula:

$$\text{DUTY}_{(\text{Load})} = \frac{(\text{Action Time})}{(\text{Action Time} + \text{Stop Time=1 Cycle})} \times (100\%)$$

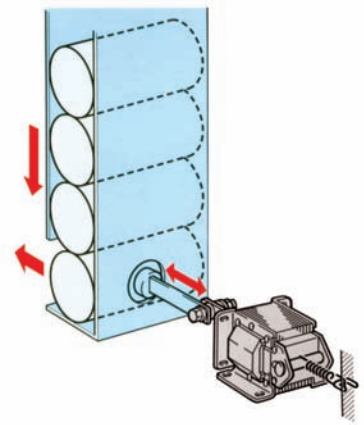
Application Example of Solenoids

● Application of brake

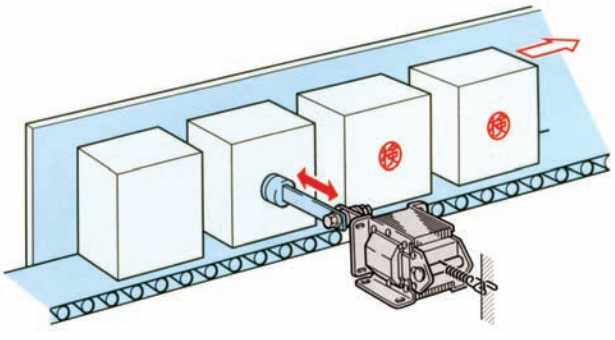
● The method to cover from rectilinear motion to rotary motion.



● Part transmission device (supply device)
(※Application above SA–4402 and SA–51 level.)



● Application of lettering and perforation
(※ Application above SA–4402 and SA–51 level.)



AC Solenoid

AC solenoids can be divided into silicon–steel sheet stacked plunger type and framework type made of cold rolled steel plate, and have more than 30 standard types with a combination of attracting force from 2.9N (0.3kgf) to 117.6N (12kgf) and stoke from 10mm to 40mm.

■Features

Outstanding anti–wearing performance, without guide rail structure

Plunger guide rail is a structure molded by nylon resin to integrate with the winding shaft, thus substantially improves the electronic and mechanical performance and make the solenoid a trustable high quality product.

Long service life

As an important functional part, solenoid plays a decisive role in a machine’s performance.

\In order to extend service life of solenoid, we have been devoted to improvement of protection technologies and now we have developed long service products that can be used over 1 million times. (Consult us for service life of our products.)

Excellent winding insulation performance

Mold according to our independently developed protection process, achieve outstanding heat, water, oil and shock resistance performance via resin molding (equivalent to type B insulation) and glass cloth tape (equivalent to type A insulation).

Rich variety and extensive use

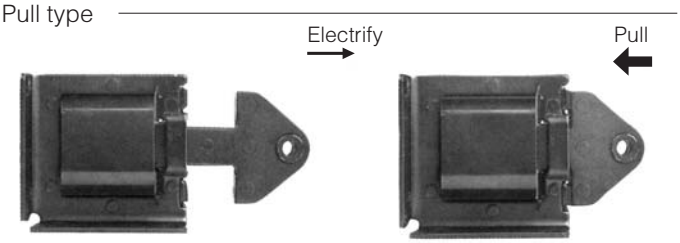
Include 30 standard types with attracting force from 2.9N (0.3kgf) to 117.6N (12kgf), provide diversified choices for various industries for labor saving and automation.

Simple installation

Horizontal installation, vertical installation, double–side installation, etc. The installation holes on the lateral plate designed for fastening facilitate installation.

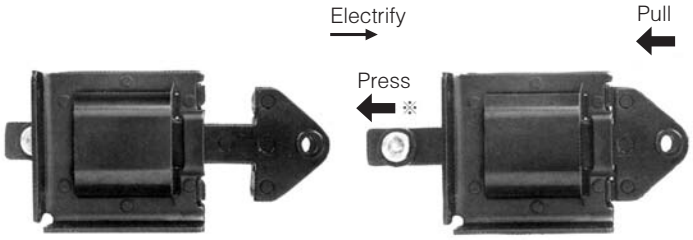
Two types of different usage

●Pull type



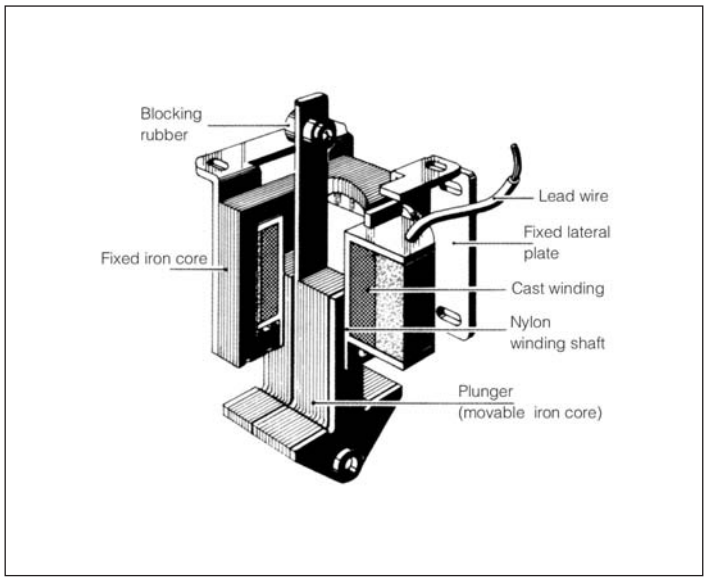
When electrified, the plunger is pulled, so the product is called pull type.

●Push–Pull type



When electrified, the plunger is pulled. At the same time, press on the other side. Since it applies force in the pull direction and press direction, it is called Push–Pull type.

AC Solenoid



The above drawing shows the general structure of our plunger type solenoid. Insert the winding into the fixed iron core, and the movable iron core can move inside.

Once the winding is electrified, magnetic force is generated at the center of the winding and the movable iron core is attracted to attach to the fixed iron core and thus push external mechanical movement. At this time, the force is attracting force, and the application of the attracting force becomes the principle of automation and labor saving.

Model No. Formation

SA – 24 0 1 – 100

AC solenoid / Model

Treatment of winding
0: epoxy
9: insulating adhesive tape
Function differentiation
1: Pull
2: Push–Pull
Winding voltage
100 : 100V
200 : 200V

SA – 33 – 100

AC solenoid / Model

Winding voltage
100: 100V
200: 200V

※The basic action of the solenoid is described below: when electrified, the plunger is attracted into the winding to attach to the fixed iron core. For most models, the plunger will not reset automatically, so screw caps should be used to make the plunger return to its original position.
※Push–Pull blocking rubber below SA–3702, SA–33 is mainly used to prevent the plunger (movable iron core) from falling.

AC Solenoid

Other Precautions and In–structions

Please use appropriate load.

When deciding the attracting force of the solenoid:

1. The full stroke attracting force must exceed the load.
2. Change of the power voltage needs to be considered.

(Figure 1)

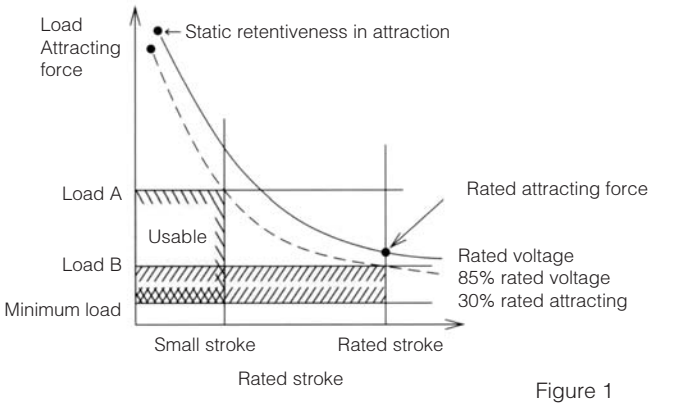


Figure 1

If the stroke is too large or the attracting force is insufficient, the movable iron core can not be attracted completely, which may lead to burn–down of the solenoid.

Do not exceed the rated stroke in use. In addition, considering the change of the voltage, select the solenoid with characteristics of attracting force under 85% rated voltage (90% rated voltage for some products).

Use under 30% rated attracting force may accelerate the breakdown of the solenoid.

In Figure 1, the attracting force under 85% rated voltage will exceed the load B to the rated stroke position. Therefore the load B can be used in the full stroke. However, the load A, which is heavier than the load B can only used under the stroke smaller than the rated stroke.

About Installation of the Solenoid

The solenoid can be installed at the vertical or horizontal direction relating to movement direction of the iron core. Action of the solenoid will generate considerable shock and advance and return movement. If not installed appropriately, the solenoid may become loose or slide, and thus leads to accidental fault or noise.

■Installation of the fixed iron core

1. Please use bolts and nuts of size suitable for installation hole of the solenoid.
2. Please use screw caps capable of preventing loose and gaskets with teeth for fastening.
3. During installation, the movable iron core must attach firmly to the fixed iron core.
   If two iron cores can not be attached, large current will pass the winding and burn down the winding.

■Connection with load

Please pay attention to following issues:

1.The load must move on the central axis of the movable iron core and apply no force to the movable iron core in horizontal and diagonal direction. If an external force affects the movable iron core in horizontal and diagonal direc–tion, it will shorten the service life of the solenoid and generate loud noise.

2.During the attraction process, the movable iron core must attach firmly to the fixed iron core.

3.Pins used for connection to load must meet the size of connection hole of the load of the movable iron core. If the connection pin and the connection hole produce any sound, the service life of the solenoid will be affected.

■Installation of the Push–Pull type

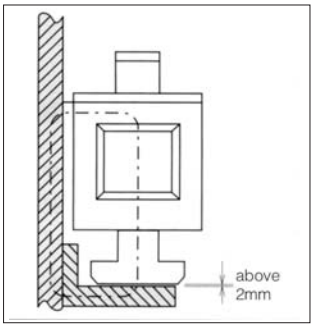
Please pay attention to following issues:

1.When the Push side (the blocking rubber side) is used, the action point of the attaching surface of the movable iron core and the load will separate considerably. Therefore, compared with the Pull side, action in horizontal and diagonal direction will generate huge noise.

2.The blocking rubber of the Push–Pull type solenoid can prevent falling cased by improper use. Therefore, when the load is directly applied to the blocking rubber in reset or the solenoid is used too frequently, an additional stopper must be used.

About external magnetic loop

■Please consider the circuit breaking method



The solenoid generates magnetic force because of the current passing the winding, and drives the movement of the plunger via the magnetic loop. Therefore, when install the installation plate, the load connection part, the stopper and the cover made of magnetic materials, an external magnetic loop will be formed, which may reduce the effective magnetic beams and substantially decrease the attracting force.

As a result, some parts should be made of non–magnetic material or clearance (over 2mm) shall be setup to prevent formation of the magnetic loop.

Maintenance of the solenoid

Please check if the attaching surface has any filth or dust.

The filth or dust on the attaching surface may generate noise. Even a tiny foreign object can generate a huge noise or burn down the winding. In addition, if the attaching surface is stained with oil, grease or water, the movable iron core may reset improperly. If abnormal noise or improper reset of the movable iron core is found in use, please check the attaching surface.

Protection against over–current

When the load increases or there is foreign object on the attaching surface, the movable iron core can not closely attach to the fixed iron core, large current may pass the winding or even burn the winding.
In order to prevent such situation, over–current protection relay is recommended. Please select the relay according to the starting current of the solenoid used.

