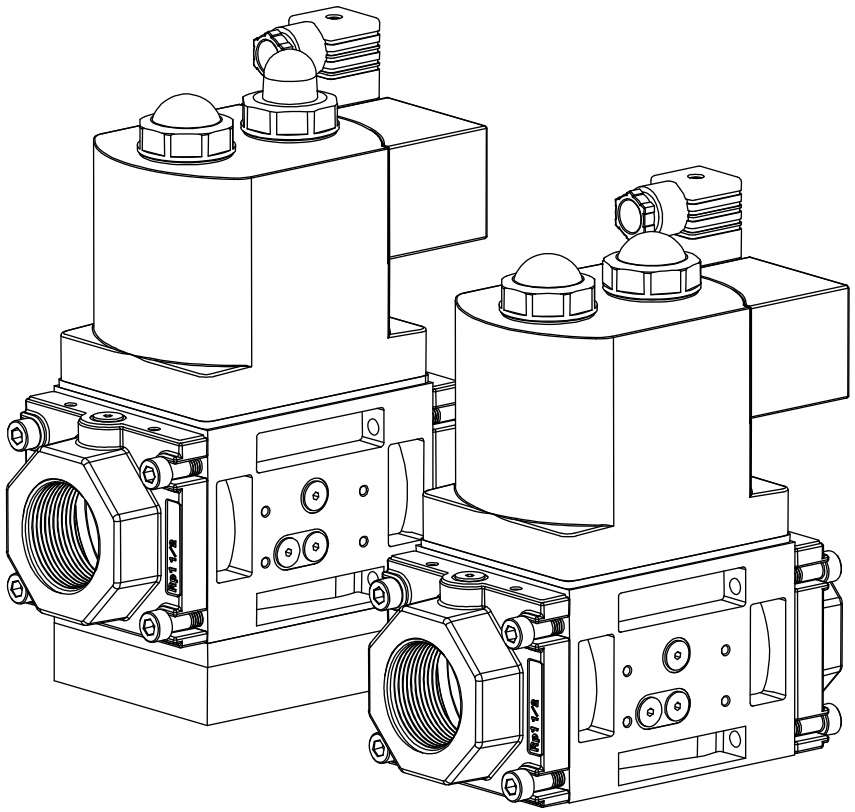
CKD

INSTRUCTION MANUAL

Gas Combustion Combination Valve

GHV Series



- Read this manual carefully and thoroughly before using this product.
- Pay extra attention to the instructions concerning safety.
- After reading this manual, keep it in a safe and convenient place.

CKD Corporation

Safety precautions

All customers designing and manufacturing a device which uses CKD products have the responsibility to, and are expected to, manufacture a device that is safe by checking that the safety of the system operated by the following components is secured: the device mechanism, the gas combustion equipment circuit, and the electrical control that controls these components.

It is important to select, operate, handle, and maintain CKD products appropriately to ensure that each CKD product is used safely.

Please observe all warnings and precautions for each CKD product to ensure the safety of not only the CKD products but also your device containing CKD products.

⚠ WARNING

1. This product has been designed and manufactured as a component for industrial use gas combustion equipment. It must only be handled by persons with sufficient relevant knowledge and experience.

2. Use this product within its specifications.

This product must be used within its stated specifications. Do not attempt to alter or modify the product.

Moreover, this product is intended to be used as a component for industrial use gas combustion equipment. It is not intended for use outdoors or in applications listed below. (However, this product may be used under some unintended conditions if the customer consults CKD prior to use, understands and agrees to the product specifications, and provides safety measures that avoid risks in the event of failures.)

(1) Applications that require safety which include nuclear power applications, railroad systems, aviation systems, ships, vehicles, medical equipment, any equipment or application that involves direct contact with food and beverage, amusement equipment, emergency shutoff circuits, press machines, brake circuits, and safeguards.

(2) Applications where serious risks to human life and/or property are expected and safety is especially required.

3. Observe all applicable organization standards and regulations to ensure safety in device design and control.

Applicable organization standards and regulations include:

- JIS B 8415, General Safety Code for Industrial Combustion Furnaces
- Safety Technology Index for Industrial Gas Combustion Equipment (The Japan Gas Association)
- Safety Technology Index for Gas Boiler Combustion Equipment (The Japan Gas Association)
- High Pressure Gas Safety Law, Occupational Safety and Health Act, and other rules, organization standards, and regulations concerning safety

4. Do not install or use this product or remove any equipment until safety is confirmed.

(1) Conduct inspection and services on machines and devices after safety of all systems related to this product is confirmed.

(2) Handle with care as there may be hot surfaces and hot parts even after operation has stopped.

(3) Before inspecting or servicing this product, stop supplying gas and turn off power to the applicable equipment. Be careful of leaks.

5. Provide overcurrent protection device.

Provide overcurrent protection device (such as a molded case circuit breaker and circuit protector) and wire the operating power source according to JIS B 9960-1: 2008, Safety of Machinery – Electrical Equipment of Machines – Part 1: General Requirements.

6. Observe all safety instructions in the pages that follow to prevent accidents.

■ In this manual, safety instructions are ranked as "DANGER", "WARNING", or "CAUTION".

DANGER DANGER indicates a hazardous situation which, if not avoided, may result in fatal or serious injury, and there is a high degree of emergency (urgency) to a warning.

WARNING WARNING indicates a hazardous situation which, if not avoided, may result in fatal or serious injury.

CAUTION CAUTION indicates a hazardous situation which, if not avoided, may result in only minor injury or property damage.

Please note that even some instructions labeled as “CAUTION” may lead to serious results depending on the situation. In any case, make sure to observe all instructions as they contain important information.

Important notes on warranty

- Term of warranty

  The product specified herein is warranted for one (1) year from the date on which the product is delivered to the location designated by the customer.

- Scope of warranty

  If the product becomes defective for reasons attributable to CKD within the above term of warranty, CKD will promptly provide replacement for the defective product or part thereof or repair the defective product at one of CKD’s facilities free of charge.

  However, following defects are excluded from this warranty:

  (1) Defects due to use of the product under conditions and in environments not conforming to those stated in this manual.

  (2) Defects due to misuse, including abuse and neglect, and improper maintenance of the product.

  (3) Defects due to reasons other than the delivered product.

  (4) Defects due to use for which the product is not intended.

  (5) Defects due to modifications and alterations to structure, performance, and/or specifications without permission from CKD and repairs not authorized by CKD.

  (6) Defects that could have been avoided if the customer’s equipment, into which the product is incorporated, had functions, structure, etc. generally provided as an accepted standard in the industry.

  (7) Defects due to reasons unforeseen at the level of technology available at the time of delivery.

  (8) Defects due to natural disasters, accidents, or any other causes beyond control of CKD.

  The warranty set forth above covers only the delivered product itself and does not cover any incidental or consequential damages due to failure of the delivered product.

- Determination of compatibility

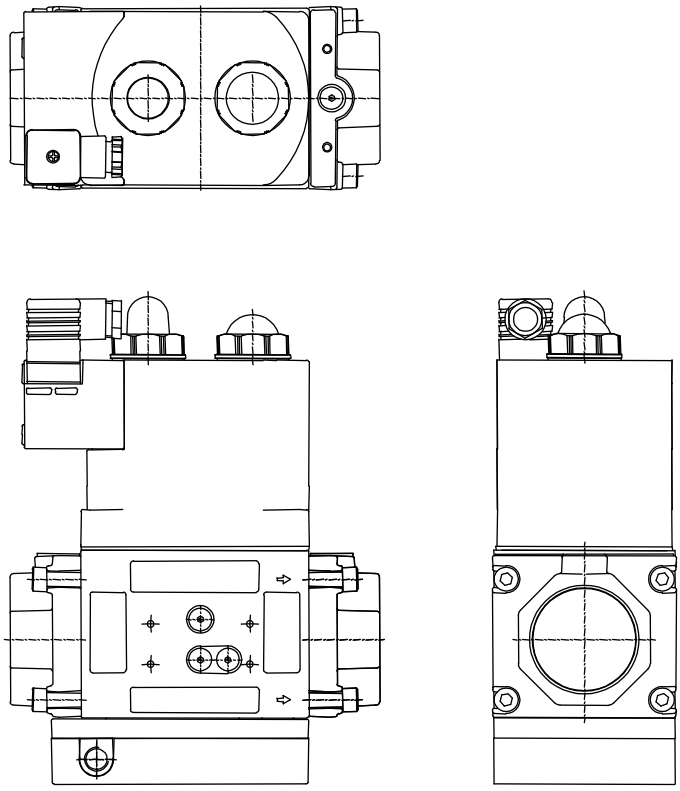
  It is the responsibility of the customer to determine whether the CKD product is compatible with the system, machinery, and/or device with which the product is to be used.

Contents

1 Inspections upon delivery

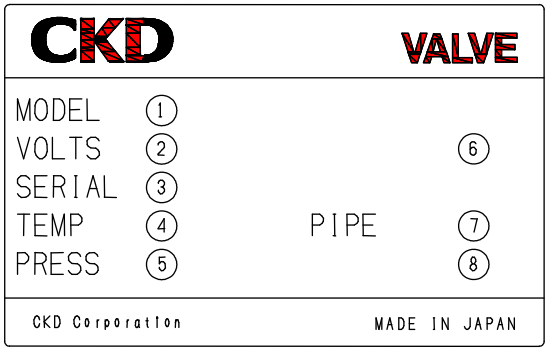
1-1 Product appearance

Check the product's exterior appearance for any abnormality by thoroughly inspecting the product for any damage or loose bolts that may have occurred during transportation.



1-2 Nameplate information

Check the model number, specification, and any other information printed on the product nameplate.



① Model number
② Rated voltage (VAC)
③ Serial number
④ Ambient temperature (°C)
⑤ Maximum working pressure (kPa)
⑥ Apparent power (VA)
⑦ Nominal diameter (Rp)
⑧ Other information

1-3 Product storage

If the product is not used immediately upon delivery, avoid storing the product in hot, humid locations. Moreover, to protect the product, store it in as much of the original packaging and condition as possible.

