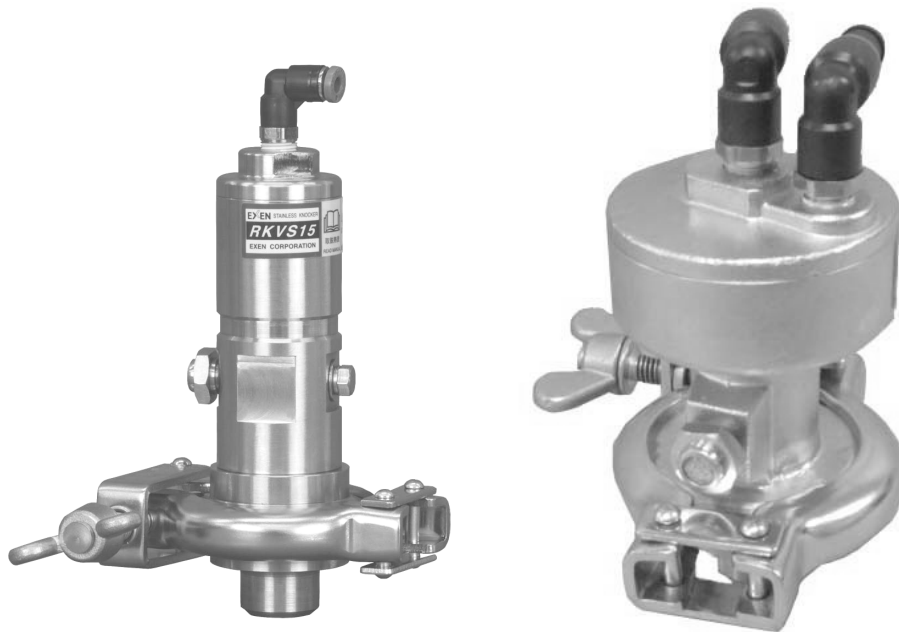




RELAY KNOCKER SERIES STAINLESS KNOCKER FERRULE TYPE OPERATION MANUAL



RKVS15-F • 20F

EXEN CORPORATION

☆ SAFETY PRECAUTIONS

- ☆ The Relay Knocker prevents granules from adhering to or blocking equipment by using the force of air. Do not use the Ferrule type for any other purpose.
- ☆ Care has been taken to ensure the safety of the knocker. Be sure to read this operation manual and take note of the DANGER, WARNING and CAUTION messages before using the knocker. Make also sure to read the operation manual of the control panel.
- ☆ The following symbols represent DANGER, WARNING and CAUTION messages to be observed when using the knocker to prevent injury or damages to users or other persons.

	DANGER	【DANGER】 indicates an imminent dangerous situation which may lead to death or serious injury.
	WARNING	【WARNING】 refers to a hazard that may cause death or serious injury.
	CAUTION	【CAUTION】 refers to a hazard that may cause minor or moderate injury.

 WARNING

(To prevent death)

-  This product is purposed to produce the impact force. Don't touch the machine during operation. Don't put the fingers, hands and legs inside the exhaust port and moving parts during operation. It may lead to injury.
-  After installing the knocker, tighten the wing bolt of the ferrule clamp strongly and firmly. The clamp may fall due to percussion during operation. In case of a dangerous site where the product may fall, attach a fall prevention wire (optional) to prevent the main unit from falling.
-  In the event that the product falls by any chance, be sure to replace it even if there is no abnormality in appearance on the fall prevention wire.
-  Do not connect the control devices (knocker control panel and 3-way solenoid valve) for the knocker to a power source which is not equipped with an earth leakage breaker for preventing electric shock as the user may suffer an electric shock from the knocker. (excluding the air system).

 CAUTION

(To prevent injury or damages)

-  This product produces the loud noise from impact force during operation. It is recommended to take break moderately if you are supposed to work near the knocker.
-  When removing the piping, please cut the air supply and vent all the remaining air loaded inside piping. It is hazardous in case removing the piping when the knocker is loaded with air.
-  When welding base of the knocker to a mounting part, be sure to make a large weld overlay to prevent the knocker from falling due to percussion during operations.
-  If the plate in the mounting part is thin, weld a reinforcing plate onto it to prevent the mounting part from being damaged as a result of percussion during operations.
-  When installing the knocker near the passageway or the like, put up the warning sign to warn people against injuring themselves by bumping into the equipment.

○ INTRODUCTION

Thank you for purchasing this Ferrule type from the Stainless Knocker Series.

Be sure to read this operation manual carefully before using the ferrule type.

Be sure to read and understand this operation manual carefully before using the product until it can be operated safely and efficiently. Handle and maintain the product appropriately for safety operation.

When you lend this product to another person, be sure to provide them the manuals, and fully explain to them safety and appropriate use of the product.

The specifications in this document are subject to change without notice due to modification.

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○ SAFETY



(For personal protection during operation)

- Put on a safety helmet, safety gloves, safety shoes, hearing protection and face protector (eye protection and mask) dust protector mask and safety harness, before installing the knocker.



Safety helmet



Safety gloves



Safety shoes



Hearing protection



Face protector



Dust protector mask



Safety harness

- When replacing, removing and assembling the consumables, please remove the knocker from the base, place the knocker on the firm workbench and carry out with the safety clothes, safety equipment and right posture.
Please vent the air in the air tank and the pipe arrangement when removing the knocker from the base.
- When fixing the fall prevention wire with the shackle, be sure to prevent the shackle screw from loosening with a wire. The screws may be loosened by the impact during operation.



(For longer service life)

- When arranging the piping, attach a filter in front of the solenoid valve. If dust gets into the solenoid valve, the knocker may not operate properly.
- Operate the knocker within the allowable compressed air pressure and piping range. Knocker and the mounting parts on hopper may damage if it is operated exceeding the range of impulsive force.
- When applying continuous percussion at short cycles, allow an interval of at least one second. An interval of less than one second may lead to malfunction.
- Never install knocker near the machine that produces vibration. Vibration may cause the base welding crack or bolt loosen.
- Perform flushing by blowing air at 0.3MPa or higher into the pipe to remove foreign matter, machining dust, and burr.
- Please use the air that passed through an air filter 5 micrometers or less. The moisture or powdering dust in piping has a possibility of causing poor operation and air leakage. (HKA5000A has equipped the air filter in standard.)
- The apparatus with direction should pipe to unite IN side of the direction of the flow of fluid and IN port displayed on the product.
- Regarding the use of sealing tape, please be sure not to get caught the tape inside the piping and not to cause air leak. When applying the sealing tape onto thread portions, avoid the 2-3 top threads. When applying liquid sealing material onto thread portions, avoid the 2-3 top threads and don't apply the excess amount. Avoid applying liquid sealing to female thread.
- In cold district use, take the suitable measures against freeze. (Air should not freeze.)
- Please use neither in the atmosphere of corrosive gas, nor the atmosphere of explosive gas.
- Don't put or use the burnable things near the knocker during operation.
- If this is operated with oil free air that hardly contains oil and moisture, the product life become short. **(Please avoid the operation using complete dry air.)**
- Please do not make valve into a scaffold or do not put heavy material.
- Please do not hit the main body and parts or give a strong impact.
- Install the knocker where rain water can't effect it.
- Please keep the knocker where the rain can't effect the maintenance of the knocker when to store for long period.

- The bolting torque at the time of piping should be referred to the following table.

