CKD

SM-7142-A/3

Instruction Manual

High Vacuum Solenoid Valve

HVB 112-6N-5
41-8N-5

- Be sure to read this instruction manual before using the product.
- In particular, read the safety instructions carefully.
- Keep this instruction manual in a safe place so that it can be taken out and read immediately when needed.

CKD

To Use This Product Safely

This product is intended for persons with basic knowledge of materials, fluids, piping, and electricity when using control valves (such as solenoid valves, motor valves, and air-operated valves). We are not responsible for any accidents caused through the selection or use of control valves by persons without knowledge or sufficient training.

The applications of our customers are so diverse that we cannot fully grasp them.

Depending on the application and usage, the product may not perform as expected or may lead to an accident due to fluid, piping, or other conditions. Therefore, it is the customer's responsibility to check the product specifications and determine the method of use according to the application and usage.

Although various safety measures have been taken for this product, improper handling by the customer may lead to an accident. To avoid such a situation, be sure to read this instruction manual carefully and fully understand its contents before using the product.

Before handling the valve, read the valve instruction manual.

In addition to the handling precautions described in the text, also pay attention to the following points.

⚠ Caution

- The coil section of a solenoid valve or motor valve generates heat when electricity is applied. Models with class H specifications in particular may become very hot. Direct contact may cause burns, so be careful.

- There is a risk of electric shock if you touch the electrical wiring connections (bare live parts) of a solenoid valve or motor valve. When disassembling or inspecting the product, be sure to turn off the power before starting work. Do not touch the energized parts with wet hands.

- When using a control valve for high-temperature control other than steam, there is a risk of burns if the high-temperature fluid leaks outside. Therefore, ensure piping without leaks and carefully check that there are no leaks from each part before use.

Thank you for choosing CKD's high vacuum solenoid valve "HVB series."
The HVB series are solenoid valves developed by leveraging many years of our experience to enable use at medium to high vacuum by as many customers as possible.
All CKD products are manufactured under strict quality control, so you can use them with confidence.
Read this instruction manual carefully to ensure the most effective use of your CKD products.

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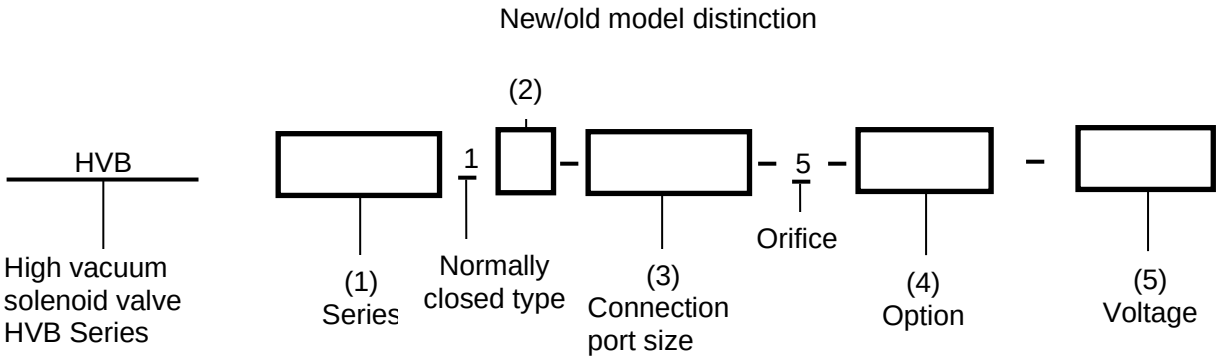
1. How to Read the Model Number



(1) Series	
1	
4	

(2) New/old model distinction	
2	After model change (new model)
None	Before model change (old model)

(2) applies only to the HVB1 type
Currently, all have been switched to HVB112.

