Read before Use

Instruction Manual

Motor Operated Valves (Electronic Expansion Valves)
Model: Type VKV

SAGInoMIYA

1. Preface

Thank you for purchasing Type VKV Motor Operated Valves.
Read this instruction manual thoroughly before use, and ensure that the product is used within its rated specifications according to the manual.
This product is supplied with a document containing a QR code for downloading the instruction manual. **Be sure to keep it in an easily accessible place for future reference. Always check the latest version of the instruction manual available on our website via the QR code before each use, paying particular attention to the safety precautions.**

2. Safety Precautions

■ Warning and caution indications
Warnings and cautions in this instruction manual provide **important safety information**.
To protect you and other people against danger or damage caused by improper use of the product, **be sure to comply with these indications, as well as international standards (ISO/IEC), Japanese Industrial Standards (JIS)[*1], and other safety regulations[*2].**

***1) IEC 60204-1: Safety of machinery -Electrical equipment of machines**
IEC 60335-1: Household and similar electrical appliances -Safety-Part1 -General requirements
IEC 60335-2-24: Household and similar electrical appliances -Safety-Part2-24
IEC 60335-2-40: Household and similar electrical appliances -Safety-Part2-40
IEC 60335-2-89: Household and similar electrical appliances -Safety-Part2-89
ISO 5149: Refrigerating systems and heat pumps -Safety and environmental requirements Part 1 to 4, etc.

***2) Industrial Safety and Health Act, High Pressure Gas Safety Act, EU Directives, Occupational Safety and Health Act, etc.**

⚠ **WARNING**	Indicates a hazardous situation that could result in serious injury(1) or death if the product is handled improperly.
⚠ **CAUTION**	Indicates a hazardous situation that could result in injury(2) or property damage(3) if the product is handled improperly.

(1) **Serious injury** refers to blindness, injury, burn (high-temperature, low-temperature), electric shock, bone fracture, or poisoning that leaves aftereffects and requires hospitalization and/or extended medical treatment.
(2) **Injury** refers to injury, burn, or electric shock that does not require hospitalization or extended medical treatment.
(3) **Property damage** refers to any damage affecting a house, household property, livestock, and/or pets.

Explanations of symbols

Symbol		Description	Example	
Prohibition		Indicates prohibited actions for handling the product.	 General prohibition	 Prohibited: Disassembly
Warning		Indicates the hazards and precautions for handling the product.	 General caution	 Caution: Electric shock
Instruction		Indicates the instructions for handling the product.	 General instruction	

WARNING	
	Use the product only under the conditions described in the instruction manual. Perform periodic maintenance. Exposure to harsh conditions beyond the specified operating conditions or prolonged use may degrade the sealing integrity of the product. In addition, leaked refrigerant may cause fire or suffocation.
	Be sure to turn off all the power before installation, wiring, maintenance, or inspection. Performing the work with power on may cause accidental contact with the live part, resulting in serious injury or death due to electric shock.
	Before using the product, ensure that the unit incorporating the product is properly grounded. Failure to do so may cause electric shock or fire, resulting in serious injury or death. Proper grounding is required for use in a safe environment.
	Wiring of the product must be performed by personnel with expertise and certification in electrical work. Otherwise, it may cause electric shock or fire due to miswiring or improper installation, resulting in death.
	Before wiring, ensure that no water is present on the product, and perform the work in an environment where the product is not exposed to water, such as rain or condensation. Performing the work with the product wet may cause electric shock, resulting in serious injury or death.

CAUTION	
	Install and wire the product in accordance with the safety regulations and standards established in the region of use, such as the Technical Standards for Electrical Equipment and the Interior Wiring Code. Failure to observe these regulations and standards may result in fire.
	Do not disassemble the product. Doing so may cause electric shock, reduced pressure capacity, or failure.

Description of terms

Terms	Definitions
%RH	Humidity unit
Pressure at which the valve can close in the A → B direction	Maximum pressure applicable from the A-side joint to maintain the valve in the closed position
MPa	Pressure unit
pps	Excitation speed unit
Erosion	A phenomenon in which the surface of the material inside the valve is gradually worn away by the fluid
Leak test pressure	Pressure used in tests performed to verify the sealing integrity of a valve
Maximum operating pressure differential (MOPD)	Maximum differential pressure at which the valve operates normally
Ambient temperature	The guaranteed temperature range around the outside of the valve
Ambient humidity	The guaranteed humidity range around the outside of the valve
Stepper motor	A motor that rotates through a fixed angle by applying pulsed voltage
Strainer	A mesh device used to remove foreign matter from fluids flowing through pipes
Sludge	Impurities and oxides generated during brazing
Design pressure	Maximum pressure expected during operation
Ground	Connecting the enclosure's reference potential wiring and similar parts to a reference potential point using an electrical conductor
Pressure resistance	Pressure used to verify the safety of a valve under high-pressure conditions (1.5 times the design pressure)
Chattering	The rapid, repeated opening and closing of a valve caused by pressure in the A → B direction
Drain	Condensed water that adheres to heat exchangers or piping
Burst pressure	Minimum pressure at which a valve ruptures and loses its sealing integrity
Pulse signal	An electrical signal consisting of a wave with a fixed width (typically a square wave)
Fume	A mixture of gases and fine particles released during the heating of metal and flux
Bracket	A part included with the coil for attachment to the main unit
Fluid temperature	The guaranteed temperature range of the fluid flowing through the valve
Excitation speed	The number of pulses per second of the pulse current applied to the valve

