

Instruction Manual

Gas Solenoid Relief Valve

VNR

- 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.

To Use This Product Safely

This product is intended to be used by those who have basic knowledge of materials, fluids, piping, and electricity when using control valves (e.g., solenoid valves, motor-operated valves and air-operated valves). We are not responsible for any accidents caused by the selection or use of control valves by those who do not have knowledge or who have not received sufficient training.

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

Depending on the application and usage, performance may not be achieved due to fluid, piping, or other conditions, or accidents may occur. Therefore, it is the customer's responsibility to confirm the product specifications and determine the usage method according to the application and usage.

Although various safety measures have been implemented for this product, improper handling by the customer may lead to an accident. To prevent this from happening, please be sure to read the instruction manual carefully and fully understand its contents before using the product.

In addition to the handling precautions described in the main text, please also note the following items.

Caution

- The coils of solenoid valves and motor-operated valves generate heat when the power is on. In particular, class H models may become hot. Be careful as direct contact may cause burns.
- There is a risk of electric shock if you touch the electrical wiring connections (bare live part) of valves such as solenoid valves and motor-operated valves. Before disassembling or inspecting the product, be sure to turn off the power. In addition, do not touch the live parts with wet hands.
- When using a valve for steam or high-temperature control, there is a risk of burns if the high-temperature fluid leaks outside, so make sure the piping is free of leaks and ensure there are no leaks from any part before use.

Introduction

Thank you for choosing CKD's Gas Solenoid Relief Valve (VNR).

This solenoid relief valve is manufactured under our strict quality control.

This product has specific temperature, pressure, and other operating conditions. Please be sure to read this manual before installation and confirm the correct installation and usage methods.

After reading, be sure to save it as it may be useful to you later.

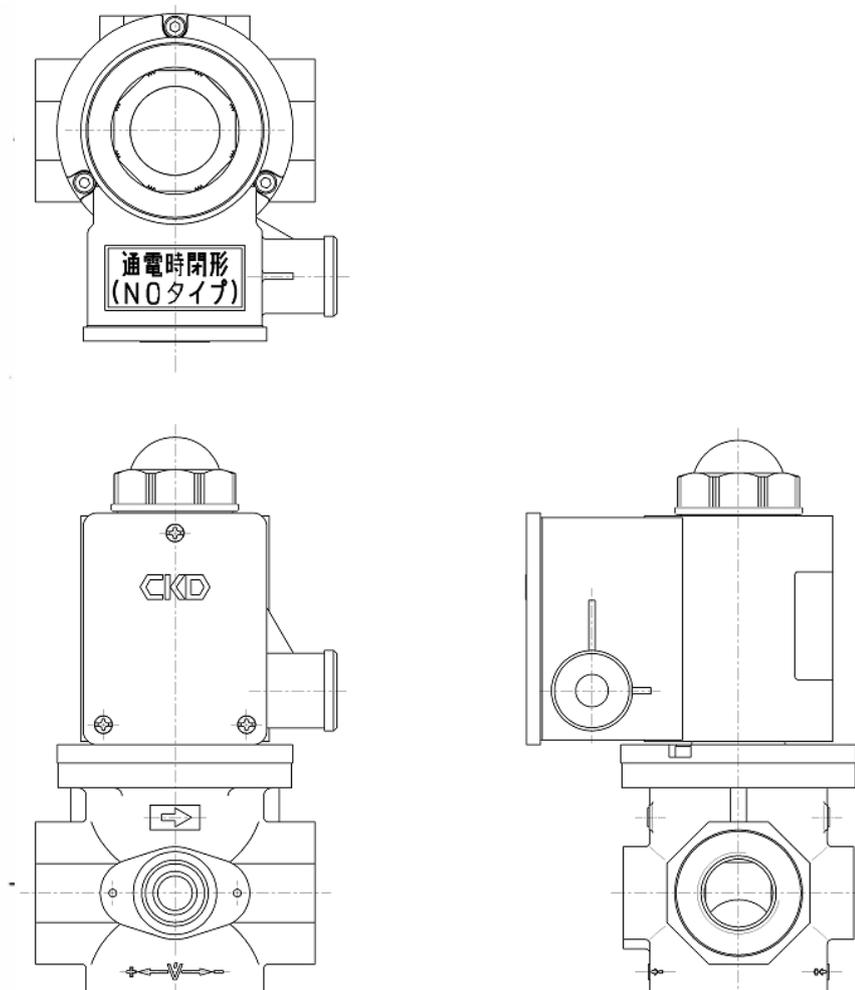
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1. Initial Confirmation

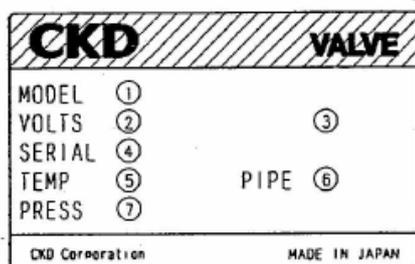
1-1. Checking the product

We take the utmost care when delivering our products, but please check the exterior of the product to make sure there are no abnormalities such as damage that may have occurred during transportation or loose bolts.



1-2. Checking the nameplate information

Check the model number, specifications, etc. written on the nameplate.