About Insulation Type

Insulation Type	Temperature ℃
Y type	90
A type	105
E type	120
B type	130
F type	155

AC Solenoid Products Checklist

■SA Series

Model	Operation Method		Rated stroke (mm)	Rated attraction force N(kgf)	Rated voltage (V)	Rated cycle (Hz)	Insula–tion type	Insulation distur–bance rejection	Voltage with–standing	Winding tem–perature rise	Weight of the movable iron core (g)	Total weight (g)
	Push–Pull	Pull										
SA–992	 SA-992	 SA-991	10	4.9 (0.5)	AC100 or AC200	50/60 for com–mon use (two lead wires)	Equiv–alent to type B insula–tion	over DC500V 50MΩ	AC1500V per minute	Below 85℃	65	205
SA–991											60	195
SA–1092	 SA-1092	 SA-1091		5.8 (0.6)							73	235
SA–1091											68	225
SA–1192	 SA-1192	 SA-1191		7.8 (0.8)							96	295
SA–1191											91	285
SA–2402	 SA-2402	 SA-2401	15	9.8 (1.0)				over DC500V 100MΩ	AC2000V for 1 minute		100	360
SA–2401											95	350
SA–2502	 SA-2502	 SA-2501		14.7 (1.5)							125	430
SA–2501											120	420
SA–2602	 SA-2602	 SA-2601		19.6 (2.0)							150	490
SA–2601											145	480
SA–3002	 SA-3002	 SA-3001	20	29.4 (3.0)							225	760
SA–3001											215	750
SA–3502	 SA-3502	 SA-3501		29.4 (3.0)		50/60 (three lead wires)					295	1015
SA–3501											285	1000
SA–3602	 SA-3602	 SA-3601		39.2 (4.0)							350	1175
SA–3601											340	1150
SA–3702	 SA-3702	 SA-3701		49.0 (5.0)							405	1315
SA–3701											395	1280
SA–4402	 SA-4402	 SA-4401	30	49.0 (5.0)							580	2130
SA–4401											555	2080
SA–4502	 SA-4502	 SA-4501		58.8 (6.0)							745	2650
SA–4501											710	2580
SA–4602	 SA-4602	 SA-4601		78.4 (8.0)							910	3250
SA–4601											880	3180

※Winding temperature rise values are under rated current. ※Refer to JISC4552 for testing conditions and judgment criteria. ※RoHS compliance product

■SA Series

Model	Operation Method		Rated stroke (mm)	Rated attraction force N(kgf)	Rated voltage (V)	Rated cycle (Hz)	Insula–tion type	Insulation distur–bance rejection	Voltage with–stand–ing	Winding tem–perature rise	Weight of the mov–able iron core(g)	Total weight (g)
	Push–Pull	Pull										
SA–21	 SA-21		10	9.8 (1.0)	AC100或AC200	50/60 for common use (two lead wires)	Equiva–lent to type B insula–tion	over DC500V 50MΩ	AC1500V for 1 minute	below 85℃	122	430
SA–32	 SA-32		15	29.4 (3.0)		50/60 (three lead wires)					350	1150
SA–33	 SA-33			49.0 (5.0)							450	1450
SA–51	 SA-51		40				Equiv–alent to type A insula–tion			below 65℃	920	3150
SA–52	 SA-52			98.0 (10.0)							1280	4400
SA–55	 SA-55						Equiv–alent to type B insula–tion			below 85℃	1280	4400
SA–56	 SA-56			117.6 (12.0)							1480	5160
SAL–02	 SAL-02		10	2.9 (0.3)		50/60 for common use (two lead wires)	Equiv–alent to type A insula–tion			(in 1 minute) below 65℃	18	81
SAL–03		 SAL-03		4.9 (0.5)							22	115

※Winding temperature rise values are under rated current.※ Refer to JISC4552 for testing conditions and judgment criteria. ※RoHS compliance product

High Attracting force Silent AC Solenoid

■SSAB Series

Model	Operation Method		Rated stroke (mm)	Rated attraction force N(kgf)	Rated voltage (V)	Exciting current (AC)	Rated cycle (Hz)	Continuous power–on hours	Duty	Insulation type	Insulation distur–bance rejection	Voltage with–standing	Instal–lation direction	Lead–ing wire color	Total weight (g)
	Push–Pull	Pull													
SSAB–1602	 SSAB-1602	 SSAB-1601	20	16.6 (1.7)	AC100 or AC200	0.9A (100V) or 0.45A (200V)	50/60 for common use	Within 3 minutes	1/8	Equivalent to type E insulation	over DC500V 100MΩ	AC1500V for 1 minute	Vertical or hori–zontal	AC100V Blue–blue / AC200V Red–red	610
SSAB–1601				19.6 (2)											600
SSAB–1802	 SSAB-1802	 SSAB-1801	25	19.6 (2)		1.1A (100V) or 0.55A (200V)									935
SSAB–1801				24.5 (2.5)											920
SSAB–2002	 SSAB-2002	 SSAB-2001	30	29.4 (3)		1.3A (100V) or 0.65A (200V)		Within 7 minutes	1/6						1720
SSAB–2001				36.7 (3.74)											1700

※Winding temperature rise values are under rated current.※ Refer to JISC4552 for testing conditions and judgment criteria. ※RoHS compliance product

Major Component Material Checklist

■AC Solenoid SA Series

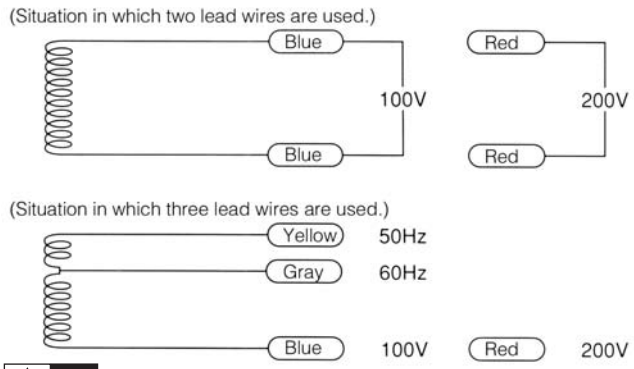
Model	SA–992	SA–1092	SA–1192	SA–2402	SA–2502	SA–2602	SA–3002	SA–3502	SA–3602	SA–3702	SA–4402
	SA–991	SA–1091	SA–1191	SA–2401	SA–2501	SA–2601	SA–3001	SA–3501	SA–3601	SA–3701	SA–4401
Power–on time	Continuous rating										
Movable iron core	Cold rolled silicon steel plate										
Fixed・movable lateral plate	Cold rolled steel plate										
Plunger guide rail	Nylon resin integrated with the winding shaft										
Winding insula–tion	Epoxy polyester insulation ad–hesive tape treatment (white)			Resin casting treatment							
Winding	Polyester copper wire										
Lead wire	Heat resisting ethylene wire (UL–1015)										
Surface treat–ment	Black electro–coating										
Lead wire color	100V–blue / 200V–red							100V–blue / 200V–red / 50Hz–yellow / 60Hz–gray			

Model	SA–4502	SA–4602	SA–21	SA–32	SA–33	SA–51	SA–52	SA–55	SA–56	SAL–02	SAL–03
	SA–4501	SA–4601									
Power–on time	Continuous rating									1 min rating	
Movable iron core	Cold rolled silicon steel plate									Rolled steel plate for ordinary structure	
Fixed・movable lateral plate	Cold rolled steel plate									Rolled steel plate for ordinary structure	
Plunger guide rail	Nylon resin integrated with the winding shaft		Brass・nylon resin molded product							Nylon resin integrated with the winding shaft	
Winding insula–tion	Resin molding treatment		Epoxy polyester insulation adhesive tape treatment (white)			Glass cloth tape immer–sion paint treatment		Resin molding treat–ment		Acetic acid adhesive tape treatment	
Winding	Polyester copper wire										
Lead wire	Heat resisting ethylene wire (UL–1015)									Heat resisting ethylene wire (UL–1007)	
Surface treatment	Black electro–coating									Complex acid salt coating treatment (Ep–Fe/Zn 5/CM2 C)	
Lead wire color	100V–blue/200V–red/ 50Hz–yellow/60Hz–gray									100V–blue / 200V–red	

■Silent AC Solenoid SSAB Series

Model	SSAB–1602 SSAB–1601	SSAB–1802 SSAB–1801	SSAB–2002 SSAB–2001
Movable iron core	SUM (free machining steel)		
Fixed iron core	SUM (free machining steel)		
Winding insulation	Resin filled		
Winding	Polyester copper wire		
Winding shaft	P.B.T containing glass		
Surface treatment	Complex acid coating treatment (Ep–Fe/Zn 5/CM2 C) Fixed iron core / Polyfurol resin coating treatment		
Pipe	STKM (Structure steel pipe for mechanical use)		
Installation platform	Cold rolled steel plate		
Lead wire	Heat resisting ethylene wire (UL–1007)		
Lead wire color	100V–blue / 200V–red		
O ring	NBR		

⊙Connection Method of Lead Wires



Note (For situation in which three lead wires are used.)
Do not use when the 50Hz (yellow)–60Hz (gray) circuit is open, other–wise the winding will burnt down.

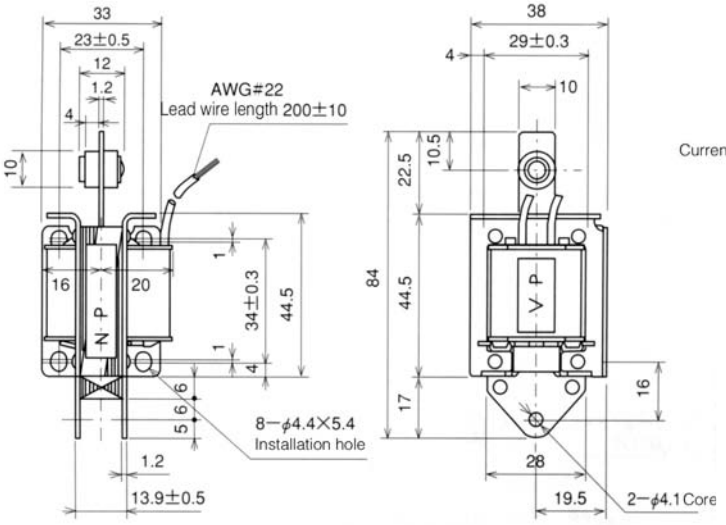
AC Solenoid

●NP: Name Plate ●VP: Voltage Plate ●PUSH–PULL ●PULL

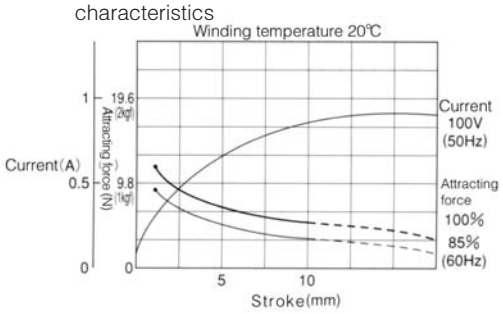
SA–992
(PUSH–PULL)

SA–991
(PULL)

(The figure is SA–992)



■Attracting force characteristics: current characteristics



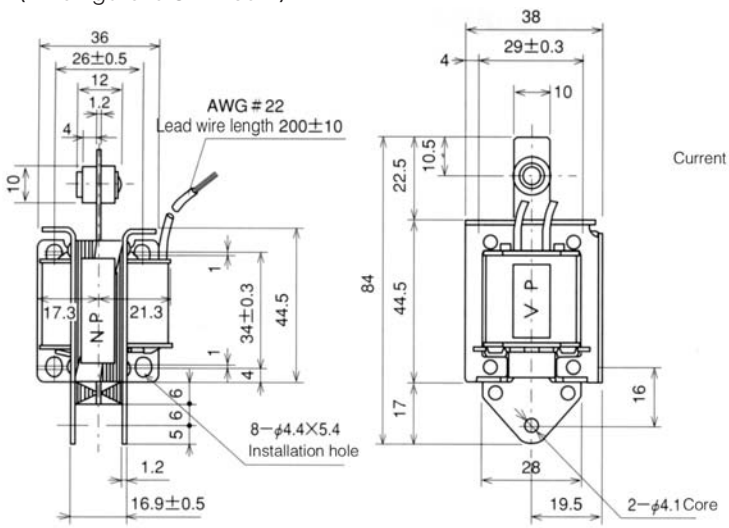
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–992	100	0.8	0.12	4.9N(0.5kgf) /10mm
	200	0.45	0.07	
SA–991	100	0.8	0.12	
	200	0.45	0.07	

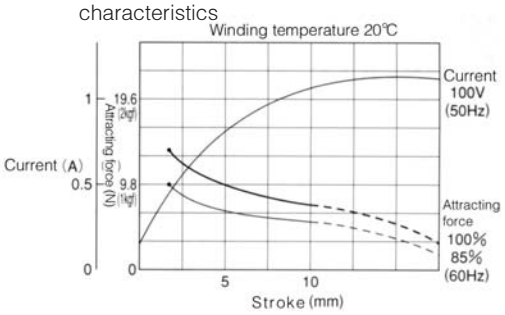
SA–1902
(PUSH–PULL)

SA–1901
(PULL)

(The figure is SA–1092)



■Attracting force characteristics: current characteristics



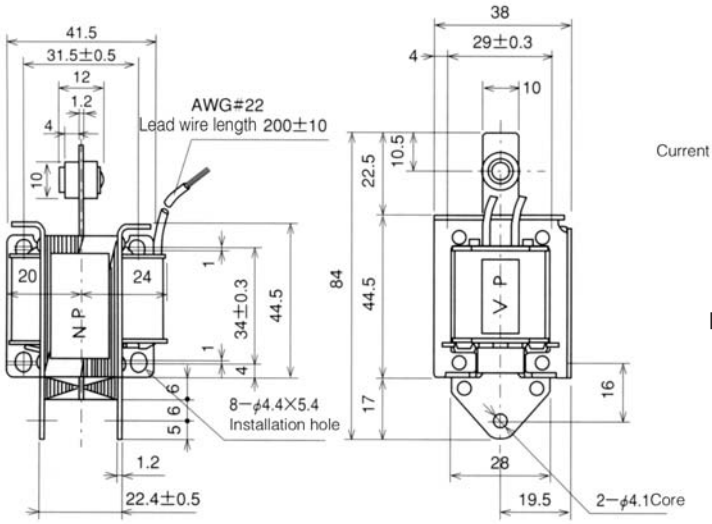
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–1092	100	1.1	0.16	5.8N(0.6kgf) /10mm
	200	0.6	0.1	
SA–1091	100	1.1	0.16	
	200	0.6	0.1	

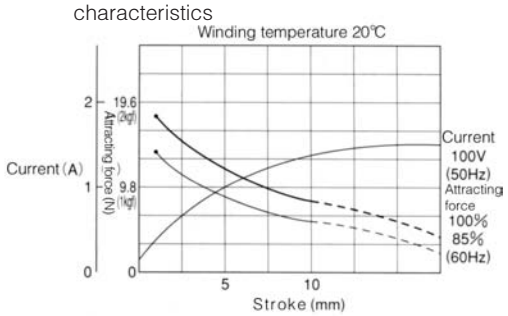
SA–1192
(PUSH–PULL)

SA–1191
(PULL)

(The figure is SA–1192)



