



Operation Manual

PRODUCT NAME

Time Delay Valve

MODEL / Series / Product Number

VR2110 Series

SMC Corporation

Contents

	Page
1. Safety Instructions	2 ~ 9
2. Application	10
3. Specifications	10
4. How to Order	10
5. Operation Patterns	11
6. Characteristics	11 ~ 12
7. Dimensions	13



Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)^{*1)}, and other safety regulations.

*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots
etc.



Danger

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



Warning

Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



Caution

Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.



Safety Instructions

Caution

We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.

Use in non-manufacturing industries is not covered.

Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

***2) Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Design precautions

Warning

(1) Actuator drive

When an actuator, such as a cylinder, is driven, take appropriate measures (cover installation or approach prohibition) to prevent potential danger caused by actuator operation.

(2) Maintenance space

When installing the products, allow access for maintenance.

(3) Ventilation

Provide ventilation when using a valve in a confined area, such as in a closed control panel. For example, install a ventilation opening, etc., in order to prevent pressure from increasing inside of the confined area and to release the heat generated by valve.

Selection

Warning

(1) Confirm the specifications.

The product is designed for use only in compressed air systems. Do not use fluids other than compressed air. Do not operate at pressures or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction.

(2) Use in low temperature environments

When using the valve in a low temperature condition, take appropriate measures to avoid drainage freezing, moisture, etc.

Mounting

Warning

(1) If air leakage increases or the equipment does not operate properly, stop operation.

Unexpected motion can cause injury.

(2) Check the mounting conditions

Make sure that screws and fittings are properly tightened and the piping is not bent or flattened. Connect the compressed air supply to the product and perform appropriate functional and leakage inspections to verify it is mounted properly.

(3) Do not paint the product.

Models or specifications printed or marked on the product should not be erased, removed or covered. Do not paint resin parts, as this may have an adverse effect due to the solvent in the paint.

Mounting

Caution

(1) Tube, other than coil tube, should be used for static piping.

For example, if a flexible moving tube is used, it may become worn, elongated, disconnected from the fitting, or torn due to tensile forces. Before using, ensure the tube is in a static condition at all times. After installation and maintenance, apply air supply to the equipment and perform appropriate functional and leakage inspections to verify the equipment is mounted properly.

(2) Transportation, installation, piping, wiring, operation, handling, and maintenance should be performed by personnel with sufficient knowledge and experience.

There is a risk of injury.

(3) Do not disassemble or modify the product.

This may cause human injury and/or an accident.

(4) Do not wipe the product using chemicals.

Piping

Caution

(1) One-touch fitting installation

Refer to Fittings & Tubing Precautions from 1 to 5 shown in Best Pneumatics on SMC's website (URL <https://www.smcworld.com>) for the recommended piping conditions.

(2) Before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil, and other debris from inside the pipe.

(3) Piping to product

When piping to the product, refer to the symbols and labels on the product to avoid mistakes in the position of the supply port, etc.

(4) Secure sufficient tubing length for connection.

Allow a sufficient margin of tube length when piping to prevent twisting, tensile, or moment loads being applied to the tubes and fittings. This can cause damage to the tube fittings and crushing, bursting or disconnection of tubing.

(5) Bending of tube

Ensure that the tube connected to the product is sufficient, such that it satisfies the required minimum bending radius. A bending radius less than the minimum required may cause folding of the tubing, which will restrict proper air flow through the tubing.

Lubrication



Caution

- (1) The product has been lubricated for life by the manufacturer and does not require additional lubrication while in service.**
- (2) Use turbine oil Class 1, ISO VG32 (with no additives), if lubricated.**

Besides, if the lubrication is suspended halfway, the original lubricant will be lost and may result in a malfunction. Be sure to keep lubricating continuously. Refer to SMC website for brand name of the lubricants compliant with Class 1 turbine oil (with no additives), ISO VG32.