- | | | | |
|---|------------------------|---|-------------------------------|
| ① |Model number | ⑤ |Ambient temperature |
| ② |Rated voltage | ⑥ |Nominal diameter |
| ③ |Power consumption | ⑦ |Maximum working pressure |
| ④ |Serial number | | |

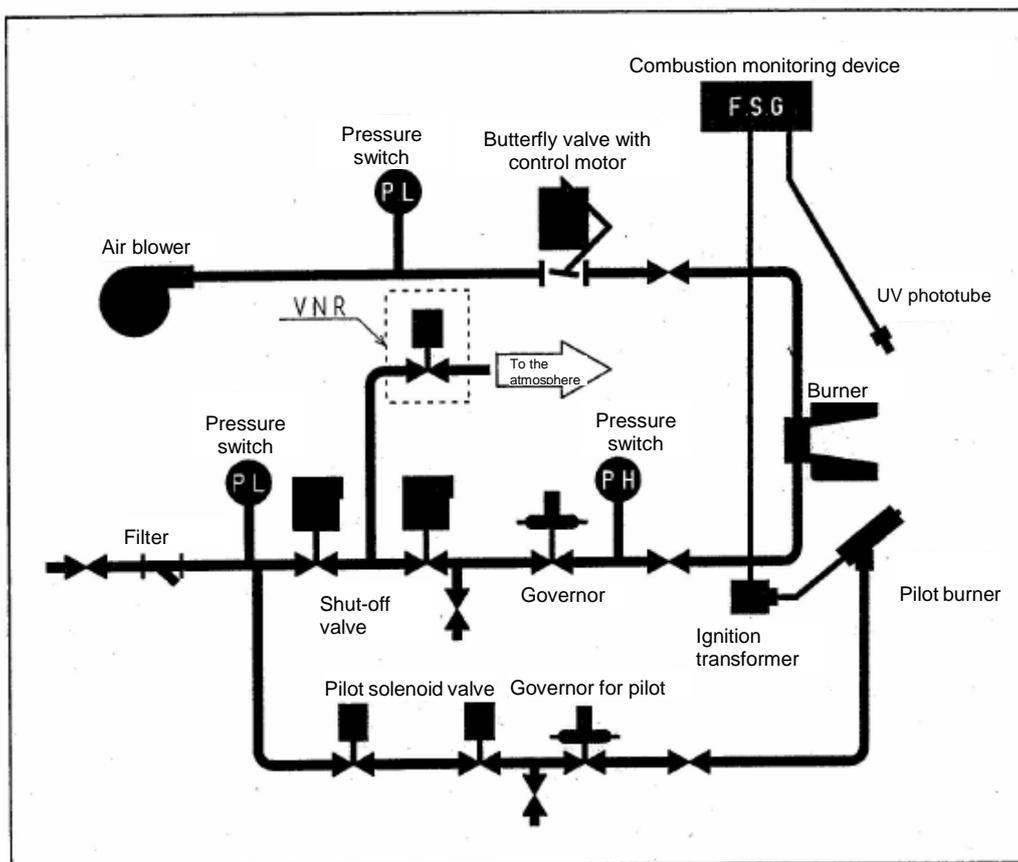
2. Product description

2-1. Application

This product is used as a gas solenoid relief valve in gas flow paths to prevent unburned gas from entering furnaces in industrial gas combustion equipment and other systems, discharging it to a safe location outside.

An example of how this product can be used on a system is shown below.

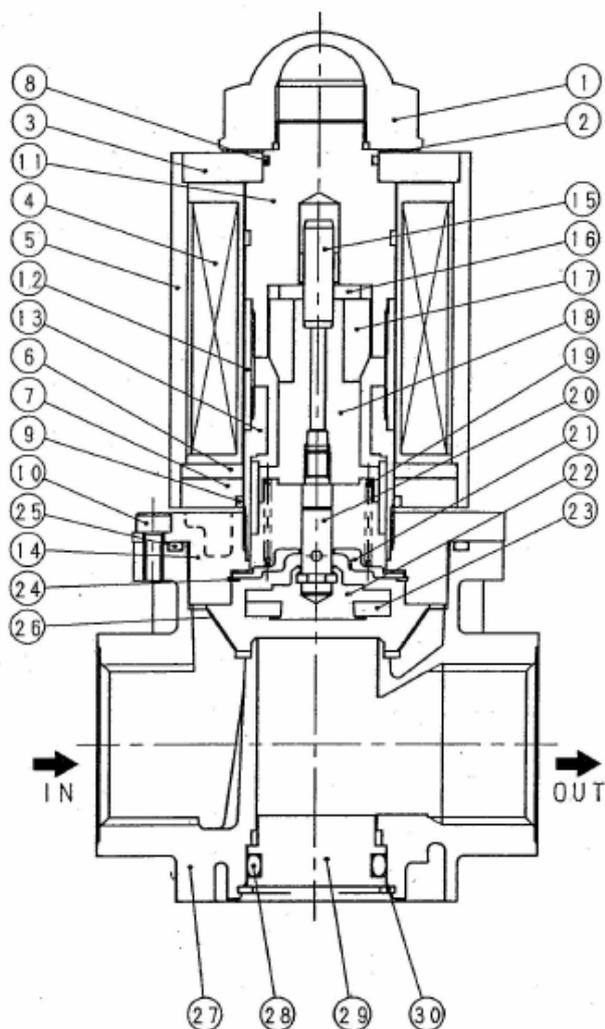
Usage example



2-2. Key features

- A sturdy dedicated terminal box with JIS standard conduit threads is attached, making electrical wiring easy.
- The DC-driven actuator has a built-in rectifier, so it is safe and does not produce noise or burn out the coil.
- It has a dustproof and splash-proof design.

