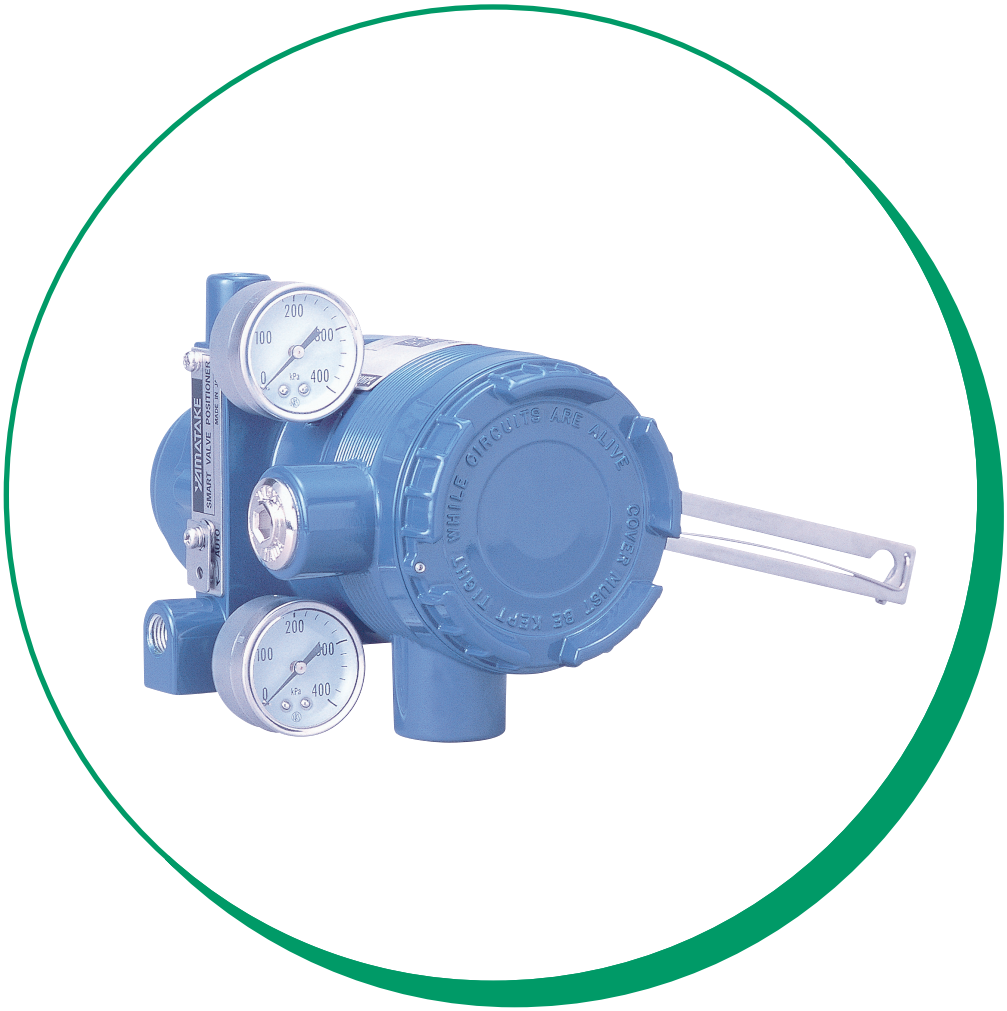
YAMATAKE

SVP3000 Alphaplus Smart Valve Positioner

Model:AVP303/203

User's Manual



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Thank you for purchasing the Yamatake SVP3000 Alphaplus model AVP303/203 Smart Valve Positioner.

The SVP Alphaplus model AVP303 is a FOUNDATION™ filedbus equipped smart valve positioners, which controls and manages the valve by using the Fieldbus protocol.

Various diagnostic functions and the automatic configuration function of the SVP Alphaplus, as well as PID function blocks, help in realizing maximum fieldbus capabilities. Split range and other special settings are also easy to set up.

This user's manual explains procedures on using the SVP3000 Alphaplus. To get the optimum results from the unit, adhere to the instructions and precautions contained in this manual.

Safety

About This Manual

This manual contains information and warnings that must be observed to operate SVP3000 Alphaplus Smart Valve Positioner (SVP) safely. Proper installation, correct operation and regular maintenance are essential to ensure safety while using this device.

For the correct and safe use of this device, it is essential that both operating and service personnel follow standard safety procedures in addition to the safety precautions specified in this manual.

The following symbols are used in this manual to alert you to possible hazards:

⚠ WARNING

Denotes a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Failure to observe these precautions may produce dangerous conditions that could result in physical injury or that could cause damage to the device.

Safety precautions

⚠ WARNING

- ELECTRICAL SHOCK HAZARD! Turn off power before performing any wiring.
- NEVER open the terminal box cover while the SVP is connected to power in a hazardous environment.
- Do not unnecessarily touch the SVP while it is in operation. The surface can be very hot or very cold, depending on the operating environment.

⚠ CAUTION

Do not stand on the installed SVP or use it as a step. This can damage the unit.

Explosion-protected models

JIS Flameproof apparatus

Ex d $\frac{\text{IIC}}{1}$ $\frac{\text{T6}}{2}$

1: Explosive gas atmosphere classified as IIC

2: Gas atmosphere of which ignition temperature is 85°C or greater

Ambient temperature: -20°C to +60°C

⚠ WARNING

Never open the terminal cover while the SVP is in operation and/or at least for one minute after it is turned off. Never open the terminal cover nor loosen the screws that fasten the angle sensor to the SVP unit. Doing so may cause an explosive atmosphere to ignite.

⚠ WARNING

Cable gland must be placed in the signal wire entry of the apparatus. Use the attached cable gland. When necessary, change the wiring direction, and use the attached elbow. No other elbow may be used. No other elbow can ensure the intended explosion-protection.

The specified type of protection cannot be guaranteed if any of the above precautions are ignored.

Prevent corrosion, deformation or damage to the housing or the terminal box cover.

Screw the cover-fastening screw tightly. Never open the cover while the apparatus is in operation.

Upon receiving the unit

Handle with care to prevent damage. Check that the following items are included:

- SVP3000 Alphaplus Smart Valve Positioner Model AVP303 or AVP203
- Feedback lever and 2 hex socket bolts
- Hex wrench for feedback and terminal box cover
- Any accessories that were ordered
- Manual (option)

Verifying the Specifications

The SVP3000 Alphaplus' specifications are written on the name plate on the body of the positioner itself. Compare these specifications to those in the appendix, and verify that the SVP3000 Alphaplus matches your order. In particular, be sure to check the following items.

- Tag number (TAG NO.)
- Model number (MODEL)
- Factory number (PROD.)
- Input current range (INPUT)
- Air supply pressure (SUPPLY)
- Explosion proof inspection passage award (for positioners with explosionproof specifications)

Inquiries

If you have any questions about the specifications, please contact the office listed at the back of this user's manual. Have the model number (MODEL) and factory number (PROD.) number ready when you make your inquiry.

Storage

Ideally, the SVP should be stored in the original packaging. However, if the original packaging is not available, store the SVP indoors at normal temperature (25°C {77°F}) and humidity (~65%) in a place free from vibration and shock and not exposed to rain or water. If you are storing the SVP after it has been used, clean the SVP and then firmly tighten the terminal box cover and seal the wiring, piping connections and bleed hole in the pilot cover using the Yamatake-supplied caps or tape to prevent entry of moisture.

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Chapter 1 : Introduction

YAMATAKE SVP3000 Alphaplus Series Smart Valve Positioners are high performance microprocessor-based Fieldbus-to-pneumatic valve positioners.

- Fully complies with Fieldbus Foundation™ H1(31.25Kbps Voltage Mode Bus) specifications.
- Supports the AO (Analog Output) Function Block, Two PID Function Blocks and Diagnostic Function Block.
- Bus-power device -- no need for external power supply
- Provided with Device Description (DD) files and a Capability File (CF) for automatic configuration.

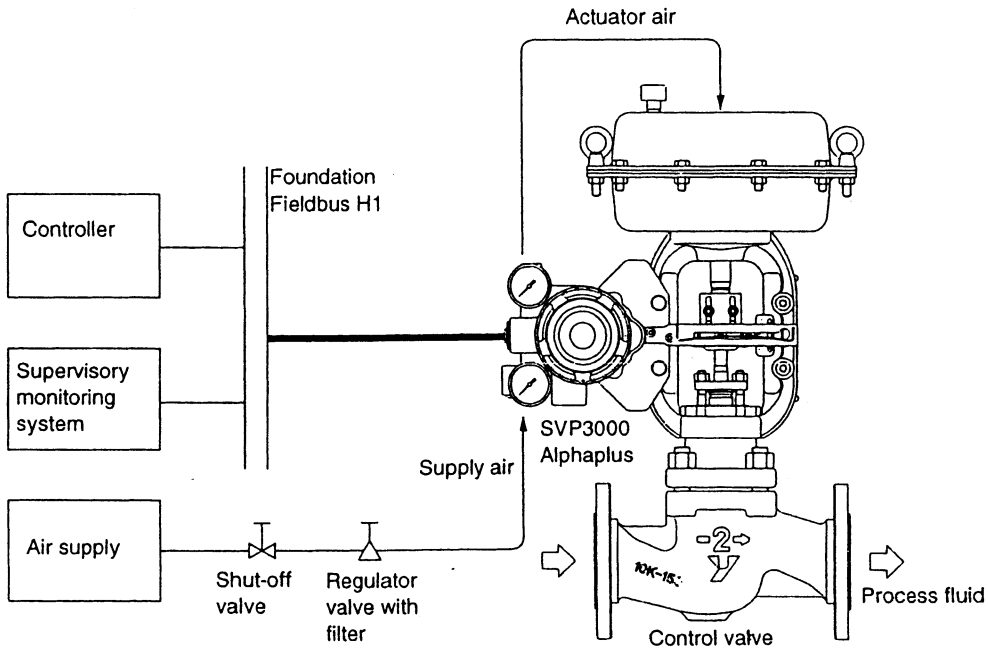


Figure 1-1 SVP Fieldbus model overview

1-1 : Fieldbus Topology

The FOUNDATION™ filedbus can be wired using either bus topology or tree topology (chicken foot). The following figure shows the two different topologies.

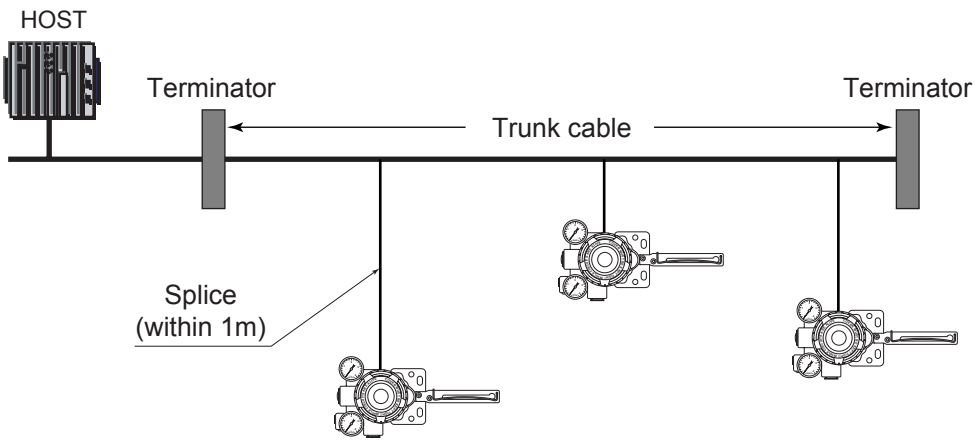


Figure 1-2 Bus topology

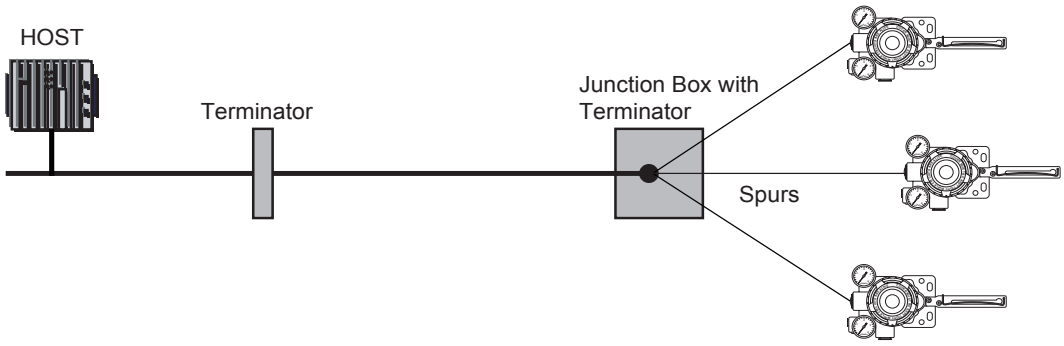


Figure 1-3 Tree topology (chicken foot)

1-2 : Structures and functions of SVP

Main components

The main SVP components are shown below.

Integral type (AVP303)

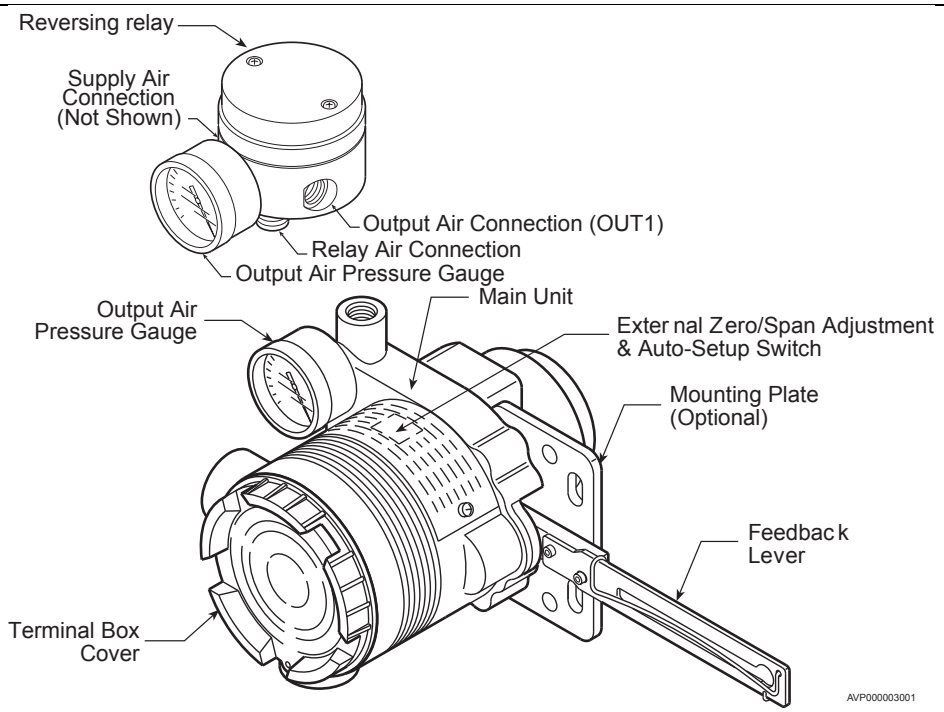


Figure 1-4 Front view

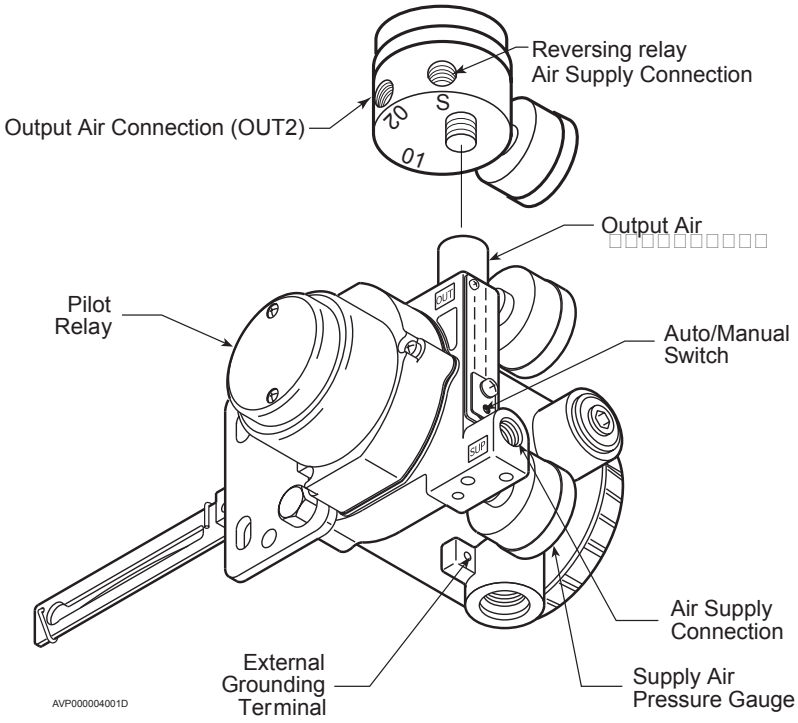


Figure 1-5 Back view

Remote type (AVP203)

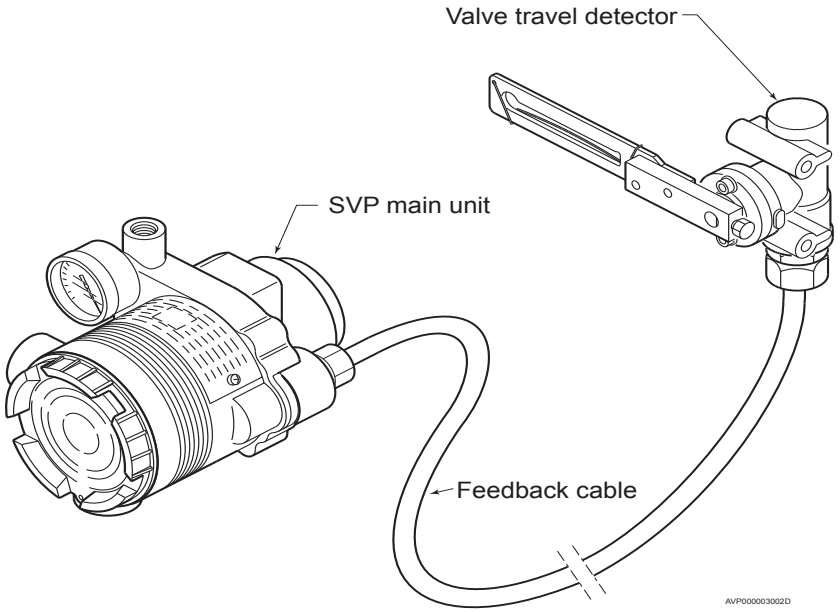


Figure 1-6 Front view of SVP remote type

Names of parts and functions of main components

Part	Description
Main unit	Holds the electronics module, EPM (electropneumatic converter module), and VTD (position sensor).
Pilot relay	Amplifies the pneumatic signal from the EPM (electropneumatic converter module) and converts it to a pneumatic signal for the actuator.
Feedback lever	Acquires the motion of the control valve travel and transmits it to the VTD (position sensor).
Auto/Manual switch	Switches the control method for the pneumatic output between the automatic operation state and the manual operation state. See “5-1 : Auto/Manual selection switch” on page 5-1 for information on operating procedures.
External zero/span adjustments Auto-setup switch	Allows the zero and span to be adjusted and auto setup to be performed with just a flat-bladed screwdriver.
Supply air pressure gauge	Indicates the supplied air pressure.
Output air pressure gauge	Indicates the pressure of the output air.
Air supply connection	The air supply is connected to this connector. Labeled “SUP”.
Output air connection	The output air is sent to the actuator from this connector. Labeled “OUT”.
Mounting plate (option)	Used to mount the actuator onto the SVP itself. The shape of this part will differ depending on the specifications (the type of actuator).
Reversing relay	Used when a double-acting actuator is used. The reversing relay is added at the output air connector of the SVP. The reversing relay provides two outputs: output air pressure 1 (OUT1), which is the SVP output air pressure without modification, and output air pressure 2 (OUT2), which is the SVP output air pressure with air pressure supplied to the reversing relay (SUP) subtracted from OUT1. Connecting these outputs to the two cylinder chambers of the double-acting cylinder allows that cylinder to function as a double-acting positioner.
Output air connection (OUT1)	The air output from this connector is delivered to the actuator. O1 is written on the lower section of the reversing relay.
Output air connection (OUT2)	The air output from this connector is delivered to the actuator. O2 is written on the lower section of the reversing relay.
Feedback cable	Connect the VTD and the main unit of SVP.
Valve travel detector	Senses a valve position through the feedback lever.

Terminal box

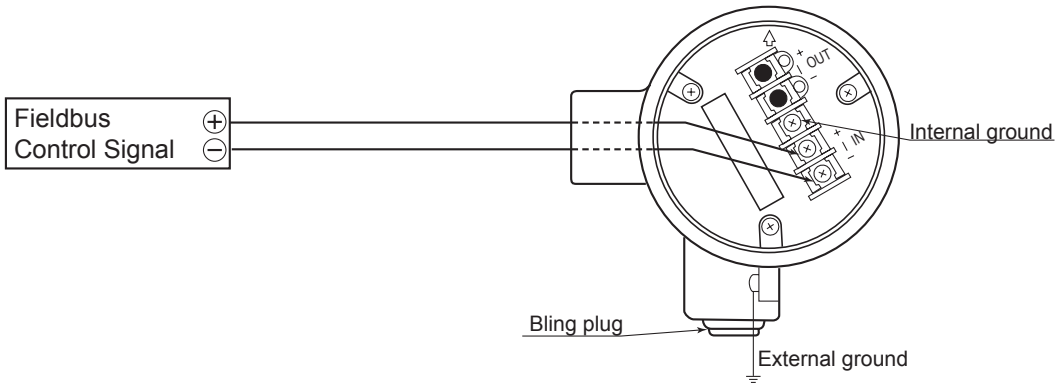


Figure 1-7 Terminal block

Names of parts and functions of terminal box

Part	Description
Terminal box cover	The cover features a pressure-resistant explosion proof structure.
Cover locking screw	Must be tightened down when an explosion proof model SVP is used in a hazardous area.
Terminal of input signal	Labeled “I IN”. Connect the signal cable from the host controller.
External grounding	Ground this pin as stipulated in the specifications.
Internal grounding	When using the SVP, use either the internal or the external ground terminal, but be sure not to create a 2-point ground.
Conduit connection (1)	Port for connection cables. The stipulated pressure-resistant packing type cable adaptor (available as an option) must be used if an explosion proof model SVP is used in a hazardous area.
Conduit connection (2)	Port for connection cables. The stipulated pressure-resistant packing cable adaptor (available as an option) must be used if an explosion proof model SVP is used in a hazardous area. This port is normally sealed with a blind plug.

Chapter 2 : Installation

2-1 : Site Selection

The SVP is designed to withstand severe operating conditions. It is designed to operate:

- Ambient temperature range conforming to the requirements for explosion-protection (See “ Explosion-protected models” on page ii.).
- In relative humidity of 10 to 90%
- Where there is no chance of sudden temperature or humidity changes
- Where magnetic field induction is not more than 400 A/m (Avoid locations near large-scale transformers, high-frequency furnaces, and similar equipment.)
- Vibration under 19.6 m/s2 (5 to 400 Hz) (AVP303 and AVP203 main unit)
- Vibration under 98 m/s2 (5 to 2000 Hz) (AVP203 valve travel detector unit)

~Note *The vibration conditions for this equipment is stipulated for the vibration at the positioner.*

2-2 : Installing an integral type SVP (Model AVP303)

Yamatake Smart Valve Positioners are designed for use in combination with a control valve that uses a direct- or reverse-acting or rotary actuator. The main SVP unit weighs about 2.5kg. It should be attached in the same way you would attach a conventional electropneumatic positioner.

⚠ CAUTION

- Do not install the SVP near a large transformer, high-frequency furnace, or other equipment that generates a magnetic field. This could result in the unit to malfunciton or produce errors.
- Incorrect settings can reduce the SVP's effectiveness and cause damage to or failure of the SVP.
- When installing a control valve, provide adequate clearance around the valve for maintenance (piping, wiring, and adjustment), and verify that the valve is positioned correctly.
- Keep the SVP in its original packing until transported to the point of installation.
- Do not apply excessive force to the feedback lever or bend the feedback pin when installing the valve.
- Be sure to tighten all bolts and nuts on the SVP and control valve securely.

