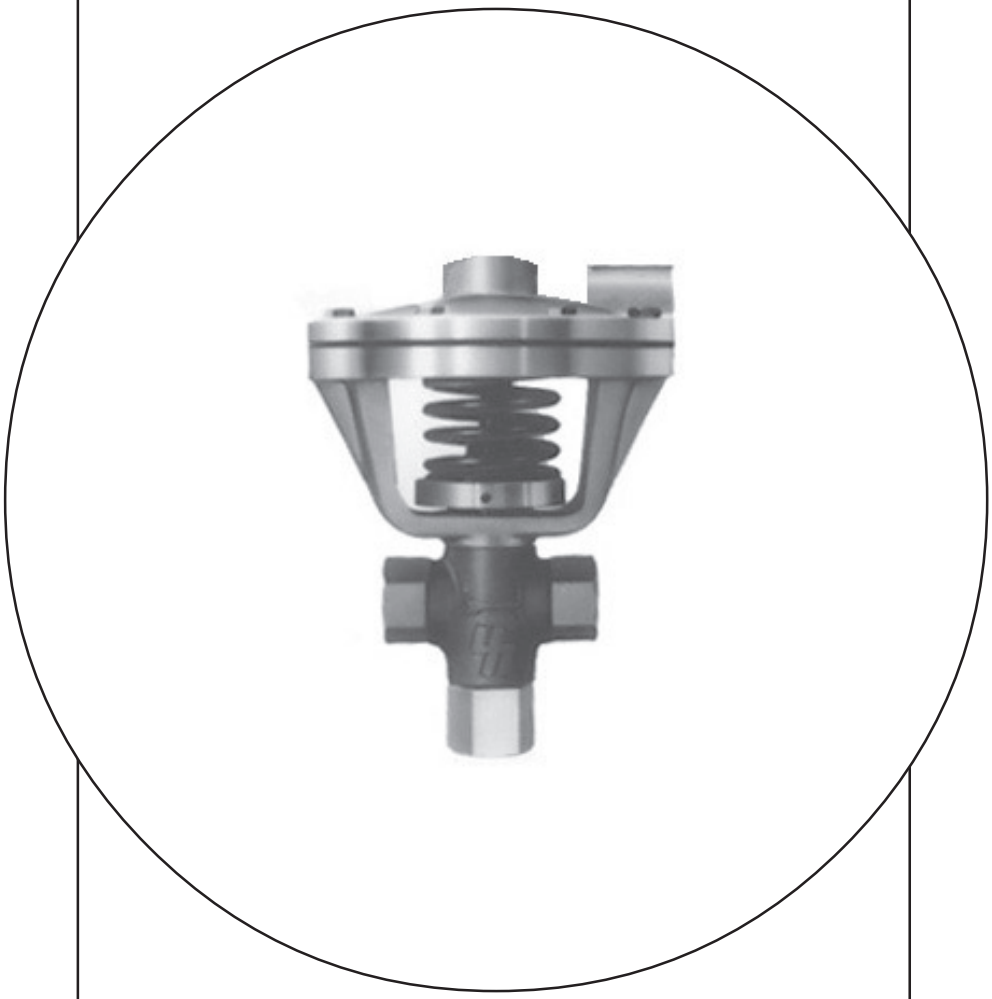
azbil

OM2-8310-0812

# Three-Way Pilot Valve
# Model : VF04

## User's Manual



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# Copyright, Notices and Trademarks

# Three-Way Pilot Valve Model VF04

## 1. Overview

Three-Way Pilot Valve Model VF04 is a small three-way On/Off valve which is equivalent to Three-Way Lock-Up Valve Model VF03 with the reset mechanism removed. It has a structure to change over air pressure lines by the balance between the signal air pressure acting on the upper diaphragm and a preset spring force.

## 2. Principle of Operation

This three-way pilot valve has the same structure as the Three-Way Lock-Up Valve Model VF03 except that it has no manual lock mechanism and the diaphragm hole is not plugged by the diaphragm ② in any situation. Therefore, the range of change-over signal pressure is determined by the compression of the diaphragm spring ⑤ in the same manner.