2-3. Structural diagram and names of each part



Part No.	Product name	
1	Cap	
2	Coned disc spring	
3	Ring core A	Actuator
4	Coil winding	
5	Bonnet	
6	Ring core C	
7	Ring core B	
8	O-ring	
9	O-ring	
10	Hexagon socket head bolt	
11	Core	Core pipe assembly
12	Seamless pipe	
13	Plunger guide	
14	(Top lid)	
15	Plunger shaft	Armature assembly
16	Residual magnetism killer	
17	Iron core	
18	Plunger	
19	Spring	
20	Valve spindle	
21	Spring supporting disk	
22	Disk holder	
23	Valve seat	
24	C-type retaining ring or retaining ring	
25	O-ring	
26	Strainer	
27	Body	Body assembly
28	O-ring	
29	Bottom plug	
30	C-type retaining ring	

2-4. Operating principle

- Opening the valve

When the current to the coil winding is stopped, the spring returns the plunger to its original position, the valve seat opens, and the fluid flows from IN to OUT.

- Closing the valve

When electricity is applied to the coil winding, the iron core is attracted to the plunger guide, the valve seat closes, and the fluid flowing from IN to OUT is cut off.

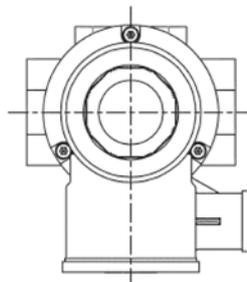
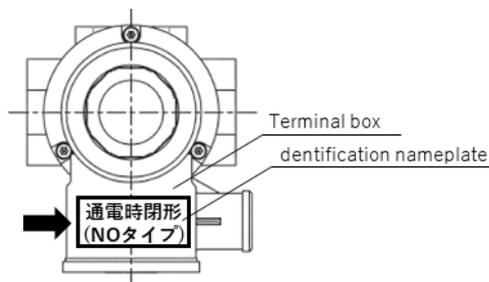
2-5. Identifying

The Gas Solenoid Relief Valve VNR and gas solenoid valve VNA have similar appearances, but can be distinguished by the following three points.

- ① Presence/absence of an identification plate on top of the terminal box.

VNR: Identification plate included

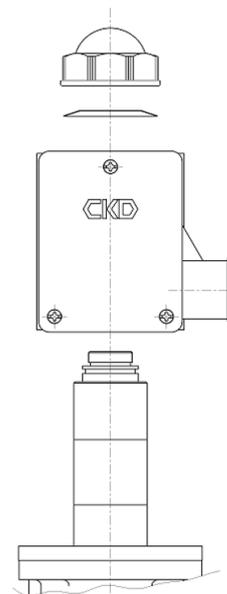
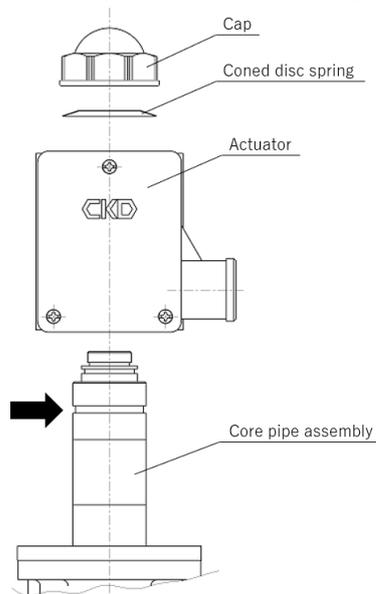
VNA: No identification plate



- ② Presence/absence of groove on the upper side of the core pipe assembly.

VNR: With grooves

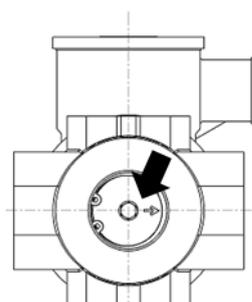
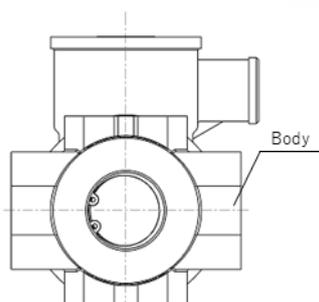
VNA: No groove



- ③ Differences in the shape of the bottom of the body (hexagon socket, presence or absence of arrow).

VNR:
No hexagon socket and arrow.

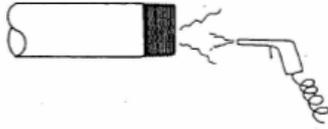
VNA:
There are hexagon socket and arrow.



3. Installation Precautions

3-1. Air flushing

Before installing the solenoid relief valve in piping, remove any chips or foreign matter from the piping by air flushing.