⚠ WARNING

- To avoid physical injury, use caution when attaching the SVP:
- Be aware of sharp edges, such as the threaded edges of the terminal box cover and any sharp edges on the unit.
- The type and size of the actuator and the SVP settings determine the type of mounting plate to be used. If you ordered your SVP with the actuator type specified, then the SVP should come packaged with the proper mounting kit, and the correct actuator settings should already be programmed into the SVP. The Auto-Setup program is then used to calibrate the SVP.

Procedure

step	Procedure
1	The SVP comes with an actuator mounting kit appropriate for your control valve and actuator. Fasten the mounting plate to the SVP securely, using the two hexagon head bolts and spring washers provided.
2	Fasten the SVP (mounting plate) securely to the actuator's mounting structure using the bolts and washers provided. During this operation, pass the actuator's feedback pin through the slot in the SVP feedback lever.

Examples

With HA1 actuator

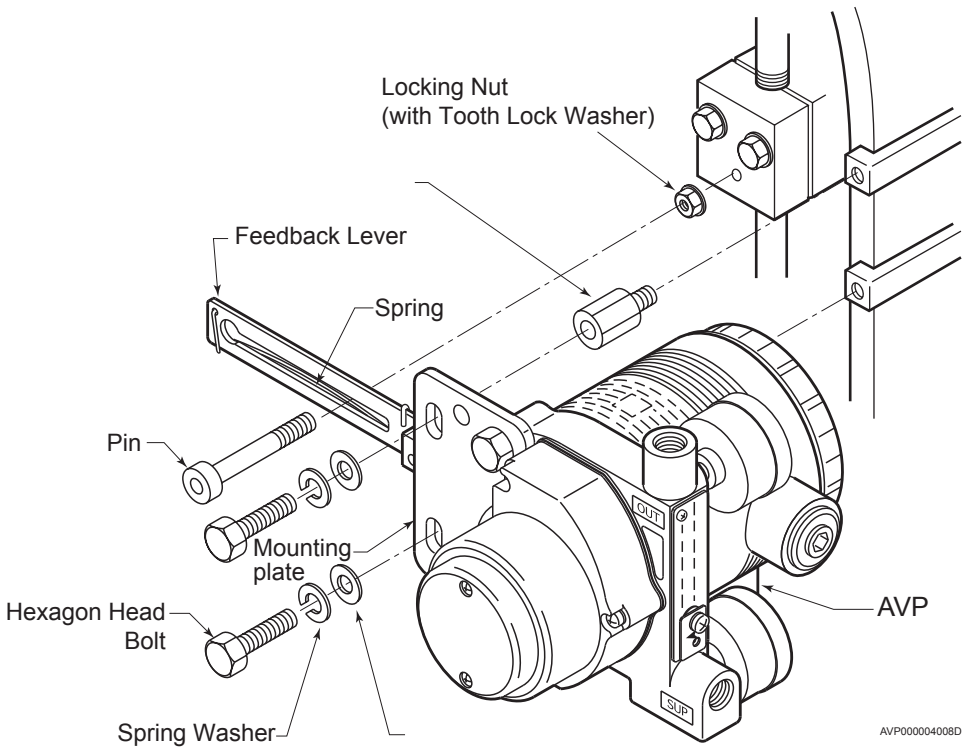


Figure 2-1 Mounting on HA1 actuator

With HA2~4, PSA1~4, 6, VA1~6 actuators

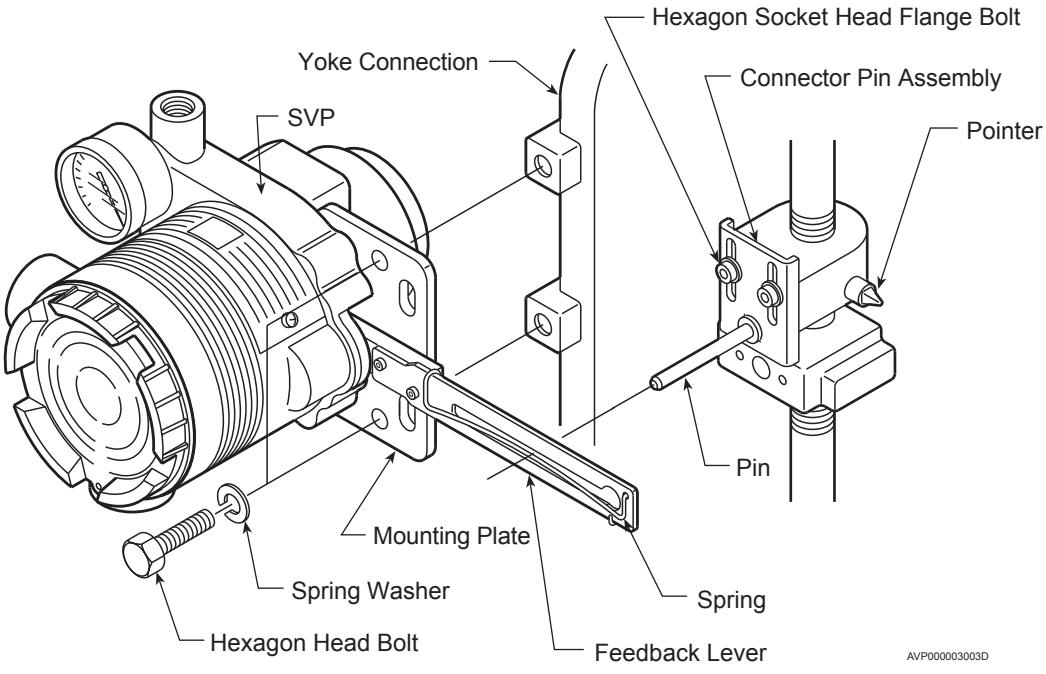


Figure 2-2 Mounting on HA2~4, PSA1~6, VA1~6

With VA1, 2, 3 actuators

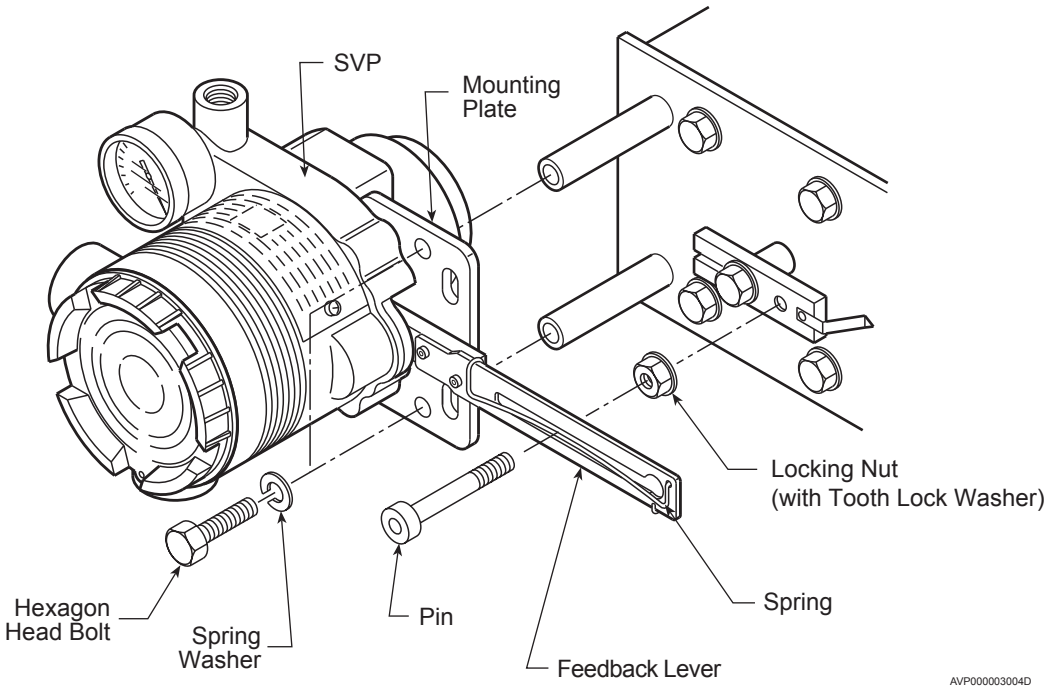


Figure 2-3 Mounting on VA1, 2, 3

Connecting the feedback pin and the feedback lever

The following points must be observed when connecting the SVP feedback lever and the feedback pin on the actuator. These parts must be connected correctly.

(1) Only a 6 mm diameter pin may be used.

(2) The pin must be fitted between the guide and the spring.

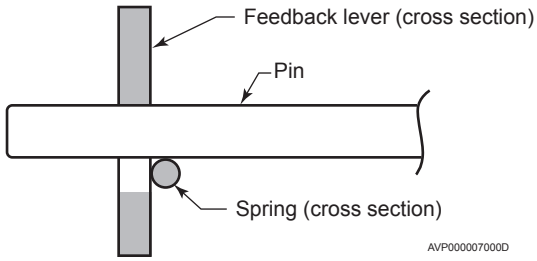


Figure 2-4 Feedback Pin and Feedback Lever Connection

(3) The angle between the feedback lever and the pin must be 90° when seen from above.

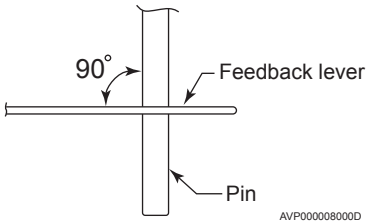


Figure 2-5 Angle Between Feedback Lever and Pin

(4) Assemble the feedback lever and the SVP using the two hex socket bolts provided. The feedback lever moves 20° up and down from the horizontal (40° travel). If this limit is exceeded, the SVP will not operate properly.

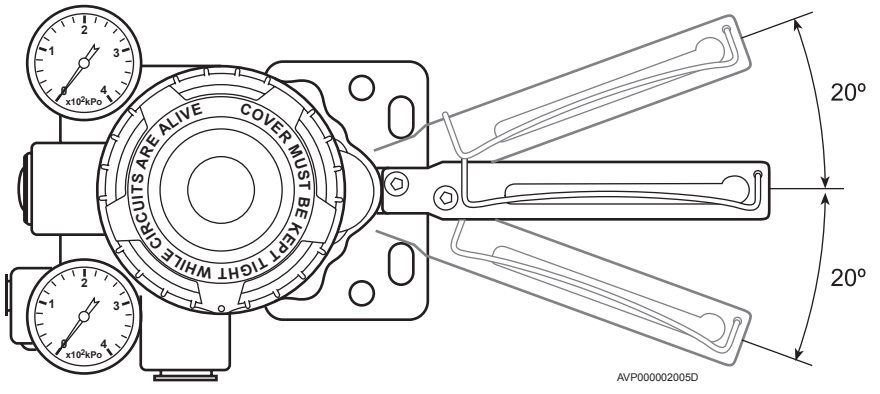


Figure 2-6 Feedback Lever Maximum Range of Motion

(5) For large actuators, use the included feedback lever extension.

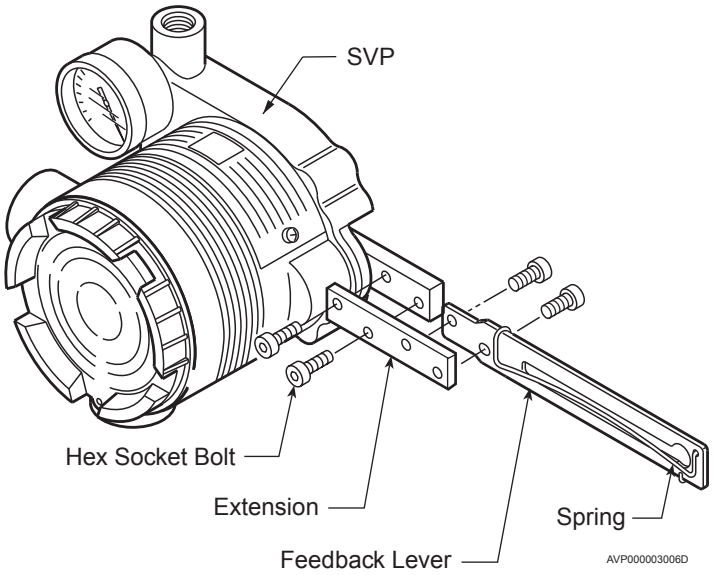


Figure 2-7 Attach the Feedback Lever (with Extension)

Space allowance for maintenance

The SVP has a nozzle flapper structure at the rear of the main unit. The SVP is designed so that the nozzle flapper structure can be accessed by removing the pilot relay cover at the back of the main unit when cleaning the flapper and adjusting the EPM balance. (See "5-4 : EPM (electropneumatic converter module) balance adjustment" on page 5-5.)

When installing the mounting bracket, provide adequate space to remove the pilot relay cover for maintenance.

Connecting the air supply

Use only a clean and dry air supply to ensure long-term stability of the SVP.

The air supply must be clean; it should not contain any foreign substance (moisture, oil, or dust). The air must be dry, with a dew point at least 10°C {18°F} lower than the SVP's lowest site operating temperature. For example, if the lowest environmental temperature the SVP is exposed to is 0°C {32°F}, then supply air should not condense at temperatures under -10°C {14° F}.

A pressure regulator with a 3μm or finer filter must be installed between the air supply and the SVP as close as possible to the SVP unit.

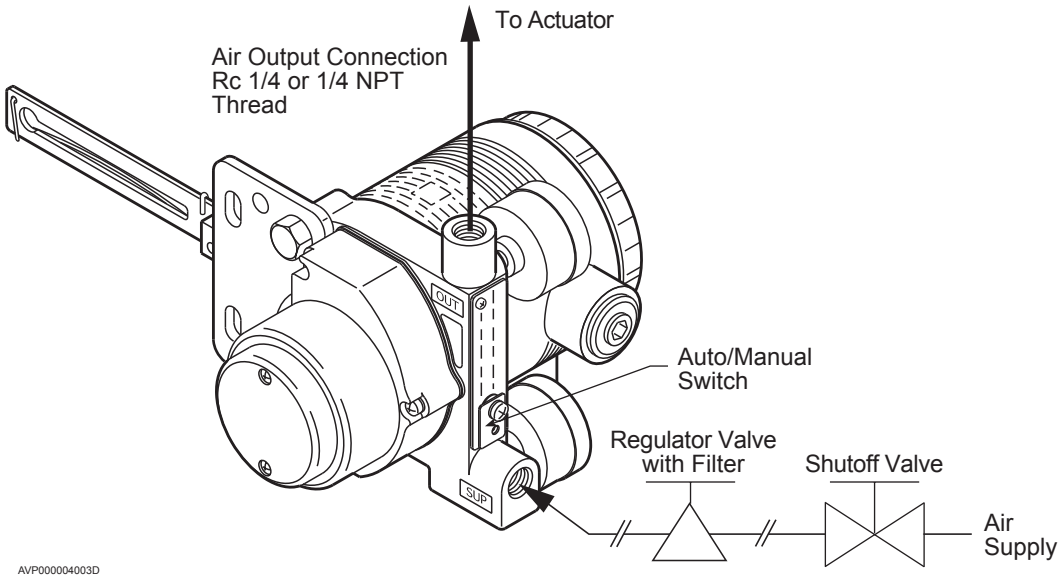


Figure 2-8 Typical Air Supply System

Pressure regulator with filter

- The control valve can be operated manually by using this regulator in conjunction with the Auto/Manual switching function.
- Use a 3 μm or better filter to solid-state particulate matter from the air supply.
- If a filter is not provided on the regulator, insert a separate 3 μm or better filter immediately before the regulator.

Shutoff valve

- This valve is used to temporarily shut off air supply to the SVP.
- The shutoff valve enables disconnection of the SVP from the control valve for ease of maintenance.

Recommended piping practices

- Air supply pipes should have an internal diameter of 6mm {1/4in.} (8mm {3/8in.} external diameter tubing recommended).
- Pipes should match the installation environment, i.e. for a corrosive environment, use vinyl-covered copper pipes.

- Only use joints that precisely fit the pipes.
- Sealing tape is preferable to solid or liquid sealants for pipe joints to SVP air connections. Prevent sealing tape/sealant from entering pipes.
- Use the right length of piping; avoid excess lengths.
- Completely flush pipes before use, checking for burrs and other problems.
- Check for leaks after installation.

2-3 : Installing a remote type SVP (Model AVP203)

Connecting the SVP and feedback cable

(1) Insert the connector plug into the receptacle.

(2) Gently push the connector assembly into the housing.

Screw the cable connector into the housing tightly so that the waterproof gland will keep water out. If you cannot screw it tight, unscrew it and move the connector assembly around inside so that it does not obstruct tightening of the cable connector.

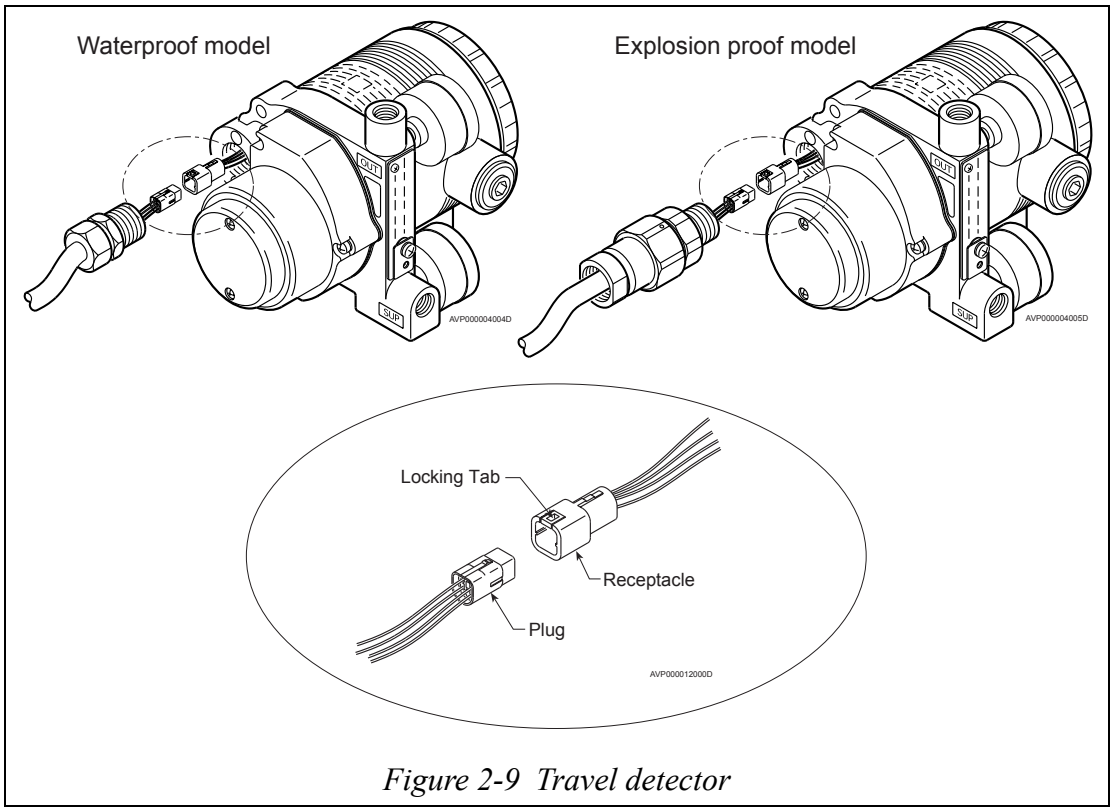


Figure 2-9 Travel detector

After connecting the connectors, push the connector into the positioner. To insure that the stipulated water resistance is maintained, push the cable adequately far into the position detector and correctly assemble either a waterproof gland or cable gland at the entry point.

If an electrical cable conduit is to be attached, remove the waterproof gland before attaching the conduit.

(If the product is purchased preassembled with a Yamatake actuator, the cable on the positioner unit is already removed. There will be a blind plug attached to the positioner unit connection screw. Remove the blind plug and then attach the cable.)

Disconnecting the SVP and feedback cable

(1) Unscrew the cable connector from the housing.

(2) Gently pull the connector assembly out of the housing.

(3) Remove the connector by lifting the locking tab of the connector slightly using a flat-head screwdriver and pulling the plug from the receptacle.

⚠ CAUTION

- While connecting and disconnecting any wiring and disassembly of the travel detector, make sure that no water or foreign objects enter the travel detector assembly or SVP conduits as this may adversely affect operation.
- Periodically tighten the waterproof gland and pressure-resistant packing type cable adaptor. Failure to do so may allow rainwater to enter the equipment and cause malfunctions.
- The cable cannot be removed from the position detector unit. However, the waterproof gland or pressure-resistant packing type cable adaptor can be removed.

Changing the feedback lever direction

Before attaching the valve travel detector to an actuator, you can change the mounting direction of the feedback lever.

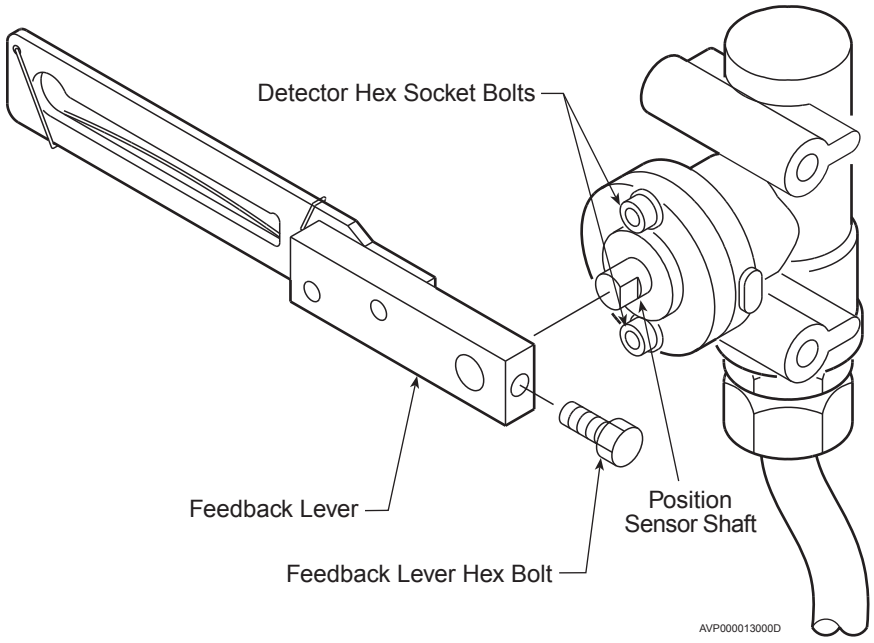


Figure 2-10 Disassembling the Feedback Lever

(1) Loosen the feedback lever hex bolt until the feedback lever can be removed.

(2) Remove the feedback lever.

(3) Rotate the position sensor shaft 180°.

(4) Reattach the feedback lever to the position sensor shaft and tighten the feedback lever hex bolt, making sure that the tip of the feedback lever hex bolt is touching the flat side of the position sensor shaft at a right angle.

~Note *Do not loosen the two hex socket bolts that fasten the position sensor to the valve travel detector housing.*

Attaching the valve travel detector to an actuator

(1) Attach the valve travel detector to the actuator.

(2) Set the valve to 50% opening either with an air pressure regulator or by using the valve's hand-wheel.

(3) Adjust the position of the feedback pin and valve travel detector so that the center of the valve travel detector and the feedback lever form a right angle (refer to “Connecting the feedback pin and the feedback lever” on page 2-5).

(4) Fasten the valve travel detector to the mounting plate with the included hex bolt and washer.

~Note *Do not point the cable removal port upwards.*

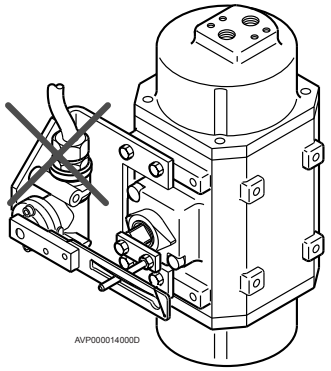


Figure 2-11 Bad example

Installing the SVP main unit

- Fasten the SVP to a 2in. pole where it will be free of vibration in excess of 2G (400 Hz).