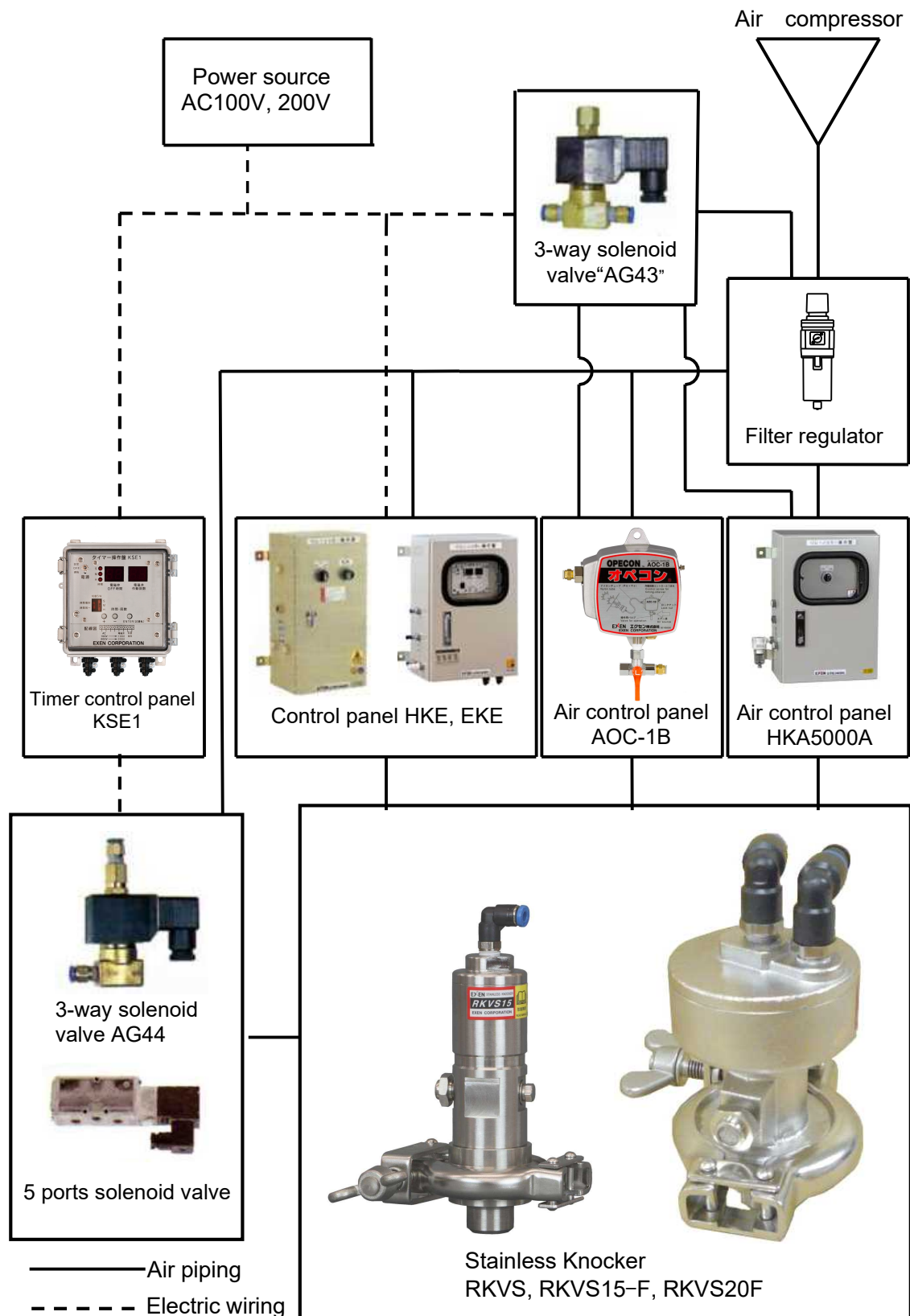
When the main part material is aluminum

Diameter of piping	Recommended bolting torque for piping (N·m)
Rc1/8	7~9
Rc1/4	12~14
Rc3/8	22~24
Rc1/2	28~30
Rc3/4	31~33

When the main part materials are metal other than aluminum

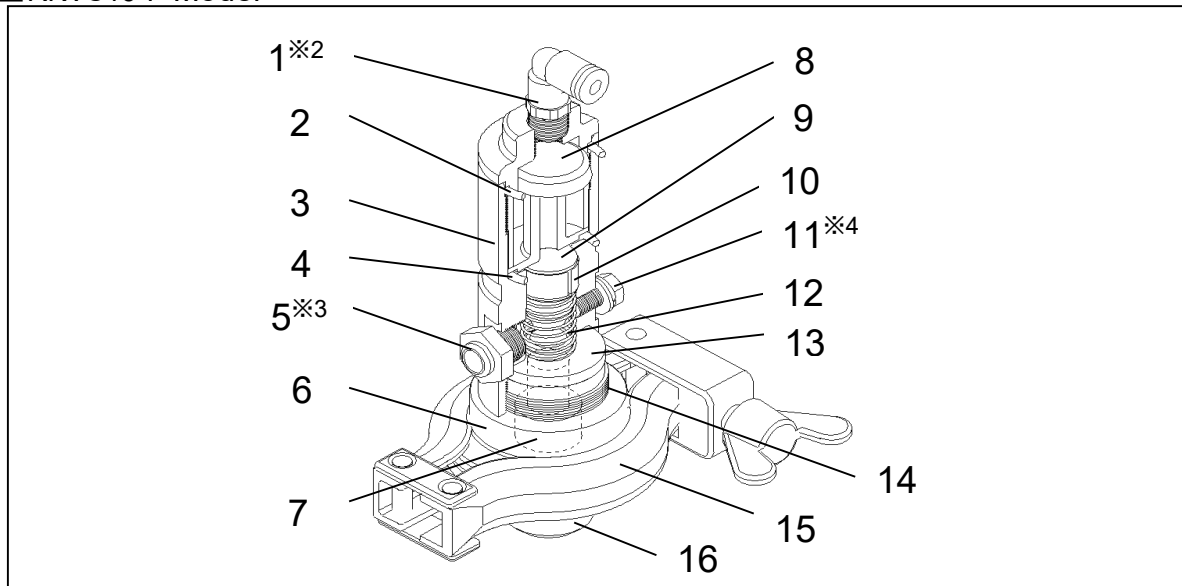
Diameter of piping	Recommended bolting torque for piping (N·m)
Rc1/8	18~20
Rc1/4	23~25
Rc3/8	31~33
Rc1/2	41~43
Rc3/4	62~65