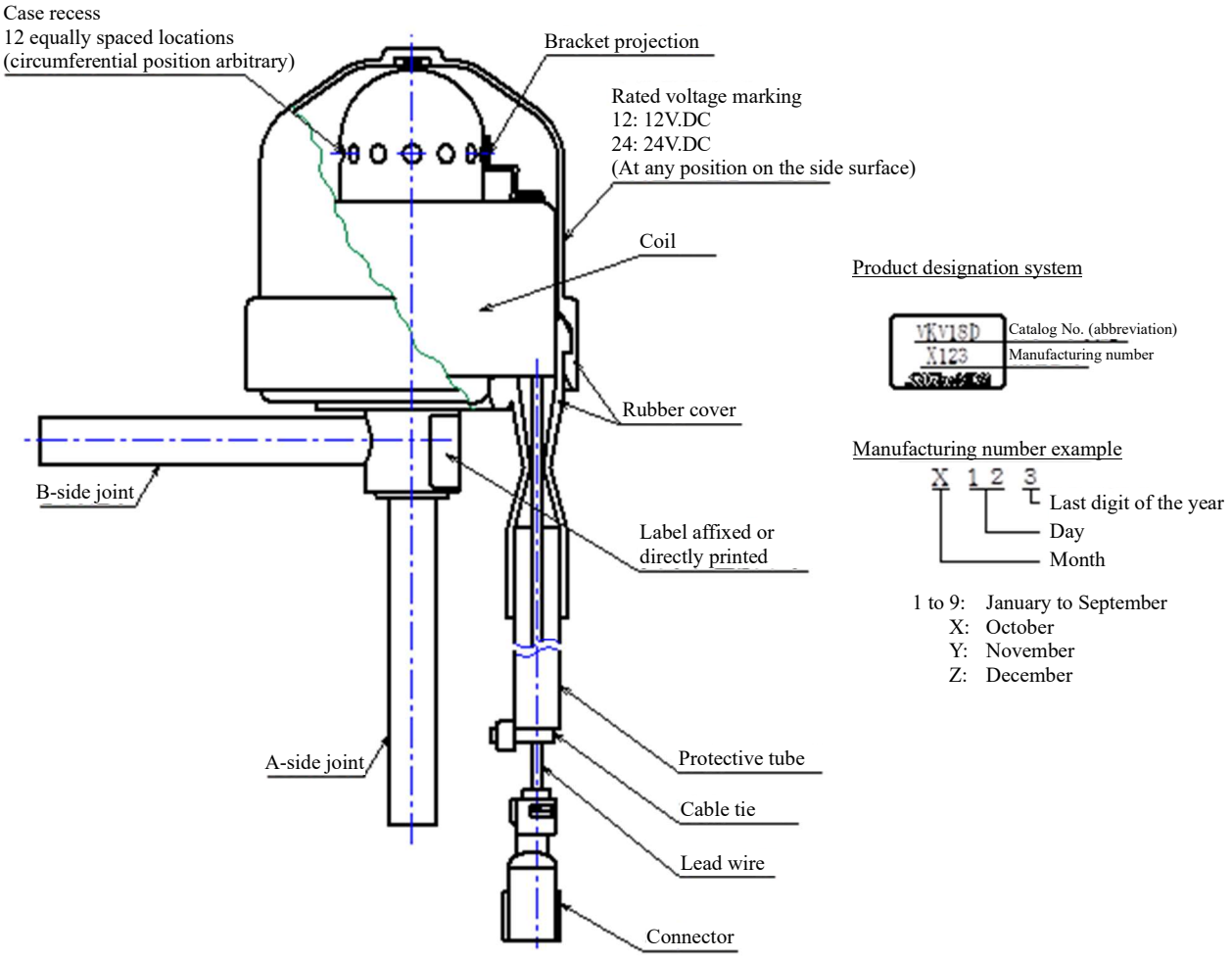
Table of Contents

3. Product Overview

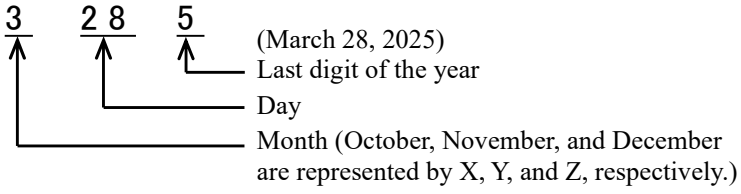
- This electronic expansion valve is a refrigerant control valve driven by a stepper motor.
- The valve opening is adjusted by pulse signals from the controller, allowing various types of control without being affected by pressure or flow rate.
- The product is not designed or manufactured for use in equipment or systems intended for life-critical applications. It is intended for use in air conditioning, heating, refrigeration, and other industrial equipment (hereinafter referred to as the "intended use").
  Do not use the product in any of the applications listed in 1) to 3) below:
  1) Nuclear power or radiation-related applications
  2) Space or subsea equipment-related applications
  3) Applications in which equipment or device failure or malfunction may result in serious consequences

- Names and functions of parts

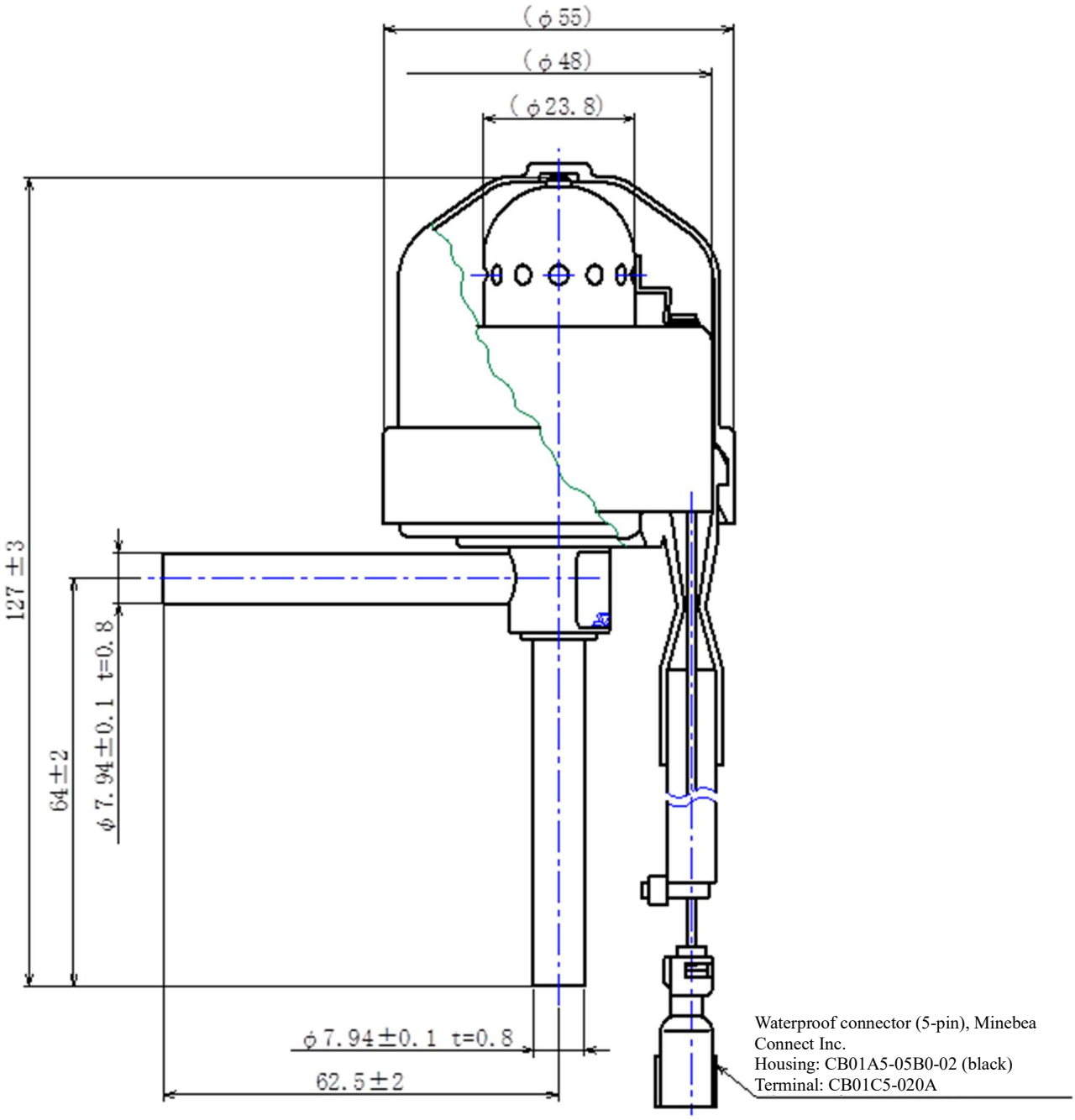
○ Part names



- Catalog No. : Model name marked using permanent ink
- Manufacturing lot number : Lot number marked using permanent ink



● External dimensions



● Model designation and numbering system

VKV – 14 D S ***

- 14 — Port size
- D — Joint shape: D = Copper tube joint
- S — Voltage: S = 12V.DC, T = 24V.DC
- *** — Sequential number

4. Specifications

Specifications table						
Product name	Type VKV Motor Operated Valves					
Type	See the information printed on the side of the main unit.					
Purpose of the control device	Refrigerant flow rate control					
Control device structure and electronic type	Electronic					
Type (VKV-**DS/**DT)	14DS 14DT	18DS 18DT	25DS 25DT	30DS 30DT	32DS 32DT	40DS 40DT
Pressure resistance	6.3 MPa					
Burst pressure	12.6 MPa					
Leak test pressure	4.2 MPa					
Design pressure	4.2 MPa					
Maximum operating pressure differential	3.5 MPa			2.5 MPa		
Pressure at which the valve can close in the A → B direction	2.8 MPa	2.4 MPa	2.2 MPa	1.5 MPa	1.0 MPa	0.3 MPa
Ambient temperature	-50°C to 60°C					
Fluid temperature	-50°C to 60°C					
Ambient humidity	95% RH or less					
Applicable fluids	R410A, R407C, R22, R134a, R1234yf, R454C, R32, R290 + refrigeration oil					
Dimensions	See p.5.					
Joint outer diameter (A side)	φ7.94				φ12.7	
Joint outer diameter (B side)	φ7.94				φ9.52	φ12.7
Product weight	0.30 kg			0.33 kg		0.35 kg
Voltage	12V.DC ±10% (VKV-**DS)/24V.DC ±10% (VKV-**DT)					
IP protection level	IP56					
Excitation method	1-2 phase excitation, bifilar winding, unipolar drive (Figure 1)					
Excitation speed	31.3 pps ±10% or 83.4 pps ±10%					
Coil duty cycle	50% or less					
Current direction	COM side positive (Figure 2)					
Valve control range	0 to 480 pulses					
Zero-point	0 pulses, Phase A excitation					
Zero-point setting	To perform zero-point setting, apply 520 drive pulses in the valve-closing direction to bring the valve to the zero-point position described above. Zero-point setting should be performed at least once a day.					