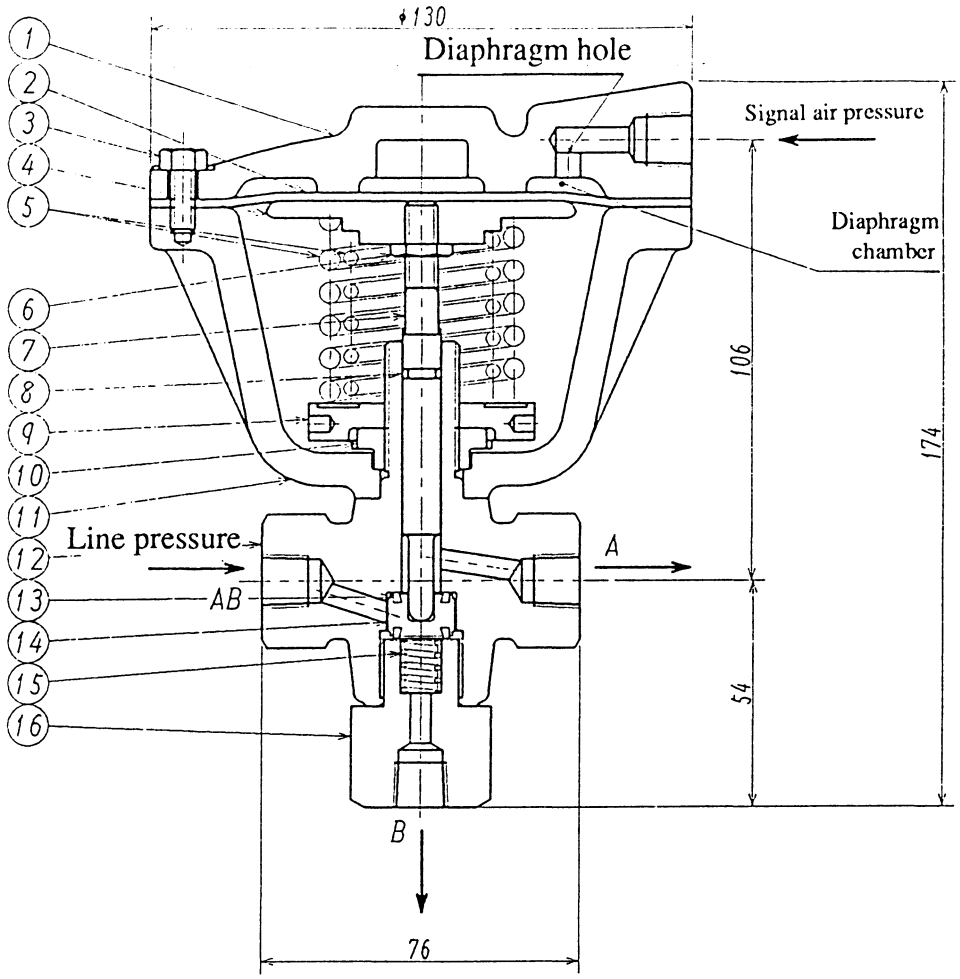
For instance, if the spring is compressed to 50 kPa {0.5 kgf/cm$^2$} of air pressure, downward force is exerted up to 50 to 100 kPa {0.5 to 1.0 kgf/cm$^2$} of diaphragm chamber pressure, then the flow medium will flow in the direction of 'AB' → 'A' through the valve body.

Where the diaphragm chamber pressure is reduced below 50 kPa {0.5 kgf/cm$^2$}, the upward force exerted by the diaphragm spring ⑤ increases and switches the port to 'AB' → 'B'. However, it switches again back to 'AB' → 'A' when the signal air pressure becomes higher than 50 kPa {0.5 kgf/cm$^2$}.