2 Installation

2-1 Installation environment

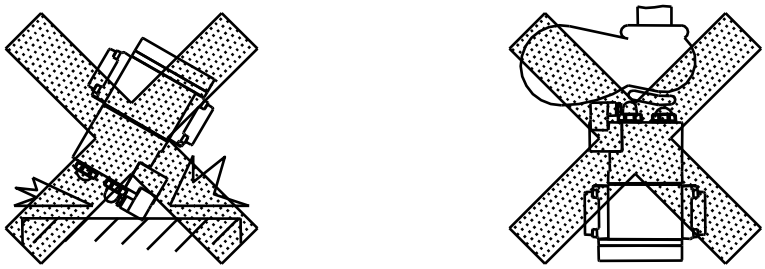
⚠ WARNING	a) Do not use this product in the presence of corrosive gas or in an atmosphere that may affect the material of construction. b) Do not install this product in locations subject to vibration and shock. c) Do not expose this product to direct sunlight, rain, and wind.

2-2 Mounting

⚠ WARNING	d) Read and understand the manual fully before mounting the product. e) Hold the body of the product when handling and mounting. f) After mounting the product, make sure it is mounted properly by checking for leaks.

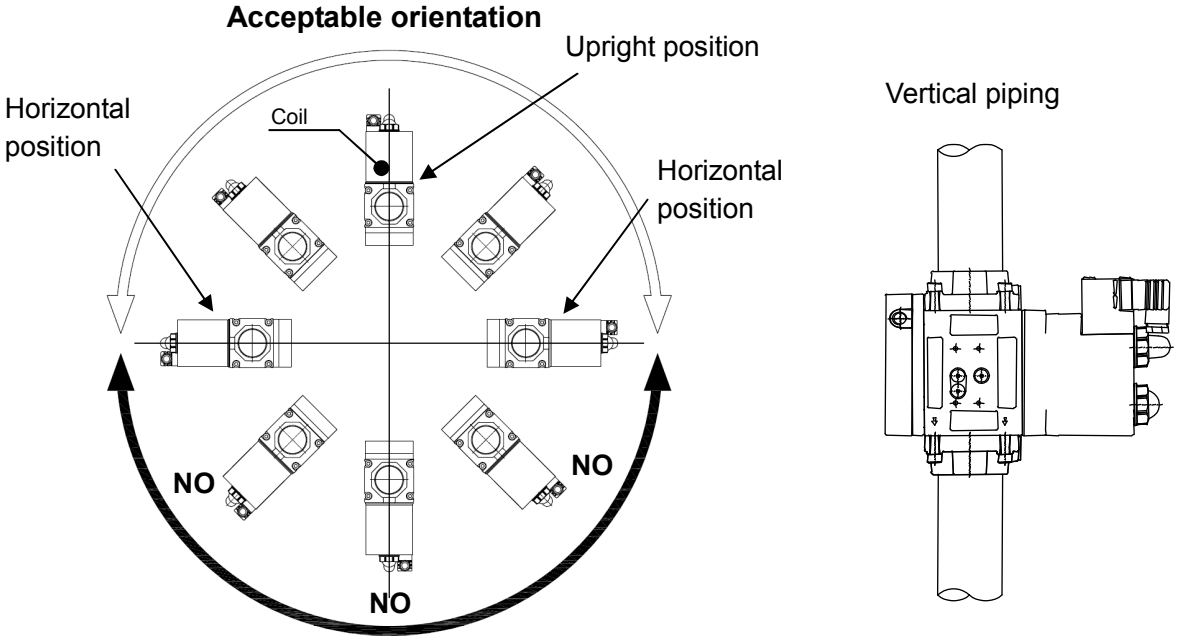
2-2-1 Handling

Do not drop or step on the product.



2-2-2 Mounting orientation

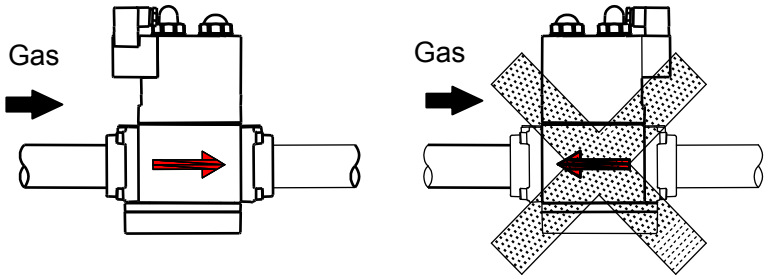
This product can be mounted on the piping at any position from upright (coil in the up position) to 90° from upright on a horizontal axis (coil lies horizontally) with respect to the piping connection or on vertical piping. The coil must not lie below the horizontal axis with respect to the piping connection.



Prohibited orientation
(Coil lies below horizontal axis with respect to piping connection)

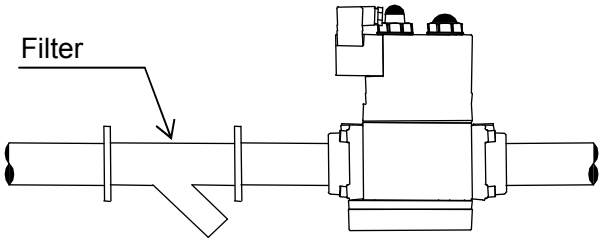
2-2-3 Flow direction

Mount the product so the direction of the arrow on the product corresponds to the direction of gas flow.



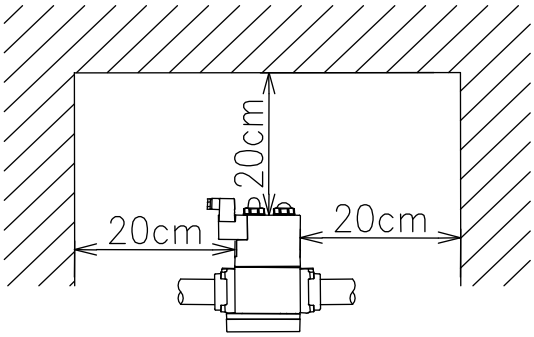
2-2-4 Filter installation

Install a filter upstream of the product to remove dust and other foreign matter.



2-2-5 Space around the product

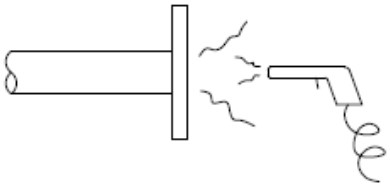
Provide an access space of about 20 cm wide around the product for inspection and maintenance.



2-3 Piping

2-3-1 Air flushing

Before piping the product, flush pipes with air to remove machining dust and other foreign matter.

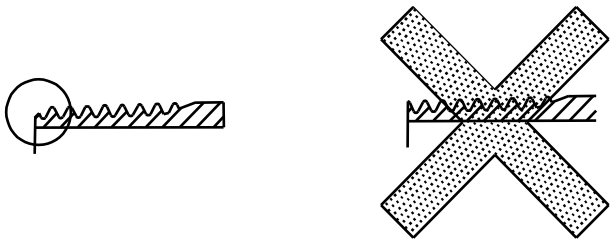


2-3-2 Application of sealant to pipe threads

Before connecting the pipes, apply a sealant designated by the city gas manufacturer to the pipe threads starting with the second thread from the end of the pipe. Do not apply too much. Also, make sure the sealant does not get into the pipes when applying it.

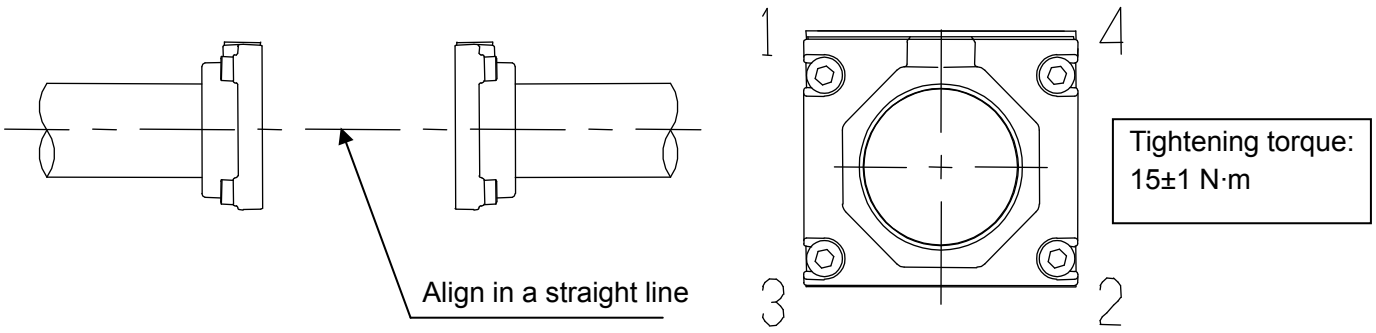
2-3-3 Length of pipe thread

For the gas pipe thread length, observe the effective thread length. Too long or too short may result in damage and leakage. Make sure to file off about one-half pitch of thread from the end.



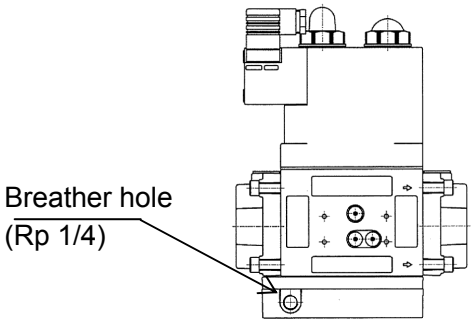
2-3-4 Mounting and piping

Before mounting this product on the pipes, attach flanges to pipe ends and align the flanges in a straight line. Use the O-rings provided with the product. Make sure the flanges cover the O-rings entirely and tighten all flange bolts at one torque level in a sequence as shown on the left to avoid uneven tightening.