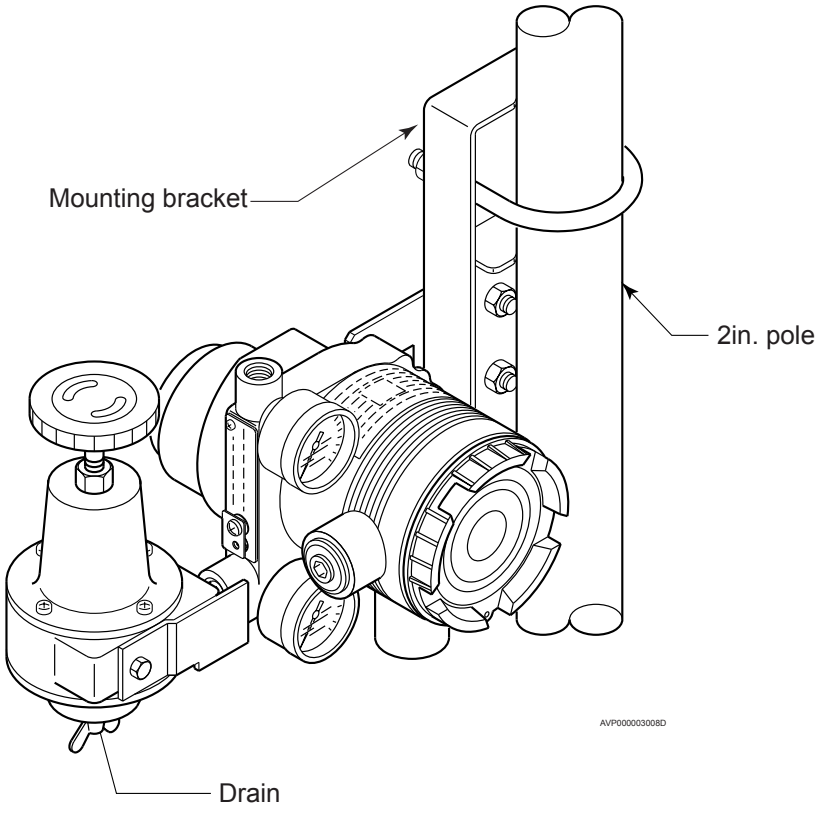


Figure 2-12 Pole Mounted SVP

⚠ CAUTION

When attaching an air pressure regulator to the SVP, make sure the regulator air vent is facing down to prevent the entry of rain.

Cable wiring between travel detector and SVP main unit

- Avoid a situation where the valve travel detector or SVP weighs directly on the cable. If this cannot be avoided, take steps such as attaching the cable to a column support.

⚠ WARNING

When connecting the cable between the valve travel detector and SVP, consider the full operation area needed for the valve and the maximum safety of the remote SVP and personnel.

2-4 : Installing a double-acting SVP for springless actuators

When an SVP is installed on a valve with a springless (double-acting) actuator, air pressure is needed for both the bottom and top of the actuator diaphragm to open or close the valve in proportion to a control signal. A reversing relay is used for this purpose.

Installing the relay

(1) Remove the dust plug from the output air connection.

(2) Screw the relay air connection of the reversing relay into the output air connection on top of the SVP.

~Note *Sealing tape is preferable to solid or liquid sealants for pipe joints to SVP air connections. Prevent sealing tape/sealant from entering pipes.*

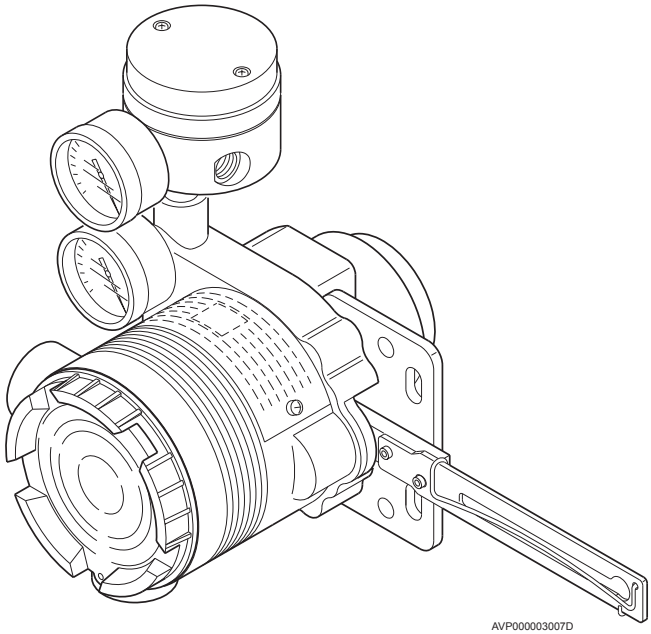


Figure 2-13 SVP with Reversing Relay Installed

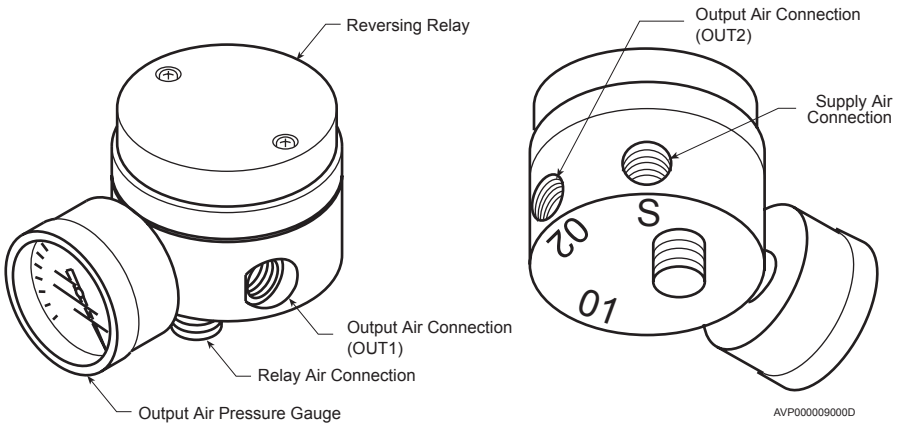


Figure 2-14 Reversing Relay

~Note *Make sure that the air piping connections and air pressure ranges as inscribed on the bottom of the reversing relay match those of your SVP.*

The reversing relay has two output air connections:

- Output air connection 1 (OUT1) which passes through the SVP's output air pressure
- Output air connection 2 (OUT2) with the balance of the supply pressure (minus SVP output air)

Installing a double-acting SVP with a KZ03 air pressure regulator with filter

A KZ03 air pressure regulator with filter has two output air connections. Connect one of the output air connections to the supply air connection on the SVP. Connect the other output air connection on the KZ03 to the supply air connection on the reversing relay using sealing tape.

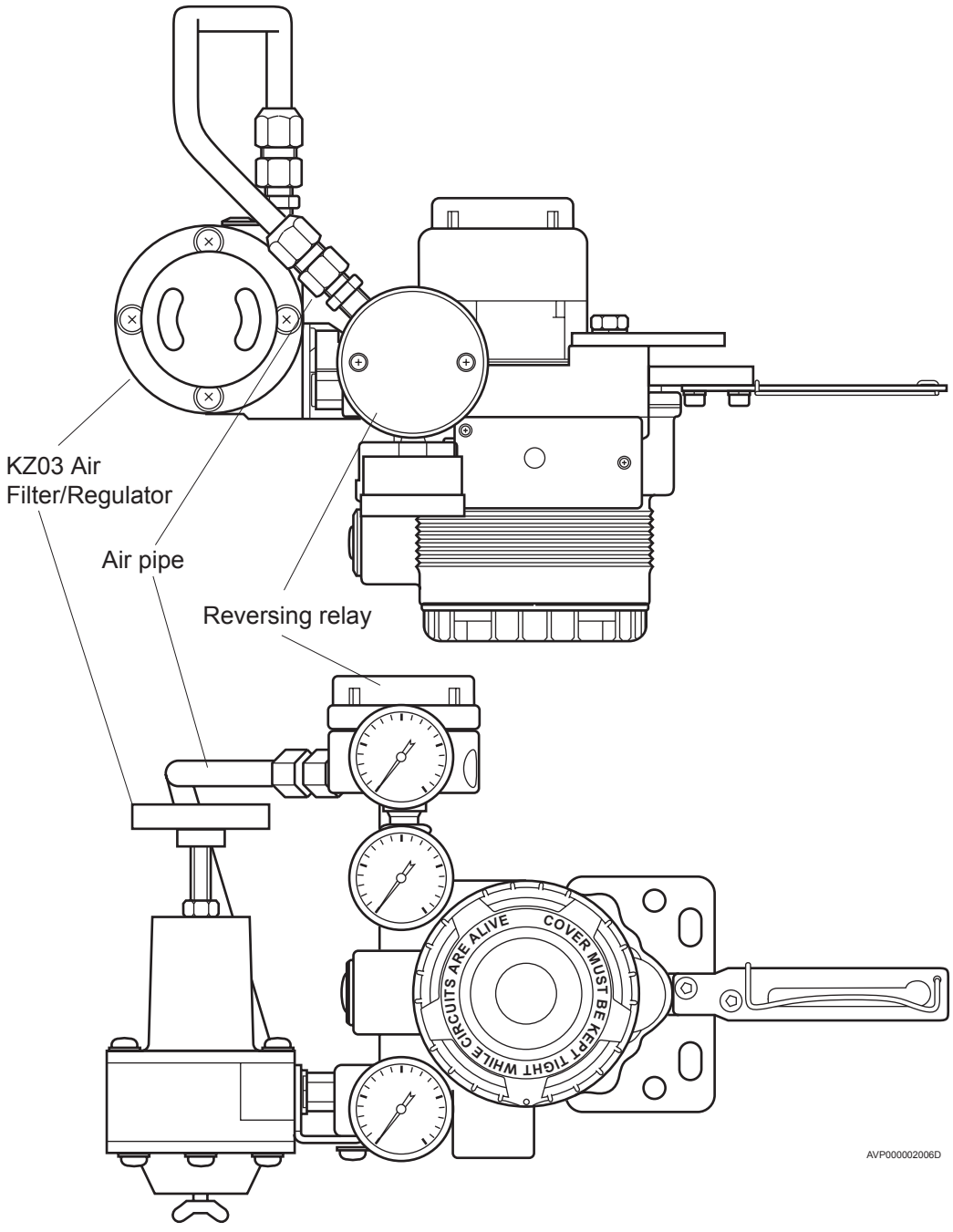


Figure 2-15 Double-acting SVP with KZ03 air pressure regulator with filter

Installing a double-acting SVP without an air pressure regulator

Using a T-connector, connect the air supply from the regulator and filter to both the SVP supply air connection and the supply air connection on the reversing relay using sealing tape. Make sure to connect only one regulator to an SVP and reversing relay combination.

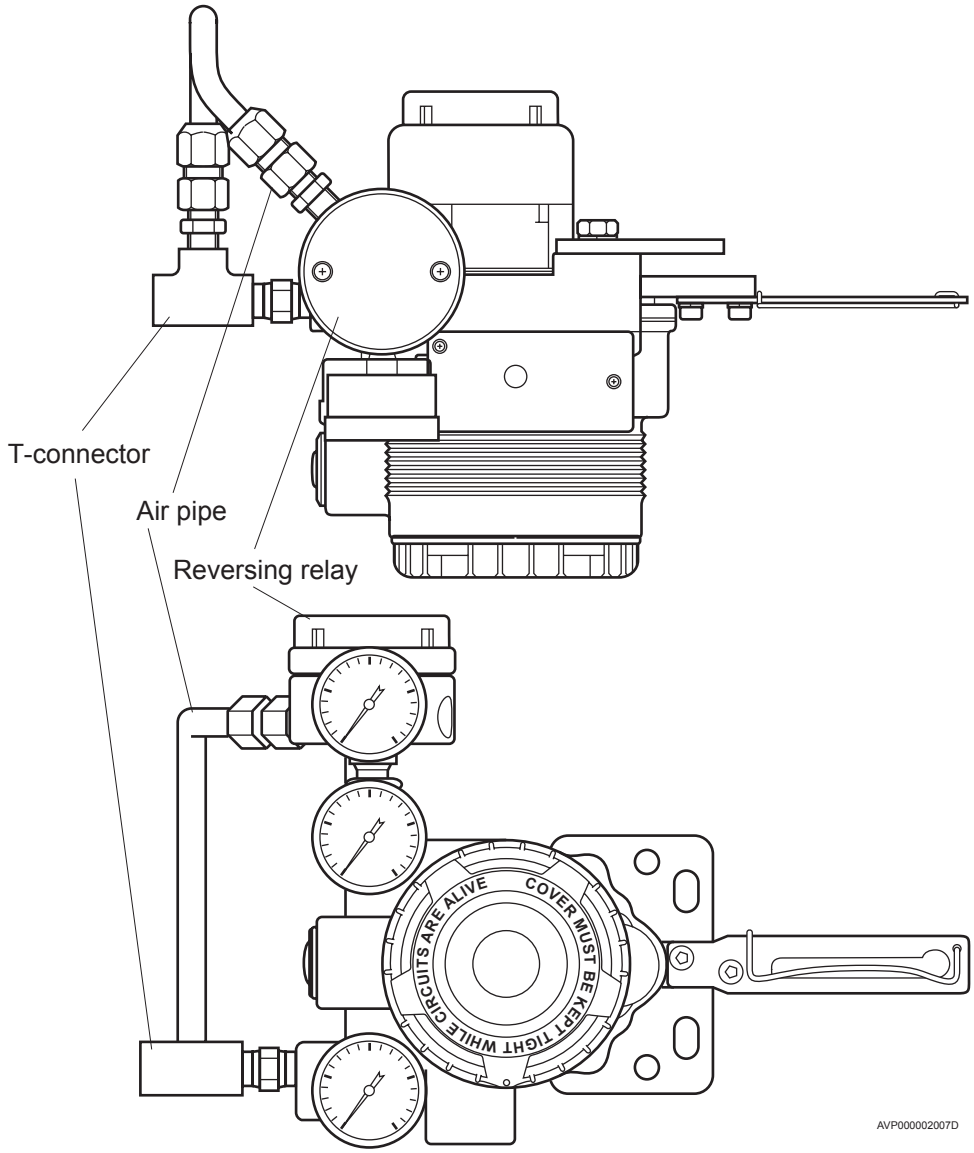


Figure 2-16 Double-acting SVP without air pressure regulator

Procedure for air pipe connection

Step	Procedure
1	Remove the dust plug from the output air connection on SVP.
2	Connect the joint to the air output connection using sealing tape. **~Note** *Sealing tape is preferable to solid or liquid sealant for pipe joints to SVP air connections. Prevent sealing tape/sealant from pipes.*
3	Connect the other air connection to each joints. **~Note** • *Completely flush pipes before use, checking for burrs and other problems.* • *Use the right length of piping, avoid excess lengths.*
4	Check for leaks after installation.

Installing a double-acting SVP onto diaphragm actuator

Reverse-Acting Actuator

Connect **OUT1** of the reversing relay to the bottom actuator air port.

Connect **OUT2** of the reversing relay to the top actuator air port.

Direct-Acting Actuator

Connect **OUT1** of the reversing relay to the top actuator air port.

Connect **OUT2** of the reversing relay to the bottom actuator air port.

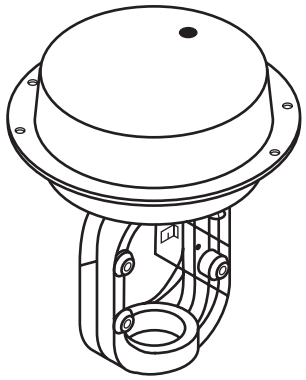


Figure 2-17 Diaphragm actuator

Installing a double-acting SVP onto a rotary actuator

Reverse-Acting Actuator (clockwise rotation with increased pressure)

Connect **OUT1** of the reversing relay to the actuator chamber that rotates the trunnion clockwise with added pressure.

Connect **OUT2** of the reversing relay to the actuator chamber that rotates the trunnion counter-clockwise with added pressure.

Reverse-Acting Actuator (counter-clockwise rotation with increased pressure)

Connect **OUT1** of the reversing relay to the actuator chamber that rotates the trunnion counter-clockwise with added pressure.

Connect **OUT2** of the reversing relay to the actuator chamber that rotates the trunnion clockwise with added pressure.

~Note *If the actual air piping is different than described above, the functions of the SVP as a positioner will not be affected. However, various valve and SVP diagnostics usually performed with the SFC will not provide accurate information. To utilize the capabilities of the SVP to the fullest, piping should match the diagrams and instructions above to maintain the relationship between the parameter settings described throughout this user manual.*

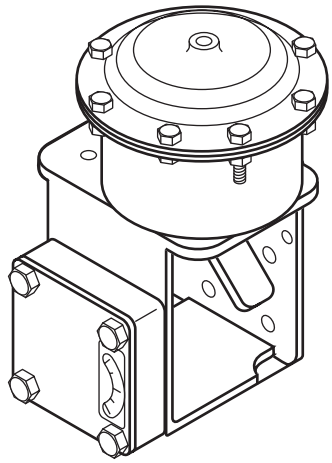


Figure 2-18 Rotary actuator

2-5 : Electrical wiring

2-5-1 Fieldbus topology

The FOUNDATION™ Fieldbus can be wired using either bus topology or tree topology (chicken foot). The following figure shows the two different topologies.

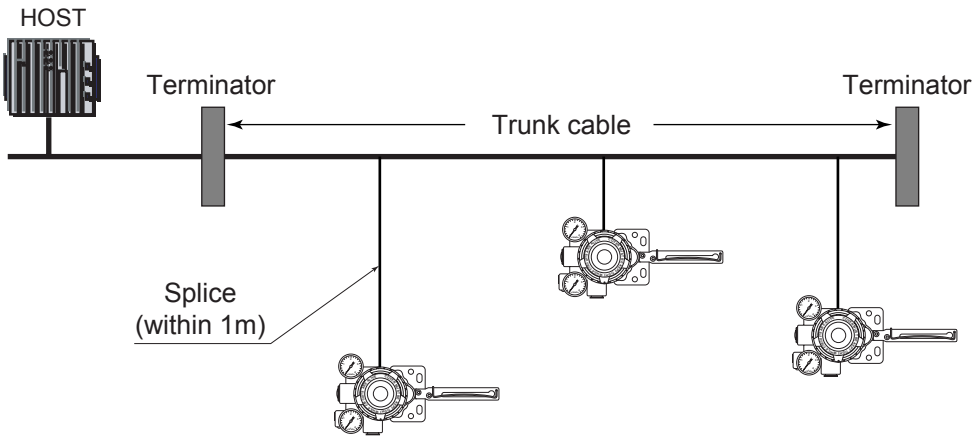


Figure 2-19 Bus topology

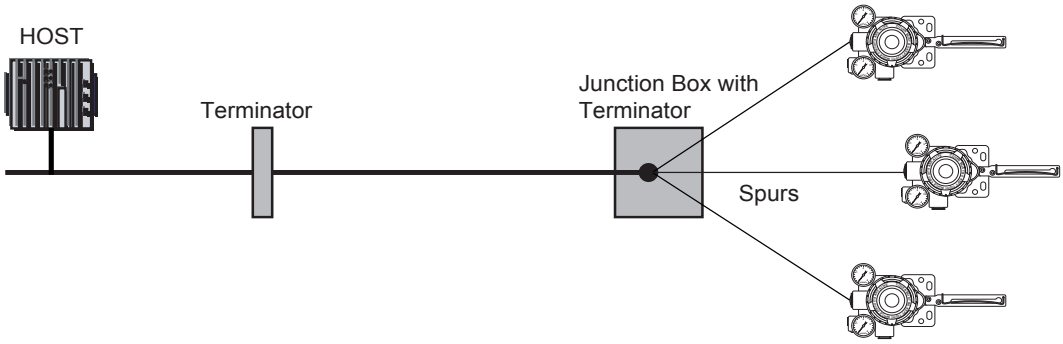


Figure 2-20 Tree topology (chicken foot)

2-5-2 Wiring for waterproof SVP

⚠ WARNING

- ELECTRICAL SHOCK HAZARD! Turn off power before performing any wiring.
- When using an explosion proof SVP in a hazardous location, wiring must be performed in accordance with the instructions in "2-5-3 : Wiring for explosion proof SVP" on page 2-24.
- Unused conduit ports must be completely sealed by attaching blind plugs.

Connection points.

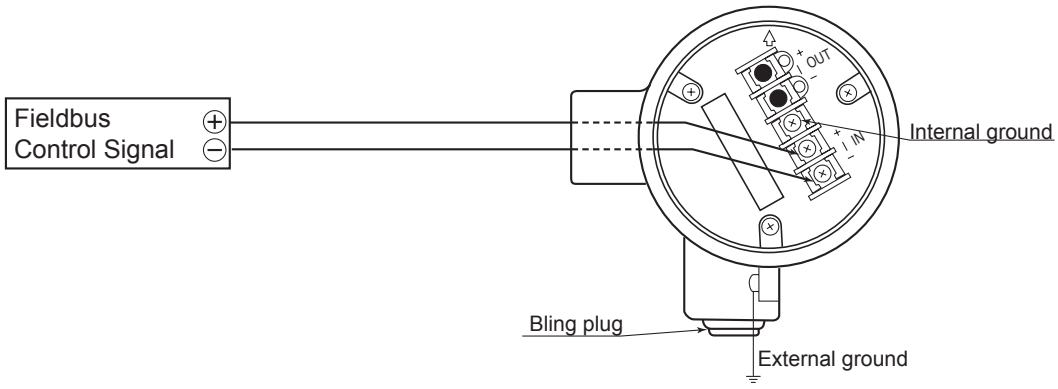


Figure 2-21 Electrical wiring connection points

Wiring guidelines

- Turn off power before performing any wiring.
- The SVP requires protective grounding on either the internal or external grounding terminal (<100Ω resistance)
- Avoid installing cables near devices that generate excessive noise such as large capacity transformers and motors. Do not lay signal/control cables in the same tray or duct as noisy switching power cables.

⚠ CAUTION

For stable and reliable field bus communication under possible electromagnetic disturbances, use shielded field bus cables, or isolate the cables on conductive cable trays or in a conduit.

~Note

- *It is preferable to use conduits and ducts to prevent water from entering and mechanical damage to electrical lines.*
  Also, always use water-tight adaptors at conduit connection ports.
- *Always follow the technical standards for electrical installation when performing wiring between the main unit and the valve travel detector for remote type models (model AVP203).*

Electrical wiring procedure

Step	Procedure
1	Unscrew the Phillips terminal box cover screw on the terminal box cover.
2	Unscrew the terminal box cover and remove it. **~Note** *Be careful not to scratch painted surfaces with tools at this time.*
3	Remove one or both of the supplied Yamatake conduit connection blind plugs depending on how you plan to wire the SVP.
4	Insert cables into the conduit connection. Strip and attach the appropriate wires to the terminals, checking for polarity. Crimp contacts with insulated sleeves are recommended. **~Note** *Be careful not to damage the cable sheath at this time.*
5	Tighten the terminal screws fully, to a torque of $1.5 N \cdot m$ $(15 kgf \cdot cm)$.
6	Apply adequate waterproofing measures to the conduits to prevent the entry of rainwater or water from any other source. **~Note** *We recommend the use of silicone resin based non-hardening sealant materials.*
7	Screw the terminal box cover onto the SVP until it is hand-tight. Use the Phillips terminal box screw to secure the terminal box cover. ⚠ **CAUTION** Be careful not to hurt your fingers on the edges of the cover and the screw threads. **~Note** *Be careful not to scratch painted surfaces with tools at this time.*

2-5-3 :Wiring for explosion proof SVP

Guidelines

Explosion proof requires special precautions and installation methods. Refer also to "2-5-2 Wiring for waterproof SVP" on page 2-21.

⚠ WARNING

- Tighten the case cover completely and lock.
- Clearly delineate safety responsibilities in operating procedures. Especially, for an explosion proof positioner, specify locking of the cover of the positioner case.

Locking

Before cabling can be performed. Use a 3mm hexagonal wrench to open the locking structure.

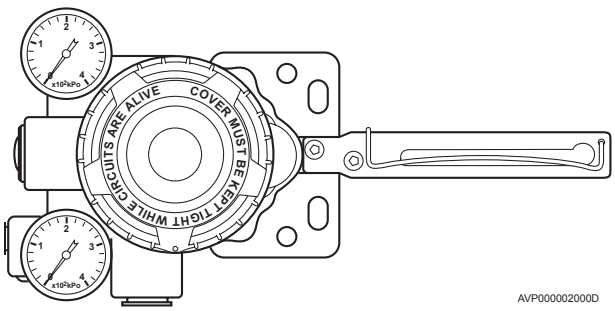


Figure 2-22 Unlock Positioner Case

Leading in external cables

Leading in cables to the equipment

Refer to the instructions in the chapter of about explosion proof (“Explosion-protected models” on page ii) in the front of this manual.

2-6 : Power supply

The SVP requires a 9 to 32V (current 25mA) power supply for fieldbus communication.

~Note *No power supply other than that for fieldbus communication can be used.*

2-7 : Cable gland and flameproof universal elbow for JIS Flameproof apparatus

JIS Flameproof SVP model is provided with a certified cable gland.