Figure 1 Excitation method (1-2 phase excitation)

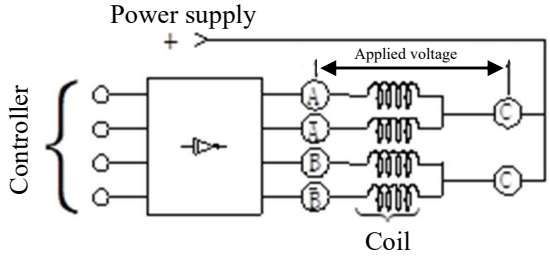
Connector terminal No.	Lead wire color	Energized phase	Excitation state							
			1	2	3	4	5	6	7	8
1	Orange	A	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
2	Red	B	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
3	Yellow	$\overline{A}$	OFF	OFF	OFF	ON	ON	ON	OFF	OFF
4	Black	$\overline{B}$	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
5	Gray	COM(+)	–	–	–	–	–	–	–	–

Valve operation

Opening direction: 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8

Closing direction: 8 → 7 → 6 → 5 → 4 → 3 → 2 → 1

Figure 2 Drive circuit



5. Handling and Storage

★ Observe the following when handling the product:

WARNING	
	When transporting the product, wear appropriate protective gear, such as safety shoes, to ensure safety. There is a risk of injury, such as a bone fracture, due to collision or dropping.
	When unpacking or installing the product, wear appropriate protective gear (work gloves, etc.) to ensure safety. There is a risk of injury from sharp edges on the packaging box, product, or tools.

- Do not drop the product.
  Doing so may cause the electronic expansion valve to fail, malfunction, or fail prematurely.
- Do not paint the product.
  If paint enters the electronic expansion valve or adheres to the sliding part, it may cause failure or malfunction.
- Do not store the product in locations subject to vibration or impact.
  Doing so may cause the electronic expansion valve to fail, malfunction, or fail prematurely.
- Do not store the product with a load applied to the main unit or joint.
  Doing so may deform the main unit or joint, causing the electronic expansion valve to fail, malfunction, or fail prematurely.
- When storing the product, avoid direct sunlight and store it in a well-ventilated place.
  Failure to do so may oxidize conductive parts, resulting in pressure switch failure, malfunction, or premature failure.
- Use a fluid that does not corrode copper alloys.
  The fluid used must not contain chemicals, synthetic oils containing organic solvents, salts, or corrosive gases.
  The presence of these substances may cause damage to or malfunction of the pressure controls.
- Use the product at the rated voltage.
  Failure to do so may cause failure or malfunction.
- Use the product at the rated working pressure.
  Failure to do so may damage the electronic expansion valve, resulting in failure or malfunction.
- Do not apply a load exceeding the maximum rated voltage and current.
  Doing so may damage the electronic expansion valve or shorten the service life.
- For the product stored for more than one year, verify operation before use.
  After the product is put into service, periodic operational checks are recommended.
- Do not scratch the joints (brazed section). Doing so may cause external leakage.
- Do not suspend the valve by the coil lead wire. Doing so may cause failure (wire breakage).
- Installation with the centerline of the main unit tilted downward by more than 90° from the vertical is not permitted.
  Installation with the coil section (motor section) facing upward and the centerline of the main unit within 15° of vertical is recommended.
  The greater the tilt of the centerline of the main unit during operation, the more likely dust and oil are to accumulate inside the main unit, thereby increasing the risk of operating problems caused by these contaminants.
- Ensure that sufficient space is provided around the valve for maintenance, inspection, and wiring.

6. Assembly

★ Observe the following when assembling the product:

WARNING	
	When unpacking or installing the product, wear appropriate protective gear (work gloves, etc.) to ensure safety. There is a risk of injury from sharp edges on the packaging box, product, or tools.
	When performing brazing with nitrogen purging, wear appropriate protective gear (protective goggles, heat-resistant gloves, etc.) and provide a pressure relief zone to prevent an unintentional rise in inner pressure for your safety. Failure to do so may cause blindness, injury, or burns due to splashing of high-temperature materials such as flux.
	When performing leak tests or charging refrigerant, do not apply pressure exceeding the limits specified in the instruction manual. Applying abnormal pressure beyond the specified limits may cause the equipment or piping to rupture, resulting in injury from scattered parts or suffocation due to leaked refrigerant. Before beginning work, be sure to check the specifications and pressure range of the equipment to be used, take all necessary safety precautions, and wear appropriate protective gear.
	When assembling the product, do not allow liquid to become trapped inside the product. If the temperature changes while liquid is trapped inside, the pressure may rise rapidly, causing damage to the product or refrigerant leakage and leading to serious accidents such as fire or suffocation. Before beginning work, always check the condition inside the piping and ensure a safe inspection environment.
	When performing brazing, always ensure that there are no flammable materials in the vicinity and take all necessary safety precautions. Failure to do so may result in unexpected fire spread or burns.
	Apply power to the coil only when it is assembled onto the valve main unit. Failure to do so may cause abnormal heating, resulting in burns or fire.
	When performing brazing, wear appropriate protective gear (safety goggles, heat-resistant gloves, etc.). Working without protective gear may result in blindness or severe burns.
	When using a flame that emits intense light during brazing, wear appropriate protective gear such as safety goggles. Looking directly at the intense light without protective gear may cause impaired vision or blindness.
	Perform blazing in a well-ventilated location or with an exhaust system with adequate ventilation. Also, wear appropriate protective gear, such as a mask. Failure to do so may cause inhalation of hazardous substances, such as fumes, resulting in respiratory disorders, or suffocation from leaked gas.

CAUTION	
	Use dollies, jacks, or similar equipment during transportation. Lifting heavy objects may cause physical injury.
	When installing heavy products, wear appropriate protective gear (such as safety shoes). There is a risk of injury if the product falls.

- Before unpacking, ensure that the packaging box is not deformed or damaged.
- During unpacking, ensure that the product is not deformed or damaged.
- After unpacking, ensure that the electronic expansion valve meets your requested specifications.
- Do not subject the product to impact during unpacking. Doing so may cause failure or malfunction.
- Be sure to remove any dust or foreign matter from the piping before installing the electronic expansion valve in the piping line.
  If foreign matter may be present in the fluid, install a filter or similar device in the piping line.
  Failure to do so may cause failure or malfunction.
- Do not install the electronic expansion valve in a location where it may be used as a step or foothold.
  If excessive force is applied by accidentally stepping on the valve or using it as a foothold, damage may result.
- Do not use the product in environments where it is exposed to corrosive gases, chemicals, or continuous moisture.
  Doing so may cause failure or malfunction.
- Install the electronic expansion valve in a location free from vibration and shock.
  Failure to do so may cause failure or malfunction.
- Prevent foreign matter, such as sludge, from entering the product.
  Failure to do so may cause failure or malfunction.
- Use the product within the specified fluid and ambient temperature ranges.
- Take measures to prevent freezing. Installation of an air dryer to drain or remove moisture is recommended.
  Also, avoid sudden temperature changes even within the specified temperature range.
- Do not use the product in locations exposed to radiant heat from surrounding heat sources.
  Doing so may cause malfunction.
- Ensure that no impact pressure, such as liquid hammer, is applied to the fluid passing through the valve.
- Do not install a check valve or similar device on the inlet side. This may create a liquid-sealed condition in the piping, resulting in abnormal pressure that may damage the valve and cause failure.
- Securely fasten the main unit and the piping.
  Piping vibration may cause cracks in the joint connection of the main unit.
- When brazing, remove the coil section and wrap the main unit with a wet cloth or immerse it in water to keep the temperature below 120°C. However, do not allow water to enter the interior.
  Also, do not direct the flame at the main unit.
- When brazing, fill the interior with an inert gas (such as nitrogen or carbon dioxide) to prevent the formation of oxide scale.
- The valve opening is set to 480 pulses at the time of shipment, but it may change due to vibration during transport.
  When filling the interior with an inert gas during brazing, fully open the valve.
- Do not apply excessive force, such as compression, tension, or torsion, to the main unit.
  Doing so may deform the main unit and cause malfunction.
- Prevent moisture from entering the piping.
  Moisture may cause freezing and rust, resulting in malfunction.
- After piping work, perform a leak test.
- When installing the coil section, insert it straight into the main unit case without deforming the cover, and fit the coil bracket projections securely into the recesses in the main unit case until they click into place. Since the main unit case has 12 recesses, orient the coil so that the lead wires can be routed out easily.