## 3. Piping

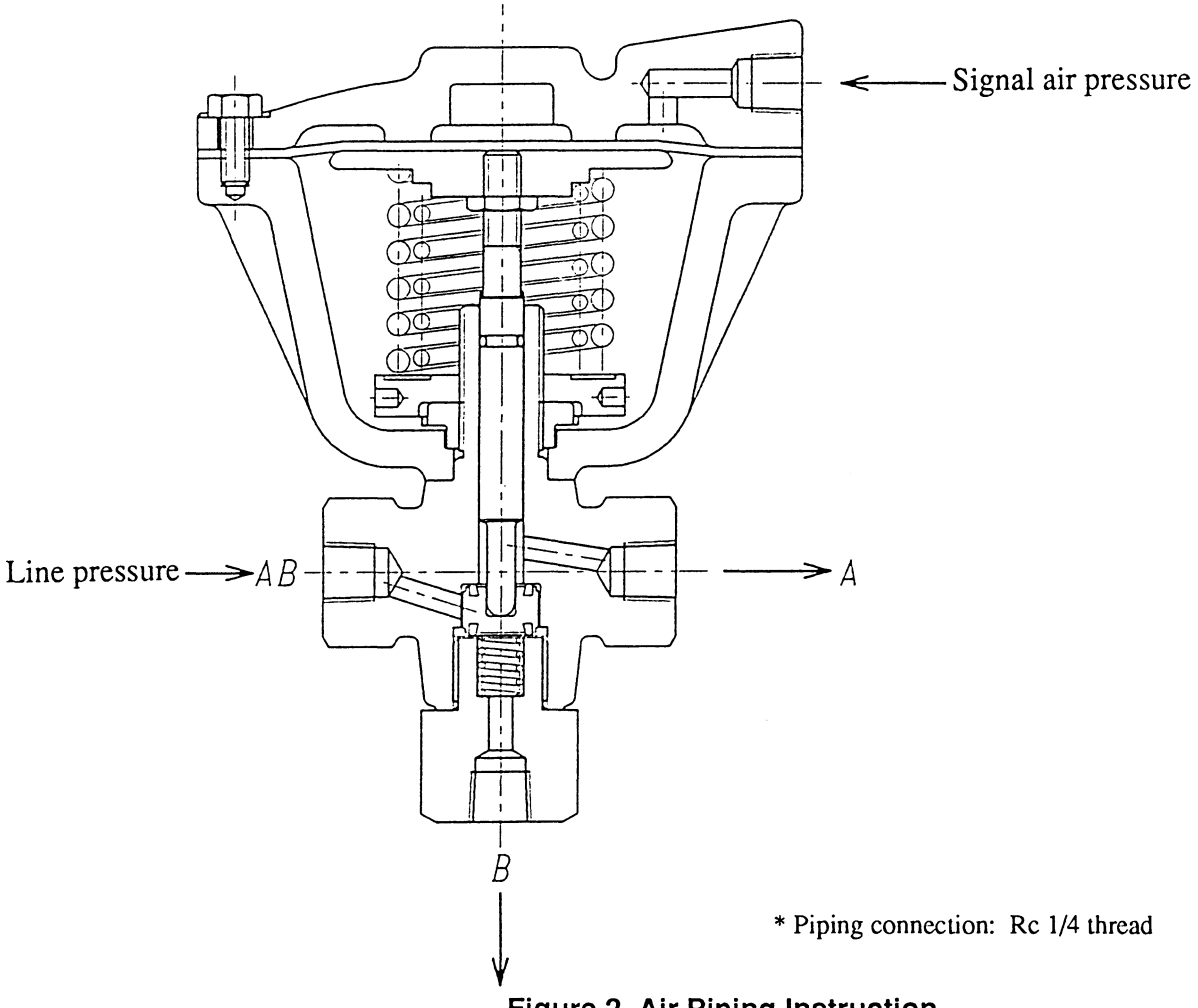
Three-Way Pilot Valve has four piping connections. The signal air pressure is introduced into the hole on the diaphragm case ①. The marks 'AB', 'A', and 'B' are printed on the body of each piping connection respectively. 'AB' is the main pressure supply hole and is capable of introducing a maximum air pressure of 490 kPa {5 kgf/cm$^2$}. In conditions where the air pressure is higher than the changeover signal pressure applied to diaphragm ②, 'AB' → 'A' is open while it switches to 'AB' → 'B' when a lower pressure is applied. Note the respective markings before connecting for this reason.

All connecting holes are Rc 1/4 thread.




| KEY NO. | Description |
|---|---|
| ① | Diaphragm case |
| ② | Diaphragm |
| ③ | Bolt |
| ④ | Diaphragm plate |
| ⑤ | Diaphragm spring |
| ⑥ | Stem nut |
| ⑦ | Stem |
| ⑧ | "O" ring |
| ⑨ | Spring seat |
| ⑩ | Lock nut |
| ⑪ | Yoke |
| ⑫ | Body |
| ⑬ | Inner seat |
| ⑭ | Seat adapter |
| ⑮ | Valve spring |
| ⑯ | Adapter |