The cable gland seals the cable entering the SVP enclosure to withstand an internal explosion and protects the cable from damage mechanically and electrically.

Use the dedicated elbow if it is necessary to change the direction of the cable with these models.

⚠ WARNING

The constituent elements of the cable gland used with the integrated models (AVP303) and that used with the separated models (AVP203) differ. Be careful not to misuse these two adaptors.

The explosion-protection of the system will be invalid if any parts are not used properly.

Structure of the cable gland

The Flameproof cable gland is shown below in assembled and exploded views.

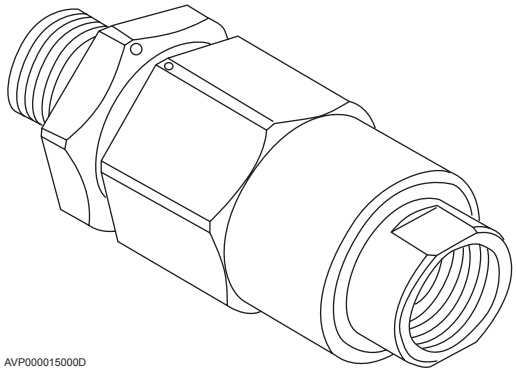


Figure 2-23 Cable gland (For models AVP303)

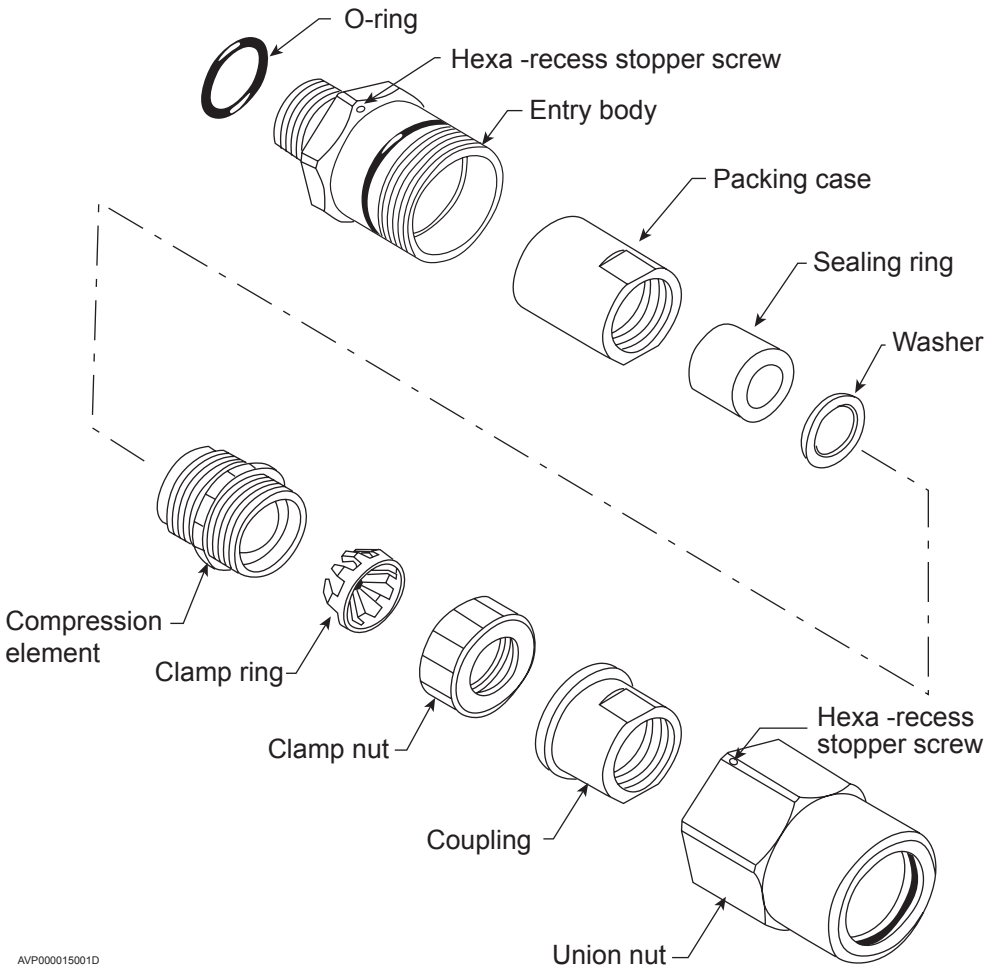


Figure 2-24 Constituent elements of cable gland (For models AVP303)

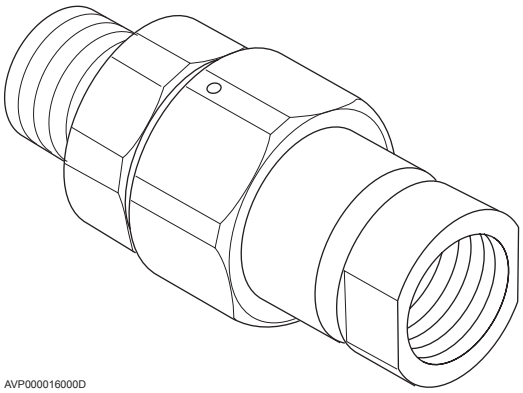


Figure 2-25 Cable gland (For models AVP203)

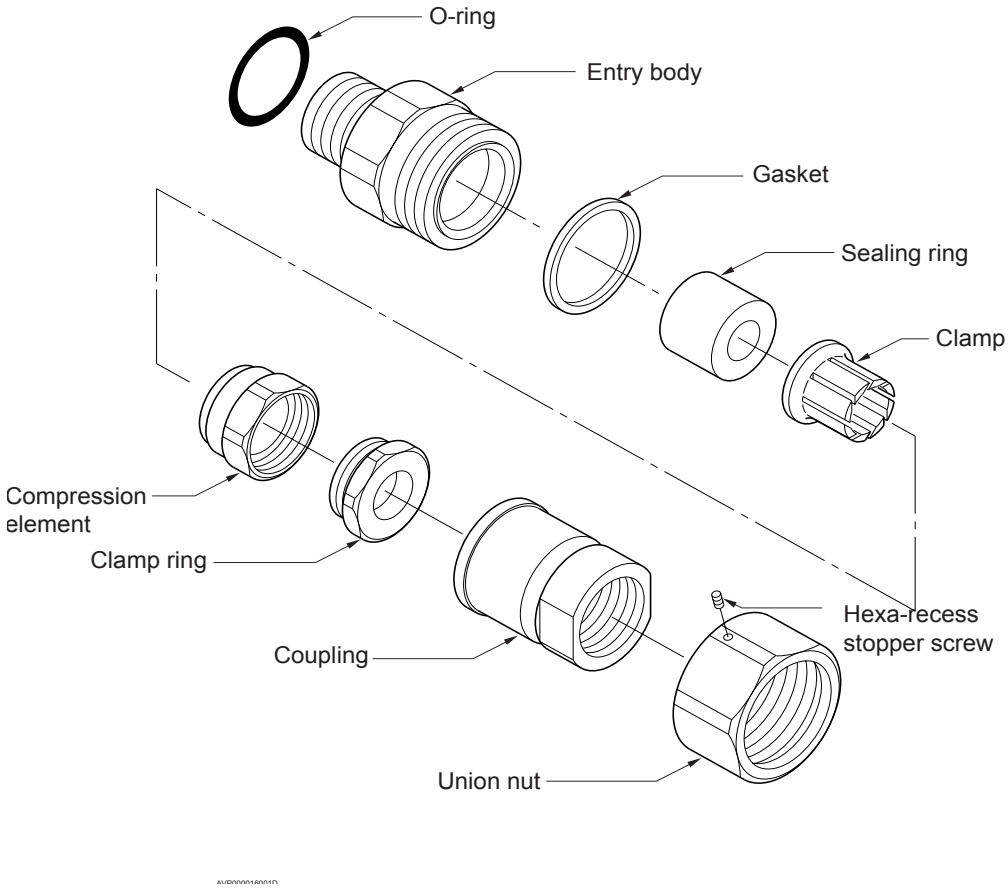


Figure 2-26 Contituent elements of cable gland (For models AVP203)

Structure of the flameproof universal elbow

The figure below shows the universal elbow.

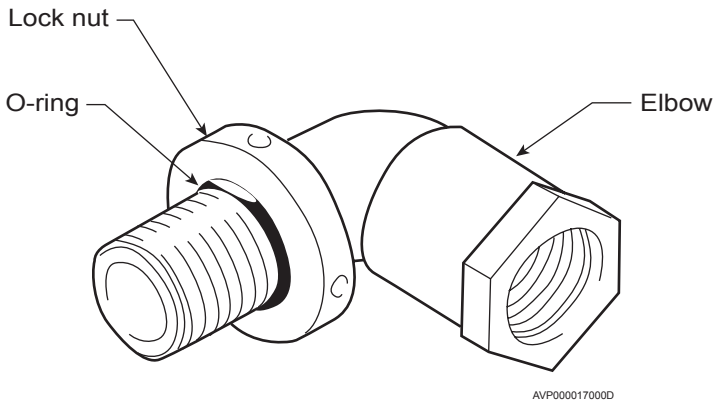


Figure 2-27 Explosion proof elbow

Mounting example

The flameproof cable gland and the universal elbow are used to connect the field wiring cable to the SVP enclosure as shown below.

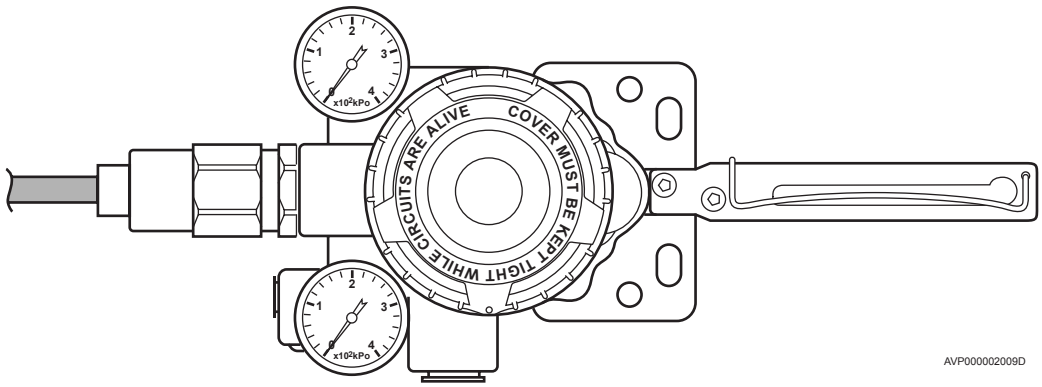


Figure 2-28 SVP fitted with cable gland

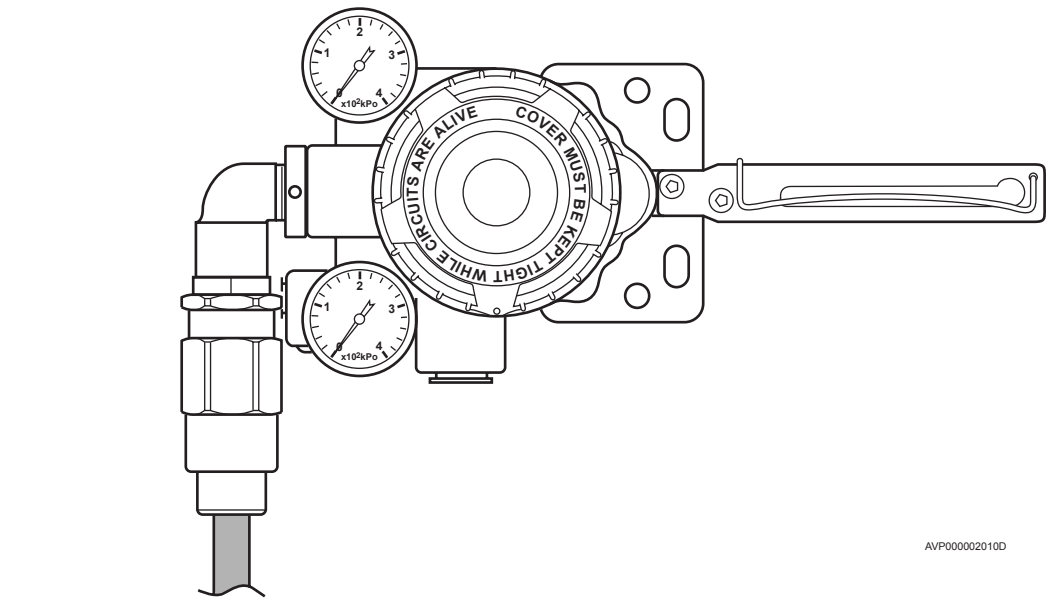


Figure 2-29 SVP fitted with universal elbow

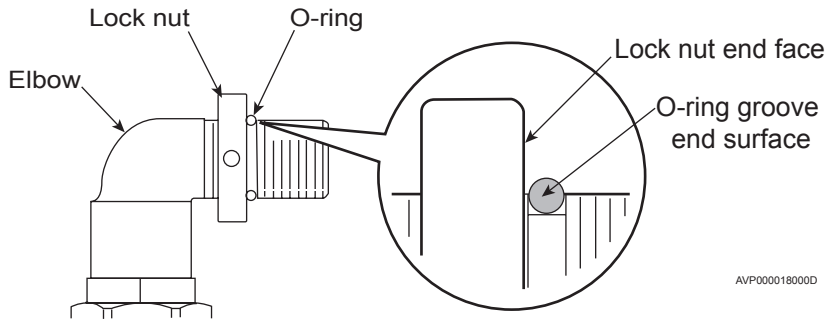
Mounting procedure for cable gland

The procedure for mounting the flameproof cable gland is given below.

Step	Procedure
1	Firmly tighten the entry body on the connection port and the universal elbow to hold it in place. Once held in place, tighten the hexa-recess stopper screw on the entry body (for models AVP303). **~Note** *Apply adequate waterproofing to these parts. We recommend the use of silicone resin based non-hardening seal materials.*
2	Refer to the illustrations and insert the cable carefully. **⚠ CAUTION** If the diameters of the cable and the packing do not match each other, the propagation of flame cannot be prevented. Refer to the table below and select a packing adaptor whose internal diameter matches the outer diameter of the cable. **Table 2-1: Integrated type** Cable outer diameter (mm) / Packing inner diameter (mm) / Notes 7.0~10.0 / 10 / Provided 10.1~12.0 / 12 / Built in **Table 2-2: Separated type** Cable outer diameter (mm) / Packing inner diameter (mm) / Notes 7.0~9.0 / 10 / Provided 9.1~11.0 / 11 / Built in 11.1~12.0 / 12 / Built in Use the provided clamp ring.
3	Fit the clamp nut onto the compression element and tighten it down to hold it in place.
4	Fit the packing case onto the compression element and tighten it down to hold it in place. **⚠ WARNING** To prevent injury due to spark travel, be sure to tighten down the packing adequately.
5	Pass the cable through the entry body and insert it into the terminal box.
6	Screw the union nut onto the entry body and tighten it down securely to hold it in place. Then, tighten the union nut's recess screw.

Mounting procedure for flameproof universal elbow

The procedure for mounting the flameproof universal elbow is given below.

step	Procedure
1	Align the end surface of the lock nut with the end surface of the O-ring groove as shown below.  *Figure 2-30 Arrangement of lock nut and O-ring*
2	Screw the flameproof universal elbow into the terminal box conduit connection port until the lock nut end surface hits the connection port end surface. **~Note** *Apply adequate waterproofing to these parts.*
3	Turn the flameproof universal elbow to position it in the desired direction. **~Note** *Do not loosen it more than 1 turn.*
4	Lock the flameproof universal elbow in place by tightening down the lock nut using the special tool.

Lead-in of cable for flameproof models other than models in accordance with JIS

If the SVP is to be used under the authorization other than that for the JIS Flameproof standards, the wiring of cables must be performed according to local regulations for electrical installations in explosive atmospheres.

Chapter 3 : Operation

Outline

This chapter describes the method of starting and stopping the operation of the SVP and its zero/span adjustment. If you have purchased your SVP as an independent unit, be sure to read Chapter 2 :Installation.

Fieldbus Configuration

This section describes a basic parameter setup procedure to connect the SVP to the Fieldbus network and an example of block configurations that may be useful to install the SVP as a key control element on the Fieldbus. Please refer to block parameter details in Chapter 4 :Parameter List.

3-1 : Fieldbus Communication Setup

To setup Fieldbus communication, refer to the following steps:

(1) Turn on the Fieldbus power supply. Make sure that the voltage across the IIN+ and IIN- terminals is between 9 and 32 volts.

(2) Locate the LAS (Lin Active Scheduler) device on the network, and set the network parameters according to the table below. Please note that since all the devices on the same Fieldbus network use the same value, the values that the slowest devices on the network can accommodate shall be set to the LAS.

Symbol	Parameter name	Range of Values
V (ST)	Slot Time	Greater than 5
V (MID)	Minimum Interframe Gap	Greater than 10
V (MRD)	Maximum Response Delay	V (MRD) x V (ST) shall be greater than 20
V (FUN)	First unpolednode number	Next of Host address shall be greater than 0×12
V (NUN)	Number of unpolednodes	MIN of instrument address -V (FUN)

~Note *An LAS requires parameters other than those listed here to operate. Please refer to the user's manual that comes with your LAS device.*

(3) If necessary, restart the LAS and make sure that the SVP appears on the Fieldbus network with one of default addresses ($0 \times F8$ through $0 \times FB$). If not, recheck the parameters above and cable connections to the SVP before calling our technical assistants.

From a Fieldbus configurator, assign the PD_TAG and the NODE_ADDRESS to the SVP. The default values of these parameters are shown in the table below. If they are set successfully, the SVP is communicating on the Fieldbus network.

Symbol	Parameter name	Range of Value	Default Values
PD_TAG	Physical Device Tag	32 character Max. by ASCII	None (32 spaces)
NODE_ADDRESS	Node Address	Min of BASIC devices address shall be smaller than $0 \times F7$	$0 \times F8$

~Note *PD_TAG and NODE_ADDRESS shall be unique among all the devices on the same Fieldbus network.*

If the same NODE_ADDRESS is assigned to two devices, one of them will change its address to a default address ($0 \times F8$ through $0 \times FB$)

3-2 : Auto-setup

Auto-setup is a unique program for automatically making various positioner adjustments.

After installing your SVP, auto-setup should be performed. The built-in zero-span adjustment switch on the SVP provides non-interactive closed and open valve position setting.

There are two ways to perform Auto-Setup.

- Using the external switch.
- Using the host system

~Note • *After auto-setup has been completed, verify valve operation by varying the input signal.*

• *After auto-setup, the SVP is calibrated to the fully shut (zero) and fully open (span) values of the valve. If the valve is not achieving the proper relationship between its travel and the control signal of the SVP, then adjustment of the zero-span must be done manually.*

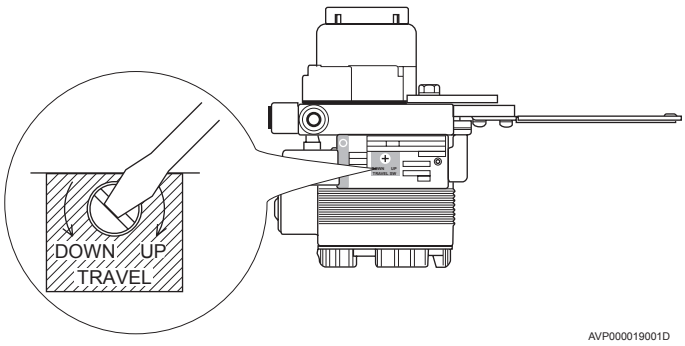


Figure 3-1 External zero-span adjustment switch

The following valve actuator characteristics are automatically detected during auto-setup:

- Zero-span adjustment

(However, as a default, the span point is taken to be 10% of the overstroke. If a span adjustment is performed after auto-setup is completed, change the overstroke value and save the changed value.)

- Actuator operation setup
- Lower Range Value (LRV) and Upper Range Value (URV) of input signal
  If actuator operation is reverse operation: LRV=4 mA, URV=20 mA
  If actuator operation is direct operation: LRV=20 mA, URV=4 mA
- Actuator size setting
- Hysteresis setting

⚠ WARNING

While auto-setup is running, the valve cycles from open to closed. Take appropriate measures to prevent injury to personnel and adverse effects on the process.

SVP setting

If the valve action parameters set up for the SVP in Table 3-1 and Table 3-2 are the reverse values, set the valve action to the reverse settings.

If the valve action parameters set up for the SVP in Table 3-1 and Table 3-2 are the direct values, no further parameter settings are required. (The SVP is shipped from the factory set to direct mode.)

It is recommended that auto-setup and initial calibration of your SVP be performed using the external zero-span adjustment switch on the SVP.

Because auto-setup and zero-span calibration must be observed for accurate valve positioning, these two steps will typically be performed by furning the external zero-span adjustment switch with a screwdriver.

Table 3-1 Integral SVP setting

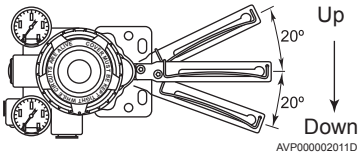
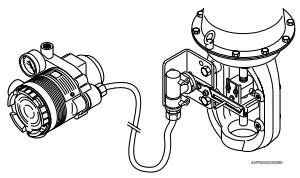
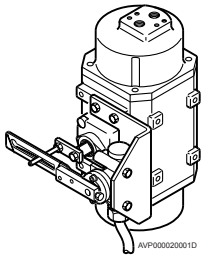
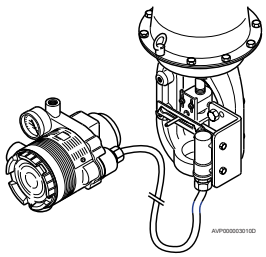
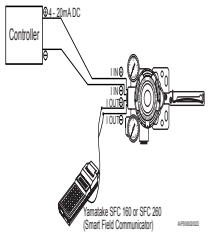
Lever	Valve Direction	Input signal	AVP Setting	
			Actuator Action	Valve Action
	Shut → Open	Direct Close: 100% Open: 0%	Reverse	Reverse
		Reverse Close: 0% Open: 100%	Direct	Reverse
	Open → Shut	Direct Close:,100% Open: 0%	Direct	Direct
		Reverse Close: 0% Open: 100%	Reverse	Direct

Table 3-2 Remote SVP setting

Valve travel	Direction position	Lever position	Lever movement	Valve direction	Input signal	AVP setting	
						Actuator action	Valve action *i
	Front	Right	Up→Down	Shut→Open	Direct action (Shut 100%, Open 0%)	Reverse	Reverse
					Reverse (Shut 0%, Open 100%)	Direct	Reverse
			Up→Down	Open→Shut	Direct action (Shut 100%, Open 0%)	Direct	Direct
					Reverse (Shut 0%, Open 100%)	Reverse	Direct
	Back	Left	Up→Down	Shut→Open	Direct action (Shut 100%, Open 0%)	Reverse	Reverse
					Reverse (Shut 0%, Open 100%)	Direct	Reverse
			Up→Down	Open→Shut	Direct action (Shut 100%, Open 0%)	Direct	Direct
					Reverse (Shut 0%, Open 100%)	Reverse	Direct
	Front	Right	Up→Down	Shut→Open	Direct action (Shut 100%, Open 0%)	Direct	Direct
					Reverse (Shut 0%, Open 100%)	Reverse	Direct
			Up→Down	Open→Shut	Direct action (Shut 100%, Open 0%)	Reverse	Reverse
					Reverse (Shut 0%, Open 100%)	Direct	Reverse
	Back	Left	Up→Down	Shut→Open	Direct action (Shut 100%, Open 0%)	Direct	Direct
					Reverse (Shut 0%, Open 100%)	Reverse	Direct
			Up→Down	Open→Shut	Direct action (Shut 100%, Open 0%)	Reverse	Reverse
					Reverse (Shut 0%, Open 100%)	Direct	Reverse

*~Note*i.Reverse means you push down to open, Direct means you push down to close.*

Initiating auto-setup on the host system

(1) Change the TARGET of MODE_BLK in the AO Transducer Block to O/S (Out of Service).

(2) Set the CAL_ENUM of CAL_CMD in the AO Transducer Block to 110.

(3) The SVP moves the stem from the fully close position to the fully open position twice, then staggering around 50% 0pening. The SVP is now calibrating itself and it takes two to three minutes.

(4) Verify if the CAL_STATUS in the AO Transducer Block is 110 (Auto set-up Success).