7. Wiring

★ Observe the following when wiring the product:

WARNING	
	Do not forcibly remove the rubber cover. Removing the cover exposes live parts, which may result in serious injury due to electric shock if directly touched.
	Be sure to turn off the power before wiring. Performing the work with power on may cause accidental contact with live parts, resulting in injury or death due to electric shock.
	Before wiring, ensure that no water is present on the product, and perform the work in an environment where the product is not exposed to water, such as rain or condensation. Performing the work with the product wet may cause electric shock, resulting in injury or death.
	Before turning on the power to the product, carefully check that there are no short circuits or wiring errors, and confirm safety. In addition, apply voltage only within the limits specified in the product specifications. Failure to follow these instructions may cause sparks due to short circuits or overvoltage, resulting in fire. In addition, wiring errors or the application of improper voltage may cause electric shock, resulting in serious injury or death.

- Use the product within the electrical ratings.
  Failure to do so may damage the electronic expansion valve or shorten the service life of the pressure control.
- Do not paint the product.
  If paint enters the electronic expansion valve or adheres to the sliding part, it may cause failure or malfunction.
- Be sure to use the specified relay lead wires manufactured by us when extending the lead wires.
- Do not wrap the lead wires around the coil section.
- Securely fasten all portions of the lead wires between the valve and the controller so that vibration or similar stress is not applied. When bending the lead wires, do not bend them sharply; bend them in a sufficiently large radius.
  Also, do not place objects on the lead wires or step on them. Doing so may cause damage or breakage.
- Do not touch the lead wires at low temperatures.
  The insulation hardens under such conditions and may be damaged or broken.
- Be sure to turn off the controller power before wiring.
- Connect the wires in accordance with the table below so that the lead wire colors match those on the controller side.

Lead wire color	Energized phase
Orange	A
Red	B
Yellow	$\overline{A}$
Black	$\overline{B}$
Gray	C (COM.: +)

- Loose terminals or incorrect wiring may not only prevent proper control but also cause failure.

$\bar{A}$

8. Operation

★ Observe the following when operating the product:

WARNING	
	Do not forcibly remove the rubber cover. Removing the cover exposes live parts, which may result in serious injury due to electric shock if directly touched.
	Before wiring, ensure that no water is present on the product, and perform the work in an environment where the product is not exposed to water, such as rain or condensation. Performing the work with the product wet may cause electric shock, resulting in injury or death.
	Use the product only under the conditions described in the instruction manual. Perform periodic maintenance. Exposure to harsh conditions beyond the specified operating conditions or prolonged use may degrade the sealing integrity of the product. In addition, leaked refrigerant may cause fire or suffocation.
	Always observe the electrical ratings when operating the product. If power exceeding the rated value is applied to the coil, the coil may overheat and cause fire. In addition, excessive heat may expose live parts, resulting in serious injury or death from electric shock.

- Do not expose the product to vibration exceeding 19.6 m/s^2.
  Doing so may cause the electronic expansion valve to fail, malfunction, or fail prematurely.
- Use the product in an environment where the ambient temperature around the main unit is between -50°C and 60°C.
  Failure to do so may cause the electronic expansion valve to fail, malfunction, or fail prematurely.
- Use the product in an atmosphere that does not corrode copper alloys.
  Failure to do so may cause the electronic expansion valve to fail, malfunction, or fail prematurely.
- Use the product in an environment free from condensation and frost formation.
  Failure to do so may cause the electronic expansion valve to fail, malfunction, or fail prematurely.
- Use the product within the maximum working pressure.
  Also, use it in a location free from impact pressure, excessive pressure fluctuations, and pulsation.
- After installing the product correctly, be sure to perform a trial operation and confirm that the entire system functions properly before use.
- Configure appropriate settings in accordance with your intended purpose.
  Failure to do so may cause malfunction.

9. Maintenance and Inspection

★ Observe the following when maintaining or inspecting the product:

WARNING	
	Do not forcibly remove the rubber cover. Removing the cover exposes live parts, which may result in serious injury due to electric shock if directly touched.
	Apply power to the coil only when it is assembled onto the valve main unit. Applying voltage to the coil while it is removed from the valve main unit may cause a large current to flow, resulting in abnormal heating of the coil and causing burns or fire.
	When replacing the product, recover the refrigerant from the refrigeration system and perform the work only after confirming that no refrigerant remains inside the product. If refrigerant recovery is incomplete, refrigerant may leak, causing fire due to ignition or suffocation due to a decrease in oxygen concentration. In addition, always follow the correct refrigerant recovery procedure, and thoroughly check the connections and control the recovered amount.
	Be sure to turn off the power and take appropriate safety precautions before performing any work. Performing maintenance with the power on may cause electric shock, resulting in serious injury or death.
	When performing work, work in a well-ventilated location or use an exhaust system with adequate ventilation. Also, be sure to wear appropriate protective gear, such as a mask. Failure to do so may result in respiratory disorders due to accumulated gas or suffocation due to leaked gas or similar substances.
	When performing leak tests or charging refrigerant, do not apply pressure exceeding the limits specified in the instruction manual. Applying abnormal pressure beyond the specified limits may cause the equipment or piping to rupture, resulting in injury from scattered parts or suffocation due to leaked refrigerant. Before beginning work, be sure to check the specifications and pressure range of the equipment to be used, take all necessary safety precautions, and wear appropriate protective gear.

- Periodic operational checks are recommended.
- Foreign matter in the piping may accumulate in the strainer. Periodic inspection and cleaning of the strainer are recommended.

10. Disposal

When you no longer need the product, dispose of it properly as industrial waste in accordance with the laws, regulations, and ordinances applicable in your area.
Also, do not reuse the product, either in whole or in part.

Phenomenon	Check item	Reference
• The valve is not operating. • Proper control cannot be achieved.	Is the product being used within the product specifications? • Check that the pressure conditions (internal valve pressure and differential pressure across the valve (MOPD)), temperature conditions (ambient temperature and fluid temperature), and flow direction are appropriate.	Item 1 on p.17 Item 4 on p.18
	Is the coil installed correctly? • Check that the coil bracket and the main unit are properly engaged. • Check that the end of the coil lead wire (housing) is connected to the circuit board (power supply). • Check that the coil specified by us is being used.	Item 2 on p.17 and p.18
	Is the correct electrical signal being sent to the coil? • Check the coil voltage, excitation method (1-2 phase excitation), and excitation speed. • Check that there is no abnormalities in the lead wires, such as wire breakage.	Item 2 on p.17 and p.18
	Is the refrigerant charge appropriate? • Check that the system is charged with the correct amount of refrigerant. • Check that the refrigerant charge is not insufficient due to external leakage.	—
	Is the valve capacity appropriate for the system capacity? • Problems such as insufficient cooling or poor response may occur.	Item 5 on p.19
	Is the valve leakage specification appropriate for the system capacity? • Even in the fully closed state, the valve does not provide complete flow shutoff. Check that the valve leakage specification matches the system design values.	Item 5 on p.19
	Is there anything unusual about the appearance of the main unit? • Check for dents or other signs of dropping or impact. Also, check whether the product has been subjected to impact, such as dropping. • Check for any unusual scorching or burn marks. Internal parts may have melted or been damaged due to the heat generated during brazing.	Item 4 on p.18
	Is anything with strong magnetic properties, such as a magnet, placed near the case? • Magnetic abnormalities in the internal magnet parts may cause the valve to stop operating.	Item 4 on p.18
	Are dust and foreign matter properly controlled? • If they become caught in sliding parts or drive parts, they may cause malfunction. • If they become caught in valve sections, they may cause valve leakage. • They may cause erosion or reduce service life.	Item 3 on p.18
	Is the refrigerant specified in the drawings being used?	Item 8 on p.19