○ SYSTEM CONFIGURATION



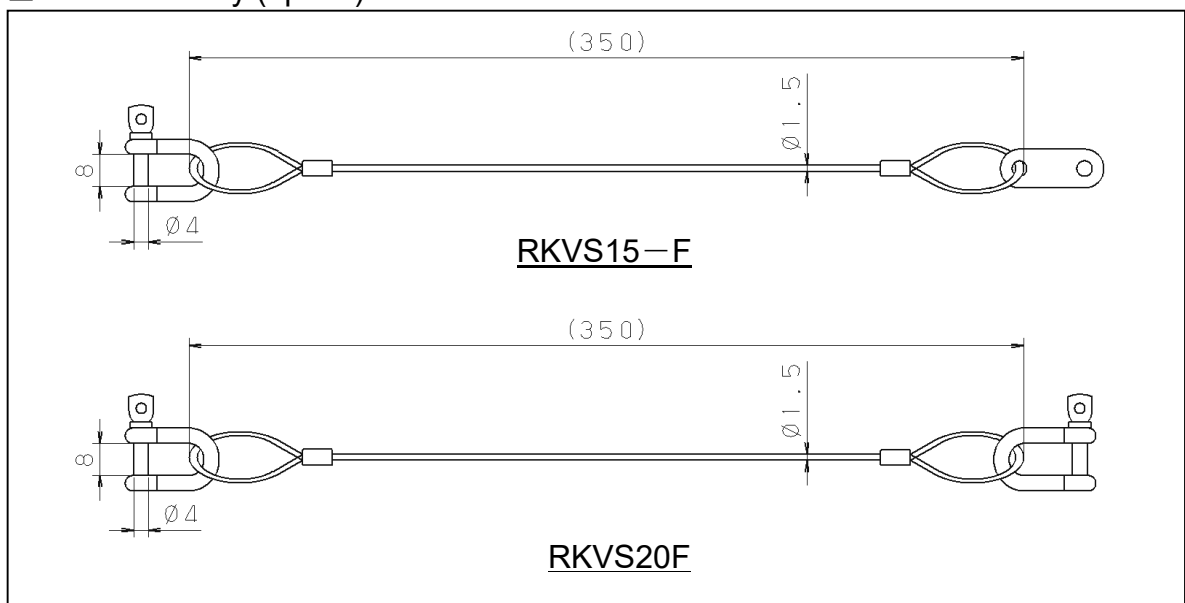
○ NAMES OF PARTS

■ RKVS15-F Model

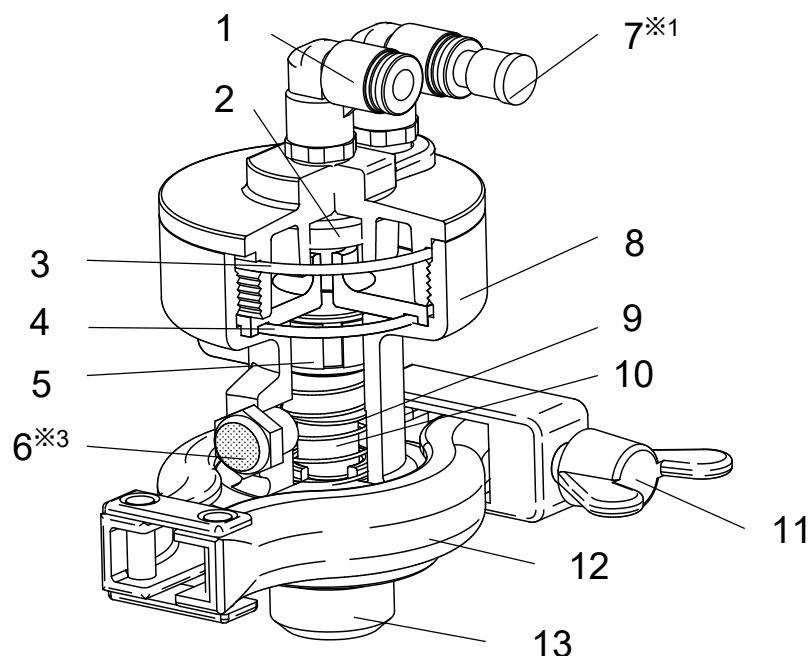


1	Push One Elbow※2	9	Piston
2	O-ring	10	Piston Ring
3	Cylinder	11	Bolt M5※4
4	O-ring	12	Spring
5	Sintering Metal Element※3	13	Impact Plate
6	Ferrule Coupling	14	Inner Base
7	Bolt M10	15	Ferrule Clamp
8	Mushroom Valve	16	Ferrule Base

■ Wire assembly (option)



■ RKVS20F



1	Push One Elbow	8	Cylinder
2	Mushroom Valve	9	Spring
3	O-ring	10	Piston Assembly
4	O-ring	11	Wing Bolt
5	Piston Ring	12	Ferrule Clamp
6	Sintering Metal Element ^{※3}	13	Ferrule Base
7	Plug ^{※1}	—	—

※ 1 When using relay system piping for RKVS20F type, remove the blank plug and connect a $\phi 6 \times \phi 4$ tube.

※ 2 RKVS15-F cannot be relay system piped.

※ 3 When using a knocker in the site where has to be kept away from the knocker's exhaust air, please screw a tube connector into the knocker's exhaust port and make exhaust air discharge outside with an extension tube.

Model	dia. of exhaust port screw	dia. of recommended tube	Max distance of extension tube
RKVS15-F	Rp 1/8	$\phi 8 \times \phi 6$	40m
RKVS20F			

※ 4 Use when attaching a wire for fall prevention to RKVS15-F type. The fall prevention wire is optional.

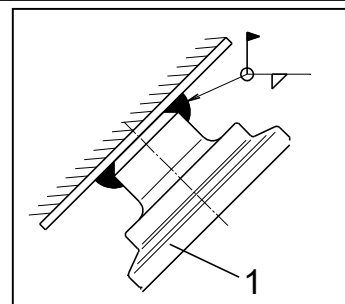
Note : In the site where the labels stuck on the body are inconvenient in the environment, please use the knocker after removing the labels.

○ INSTALLATION

1. Ferrule base welding

⚠ **A remarkable impact is added to a weld zone at the time of an operation. In order to avoid emergency breakage and falling, please be sure to result in great weld bead as possible.**

⚠ **Use welding rod JIS Z3221 ES308-16 or above. (Kobe Steel welding rod NC-38 or above)**



▶ 1. Ferrule base

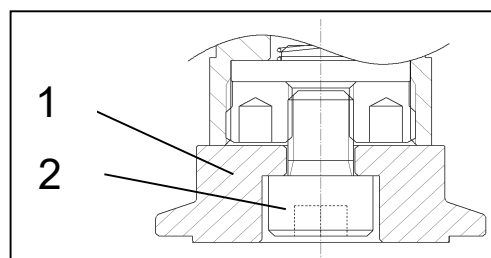
2. Installation of ferrule coupling (RKVS15-F type)

⚠ **Install the ferrule coupling to the main body with the attached bolt. Tightening torque should be strictly observed referring to the table below.**

■ Tightening torque

Model	Mounting bolt size (Bolt diameter)	Tightening Torque (N·m)
RKVS15-F	M10	23

⚠ **Tighten this product to the specified torque, but check the looseness of the bolts periodically in case of emergency.**



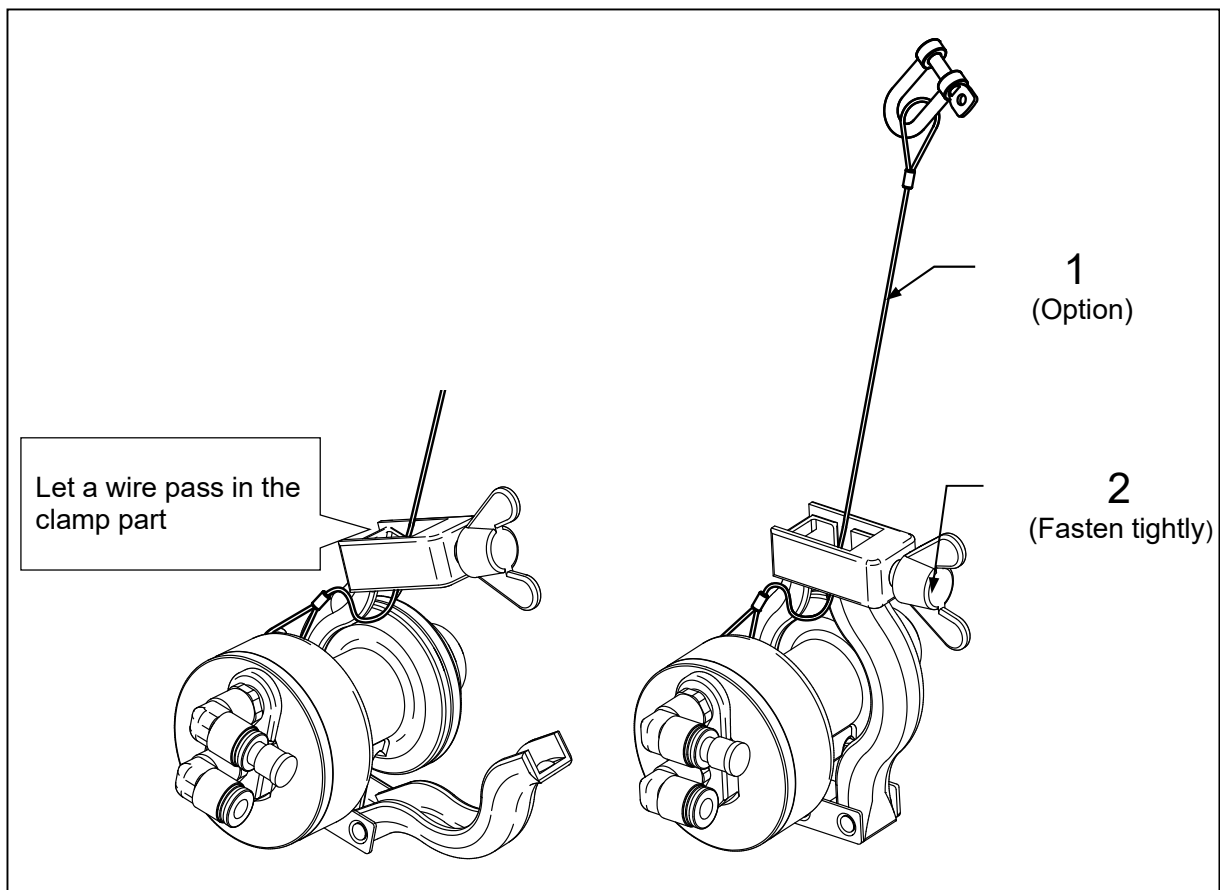
▶ 1. Ferrule coupling

2. Hexagon socket head bolt

3. Mounting the knocker

⚠ Tighten the wing bolt of the ferrule clamp section at least $3\text{N} \cdot \text{m}$ (hand tightened strongly). If not tightened properly, the wing bolt may loosen and fall due to impact during operation.