Air Supply



Warning

- (1) Use clean air.**

Do not use compressed air that contains chemicals, organic solvent based synthetic oils, salts, corrosive gases, or etc., as this can cause damage or malfunction.



Caution

- (1) Install an air filter.**

Install air filters close to valves on the upstream side. A filtration degree of 5 micron millimeter or less should be selected.

- (2) Install an aftercooler, air dryer or drain catch before the filter.**

Compressed air that contains excessive drainage may cause malfunction of valves and other pneumatic equipment. Therefore, take appropriate measures to ensure air quality, by providing an after cooler or water separator, if needed.

- (3) Install a mist separator.**

Install a mist separator on the upstream side of the valve, when excessive carbon powder is generated by the compressor. Carbon powder which adheres to the inside of the valves may cause malfunction.

- (4) Grease is applied to the inner parts of the valve.**

Grease may enter on the downstream side of the valve.

For detailed information regarding the quality of the compressed air described above, refer to SMC's Cleaning Systems".

Operating Environment

Warning

- (1) Do not use in an environment where corrosive gases, chemicals, sea water, water or steam are present.**
- (2) Do not operate in a location subject to vibration or impact.**
- (3) Use a protective cover, etc. to shield the product from direct sunlight.**
- (4) Shield the product from radiated heat generated by nearby heat sources.**
- (5) Employ suitable protective measures in a location where there is contact with oil or welding spatter, etc.**

Caution

- (1) Avoid using in a location where it could be splashed by liquids such as oils, coolants and water. Also avoid locations exposed to dust.**

Maintenance

Warning

(1) Removal of equipment, and supply/exhaust of compressed air

When equipment is serviced, first confirm that measures are in place to prevent dropping of driven objects and/or equipment running out of control, etc. Then cut the supply pressure and power, and exhaust all compressed air from the system using its residual pressure release function.

When the equipment is to be started again after remounting, first confirm that measures are in place to prevent lurching of actuators, etc., and then confirm that the equipment can operate normally.

(2) Before performing maintenance, confirm that measures are taken to prevent sudden action and protect operators.

(3) Draining

Exhaust the drainage from an air filter periodically.

1-2. Time Delay Valve Specific Product Precautions

Air Source

Caution

(1) Use regulated air using a regulator for input signal air.

When the input signal air fluctuates, there will be larger differences in the delayed time, making it impossible to obtain the intended functions. Make sure to regulate the air using a regulator to avoid any influence of pressure fluctuation due to air consumption of other equipment.

Operation

Warning

(1) The Time Delay Adjusting Handle should be operated by hand ONLY. Do not over tighten the handle.

If operating the handle with pliers or a jig or when the handle is over tightened, the needle at the adjusting part may damage, causing an operation failure.

The handle should be operated by hand ONLY. Do not tighten the handle further than the fully closed position of the needle (the position at which the needle stops rotating when it is tightened gently by hand).

(2) Do not turn off the input signal pressure (PIL) before reaching the delay time.

When the input signal pressure (PIL) is turned off before reaching the delay time, air flows out momentarily (about 1/10 seconds) to the outlet side, which may cause devices and components on the outlet side to operate unintentionally.

Caution

(1) Differences in the delayed time may be larger due to adhesion of the seal when the product is operated for the first time following an extended period of non-operation.