**Figure 1 Three-Way Pilot Valve**




* Piping connection: Rc 1/4 thread

**Figure 2 Air Piping Instruction**

# 4. Specifications

**Body rating:** 690 kPa {7.0 kgf/cm$^2$}
**Main materials:**
Body : Brass
Diaphragm : Ethylene propylene rubber
Trim : SUS 304 (with neoprene sheet)
Actuator : Aluminium alloy
**Line pressure:** 490 kPa {5.0 kgf/cm$^2$}
**Signal air pressure:** 20 to 100 kPa {0.2 to 1.0 kgf/cm$^2$}
(Max.: 270 kPa {2.8 kgf/cm$^2$})
**Adjustable range of air pressure for Change-over point setting range:** 40 to 80 kPa {0.4 to 0.8 kgf/cm$^2$}
**Dead band:** 10 kPa {0.1 kgf/cm$^2$} (max.)
**Air piping connection:** Rc 1/4 thread
**Ambient temperature range:** –30 to +80°C

# 5. Assembly, Adjustment and Disassembly

## 5-1. Assembly and Adjustment

| | Assembly and Adjustment | Remarks |
|---|---|---|
| a) | Assemble the yoke ⑪ and the body ⑫. Insert the stem ⑦ with the "O" ring ⑧ into the body ⑫, then, push it down lightly by hand from the top so as not to touch the seat adapter ⑭. (Instead of inserting the stem ⑦, it can be accomplished by plugging the hole in the body with a finger.) At this stage, it is necessary to prevent leakage from the 'AB' and 'B' holes when an air pressure of 490 kPa {5 kgf/cm$^2$} is applied through the 'A' hole. | If there is leakage, the reason is that the inner seat ⑬ of the seat adapter ⑭ is not properly seated on the body. Therefore, it is necessary to readjust either the adapter or the inner seat ⑬. |
| b) | If there is no leakage from the 'AB' and 'B' holes install the diaphragm case ① to the yoke ⑪. | |
| c) | Apply an air pressure of 100 kPa {1 kgf/cm$^2$} through the signal air pressure hole, and check for any leakage from the hole on the diaphragm case. | If there is leakage, tighten the diaphragm spring ⑤ within one full turn or less. If there is further leakage, readjust either the hole of the diaphragm case ① or the diaphragm ②. |
| d) | If the leakage from the diaphragm holes has been completely stopped, once again, check for leakage in the 'AB' and 'B' holes with the body ⑫ and the diaphragm case ① assembled. | If there is leakage, this is due to excessive length of the stem ⑦ which is pressing down the seat adapter ⑭. Therefore, the stem ⑦ and the diaphragm plate must be adjusted and step d) repeated. |
| e) | Carry out adjustment of the stem ⑦ until leakage from the 'AB' and 'B' holes ceases. When the leakage is completely stopped, any change-over point can be selected by merely adjusting the diaphragm spring ⑤. | |

## 5-2. Disassembly

To disassemble, follow the assembly procedure in reverse.

# *Note*

# Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.
You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

1.2 Warranty scope

In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place.

Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

(1) Failure caused by your improper use of azbil product
(noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
(2) Failure caused for other reasons than Azbil Corporation's product;
(3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
(4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
(5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
(6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

(1) Regulations and standards or laws that your Equipment is to comply with.
(2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
(3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down.
You are required to provide your Equipment with safety design such as fool-proof design, *1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance, *3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

*1. A design that is safe even if the user makes an error.
*2. A design that is safe even if the device fails.
*3. Avoidance of device failure by using highly reliable components, etc.
*4. The use of redundancy.

3. Precautions and restrictions on application

Azbil Corporation's products other than those explicitly specified as applicable (e.g. azbil Limit Switch For Nuclear Energy) shall not be used in a nuclear energy controlled area (radiation controlled area).
Any Azbil Corporation's products shall not be used for/with medical equipment.
The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.
In addition,
you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below.
Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

(1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
(2) For use of specific purposes, such as:
* Nuclear energy/radiation related facilities
[For use outside nuclear energy controlled areas] [For use of Azbil Corporation's Limit Switch For Nuclear Energy]
* Machinery or equipment for space/sea bottom
* Transportation equipment
[Railway, aircraft, vessels, vehicle equipment, etc.]
* Antidisaster/crime-prevention equipment

* Burning appliances
* Electrothermal equipment
* Amusement facilities
* Facilities/applications associated directly with billing

(3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
(4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
(5) Machinery or equipment that may affect human lives, human bodies or properties
(6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification.
Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.
In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used.
Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals.
System products, field instru ments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts.
For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason.
For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice.
For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts.
For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service.
Accordingly, a separate fee will be charged in any of the following cases:

(1) Installation, adjustment, guidance, and attendance at a test run
(2) Maintenance, inspection, adjustment, and repair
(3) Technical guidance and technical education
(4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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