(3) Connection port size	
6N	NPT 1/8
8N	NPT 1/4

(4) Options	
3H	Square terminal with lamp (PF1/2)
3K	Square terminal without lamp (PF1/2)
B	Mounting base
3HB	Square terminal with lamp (PF1/2) + Mounting base
3KB	Square terminal without lamp (PF1/2) + Mounting base

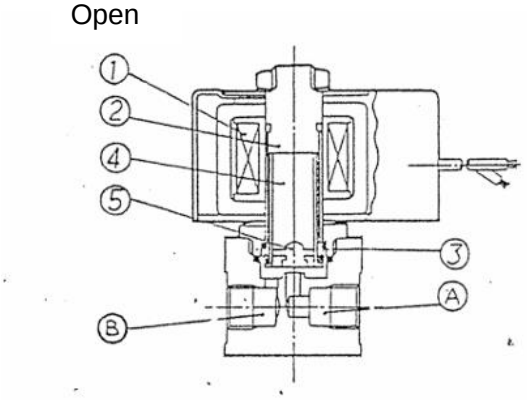
Options apply only to HVB41.

(5) Voltage
100VAC (50Hz/60Hz)
200VAC (50Hz/60Hz)
24VDC

2. Operation Description, Internal Structure, and Parts List

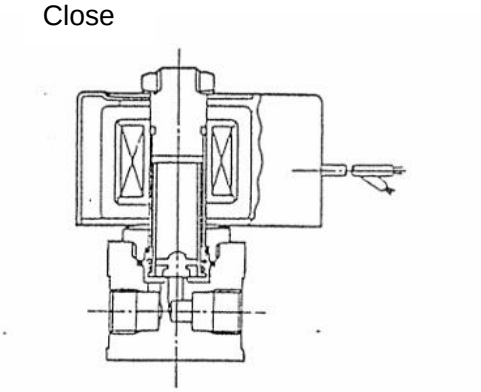
- Operation Description

Open



When coil (1) is energized, the valve element (5), with plunger (4) attracted to fixed iron core (2), opens, and chambers (A) and (B) become open.

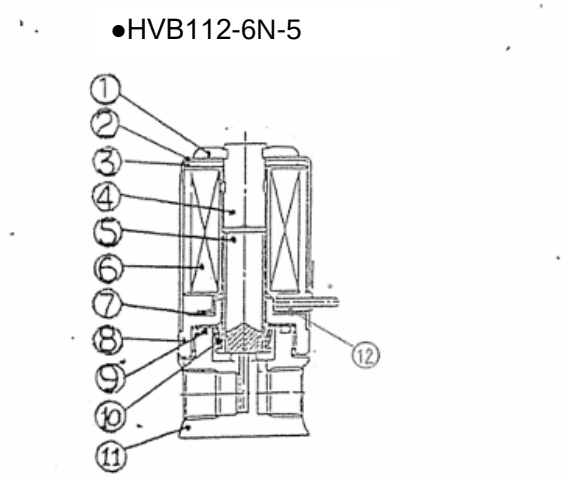
Close



When the coil (1) is de-energized, the plunger (4) is lowered by the spring (3), closing the valve element (5). Therefore, chambers (A) and (B) are shut off.

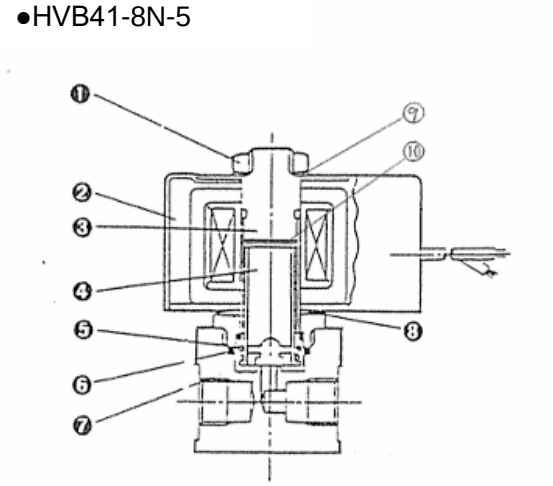
- Internal Structure and Parts List

●HVB112-6N-5



Part number	Part name	Material
(1)	Clip	PBT
(2)	Bonnet	SPCC
(3)	Bonnet piece	SPCC
(4)	Core assembly	SUS316, SUS405
(5)	Plunger assembly	SUS405, FKM
(6)	Coil assembly	
(7)	Wave washer	S65CM
(8)	Core B	SUM22
(9)	O-ring	FKM
(10)	Spring	SUS304WPB
(11)	Body	SUS303
(12)	Insulation film	PET