3-2. Sealing to pipe connections

Use the sealant specified by the city gas manufacturer and apply it from the second thread from the tip of the pipe thread, being careful not to apply too much when connecting the pipes. When applying the sealant, be careful not to let it get into the piping.



3-3. Thread length

Maintain the effective thread length of the gas pipe. If it is too long or too short, it may cause damage and leakage. In addition, use a file to cleanly sand down about half a pitch from the tip of the screw.



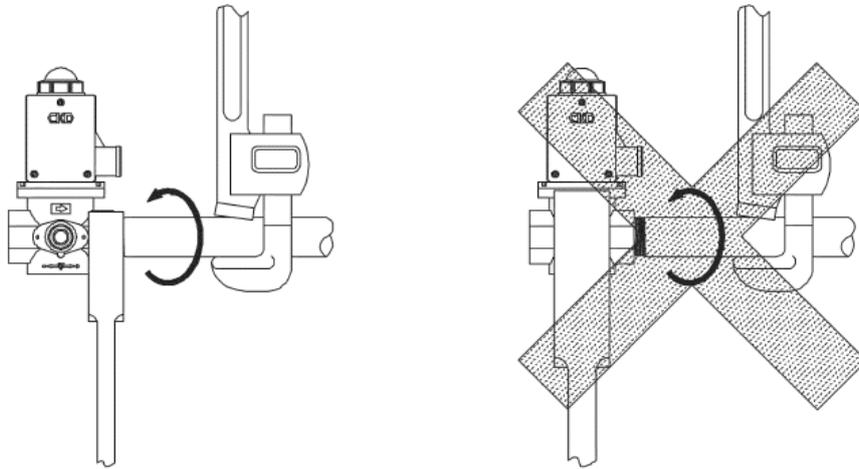
3-4. Flow direction

Install the solenoid relief valve in the direction of the gas flow indicated by the arrow on the valve body.



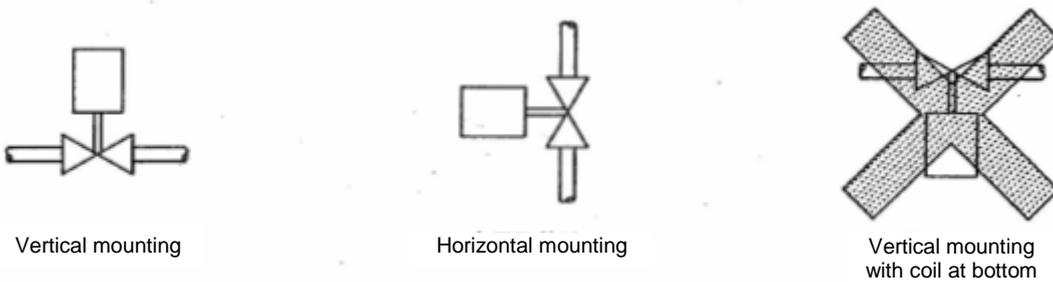
3-5. Installation on pipes

Hold the two sides of the body connection port with a spanner or wrench and install the pipes. Do not chuck any other parts (other than the actuator and two body surfaces).



3-6. Mounting posture

When connecting the solenoid relief valve to piping, install it vertically with the actuator facing up or horizontally with the actuator facing to the side.



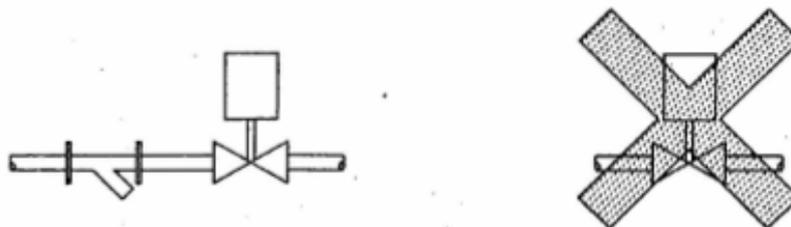
Vertical mounting

Horizontal mounting

Vertical mounting with coil at bottom

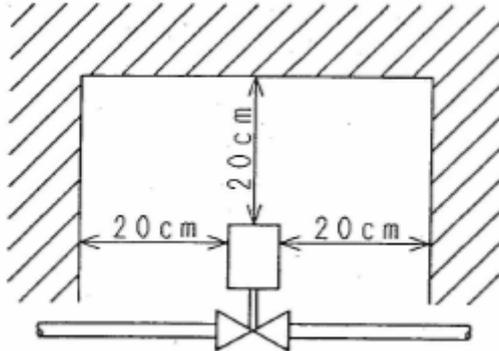
3-7. Installing the filter

Install a filter upstream of the solenoid relief valve to remove dust and other foreign matter.