(5) Change the STATUS of FINAL_VALUE in the AO Transducer Block to GOOD (0x80).

(6) Check the valve response by changing the FINAL_VALUE in the AO Transducer BLK to any number. This is to verify if the SVP has been successfully calibrated.

(7) Conduct the Zero and Span adjustments (See section "3-3: Zero-Span adjustment" on page 3-6) if necessary.

Initialing auto-setup using the external switch

(1) Change the TARGET of MODE_BLK in the AO Transducer Block to O/S (Out of Service).

(2) Change the STATUS of FINAL_VALUE in the AO Transducer Block to GOOD (0x80).

(3) Set the VALUE greater than the value of FINAL_VALUE_CUTOFF_HI (default value is 109) in the AO Transducer Block.

(4) With a flat tail screwdriver, turn the Zero-Span Adjustment Switch 90 degrees clockwise and hold it until the valve stem moves. (In the case of a RSA or VR actuator, turn the switch counterclockwise.) It will take about three seconds for the valve stem to move. Release the screwdriver once the valve stem moves.

(5) The SVP moves the stem from the fully close position to the fully open position twice, then staggering around 50% opening. The SVP is now calibrating itself and it takes two to three minutes.

(6) When the auto-setup is complete, the valve stem will move to value which is set in step(3) position.

(7) Check the valve response by changing the FINAL_VALUE in the AO Transducer BLK to any number. This is to verify if the SVP has been successfully calibrated.

(8) Conduct the Zero and Span adjustments (See section "3-3: Zero-Span adjustment" on page 3-6) if necessary.

~Note • *The SVP calibrates itself to set the FINAL_VALUE_CUTOFF_HI+1% value to be the span, including over-stroke. Since a 100% opening position varies from valve to valve, manual span adjustments may be required if the SVP is connected to a valve other than one made by Yamatake's.*

- *In some cases where the actuator is too small (diaphragm capacity is less than 850cm^3), or valve stroke is too short (less than 14.3mm), the automatic setup may not function correctly. If this occurs, please contact our field service engineers.*

- *Change the VALVE_ACTION in the AO Transducer Block to 0 (Direct) to 1 (Reverse), or 1 (Reverse) to 0 (Direct) if the zero position and span position are reverse.*

- *In the case of the ACTUATOR_SIZE in the AO Transducer is 0, in the Auto set-up calibration, the value of the ACTUATOR_SIZE is not changed.*

- *Set the ACTUATOR_SIZE in the AO Transducer Block to 7, 8 or 9 before conducting the Auto set-up if the actuator is RSA or VR which Yamatake's actuator for type VFR, eccentric rotary valve.*

3-3 : Zero-Span adjustment

The SVP is provide with an external zero-span adjustment function. This enables adjustment to be mode by using screw-driver.

~Note *After auto set-up, the SVP will calibrate the forced full open value to a default value of 109% of the rated stroke. Therefore, if you calibrate the span following the procedures described in this section after auto set-up and are using the SVP with the forced full open function out of the default value, please recalibrate the forced full open value to suit your requirement after performing manual span adjustment.*

Zero-Span adjustment using external switch

The zero-span adjustment screw functions as an on/off switch. When rotated 90° either clockwise or counterclockwise, it switches the unit on, and when turned back, it switches it off. Adjust the position by turning the unit on and off repeatedly. Record the position at which the valve switches off.

Since the zero point and span adjustments do not interfere with each other, they can be adjusted independently.

- Adjustment direction

  When the adjustment screw is turned in the clockwise direction, the feedback lever moves up.

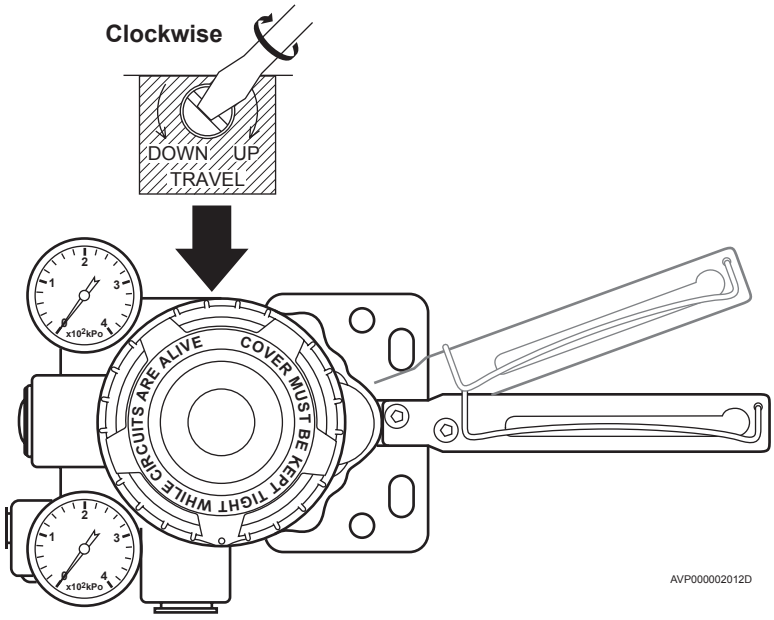


Figure 3-2 External switch turning (counter wise)

When the adjustment screw is turned in the counterclockwise direction, the feedback lever moves down.

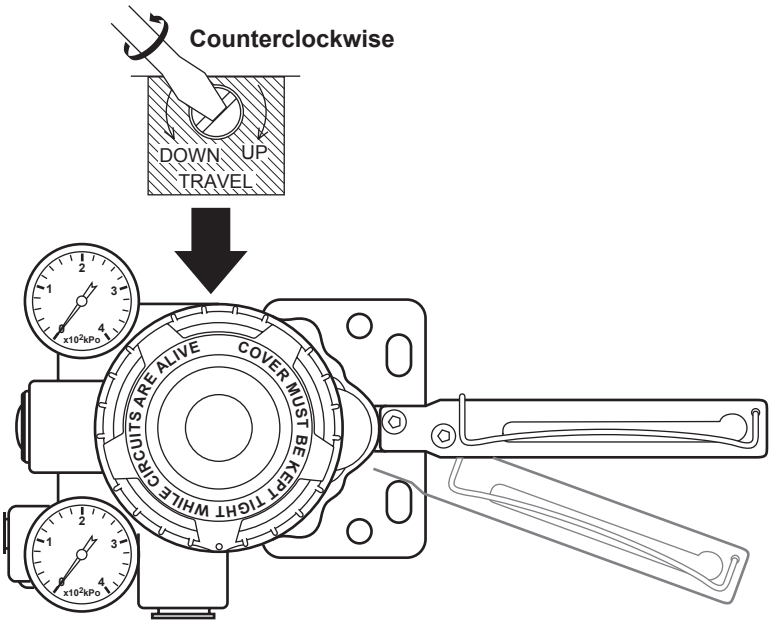


Figure 3-3 External switch turning (counterclockwise)

~Note *The external zero-span adjustment structure uses a magnet to turn a reed switch on and off.*

Procedure to adjust valve to fully shut position (zero)

The procedure for adjusting the valve to the fully shut position (zero) is given below.

Step	Procedure
1	Change the TARGET of MODE_BLK in the AO Transducer Block to O/S (Out of Service).
2	Change the STATUS of FINAL_VALUE in the AO Transducer Block to GOOD (0x80) and set the VALUE to 0.
3	With a flat screwdriver, turn the Zero-span adjustment switch clockwise (UP direction) to move the feedback lever upward, or turn it counter-clockwise (DOWN direction) to move the feedback lever downward. The SVP will recall the valve stem position of when the Zero-span adjustment Switch was last returned to center.

~Note
- *The valve stem does not move if the Forced fully closed function is working. The forced fully closed value shall be a negative value (default value is 0.5%) to conduct the zero adjustment using external switch. (See section "3-4:Forced fully closed and forced fully open adjustment" on the page 3-9.)*

Procedure to adjust valve to fully open position (span)

The procedure for adjusting the valve to the fully open position (span) is given below.

Step	Procedure
1	Change the TARGET of MODE_BLK in the AO Transducer Block to O/S (Out of Service).
2	Change the STATUS of FINAL_VALUE in the AO Transducer Block to GOOD (0x80) and set the VALUE to 100.
3	With a flat screwdriver, turn the Zero-span adjustment switch clockwise (UP direction) to move the feedback lever upward, or turn it counter-clockwise (DOWN direction) to move the feedback lever downward. The SVP will recall the valve stem position of when the Zero-span adjustment switch was last returned to center.

~Note *After completing the valve fully open and fully closed position (zero and span) adjustments, check the valve operation by varying the input signal and verifying that the valve goes to the correct position corresponding to the signal.*

3-4 : Forced fully closed and forced fully open adjustment

- This procedure allows you to set the current input values (%) that forcibly fully opens and fully closes the valve.
- The valve will be fully closed at input values less than the forced fully closed value, and it will be fully open at input values greater than the forced fully open value.
- The forced fully closed and forced fully open values can be set independently as percentages or IIN of the current input value.
- The figure below presents an overview of the I/O characteristics when the forced fully closed and forced fully open values have been set.

~Note • *These parameters must be set to values such that the forced fully open value is strictly less than the forced fully open value.*

~Note • *If the span setting is adjusted after an auto-setup operation, change the forced fully open value (FULL OPEN VALUE) to be 1% less than the overstroke percentage.*

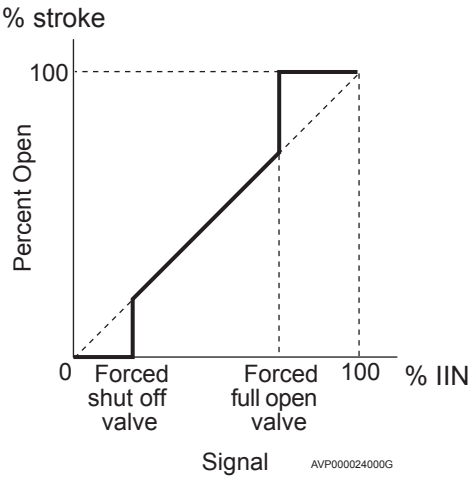


Figure 3-4 Forced fully open and forced fully closed values

Procedure

Step	Procedure
1	The SVP forces the valve to close if the OUT parameter becomes smaller than the Forced close value. To set it, use the FINAL_VALUE_CUTOFF_LO parameter of the AO Transducer Block.
2	The SVP forces the valve to open if the OUT parameter becomes greater than the Forced Open value. To set it, use the FINAL_VALUE_CUTOFF_HI parameter of the AO Transducer Block.

Chapter 4 : Parameter List

The SVP includes two PID function blocks as well as the following blocks: a resource block, an AO transducer block, an AO function block and a diagnostic function block. Other than the transducer and diagnostic function blocks, all blocks support the Fieldbus standard. In addition to the standard parameters, the transducer blocks have added parameters that are unique to those devices.

The table below describes the items mentioned in the parameter tables for each block.

Item	Description
Parameter	A standard parameter name as stipulated by the Fieldbus Foundation. Parameters that are unique to Yamatake are assigned unique names.
Description	Describes the corresponding parameter.
Subparameter	Some parameters have a hierarchical structure. Parameters at a lower level are shown as subparameters.
Access attributes	The following symbols are used to indicate attributes related to parameter access. S: Static data - Indicates that the parameter value cannot be overwritten during the execution of a block to which it belongs. (Data such as fixed data for individual device types and various configuration data) D: Dynamic data - Indicates that the parameter value can be modified by the block itself or by the user during the execution of a block to which it belongs. These are parameters that are changed occasionally or continuously according to the system state, device, or process that is in progress. These values are lost if a power outage occurs. (Data such as process measurement values and device execution status parameters) N: Nonvolatile data - These parameters, like dynamic data, may change during system operation. However, they are stored in nonvolatile memory and their most recent value is not lost if a power outage occurs. (This includes data such as PID setpoint values that must be restarted from the most recent value after a power outage occurs.) R: Parameters can only be read out. R/W: Parameters can be read out and modified.
Size	Indicates the size of the block in bytes.
Range	Range (upper limit, lower limit) of values that can be taken by each parameter. Note that these values are for the standard specifications, and are not all the values that can be taken at any time according to the state of the device or block. Rather, these are values that may be subject to other limitations within these ranges.
Initial value	Indicates the initial value when shipped from the factory.
Unit	The engineering units for the parameter. When a parameter name, e.g. “PV”, is entered in this column, it indicates that the units follow those of the indicated parameter.

4-1 : Resource Block Parameters

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
1	ST_REV	Indicates the revision number of the static data that belongs to the block. If a parameter for which the access attribute is “S-” is modified, it is incremented by 1 (0×0001) each modification.	---	S-R	2	$0 \sim 0 \times FFFF$	0	Absolute No.
2	TAG_DESC	Tag name for the user-defined resource block. This is used for reference by the host, and is unrelated to the operation or execution of the resource block itself.	---	S-R/W	32	----	32 space characters	Absolute No.
3	STRATEGY	An arbitrary group number for the resource block. (This parameter is unrelated to device operation. It is provided so that the different types of blocks can be grouped arbitrarily so that they can be identified more easily in later database search operations.)	---	S-R/W	2	$0 \sim 0 \times FFFF$	0	Absolute No.
4	ALERT_KEY	Identification number for the related plant-internal devices. (This parameter is unrelated to device operation. It is provided so that the different types of blocks can be grouped arbitrarily so that they can be identified more easily in later database search operations.)	---	S-R/W	1	$1 \sim 0 \times FF$	0	Absolute No.
5	MODE_BLK	Resource block mode parameter set. MODE_BLK has the following structure. • Target: Parameter for the mode set by the host. • Actual: Indicates the value of the current mode. • Permitted: Indicates the value of the mode used by the resource block. • Normal: Indicates the value of the mode that should be the normal state.	Target	N-R/W	1	AUTO (processing execution) or O/S (executing or stopped) "4-6-2 : MODE_BLK Parameter"		Absolute No.
			Actual	D-R	1			
			Permitted	S-R/W	1			
			Normal	S-R/W	1			
6	BLOCK_ERR	Indicates the error status concerning the resource block.	Bit string	D-R	2			Absolute No.
7	RS_STATE	Indicates the device operating state.	Unsigned8	D-R	1	0=Undefined (undefined) 1=Start/Restart (start processing in progress) 2=Initialization (initialization in progress) 3=Online Linking (connection confirmation in progress) 4=Online (operating) 5=Standby (standby state) 6=Failure (A failure occurred)		Absolute No.
8	TEST_RW	Parameter used for applicability testing of communication software. This parameter is not used by users.	---	D-R/W	112	----	Arbitrary	Absolute No.
9	DD_RESOURCE	(Unused)	---	S-R	32	----	-----	Absolute No.
10	MANUFAC_ID	Unique identification number for manufacturers registered with the Fieldbus Foundation.	---	S-R	4	----	0×000DFC96 (YAMATAKE)	Absolute No.

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
11	DEV_TYPE	Identification number that indicates the model of the device as defined by the manufacturer.	---	S-R	2	0~0 × *FFFF*	0×0203 (AVP303)	Absolute No.
12	DEV_REV	Revision number of the device as defined by the manufacturer.	---	S-R	1	0~0 × *FF*	Differs depending on the device.	Absolute No.
13	DD_REV	Revision number of the DD file that applies to this device.	---	S-R	1	0~0 × *FF*	Differs depending on the device.	Absolute No.
14	GRANT_DENY	Parameter that enables/disables access to the parameters in this block from the human interface or the host. Whether or not this parameter is used depends on settings in the host.	Grant (Enable)	D-R/W	1	0 or 1	All bits set to 0.	Absolute No.
			Deny (Disable)	D-R/W	1	0 or 1	All bits set to 0.	Absolute No.
15	HARD_TYPES	Indicates the type of the hardware in which this resource block exists.	---	S-R	2	Fixed at 0×4000 (continuous variable output) by the SVP.	0×4000	Absolute No.
16	RESTART	Restarts the device manually. In the specifications, there are several types of restart which the user can select from.	---	D-R/W	1	1: RUN 2: Restart resource 3: Restart with defaults 4: Restart processor		Absolute No.
17	FEATURES	Indicates the current operating state based on the content set with FEATURE_SEL in the option settings for device usage.	---	S-R	2	"4-6-1 : Parameters"	0 × *F*500	Absolute No.
18	FEATURE_SEL	Sets the device usage options.	---	S-R/W	2	"4-6-1 : Parameters"	0	Absolute No.
19	CYCLE_TYPE	Indicates the current operating state based on the content set with CYCLE_SEL for the function block execution method. (The SVP only supports “scheduled” Function.)	---	S-R	2	0×8000: Scheduled (Follows the LAS schedule) 0×4000: Completion of block (When the block that was executing immediately before completes) 0×2000: Manufacturer specific	0 × 8000	Absolute No.
20	CYCLE_SEL	Sets the function block execution method.	---	S-R/W	2	As above	0	Absolute No.
21	MIN_CYCLE_T	Indicates the minimum period for which a function block can be executed.	---	S-R	4	0~2^{32}-1	4000 (125ms)	1/32 msec
22	MEMORY_SIZE	Indicates a memory capacity that enables the addition of function blocks as a guideline. (Unused)	---	S-R	2	0~65535		Kbytes
23	NV_CYCLE_T	Indicates the minimum required time to write “N-” type parameters to nonvolatile memory.	---	S-R	4	0~2^{32}-1	0	1/32 msec
24	FREE_SPACE	Indicates a memory capacity that enables the configuration addition as a guideline. (Unused)	---	D-R	4	0~100.0	0	%

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
25	FREE_TIME	Indicates the load state as how much available time there is compared with the function block execution time. (Unused)	---	D-R	4	0~100.0	0	%
26	SHED_RCAS	Sets the write timeout time for a setpoint value change (SPC) from the host connected by the RCAS_IN parameter when the function block mode is RCAS. If the write of the setpoint value is not performed within the time specified by this parameter, the function block automatically switches to the mode set in advance with the SHED_OPT parameter in the function block.	---	S-R/W	4	0 or a positive value	640000 (20sec)	1/32 msec
27	SHED_ROUT	Sets the write timeout time for a output value change (DDC) from the host connected by the ROUT_IN parameter when the function block mode is ROUT.If the write of the output value is not performed within the time specified by this parameter, the function block automatically switches to the mode set in advance with the SHED_OPT parameter in the function block.	---	S-R/W	4	0 or a positive value	640000 (20sec)	1/32 msec
28	FAULT_STATE	Indicates the current fault state (the output state when a fault has occurred in the function block) in the AO block. The value of this parameter can be set either in PID block execution or from the SET_FSTATE parameter of the next item.	---	N-R	1	1: Clear (The normal state) 2: Active (The abnormal state)	1	Absolute No.
29	SET_FSTATE	Forcibly sets the AO block to the fault state. The FAULT_STATE parameter is set to Active.	---	D-R/W	1	1: Off 2: Set	1	Absolute No.
30	CLR_FSTATE	Clears the FAULT_STATE parameter. The FAULT_STATE parameter is cleared as long as there are no specific conditions for transitioning to the fault state in a SET_FAULT state parameter or function block execution.	---	D-R/W	1	1: Off 2: Clear	1	Absolute No.
31	MAX_NOTIFY	In alert transmission operations due to an alert object, indicates the maximum capacity of the device in terms of the maximum number of alarms that can be sent when confirmations are not performed by the host.	---	S-R	1	0~3	3	Absolute No.
32	LIM_NOTIFY	Limit value for the actual use of the alert transmissions described above as stipulated by user settings.	---	S-R/W	1	0~3	3	Absolute No.
33	CONFIRM_TIME	The maximum wait time for a confirmation for an alert transmission from a device. The alert will be resent if this time is exceeded without receiving a confirmation.	---	S-R/W	4	$0 \sim 2^{32}-1$	640000 (20sec)	1/32 msec.
34	WRITE_LOCK	This parameter disables writes to all parameters within the device other than this parameter itself.	---	S-R/W	1	1: Unlocked (write enabled), 2: Locked (Write disabled)	1	Absolute No.

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
35	UPDATE_EVT	Alert parameter issued when a change occurs in resource block fixed data (items that have an access attribute of "S-" or "N-"). It has the following structure. • Unacknowledged: The acknowledgement state • Update state: The update state • Time stamp: The time changed • Static revision: The revision number after the update Relative index: Parameter identification number for the parameter changed	Unac-knowl-edged	D-R	1	"Unacknowledged": 0=Undefined (no change) 1=Acknowledged (acknowledged) 2=Unacknowledged (unacknowledged) "Update state": 0=Undefined (no change) 1=Update reported (The update was reported.) 2=Update not reported (The update was not reported.)		Absolute No.
			Update State	D-R	1			
			Time stamp	D-R	8			
			Static Revision	D-R	2			
			Relative Index	D-R	2			
36	BLOCK_ALM	Parameter that indicates the configuration of the resource block and error states during execution. It has the following structure. • Unacknowledged: Occurrence verification state • Alarm state: State in which an alarm has occurred • Time stamp: Time of alarm occurrence/recovery • Subcode: Alarm content subcode Value: Alarm value	Unac-knowl-edged	D-R	1			Absolute No.
			Alarm State	D-R	1			
			Time stamp	D-R	8			
			Subcode	D-R	2			
			Value	D-R	1			
37	ALARM_SUM	Parameter that summarizes the state of the resource block BLOCK_ALM • Current: The currently occurring state • Unacknowledged: Alarm verification state • Unreported: The state of reporting to the host. • Disabled: Alarm detection disablement state	Current	D-R	2	In the resource block, only the state of the block alarm is the object of this parameter.		Absolute No.
			Unac-knowl-edged	D-R	2			
			Unre-ported	D-R	2			
			Disabled	S-R/W	2			
38	ACK_OPTION	Enables or disables automatic confirmation on the occurrence of a block alarm (BLOCK_ALM) for a resource block. Automatic confirmation refers to confirmation over the communication system without any operator actions, and is seen as equivalent.	---	S-R/W	2	0: Disabled, 1: Enabled	0 × 0000	Absolute No.
39	WRITE_PRI	Defines the priority of the warning issued when a WRITE_LOCK is set to the write enabled (unlocked) state.	---	S-R/W	1	0~15	0	Absolute No.

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
40	WRITE_ALM	Alarm parameter that is issued when the resource block WRITE_LOCK parameter is unlocked.	Unacknowledged	D-R	1			Absolute No.
			Alarm State	D-R	1			
			Time stamp	D-R	8			
			Subcode	D-R	2			
			Value	D-R	1			
41	ITK_VER	Version number of the mutual operability test tool.	---	D-R	1	SVP	4	Absolute No.
42	SOFTWARE_REV	Indicate the software revision of the device.	---	S-R	4			Absolute No.
43	SIM_ACTIVE_SW	Activate or inactivate the simulation function.	---	D-R/W	2	0: Inactive 1: Active	0	Absolute No.