●HVB41-8N-5



Part number	Part name	Material
❶	Nut	C3604
❷	Coil assembly	
❸	Core Assembly	SUS405,403,316L
❹	Plunger assembly	SUS405-FKM, PET
❺	Spring	SUS304
❻	O-ring	FKM
❼	Body	SUS303
❽	Wave washer	SUS301
❾	Spacer A	SUS304
❿	Cushion plate	PET

3. Precautions for Use

3-1. Precautions during use

(1) Do not use the product in an environment where a corrosive or explosive gas is present.

(2) Use it within the specified pressure range. Using the product outside the specified pressure range may result in malfunction.

(3) Use the product within the specified ambient and fluid temperature ranges.

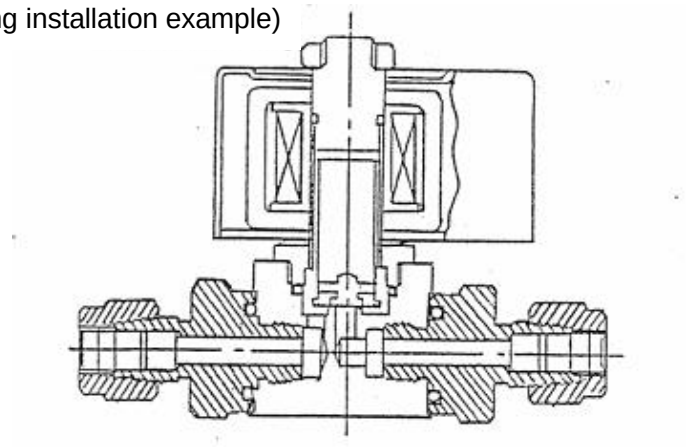
(4) Use it at ambient humidity of 70°% or below.

(5) If dust or other foreign matter is likely to get mixed into the fluid, be sure to install a filter of 60 μm or less on the atmospheric side of the solenoid valve.

3-2. Precautions when piping

(1) Commercially available Swagelok fittings can be used as piping fittings. (HVB41-8N type...SS400-1-4-OR) For the HVB112 type, we recommend using adhesive to seal the fitting.

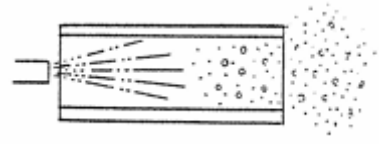
(Piping installation example)



(2) The mounting orientation should be vertical with the coil facing upwards.

(3) Pay attention to the connection direction. Carefully check the pressure specifications and select the direction.

(4) Before piping, flush out any foreign matter, chips, etc. from the piping and equipment.
If foreign matter, chips, etc. are not properly removed, it may cause malfunction of the solenoid valve.



(5) After installing the piping, check for leaks at each connection.
We recommend checking with a helium leak detector.

3-3. Precautions when wiring

(1) Use wiring wires with a nominal cross-sectional area of 0.5 mm^2 or more.

(2) For the electrical circuit, use a switching circuit that does not cause contact chattering.

(3) Use a voltage within ±10% of the rated voltage.

(4) When using a contactless relay circuit, be careful of leakage current.
Select a switch with a leakage current of 5% or less of the rated current.

4. Maintenance and Inspection

4-1. Regular inspection

(1) To ensure optimal operation of the solenoid valve, inspect it once or twice a year.