3-8. Space around the solenoid relief valve

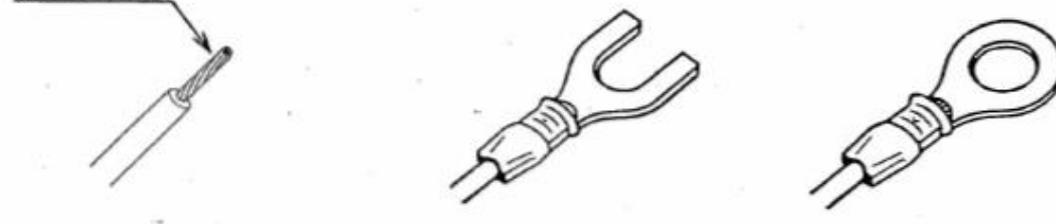
Leave a space of about 20 cm around the installation location of the solenoid relief valve to allow for easy daily inspection and maintenance.



3-9. Electric wires

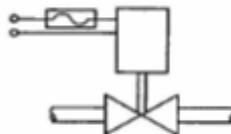
Use electrical wires with a cross-sectional area of 0.75 mm^2 or greater. On the side connecting to the terminal block of the solenoid relief valve, secure the wires using U-shaped terminals or round terminals (for M4 screws).

0.75 mm^2 or more



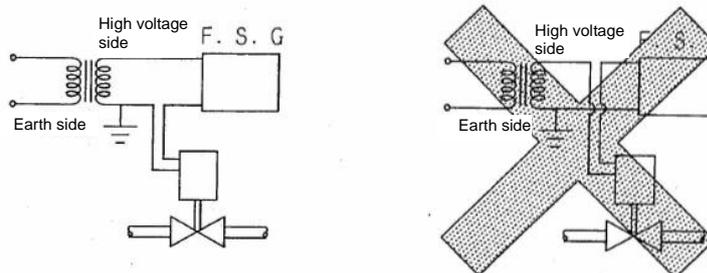
3-10. Installing the fuse

When installing a fuse in the solenoid relief valve power circuit, use one with the appropriate capacity.

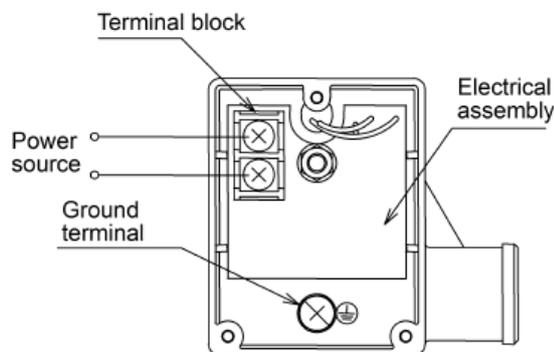


3-11. Connecting the operating power supply

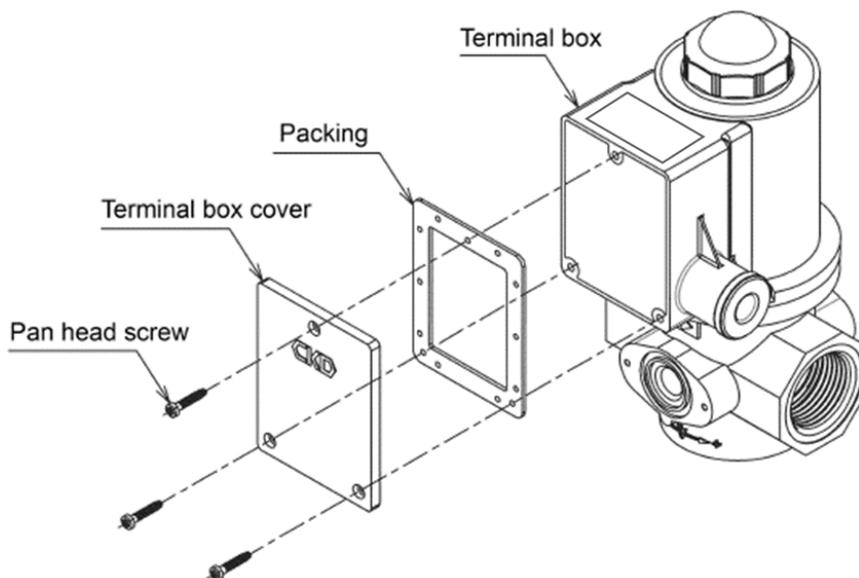
When connecting the power supply, connect the high-potential side and the ground side correctly as shown in the diagram below.



To connect to the solenoid relief valve terminal block, remove the terminal box cover, pass the wires through the CTC19 conduit connection screws into the terminal box, and connect them to the terminal block. Tighten the terminal screws with a torque of 1.37 N·m {14 kgf·cm}. In addition, to prevent electric shock in the event of a power leak, connect the earth terminal to the ground.

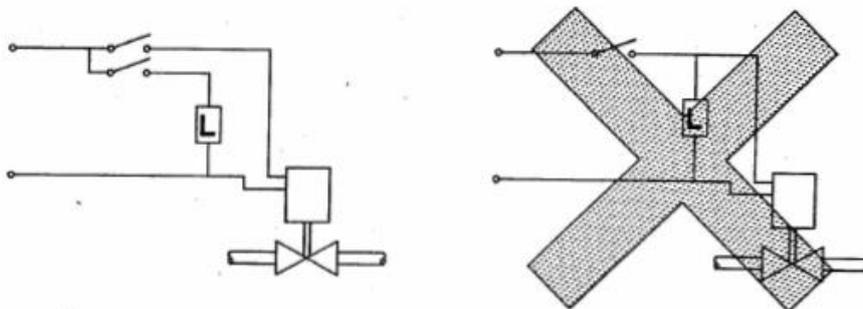


After connecting the power supply, reattach the terminal box cover. Tighten the terminal box cover mounting screws (cross-recessed round head machine screws) with a torque of 0.30 to 0.49 N·m {3 to 5 kgf·cm}.