- When attach the main body, please attach so that the wing bolt side clamp part is positioned upwards.
- In sites where it is dangerous to drop, be sure to install the drop fall prevention wire (option) so that the main unit will not fall. Please pass the wire through the clamp when installing.



1. Fall prevention wire 2. Wing bolt

⚠ Position the shackle directly above the knocker so that the fall prevention wire is in a taut position.

○ PIPING

⚠ Regarding the piping and wiring of the control panel, please refer to the manual and connect correctly.

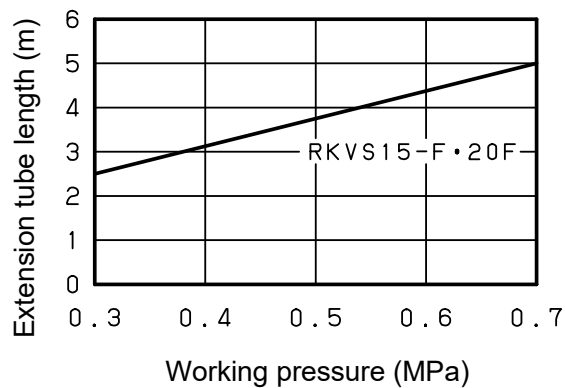
- Select either standard or relay system piping as refer the examples below.
- When only one system is used with the exclusive control panel (HKE, EKE, HKA models), place a plug in the unused system.
- In the exclusive control panel (HKE, EKE, HKA models), the knocker can be connected to system A or system B, but note that the pressure accumulation and percussion operations are reversed on one system.
- See table below for piping from knockers to control equipment.

Model	Tube diameter	Push one reducer diameter (Accessory)
RKVS15-F	$\phi 4 \times \phi 2$	4—8
RKVS20F	$\phi 6 \times \phi 4$	6—8

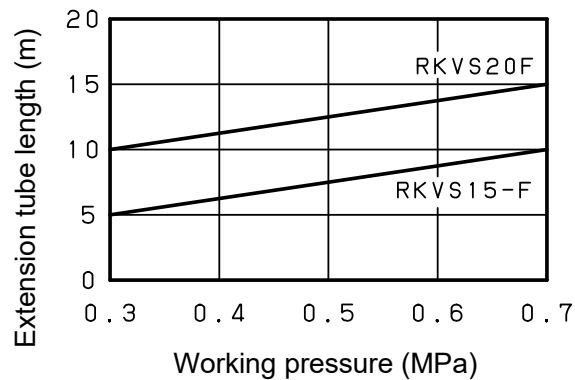
1. Tube length in standard piping

- ⚠ Please set piping tubes as short as possible. The fall of impaction force or the phenomenon of continuous blow are caused as the tube becomes long.**
- ⚠ The maximum length of a piping tube changes with model, air pressure, and control unit. The impaction force may fall from 10% to 20 % at the area where closed to the maximum length according to the piping arrangement.**
- ⚠ When branching a pipe, locate the turning point at the center of the branch tube and set each tube at same length. Also, set the total length of the tubes not to exceed the maximum tube length.**
- ⚠ Please avoid extreme bending and making many branches. It may cause malfunction and impaction force down especially in the place where remotes from the air supply, also extension of the tube to the maximum length becomes impossible.**
- ⚠ It is recommended to set the piping within the maximum tube length at 0.3MPa to maintain the stable performance even the decrease of the impaction force in remote piping can be prevented by increasing air pressure.**
- ⚠ For the remote piping, the percussion force can be increased by applying the master valve MV-1 near knocker (within 1 meter).**

A. When using the solenoid valve AG44-02-3



B. When using the HKE, EKE, HKA model exclusive control panel and 5 port solenoid valve 4F310 type (per system)



C. When using the air control panel AOC-1B

Model	Maximum tube length Between AOC-1B and knocker
RKVS15-F	2m ($\phi 4 \times \phi 2$ mm tube)
RKVS20F	2m ($\phi 6 \times \phi 4$ mm tube)

D. When master valve MV-1 is used

- Length from knocker to MV-1 = 1 m or less
- Length between MV-1 and operating equipment = 50m or less
- Supply pressure = 0.4 MPa or more

■ Maximum number of connections for normal piping

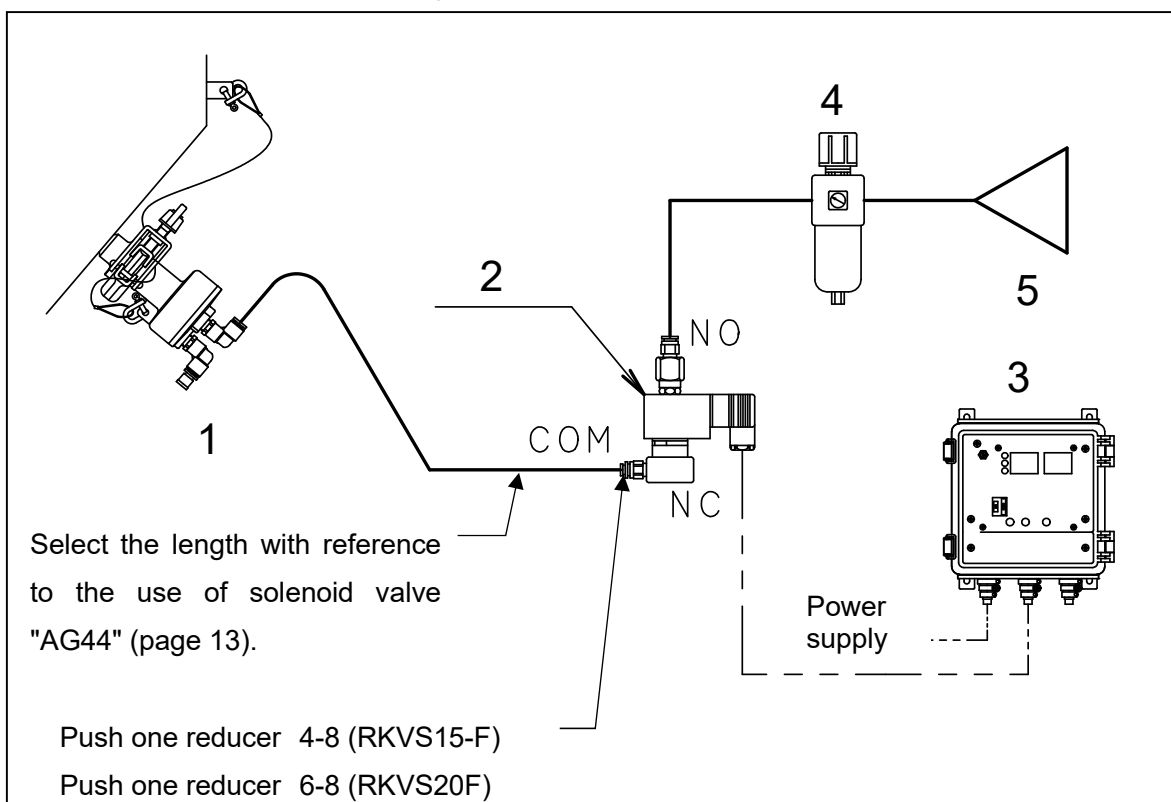
Control equipment	Solenoid valve AG44	HKE,EKE,HKA,4F310 (Number of units that can be connected per system)	AOC-1B
Maximum number of connections	1 unit	8 units	1 unit