2-3-5 Breather hole (for GHV-G)

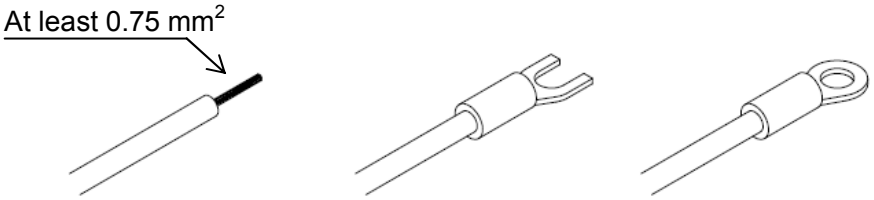
Breather hole located at lower part of this product is provided with an Rp 1/4 connection for ventilation in case of failures such as damage to the diaphragm. Vent properly and make sure the breather hole does not become blocked.



2-4 Wiring

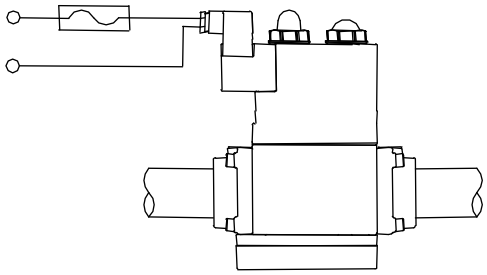
2-4-1 Electric wire

Use an electric wire with a cross-sectional area of at least 0.75 mm^2. For terminal block connection, crimp a spade tongue crimp terminal or a ring tongue crimp terminal (for M3 screws) to the wire.



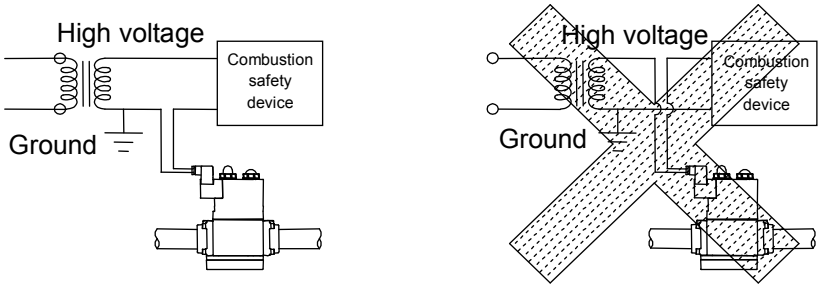
2-4-2 Fuse installation

When installing a fuse in the power circuit, make sure to use a fuse of appropriate capacity.



2-4-3 Operating power source connection

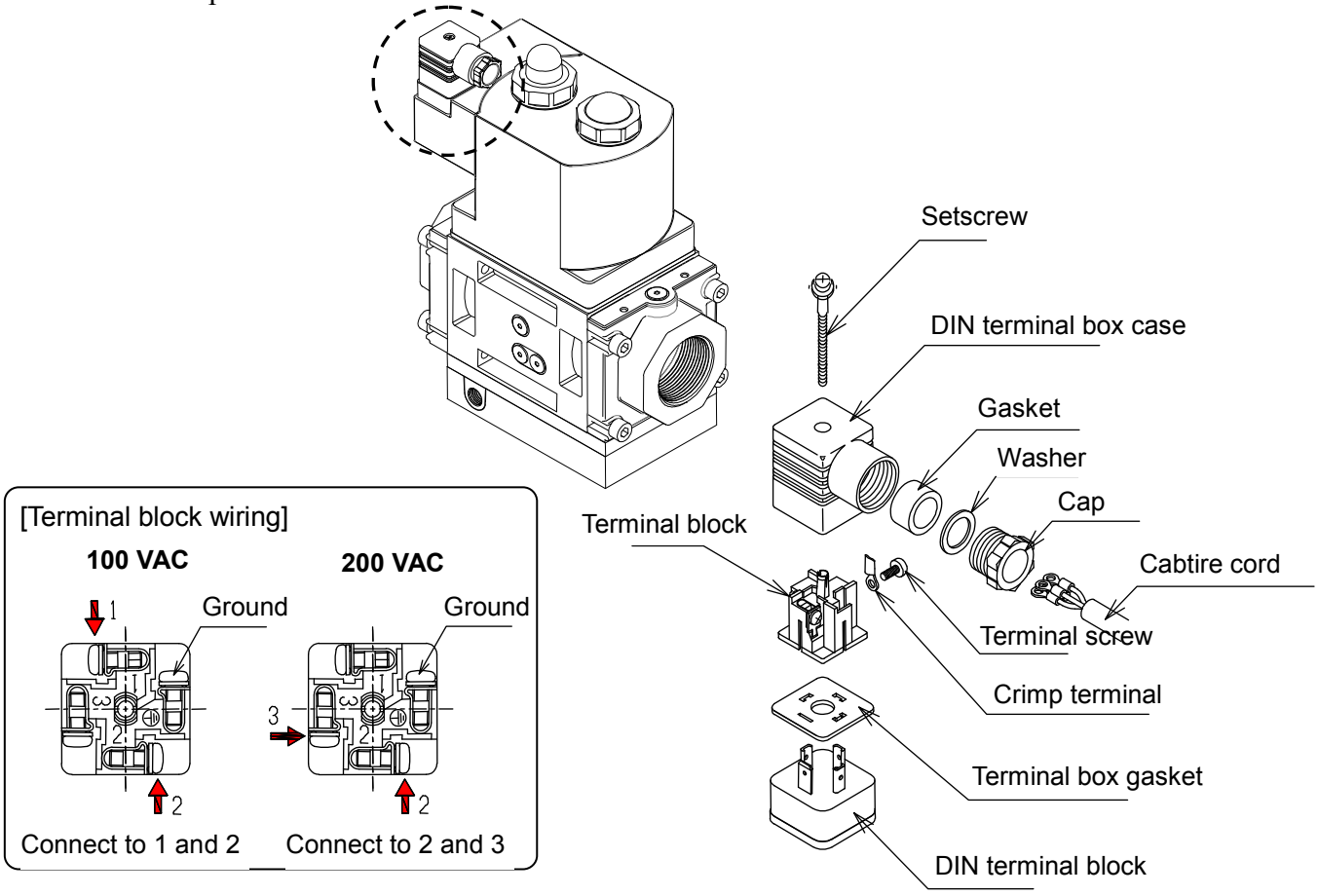
(1) When connecting the power source, properly connect the high voltage and ground wiring as shown below.



(2) Wiring method

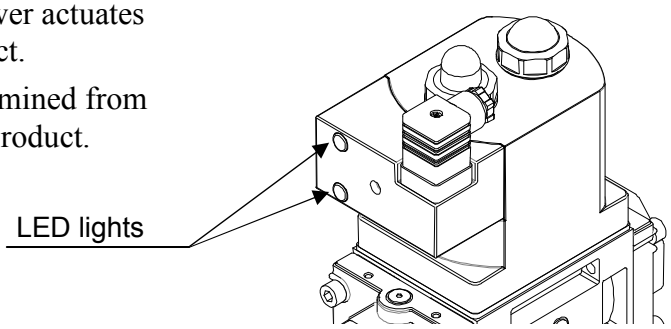
[Connecting to DIN terminal]

1) Strip away lead sheath and pass leads through cap, washer, gasket, and DIN terminal box case.
2) Crimp the crimp terminals (for M3 screws) onto leads. Secure the crimp terminals to the terminal block terminals specified for each voltage (see below). Terminal screw tightening torque is 0.5 N·m.
3) Attach terminal box gasket and terminal block to DIN terminal block on the product. Place DIN terminal box case over them and secure with the setscrew. Setscrew tightening torque is 0.5 N·m.
4) Screw on the cap to secure the cord.



Once wiring is complete, turning on the power actuates the 2 solenoid valves constituting the product.

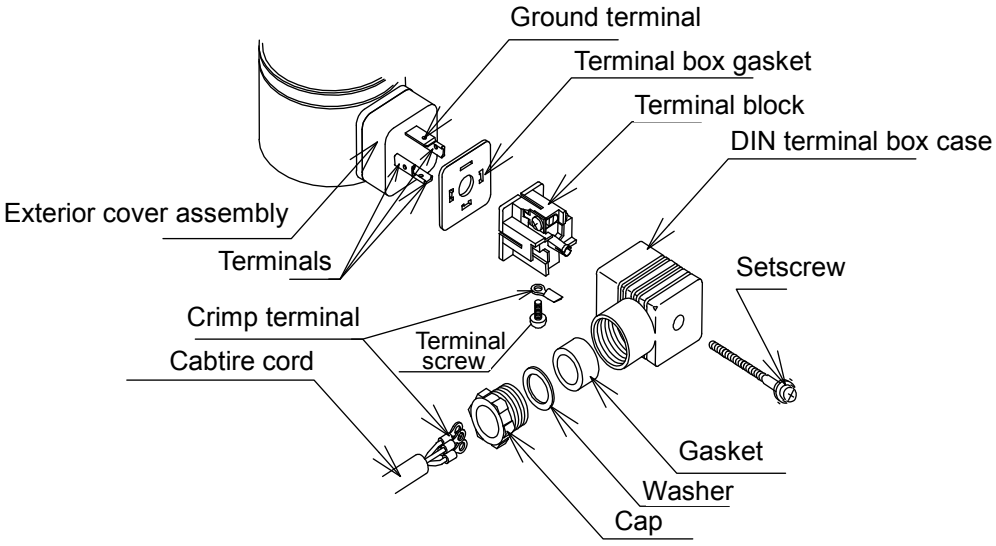
Whether or not the power is on can be determined from the LED lights on the electrical part of the product.