Phenomenon	Check item	Reference
Abnormal noise	Is the noise vibration noise coming from outside the valve? • Check whether a rattling noise is occurring between the coil and the main unit because the coil is not properly installed. • Check that the piping is not vibrating and that the valve is not in contact with the enclosure or piping.	Item 6 on p.19
	Is it a sound coming from inside the valve, such as a humming or rattling noise, as if something were moving inside? • Operating noise occurs when internal parts rotate. In addition, the noise may sound louder due to reverberation caused by the installation condition, such as when the valve is in contact with the enclosure.	Item 6 on p.19
	Is the abnormal noise coming from the refrigerant (inside the piping)? • Depending on the refrigerant conditions and state, abnormal noise (refrigerant flow noise) may occur.	Item 6 on p.19
	Has the product been subjected to abnormal external force, such as dropping? • If internal parts become loose or damaged, they may make abnormal contact with each other, causing abnormal noise.	Item 4 on p.18
	Does the pressure difference in the A ⇒ B flow direction exceed the valve closing pressure differential? • Depending on the pressure balance, chattering may occur in the valve section, causing abnormal noise.	Item 6 on p.19
Scratches and discoloration	Due to the manufacturing process, scratches and discoloration may occur on the surfaces of the copper tube joints and the main unit. • Depending on the surrounding environment, discoloration due to natural oxidation may be observed on the surfaces of the copper tube joints and the main unit. • Scorch marks and discoloration may be observed around welded areas due to heat effects. • Models using a brass main unit may show cleaning marks. • Depending on the manufacturing conditions, uneven surface coloration may be observed.	—
Rust has formed	Depending on the operating environment, rust may form. • If significant rust has formed, review the operating environment. • Depending on the condition of the rust, it may cause malfunction or sealing defects.	Item 2 on p.17 and p.18 Item 7 on p.19
The coil is too stiff to install	The insertion feel of the coil varies depending on the valve model. • It is easier to install if it is pushed in while being rotated. • Check that the coil specified by us is being used.	—
Refrigerant is leaking	Check the leakage location.	Item 7 on p.19

Item	Phenomenon	Possible cause	Check item	Notes	Action
1	Deterioration in operation due to an abnormal increase in sliding resistance or wear	Abnormally high differential pressure	Pressure difference across the valve	If the pressure difference across the valve is too high, the valve may not open and close properly, which may cause malfunction.	Check
		Abnormal temperature	Ambient temperature, fluid temperature	Part deformation or damage may occur, which may cause malfunction. It may also accelerate durability degradation.	Check
		Abnormal fluid viscosity	Condition of refrigeration oil	If refrigeration oil accumulates inside the main unit, its viscous resistance may cause malfunction. It may also impair the internal pressure equalization function, causing operating problems. In addition, refrigeration oil viscosity increases in low-temperature environments, so special care is required.	Check
		Durability degradation	Operating frequency	Keep the operating frequency within the specified range.	Replace
		Dust or foreign matter caught in the valve	Condition of sludge or other foreign matter	Large amounts of foreign matter accelerate durability degradation. In addition, if foreign matter becomes caught in sliding parts, sliding resistance increases, which may cause malfunction.	Replace
2	Deterioration in operation due to coil malfunction	Insufficient current	Voltage and current values	Check that the appropriate voltage is applied to the coil and that the appropriate current is obtained. Insufficient current to the coil may cause malfunction.	Check
		Abnormal DC resistance	Coil resistance, open circuit	Insufficient current to the coil may cause malfunction.	Check
			Coil temperature, duty cycle	The higher the coil temperature, the greater the DC resistance of the coil. As a result, insufficient current flows to the coil, which may cause malfunction.	Check
		Improper coil wiring or connection state	Connection to the control board	Check that the coil connector is properly inserted into the mating connector on the board. Also, check that the phases of the connector (pins) match the excitation phases.	Check
		Abnormal control signal	Excitation method, excitation speed	Use an appropriate method conforming to the drawings. Check that each phase is properly excited.	Check
		Deterioration of coil performance due to corrosion	Corrosive environment	Significant rusting is not only a cosmetic issue, but may also cause damage or deformation of metal parts such as brackets, stators, and housings. Damage or deformation of the brackets affects the coil retention state. Furthermore, damage or deformation of the stator or housing may cause deterioration of coil insulation, leading to malfunction of the valve itself.	Replace

Item	Phenomenon	Possible cause	Check item	Notes	Action
2 (Continued from previous page)	Deterioration in operation due to coil malfunction	Improper coil installation	Bracket engagement	Ensure that the recesses in the main unit and the projections on the coil bracket are securely engaged. Failure to do so may prevent the magnetic force of the coil from being properly transmitted to the main unit, which may cause malfunction. In addition, the coil may not be properly secured, which may cause it to come off.	Check
			Coil type	Do not use coils not specified by us or coils from other manufacturers. Even if the size is the same, they cannot be used. Doing so may cause malfunction.	Replace
3	Foreign matter	Dust or foreign matter caught in the valve	Condition of sludge or other foreign matter	Large amounts of foreign matter accelerate durability degradation. In addition, if foreign matter becomes caught in sliding parts, sliding resistance increases, which may cause malfunction. Install a strainer (except for types with built-in strainers). Even if a strainer is installed, ensure proper control of dust and foreign matter. In particular, when brazing the piping, perform inert gas purging to reliably prevent the formation of oxide scale.	Replace
4	Part deformation or damage	Damage to internal parts caused by external force	Dropping	Do not use the product if it has been dropped. Even if there are no visible abnormalities, internal parts may be damaged.	Replace
			Liquid shock	Depending on the installation configuration of the solenoid valve, liquid shock generated when the solenoid valve opens and closes may be transmitted to the valve, which may cause part damage. Even if the solenoid valve is not installed immediately upstream, liquid shock may still be transmitted by reflection in a parallel circuit.	Replace
		Deformation or deterioration of internal parts due to excessively high temperature	Piping brazing method, main unit temperature	Ensure proper cooling so that the main unit temperature remains at 120°C or below. Internal parts may melt or deform, causing operating problems. In addition, if the brazing material at the base of the joint deteriorates due to overheating, defects such as cracks may occur, leading to external leakage.	Replace
		Strong external magnetic field	Use of magnets or similar items	Do not bring magnetic materials, such as strong magnets, near the case. Doing so may cause magnetic damage to the internal magnet parts, leading to malfunction.	Replace
		Abnormal vibration	Valve mounting condition	Check that the main unit is properly secured. For example, if the valve main unit is not secured and only the piping is secured at a distant position, abnormal stress may concentrate at the base of the copper tube joint, causing damage.	Replace
			Valve installation location	Installation in contact with or near the compressor may subject the valve to constant vibration from the compressor, causing fatigue failure of internal and external parts.	Replace