4-2 : AO Transducer Block Parameters (Base INDEX: 1100)

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
1	ST_REV	Indicates the revision number of the static data that belongs to the block. If a parameter for which the access attribute is “S-” is modified, it is incremented by 1 (0x0001) each modification.	---	S-R	2	0~65535	0	Absolute No.
2	TAG_DESC	Tag name for the user-defined transducer block. This is used for reference by the host, and is unrelated to the operation or execution of the function block itself.	---	S-R/W	32		32 space characters	Absolute No.
3	STRATEGY	An arbitrary group number for the transducer block. (This parameter is unrelated to block operation. It is provided so that the different types of blocks can be grouped arbitrarily so that they can be identified more easily in later database search operations.)	---	S-R/W	2	0~65535	0	Absolute No.
4	ARERT_KEY	Identification number for the related plant-internal devices. (This parameter is unrelated to block operation. It is provided so that the different types of blocks can be grouped arbitrarily so that they can be identified more easily in later database search operations.)	---	S-R/W	1	1~255	0	Absolute No.
5	MODEL_BLK	Transducer block mode parameter set. MODE_BLK has the following structure. • Target: Parameter for the mode set from the host. • Actual: Indicates the value of the current mode. • Permitted: Indicates the value of the mode used by the function block. • Normal: Indicates the value of the mode that should be the normal state.	Target	S-R/W	1	AUTO (processing is executed) or O/S (execution is disabled) "4-6-2 : MODE_BLK Parameter".	O/S	Absolute No.
			Actual	S-R	1			
			Permitted	S-R/W	1			
			Normal	S-R/W	1			
6	BLOCK_ERR	Indicates the error status for the transducer block.	----	D-R	2			Absolute No.
7	UPDATE_EVT	Alert parameter issued when a change occurs in transducer block fixed data (items that have an access attribute of “S-” or “N-”). It has the following structure. • Unacknowledged: The acknowledgement state • Update state: The update state • Time stamp: The time changed • Static revision: The revision number after the update • Relative index: Parameter identification number for the parameter changed	Unacknowledged	D-R	1	“Unacknowledged”: 0=Undefined (no change) 1=Acknowledged (acknowledged) 2=Unacknowledged (unacknowledged) “Update state”: 0=Undefined (no change) 1=Update reported (The update was reported.) 2=Update not reported (The update was not reported.)		Absolute No.
			Update Status	D-R	1			
			Time Stamp	D-R	8			
			Static Revision	D-R	2			
			Relative Index	D-R	2			

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
8	BLOCK_ALM	Parameter that indicates the configuration of the transducer block and error states during execution. It has the following structure. • Unacknowledged: Occurrence verification state • Alarm state: State in which an alarm has occurred • Time stamp: Time of alarm occurrence/recovery • Subcode: Alarm content subcode • Value: Alarm value	Unacknowledged	D-R	1			Absolute No.
			Alarm State	D-R	1			
			Time Temp	D-R	8			
			Subcode	D-R	2			
			Value	D-R	1			
9	TRANSDUCER_DIRECTORY	The transducer block header information. The user does not use this parameter directly.	---	S-R	2n			Absolute No.
10	TRANSDUCER_TYPE	Indicates the type (e.g., pressure, temperature, or valve positioner) of the device.	---	N-R	2	100~107, 65535	106 (advanced valve positioner)	Absolute No.
11	XD_ERROR	Indicates the I/O Failure when an error occurs related to a transducer block.		D-R	1	0=Good 22=I/O Failure		Absolute No.
12	COLLECTION_DIRECTORY	Parameter set definition information provided so that the host can access the parameters that have the same attributes efficiently. (Unused for SVP)	---	N-R	2n			Absolute No.
13	FINAL_VALUE	Most recent value of the final output value sent to an actuator such as a control valve or damper.	Status	N-R	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.
			Value	N-R	4			FINAL_VALUE_RANGE
14	FINAL_VALUE_RANGE	Range of the SVP control final output parameter FINAL_VALUE. This must be set to the same value as the XD_SCALE parameter in the AO function block. In the SVP, the standard range is 0 to 100%.	EU_100	S-R	4	100	100	XD_SCALE
			EU_0	S-R	4	0	0	XD_SCALE
			Unit Index	S-R	2	"4-6-7 : UNIT_INDEX Parameter"	%	Absolute No.
			Decimal Point	S-R	1	0~255	1	Absolute No.
15	FINAL_VALUE_CUTOFF_HI	Forced fully open setpoint value of position control output.	---	S	4	FINAL_VALUE_RANGE, +∞	109	FVR
16	FINAL_VALUE_CUTOFF_LO	Forced fully closed setpoint value of position control output.	---	S	4	FINAL_VALUE_RANGE, -∞	0.5	FVR
17	FINAL_POSITION_VALUE	Most recent value of the final output value sent to an actuator such as a control valve or damper.	Status	N-R	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.
			Value	N-R	4			FINAL_VALUE-RANGE
18	SERVO_GAIN	The PID gain for position control of the positioner in control valves or similar devices.	---	S-R	4		0.0	Absolute No.

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
19	SERVO_RESET	The PID integration constant for position control of the positioner in control valves or similar devices.	-----	S-R	4		0.0	Sec.
20	SERVO_RATE	The PID differentiation constant for position control of the positioner in control valves or similar devices.	-----	S-R	4		0.0	Sec.
21	ACT_FAIL_ACTION	Unused	-----	S-R	1			
22	ACT_MAN_ID	Unused	-----	N-R	4			
23	ACT_MODEL_NUM	Unused	----	N-R	32			
24	ACT_SN	Unused	----	N-R	32			
25	VALVE_MAN_ID	Unused	----	N-R	4			
26	VALVE_MODEL_NUM	Unused	----	N-R	32			
27	VALVE_SN	Unused	----	N-R	32			
28	VALVE_TYPE	Unused	----	N-R	1			
29	XD_CAL_LOC	Parameter that holds the location where positioner calibration was performed most recently.	----	S-R/W	32			
30	XD_CAL_DATE	Parameter that holds the date and time where positioner calibration was performed most recently.	----	S-R/W	7			
31	XDCAL_WHO	Parameter that records the ID number of the person who performed positioner calibration most recently.	----	S-R/W	32			
32	CAL_CMD	The SVP calibrate command. Calibration, or resetting the calibration value, is performed by writing the appropriate value as shown in the Range column to this parameter. Calibration and configuration tools that support DD (device description) display the character strings for the values shown in the Range column and support the above operations by selection of the corresponding character string.	----	D-R/W	1	0: No operation 1: Open set (Start span calibration) 2: Shut set (start zero calibration) 110: Auto set-up 250: IO reset 253: User save 255: Correct reset	0	
			----	D-R/W	4	(Unused)	0.0	Absolute No.

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
33	CAL_STATUS	Indicates the calibration status.	----	D-R	1	0: No operation 1: Open set success (span calibration finished) 2: Zero set access (zero caliibration finished) 11: Open set failed (span calibration failure) 12: Zero set failed (zero calibration failure) 110: Auto set-up success 111: Auto set-up failed 220: IO reset failed 221: User saved failed 222: Correct reset	0	Absolute No.
34	MEASUREMENT_STATUS	Indicates the results of the individual items in the SVP self diagnostics. This parameter has a multi-byte structure. Byte 1 (the first byte) includes diagnostic results for failures related to device operation itself. Bytes 2 and later include results for warnings and adjustment and operating status items.	Byte1	D-R	1	Bit 0 = 1: Position sensor (VTD) error Bits 1 to 3: Unused. Bit 4 = 1: Nonvolatile memory (NVM) error Bit 5 = 1: RAM error Bit 6 = 1: ROM error Bit 7 = 1: A/D converter error	All bits set to 0.	Absolute No.
			Byte2	D-R	1	Bit 0 = 1: Positioner internal temperature error Bit 1: Unused. Bit 2 = 1: Automatic setup execution in progress Bit 3 = 1: Automatic setup execution in progress Bit 4 = 1: Automatic setup execution in progress Bits 5 to 7: Unused.	All bits set to 0.	Absolute No.
			Byte3	D-R	1	Bit 0: Unused. Bit 1 = 1: External zero or span adjustment allowed state Bit 2 = 1: Electro-pneumatic conversion module error Bit 3 = 1: Actuator forcible opened or forcible closed state Bits 4 to 7: Unused.	All bits set to 0.	Absolute No.
			Byte4	D-R	1	Bits 0 to 7: Unused.	All bits set to 0.	Absolute No.
35	ELECT_TEMP	SVP electrical circuit block temperature	----	D-R	4		-----	°c

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
36	PID_PARAM Note 1: The set of parameters listed here is used to control the position of a positioner such as a control valve or a damper, and differ from the parameters used for process control, that is, the PID function block parameters. Note 2: This set of parameters is for the "PID with GAP" provided for SVP use. Available only for "0: User specific" for ACTUATOR_SIZE. Note 3: When GE=0, GP, GI and GD are not used.	The control gain within the differential (PV - SP) gap used for control valve position control by the SVP.	P	S-R/W	4		1.2	Absolute No.
		Integration constant for the differential gap mentioned above.	I	S-R/W	4		4	Sec.
		Differentiation constant for the differential gap mentioned above.	D	S-R/W	4		0.5	Sec.
		Number that indicates the width of the differential gap as a percentage.	GE	S-R/W	4		0.0	%
		The control gain outside of the differential gap.	GP	S-R/W	4		0.7	Absolute No.
		Integration constant outside of the differential gap mentioned above.	GI	S-R/W	4		4	Sec.
		Differentiation constant outside of the differential gap mentioned above.	GD	S-R/W	4		0.5	Sec.
37	EPM_DUTY	Electro-pneumatic conversion module load current expressed as a percentage. If positive numbers are written, the MODE will change to "Manual", when negative numbers are written, the MODE will be released.	----	D-R	4		-----	%
38	POSITIONER_ID	Eight-digit ID number that can be stored in the SVP.	ID	S-R/W	8		XXXXXXXX	Absolute No.
39	SCRATCH_PAD	Note or comment with up to 32 characters.	SCRPD	S-R/W	32		XXXX...XXXX	Absolute No.
40	PACKING_TYPE	The friction type of the gland packing.	HYS	S-R/W	1	0: Heavy 1: Medium 2: Light	0	Absolute No.
41	ACTUATOR_SIZE	The size of the actuator	PARAM	S-R/W	1	0: User specific 1~9: PARAM 1~2	1	Absolute No.
42	POSITIONER_ACTION	The operating direction of the position (Direct or reverse)	----	S-R/W	1		0	Absolute No.
43	ACTUATOR_ACTION	The operating direction of the actuator (Direct or reverse)	----	S-R/W	1		1	Absolute No.
44	POSITIONER_TYPE	Unused	----	S-R/W	1		0	Absolute No.
45	VALVE_ACTION	The operating direction of the valve (Flow to open or flow to close)	----	S-R/W	1		0	Absolute No.
46	VALVE_MOTION	Unused	----	S-R/W	1		0	Absolute No.
47	FLOW_CHARACTERISTIC	Positioner I/O characteristics (linear, EQ%, QO, USER)	----	S-R/W	1		0	
48	CAL_OPEN	The angle when open	----	S-R/W	4		60.001	
49	CAL_SHUT	The angle when shut	----	S-R/W	4		-60.001	
50	CONVERSION_INPUT	The 16 points of input data used when USER is selected as the positioner I/O characteristics.	----	S-R/W	4×16			

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units
51	CONVERSION_OUTPUT	The 16 points of output data (position) used when USER is selected as the positioner I/O characteristics.	----	S-R/W	4×16			
52	VTD_DEGREE	Indicate the angle of value travel detector.		D-R	4			deg.

~Note *The writable parameters can be written into the memory, but only if the mode is out of service.*

4-3 : AO Function Block Parameters (Base INDEX: 1200)

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
1	ST_REV	Indicates the revision number of the static data that belongs to the block. If a parameter for which the access attribute is "S-" is modified, it is incremented by 1 (0×0001) each modification.	---	S-R	2	0~65535	0	Absolute No.	
2	TAG_DESC	Tag name for the user-defined function block. This is used for reference by the host, and is unrelated to the operation or execution of the function block itself.	---	S-R/W	32		32 space characters	Absolute No.	
3	STRATEGY	An arbitrary group number for the function block. (This parameter is unrelated to block operation. It is provided so that the different types of blocks can be grouped arbitrarily so that they can be identified more easily in later database search operations.)	---	S-R/W	2	0~65535	0	Absolute No.	
4	ALERT_KEY	Identification number for the related plant-internal devices. (This parameter is unrelated to block operation. It is provided so that the different types of blocks can be grouped arbitrarily so that they can be identified more easily in later database search operations.)	---	S-R/W	1	1~255	0	Absolute No.	
5	MODE_BLK	Function block mode parameter set. MODE_BLK has the following structure. • Target: Parameter for the mode set from the host. • Actual: Indicates the value of the current mode. • Permitted: Indicates the value of the mode used by the function block. • Normal: Indicates the value of the mode that should be the normal state.	Target	N-R/W	1	ROUT, RCAS, CAS, AUTO, MAN, or O/S. "4-6-2 : MODE_BLK Parameter"		Absolute No.	
			Actual	D-R	1				
			Permitted	S-R/W	1				
			Normal	S-R/W	1				
6	BLOCK_ERR	Indicates the error status for the function block.	---	D-R	2			Absolute No.	
7	PV	Value that has been converted to engineering units based on the range set in PV_SCALE for the value in the AO block READBACK parameter. When has position feedback from, for example, a control valve, that value (the transducer block FINAL_POSITION_VALUE) is reflected.	Status	D-R	1	Good: Good value Uncertain: Unknown Bad: Unusable		Absolute No.	
			Value	D-R	4			PV	
8	SP	The value, expressed in engineering units, of the setpoint value (target value) from the upstream function block that is performing AO output.	Status	N-R	1	Good: Good value Uncertain: Unknown Bad: Unusable		Absolute No.	
			Value	N-R	4	PV_SCALE +/-10%		PV	
9	OUT	The AO block output, which is output to a transducer block. The units are the same as those used in the transducer block. (For the SVP, the units will be percent.)	Status	N-R/W	1	Good: Good value Uncertain: Unknown Bad: Unusable		Absolute No.	
			Value	N-R/W	4	XD_SCALE +/-10%		XD	

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
10	SIMULATE	Simulate the read-back value from the AO block to a transducer block downstream from the AO block can be set manually. • Simulate status: Status of the read-back value. • Simulate value: The read-back value. • Transducer status: Read-back value status within the transducer block. • Transducer value: Read-back value within the transducer block. • Enable/disable: Control switch for the simulation function. (enable/disable)	Simulate Status	D-R/W	1	Good: Good value Uncertain: Unknown Bad: Unusable		Absolute No.	
			Simulate Value	D-R/W	4	Same value as "FINAL_POSITION_VALUE" in "4-2 : AO Transducer Block Parameters (Base INDEX: 1100)"		XD	
			Transducer Status	D-R	1	Good: Good value Uncertain: Unknown Bad: Unusable		Absolute No.	
			Transducer Value	D-R	4	See AO Transducer block		XD	
			Enable/disable	S-R/W	1	0 (not initialized) 1 (disable) 2 (enabled)	1: disable	Absolute No.	
11	PV_SCALE	Range used for converting a value in engineering units output from an upstream control block (such as a PID block) to a percentage. For normal PID control, this parameter is set to the same value as the PID block OUT_SCALE.	EU_100	S-R/W	4		100	PV	Can only be changed when the mode is MAN.
			EU_0	S-R/W	4		0	PV	
			Unit Index	S-R/W	2	"4-6-7 : UNIT_INDEX Parameter"	%	Absolute No.	
			Decimal Point	S-R/W	1	0~255	1	Absolute No.	
12	XD_SCALE	Range used for converting to a value in engineering units for output to a downstream transducer block. For normal use, the range 0.0 to 100.0% is used for this range.	EU_100	S-R/W	4	Same as XD	100	XD	Can only be changed when the mode is MAN.
			EU_0	S-R/W	4	Same as XD	0	XD	
			Unit Index	S-R/W	2	"4-6-7 : UNIT_INDEX Parameter"	%	Absolute No.	
			Decimal Point	S-R/W	1	0~255	1	Absolute No.	
13	GRANT_DENY	Parameter that enables/disables access to the parameters in this block from the human interface or the host. Whether or not this parameter is used depends on settings in the host. This parameter has no effect on block operation.	Grant	D-R/W	1	0 or 1	All bits set to 0.	Absolute No.	
			Deny	D-R/W	1	0 or 1	All bits set to 0.	Absolute No.	
14	IO_OPT	Parameter that sets the options for an output function.	---	S-R/W	2	0 (invalid) or 1 (valid). "4-6-6 : IO_OPTS Parameter"	All bits set to 0.	Absolute No.	Can only be changed when the mode is O/S.
15	STATUS_OPTS	Controls various option settings provided in relation to the OUT (PID output) parameter status information.	---	S-R/W	2	0 (invalid) or 1 (valid). "4-6-5 : STATUS_OPTS Parameter"	All bits set to 0.	Absolute No.	Can only be changed when the mode is O/S.

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
16	READBACK	The read back position of the actuator (FINAL_POSITION_VALUE of the transducer block) converted to the XD_SCALE (the range conversion factor between the AO block and the transducer block). For the SVP, this will be in units of percent for control valve and damper positions.	Status	D-R	1	Good: Good value Uncertain: Unknown Bad: Unusable	Absolute No.	16	READBACK
			Value	D-R	4	---	XD		
17	CAS_IN	Input value of a setpoint output to the AO block. This parameter is normally connected to the OUT parameter (output value) of a control block such as a PID block. This value is used as the AO block setpoint (SP) when the AO block mode is CAS.	Status	N-R/W	1	Good: Good value Uncertain: Unknown Bad: Unusable	Absolute No.	17	CAS_IN
			Value	N-R/W	4	---	PV		
18	SP_RATE_DN	Rate of change limit values for SP (output setpoint values from higher level blocks). Individual settings are provided for changes in the upward and downward directions. These rate of change limits are valid when the mode is AUTO, CAS, or RCAS.	---	S-R/W	4	0 or a positive value	+∞	PV/Sec.	
19	SP_RATE_UP		---	S-R/W	4	0 or a positive value	+∞	PV/Sec.	
20	SP_HI_LIM	Upper and lower setpoint value limits for SP (output setpoint values from higher level blocks).	---	S-R/W	4	PV_SCALE (EU_100) +10%	100	PV	
21	SP_LO_LIM		---	S-R/W	4	PV_SCALE (EU_0) - 10%	0	PV	
22	CHANNEL	Specifies the number of hardware units (transducer blocks) that are the objects of control of AO block output.	---	S-R/W	2	1	1	Absolute No.	Can only be changed when the mode is O/S. Always 1 for the SVP.
23	FSTATE_TIME	Failsafe processing is performed when a fault occurs in either a value or communication either between field devices, or in an AO block output setpoint (CAS_IN) connection from the host. This parameter sets (in seconds) the time interval in which the settings must be updated once a fault is detected. Failsafe processing based on the IO_OPTS and FSTATE_VAL settings is performed at the timeout time. (For example, the mode is set to MAN and the final value is retained.)	---	S-R/W	4	A Positive value	0	Sec.	
24	FSTATE_VAL	In the fault state processing described above under FSTATE_TIME, if the safety value is a fixed value of either fully open or fully closed, then the value is stored in this parameter. Note that specification with the IO_OPTS parameter that this parameter be used is required at the same time.	---	S-R/W	4	PV_SCALE +/-10%	0	PV	
25	BKCAL_OUT	Value that is fed back to the BKCAL_IN parameter of an upstream block (PID or other calculation) for use in the upstream calculation. Either the post-limiter SP or PV value (that is, the actuator position readback value after conversion to engineering units) in the AO block is connected to the BLCAL_OUT parameter. This is specified with the IO_OPTS parameter.	Status	D-R	1	Good: Good value Uncertain: Unknown Bad: Unusable		Absolute No.	
			Value	D-R	4	---		PV	
26	RCAS_IN	Input value used when control is performed directly through the AO block output from the host. When the mode is RCAS, this value is used as the AO block SP (output setpoint value).	Status	N-R/W	1	Good: Good value Uncertain: Unknown Bad: Unusable		Absolute No.	
			Value	N-R/W	4	---		PV	

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
27	SHED_OPT	In remote output from the host specifies the processing when a write of the setpoint value (RCAS_IN) times out. The time at which a timeout is detected is set separately using the block SHED_RCAS.	---	S-R/W	1	"4-6-3 : SHED_OPT Parameter"	0	Absolute No.	
28	RCAS_OUT	Output for use with output limit conditions or initialization when changing modes. This parameter is output to the host when control is performed directly through the AO block output from the host. The setpoint value after rate of change or HILO limits have been applied is connected to RCAS_OUT within the AO block.	Status	D-R	1	Good: Good value Uncertain: Unknown Bad: Unusable		Absolute No.	
			Value	D-R	4	---		PV	
29	UPDATE_EVT	Alert parameter issued when a change occurs in function block fixed data (items that have an access attribute of "S-"). It has the following structure. • Unacknowledged: The acknowledgement state • Update state: The update state • Time stamp: The time changed • Static revision: The revision number after the update • Relative index: Parameter identification number for the parameter changed	Unacknowl-edged	D-R	1	"Unacknowledged": 0=Undefined (no change) 1=Acknowledged (acknowledged) 2=Unacknowledged (unacknowledged) "Update state": 0=Undefined (no change) 1=Update reported (The update was reported.) 2=Update not reported (The update was not reported.)		Absolute No.	
			Update State	D-R	1				
			Time Stamp	D-R	8				
			Static Revision	D-R	2				
			Relative Index	D-R	2				
30	BLOCK_ALM	Parameter that indicates the configuration of the function block and error states during execution. It has the following structure. • Unacknowledged: Occurrence verification state • Alarm state: State in which an alarm has occurred • Time stamp: Time of alarm occurrence/recovery • Subcode: Alarm content subcode • Value: Alarm value	Unacknowl-edged	D-R	1			Absolute No.	
			Alarm State	D-R	1				
			Time Stamp	D-R	8				
			Subcode	D-R	2				
			Value	D-R	1				

4-4 : PID Function Block Parameters (PID1 BAse INDEX:1300, PID2 Base INDEX:1400)

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
1	ST_REV	Indicates the revision number of the static data that belongs to the function block. If a parameter for which the access attribute is “S-” is modified, it is incremented by 1 (0x0001) each modification.	---	S-R	2	0~65535	0	Absolute No.	
2	TAG_DESC	Tag name for the user-defined function block. This is used for reference by the host, and is unrelated to the operation or execution of the function block itself.	---	S-R/W	32		32 space characters	Absolute No.	
3	STRATEGY	An arbitrary group number for the function block. (This parameter is unrelated to block operation. It is provided so that the different types of blocks can be grouped arbitrarily so that they can be identified more easily in later database search operations.)	---	S-R/W	2	0~65535	0	Absolute No.	
4	ALERT_KEY	Identification number for the related plant-internal devices. (This parameter is unrelated to block operation. It is provided so that the different types of blocks can be grouped arbitrarily so that they can be identified more easily in later data-base search operations.)	---	S-R/W	1	1~255	0	Absolute No.	
5	MODE_BLK	Function block mode parameter set. MODE_BLK has the following structure. • Target: Parameter for the mode set from the host. • Actual: Indicates the value of the current mode. • Permitted: Indicates the value of the mode used by the function block. • Normal: Indicates the value of the mode that should be the normal state.	Target	N-R/W	1	ROUT, RCAS, CAS, AUTO, MAN, or O/S "4-6-2 : MODE_BLK Parameter"		Absolute No.	
			Actual	D-R	1				
			Permitted	S-R/W	1				
			Normal	S-R/W	1				
6	BLOCK_ERR	Indicates the error status for the function block.	---	D-R	2			Absolute No.	
7	PV	The value after application of the primary delay filter based on the time constant set with PV_FTIME for in IN parameter (input value from another block) to the PID block. Inputs to PID calculations are expressed in engineering units.	Status	D-R	1	Good: Good value, Uncertain: Unknown, Bad: Unus-able		Absolute No.	
			Value	D-R	4	---		PV	
8	SP	Value that indicates, in engineering units, the setpoint value (target value) used in PID control calculations.	Status	N-R/W	1	Good: Good value, Uncertain: Unknown, Bad: Unus-able		Absolute No.	
			Value	N-R/W	4	PV_SCALE +/-10%		PV	

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
9	OUT	Parameter that indicates the PID calculation output in engineering units.	Status	N-R/W	1	Good: Good value, Uncertain: Unknown, Bad: Unus-able		Absolute No.	
			Value	N-R/W	4	OUT_SCALE +/-10%		OUT	
10	PV_SCALE	PV value range in engineering units (PID input) • EU_100: Value in engineering units corresponding to 100% input. • EU_0: Value in engineering units corresponding to 0% input. • Unit index: Engineering units index (identification number) • DP: Position of the decimal point in the display (the number of digits below the decimal point)	EU_100	S-R/W	4		100	PV	Can only be changed when the mode is MAN.
			EU_0	S-R/W	4		0	PV	
			Unit Index	S-R/W	2	"4-6-7 : UNIT_INDEX Parameter".	%	Absolute No.	
			DP	S-R/W	1	0~255	0	Absolute No.	
11	OUT_SCALE	OUT value range in engineering units (PID output) • EU_100: Value in engineering units corresponding to 100% input. • EU_0: Value in engineering units corresponding to 0% input. • Unit index: Engineering units index (identification number) • DP: Position of the decimal point in the display (the number of digits below the decimal point)	EU_100	S-R/W	4		100	OUT	Can only be changed when the mode is MAN.
			EU_0	S-R/W	4		0	OUT	
			Unit Index	S-R/W	2	"4-6-7 : UNIT_INDEX Parameter"	%	Absolute No.	
			DP	S-R/W	1	0~255	0	Absolute No.	
12	GRANT_DENY	Parameter that enables/disables access to the parameters in this block from the human interface or the host. Whether or not this parameter is used depends on settings in the host. This parameter has no effect on block operation.	Grant	D-R/W	1	0 or 1	All bits set to 0.	Absolute No.	
			Deny	D-R/W	1	0 or 1	All bits set to 0.	Absolute No.	
13	CONTOL_OPTS	Controls various option settings for the control function.	---	S-R/W	2	0 (invalid) or 1 (valid). "4-6-4 : Control_OPTS Parameter"	All bits set to 0.	Absolute No.	Can only be changed when the mode is O/S.
14	STATUS_OPTS	Controls various option settings provided in relation to the OUT (PID output) parameter status information.	---	S-R/W	2	0 (invalid) or 1 (valid). "4-6-5 : STATUS_OPTS Parameter"	All bits set to 0.	Absolute No.	Can only be changed when the mode is O/S.
15	IN	The input value to the PID block. This value acquires the output value from another function block, such as an AI block, directly with no modification. The value is expressed as an value in engineering units, and the units are those set in both this PID block's PV_SCALE (EU_INDEX) parameter and the upstream block's OUT_SCALE (EU_INDEX) parameter.	Status	N-R/W	1	Good: Good value, Uncertain: Unknown, Bad: Unus-able	Absolute No.	15	IN
			Value	N-R/W	4	---	PV		