2-4-4 Wiring of closed position indicator switch (Option: E)

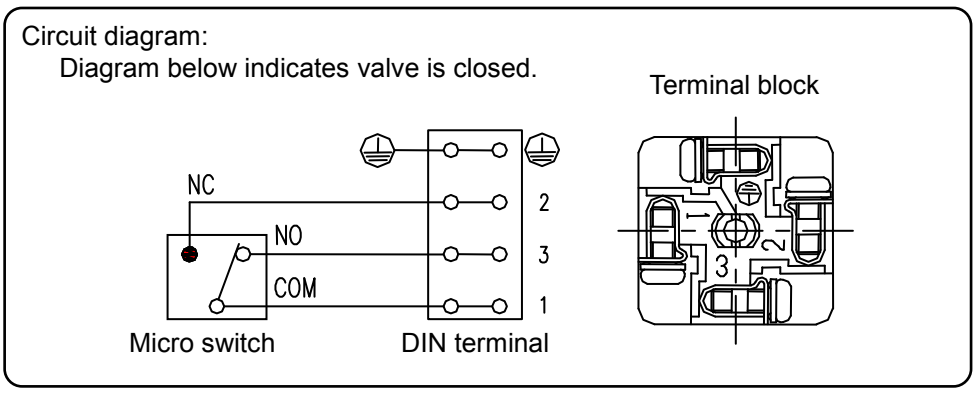
[Connecting to DIN terminal]

1) Strip away lead sheath and pass leads through cap, washer, gasket, and DIN terminal box case.
2) Crimp the crimp terminals (for M3 screws) onto leads. Secure the crimped terminals to the terminal block. Terminal screw tightening torque is 0.5 N·m.
3) Attach terminal box gasket and terminal block to the exterior cover assembly. Place DIN terminal box case over them and secure with the setscrew. Setscrew tightening torque is 0.5 N·m.
4) Secure the cord with the cap.



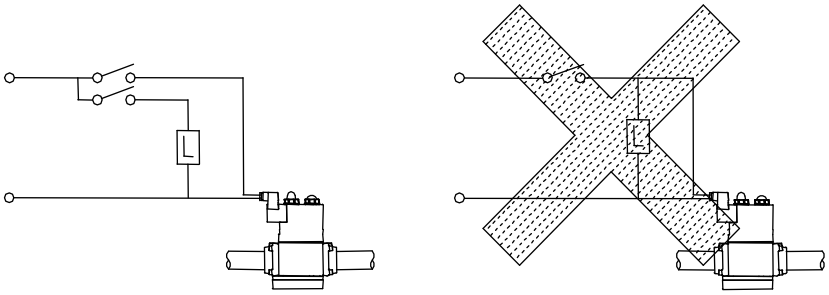
[Precautions for connecting the wires]

- Use a cabtire cord with an outer diameter of ø6 mm to ø10 mm and a nominal cross-sectional area of 0.75 mm^2 to 1.5 mm^2.
- Connect the ground terminal to ground to prevent electrical shock in the event of a current leak.
- To change the orientation of the cord outlet, remove the terminal block from the case, rotate it by 90° for each orientation, and return it to the case.



2-4-5 Surge voltage prevention

When connecting the product and inductive load (such as motor, relays) in parallel, wire them as shown below so the surge voltage is not applied to the product.

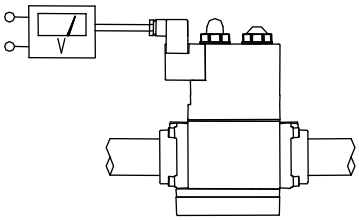


3 Inspections before operation

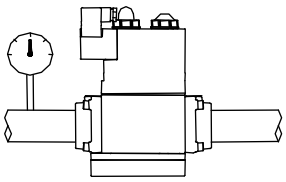
3-1 Conformity with the specifications

Make sure operating conditions such as voltage and gas pressure are in conformity with the specifications on the product nameplate.

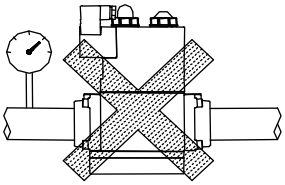
· Power voltage
Make sure the power voltage is within -15% to +10% of the rated voltage.



· Working pressure
Make sure the inlet pressure is within the primary working pressure range.

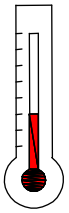


Within allowable range

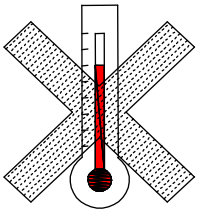


Outside allowable range

· Ambient temperature
Make sure the installation site's ambient temperature is within the allowable ambient temperature range.



Within allowable range



Outside allowable range

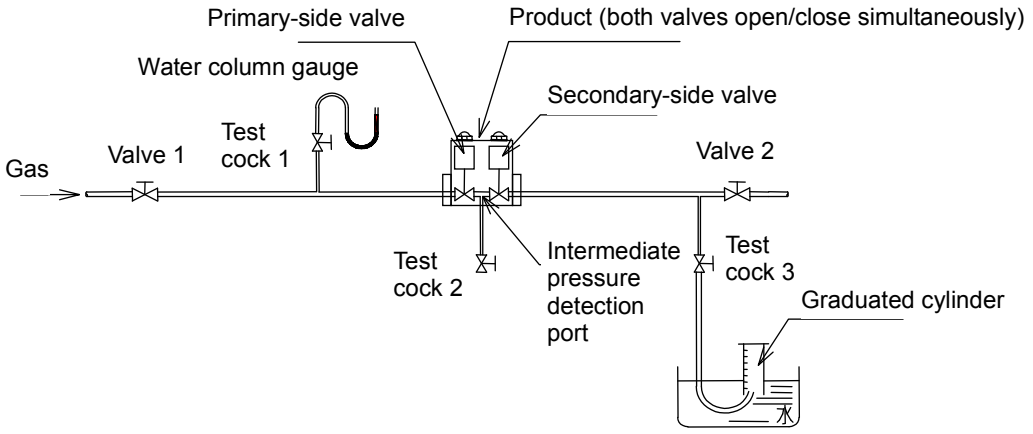
3-2 Actuation

Apply operating power to this product, and make sure the valves actuate and the valves return to the original position when the power is turned off.

3-3 Leakage

· External leakage
Use a gas leak detector or soap water to make sure there is no external leakage from the connections and from the product.

· Internal leakage



Procedure 1: Test for leakage of gas pipes

a) Close valve 2. Apply power to the product. With the product in the open position, apply supply gas pressure. Close valve 1.
b) Measure the pressure within the pipes using a water column gauge. Leave it for more than 5 minutes and check for leakage.
c) If there is leakage, inspect the connections and wherever leak is likely occurring using a leak detector or soap water.

Procedure 2: Test for internal leakage of primary-side valve

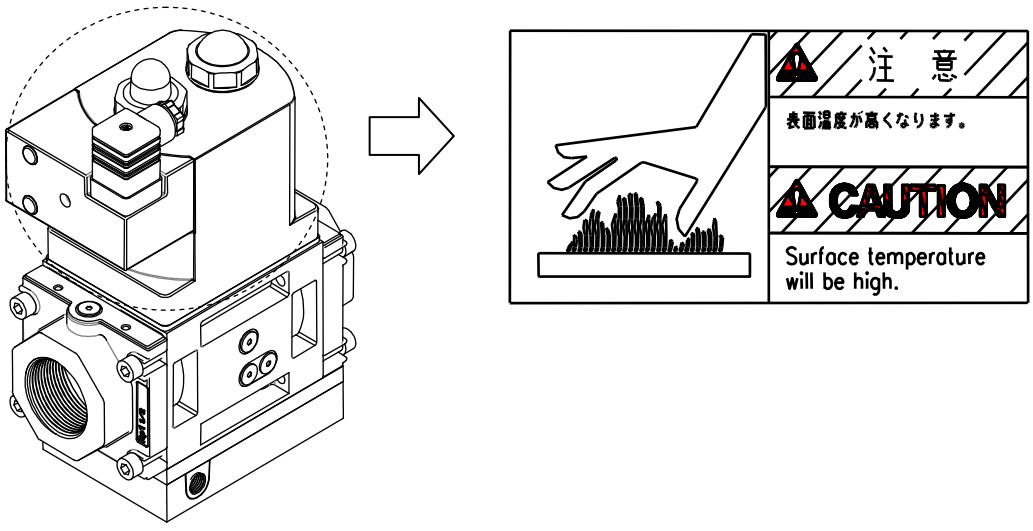
a) Turn off power to the product so it is in the closed position. Open valve 1. Apply normal operating pressure from the upstream side of primary-side valve.
b) Connect rubber hose to test cock 2 which leads to intermediate pressure detection port on the product. Submerge the loose end of the hose into a water-filled container, such as a beaker, by about 10 mm. Open test cock 2 and check for bubbles.

Procedure 3: Test for internal leakage of secondary-side valve

a) Apply normal operating pressure between secondary-side of the product and valve 2. Make sure there is no pressure drop.
b) With the product in the closed position, connect test cocks 1 and 2. Open valve 1. Apply normal operating pressure from the upstream side of secondary-side valve.
c) Under this condition, open valve 2. After adjusting the pressure of the downstream side of the product to atmospheric pressure, close valve 2. Connect rubber hose to test cock 3. Submerge the loose end of the hose into a water-filled container, such as a beaker, by about 10 mm. Open test cock 3 and check for bubbles.

3-4 Heat generation of coil

Beware of hot surface. When the power is turned on, surface temperature rises to a high level due to coil temperature rise. (Please be assured that high surface temperature does not affect product performance.)



4 Proper operation

4-1 Precautions

⚠ **WARNING**	a) This product is not for use as an emergency shutoff valve. · This product is not designed to provide safety protection, like that provided by an emergency shutoff valve. If this product is used in a system which requires safety measures, make sure to adopt other reliable safety measures. b) To protect against possible harm to people and equipment in case of product failure, implement necessary measures beforehand. c) Working fluid · Do not use fluids other those listed in the specification.