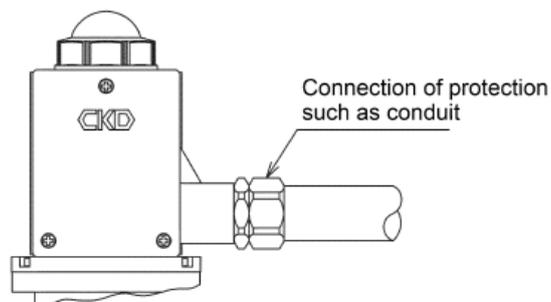
3-12. Surge voltage prevention

When connecting a solenoid relief valve and an inductive load (for example, a motor or multiple relays) in parallel, wire as shown in the diagram below so that surge voltage is not applied to the solenoid relief valve.



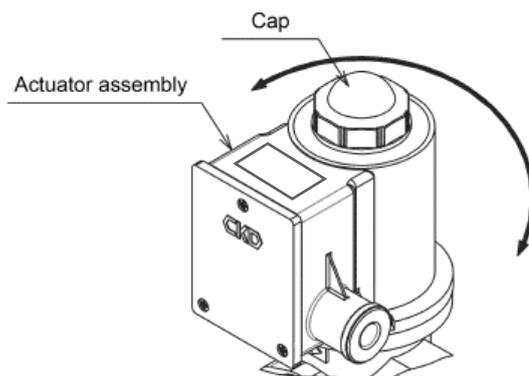
3-13. Conduit conduit tube

We recommend using a conduit, etc. to bundle and protect the wires connected to the solenoid relief valve.



3-14. Change the actuator installation direction

If you need to change the actuator installation direction due to space constraints for the solenoid relief valve, simply rotate the actuator. If it does not rotate, you can easily rotate it by loosening the cap on the top of the main unit by about one turn. Then, re-tighten the cap.



3-15. Product storage

If you are not going to use the product immediately after receiving it, avoid storing it in a hot or humid place.

To protect the product, store it in its original packaging.

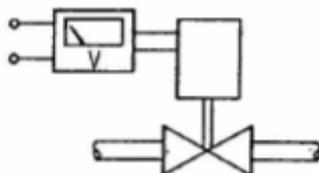
4. Precautions during trial operation

4-1. Confirmation of specifications

Check that the voltage, gas pressure, etc. comply with the specifications.

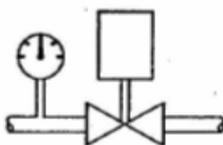
- Power supply voltage

Make sure that the power supply voltage is within the range of -15 to 10% of the rated voltage.

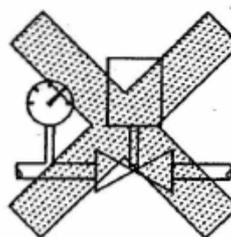


- Operating pressure

Make sure the inlet pressure of the solenoid relief valve is within the range of 0 to 19.6 kPa {0 to 2000 mm H₂O}.



Within maximum operating pressure



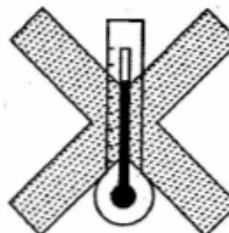
Outside the maximum operating pressure

- Ambient temperature

Make sure that the ambient temperature of the solenoid relief valve installation location is within the range of -20 to 60°C.



Within the allowable ambient temperature



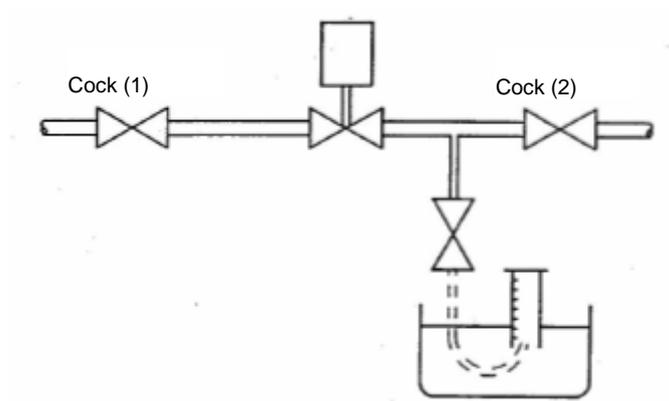
Outside the allowable ambient temperature

4-2. Operation check

Apply power to the solenoid relief valve and check that the valve operates, and that the valve returns to its original position when the power is turned off.

4-3. Leak check

- External leakage
Use a gas leak detector or soapy water to check for external leaks from the piping connections and solenoid relief valves.
- Internal leakage
Close the solenoid relief valve, open the cock (1), close the cock (2), connect a rubber hose to the end of the solenoid relief valve and submerge the end in water about 10 mm to check for leaks and see if any bubbles appear.