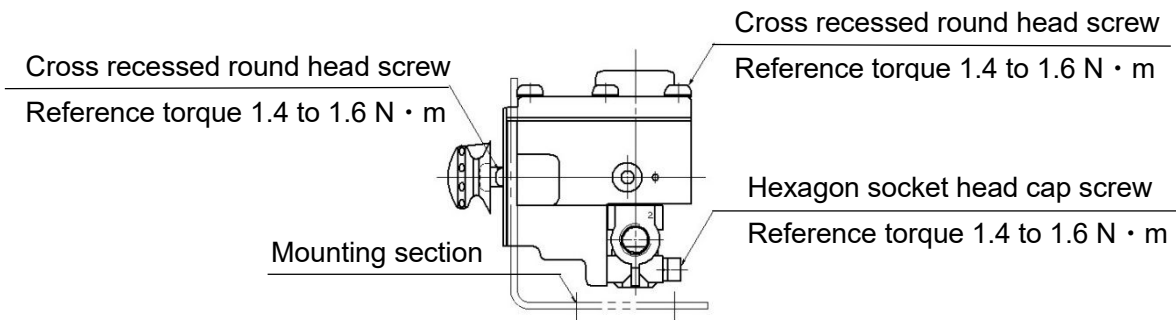
When the product is operated after an extended period of non-operation, the tolerance for the accuracy of repeatability for the time delay may be outside of the +/- 10 % range. To eliminate this issue, run the Time Delay Valve a number of cycles prior to operation.

Maintenance

Warning

- (1) Perform inspection on a regular basis as necessary, such as at the beginning of operation, to verify that the Time Delay Valve operates properly.
- (2) Check whether the bolts on the mounting surface or the VR21 body are loose or damaged.

If the bolts are loose, refer to the drawing below and use a hexagon wrench or a Phillips head screwdriver to tighten them.



2. Application

For design of a sequence control using pneumatic pressure, delayed operation is necessary as one of the basic functions. The VR2110 Time Delay Valve is used to delay the operation in a general industrial pneumatic circuit.

3. Specifications

Fluid	Compressed air	
Supply pressure	0 to 1.0 MPa	
Input signal pressure	0.25 to 0.8 MPa	
Delayed time	0.5 to 60 s	
Repeated accuracy *	+/- 10% F.S. (Representative valve)	
Ambient and operating air temperature	-5 to 60 °C (No freezing)	
Flow rate characteristics	C(dm ³ /(s · bar))	0.6 [1(P) →2(A)] , 0.5 [2(A)→3(R)]
	b	0.2 [1(P) →2(A)] , 0.15 [2(A)→3(R)]
Port size	Rc, NPT, G1/8	
ON timing	ON upon the set delay	
Output method	Normal close	
Reset	Resets by exhausting the input signal pressure	
Weight	480g	

*)The dispersion is shown excluding the first actuation when actuated 4 times continuously.

*)The accuracy may differ from the values above due to the actual conditions, such as pressure fluctuations, temperature changes, operation intervals, changes over time, etc., so be sure to check the actual machine.

4. How to Order

VR2110 – 01

• Port size

01	Rc1/8
N01	NPT1/8
F01	G1/8

5. Operation Patterns

ON timing: ON upon the set delay
Output method: Normal close
Settable time delay: 0.5 to 60 seconds

Operation time chart is shown in Fig. 1.

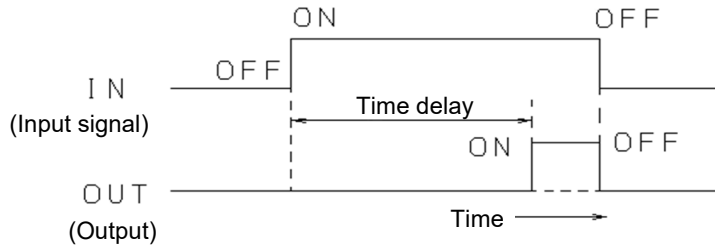


Fig. 1: Operation timing chart

When an Input Signal Pressure is provided, Output turns ON after the preset time. The Output will be switched OFF after the Input Signal Pressure is removed.