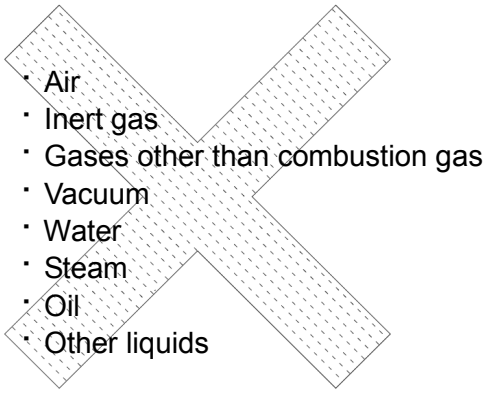
· Do not use this product with fluids other than city gas, natural gas, and LPG.

Working fluid

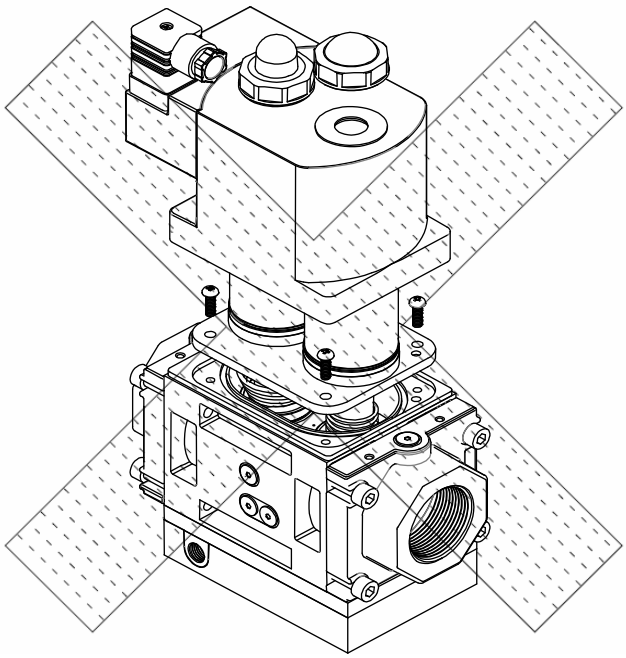
· City gas

· Natural gas

· LPG



· Do not disassemble, repair, or modify this product.

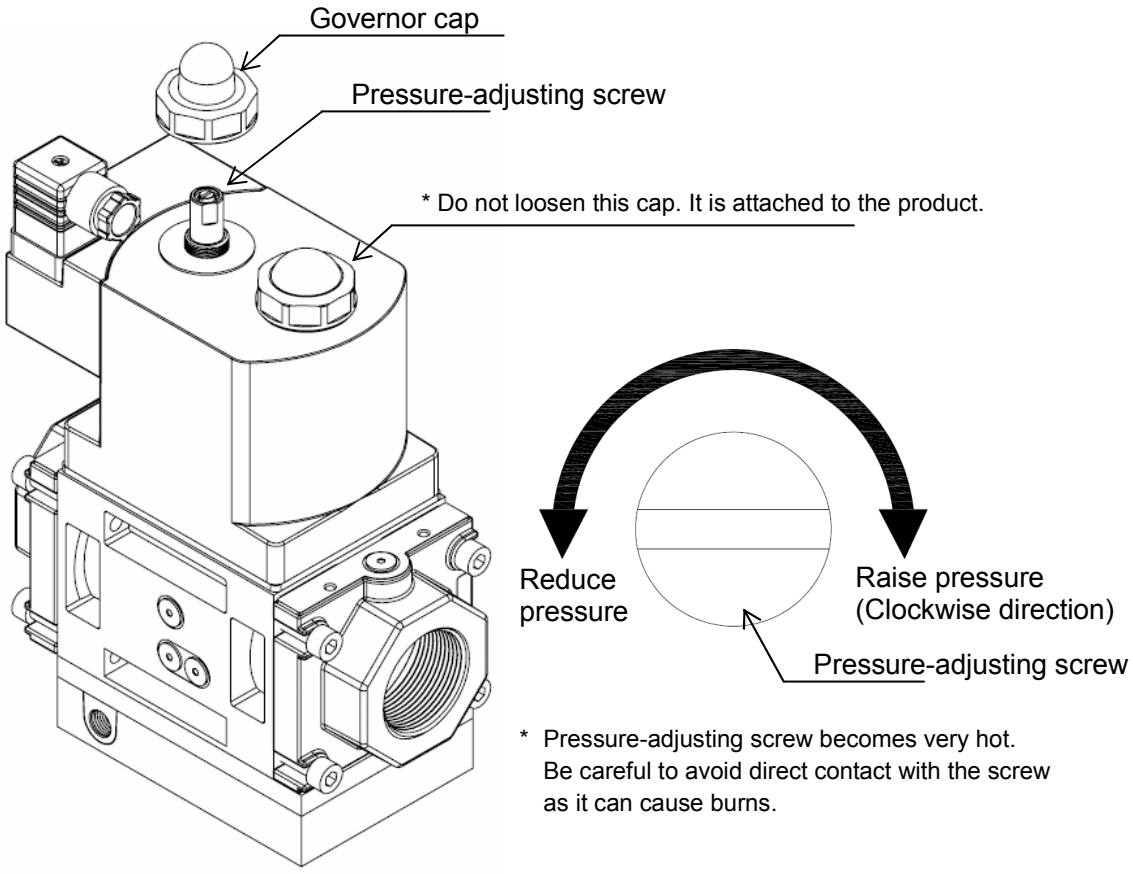


4-2 Pressure adjustment

This feature is available only on GHV-G-※, "solenoid valve with built-in governor + solenoid valve" type models.

[Adjusting the pressure]

Loosen and remove the governor cap (the taller cap). Adjust pressure by turning the pressure-adjusting screw with a **flat blade screwdriver**. Turning the screw clockwise raises the pressure and turning it counterclockwise reduces the pressure.



[Precautions for adjusting the pressure]

- A stopper prevents the pressure-adjusting screw from being turned beyond the upper and lower limits of the pressure adjustment range. Do not try to turn the screw beyond these limits as doing so may damage some parts and cause gas leak.
- Pressure is set to maximum before shipping. (However, after turning the pressure-adjusting screw clockwise to a stop, it has been turned back a few turns to prevent damage to it.)
- Pressure-adjusting screw becomes very hot during pressure adjustment. Be careful to avoid direct contact with the screw as it can cause burns.
- Install a pressure gauge and check the actual pressure while adjusting pressure.
- The cap (one with a red marking) next to the governor cap is attached to the product and will not turn. This cap is not relevant to pressure adjustment. Do not loosen this cap. If this cap is forcibly loosened, its contents may fall out.

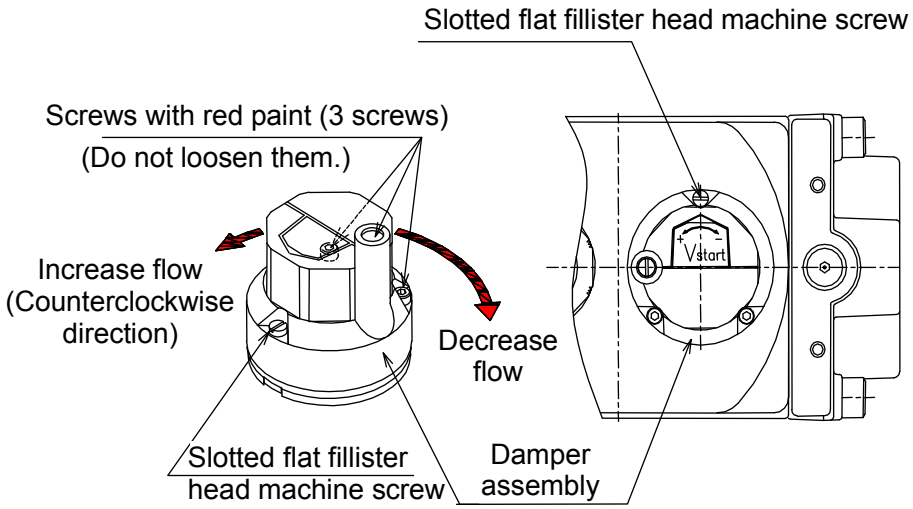
* If this product is not used for a certain period of time after installing it in your device, the valves may not open depending on the usage environment. If this is the case, turn the pressure-adjusting screw to the maximum set pressure and actuate the product before starting regular operation.

4-3 Start gas adjustment

This feature is available only on GHV-L-※, "solenoid valve + solenoid valve (slow open)" type models.

[Adjusting the start gas]

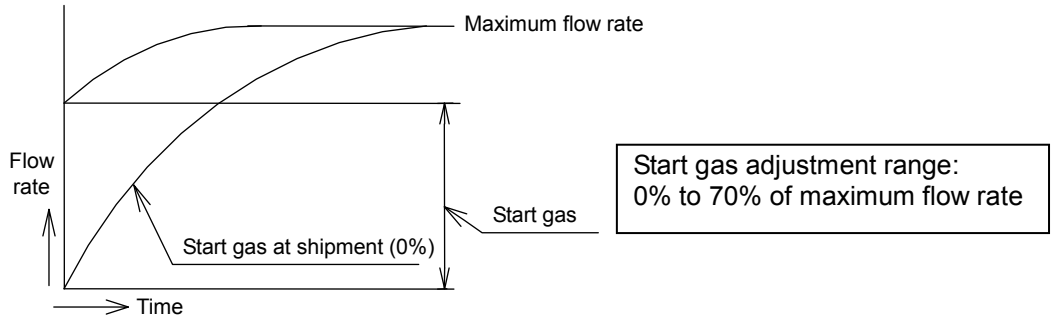
To adjust the start gas, turn the damper assembly as shown below to change the flow rate of start gas.