■Attracting force characteristics: current characteristics



■Current Value

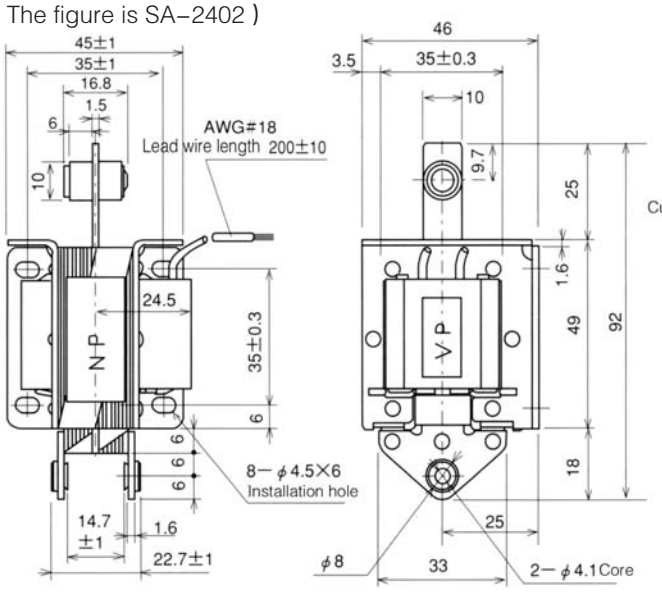
Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–1192	100	1.3	0.18	7.8N(0.8kgf) /10mm
	200	0.7	0.1	
SA–1191	100	1.3	0.18	
	200	0.7	0.1	

AC Solenoid

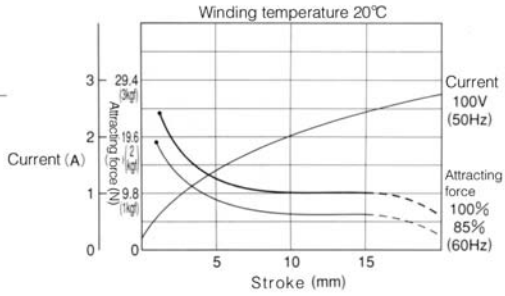
SA–2402
(PUSH–PULL)

SA–2401
(PULL)

(The figure is SA–2402)



■Attracting force characteristics: current characteristics



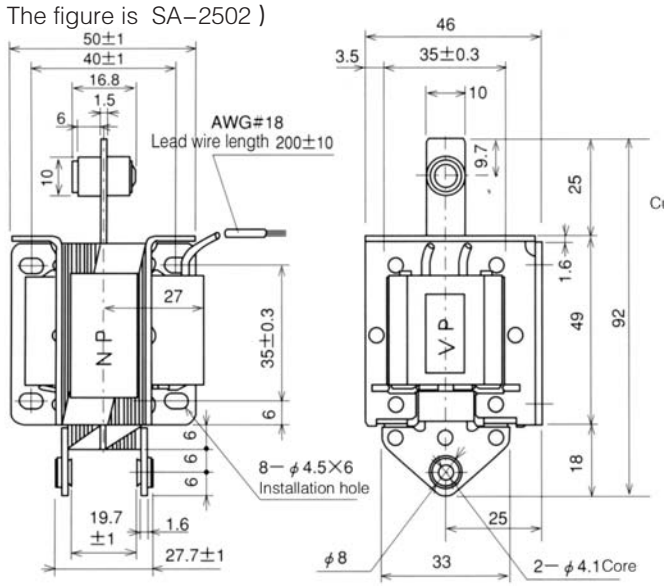
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–2402	100	2.1	0.30	9.8N(1.0kgf) /15mm
	200	1.1	0.12	
SA–2401	100	2.1	0.30	
	200	1.1	0.12	

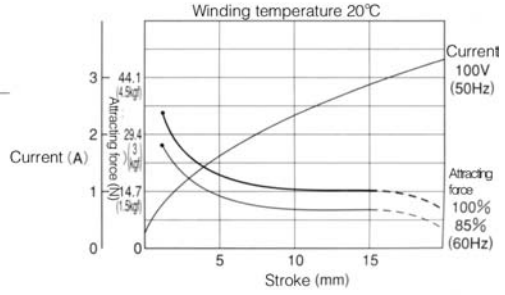
SA–2502
(PUSH–PULL)

SA–2501
(PULL)

(The figure is SA–2502)



■Attracting force characteristics: current characteristics



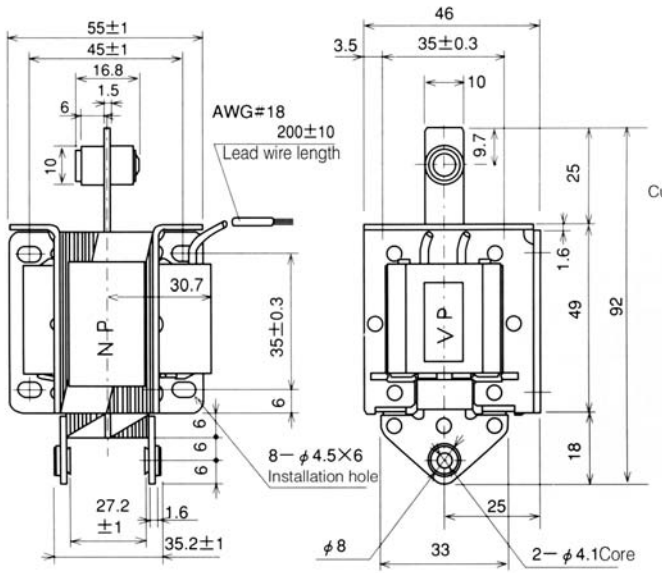
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–2502	100	3.1	0.35	14.7N(1.5kgf) /15mm
	200	1.4	0.17	
SA–2501	100	3.1	0.35	
	200	1.4	0.17	

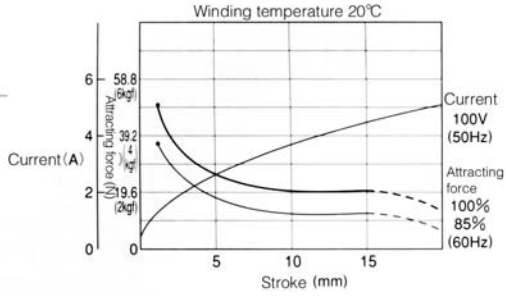
SA–2602
(PUSH–PULL)

SA–2601
(PULL)

(The figure is SA–2602)



■Attracting force characteristics: current characteristics



■Current Value

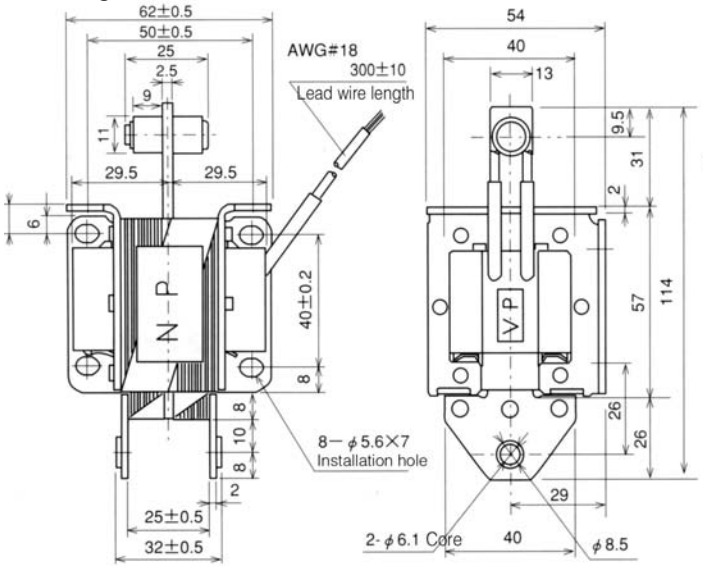
Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–2602	100	4.0	0.4	19.6N(2.0kgf) /15mm
	200	2.0	0.2	
SA–2601	100	4.0	0.4	
	200	2.0	0.2	

●PUSH–PULL ●PULL

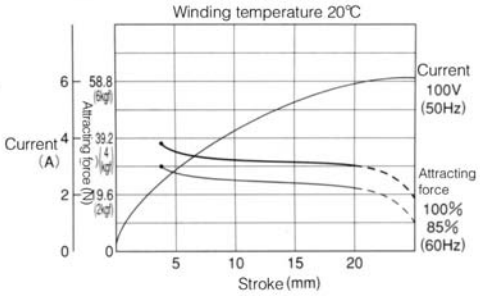
SA–3002
(PUSH–PULL)

SA–3001
(PULL)

(The figure is SA–3002)



■Attracting force characteristics: current characteristics



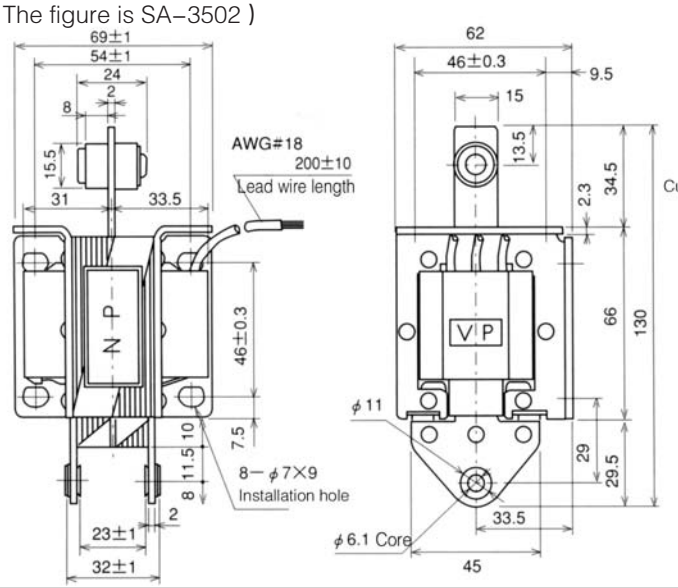
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–3002	100	5.8	0.52	29.4N(3.0kgf) /20mm
	200	2.9	0.25	
SA–3001	100	5.8	0.52	
	200	2.9	0.25	

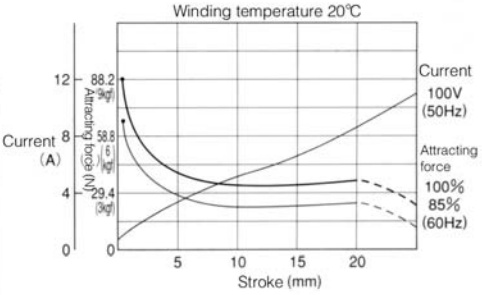
SA–3502
(PUSH–PULL)

SA–3501
(PULL)

(The figure is SA–3502)



■Attracting force characteristics: current characteristics



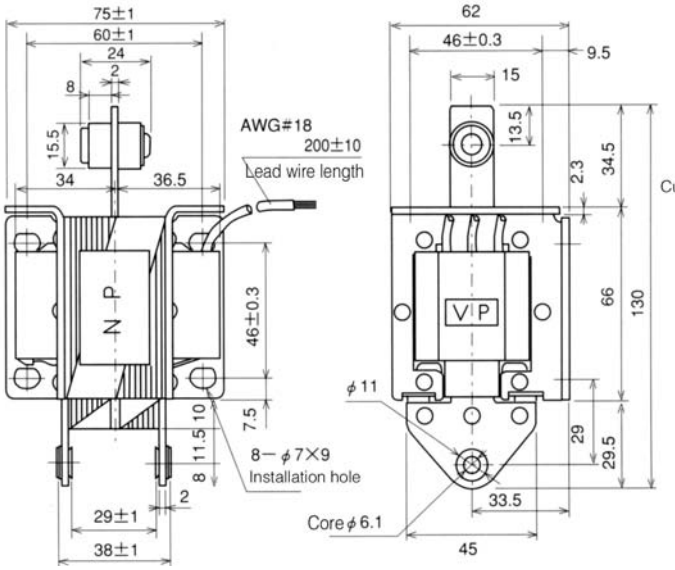
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–3502	100	8.0	0.6	29.4N(3.0kgf) /20mm
	200	4.0	0.33	
SA–3501	100	8.0	0.6	
	200	4.0	0.33	

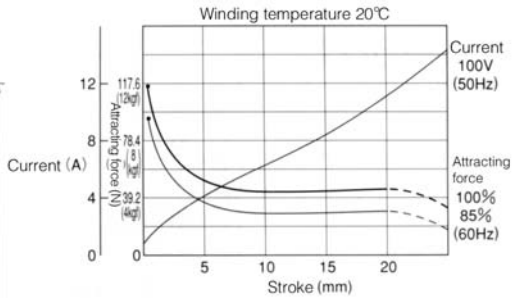
SA–3602
(PUSH–PULL)

SA–3601
(PULL)

(The figure is SA–3602)



■Attracting force characteristics: current characteristics



■Current Value

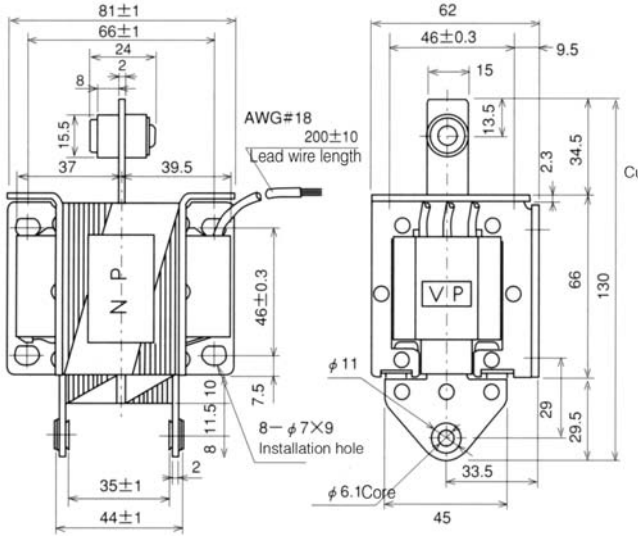
Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–2602	100	9.6	0.8	39.2N(4.0kgf) /20mm
	200	4.5	0.4	
SA–2601	100	9.6	0.8	
	200	4.5	0.4	