6. Characteristics

(1) How to set the time delay

The time delay can be set by turning the setting handle. Relation between the delay time and the number of rotations of the handle is shown in Fig. 2. Turning the handle in the clockwise direction will increase the time delay, while turning it in the counter-clockwise direction will decrease the time delay. However, as there are variations in the time delay, it should be confirmed with a stopwatch prior to use

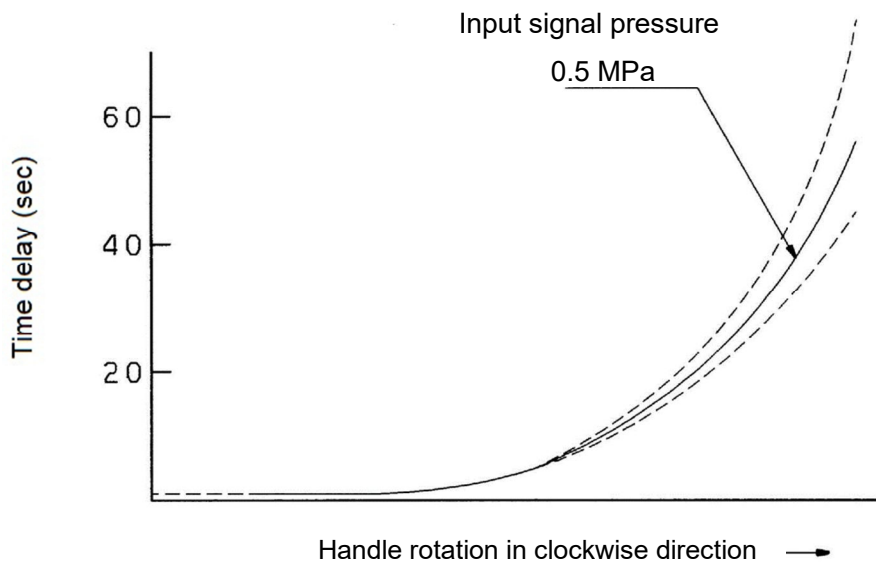


Fig. 2: Relationship between the time delay and number of rotations of the setting handle

(2) Input signal pressure and the set delay time

Input signal pressure and supply pressure are fed from separate lines for the VR2110 Time Delay Valve. It is possible to operate the valve at pressure levels independent of each other.

Supply pressure fluctuation is not related to the time delayed switch ON operation. However, fluctuation of the input signal pressure does influence the time delay. The time delay will decrease by increasing the input signal pressure with the setting handle fixed in place. Fig. 3 shows this relationship.

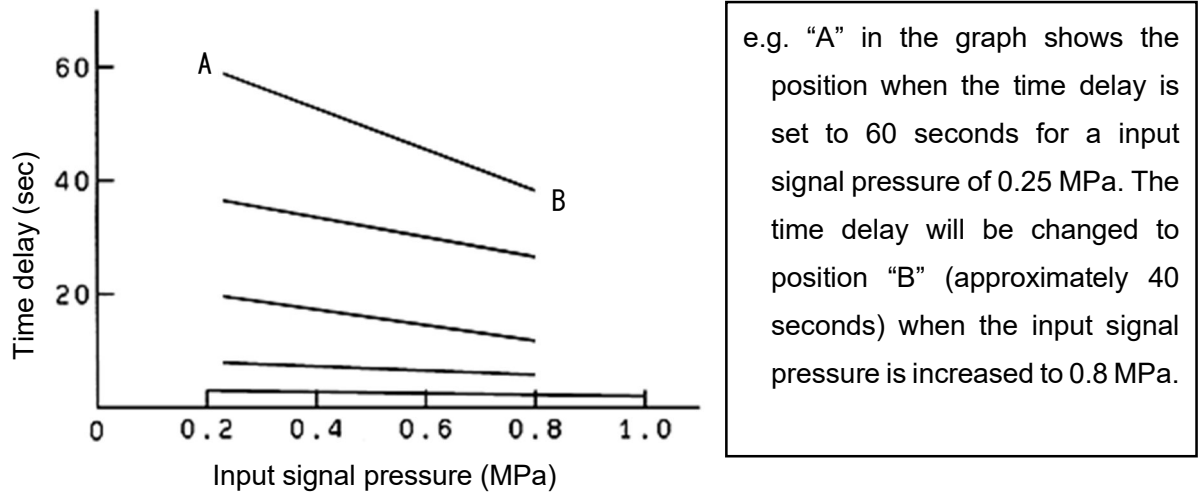


Fig. 3: Relationship between the input signal pressure and time delay

(3) Reset time

The time delay from when Input is turned OFF until Output is turned OFF is the Reset time. The reset time of the Time Delay Valve varies depending on the signal generating valve type, pressure and piping length ^{Note 1)} as shown in Fig. 4.