Item	Phenomenon	Possible cause	Check item	Notes	Action
5	Abnormal control	Valve operating problems	—	See sections 1 and 2.	—
		System compatibility	Valve capacity, flow rate specifications, and valve leakage specifications	Design the system to be compatible with the valve nominal refrigerating capacity, flow rate specifications, and valve leakage specifications. Failure to do so may cause problems such as insufficient refrigerating capacity, hunting, or excessive subcooling.	Check
6	Abnormal noise	Improper installation	Coil mounting and valve piping installation	Check for improper mounting or interference with the enclosure that may cause abnormal resonance.	Check
		Abnormal contact noise from internal parts	Loose or damaged internal parts	Abnormal contact between internal parts caused by looseness or damage may cause abnormal noise. See section 4.	Check
		Abnormal reverse pressure	Pressure in the A ⇒ B flow direction	Use within the valve closing pressure differential range. Depending on the pressure balance, chattering may occur in the valve section, causing abnormal noise.	Check
		System compatibility (Refrigerant conditions and state)	Refrigerant conditions and state when abnormal noise occurs	Depending on the refrigerant conditions and state, abnormal noise (refrigerant flow noise) may occur. Avoid use in the range in which abnormal noise occurs.	Check
7	External leakage	Leakage from the welded area	Corrosive environment	Depending on the corrosive atmosphere of the operating environment, cracks or defects may develop in the welded area, causing external leakage. Review and take corrective action on the operating environment (corrosive atmosphere).	Replace
		Leakage from the brazed section	Degradation of brazing material	If overheating occurs during pipe brazing, the heat may deteriorate the brazing material, causing cracks or damage that lead to external leakage. Ensure proper cooling during brazing.	Replace
		Leakage from the joint	Corrosive environment	Depending on the corrosive atmosphere of the operating environment, cracks or defects may develop in the copper tube joint or the brazed section of the joint, causing external leakage. Review and take corrective action on the operating environment (corrosive atmosphere).	Replace
			Abnormal vibration	Ensure that no abnormal vibration is applied. Repeated abnormal vibration places excessive stress on the base of the joint, causing cracks or breakage.	Replace
			Bending of the joint	Installation that places stress on the base of the joint may cause cracking or breakage.	Replace
8	Others	Incompatible refrigerant	Refrigerant used	Use of an incompatible refrigerant may cause unexpected problems, such as part deformation, abnormal sliding performance, or abnormal durability deterioration, which may lead to malfunction.	Check
		Unknown	----------	Investigate the details such as the usage conditions and environment and contact us.	Investigation required

12. Troubleshooting List

Q What happens if the piping is brazed without cooling or inert gas purging?

A It may cause malfunction or external leakage.

- Insufficient cooling: The heat from brazing may cause parts to deteriorate, deform, or melt.
- No inert gas purging: Oxide scale may form.

Specific effects

- Part deformation or melting ⇒ May cause malfunction
- Deterioration of the brazed section ⇒ May cause external leakage
- Formation of oxide scale ⇒ May cause malfunction

Q It is preferable for the valve to be fully open during pipe brazing, but can the valve opening at the time of delivery be specified? Also, what happens if a custom jig is used to fully open the valve?

A The valve opening at the time of delivery cannot be specified. Since the valve opening may change due to vibration during transport, the valve opening upon delivery is arbitrary.
If your work process requires a fully open valve state and a custom-made jig incorporating a strong magnet is used to perform an additional valve-opening operation, the internal magnet parts may be damaged by magnetism, which may cause malfunction.

(Note)
There is a magnet part inside the motor operated valve case, and the valve opens and closes as this magnet part rotates. If a strongly magnetized object is brought near the main unit case, the magnetic characteristics of the magnet part inside the case may be disturbed, preventing proper rotation and causing malfunction. When opening or closing the valve during brazing or refrigerant charging operations, use either the coil specified by us or the manual coil recommended by us. (Manual coil: Not available for some models.)

Examples of demagnetization

(Normal product) (Demagnetized product)

Normal product: The magnetic poles (the boundaries between the N and S poles) are evenly aligned.
Demagnetized product: The magnetic poles are irregularly aligned. = Magnetic force has decreased.
(Above figure: Surface magnetic poles observed using a magnet viewer)

Q Strainers are installed upstream and downstream of the valve, but is foreign matter control in the piping still necessary?

A Yes, it is necessary.
Depending on the shape and properties of dust or foreign matter, dust or foreign matter may pass through the strainer.
If dust or foreign matter accumulates in the sliding parts of the valve, it may cause malfunction or valve leakage.
In addition, erosion may occur depending on the foreign matter and fluid conditions.
The recommended strainer mesh size is #100 to #120.

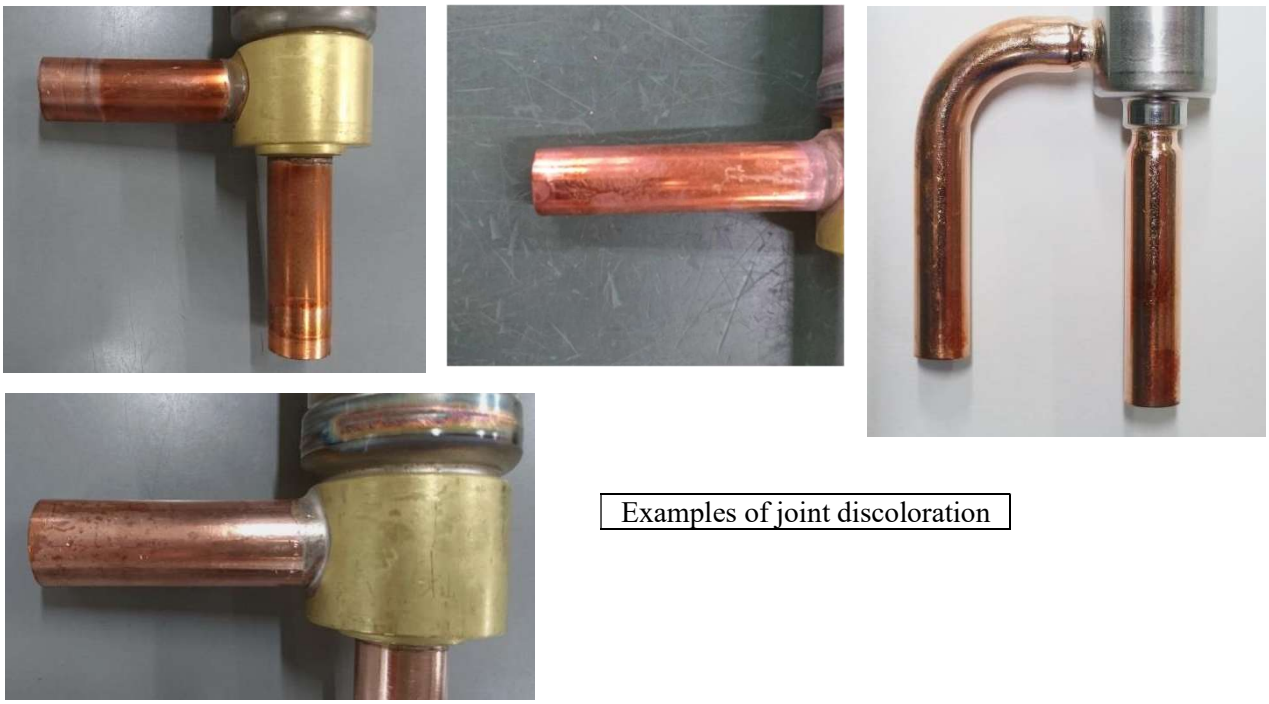
When brazing the piping, perform inert gas purging to prevent the formation of oxide scale.
However, in actual operation, it is difficult to completely remove all dust and foreign matter from the piping, and sudden malfunction caused by these contaminants may occur.
To correct pulse misalignment (valve opening deviation) caused by this malfunction, perform zero-point setting periodically. (For zero-point setting, see p.23 "Is zero-point setting necessary?")

Q What happens if the product is dropped on the floor but shows no visible damage?

A It may cause malfunction.
Even if no visible damage is observed, internal parts may be damaged or deformed.

Q The copper tube joint is discolored. Is it still usable?

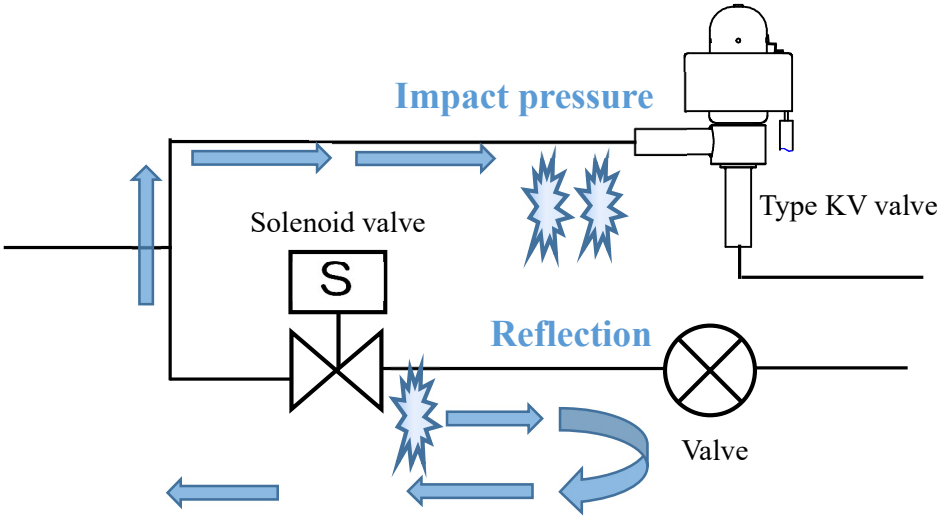
A Yes, it is usable.
Slight discoloration (oxidation) may occur depending on the surrounding environment.
There are no functional or performance issues in use.