AC Solenoid

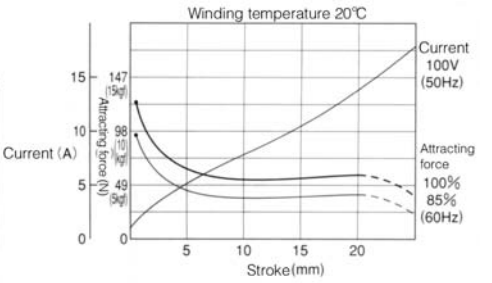
SA–3702
(PUSH–PULL)

SA–3701
(PULL)

(The figure is SA–3702)



■Attracting force characteristics: current characteristics

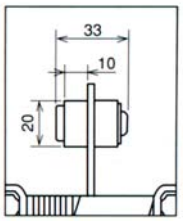


■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–3702	100	12.0	0.9	49.0N(5.0kgf) /20mm
	200	5.5	0.45	
SA–3701	100	12.0	0.9	
	200	5.5	0.45	

SA–4402
(PUSH–PULL)

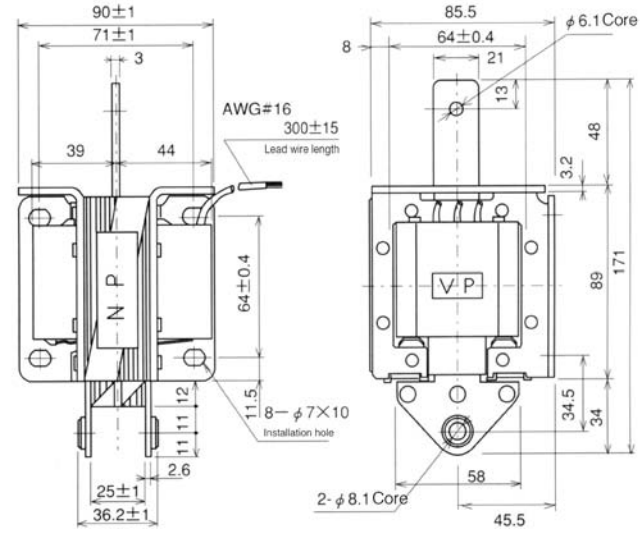
SA–4401
(PULL)



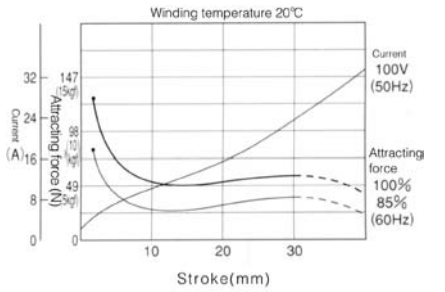
When blocking rubber is connected.

⚬ With SA–4402 blocking rubber

(The figure is SA–4402)



■Attracting force characteristics: current characteristics

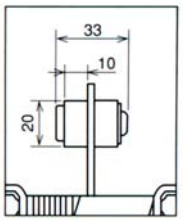


■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–4402	100	20.0	1.4	49.0N(5.0kgf) /30mm
	200	10.0	0.65	
SA–4401	100	20.0	1.4	
	200	10.0	0.65	

SA–4502
(PUSH–PULL)

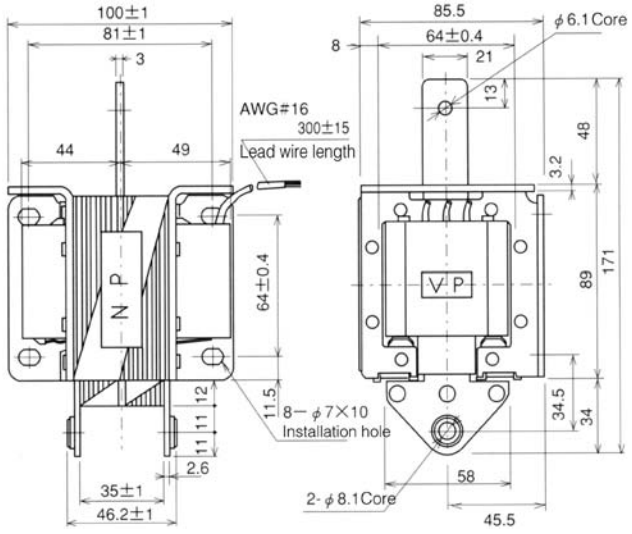
SA–4501
(PULL)



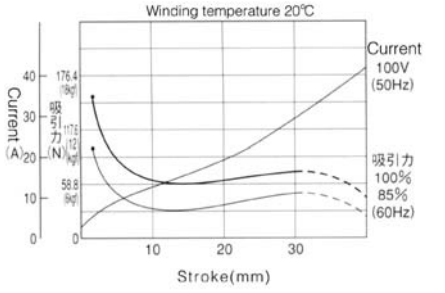
When blocking rubber is connected.

⚬ With SA–4502 blocking rubber

(The figure is SA–4502)



■Attracting force characteristics: current characteristics



■Current Value

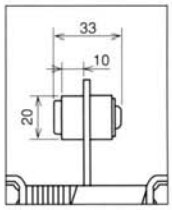
Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–2602	100	27.0	1.75	58.8N(6.0kgf) /30mm
	200	12.6	0.76	
SA–2601	100	27.0	1.75	
	200	12.6	0.76	

●PUSH–PULL ●PULL

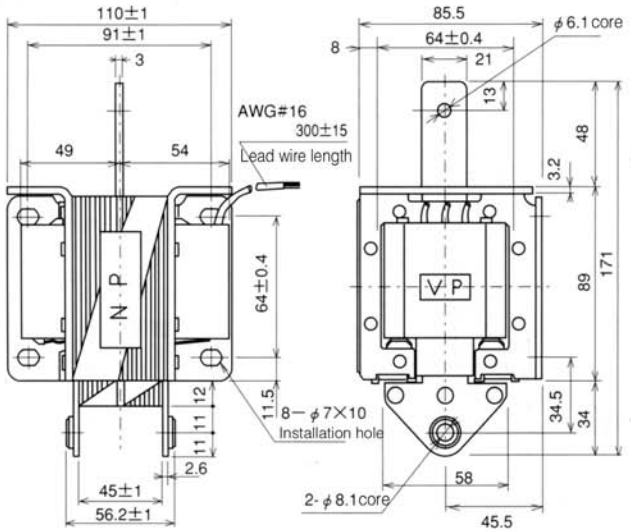
SA–4602
(PUSH–PULL)

SA–4601
(PULL)

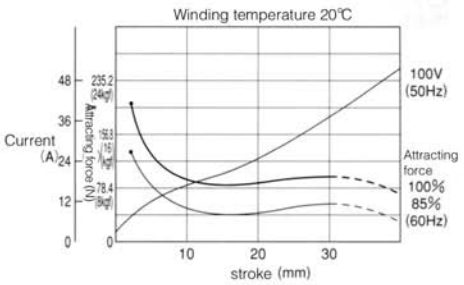
(The figure is SA–3002)



○ With SA–4402 blocking rubber



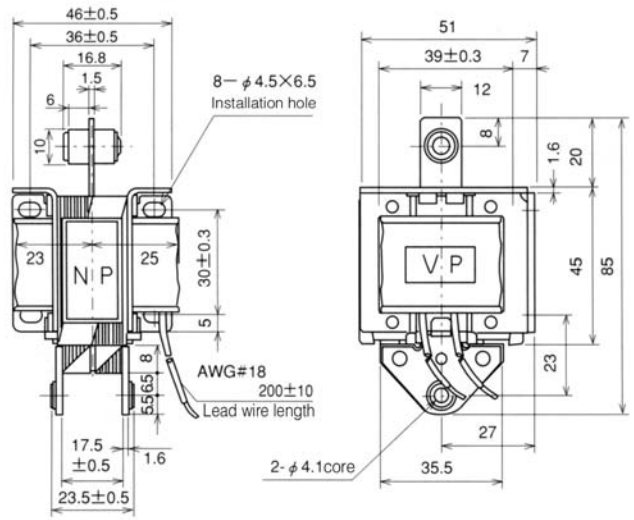
■Attracting force characteristics: current characteristics



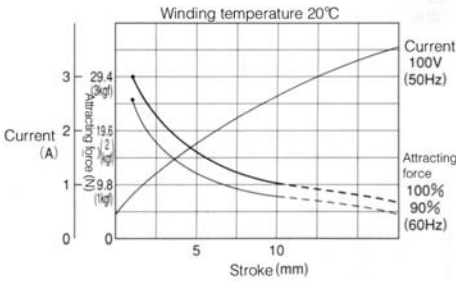
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–4602	100	32.0	2.0	78.4N(8.0kgf) /30mm
	200	14.5	1.0	
SA–4601	100	32.0	2.0	
	200	14.5	1.0	

SA–21
(PUSH–PULL)



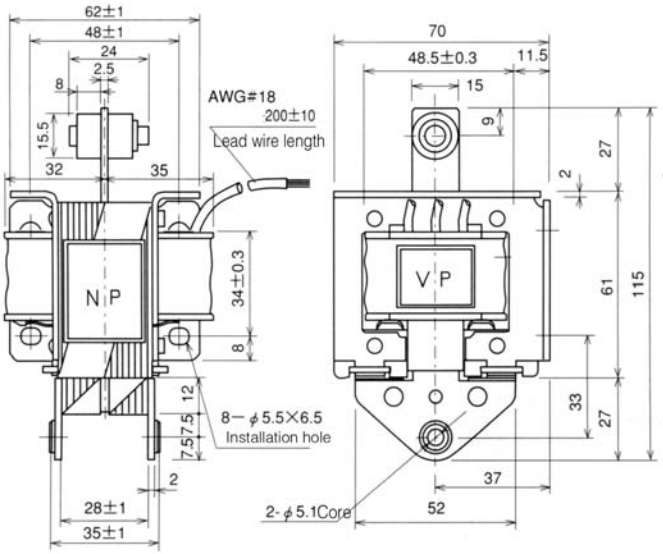
■Attracting force characteristics: current characteristics



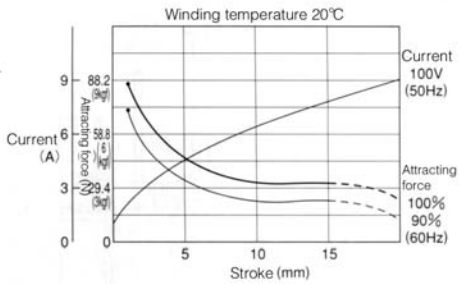
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–21	100	2.6	0.42	9.8N(1.0kgf) /10mm
	200	1.3	0.2	

SA–32
(PUSH–PULL)



■Attracting force characteristics: current characteristics

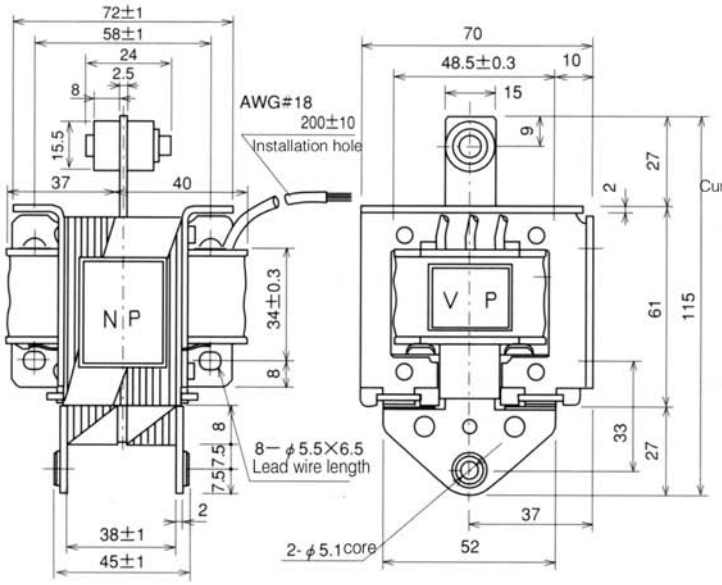


■Current Value

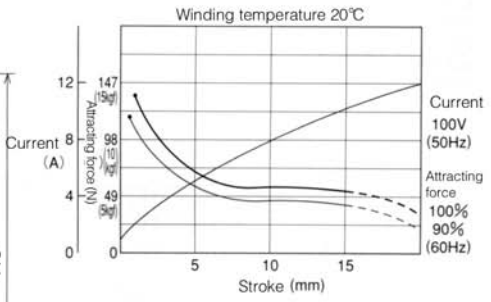
Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–32	100	7.2	0.8	29.4N(3.0kgf) /15mm
	200	3.6	0.42	

AC Solenoid

SA–33
(PUSH–PULL)



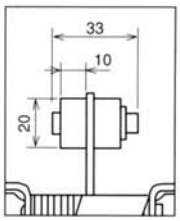
■Attracting force characteristics: current characteristics