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
16	PV_FTIME	Temporary delay filter time constant used for PV (PID input).	---	S-R/W	4	0 or a positive value	0	Sec.	
17	BYPASS	Switch provided for bypassing PID calculation. When this switch is off, the calculation is performed, and when on, SP (setpoint value) is directly connected to OUT (the output).	---	S-R/W	1	1: Off 2:On	0	Absolute No.	Can only be changed when the mode is O/S.
18	CAS_IN	Input value used in cascade control. When the PID block mode is CAS, this value is used as a setpoint value for PID calculation.	Status	N-R/W	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	N-R/W	4	---		PV	
19	SP_RATE_DN	Limit values for the rate of change of SP (setpoint value). Individual settings are provided for changes in the upward and downward directions. These rate of change limits are value when the mode is AUTO, CAS, or RCAS.	---	S-R/W	4	0 or a positive value	$+\infty$	PV/Sec.	
20	SP_RATE_UP		---	S-R/W	4	0 or a positive value	$+\infty$	PV/Sec.	
21	SP_HI_LIM	Upper and lower limit values for SP (setpoint value).	---	S-R/W	4	Pv_SCALE (Eu_100) +10%	100	PV	
22	SP-LO_LIM		---	S-R/W	4	Pv_SCALE (Eu_0) -100%	0	PV	
23	GAIN	PID gain parameter.	---	S-R/W	4	Positive value		Absolute No.	
24	RESET	PID integration constant.	---	S-R/W	4	0 or a positive value		Sec.	
25	BAL_TIME	Sets the time for which the integration term is calculated continuously when OUT (output value) has exceeded a limit set with either OUT_HI_LIM or OUT_LO_LIM. In other words, in cases where, after a limit has been exceeded, the calculation is working in the direction of resolving the limit, this parameter sets the time until the value of the integration term reaches the output limit. If this parameter is set to 0, windup of the integration term will be performed at the output limit value.	---	S-R/W	4	Positive value	0	Sec.	
26	RATE	PID differentiation constant.	---	S-R/W	4	0 or a positive value		Sec.	
27	BKCAL_IN	Value fed back through a downstream block (such as and AO or PID block) BKCAL_OUT parameter for use in PID calculation.	Status	N-R/W	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	N-R/W	4	---		OUT	

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
28	OUT_HI_LIM	Upper and lower limit values provided for the OUT parameter.	---	S-R/W	4	OUT_SCALE (EU_100) +10%	100	OUT	
29	OUT_LO_LIM		---	S-R/W	4	OUT_SCALE (EU_0) -10%	0	OUT	
30	BKCAL_HYS	Sets the hysteresis when recovering from the OUT value reaching the upper or lower limit. For example, if OUT_HI_LIM is 100% and BKCAL_HYS is 0.5, then while the limit function will be applied when the value reaches 100%, recovery will not be performed until the value falls under 99.5%.	---	S-R/W	4	0 ~ 50%	0.5%	%	Expressed as a percentage of the full scale of the output.
31	BKCAL_OUT	Value fed back to the BKCAL_IN parameter of an upstream block (PID or other calculation) to be used in the upstream block's calculation. Either the post-limiter SP or PV value in this block is connected to the BLCAL_OUT parameter. This is specified with the CONTROL_OPTS parameter.	Status	D-R	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	D-R	4	---		PV	
32	RCAS_IN	Input value connected from the host for performing SPC (set point control). This value is used as the PID setpoint value when the mode is RCAS.	Status	N-R/W	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	N-R/W	4	---		PV	
33	ROUT_IN	Input value connected from the host for DDC (Direct Digital Control). Used as the PID setpoint value when the mode is ROUT.	Status	N-R/W	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	N-R/W	4	---		OUT	
34	SHED_OPT	In remote output or remote cascade control (SPC or DDC) from the host, specifies the processing when a write of the setpoint value (RCAS_IN) or output value (ROUT_IN) times out. The time at which a timeout is detected is set separately using the block SHED_RCAS and SHED_ROUT.	---	S-R/W	1		0	Absolute No.	
35	RCAS_OUT	Output (to the host) used for initialization and other purposes when the output limit conditions or mode changes when performing SPC. The post-limit setpoint value is connected to RCAS_OUT within the PID block.	Status	D-R	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	D-R	4	---		PV	

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
36	ROUT_OUT	Output (to the host) used for initialization and other purposes when the output limit conditions or mode changes when performing DDC. The post-limit set-point value is connected to ROUT_OUT within the PID block.	Status	D-R	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	D-R	4	---		OUT	
37	TRK_SCALE	The engineering units range of the TRK_VAL (external feedback input) parameter. • EU_100: Value in engineering units corresponding to 100% output. • EU_0: Value in engineering units corresponding to 0% output. • Unit index: Engineering units index (identification number) • DP: Position of the decimal point in the display (the number of digits below the decimal point)	EU_100	S-R/W	4		100	TRK	Can only be changed when the mode is MAN.
			EU_0	S-R/W	4		0	TRK	
			Unit Index	S-R/W	2	"4-6-7 : UNIT_INDEX Parameter".	%	Absolute No.	
			DP	S-R/W	1	0~255	0	Absolute No.	
38	TRK_IN_D	Parameter that specifies whether or not to use the TRK_VAL (external feedback input value) to the PID block for the calculated value. An on/off type output (such as the output value of a DI block) from an external device is connected to this parameter.	Status	N-R/W	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	N-R/W	1	0 (false: feedback off) or 1 (true: feedback on)		Absolute No.	
39	TRK_VAL	External feedback value to the PID block. An AI block output value or similar value from an external device is connected to this parameter.	Status	N-R/W	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	N-R/W	4	---		TRK	
40	FF_VAL	Feed forward input value to the PID block. An AI block output value or similar value from an external device is connected to this parameter.	Status	N-R/W	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	N-R/W	4	---		FF	

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
41	FF_SCALE	FF_VAL value range in engineering units (external feed forward input) parameter. • EU_100: Value in engineering units corresponding to 100% output. • EU_0: Value in engineering units corresponding to 0% output. • Unit index: Engineering units index (identification number) • DP: Position of the decimal point in the display (the number of digits below the decimal point)	EU_100	S-R/W	4		100	FF	Can only be changed when the mode is MAN.
			EU_0	S-R/W	4		0	FF	
			Unit Index	S-R/W	2	"4-6-7 : UNIT_INDEX Parameter"	%	Absolute No.	
			DP	S-R/W	1	0~255	0	Absolute No.	
42	FF_GAIN	Gain applied to the FF_VAL (feed forward input) parameter.	---	S-R/W	4		0	Absolute No.	Can only be changed when the mode is MAN.
43	UPDATE_EVT	Alert parameter issued when a change occurs in function block fixed data (items that have an access attribute of "S-" or "N-"). It has the following structure. • Unacknowledged: The acknowledgement state • Update state: The update state • Time stamp: The time changed • Static revision: The revision number after the update • Relative index: Parameter identification number for the parameter changed	Unac-knowl-edged	D-R	1	"Unacknowl-edged": 0=Undefined (no change) 1=Acknowl-edged (acknowl-edged) 2=Unac-knowledged (unacknowl-edged) "Update state": 0=Undefined (no change) 1=Update reported (The update was reported.) 2=Update not reported (The update was not reported.)		Absolute No.	
			Update State	D-R	1				
			Time Stamp	D-R	8				
			Static Revision	D-R	2				
			Relative Index	D-R	2				

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
44	BLOCK_ALM	Parameter that indicates the configuration of the function block and error states during execution. It has the following structure. • Unacknowledged: Occurrence verification state • Alarm state: State in which an alarm has occurred • Time stamp: Time of alarm occurrence/recovery • Subcode: Alarm content subcode • Value: Alarm value	Unac-knowl-edged	D-R	1			Absolute No.	
			Alarm State	D-R	1				
			Time Stamp	D-R	8				
			Subcode	D-R	2				
			Value	D-R	1				
45	ALARM_SUM	Parameter that summarizes the state of the function block BLOCK_ALM • Current: The currently occurring state • Unacknowledged: Alarm verification state • Unreported: The state of reporting to the host. • Disabled: Alarm detection disablement state	Current	D-R	2	Bit1: High high alarm Bit2: High alarm Bit3: Low low alarm Bit4: Low alarm Bit5: Deviation high alarm Bit6: Deviation low alarm Bit7: Block alarm		Absolute No.	
			Unac-knowl-edged	D-R	2				
			Unre-ported	D-R	2				
			Disabled	S-R/W	2				
46	ACK_OPTION	Enables or disables automatic confirmation on the occurrence of a block alarm (BLOCK_ALM) for a Function block. Automatic confirmation refers to confirmation over the communication system without any operator actions, and is seen as equivalent.	---	S-R/W	2	0: Disabled 1: Enabled	0x0000	Absolute No.	
47	ALARM_HYS	Sets the hysteresis for recovery from a PV alarm (HI_HI, HI, LO, LOLO).	---	S-R/W	4	0~50%	0.5%	%	Expresses as a percent of the PV full scale.
48	HI_HI_PRI	These parameters set the priorities of the various alarms. • PV alarm priorities	---	S-R/W	1	0~15	0	Absolute No.	
49	HI_HI_LIM	Alarm setting values in engineering units. • Used for detecting the HI_HI_ALM.	---	S-R/W	4	PV_SCALE, +∞		PV	
50	HI_PRI	These parameters set the priorities of the various alarms. • PV alarm priorities							
51	HI_LIM	Alarm setting values in engineering units. • Used for detecting the HI_ALM.	---	S-R/W	4	PV_SCALE, +∞		PV	
52	LO_PRI	These parameters set the priorities of the various alarms. • PV alarm priorities							

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
53	LO_LIM	Alarm setting values in engineering units. • Used for detecting the LO_ALM.	---	S-R/W	4	-∞ , PV_SCALE		PV	
54	LO_LO_PRI	These parameters set the priorities of the various alarms. • PV alarm priorities							
55	LO_LO_LIM	Alarm setting values in engineering units. • Used for detecting the LO_ LO_ALM.	---	S-R/W	4	-∞ , PV_SCALE		PV	
56	DV_HI_PRI	These parameters set the priorities of the various alarms. • Deviation alarm priorities							
57	DV_HI_LIM	Alarm setting values in engineering units. • Used to detect the DV_HI_ALM (deviation HI) state.	---	S-R/W	4	0~ PV span, +∞		PV	
58	DV_LO_PRI	These parameters set the priorities of the various alarms. • Deviation alarm priorities							
59	DV_LO_LIM	Alarm setting values in engineering units. • Used to detect the DV_LO_ALM (deviation HI) state.	---	S-R/W	4	-∞ , PV span ~0		PV	
60	HI_HI_ALM	Parameters that indicate the process alarms output by the function block. These have the following structure. • Unacknowledged: Occurrence verification state • Alarm state: State in which an alarm has occurred • Time stamp: Time of alarm occurrence/recovery • Subcode: Alarm content subcode • Value: Alarm value	Unac-knowl-edged	D-R	1			Absolute No.	
61	HI_ALM								
62	LO_ALM		Alarm State	D-R	1				
63	LO_LO_ALM		Time Stamp	D-R	8				
64	DV_HI_ALM		Subcode	D-R	2				
65	DV_LO_ALM		Value	D-R	4			PV	

4-5 : Diagnostics Function Block Parameters (Base INDEX: 1500)

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
1	ST_REV	Represents the revision number of the static data that belongs to the block. If a parameter for which the access attribute "S-" is modified, it will be incremented by 1 (0×0001) with each modification.	---	S-R	2	0~65535	0	Absolute No.	
2	TAG_DESC	Tag name for the user-defined transducer block. This is used as a reference by the host and is unrelated to the operation or execution of the function block itself.	---	S-R/W	32		32 space characters	Absolute No.	
3	STRATEGY	An arbitrary group number for the transducer block. (This parameter is unrelated to block operation. It is provided so that the different types of blocks can be grouped arbitrarily in order that they can be identified more easily in later database search operations.)	---	S-R/W	2	0~65535	0	Absolute No.	
4	ALERT_KEY	Identification number for any plant device. (This parameter is unrelated to block operation. It is provided so that the different types of blocks can be grouped arbitrarily in order that they can be identified more easily in later database search operations.)	---	S-R/W	1	1~255	0	Absolute No.	
5	MODE_BLK	Transducer block mode parameter settings. MODE_BLK has the following structure: • Target: Parameter for the mode set from the host. • Actual: Represents the value of the current mode. • Permitted: Represents the value of the mode used by the function block. • Normal: Represents the value of the mode in the normal state.	Target	S-R/W	1	AUTO (processing is executed) or O/S (execution is disabled) "4-6-2 : MODE_BLK Parameter"	O/S	Absolute No.	
			Actual	S-R	1				
			Permitted	S-R/W	1				
			Normal	S-R/W	1				
6	BLOCK_ERR	Refers to the error status for the transducer block.	---	D-R	2			Absolute No.	
7	DEVICE_STATUS	SVP status.		D-R	4	bit 0: ROM error bit 1: RAM bit 2: Non-volatile memory (NVM) writing count alarm bit 3: I/O error	All bits set to 0.	Absolute No.	

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
8	MEASUREMENT_STATUS	Represents the results of individual items in the SVP self diagnostics. This parameter has a multi-byte structure. Byte 1 (the first byte) includes diagnostic results for failures related to device operation itself. Bytes 2 and later include results for warnings and adjustment and operating status items.	Byte1	D-R	1	Bit 0 = 1: Position sensor (VTD) error Bits 1 to 3: Unused. Bit 4 = 1: Nonvolatile memory (NVM) error Bit 5 = 1: RAM error Bit 6 = 1: ROM error Bit 7 = 1: A/D converter error	All bits set to 0.	Absolute No.	
			Byte2	D-R	1	Bit 0 = 1: Positioner internal temperature error Bit 1: Unused. Bit 2 = 1: Automatic setup execution in progress Bit 3 = 1: Automatic setup execution in progress Bit 4 = 1: Automatic setup execution in progress Bits 5 to 7: Unused.	All bits set to 0.	Absolute No.	
			Byte3	D-R	1	Bit 0: Unused. Bit 1 = 1: External zero or span adjustment allowed state Bit 2 = 1: Electro-pneumatic conversion module error Bit 3 = 1: Actuator forcible opened or forcibly closed state Bits 4 to 7: Unused.	All bits set to 0.	Absolute No.	
			Byte4	D-R	1	Bits 0 to 7: Unused.	All bits set to 0.	Absolute No.	
9	OPERATING_TIME	Operating time		N-R/W	4			Hour	
10	FINAL_VALUE	The latest value of the final output value sent to a control valve, damper, or another actuator.	Status	N-R	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	N-R	4			FINAL_VALUE_RANGE	

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
11	FINAL_POSITION_VALUE	The latest value of the final output value sent to a control valve, damper, or another actuator.	Status	N-R	1	Good: Good value, Uncertain: Unknown, Bad: Unusable		Absolute No.	
			Value	N-R	4			FINAL_VALUE_RANGE	
12	ELECT_TEMP	SVP electrical circuit block temperature	----	D-R	4		-----	℃	
13	EPM_DUTY	Electro-pneumatic conversion module load current expressed as a percentage.	----	D-R	4		-----	%	
14	STICK_SLIP_N	Defines the number of data samples for stick diagnostics.	N	S-R/W	2	100 ~ 65535	1000	Absolute No.	
15	STICK_SLIP_XY	Processed data for stick diagnostics	X, Y	D-R	8		0	Absolute No.	
16	FLOW_FORCE_N	(Unused.)		S-US	2				
17	FLOW_FORCE_XY	(Unused.)		D-R	8			Absolute No.	
18	AUTO_SETUP_SPEED	Operating speed from full closed to full open during auto setup.		D-R	4		0	sec.	
19	AUTO_SETUP_ERROR	Valve friction coefficient value during auto setup.		D-R	4		0	%	
20	TOTAL_STROKE	The amount of the change of FINAL_POSITION_VALUE is calculated. However, the change is not calculated if the value is less than TOTAL_STROKE_DEADMBAND. The value is written into the nonvolatile memory once a day.		N-R/W	4	Positive numbers	0	%	
21	TOTAL_STROKE_DEADBAND	This DEADBAND is used for whether the change of TOTAL_STROKE FINAL_POSITION_VALUE is accumulated into TOTAL_STROKE or not.		S-R/W	4	0~100	0.5	%	
22	CUTOFF_LO_COUNT	This is the total calculated value of how many times the valve fully closed. The calculated value is written into the nonvolatile memory once a day.		N-R/W	4		0	Absolute No.	
23	TRAVEL_RATE_VALUE	Valve stroke (from full close to full open) is divided into 16 bands. The frequency of occurrence for each of the assigned TRAVEL_RATE_VALUE is counted and recorded.		S-R/W	4×16	Positive numbers	0, 10, 2, 0.....150	Absolute No.	
24	TRAVEL_RATE_RATIO	This shows position of each of the bands, which are used for TRAVEL_RATE_VALUE.		N-R/W	4×16	Positive numbers	0	%	
25	MAX_SPEED_P	Represents the maximum speed in positive valve movement.		D-R	4		0	%/40ms	
26	MAX_SPEED_M	Represents the maximum speed in negative valve movement.		D-R	4		0	%/40ms	
27	LIMIT_CYCLE_COUNT	The number of times the valve position exceeded the LIMIT_CYCLE_HI and LIMIT_CYCLE_LO is counted and recorded.		N-R/W	4	Positive numbers	0	Absolute No.	
28	LIMIT_CYCLE_HI	This is the upper threshold value used in LIMIT_CYCLE_COUNT.		S-R/W	4		+∞	%	
29	LIMIT_CYCLE_LO	This is the lower threshold value used in LIMIT_CYCLE_COUNT.		S-R/W	4		-∞	%	

Index	Parameter	Description	Sub-parameter	Access attribute	Size (bytes)	Range	Initial value	Units	Remarks
30	SHUT_ERR_TIME	This refers to the time before the SHUT_ERR_ALM flag of V A L V E_D I A G_S T A T U S is raised when the valve is not closed even if the input signal is zero.		S-R/W	4	Positive numbers	+∞	s	
31	SHUT_ERR_P	This refers to the value of deflection that occurs on the positive side thereby raising the SHUT_ERR_ALM flag of V A L V E_D I A G_S T A T U S when the input signal is zero but the valve has not closed.		S-R/W	4	Positive numbers	+∞	%	
32	SHUT_ERR_M	This refers to the value of deflection that occurs on the negative side thereby raising the SHUT_ERR_ALM flag of V A L V E_D I A G_S T A T U S when the input signal is zero but the valve has not closed.		S-R/W	4	Negative numbers	-∞	%	
33	VALVE_DIAG_STATUS	This refers error status when valve is not fully closed. This is either the SHUT_ERR_ALM or zero (0).		D-R	4	Bit 0: SHUT_ERR_ALM	0	Absolute No.	

4-6 : Description of the parameter range

4-6-1 : Parameters

Bit	Function	Description
0	Unicode strings	Specifies Unicode (2-byte encoding) support for character string parameters such as PD_TAG and TAGNAME. This bit is set according to which is required by the host system. When configured for alpha numerics only, ASCII (that is, a setting of FALSE) can be used.
1	Reports supported	Selects whether or not the alert notification and trend notification functions are used. If this bit is FALSE, report notifications are not performed, regardless of the alert object and trend object settings. This is set according to the requirements of the host system.
2	Fault State supported	This is a bit that is meaningful to AO and DO function blocks. It selects whether or not the Fault State function of these function blocks is used. Fault State refers to operation when, for example, it becomes impossible to update the CAS_IN data for an AO function block and either the output value is held constant, or the output value is forcibly switched to a preset value. This is set according to the requirements of the application.
3	Soft Write lock supported	Selects whether or not the function that disables writes of the various static data within the device with the WRITE_LOCK parameter in the resource block is used. This should normally be set to the write enabled (FALSE) value.
4	Hard write lock supported	Function that selects whether or not that function is used when the hardware switch based write protect function can be implemented. Since the SVP does not have a hardware write protect function, this bit is not used.
5	Output readback supported	Selects whether or not the position feedback function, such as that for the valve position, is used. If this bit is FALSE, the READBACK value will reflect the same value as that of the position setpoint. The SVP supports the position readback function, and this bit should be set to TRUE if it is used.
6	Direct write to output hardware	Selects whether or not the function that directly modifies the final output value with a special procedure even if it is not possible for the device to continue normal operation due to a fault in the fieldbus itself is used. This output modification procedure has not been standardized under FF. The SVP does not support this function.
7	Change of BYPASS in an automatic mode	Selects whether or not switching to the bypass function included in the PID function block can be performed in auto mode as well. Since the use of this function is thought to be a special case, we recommend using the FALSE setting for this bit.

4-6-2 : MODE_BLK Parameter

Bit	Function	Description
0	Remote-Output (ROut)	Remote output mode from the host (DDC)
1	Remote-Cascade (RCas)	Remote setting mode from the host (SPC)
2	Cascade (Cas)	Cascade mode
3	Automatic (Auto)	Indicates automatic mode for function blocks and block execution for resource blocks and transducer blocks.
4	Manual (Man)	Manual mode
5	Local Override (LO)	Control mode based on external feedback input of the TRACK_VALUE
6	Initialization Manual (IMan)	Output initialization mode (For example, if a block connected downstream is in manual operation)
7	Out of service (O/S)	Operation stopped mode (For example, when modifying the configuration data)

4-6-3 : SHED_OPT Parameter

Bit	Function	Description
0	Undefined	Undefined
1	Normal shed, normal return	When a fault occurs in the host, the block sheds to the mode with the next priority, and when the host recovers, the block automatically recovers to either ROut or RCas.
2	Normal shed, no return	When a fault occurs in the host, the block sheds to the mode with the next priority, and when the host recovers, the block does not automatically recover
3	Shed to Auto, normal return	When a fault occurs in the host, the block sheds to auto mode, and when the host recovers, the block automatically recovers to either ROut or RCas.
4	Shed to Auto, no return	When a fault occurs in the host, the block sheds to auto mode, and when the host recovers, the block does not automatically recover.
5	Shed to Manual, normal return	When a fault occurs in the host, the block sheds to manual mode, and when the host recovers, the block automatically recovers to either ROUT or RCAS.
6	Shed to Manual, no return	When a fault occurs in the host, the block sheds to manual mode, and when the host recovers, the block does not automatically recover.
7	Shed to Retained target, normal return	When a fault occurs in the host, the block sheds to the mode it was in immediately prior to switching to Rout or Rcas, and when the host recovers, the block automatically recovers to either ROut or RCas.
8	Shed to Retained target, no return	When a fault occurs in the host, the block sheds to the mode it was in immediately prior to switching to Rout or Rcas, and when the host recovers, the block does not automatically recover.