(2) Regular inspection

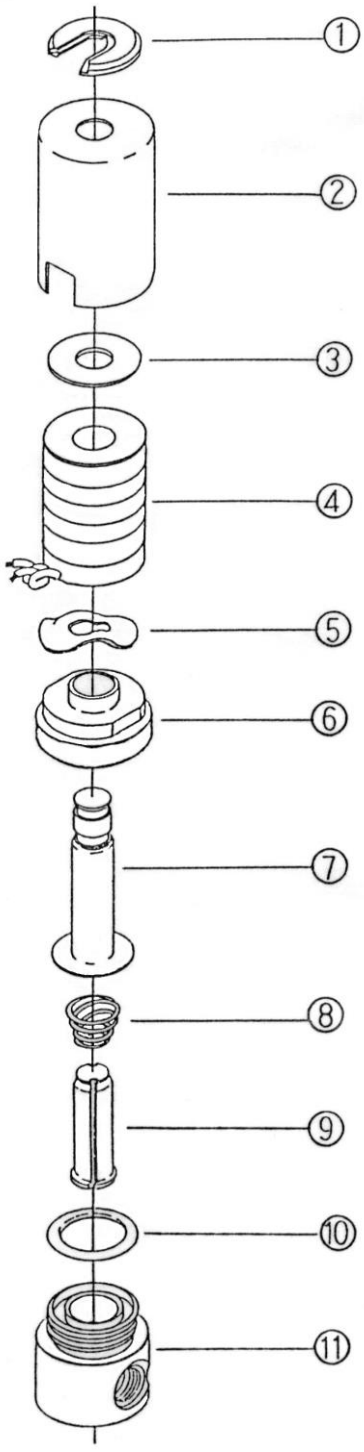
(a) Check that there is no dirt or foreign matter accumulated on the plunger, body, or valve disc. If there is any abnormality, disassemble and clean it.

(b) Check that the plunger and core assembly of the actuator are not damaged or abnormally worn. If there is an abnormality, replace it.

(c) Check the valve element of the actuator for damage or abnormal wear. If there is an abnormality, replace it.

4-2. Disassembly - assembly - inspection

(For HVB112 type)



·Disassembly

(1) Be sure to turn off the power and release fluid pressure before disassembly.

(2) When removing the coil (4)

Removing the clip (1) will make the bonnet (2) come off, and the ring (3), coil (4), and wave washer (5) can be removed.

(3) When removing the plunger assembly (9)

Loosening the core B (6) will detach the core assembly (7), allowing the conical spring (8) and plunger assembly (9) to be taken out.

·Assembly

(1) For reassembly, follow the reverse order of disassembly and make sure no parts are left out.

(2) Assemble carefully so that no dirt or foreign matter adheres to the plunger assembly (9), conical spring (8), core assembly (7), O-ring (10), or body (11), which correspond to the flow path.

(3) When tightening core B, use a torque in the range of 20 to 25 N·m.
(At a torque of 20 N·m or less, the standard value of 1.3 × 10^{-9} Pa·m^3/s or less for external leakage may not be met.)

·Inspection

(1) Check for external and internal leakage using a leak detector or equivalent.

(2) Finally, turn on the signal (power on) and check that the valve opens and closes normally.

(For HVB41 type)

·Disassembly

(1) Be sure to turn off the power and release fluid pressure before disassembly.

(2) When removing the coil assembly (4)
Loosening the nut (1) will remove the spacer A (2) and nameplate (3), and the coil assembly (4) can be taken out.

(3) When removing the plunger (5)
If you remove the wave washer (11) and loosen the core assembly (7), you can take out the spring (8) and plunger (5).

·Assembly

(1) For reassembly, follow the reverse order of disassembly and make sure no parts are left out.

(2) Assemble carefully so that no dirt or foreign matter adheres to the plunger (5), spring (8), core assembly (7), O-ring (9), or body (10), which correspond to the flow path.