5. Periodic inspection

Carry out periodic inspections in accordance with the periodic inspection procedures for safety shut-off valves as described in the safety standards listed below.

Issued by The Japan Gas Association

"Safety Technology Index for Industrial Gas Combustion Equipment"
"Safety Technology Index for Gas Boiler Combustion Equipment"
"Safety Technology Guide for Gas Engines for Power Generation"

6. Trouble shooting

Trouble	Cause	Check	Remedy
1. The valve does not close	a. Malfunction of the control electrical circuit	Measure the voltage with AC terminals of the electrical assembly (3-11 Connecting the Operating Power Supply (see diagram on page 10)) Allowable voltage range AC 100 V □ +10% AC 200 V □ -15%	If the measured voltage is not within the range shown on the left, inspect and repair the electrical circuit
	b. Malfunction of the electrical assembly	Measure the voltage with DC terminals of the electrical assembly (3-11 Connecting the Operating Power Supply (see diagram on page 10)) Allowable voltage range AC 100 V → Approx. DC 90 V AC 200 V → Approx. DC 180 V Tolerance: -15 to +10%	If the measured voltage is not within the range shown on the left, replace the electrical assembly or the actuator
	c. Burnt out coil, short-circuit layer	Turn off the power and measure the coil resistance with DC terminals of the electrical assembly (Unit: Ω) AC 100 V AC 200 V Nominal size: 15A 360 1267 Nominal size: 20/25A 315 1231 Nominal size: 32/40A 186 777 Tolerance: -5 to +5%	If the measurement value is not within the range shown on the left, replace the actuator (Note: The values shown are at 20°C)
	d. Foreign matter adhering to the valve seat, etc.	Contact your nearest service center. (Never disassemble)	Replace the entire product or have it repaired by a designated service technician
2. The valve does not open	a. Malfunction of the control electrical circuit	Measure the voltage with AC terminals of the electrical assembly	If voltage is applied, inspect and repair the electrical circuit.
	b. Excess gas pressure applied	Check the gas pressure to see if it exceeds the maximum operating pressure	Inspection and repair the pressure regulator
3. Leakage	a. Poor sealing of piping connections	Check for leakage from piping connections	Repair the seal of the piping connections
	b. Foreign matter adhesion and damage to the valve seat	Contact your nearest service center. (Never disassemble)	Replace the entire product or have it repaired by a designated service technician
4. Low flow rate	a. Clogging of the strainer	Contact your nearest service center. (Never disassemble)	Replace the entire product or have it repaired by a designated service technician

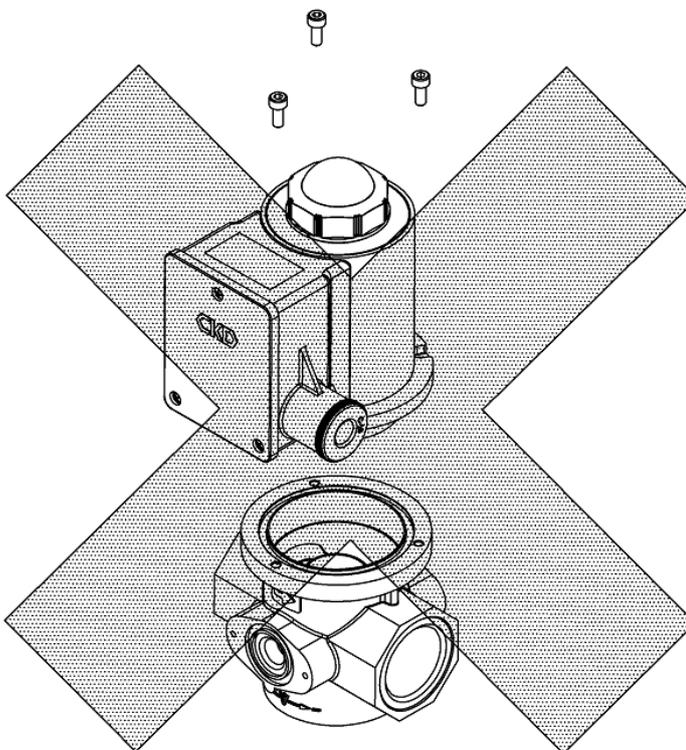
7. Other prohibited handling

Observe the following points to ensure proper use of the product.

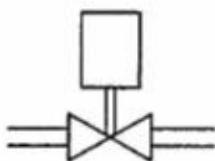
- Do not drop or stand on the product.



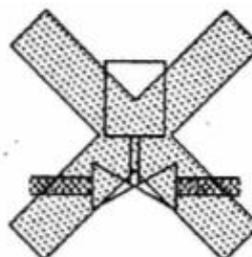
- Do not modify, disassemble or repair the product yourself.



- Do not use with fluids other than city gas, natural gas, or LPG.