Examples of joint discoloration

Q What happens when used with a solenoid valve?

A Some Type PKV and GKV motor operated valves can be used in combination with a solenoid valve. However, repeated impact pressure affects product service life, so keep the pressure and frequency as low as possible.
Combination with motor operated valves other than those listed above is not possible.
Impact pressure generated when the solenoid valve opens and closes may damage internal parts, causing malfunction, or damage external parts, resulting in external leakage. Also, even if the solenoid valve is not installed immediately upstream, impact pressure may propagate due to reflection if it is located within the same refrigerant system.



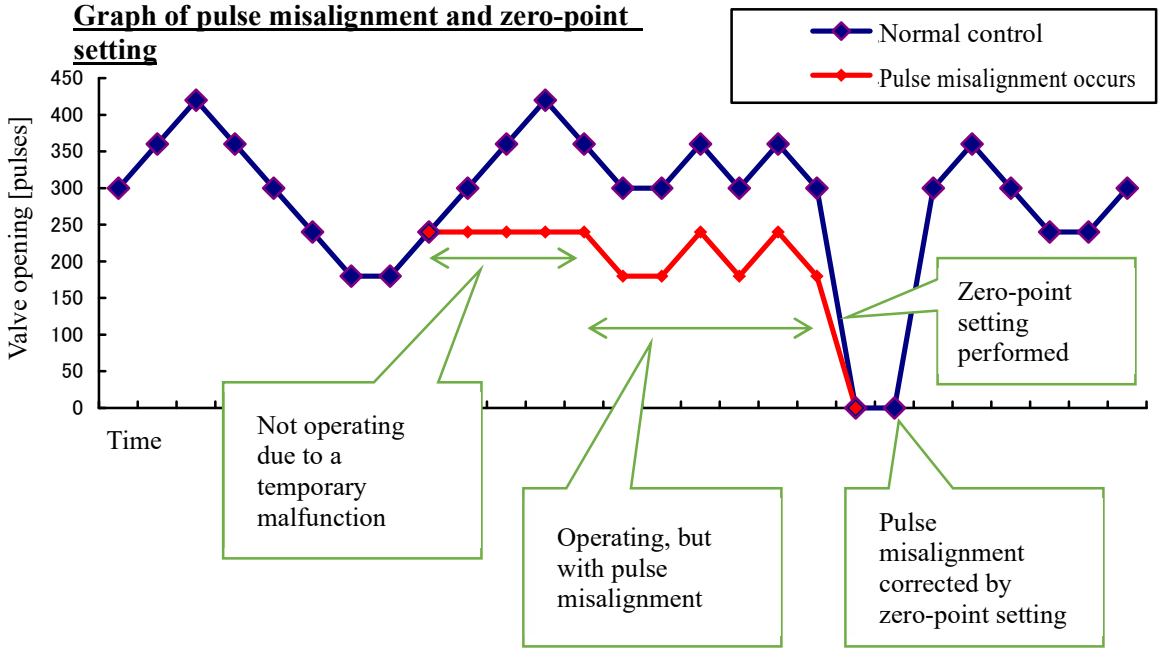
Q Is zero-point setting necessary?

A Periodic zero-point setting is recommended.
Unexpected problems, such as temporary dust interference, may cause a discrepancy between the commanded valve opening and the actual valve opening. The guaranteed number of zero-point setting operations is specified for each motor operated valve model. See the drawings and product specifications for details.

Q What are "pulse misalignment" and "loss of synchronism"?

A These terms refer to a condition in which the commanded valve opening does not match the actual valve opening.
As a result, the intended design temperature, pressure, and refrigerating capacity may not be achieved, and control problems may occur. Possible causes include improper drive methods, erroneous control signals, and temporary interference with normal operation due to foreign matter temporarily caught in the valve.
Perform control in accordance with the product specifications. In addition, perform zero-point setting periodically to correct sudden pulse misalignment caused by foreign matter becoming trapped in the valve or by similar events.

Graph of pulse misalignment and zero-point setting



Q Can the product be used with a bipolar drive circuit?

A The product cannot be used with a bipolar drive circuit.
The coil is designed exclusively for unipolar drive. Even if compatibility with a bipolar drive circuit has been confirmed in your evaluation, do not use it. Unexpected problems may occur due to long-term use or changes in operating conditions.

Q What happens if a 24V.DC coil is used with a 12V.DC power supply, or a 12V.DC coil is used with a 24V.DC power supply?

A This may cause malfunction or damage to internal parts.
There is also a risk of smoke or fire, so never use the product in this manner. Always use the product within the specified voltage range.

Q What happens if the coil remains energized even when the valve is stopped in order to maintain the valve opening?

A This may cause wire breakage or shorten service life.
If the coil remains energized during a stop, the coil temperature may rise abnormally, causing wire breakage or shortening service life. Use the duty cycle within the specified range.
The valve is designed to maintain the valve opening even when unenergized, so energization during a stop is unnecessary.

Q Are there any precautions regarding control pulses or excitation methods?

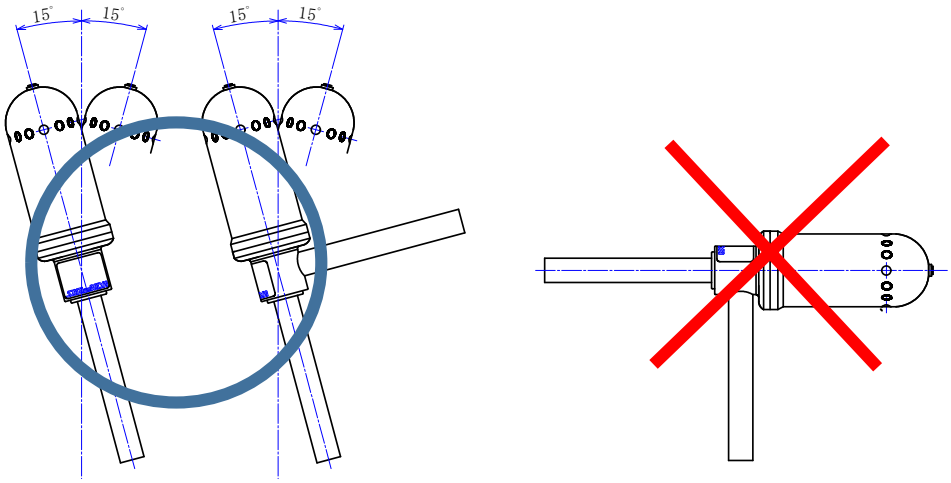
A When valve operation ends, continue excitation of the final phase for approximately 0.5 seconds before stopping. When shifting from the stopped state to operation, apply excitation to the stop phase for approximately 0.5 seconds before sending the operating pulses. When reversing valve operation, apply excitation to the return phase for approximately 0.5 seconds before sending the operating pulses in the reverse direction. Failure to follow the above may cause loss of synchronism under certain conditions, which may prevent proper valve control.

Q What happens if the excitation speed is increased to shorten the operating time? Conversely, what happens if it is reduced?

A The excitation speed cannot be changed. Using the product outside the specified range may cause malfunction.

Q What happens if the main unit is tilted during installation?

A Tilting the main unit beyond the specified range increases the risk of malfunction and reduced durability.
The greater the tilt of the main unit, the more likely foreign matter, such as oil and dust, is to accumulate inside.
This may cause malfunction.
The motor operated valve main unit can be installed with the case facing upward within 15°.