Procedure

(1) Loosen the slotted flat fillister head machine screw.
(2) Turn the damper assembly and adjust the flow rate of start gas.
Turning the damper assembly **counterclockwise** increases start gas.
(Turning it clockwise decreases start gas.)
(3) After adjusting the start gas, tighten the slotted flat fillister head machine screw.

* The start gas flow rate adjustment range is 0% to 70% of maximum flow rate.



[Precautions for adjusting the start gas]

- Start gas flow rate is set to 0% before shipping.
- Do not remove the slotted flat fillister head machine screw. Only loosen it.
Do not loosen other screws (heads painted in red).
- Damper assembly is allowed to be turned to a position in between the position at shipment and a position that corresponds to about 3 turns **in counterclockwise direction** (from the position at shipment). Turning the damper assembly outside of this range and applying excessive force may damage internal parts and obstruct adjustment.

5 Periodic inspection

⚠ **WARNING**	Do not disassemble, repair, or modify this product.

Conduct actuation and leakage tests at least once a year (refer to sections 3-2 and 3-3). For repairs in case of abnormal actuation, contact the dealer from whom you made your purchase or your nearest CKD agent.

Conduct periodic inspections according to the periodic inspection procedures for safety shutoff valves given in safety standards such as those listed below.

Published by The Japan Gas Association

"Safety Technology Index for Industrial Gas Combustion Equipment"
"Safety Technology Index for Gas Boiler Combustion Equipment"

6 Troubleshooting

Cause of the problem and corrective action

Problem	Cause	Investigation	Corrective action
1. Does not open	a. Operating power circuit has failed	Measure voltage at terminal block inside DIN terminal box. Allowable voltage range: -15% to +10% of rated voltage. Ex: For 100 VAC, allowable range is 85 VAC to 110 VAC.	If measured voltage is not within the range specified in left column, inspect and repair the power circuit.
	b. Valve disc is stuck	Remove combination valve from piping, turn on power, and check whether or not the valve disc rises.	Turn pressure-adjusting screw clockwise to the maximum and turn on power.
	c. Foreign matter is caught between internal sliding parts	None (Do not disassemble the product.)	Contact the dealer from whom you made your purchase or your nearest CKD agent.
2. Does not close	a. Control electric circuit has failed	Measure voltage at terminal block inside DIN terminal box.	If voltage is applied, inspect and repair the electric circuit.
	b. Foreign matter is caught between internal sliding parts	None (Do not disassemble the product.)	Contact the dealer from whom you made your purchase or your nearest CKD agent.
3. Leaks externally	a. Pipe connection seal has failed	Check for leaks from pipe connections.	Repair the pipe connection seal.
	b. Flange seal has failed	Check for leaks from flanges. Check for loose bolts. Check for any damage to O-ring and foreign matter attached to O-ring.	Replace O-ring. Tighten bolts. Remove foreign matter.
4. Leaks internally	a. Foreign matter has adhered to valve disc or valve seat, or they are damaged	None (Do not disassemble the product.)	Contact the dealer from whom you made your purchase or your nearest CKD agent.
5. Flow rate is low	a. Strainer is clogged	Remove combination valve from piping and check the condition of strainer located at back of IN-side port.	Remove flange, and either clean or replace the filter.
6. Does not adjust pressure (GHV-G)	a. Valve disc is stuck	Remove combination valve from piping, turn on power, and check whether or not the valve disc rises.	Turn pressure-adjusting screw clockwise to the maximum and turn on power.
	b. Primary-side pressure has dropped	Check whether or not primary-side pressure is higher than set pressure.	Set primary-side pressure so that it is higher than set pressure.
7. Does not perform “slow open” (GHV-L)	a. Damper oil is leaking	None (Do not disassemble the product.)	Contact the dealer from whom you made your purchase or your nearest CKD agent.

7 Product specification and model number

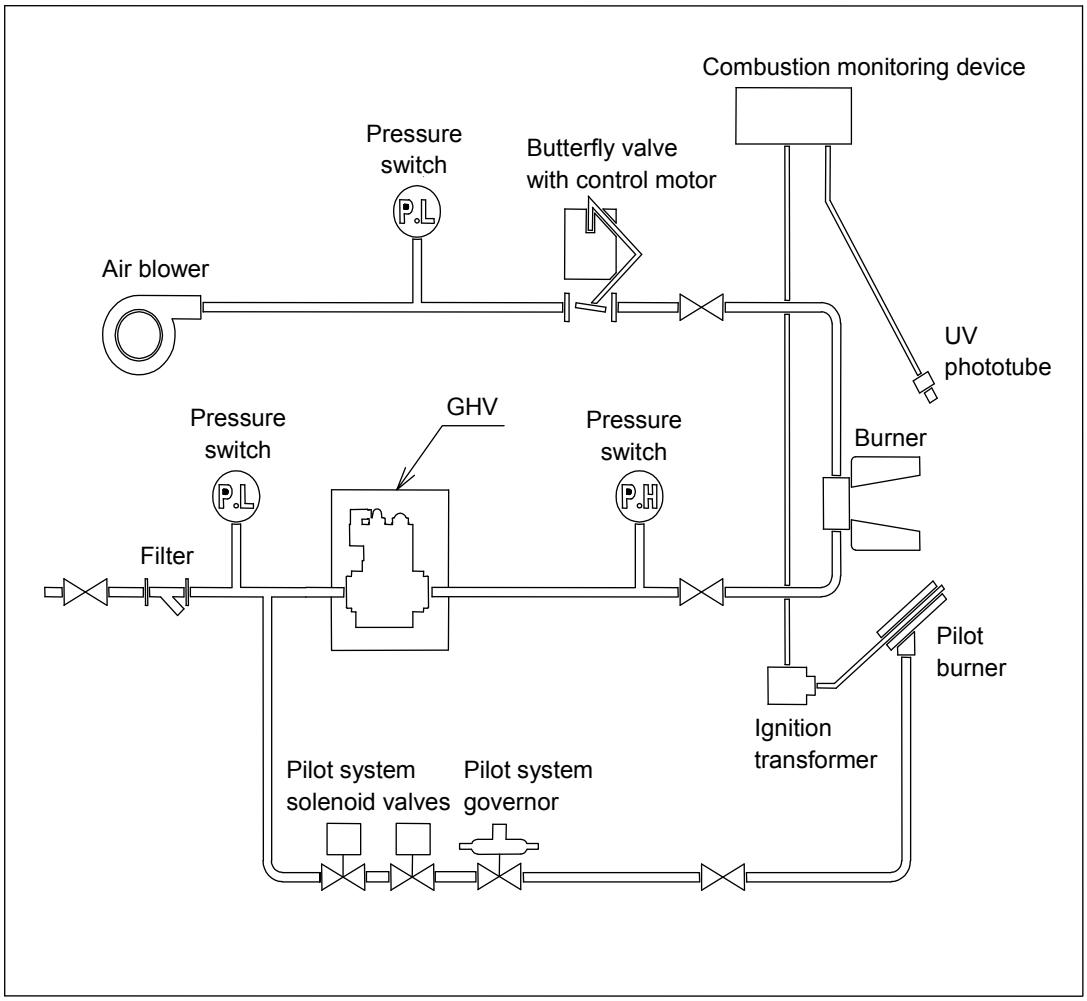
7-1 Product application

This product is used in gas passages as a gas shutoff valve and controls the ON and OFF supply of gas fuel within industrial gas combustion equipment.

(This product is not for use as an emergency shutoff valve.)

An example of how this product can be applied in a gas combustion system is shown below.

Example of application:



7-2 Main features

- Two solenoid valves are integrated into one compact unit for the purpose of providing a double shutoff mechanism; a governor is also available on GHV-G models
- GHV operates under a wide range of pressures, from low to medium (working pressure range: 0 kPa to 50 kPa)
- Secondary-side pressure can be easily adjusted and is adjustable even after installation (secondary pressure range: 0.4 kPa to 2.0 kPa)
- Size of the ports, ranging from 25A up to 50A, can be changed just by changing the flange connections
- There is no noise and coil burnout because the actuator is a DC drive with a built-in rectifier
- GHV is dust proof and splash proof (IP54)

7-3 Product specification

Description	Variation	GHV-G				GHV-N				GHV-L			
		Solenoid valve with built-in governor + solenoid valve				Solenoid valve + solenoid valve				Solenoid valve + solenoid valve (slow open)			
	Port size	-D25	-D32	-D40	-D50	-D25	-D32	-D40	-D50	-D25	-D32	-D40	-D50
Working fluid		City gas/Natural gas/LPG											
Working primary pressure kPa		0 to 50											
Pressure adjustment range kPa		0.4 to 2.0				N/A							
Flow rate (Natural gas specific gravity 0.65, ⊿P = 0.25 kPa) m^3/h (ANR)		35	43.7	47.5	51	35	43.7	47.5	51	35	43.7	47.5	51
Voltage V		AC 100 $^{+10\%}_{-15\%}$ AC 200 $^{+10\%}_{-15\%}$											
Frequency Hz		50/60 (common)											
Power consumption (apparent power) VA		80											
Thermal class		180 (H)											
Ambient temperature °C		-15 to 70 (no freezing) *1								-15 to 60 (no freezing)			
Close operation time s		1.0 or less											
Cycle rate cycles/min		10 or less								1 or less			
Mounting orientation		Upright with coil on top or horizontally with coil lying horizontally (vertical piping also allowed)											
Connection		Screw-in (Rp)											
Nominal diameter		1	1 1/4	1 1/2	2	1	1 1/4	1 1/2	2	1	1 1/4	1 1/2	2
Weight kg		6.1				5.5				5.8			
Proof pressure kPa		75											
Open operation time s		N/A				1 or less				About 10			
Start gas adjustment %		N/A								0 to 70			
Time to wait before turning on power s		N/A								At least 5			

*1 -15°C to 60°C (no freezing) for models with closed position indicator switch

7-4 Model number representation

GHV – G (A) – D40 (B) – E (C) – AC200V (D)

A	Variation
G	Solenoid valve with built-in governor + solenoid valve
N	Solenoid valve + solenoid valve
L	Solenoid valve + solenoid valve (slow open)

B	Port size
D00	Without flange
D25	Rp 1
D32	Rp 1 1/4
D40	Rp 1 1/2
D50	Rp 2

C	Option
Blank	None
E	With closed position indicator switch

D	Voltage
AC100V	100 VAC 50 Hz/60 Hz
AC200V	200 VAC 50 Hz/60 Hz

7-5 Closed position indicator switch specification

This section is only for GHV-※-E, models with closed position indicator switch (option).