City gas, natural gas, LPG

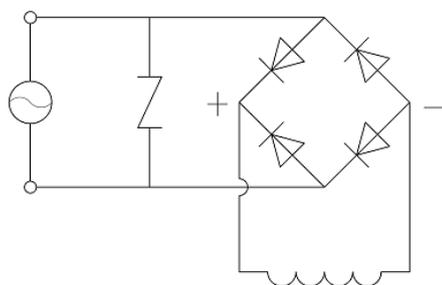


Other fluid

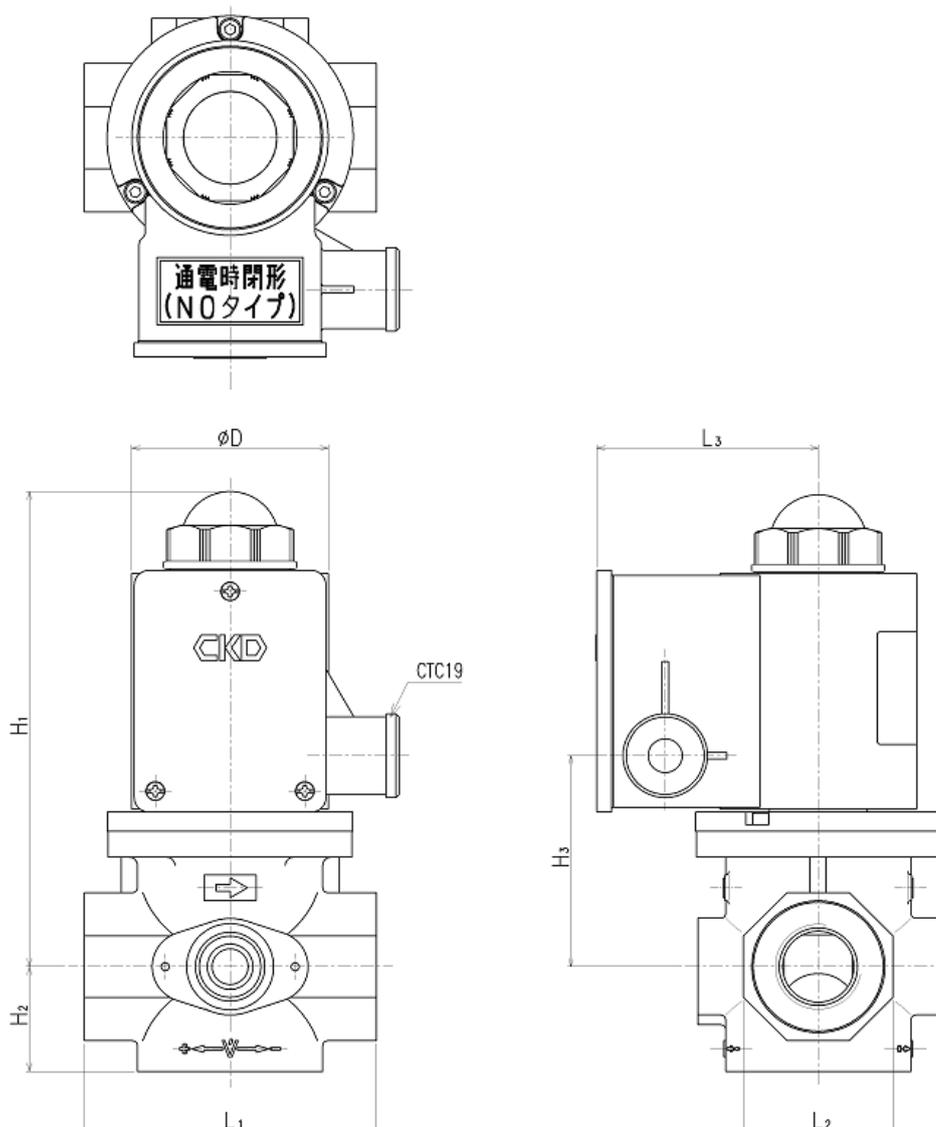
8. Specifications

Item		VNR-15	VNR-20	VNR-25	VNR-32	VNR-40
Model number		VNR-15	VNR-20	VNR-25	VNR-32	VNR-40
Gas used		City gas, natural gas, LPG				
Working pressure range	kPa {mmH ₂ O}	0 to 19.6 {0 to 2000}				
Flow rate	Natural gas specific gravity: 0.65, $\Delta P = 0.245$ kPa {25 mmH ₂ O} m ³ /h (ANR)	5.8	11.7	12.7	16.6	17.2
Voltage	V	AC 100 ^{+10%} _{-15%} , AC 200 V ^{+10%} _{-15%}				
Power consumption	VA	31		50		
Frequency	Hz	50/60 commonly applicable				
Ambient temperature	°C	-20 to +60 (without freezing)				
Storage temperature	°C	-20 to +60				
Operating time	sec	Closing	Below 1			
		Opening	Approx. 0.5			
Operation frequency	times/min	Below 30				
Mounting posture		Install vertically with the actuator facing up or horizontally with the actuator facing to the side.				
Connection		Screw-in (Rp)				
Nominal diameter		15A	20A	25A	32A	40A
Mass	kg	1.6	2.3	2.2	3.4	3.3

Electrical circuit (AC voltage specifications)



External dimensions



Model number / Symbol	H ₁	H ₂	H ₃	L ₁	L ₂	L ₃	φD
VNR-15	132	24	52	69	32	63	50
VNR-20	146	33	66	89	46	68	60.5
VNR-25	146	33	66	89	46	68	60.5
VNR-32	165	40	84	128	65	73	70
VNR-40	165	40	84	128	65	73	70