2. Example in standard piping

■ When using the 3-way solenoid valve AG44 model

(1 knocker per solenoid valve AG44 unit)

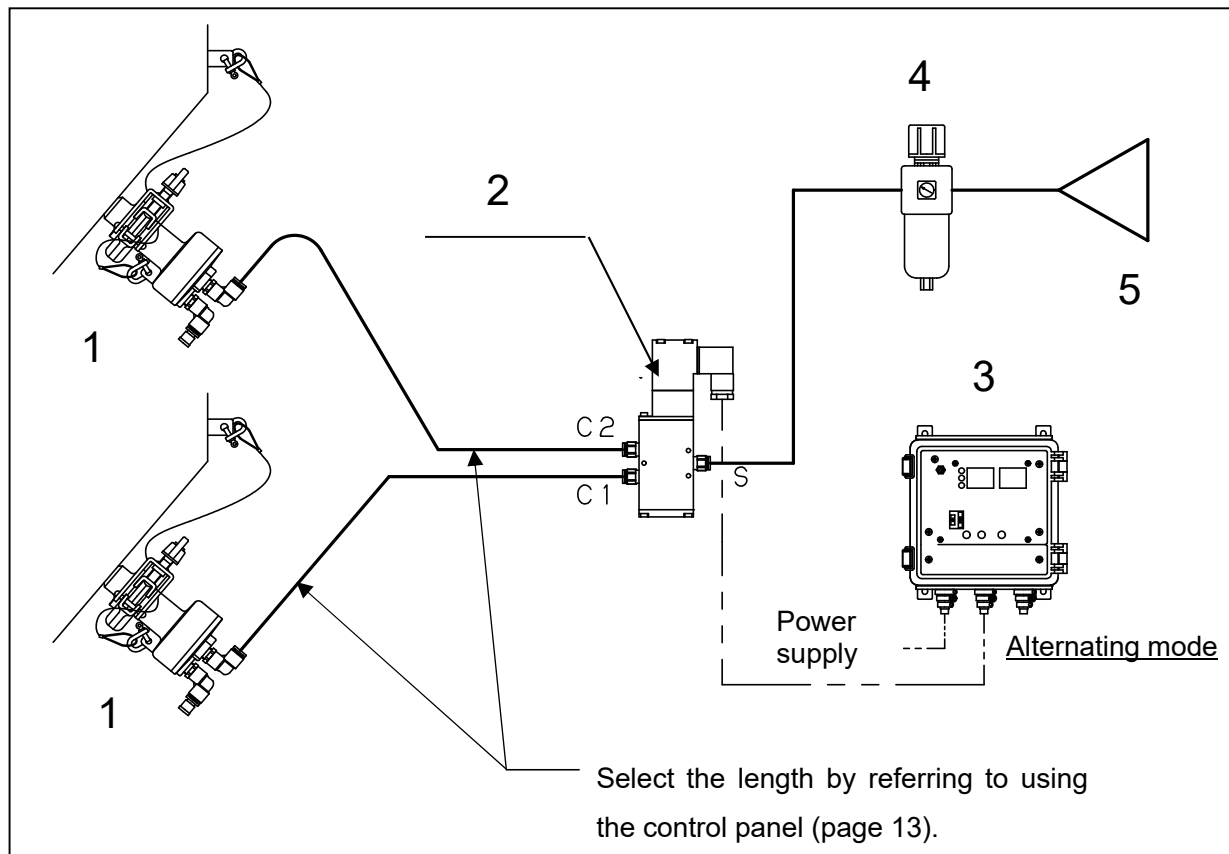
- Control equipment: 3-way solenoid valve AG44 and timer control panel KSE1.
- Operating conditions: KSE1 operation setting activates knocker when solenoid valve is energized.



- ▶ 1. Knocker 2. Solenoid valve AG44 (NO) 3. Timer control panel KSE model
4. Air filter regulator 5. Compressor

■ When using 5 port solenoid valve 4F310 model
(Maximum 8 units per system)

- Control equipment: Solenoid valve 4F310 and timer control panel KSE1.
- Operating conditions: C1 and C2 systems operate alternately according to KSE1 operation settings.

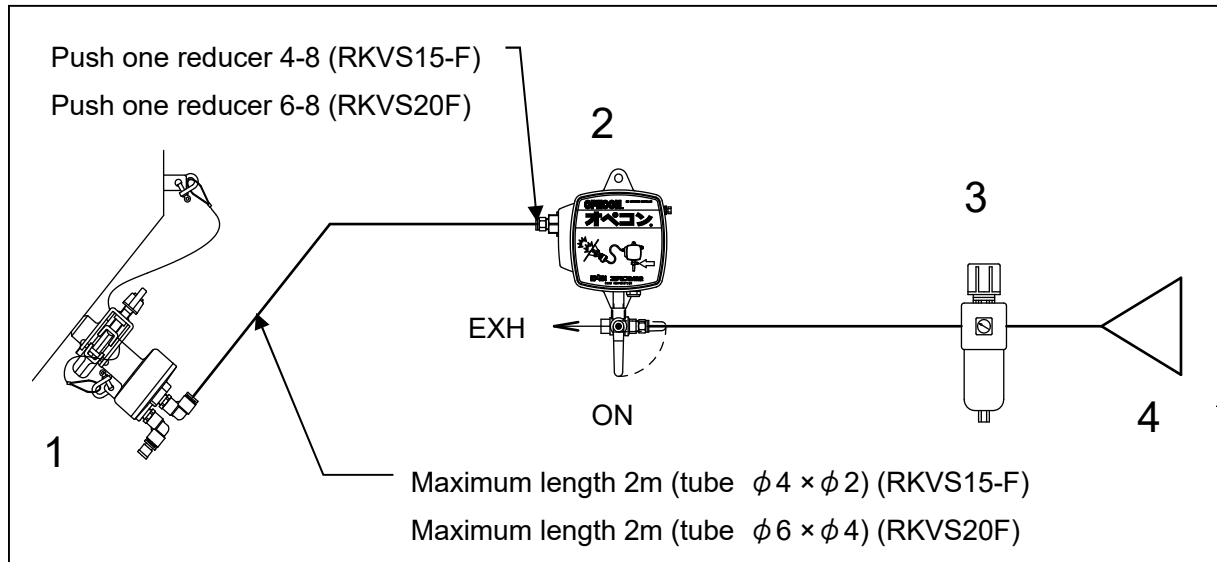


- ▶ 1. Knocker 2. 5 port solenoid valve 4F310 3. Timer control panel KSE model
4. Air filter regulator 5. Compressor

■ When using the air control panel AOC-1B model

(1 knocker per AOC-1B unit)