4-6-4 : Control_OPTS Parameter

Bit	Function	Description (When set to 1: True)	PID
0	Bypass Enable	Enables the control function block bypass function.	✔
1	SP-PV Track in Man	SP tracks PV when the function block mode (target value) is manual.	✔
2	SP-PV Track in ROut	SP tracks PV when the function block mode (target value) is ROut.	✔
3	SP-PV Track in LO or IMan	SP tracks PV when the function block mode (actual value) is LO (local override) or Iman (initialization manual).	✔
4	SP Track in retained target	Specifies the function that tracks according to the MODE (Target) that retains SP when the function block MODE (Actual) is IMan, LO, Man, or ROut. The object of the value retained here in the MODE (Target) will be either RCas or Cas. This specification takes priority over the above SP-PV tracking function specifications.	✔
5	Direct Acting	Performs direct acting (the output increases when PV increases) control.	✔
6	Reserved	Unused.	
7	Track Enable	Enables the external feedback optional function. That is, when this parameter is true, under conditions where the TRK_IN_D parameter is ON and the mode is not manual, the TRK_VAL is output to the OUT parameter. At this time, the value of MODE (Actual) will be LO.	✔
8	Track in Manual	When the external feedback optional function is enabled, under conditions where the TRK_IN_D parameter is ON and the mode is manual, the TRK_VAL is output to the OUT parameter. Similarly, the value of MODE (Actual) will be LO.	✔
9	Use PV for BKCAL_OUT	When this control function block is operating in the Cas or RCas mode, it outputs PV for the BKCAL_OUT and RCAS_OUT outputs, which are output parameters for initialization for the higher level block. When this bit is set to False, the SP value is output.	✔
10	Act on IR (Unused in PID blocks)	Adjusts SP to be within the setpoint limit range and stops the valve on initialization request recovery on an initialization request for a calculation initialization input that is input to BKCAL_IN. If the result of the reverse calculation for the SP that will stop the valve falls outside the setpoint limit range, this adjustment will be performed according to BAL_TIME set time. This parameter is valid for PD and ratio operation.	
11	Use BKCAL_OUT with IN_1	Normally, the object parameter that is initialized and output to the upstream side of the cascade connection with BKCAL_OUT is input to the downstream block CAS_IN. However, depending on the type of the control block, e.g. for ratio or bias/gain blocks, there are cases where the parameter connected to IN_1 is the object of that. In such cases, set this bit to True.	
12	Obey SP limits if Cas or RCas	Makes the setpoint limits valid in Cas and RCas modes as well. When this bit is False, the SP limit is only valid in auto and manual modes.	✔
13	No OUT limits in Manual	Makes the OUT_HI_LIM and OUT_LO_LIM limits invalid in manual mode.	✔
14	Reserved	Unused.	
15	Reserved	Unused	

4-6-5 : STATUS_OPTS Parameter

Bit	Function	Description (When set to 1: True)	AI	AO	PID
0	IFS if BAD IN	Turns on the OUT parameter fault status (and starts fault status processing) if the IN parameter status is BAD.			✔
1	IFS if BAD CAS_IN	Turns on the OUT parameter fault status (and starts fault status processing) if the CAS_IN parameter status is BAD.			✔
2	Use Uncertain as Good	Sees the IN parameter status as GOOD when that status is actually Uncertain. (When this bit is false, the uncertain status is handled as though it were a BAD status.)			✔
3	Propagate Fault Forward	This is an option that causes the block to not issue an alarm but rather to propagate the fault to the down-stream function block for fault states such as sensor input errors, sensor faults, and faults in the field device itself. For example, in a system where the control loop is formed from only field devices and the assumption is that faults will be reported with, for example, block alarms, this function can be effective in cases where the AI blocks will be used as structural elements in the control loop and alarms will be reported through downstream PID blocks.	✔		
4	Propagate Fault Backward	This function is similar to the above, but here, actuator errors and LO mode and other alarms are reported through upstream blocks.		✔	
5	Target to Manual if BAD IN	Locks the block in manual mode if the status of the IN parameter is BAD.			✔
6	Uncertain if Limited	Sets the OUT parameter status to Uncertain of a range is exceeded by an input parameter or an intermediate value in a calculation.	✔		
7	BAD if Limited	Sets the OUT parameter status to BAD of a range is exceeded by an input parameter or an intermediate value in a calculation.	✔		
8	Uncertain in Man mode	Sets the status of the OUT parameter to Uncertain if the MODE (Actual) is Manual.	✔		
9	Target to next permitted mode if BAD CAS_IN	Automatically transitions to the next permitted mode that has priority if the status of CAS_IN goes to BAD during control in Cas mode. Mode transition permissions can be set for each function block using the MODE (Permitted) parameter.			✔
10	Reserved	Unused			
11	Reserved	Unused			
12	Reserved	Unused			
13	Reserved	Unused			
14	Reserved	Unused			
15	Reserved	Unused			

4-6-6 : IO_OPTS Parameter

Bit	Function	Description (When set to 1: True)	AI	AO
0	Invert	Inverts I/O in digital I/O blocks		
1	SP-PV Track in Man	SP tracks PV when the output block MODE (Target) is manual.		✔
2	Reserved	Unused		
3	SP-PV Track in LO	SP tracks PV when the output block MODE (Target) is LO.		✔
4	SP Track retained target	Specifies the function for tracking according to the MODE (Target) in which SP is retained when the function block MODE (Actual) is either LO or Man. The object values retained by MODE (Target) here are RCas or Cas. This specification takes priority over any of the previously mentioned SP-PV tracking functions.		✔
5	Increase to close	Specifies reverse specification of the display of analog outputs. (When the displayed output increases, the actual output will decrease.)		✔
6	Fault State to value	Determines the output operation when a fault state occurs. (0: Last value hold, 1: preset value) The AO function block FSTATE_VAL parameter is used to set the preset value.		✔
7	Use Fault State value on restart	The device uses the FSTATE_VAL as the initial output value on restart. When this parameter is set to 0:False, the device restarts control from the final output value stored in nonvolatile memory.		✔
8	Target to Man if Fault State activated	Locks the mode to manual when a fault state occurs.		✔
9	Use PV for BKCAL_OUT	When this output block is operating in Cas mode, it outputs the PV value to the BKCAL_OUT output, which is the initialization output parameter to the higher level block. When set to 0:False, the SP value is output		✔
10	Low cutoff	Enables the AI block low cutoff (constant flow cutoff) function.	✔	
11	Reserved	Unused		
12	Reserved	Unused		
13	Reserved	Unused		
14	Reserved	Unused		
15	Reserved	Unused		

4-6-7 : UNIT_INDEX Parameter

The Fieldbus Foundation has determined descriptors and their indices (identification numbers) for the engineering units specified for each parameter. Since there are a large number of these, we have omitted them from this document. Use the specification method stipulated by the configuration tool you are using to specify these units.

Chapter 5 : Maintenance

5-1 : Auto/Manual selection switch

The Auto/Manual switch selects the method that will control the pneumatic output from the positioner to be either automatic operation or manual operation.

Automatic operation

- An air pressure output corresponding to the input signal is output from the SVP.
- See Figure 5-2 Automatic operation state.

Manual operation

- The supplied air pressure is output directly from the positioner.
- This allows manual operation using a pressure reducing valve.
- See Figure 5-3 Manual operation state.

⚠ WARNING

The valve may move suddenly when the A/M switch is operated. Prepare yourself and the process in advance so that the process will not be adversely affected when the valve moves.

Structure of the A/M switch

The structure of the A/M switch is shown below.

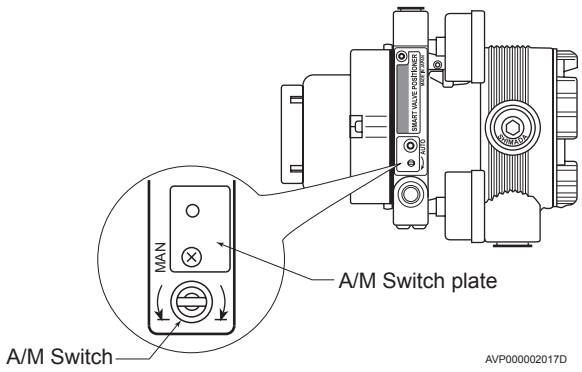


Figure 5-1 Structure of the A/M Switch

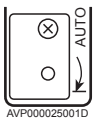


Figure 5-2 Automatic operation state

Figure 5-3 Manual operation state

Operating procedure

The procedure for using the A/M switch is given below.

Switching from automatic (normal) operation to manual operation

- Rotate the A/M switch cover plate by hand 180° in the clockwise direction.
  (It will be easier to rotate the plate if you press on the upper left corner of the plate while turning it.)
- Use a flat-bladed screwdriver to turn the A/M switch in the counterclockwise direction until it stops.

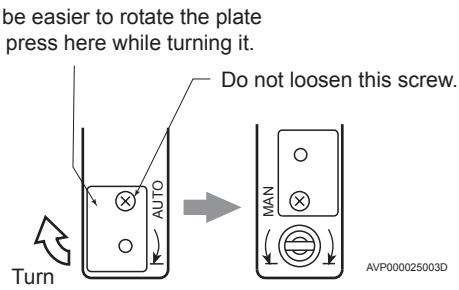


Figure 5-4 Switching from automatic (normal) operating state to manual operating State

~Note *Do not loosen the A/M switch cover plate screw. It will move without loosening it.*

Switching from manual operation to the automatic operation

- Use a flat-bladed screwdriver to turn the A/M switch in the clockwise direction until it stops.
- Rotate the A/M switch cover plate by hand 180° in the counterclockwise direction.

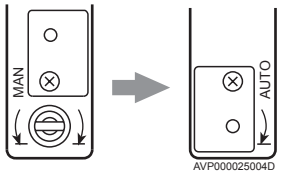


Figure 5-5 Switching from manual operating state to automatic operating state

~Note *Do not loosen the A/M switch cover plate screw.*

5-2 : Filter replacement and diaphragm maintenance

The contamination from the instrumentation air that collects in the diaphragm area in the SVP can be removed during maintenance. For instrumentation air, use dry air which has been cleaned of 3 μm (or smaller) solid particles. Always use a Phillips screwdriver.

Procedure

Step No.	Procedure
1	Turn off the air supply to the SVP.
2	Remove the setscrews from the A/M switch nameplate section. **~Note** *Be careful not to lose the A/M switch cover plate washers and corrugated washers when removing the screws.*
3	Turn the A/M switch to the MAN (manual) position.
4	Use wire snipers or some other tool to cut the holder and remove the old filter.
	Note: Dispose of the old holder and filter appropriately.
5	Use wire (with a diameter of 0.25 mm) to remove the contamination from the diaphragm area. **~Note** *Be careful not to damage the diaphragm hole when removing the contamination. Do not use an air gun. Do not allow any oil or grease to contaminate the diaphragm area.*
6	Wrap a new filter around the A/M switch, and press it into place with the holder.
7	Screw down the A/M switch until it stops.
8	Reassemble the A/M switch section name plate together with the A/M switch cover plate using the setscrews.

5-3 : Cleaning the flapper

If contamination from the instrumentation air has accumulated on the flapper, clean the flapper as described below.

⚠ CAUTION

If air pressure is supplied to the SVP, the nozzle back pressure may change causing the valve position may change suddenly when the flapper is cleaned. Only clean the flapper in a state where no one will be injured and plant operation will not be adversely influenced even if the valve moves suddenly.

Procedure

Step No.	Procedure
1	Remove the three pilot cover screws.
2	Provide scraps of paper with a thickness of 0.2 mm. Common business cards can be used.
3	Use the scraps of paper to clean the contamination from the gap between the EPM nozzle and the flapper.
4	After cleaning the gap, reassemble the pilot cover onto the main unit.

5-4 : EPM (electropneumatic converter module) balance adjustment

If the SVP has experienced excessive mechanical shock or some other external disturbance, or if contamination from the instrumentation air has collected in the nozzle flapper area, the internal EPM (electropneumatic converter module) balance point may be displaced and the response characteristics degraded. This can lead to the unit to malfunction. If the balance point displacement cannot be rectified by cleaning the nozzle flapper area, EPM adjustment will be necessary.

⚠ CAUTION

The EPM balance adjustment can cause the valve position to change rapidly. Only perform this adjustment in a state where no one will be injured and plant operation will not be adversely influenced even if the valve moves suddenly.

Procedure

Step No.	Procedure
1	Remove the three pilot cover screws.
2	After supplying the stipulated air pressure, set the input signal to 50%.
3	Observe the Parameter EPM_DUTY from the Host system (Refer to EPM_DUTY in subsection "4-2 : AO Transducer Block Parameters (Base INDEX: 1100)" on page 4-7)
4	Adjust the EPM drive signal to have a 50% ±5% duty by turning the EPM adjustment screw.

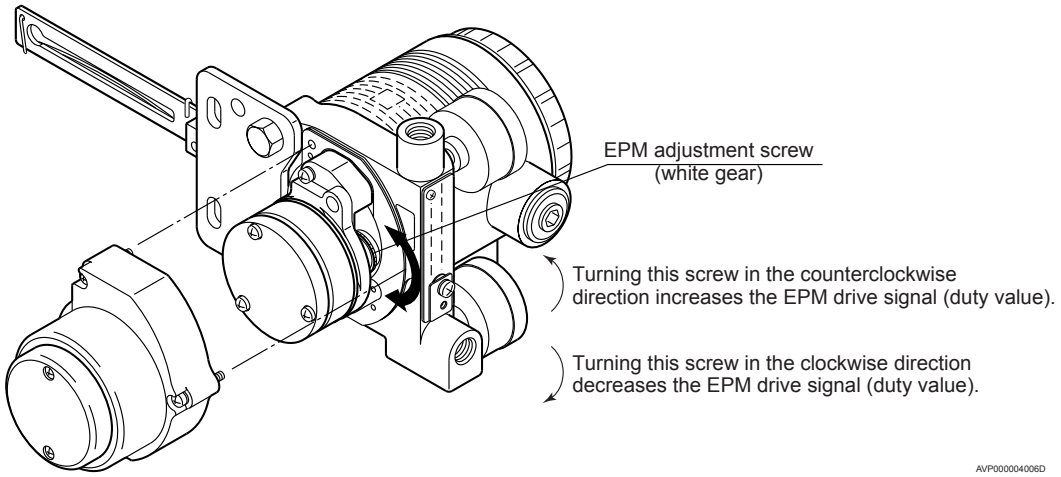
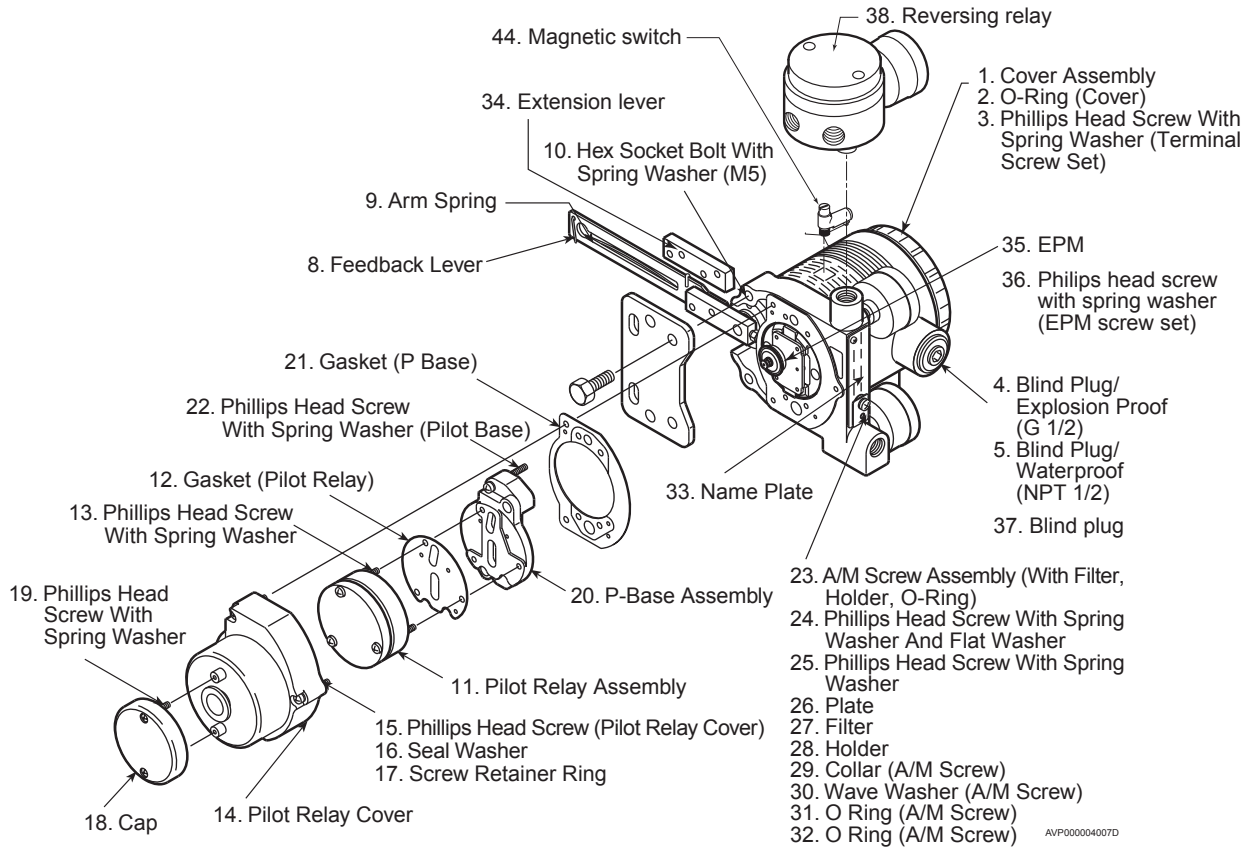
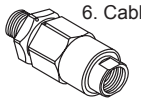


Figure 5-6 EPM Balance Adjustment

5-5 : Replaceable parts





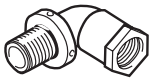


Table 5-1: Replacement parts

No.	Parts		Parts number	Qty	Recommended replacement cycle
1	Cover assembly	Standard finish	80377007-001	1	—
		Corrosion proof f.	80377007-002		
		Silver finish	80377007-003		
2	O-ring (cover)		80020935-845	1	5 years
3	Phillips head screw with spring washer (terminal screw set)		80277581-001	5	—
4	Blind plug/Explosion proof (G1/2)		80377115-001	1	—
5	Blind plug/Waterproof (NPT1/2)		80277971-001	1	—
6	Cable gland		80343903-003	1	—
7	Universal elbow		80357206-107	1	—
8	Feedback lever		80377121-001	1	—
9	Arm spring		80377122-001	1	—
10	Hex socket bolt with spring washer (M5)		80377127-001	2 (4)	—
11	Pilot relay assembly		80377050-001	1	5 years
12	Gasket (Pilot relay)		80377072-001	1	5 years
13	Philip head screw with spring washer		398-204-300	3	—
14	Pilot relay cover	Standard finish	80377064-001	1	—
		Corrosion proof f.	80377064-002		
		Silver finish	80377064-003		
15	Phillips head screw (Pilot relay cover)		398-204-250	3	—
16	Seal washer		80357789-001	3	—
17	Screw retainer ring		80235519-010	3	—
18	Cap	Standard finish	80377066-001	1	—
		Corrosion proof f.	80377066-002		
		Silver finish	80377066-003		
19	Phillips head screw with spring washer		398-203-080	2	—
20	P-base assembly		80377069-001	1	—
21	Gasket (P-base)		80377068-001	1	5 years
22	Phillips head screw with spring washer (Pilot base)		398-204-200	4	
23	A/M screw assembly (with Filter, Holder, O-ring)		80377074-001	1	4 years
24	Phillips head screw with spring washer and flat washer		80277581-002	1	—
25	Phillips head screw with spring washer		398-204-080	1	—
26	Plate		80377089-001	1	—
27	Filter		80377077-001	1	—
28	Holder		80377078-001	1	4 years
29	Collar (A/M screw)		80377088-001	1	—
30	Wave washer (A/M screw)		80377073-001	1	—
31	O-ring (A/M screw)		80020935-216	1	5 years
32	O-ring (A/M screw)		80020935-313	2	5 years
33	Name plate		80377079-001	1	—
34	Extension lever		80377142-001	1	—
35	EPM	Direct	80377010-001	1	—
		Reverse	80377010-002		
36	Phillips head screw with spring washer (EPM screw set)		80377046-001	2	—
37	Bling plug		80377205-001	1	—
38	Reversing relay	Standard finish, Rc1/4	80377323-001	1	5 years
		Corrosion proof f., Rc1/4	80377323-011		
		Silver finish, Rc1/4	80377323-021		
		Standard finish, 1/4NPT	80377323-002		
		Corrosion proof f., 1/4NPT	80377323-012		
		Silver finish, 1/4NPT	80377323-022		
44	Magnetic switch		80377080-001	1	—

Chapter 6 : Troubleshooting

The SVP is a precision instrument and requires the same level of care as any other field device. Unlike an air-actuated control valve, the SVP contains many electronic components and mechanical parts which must be set and calibrated properly. Poor SVP performance is usually easy to correct by adjusting settings.

A Minor Failure indicates no immediate danger or serious trouble in the operation of the SVP. The SVP will continue to operate normally.

A Major Failure indicates serious trouble in the operation of the SVP and, if no action is taken, may lead to damage to the SVP itself. Should serious trouble occur during SVP operations, the SVP will drive the valve to the fail-safe position.

6-1 : General troubleshooting

If, after attaching your SVP to a control valve and performing Auto-Setup or manual calibration, you are experiencing performance problems, follow the troubleshooting steps below.

If the troubleshooting procedures below do not fix the problem, contact your Yamatake representative.

SVP does not operate (no output air pressure)

1. Confirm that the internal SVP settings for actuator size, hysteresis, etc. are appropriate for your control valve.

2. Make sure that the SVP feedback lever is not exceeding a 20° angle of rotation. If it is, add an extension bracket to the feedback lever to provide the necessary feedback lever length.

3. Check for air leaks in air supply.

4. Check fieldbus power supply.

5. Check Auto/Manual switch in Auto.

6. Check the flapper and the filter clears.

7. Perform self diagnostics and take action based on errors messages. See “Troubleshooting Codes” on page 6-3.

Abnormal action of control valve (although output air is supplied, the control valve does not operate properly):

1. Change the A/M switch to manual (See section "5-1 : Auto/Manual selection switch" on page 5-1) and adjust the air pressure using the regulator valve from fully open to fully closed. Watch to see if valve stem moves smoothly. If it does not, this may indicate galling or hardening of the valve packing.

2. Confirm that the internal SVP settings for actuator size, hysteresis, etc. are appropriate for your control valve.

3. Hunting, Overshoot

- Change hysteresis setting from medium to heavy. If the problem persists, set the hysteresis to heavy and change the actuator size setting to smaller PRAM numbers.
- Check permissible angle of rotation of feedback lever.

4. Absence of full stroke, slow response.

- Check the zero (fully closed) and span (fully opened) are properly adjusted.
- Check the EPM drive signals are within range of 50+/-25%.
- Check the filter and the flapper are clean.

6-2 : Self-diagnostic

Host system reads the 4 Bytes data of MEASUREMENT_STATUS for AO Transducer Block and Function Block for the configuration of 4 Byte data and the following message, please refer to Chapter 4 : Parameter List.

Troubleshooting Codes

Message	Cause	Correction
LO IIN	Input signal is too low (3.8 mA or lower).	Provide an input signal of at least 3.8 mA.
VTD FAULT	(Valve position sensor) Feedback lever has fallen off or has turned beyond the allowable turning angle (+/-20°C)	Check if feedback lever has fallen off and that it is within permissible turning angle.
A/D FAULT	(Analog/Digital conversion)	Contact YAMATAKE.
NVM FAULT	(Non-Volatile Memory)	Contact YAMATAKE.
RAM FAULT	(RAM error)	Contact YAMATAKE.
ROM FAULT	(ROM error)	Contact YAMATAKE.
SHUT ON	SVP is forced fully closed	Apply an input signal above the forced fully shut value. Use the SFC to check and/or adjust the forced fully open/close values (%).
HI/LO EPM OUT	Electropneumatic Module is outside normal range No air is being supplied Valve is closed Galling of valve stem Clogged nozzle Clogged orifice	Check air supply pressure Confirm A/M switch is set to Auto Clean air nozzle Clean orifice Adjust the EPM balance
EXT ZERO ACTIVE	External Zero-span adjustment is being made.	Release the external Zero-span adjustment screw.
MANUAL MODE	Dummy input signal from SFC/HART.	Cancel the dummy current input.
FIXED EPM OUT	Dummy EPM pseudo-drive signal from SFC/HART.	Cancel the dummy EPM signal.
OUTPUT MODE	Dummy pseudo-signal output state for SFC/HART.	Cancel the dummy output.
CORRECT RESET	Data was reset at the time of shipment.	Set actuator type and other parameters before use.
OVER TEMP	Abnormal Temperature within SVP unit.	Check SVP temp and move it to a cooler location.

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YAMATAKE

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Saving through Automation

Yamatake Corporation

Totate international Building
2-12-19 Shibuya
Shibuya-ku, Tokyo 150-8316
Japan
Tel : 81-3-3486-2310
Fax : 81-3-3486-2593

http://www.yamatake.com/

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