The figure shows the valve with the coil removed.

Q What precautions should be taken when using the product in low-temperature environments?

A (1) Take care in handling the coil lead wires and in selecting the installation environment. Due to the characteristics of the lead wire insulation material, it hardens and becomes brittle in low-temperature environments. If abnormal vibration or repeated bending occurs in this condition, cracking or breakage of the lead wire insulation may result.

(2) The effects of refrigeration oil become more significant. In low-temperature environments, the viscosity of the refrigeration oil increases, resulting in greater sliding resistance during valve operation. If refrigeration oil fills or accumulates inside the main unit, the sliding resistance of internal parts increases further, which may cause malfunction.

(3) Pay attention to the flow direction. For bidirectional-flow models, if the main unit (coil mounting section) is positioned on the evaporator side of the flow path (flow direction: A → B), significant frost buildup (so-called "snowman" formation) may occur. Repeated defrosting and frost buildup may shorten coil service life and increase the risk of joint damage due to freezing.

CONSENT RELATED TO DISCLAIMERS

We, SAGINOMIYA SEISAKUSHO, INC., (hereinafter referred to as "Saginomiya"), truly appreciate your choosing Saginomiya's product.
When using Saginomiya's own products and other products supplied by Saginomiya (hereinafter referred to as the "Product"), this document as provided below shall be applicable except to the extent that there is anything to the contrary in any applicable estimate, agreement, catalogue, specification, etc.

• CONFIRMATION OF OPERATION

All customers using the Product (hereinafter referred to as "Customers") are requested to, after properly installing the Product, test the operation of the Product to confirm that all the systems in connection with the Product fully function.
In order to prevent the occurrence of bodily injury, fire accidents, serious damage, etc., in connection with the Customers' machinery or equipment due to improper installation of the Product, Saginomiya kindly requests the Customers to take the necessary safety measures by preparing safe designs such as a fail-safe design (*1) and a fire spread prevention design, as well as to make the proper adjustments for product reliability necessary for fault-tolerance (*2).

(*1) Fail-safe design: Design to ensure safety in the event of any mechanical failure
(*2) Fault-tolerance: Utilization of redundancy technology

Periodic Inspection of the Product
Be sure to confirm the proper operation of the Product and keep records of such operation at least once a year.

Saginomiya shall be held harmless and be indemnified by the Customers from any damages incurred due to the Customers failing to conduct the above operational procedures, provided, however, that, this shall not apply if the damages which the Customers incurred due to the defect of the Product caused by Saginomiya.

• RESTRICTIONS OF USE

The Product is designed and manufactured for the purpose of using them for cooling and heating and refrigerating appliances and air conditioning equipment or various industrial equipment, but is not designed and manufactured for the purpose of using the Product for any instrument or system related to human life or health purposes.
Therefore, the use of the Product in fields related to items (1) through (3) below is not intended whatsoever.
Saginomiya shall be held harmless and be indemnified from any and all damages incurred by use of the Product under item (3).

(1) In any field related to nuclear power and radiation;
(2) In any field related to space or seafloor equipment;
(3) In any equipment or device requiring a high degree of reliance on such equipment or device with respect to which it is reasonably foreseeable that failure or malfunction of the equipment or device would either directly or indirectly cause serious damage to human life, health or property;

Also, when using the Product under the fields related to items (1) through (10), (except for item (3), in relation to which the Product must never be used), please be sure to notify Saginomiya's contact desk in charge of sales and obtain Saginomiya's prior written approval for such use.

Saginomiya shall be held harmless and be indemnified from any and all damages incurred by use of the Product in relation to these fields if the Customers do not notify Saginomiya's contact desk and obtain Saginomiya's prior written approval.

(4) Heating, cooling, and refrigeration/air conditioning equipment using flammable and/or toxic refrigerants, excluding A2L refrigerants as defined in ISO 817, or various industrial equipment using flammable and/or toxic fluids, excluding A2L refrigerants as defined in ISO 817;
(5) Transportation device (railroad, aviation, ship or vessel, vehicle equipment, etc.);
(6) Disaster-prevention or crime-prevention device;
(7) Facility or application directly related to medical equipment, burning appliances, electro thermal equipment, amusement rides and devices, facilities/applications associated directly with billing;
(8) Equipment requiring high reliance on supply systems such as electricity, gas, water, etc., in large-scale communication system, or in transportation or air traffic control system;
(9) Facilities that are to comply with regulations of governmental / public agencies or specific industries or
(10) Other machineries or equipment equivalent to those set forth in the above items (4) to (9) which require for high reliability and safety.
(11) Machinery and equipment that are intended or expected to be used under conditions other than those specified in the catalogues and instruction manuals;

It is recommended to replace the Product within 5 to 10 years of delivery if no other duration of use is provided in the applicable specifications or instruction manual because the conditions and environment of use also have an impact on the Product.

• SCOPE OF WARRANTY

SAGINOMIYA WILL PROVIDE THE CUSTOMERS WITH REPLACEMENT OR REPAIRED THE PRODUCT DELIVERED, FREE OF COST, ONLY WITHIN ONE YEAR (NOTE 1) OF DELIVERY TO THE CUSTOMER, IF FAILURE OCCURS IN THE CUSTOMERS' EQUIPMENT USING THE PRODUCT DUE TO A DEFECT OF THE PRODUCT; PROVIDED, HOWEVER, THAT IN ANY EVENT THE AMOUNT THAT SAGINOMIYA BEARS FOR THE DAMAGES INCURRED BY THE FAILURE OF THE PRODUCT OR CUSTOMERS' EQUIPMENT SHALL NOT EXCEED THE PRICE OF THE PRODUCT WE DELIVERED. IN ADDITION, SAGINOMIYA SHALL BE HELD HARMLESS AND BE INDEMNIFIED FROM ANY AND ALL DAMAGES INCURRED WHEN THE FAILURE OF THE CUSTOMERS' EQUIPMENT OCCURRED DUE TO ANY CAUSE SET FORTH BELOW.

(1) WHEN CAUSED BY INAPPROPRIATE HANDLING OR USE OF THE PRODUCT BY THE CUSTOMERS (SUCH AS NOT COMPLYING WITH THE CONDITIONS, ENVIRONMENTAL SPECIFICATIONS OR CAUTIONS INDICATED IN ANY APPLICABLE CATALOGUE, SPECIFICATIONS, INSTRUCTION MANUAL, ETC.);
(2) WHEN FAILURE OCCURRED DUE TO ANY REASON OTHER THAN THE PRODUCT;
(3) WHEN CAUSED BY MODIFICATION OR REPAIR OF THE PRODUCT MADE BY ANYONE OTHER THAN SAGINOMIYA OR DESIGNEE OF SAGINOMIYA;
(4) WHEN CAUSED BY THE USE OF THE PRODUCT IN VIOLATION OF THE ABOVE "RESTRICTIONS OF USE" OR "CONFIRMATION OF OPERATION";
(5) WHEN SUCH FAILURE WAS NOT REASONABLY FORESEEABLE AT THE TIME OF SAGINOMIYA'S SHIPMENT; OR
(6) BY ANY OTHER CAUSE NOT ATTRIBUTABLE TO SAGINOMIYA, SUCH AS AN ACT OF GOD, DISASTER, OR ACT OF ANY THIRD PARTY.

PLEASE NOTE THAT THE CUSTOMERS WILL NOT BE ENTITLED TO ANY OF THE ABOVE WARRANTY IF THE CUSTOMERS PURCHASED THE PRODUCT FROM INTERNET AUCTION, ETC.
(NOTE 1): IN THE CASE OF DANFOSS PRODUCTS, WITHIN EIGHTEEN (18) MONTHS FROM THE DATE OF MANUFACTURE.

SAGINOMIYA
SEISAKUSHO,INC.

This document shall apply to any catalogue and instruction manual issued by Saginomiya on or after December 2025.
STF04001 Annex1a 2025.12

The information in this instruction manual is current as of the date of publication and is subject to change without prior notice due to specification changes or improvements to the product.

We have made every effort to ensure its accuracy, but we shall not be responsible for any damages, direct or indirect, arising from errors, omissions, or use of the information.

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