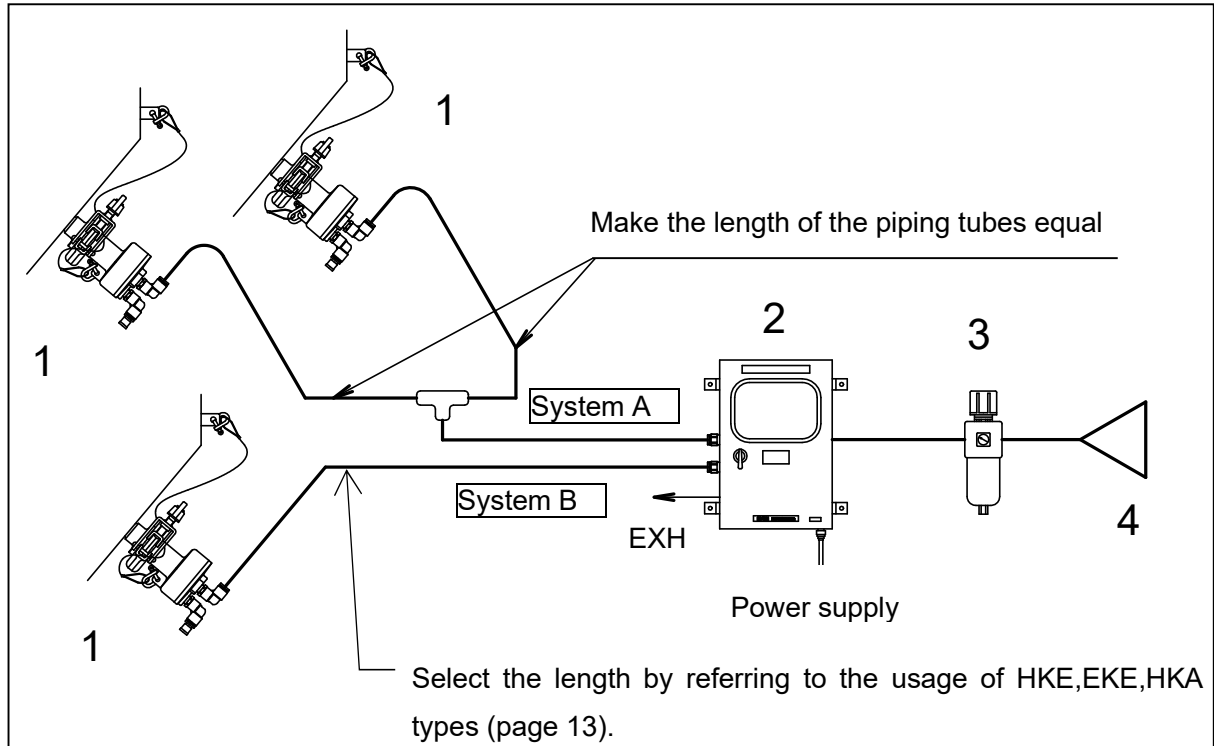
- Operating conditions: Operated at speed controller set intervals by opening and closing valves in the AOC-1B.



▶ 1. Knocker 2. Air control panel AOC-1B model 3. Air filter regulator 4. Compressor

■ When using the HKE, EKE, HKA model exclusive control panel
(Maximum 8 units per system)

- Operating conditions: A system and B system timer setting alternate operation.



- ▶ 1. Knocker 2. Exclusive control panel HKE, EKE, HKA model 3. Air filter regulator
4. Compressor

- The HKA type has the same usage conditions as the HKE and EKE types. However, no power supply is required and the control is by air.
- When only one system is used with the exclusive control panel (HKE, EKE, HKA models), place a plug in the unused system.

3. Tube length of relay system piping and air pressure (RKVS20F only)

⚠ In relay system piping, compression air in the relay tube is also used for knocking action of the knocker. Accordingly, keep the air pressure not to exceed the regulated value.

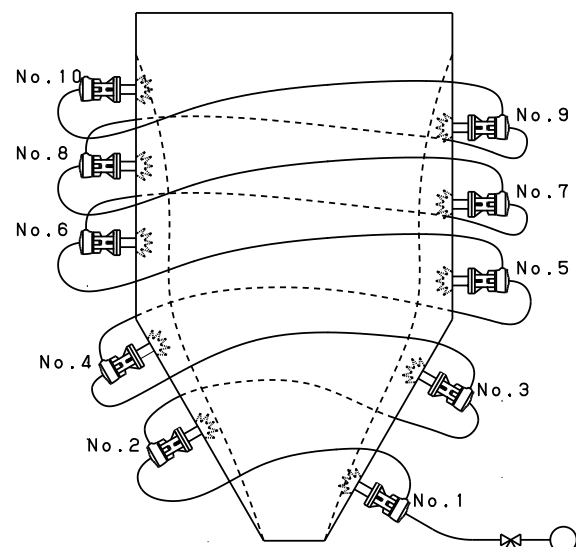
Model	Length of relay tube	Air pressure
RKVS20F	1m or less ($\phi 6 \times \phi 4$ mm tube)	0.3MPa

Note : Knocking force at value listed above is equivalent to the knocking force at maximum air pressure (0.7MPa) in standard piping.

- Use $\phi 6$ mm nylon or urethane tube when arrange piping between knockers and control equipment.
- Arrange tube length to the first knocker as refer to 1. Tube length in standard piping.
- It is recommended to connect a piece of dummy tube (has same length as the relay tube) to the terminal knocker. So, the knocking force of every knocker becomes evenly in the same system. (Refer to length of relay tube in relay system piping and air pressure)
- In order to prevent an air leak, please equip the end of the dummy tube with a cap.

⚠ In relay system piping, the knocking force increases when the tube length is extended. The knocking force becomes too much and it effects durability of the knocker unit when the tube length exceeds regulated length.

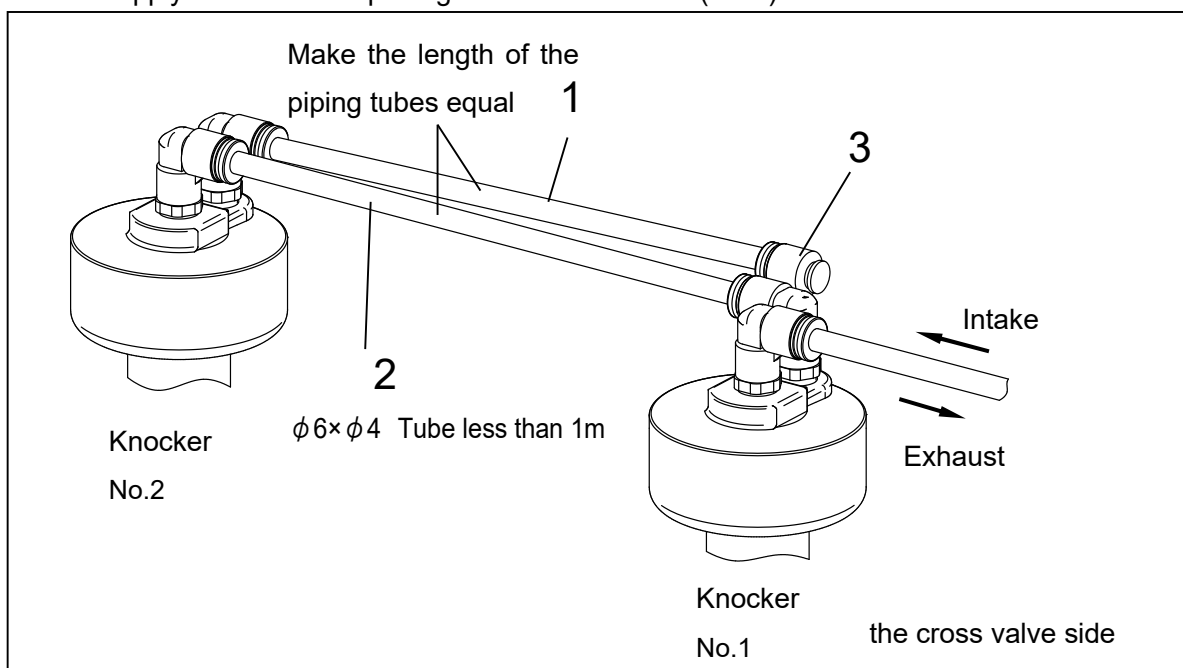
- length of the connection tube (relay tube) of the knocker after the 2nd should not exceed the specified length. Also, in order to balance the knocking force of each knocker, make the lengths as uniform as possible within the same system. (Refer to 3. Tube length of relay system piping and air pressure)



Start knocking in order from No.1
(From lower to upper).

4. Example in relay system piping (RKVS20F only)

- Relay system piping method is the way to connect two or more knockers in series. This method is connecting a relay tube from air tank of the knocker (No.1) (cross valve side) to air supply and exhaust opening of another knocker (No.2).



▶ 1. Dummy tube 2. Relay tube 3. Tube cap

Note : RKVS15-F cannot be relay system piped.

- In order to prevent an air leak, equip the end of the dummy tube with a cap.
- In case of the relay system piping, knocking action starts in order from a knocker that is located at the side of the cross valve to another knockers. The maximum number of the knocker that can be used is regulated according to the control panel.
- When arranging relay piping, please set the turning on electricity time of solenoid valve as 1 second or more.