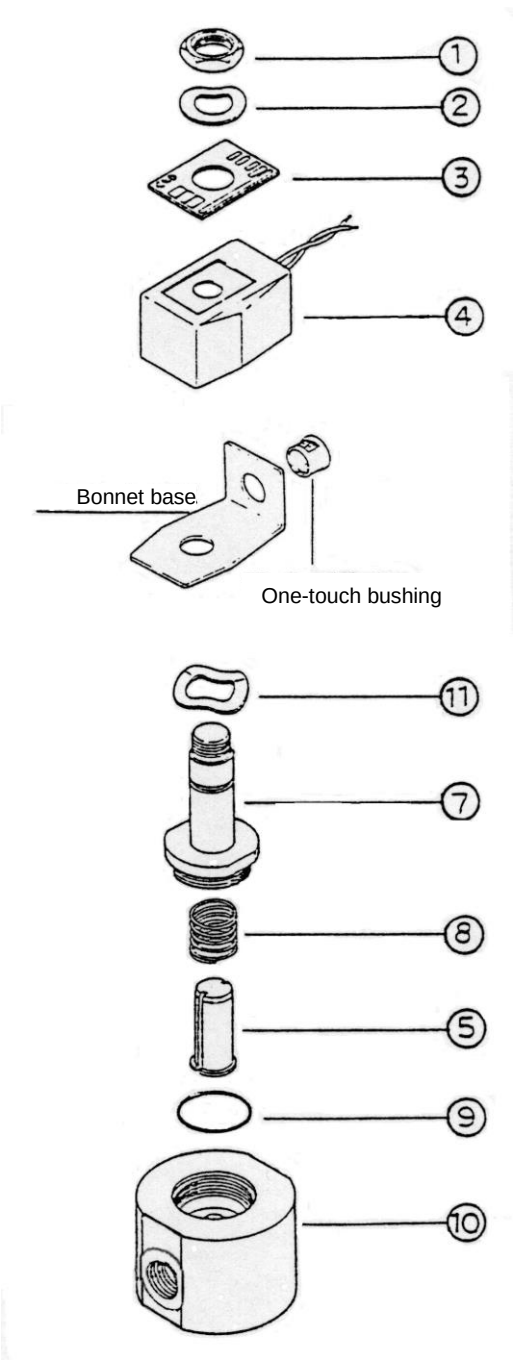
(3) When tightening the core assembly (7), apply a torque in the range of 25 to 30 N·m.
(At a torque of 25 N·m or less, the standard value of 1.3×10^{-9} Pa·m³/s or less for external leakage may not be met.)

(4) When tightening the nut (1), apply a torque in the range of 8 to 10 N·m.
(At a torque of 8 N·m or less, the valve may not operate normally.)

·Inspection

(1) Check for external and internal leakage using a leak detector or equivalent.

(2) Finally, turn on the signal (power on) and check that the valve opens and closes normally.



4-3. Malfunctions and Countermeasures

Malfunction		Cause	Countermeasure
Vacuum degree does not increase	There is an internal leak. (Leakage from the valve disc or valve seat)	・ Foreign matter adhering to the valve seat. ・ Foreign matter is attached to the valve disc. ・ Damage to the valve seat. ・ Incorrect piping direction.	Disassemble and clean. Disassemble and clean. Replace. Correct the piping direction.
	There is an external leak. (Leakage from areas other than the valve disc and valve seat)	・ Foreign matter adhering to the O-ring and gasket of the sealing section. ・ The core assembly is damaged. ・ ·The sealing of the connection port is incomplete.	Disassemble and clean. Replace. Ensure reliable sealing with adhesive or fittings with O-rings (for HVB type).
The valve does not operate properly.	The valve does not open.	・ The power is not on. ・ Foreign matter is caught in the plunger or core assembly. ・ The plunger or core assembly is abnormally worn. ・ The operating differential pressure is outside the allowable differential pressure range of the valve. ・ Coil failure	Check the power supply. Disassemble and clean. Replace. Change the pressure to within the allowable differential pressure range or replace with an appropriate model. Replace.
	The valve does not close.	・ The power is not turned off. ・ Foreign matter is caught in the plunger or core assembly.	Voltage check Disassemble and clean.
	Unstable operation	・ Foreign matter is caught in the plunger or core assembly. ・ The plunger or core assembly is abnormally worn.	Disassemble and clean. Replace.
	Coil burnout	・ Abnormal voltage	Voltage check Match the coil and power supply voltage.

◎If you have any problems other than those mentioned above, please contact us or our distributor.