CAUTION	Ambient temperature for models with closed position indicator switch is -15°C to 60°C. Under low temperatures, micro switch takes longer time to operate **when the valve is open** (about 5 seconds at -15°C).

Circuit diagram

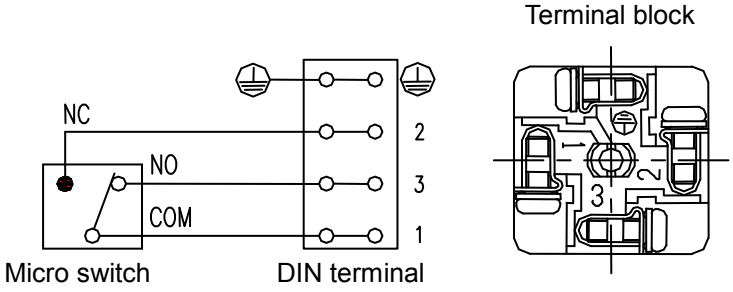


Diagram above indicates valve is closed.

Electrical specification

Electrical rating:

Rated voltage	Resistance load
125 VAC	5A
250 VAC	3A

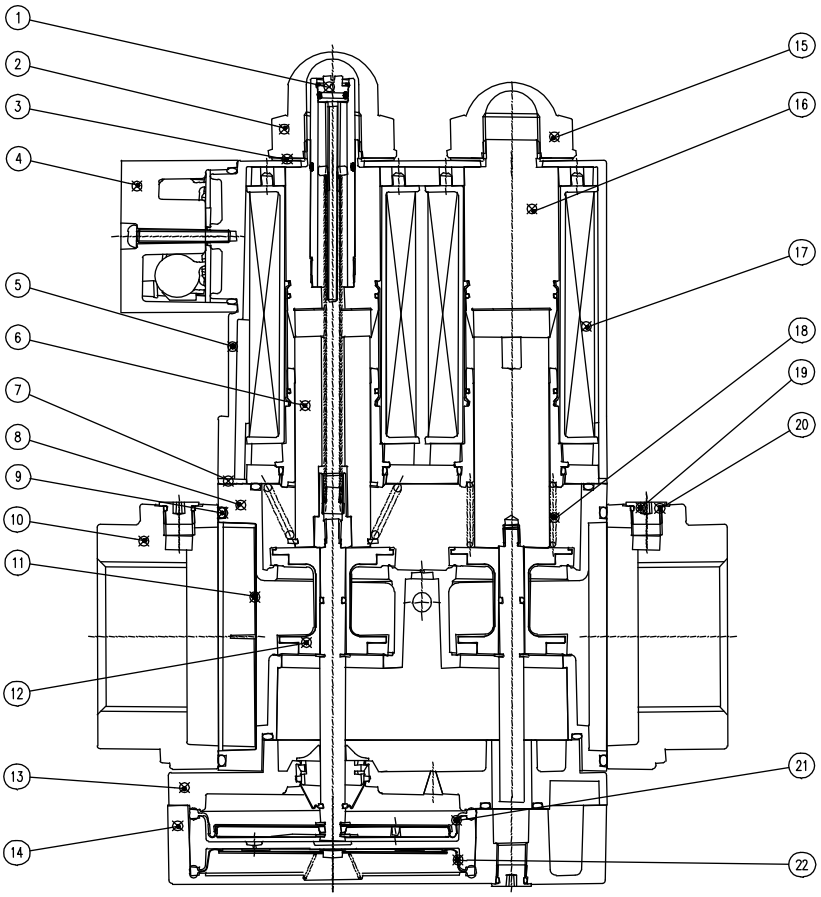
* Minimum applicable load: 5 VDC 160 mA

When the valve is closed, ON signal is generated between terminals 1 (COM) and 3 (NO); when the valve is open, ON signal is generated between terminals 1 (COM) and 2 (NC).

8 Internal structure and outside dimensions

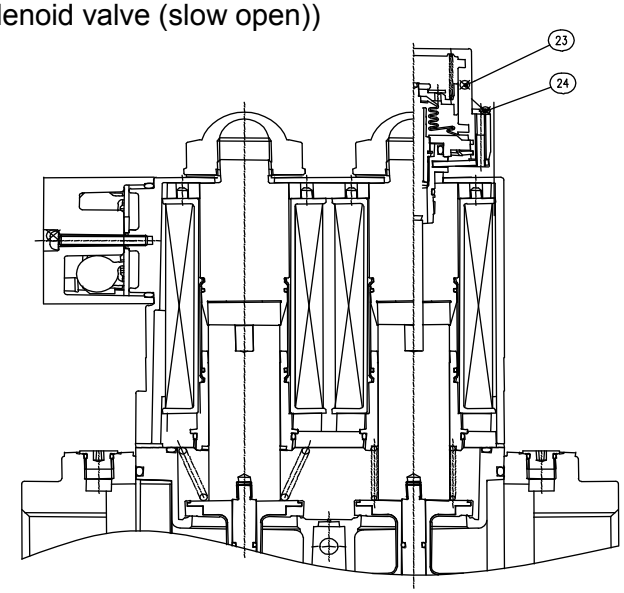
8-1 Internal structure

・ GHV-G (Solenoid valve with built-in governor + solenoid valve)



・ GHV-N (Solenoid valve + solenoid valve)

・ GHV-L (Solenoid valve + solenoid valve (slow open))

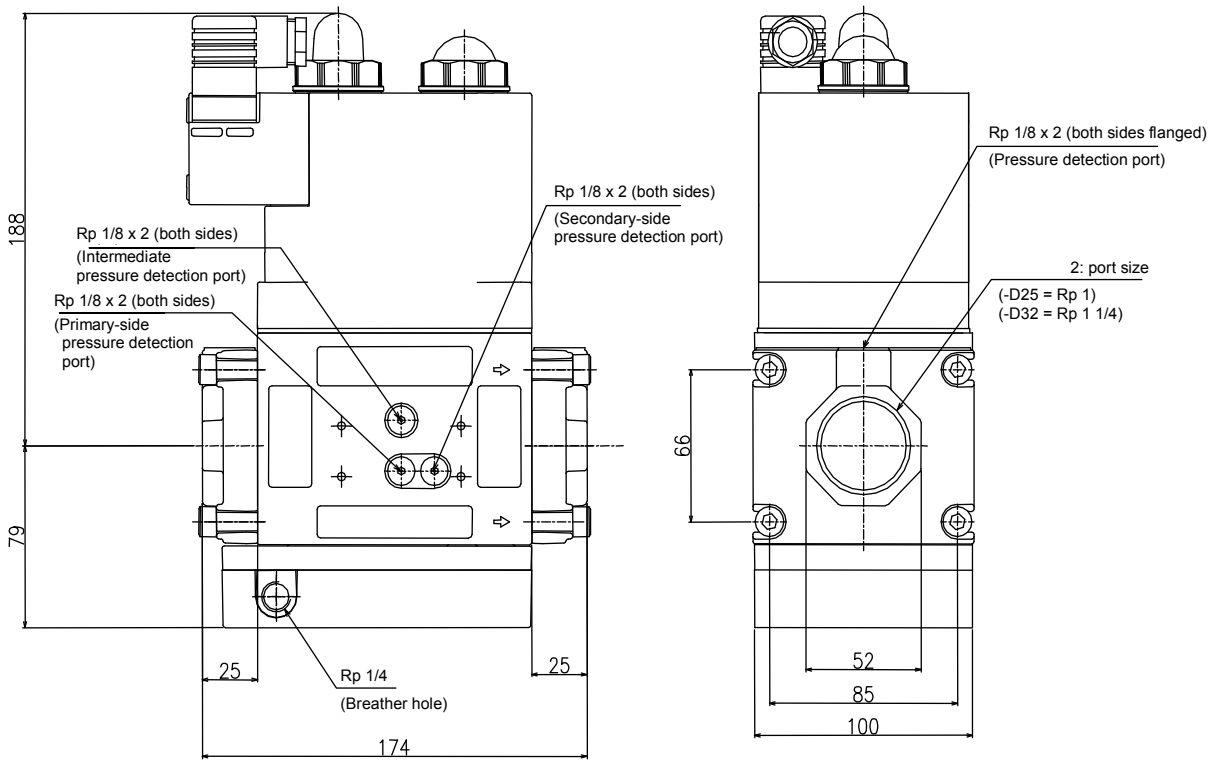


No.	Part name	No.	Part name	No.	Part name
1	Pressure-adjusting screw	9	O-ring	14	Coil winding
2	Governor cap	10	Flange	18	Stoppage spring
3	Cap gasket	11	Filter	19	Plug
4	Electrical component case	12	Valve assembly	20	O-ring
5	Electrical component cover	13	Bottom plate	21	Diaphragm
6	Plunger	14	Diaphragm cover	22	Damper diaphragm
7	Cover gasket	15	Cap	23	Damper assembly
8	Body	16	Core assembly	24	Slotted flat fillister head machine screw