When the tube length of relay piping becomes longer or the number of knockers in relay piping increase, please extend turning on electricity time of solenoid valve further till all the knockers become working.

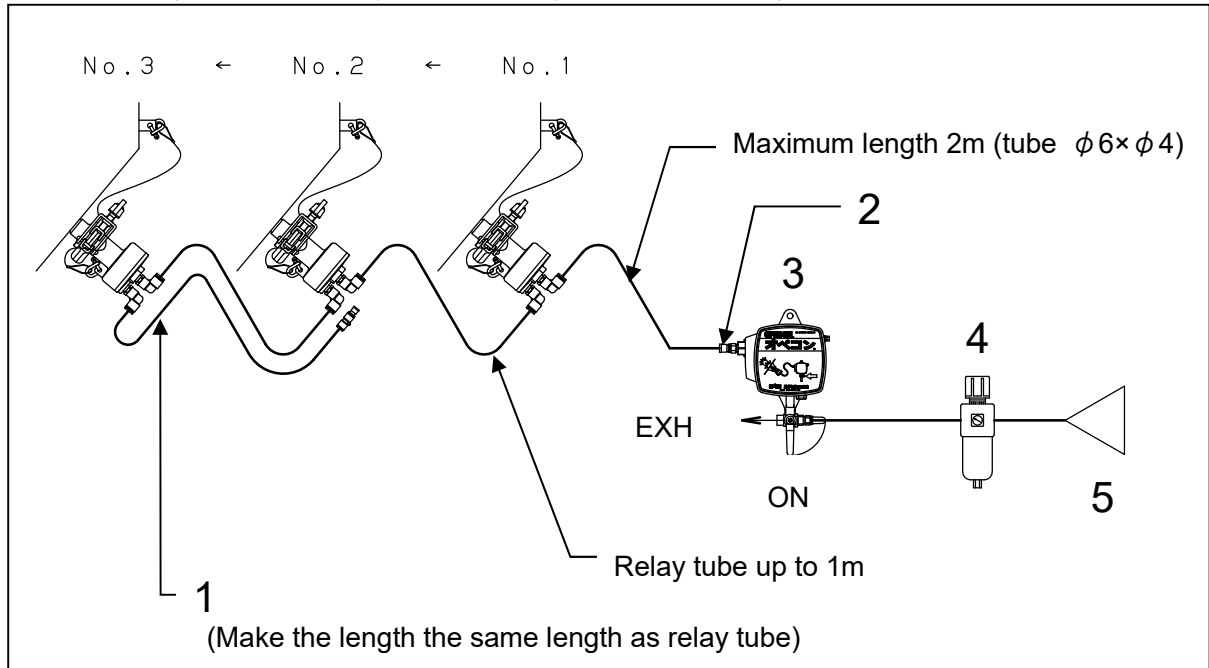
■ Maximum number of relay piping connections (RKVS20F)

Control equipment	Solenoid valve AG44	HKE,EKE,HKA,4F310 (Number of units that can be connected per system)	AOC-1B
Maximum number of connections	5 units	10 units	3 units

■ When using the air control panel AOC-1B model

(3 knockers per AOC-1B units)

- Operating conditions: A system and B system timer setting alternate operation.

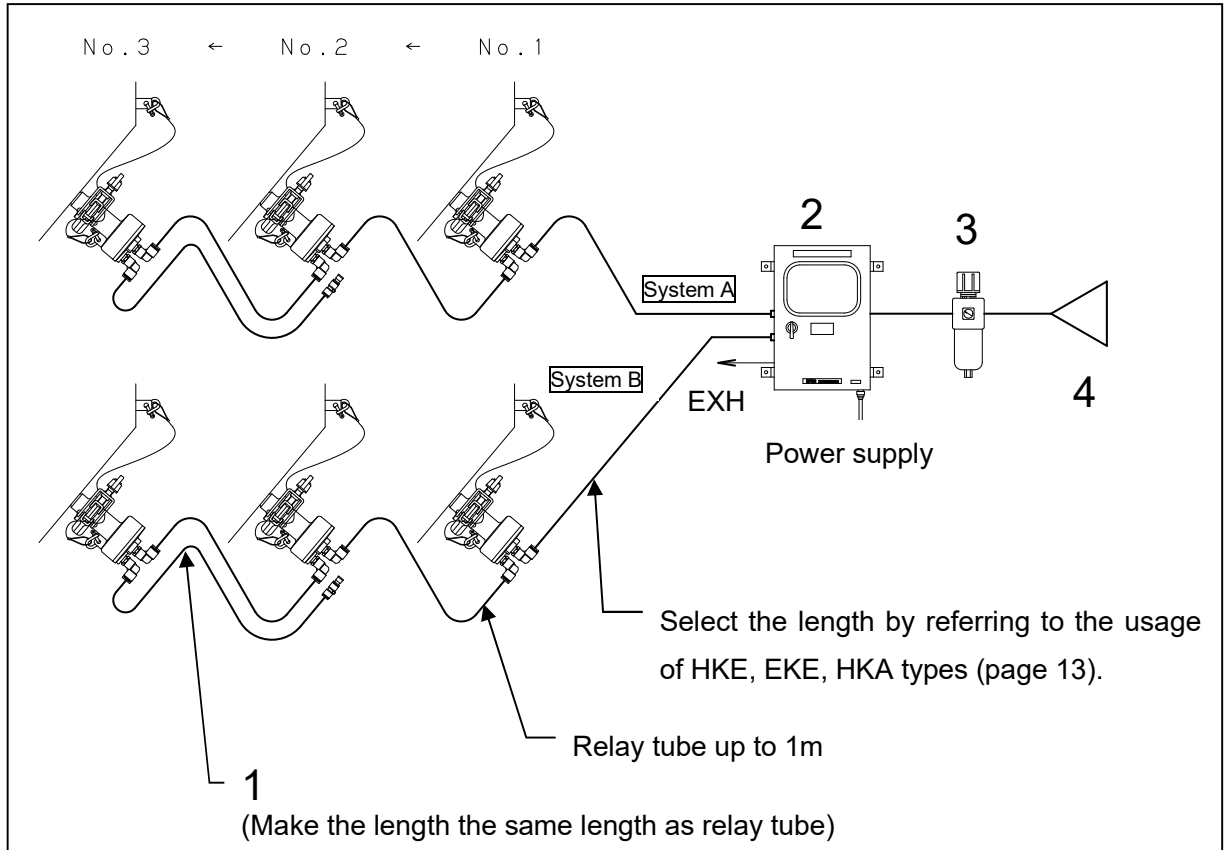


- ▶ 1. Dummy tube 2. Push one reducer 6-8 3. Air control panel AOC-1B model
4. Air filter regulator 5. Compressor

■ When using the HKE, EKE, HKA model exclusive control panel

(Maximum 10 units per system)

- Operating conditions: A system and B system timer setting alternate operation.



1. Dummy tube 2. Exclusive control panel HKE,HKA,EKE model 3. Air filter regulator
4. Compressor

○ TEST OPERATION AND SETTINGS BEFORE USAGE

- After mounting and piping the knocker, run a test operation and complete the settings in accordance with the following procedure.

Note : The farther the knocker is from the regulator, the lower the pressure at the knocker will be compared to the pressure indicated at the regulator. In such a configuration, set the pressure slightly higher.

1. Set the regulator air pressure to 0.3MPa.
2. Increase the regulator air pressure in increments of 0.05MPa and set to an air pressure which can get an optimum impact force within the range of working pressure.
3. Please operate a knocker ten times with set pressure and confirm that the wing bolt of ferrule clamp does not loosen. Re-tighten when looseness is confirmed, and please confirm operating the knocker again and not loosening.

Note : The guide of the wing bolt tightening torque is more than 3N·m (hand tightened strongly).

○ THE STOPPING PROCEDURE OF KNOCKER

- Please stop according to the procedure following below when it is desired to stop the knocker or removing the knocker from the base.