Note 1) Piping length is the distance for piping from the OUT port of the signal generating valve to the signal port of the Time Delay Valve.

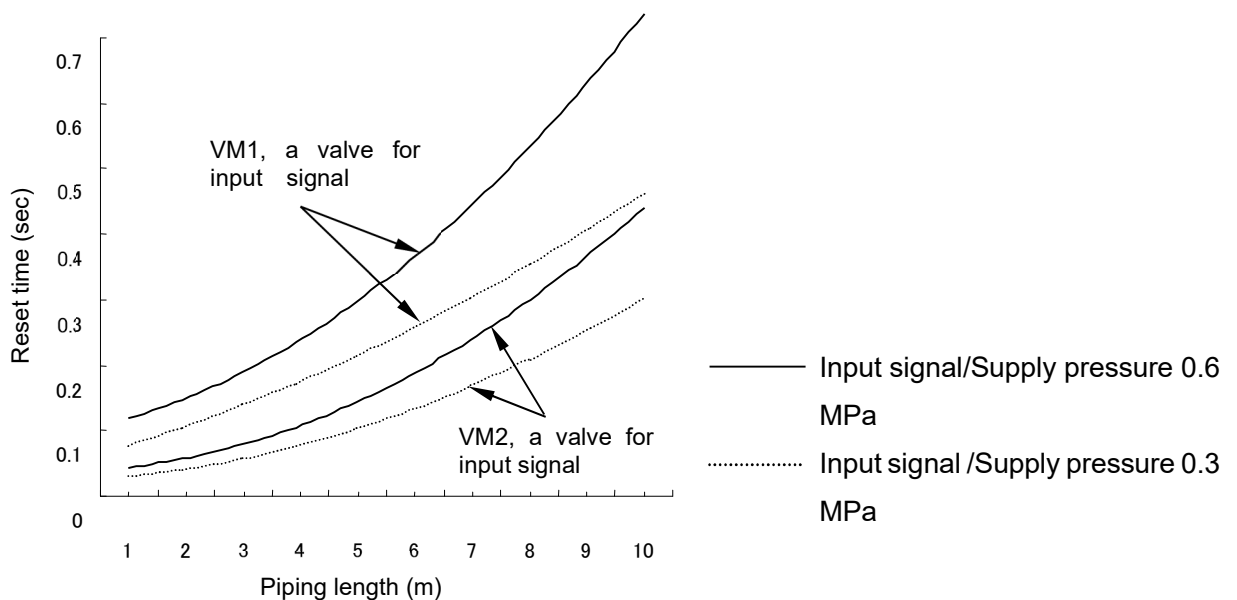
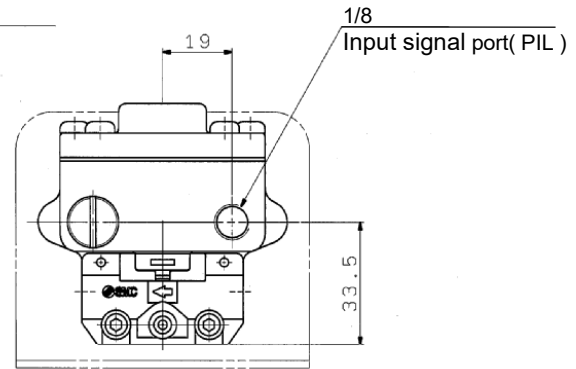
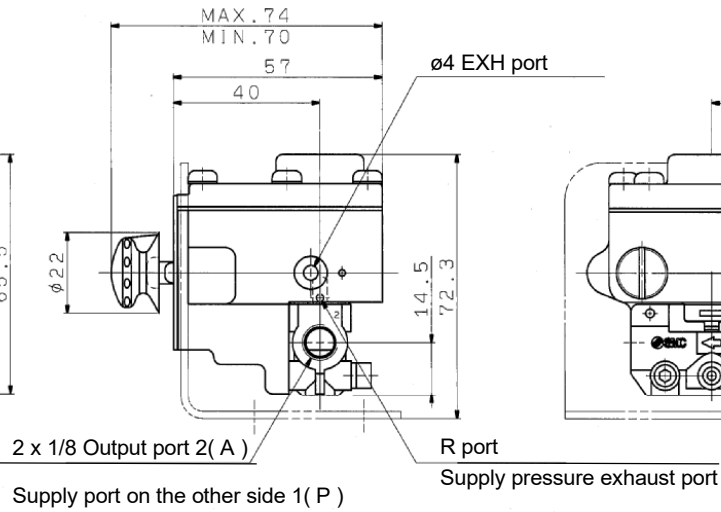
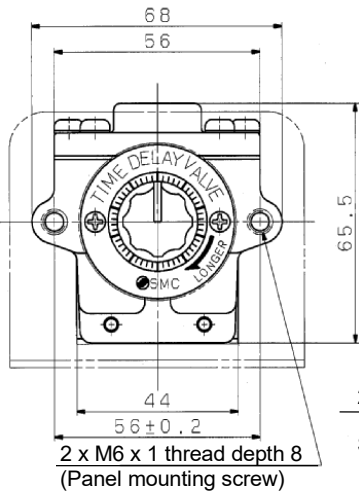
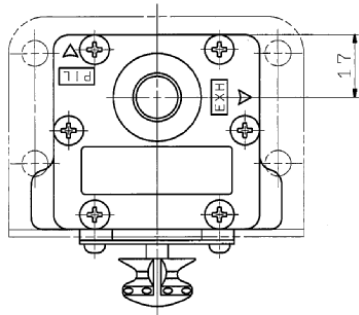