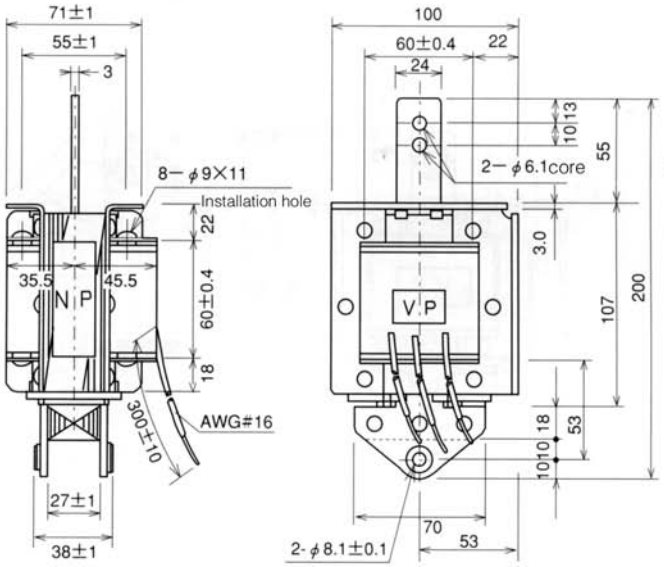
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–33	100	11.0	1.1	49.0N(5.0kgf) /15mm
	200	5.5	0.55	

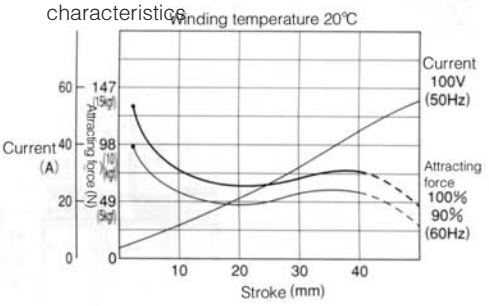
SA–51
(PUSH–PULL)



◎With blocking rubber



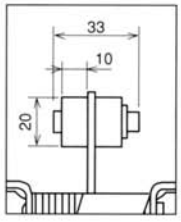
■Attracting force characteristics: current characteristics



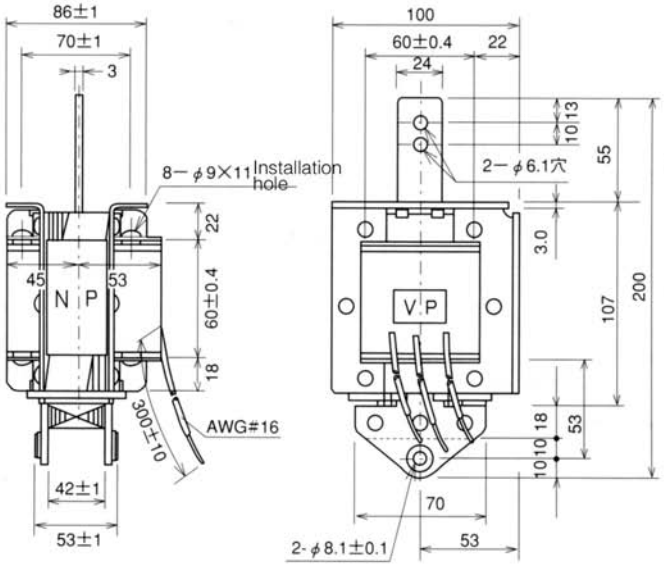
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–51	100	45.0	2.6	49.0N(5.0kgf) /40mm
	200	14.0	1.6	

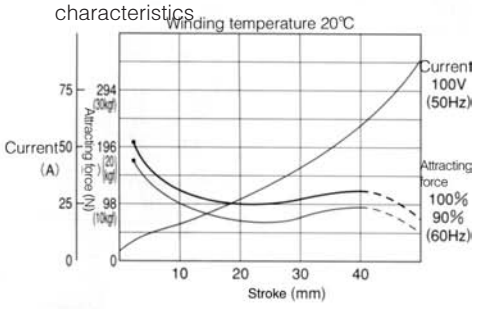
SA–52
(PUSH–PULL)



◎With blocking rubber



■Attracting force characteristics: current characteristics

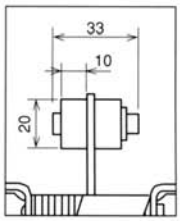


■Current Value

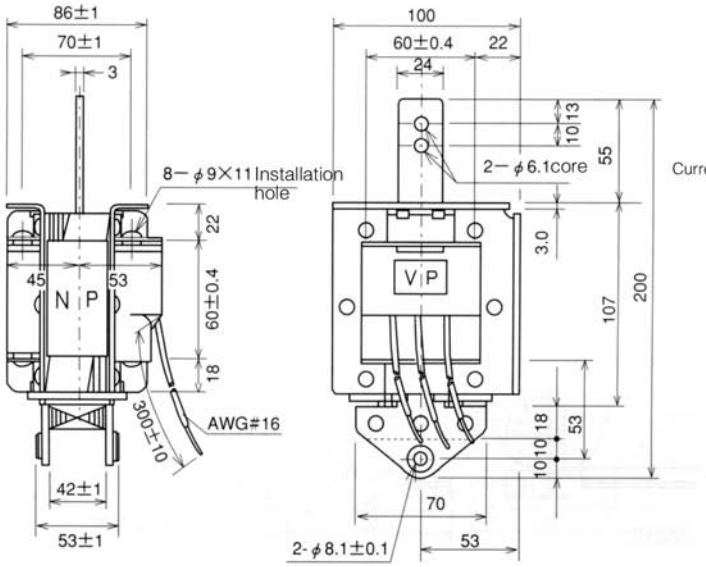
Model	Voltage AC (V)	Starting urrent (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–52	100	70.0	3.7	98.0N(10.0kgf) /40mm
	200	35.0	2.0	

●PUSH–PULL ●PULL

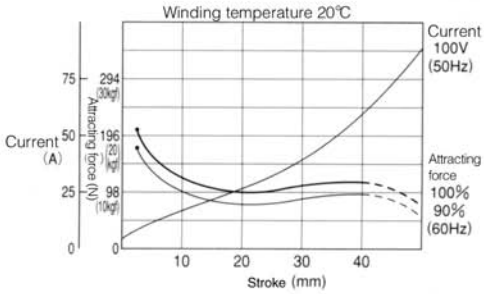
SA–55
(PUSH–PULL)



○With blocking rubber



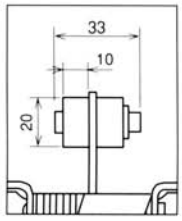
■Attracting force characteristics: current characteristics



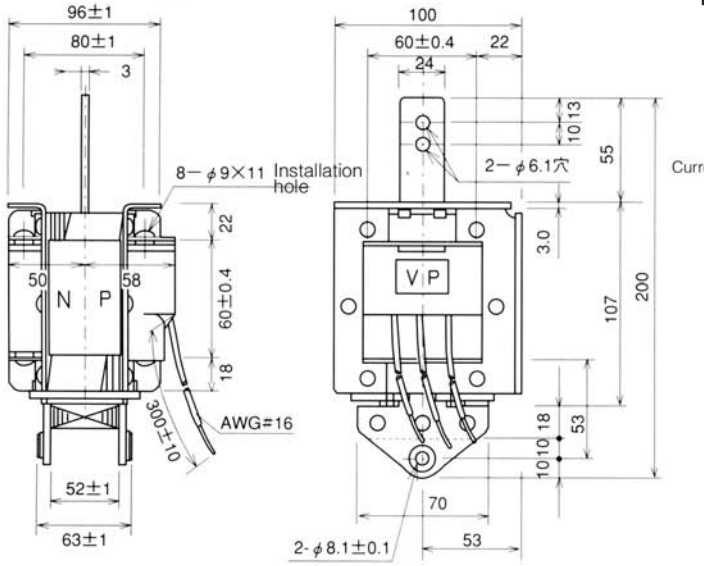
■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–55	100	70.0	3.7	98.0N(10.0kgf) /40mm
	200	35.0	2.0	

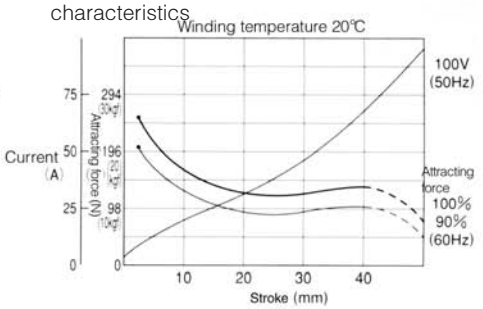
SA–56
(PUSH–PULL)



○With blocking rubber



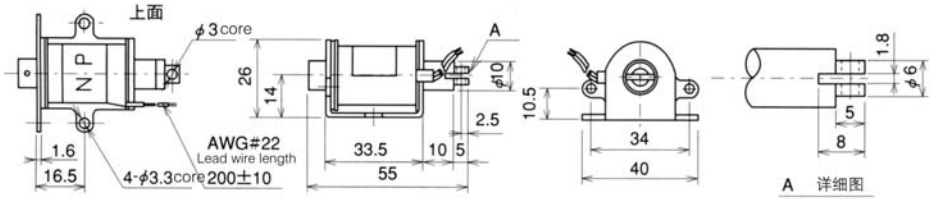
■Attracting force characteristics: current characteristics



■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SA–56	100	75.0	3.7	117.6N(12.0kgf) /40mm
	200	40.0	1.8	

SAL–02 (PUSH–PULL)



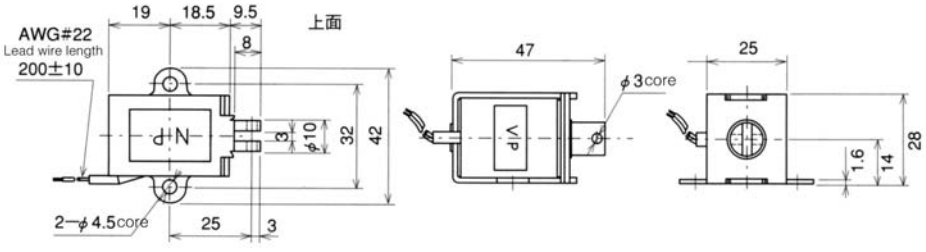
■Characteristics

SAL–02 is a automatic reset model using built–in screw caps.

Note

For SAL–02 and SAL–03, at duty of 1/10 and frequenty of use at 6 times per minute, please use at maximum power–on time of 1 minute. Use at a condition exceeding the rating may lead to burndown of the winding.

SAL–03 (PUSH–PULL)



■Current Value

Model	Voltage AC (V)	Starting current (A)	Holding current (A)	Rated attracting force / Rated stroke
SAL–02	100	1.0	0.6	2.9N(0.3kgf) /10mm
	200	0.5	0.29	
SAL–03	100	1.0	0.42	4.9N(0.5kgf) /10mm
	200	0.5	0.22	

High Attracting Force Silent AC Solenoid

For the SSAB series, movable iron core has received polyfurol resin coating treatment to achieve excellent wearing and rust resistance performance and substantially increase the service life

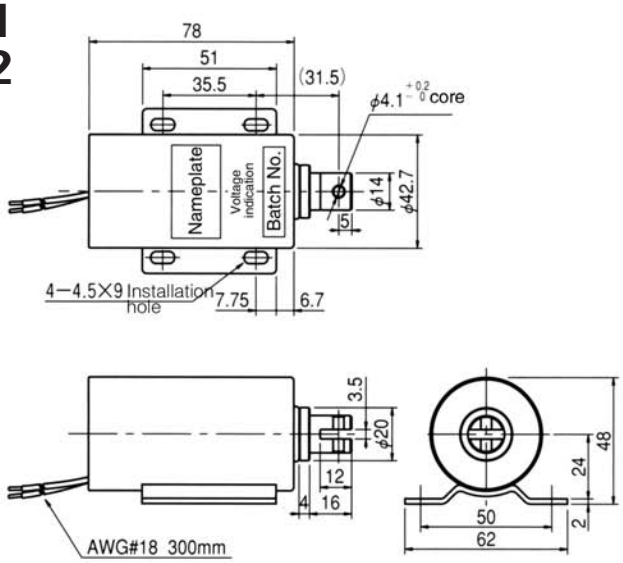
Compared with original silent AC solenoids, the SSAB series have stronger attracting force.