1. Stop the air supply.
2. Please vent the air in the tank by turning on and off the 3-way valve several times.

Note : Please vent the air when using with relay piping system and enlarging the tube length.

○ INSPECTION

- Inspect the following items at least once every three months to minimize trouble during operations.

Note : When inspecting the knocker, be sure to completely vent the residual pressure in the air tank and piping.
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1. Isn't there any looseness in the wing bolt of ferrule clamp?
2. Is any welded part cracked?
3. Has any granule got into the knocker?
4. Are there any cracks in the piston rings or piston?
5. Is any spring damage?
6. Is there anything abnormalities with the fall prevention wire?
7. Are there any scratches or deformation on the packing?
8. Is the impact plate cracked or deformed? (RKVS15-F)
9. Is the cylinder head loose?
10. Is the inner base loose? (RKVS15-F)

○ REPLACEMENT PERIOD FOR CONSUMABLES

- Replace consumables as set out in the following table.

Note : When replacing, removing and assembling the consumables, please remove the knocker from the base, place the knocker on the firm workbench and carry out with the safety clothes, safety equipment and right posture.

Please vent the air in the air tank and the pipe arrangement when removing the knocker from the base.

Parts	How to determine the replacement period from visual and audible signs	Replacement period (Average)
Mushroom valve	Determine according to the amount of wear, scratches and cracks (visual)	1,000,000 strokes
Spring	Determine according to the amount of wear and operation conditions (Visual and audible)	1,000,000 strokes (RKVS15-F=500,000 strokes)
Piston ring	Judge in crack or wear condition (visual)	1,000,000 strokes (RKVS15-F=500,000 strokes)
Impact	Judged by the wear of the tip (visual)	1,000,000 strokes
O-ring	Determine according to the amount of deformation (Visual)	1,000,000 strokes (RKVS15-F = 500,000 strokes)
Cylinder	Determine according to the amount of wear (Visual)	1,000,000 strokes (RKVS15-F = 500,000 strokes)
Impact plate (Only in RKVS15-F)	Judged by the wear of the tip (visual)	500,000 strokes

Note : The replacement time (guideline) for consumable parts of RKVS15-F is set at 500,000 strokes.

Note : The replacement time for consumables is just the approximated time.

Since it depends on the usage condition, it is recommended to replace in the earlier time.

○ TROUBLESHOOTING

○ Simple diagnosis by checking audible and visual signs and signs detectable by touch

Phenomenon	Sign	Cause	Action
Percussions	Low Impulsive force	The air pressure is low	Increase the air pressure
		The 3-way valve is abnormal	Repair or replace the valve
		The spring is damaged	Replace the spring
		Piston ring is worn	Replace the piston ring
		The tube is too long (Standard piping)	Ameliorate the piping
		Foreign matter has got into the cylinder	Clean the cylinder
		Clogged exhaust filter	Cleaning (approx. every 100,000 cycles)
Does not percussion	Does not percussion	The air pressure is low	Increase the air pressure
		The 3-way valve is abnormal	Repair or replace the valve
		The spring is damaged	Replace the spring
		Foreign matter has got into the cylinder	Clean the cylinder
		The tube is bent	Ameliorate the piping
		The tube is too long	Ameliorate the piping
		The mushroom valve is worn or damaged	Replace the mushroom valve

○ SPECIFICATIONS

■ Specifications

Model	Working pressure (MPa)	Stroke cycle (times/min)	Air consumption (L/times(ANR))	Stroke energy (N·m)	Impulsive force		Mass (kg)
					(kg · m/s)	Converts into Hammer pound (lb)	
RKVS15-F	0.3—0.7	1—60	0.03—0.06	2.7—5.9	0.3—0.5	Mini hammer	0.94
RKVS20F			0.04—0.10	4.3—8.3	0.6—0.8	Lower than 0.6	0.90

Note : The base is included in weight, too.

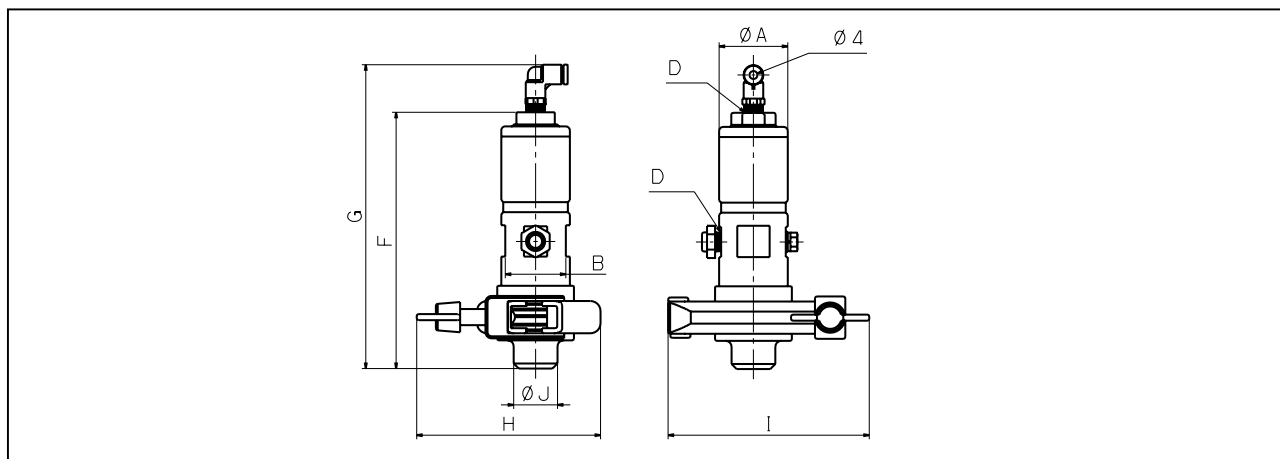
■ Dimension table

(Unit : mm)

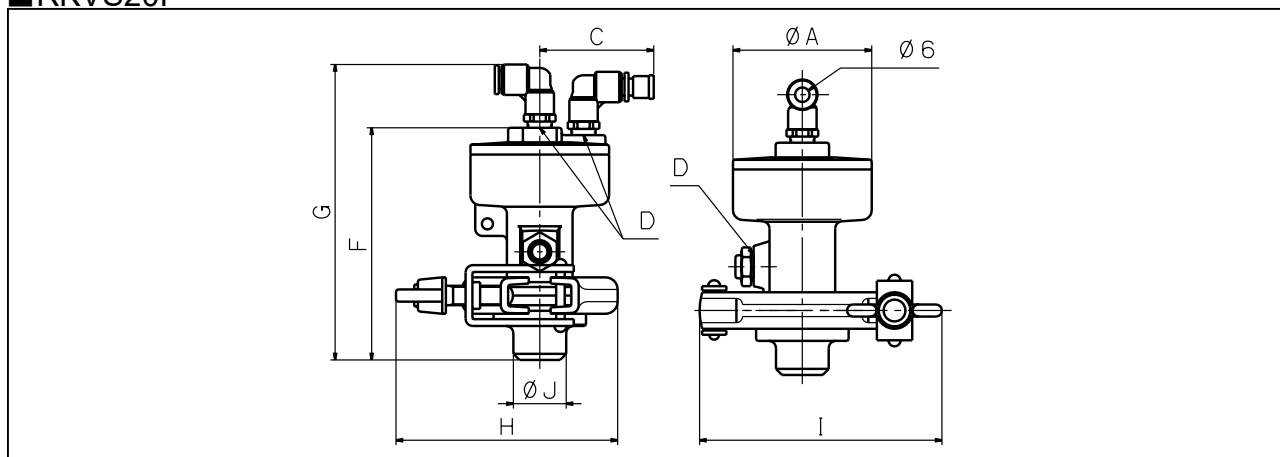
Model	A	B	C	D	F	G	H	I	J
RKVS15-F	34	30	—	1/8	127.5	(151)	(91)	(100)	21.7
RKVS20F	57	—	47		95.5	(121.5)			

■ Dimension drawing

■ RKVS15-F



■ RKVS20F



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