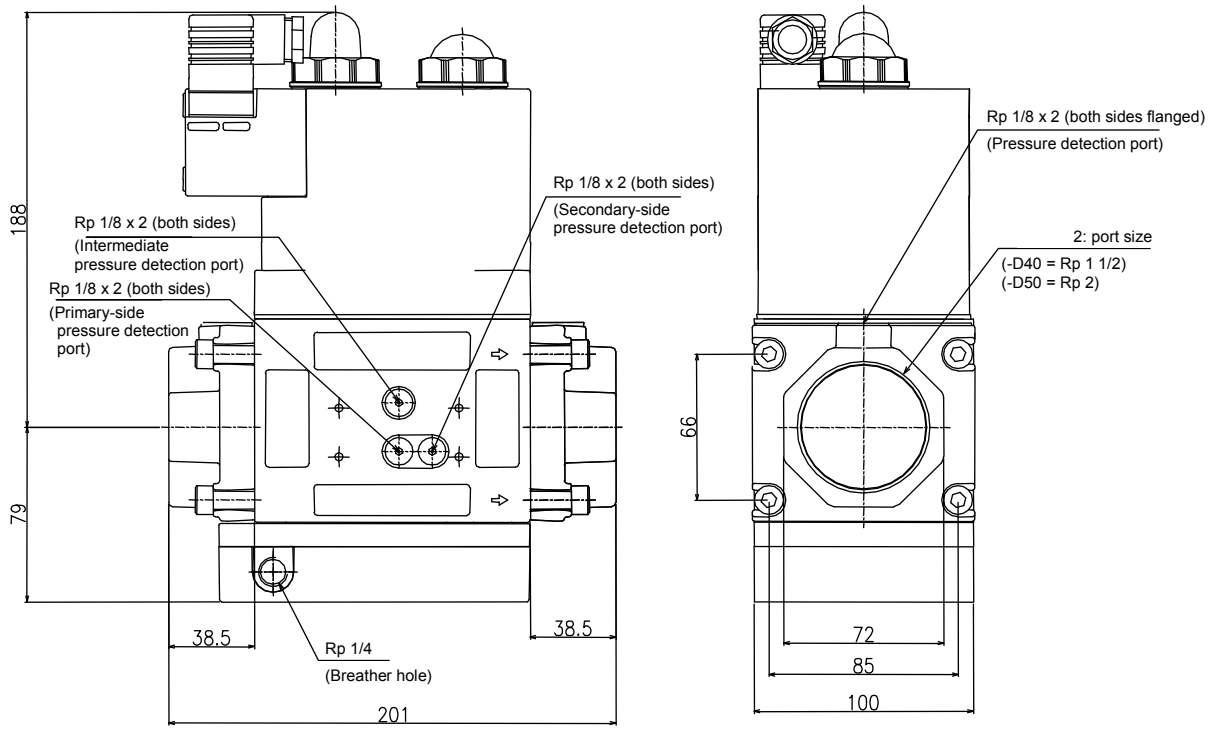
8-2 Outside dimensions

- Solenoid valve with built-in governor + solenoid valve

GHV-G-D25 and -D32

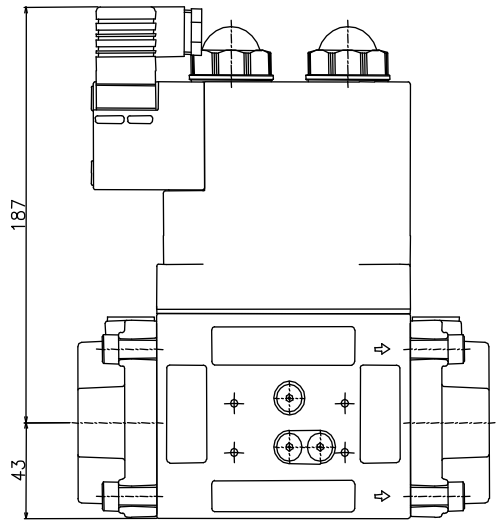


GHV-G-D40 and -D50



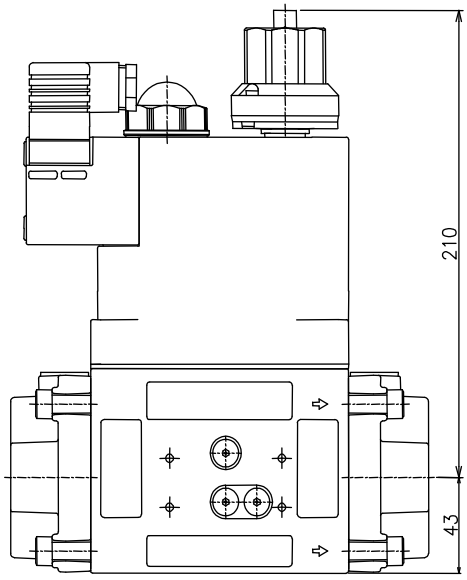
- Solenoid valve + solenoid valve

  GHV-N-D25 to -D50



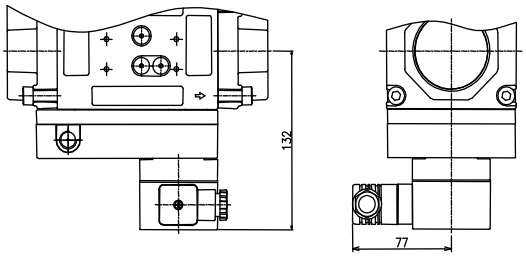
- Solenoid valve + solenoid valve (slow open)

  GHV-L-D25 to -D50



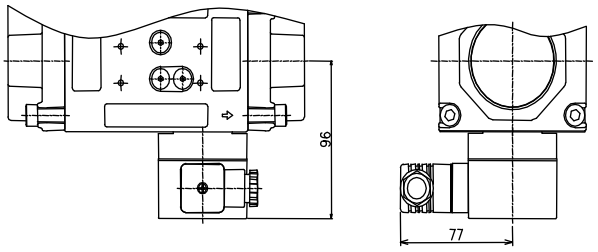
- Models with closed position indicator switch

  GHV-G-D25- to -D50-E



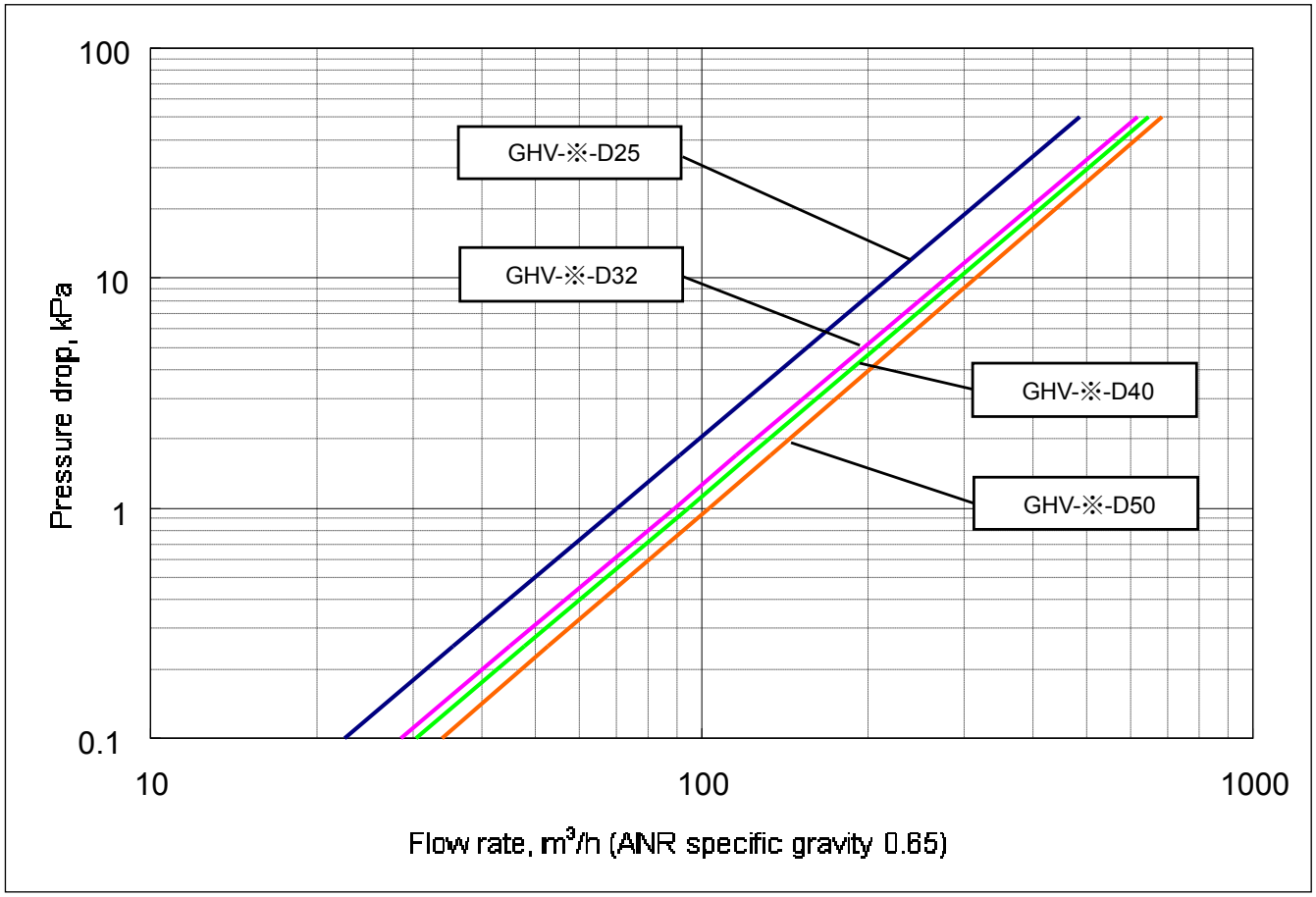
  GHV-N-D25- to -D50-E

  L



9 Reference materials

9-1 Flow characteristics



9-2 Flow rate conversion factor

Corresponding flow rate = (Flow rate from above table) x (factor)

Gas type	Natural gas (13A)	City gas (6B, 6C)	Air	Propane
Specific gravity	0.65	0.54	1	1.6
Factor	1	1.09	0.8	0.63