New Product

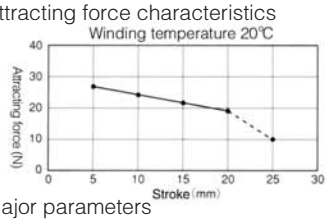
■Pull Type

SSAB–1601–81
SSAB–1601–82

(Customized Products)



■Attracting force characteristics

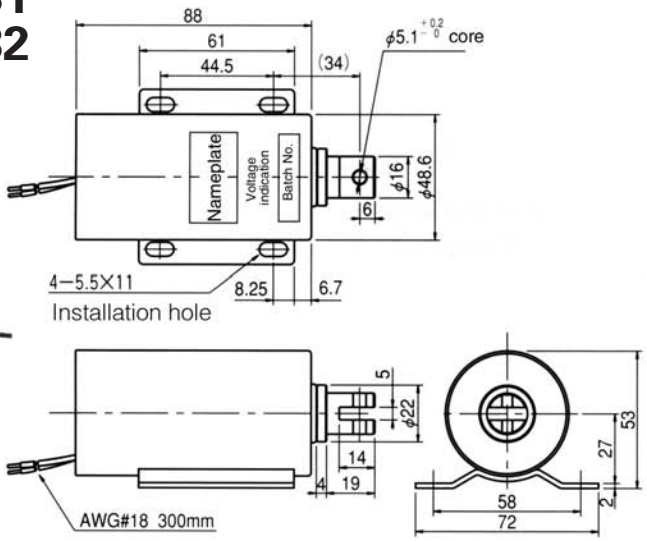


■Major parameters

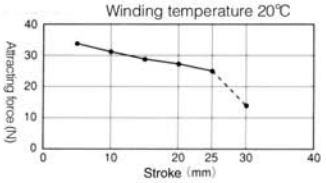
Rated voltage	AC100V 50/60Hz	AC200V 50/60Hz
Exciting current (AC)	0.9A	0.45A
Continuous power on	Within 3 min	
Duty	1/8 DUTY	
Rated attracting force	19.6N(2kgf)	
Rated stroke	20mm	
Installation direction	Horizontal or vertical	
Operation mode	Pull type	
Insulation resistance	Above DC500V 100MΩ	
Voltage withstanding	AC1500V for 1 minute	
Insulation type	Equivalent to type E insulation	
Lead wire color	AC100 blue, blue	AC200V red, red
Model No. composition	SSAB–1601–8□ 1 : AC100V 2 : AC200V	

SSAB–1801–81
SSAB–1801–82

(Customized Products)



■Attracting force characteristics

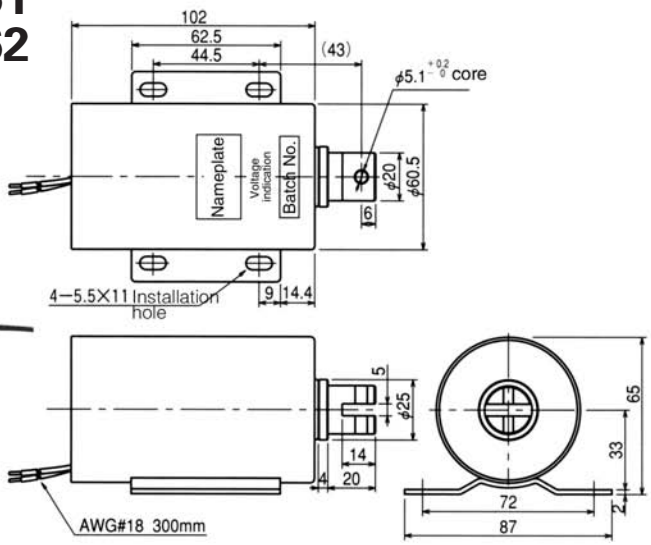


■Major parameters

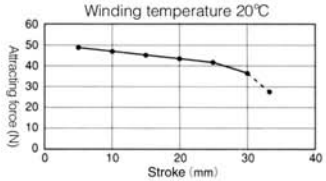
Rated voltage	AC100V 50/60Hz	AC200V 50/60Hz
Exciting current (AC)	1.1 A	0.55 A
Continuous power on	Within 3 min	
Duty	1/8 DUTY	
Rated attracting force	24.5 N (2.5 kgf)	
Rated stroke	25mm	
Installation direction	Horizontal or vertical	
Operation mode	Pull type	
Insulation resistance	Above DC500V 100MΩ	
Voltage withstanding	AC1500V for 1 minute	
Insulation type	Equivalent to type E insulation	
Lead wire color	AC100 blue, blue	AC200V red, red
Model No. composition	SSAB–1801–8□ 1 : AC100V 2 : AC200V	

SSAB–2001–61
SSAB–2001–62

(Customized Products)



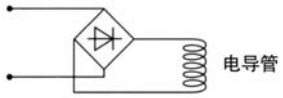
■Attracting force characteristics



■Major parameters

Rated voltage	AC100V 50/60Hz	AC200V 50/60Hz
Exciting current (AC)	1.3 A	0.65 A
Continuous power on	Within 7 min	
Duty	1/6 DUTY	
Rated attracting force	36.7 N (3.74 kgf)	
Rated stroke	30 mm	
Installation direction	Horizontal or vertical	
Operation mode	Pull type	
Insulation resistance	Above DC500V 100MΩ	
Voltage withstanding	AC1500V for 1 minute	
Insulation type	Equivalent to type E insulation	
Lead wire color	AC100 blue, blue	AC200V red, red
Model No. composition	SSAB–2001–6□ 1 : AC100V 2 : AC200V	

■connection diagram



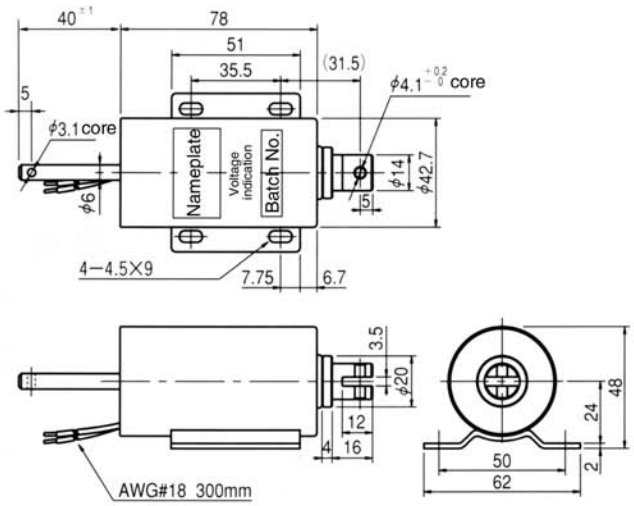
●PUSH–PULL

●PULL

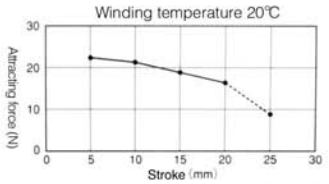
■Pull Type

SSAB–1602–81
SSAB–1602–82

(Customized Products)



■Attracting force characteristics

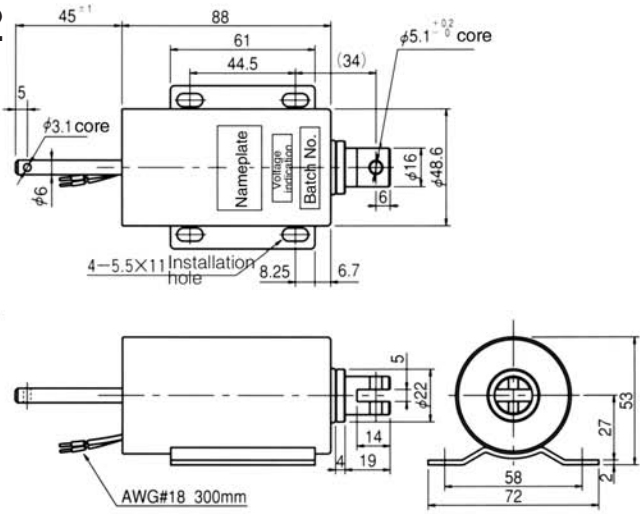


■Major parameters

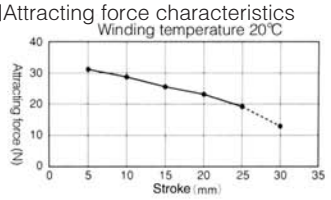
Rated voltage	AC100V 50/60Hz	AC200V 50/60Hz
Exciting current (AC)	0.9A	0.45A
Continuous power on	Within 3 min	
Duty	1/8 DUTY	
Rated attracting force	16.6 N (1.7 kgf)	
Rated stroke	20 mm	
Installation direction	Horizontal or vertical	
Operation mode	Pull type	
Insulation resistance	Above DC500V 100MΩ	
Voltage withstanding	AC1500V for 1 minute	
Insulation type	Equivalent to type E insulation	
Lead wire color	AC100 blue, blue	AC200V red, red
Model No. composition	SSAB–1602–8□ 1 : AC100V 2 : AC200V	

SSAB–1802–81
SSAB–1802–82

(Customized Products)



■Attracting force characteristics

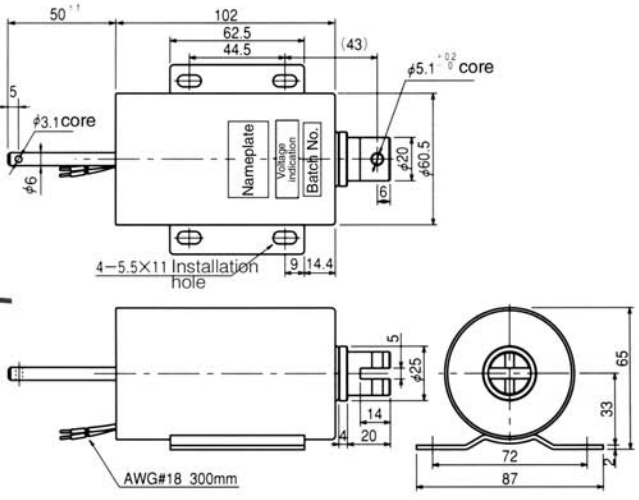


■Major parameters

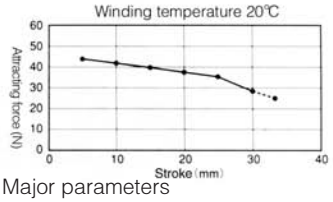
Rated voltage	AC100V 50/60Hz	AC200V 50/60Hz
Exciting current (AC)	1.1 A	0.55 A
Continuous power on	Within 3 min	
Duty	1/8 DUTY	
Rated attracting force	19.6 N (2 kgf)	
Rated stroke	25 mm	
Installation direction	Horizontal or vertical	
Operation mode	Pull type	
Insulation resistance	Above DC500V 100MΩ	
Voltage withstanding	AC1500V for 1 minute	
Insulation type	Equivalent to type E insulation	
Lead wire color	AC100 blue, blue	AC200V red, red
Model No. composition	SSAB–1802–8□ 1 : AC100V 2 : AC200V	

SSAB–2002–61
SSAB–2002–62

(Customized Products)



■Attracting force characteristics



■Major parameters

Rated voltage	AC100V 50/60Hz	AC200V 50/60Hz
Exciting current (AC)	1.3 A	0.65 A
Continuous power on	Within 7 min	
Duty	1/6 DUTY	
Rated attracting force	29.4 N (3 kgf)	
Rated stroke	30 mm	
Installation direction	Horizontal or vertical	
Operation mode	Pull type	
Insulation resistance	Above DC500V 100MΩ	
Voltage withstanding	AC1500V for 1 minute	
Insulation type	Equivalent to type E insulation	
Lead wire color	AC100 blue, blue	AC200V red, red
Model No. composition	SSAB–2002–6□ 1 : AC100V 2 : AC200V	

Silent DC Solenoid

"International" silent DC solenoid is an epoch making DC solenoid product that meets the social demand, featuring no noise and long service life. AC and DC solenoids are widely used in various sectors of automation control, but the shocking sound generated by attaching of plungers may make operators at operation site feel uncomfortable and sometimes become a public nuisance. The silent DC solenoid solves such deficiency and substantially extends the service life by removing the shock of plunger, so it is a trustable high quality product. The silent DC solenoid is suitable for sound equipment, office equipment, medical equipment, measuring instrument, etc.

■Features

Noise free
Silent DC solenoid is different from other solenoids in that its plunger has no shock and can move freely in the space inside the winding and thus generates power, so it is noise free.

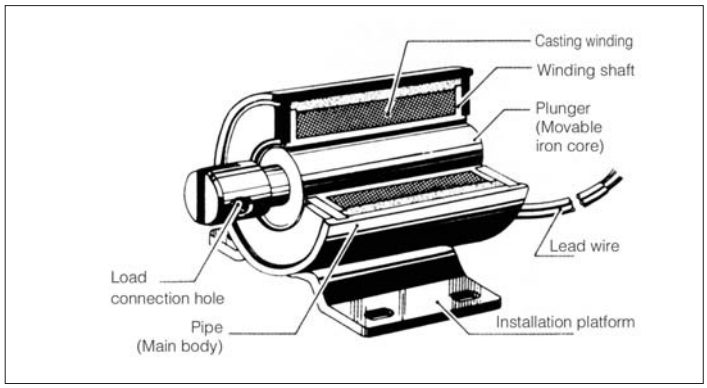
Long service life
Considering the wearing resistance, the moving part of the plunger is surface treated to improve its service life.

Small size and large output
In the intermittent solenoid of pulse driving type, in order to achieve large attracting force in long stroke, the ratio of plunger diameter to winding cord has been setup. In addition, clearance of the winding has been filled with resin to improve the cooling effect to achieve the features of small size and large output.

Flat attracting force characteristics
Silent DC solenoid has very flat attracting force characteristics and is convenient to use.

Simple installation
With a long hole designed, silent DC solenoid is simple to install and can be adjusted after installation.

Structure of Silent DC Solenoid



Silent DC solenoid takes full advantage of functions and electromagnetic characteristics of leak type (framework type) solenoid to achieve best effect.
As shown in the figure above, the plunger can move freely in the space inside the winding and thus generate power, while the plunger itself remains delicate in the balancing of load.

Model No. Structure

SSD — 10 2 4

Silent DC solenoid

Model (max stroke):
10: 10mm
12: 15mm
16: 20mm
18: 25mm

Duty symbol
1: 1/1
2: 1/2
4: 1/4
6: 1/6
8: 1/8
0: 1/10

Voltage symbol
2: 12V
4: 24V
8: 48V
0: 100V

Other Precautions and Instructions

Please use proper loads.
Please use model with load of 1.3 –1.5 times attracting force. According to actual action of the solenoid, in order to protect the full stroke passing in any condition, please use solenoid under the load attracting force.