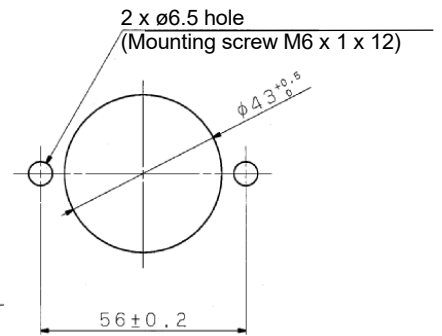
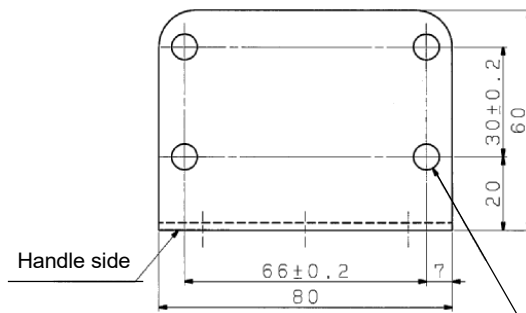
Fig. 4: Relationship among the signal generating valve type, pressure, piping length and reset time

7. Dimensions



Bracket mounted

Panel mounted



4 x M6 screw
4 x ø7 hole on the bracket side

Bracket plate thickness t = 2

Panel plate thickness t = 3 or less

Revision history

A: Update VM to VM100-A

B: Note added on page 8, weight corrected on page 10.

Incorrect description corrected on page 12, outside diameter dimension drawing layout changed on page 13.

C: Change of the note on the Specifications and Safety Instructions.

2024.3

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
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