Time rating (duty)
●The time rating can be divided into continuous rating and intermittent rating in terms of the purpose of use.

By allowing large consumption power according to the duty, intermittent rating can result in attracting force that is several times larger than the continuous rating.

●Considering the actual frequency of use and power supply capacity, the duty can be determined according to following formula:

$$\text{DUTY load} = \frac{\text{(Action Time)}}{\text{(Action Time + Stop Time=1 Cycle)}} \times (100\%)$$

If the power–on time in a cycle exceeds following value, please select continuous rating for all.

Duty: 50% duty time for 7 minutes, 25% duty time for 2 minutes, 10% duty time for 1 minute.

About installation of the solenoid(main body)
The solenoid can be installed at the vertical or horizontal direction relating to movement direction of the iron core. Action of the solenoid is repeated advance and return movement. If not installed appropriately, the solenoid may become loose or slide, and thus leads to accidental fault or noise.

■Installation of the fixed iron core
1. Please use bolts and nuts of size suitable for installation hole of the solenoid.
2. Please use screw caps capable of preventing loose and gaskets with teeth for fastening.
3. Please adjust the plunger so that it can be parallel to the hole of the solenoid when it is attracted.

■Connection with load

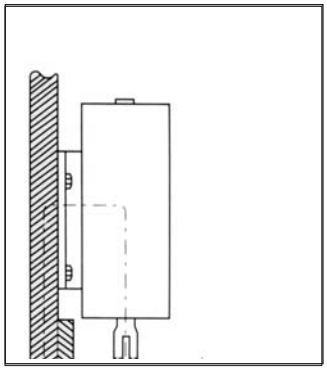
Please pay attention to following issues:
1. The load must move on the central axis of the movable iron core and apply no force to the movable iron core in horizontal and diagonal direction. If an external force affects the movable iron core in horizontal and diagonal direction, it will shorten the service life of the solenoid.
2. Pins used for connection to load must meet the size of connection hole of the load of the movable iron core..

Maintenance of the solenoid
Please check if the plunger and solenoid have any filth or dust inside. The filth or dust may lead to improper action.

About external magnetic loop

■Please consider the circuit breaking method

The solenoid generates magnetic force because of the current passing the winding, and drives the movement of the plunger via the magnetic loop. Therefore, when install the installation plate, the load connection part, the stopper and the cover made of magnetic materials, an external magnetic loop will be formed, which may reduce the effective magnetic beams and substantially decrease the attracting force. As a result, some parts should be made of non–magnetic material or clearance (over 2mm) shall be setup to prevent formation of the magnetic loop.



Silent DC Solenoid Product Checklist

■SSD Series (Customized)

Model	Range of Attracting Force N(gf)	Max stroKe (mm)	Power Consumption (W)	Weight of the Movable Iron core (g)	Total Weight (g)
SSD–10	0.16~2.74(16~280)	10	4~40	25	110
SSD–12	0.63~7.45(64~760)	15	7.5~75	45	210
SSD–16	0.86~15.68(88~1600)	20	10~100	115	550
SSD–18	1.57~23.52(160~2400)	25	14~140	165	850

※RoHS compliance product


SSD-10


SSD-12


SSD-16


SSD-18

■Universal parameters

Rated voltage	DC12V、24V 、 48V 、 100V
Duty	1/1、 1/2、 1/4、1/6、 1/8、 1/10
Winding temperature rise	※Below 65℃ at rated power consumption
Insulation type	Equivalent to type E insulation
Voltage withstanding (between winding and non–charging metal part)	60V以下 AC1000V for 1 minute
	Above 60V 125V以下 AC1500V for 1 minute
Insulation resistance (between winding and non–charging metal part)	Above DC500V 20MΩ

※ Note When the temperature exceeds 65℃, the winding may burn down because of overheat.

■SSD major components

Movable iron core	SUM (quick cutting steel)
Winding insulation	Resin filling
Winding shaft	Include glass PBT
Surface treatment	Pipe: complex acid salt coating treatment (Ep–Fe/Zn 5/CM2 C) Movable iron core: tufftride processing
Pipe	STKM structural steel pipe for mechanical use
Installation platform	SPCC (cold rolled steel plate)
Lead wire	Heat resisting ethylene wire (UL–1007)
Winding	PEW (polyester copper wire)

■Lead wire colors (applicable to all models)

DUTY \ Voltage	DC12V	DC24V	DC48V	DC100V
1/1	Black – Brown (Black)	Brown – Orange (Black)	Orange – Blue (Black)	Blue – Red (Black)
1/2	Black – Brown (Gray)	Brown – Orange (Gray)	Orange – Blue (Gray)	Blue – Red (Gray)
1/4	Black – Gray (Black)	Brown – Black (Black)	Orange – Brown (Black)	Blue – Orange (Black)
1/6	Black – Black (Black)	Brown– Brown (Black)	Orange – Orange (Black)	Blue – Blue (Black)
1/8	Black – Gray (Gray)	Brown – Black (Gray)	Orange – Brown (Gray)	Blue – Orange (Gray)
1/10	Black – Black (Gray)	Brown – Brown (Gray)	Orange – Orange (Gray)	Blue – Blue (Gray)

■Lead wire colors (applicable to all models)

Model	Attracting force N(gf)	Maximum stroke (mm)	Power consump–tion	Continuous power–on time	Total weight (g)
SSD–18MD	19.6(2.0)	20	84VA	Within 180s	1000
SSD–20MD	29.4(3.0)	20	120VA	Within 240s	1500


SSD-18MD

■Universal parameters

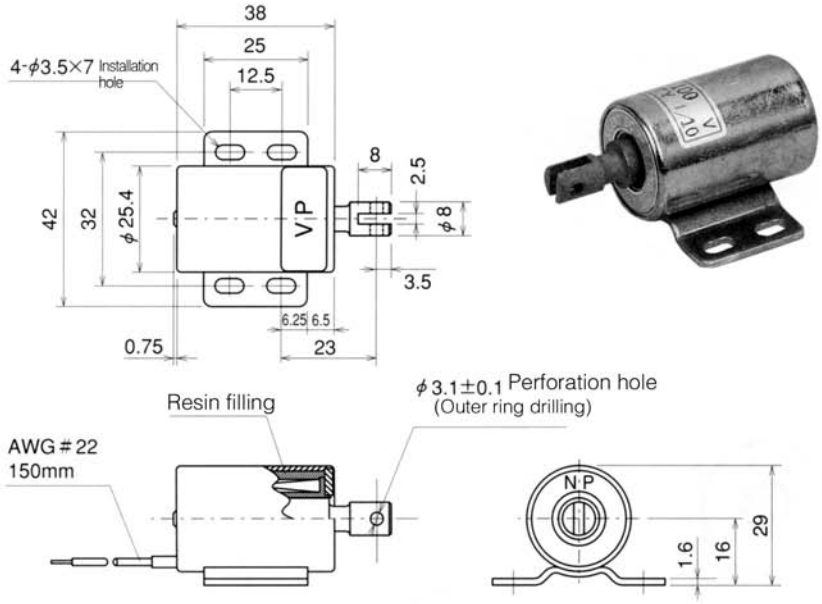
Rated voltage	AC100V 50/60Hz
Winding temperature rise	※Below 65℃ at rated power consumption
Insulation type	Equivalent to type E insulation
Voltage withstanding (between winding and non–charging metal part)	AC1500V for 1 minute
Insulation resistance (between winding and non–charging metal part)	Above DC500V 100MΩ
Installation direction	Horizontal or vertical
Action mode	Pull
Micro switch rating	AC250V 2A以下 (resistance load) DC30V 2A以下(resistance load)
Insulation rubber soft wire	VCTF 4 core x0.75mm²x300mm

※ 警告 When the temperature exceeds 65℃, the winding may burn down because of overheat.

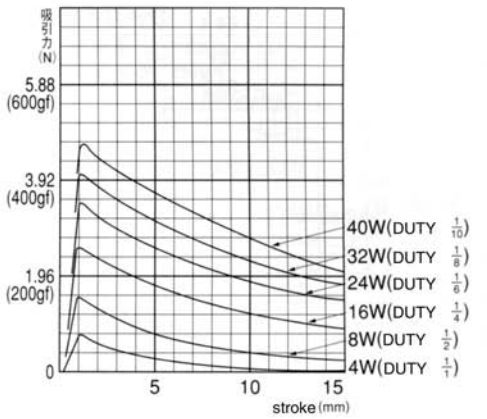
Silent AC Solenoid

●NP: Name Plate ●VP：VP: Voltage Plate

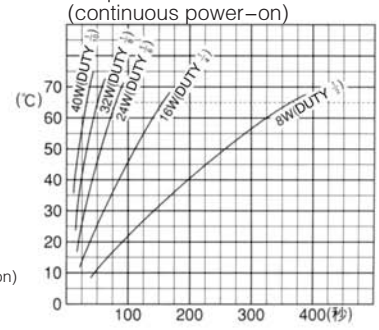
SSD–10 (Customized Product)



■Stroke/Attracting Force Characteristic Table
(Winding Temperature 20℃)



■Temperature rise characteristics
(continuous power–on)



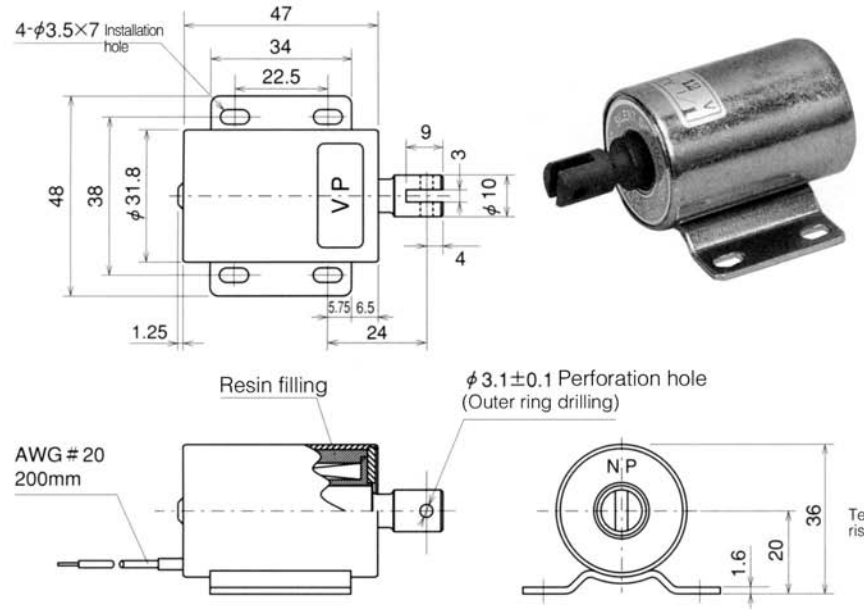
■Major parameters

Range of attracting force	Max stroke	External pipe diameter	Movable iron core diameter
0.16~2.74N(16~1280gf)	10mm	φ25.4	φ10

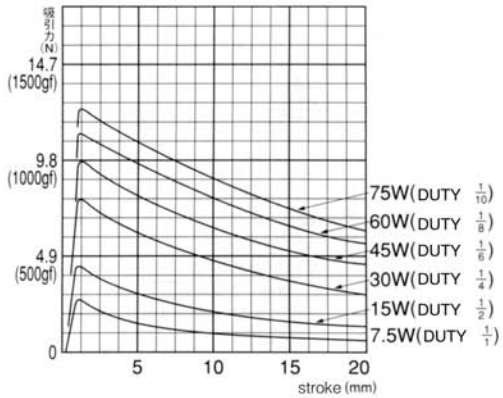
■Universal parameters

Temperature rise: below 4W65℃ (continuous power–on)
Insulation resistance:
above ： DC500V 20MΩ.
Voltage withstanding:
(between winding and non–charging metal part)
Below 60V, AC 1000V for 1 minute.
Above 60V and below 125V, AC 1500V for 1 minute.

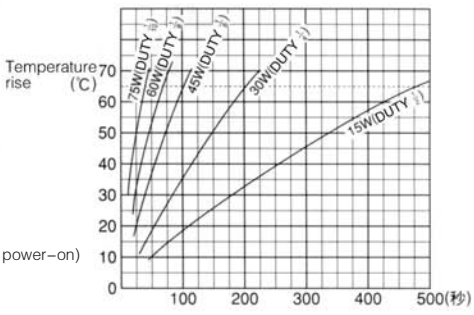
SSD–12 (Customized Product)



■Stroke/Attracting Force Characteristic Table
(Winding Temperature 20℃)



■Temperature rise characteristics
(continuous power–on)



■Major parameters

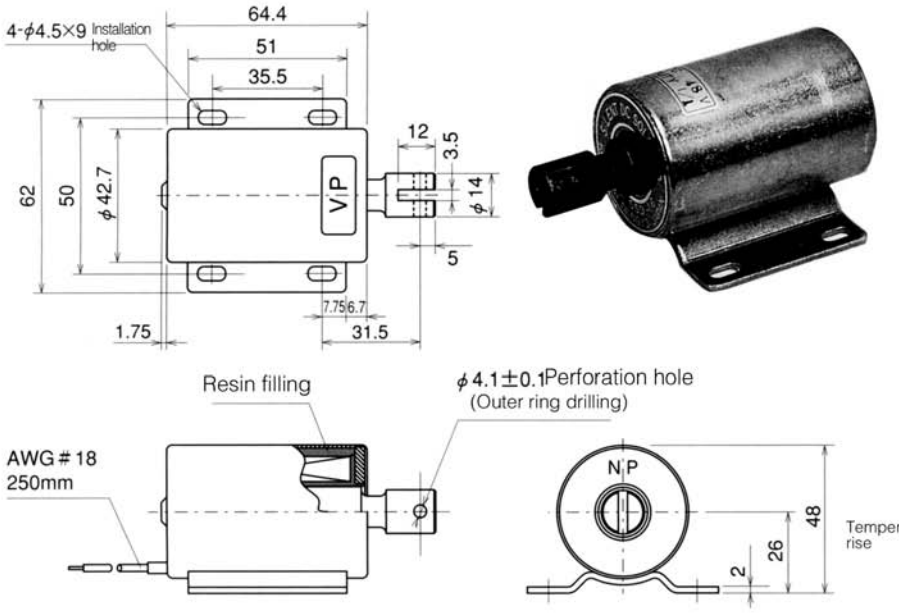
Range of attracting force	Max stroke	External pipe diameter	Movable iron core diameter
0.63~7.45N(64~760gf)	15mm	φ31.8	φ12

■Universal parameters

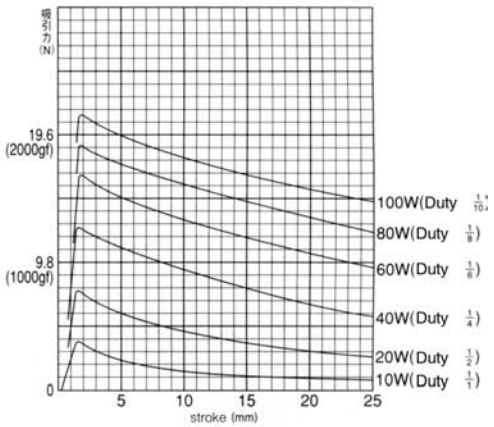
Temperature rise: below 7.5W65℃ (continuous power–on)
Insulation resistance:
above ： DC500V 20MΩ.
Voltage withstanding:
(between winding and non–charging metal part)
Below 60V, AC 1000V for 1 minute.
Above 60V and below 125V, AC 1500V for 1 minute.

Silent AC Solenoid

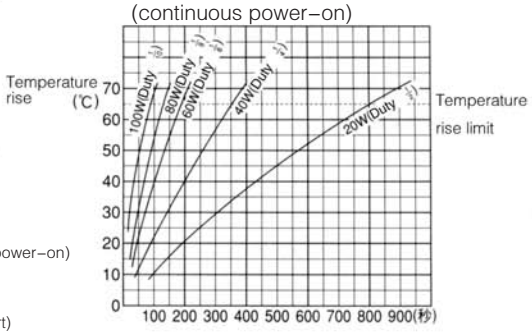
SSD–16 (Customized Product)



■Stroke/Attracting Force Characteristic Table
(Winding Temperature 20℃)



■Temperature rise characteristics
(continuous power–on)



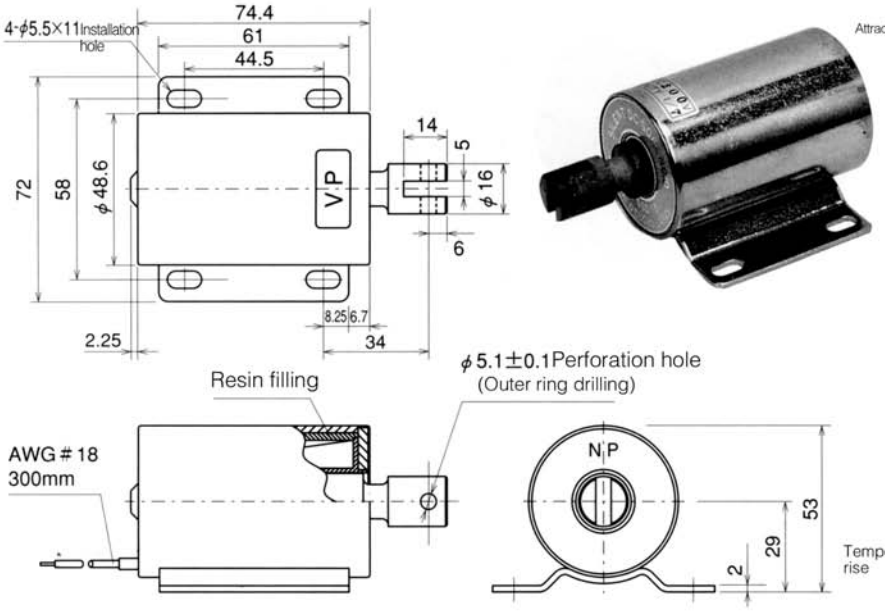
■Major parameters

Range of attracting force	Max stroke	External pipe diameter	Movable iron core diameter
0.86~15.19N(88~1550gf)	20mm	φ42.7	φ16

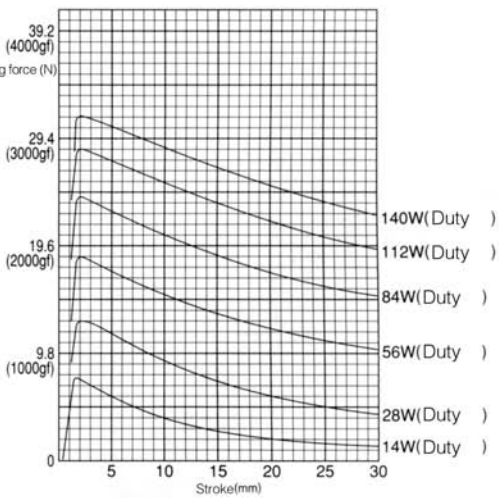
■Universal parameters

Temperature rise: below 4W65℃ (continuous power–on)
Insulation resistance:
above ： DC500V 20MΩ.
Voltage withstanding:
(between winding and non–charging metal part)
Below 60V, AC 1000V for 1 minute.
Above 60V and below 125V, AC 1500V for 1 minute.

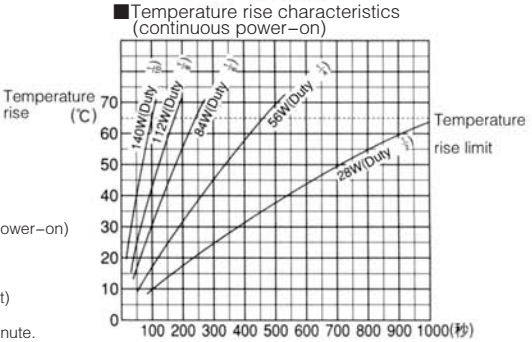
SSD–18 (Customized Product)



■Stroke/Attracting Force Characteristic Table
(Winding Temperature 20℃)



■Temperature rise characteristics
(continuous power–on)



■Major parameters

Range of attracting force	Max stroke	External pipe diameter	Movable iron core diameter
1.57~23.52N(64~760gf)	25mm	φ48.6	φ18

■Universal parameters

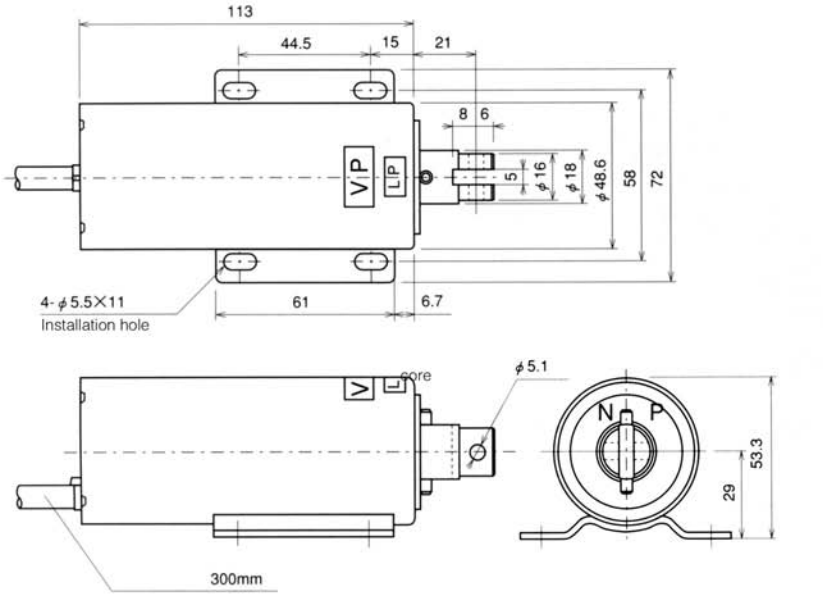
Temperature rise: below 4W65℃ (continuous power–on)
Insulation resistance:
above ： DC500V 20MΩ.
Voltage withstanding:
(between winding and non–charging metal part)
Below 60V, AC 1000V for 1 minute.
Above 60V and below 125V, AC 1500V for 1 minute.

Silent DC solenoid with limit switch

Silent DC solenoid SSD series is equipped with a limit switch to indicate the action status of the solenoid.
In addition, with a rectifier equipped, it can be used with AC power.
Plunger attraction: limit switch ON.

●NP: Name Plate ●VP: Voltage Plate ●LP: Lot Number

SSD–18MD (Customized Product)

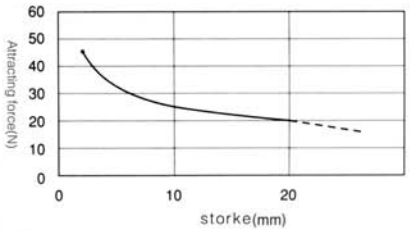


■Major characteristics

Rated voltage	AC200V 50/60Hz
Power consumption	84VA
Attracting force	19.6N(2.0kgf)
Stroke	20mm
Duty	1/6
Duty rating	Continuous power–on within 3 minutes
Temperature rise	below 65℃
Insulation type	JISC4552, Equivalent to type E insulation
Insulation resistance	Above DC500V 100MΩ
Voltage withstanding	AC1500V for 1 minute
Installation direction	Horizontal or vertical
Action mode	Pull
Micro switch rating	AC250V Below 2A DC30V Below 2A (resistance load)
Wires	VCTF4 core x0.75mm²x300mm

Note: the minimum load of the micro switch is DC15V, 0.1A.
Notify in addition when connecting small loads.

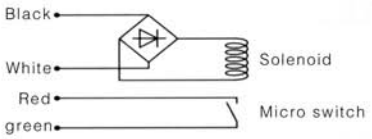
■Attracting Force Characteristic



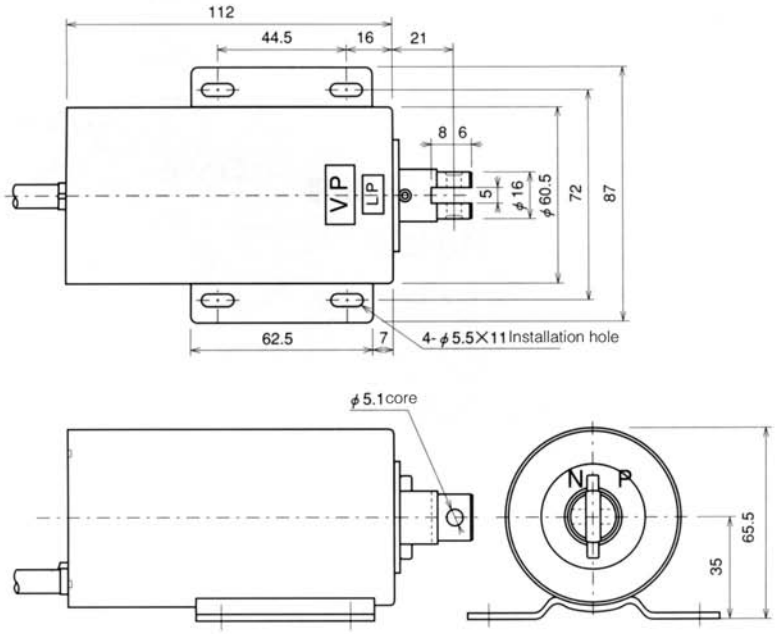
■Major parameters

Range of attracting force	Max stroke	External pipe diameter	Movable iron core diameter
19.6N(2.0gf)	20mm	φ48.6	φ18

■Connection diagram (lead wire colors)



SSD–20MD (Customized Product)

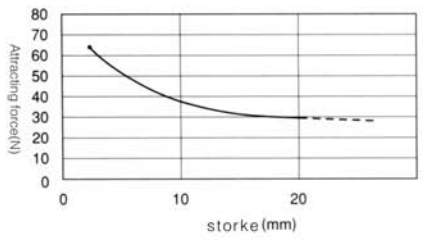


■Major characteristics

Rated voltage	AC200V 50/60Hz
Power consumption	120VA
Attracting force	29.4N(3.0kgf)
Stroke	20mm
Duty	1/6
Duty rating	Continuous power–on within 4 minutes
Temperature rise	below 65℃
Insulation type	JISC4552, Equivalent to type E insulation
Insulation resistance	Above DC500V 100MΩ
Voltage withstanding	AC1500V for 1 minute
Installation direction	Horizontal or vertical
Action mode	Pull
Micro switch rating	AC250V Below 2A DC30V Below 2A (resistance load)
Wires	VCTF4 core x0.75mm²x300mm

Note: the minimum load of the micro switch is DC15V, 0.1A.
Notify in addition when connecting small loads.

■Attracting Force Characteristic



■Major parameters

Range of attracting force	Max stroke	External pipe diameter	Movable iron core diameter
29.4N(3.0gf)	20mm	φ60.5	φ18

■Connection diagram (lead wire colors)