azbil

Smart Valve eXplorer

Model: SVX100/102

User's Manual

Azbil Corporation

CM2-SVX100-2001
First Issue: Dec. 2002, Rev.3: Apr. 2012

Copyright, Notices and Trademarks

Thank you for purchasing the Azbil Corporation's Smart Valve eXplorer model SVX100/102 Smart Valve Positioner.

The Smart Valve eXplorer (also referred to as SVX in this manual) is an intelligent valve positioner that can be connected to a 4-20 mA signal line. Since all adjustments can be performed electrically using the Smart Communicator (CommPad), or HART communicator model 375 the relationship between the input signal and the position of the control valve can be set arbitrarily. Split range and other special settings are also easy to set up.

This user's manual describes the use of the Smart Valve eXplorer. Use this manual to get the most from the features of this product.

Safety

About this manual

This manual contains information and warnings that must be observed to keep the Smart Valve eXplorer (SVX) operating safely. Correct 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 generally accepted 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
Denotes a potentially hazardous situation which, if not avoided, could result in operator minor injury or damage to device.

~Note *Information that can be useful to the user.*

Safety precautions

⚠ WARNING

- ELECTRICAL SHOCK HAZARD! Turn off power before performing any wiring.
- NEVER open the terminal box cover while the SVX is energized in a hazardous environment.
- Do not unnecessarily touch the SVX 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 SVX or use it as a step. You can damage the unit.

Approvals

FM Intrinsically Safe and Nonincendive Approvals

Ratings

- Intrinsically Safe Apparatus for Class I, II, III, Division 1, Groups A, B, C, D, E, F and G, T4
- Class I, Zone 0, AEx ia IIC T4
- Nonincendive Apparatus and Nonincendive Field Wiring Apparatus for Class I, Division 2, Groups A, B, C and D, T4; Class I, Zone 2, Group IIC, T4
- Suitable Protection for Class II, III, Division 2, Groups F and G, T4
- Associated Nonincendive Field Wiring Apparatus for Class I, II, III, Division 2, Groups A, B, C, D, F and G, T4; Nonincendive Field Wiring

at -40°C $\leq$ Tamb $\leq$ +80°C

Entity and Nonincendive Field Wiring Parameters:

Vmax = 30V, Imax = 100mA, Pi = 1W, Ci = 0.015uF, Li = 0.22mH

Voc = 6.6V, Isc = 0.315mA, Po = 0.52mW, Ca = 22uF, La = 1H

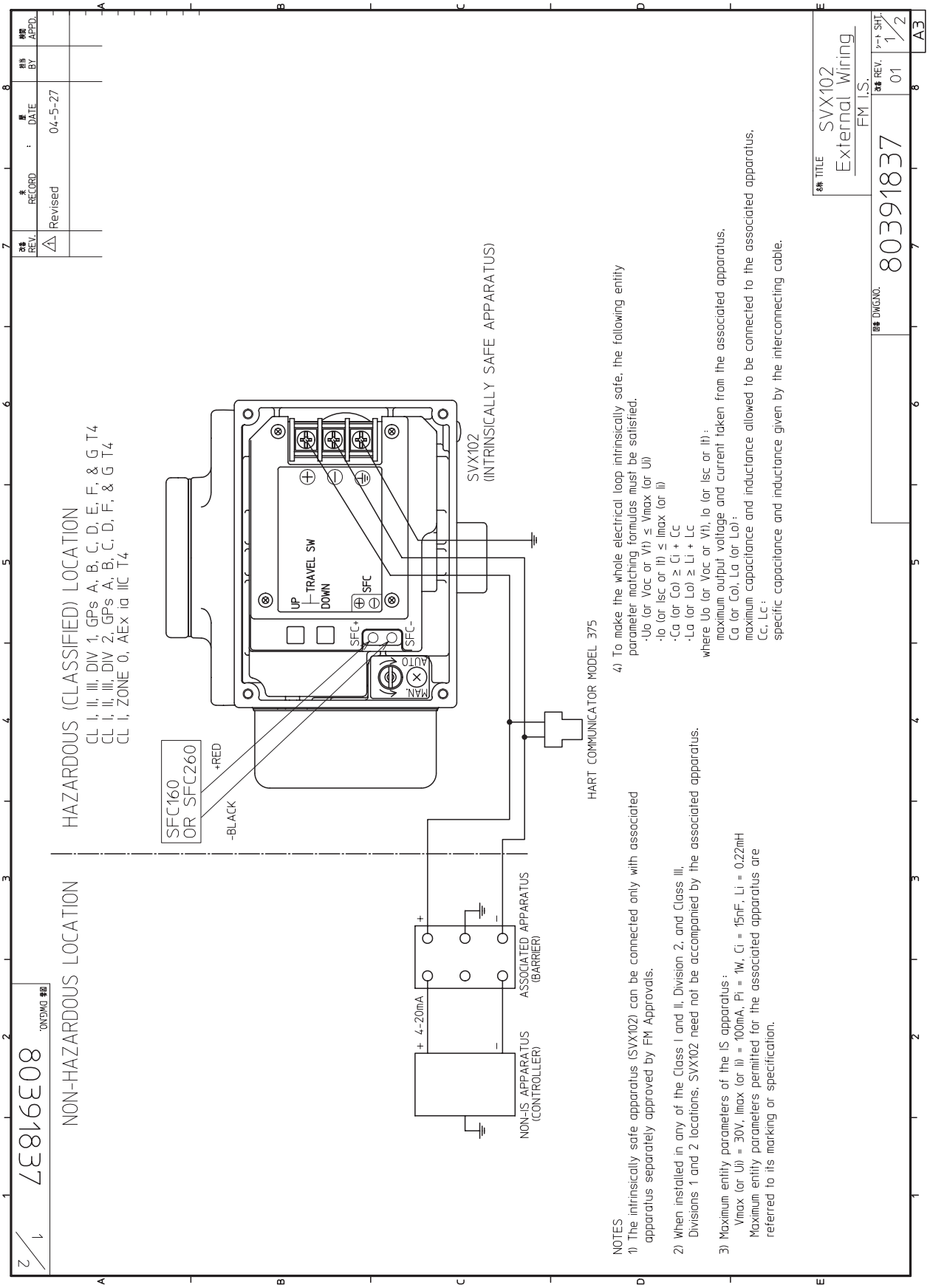
Enclosure: Type 4X, IP66

⚠ CAUTIONS

- Substitution of components may impair Intrinsic Safety and suitability for Division 2.
- Control room equipment connected to intrinsically safe associated apparatus should not use or generate more than 250 Vr.m.s. or DC.

Installation

- Install per drawing 80391837.
- The equipment shall be installed in accordance with the relevant requirements of the National Electrical Code (ANSI/NFPA70) and ANSI/ISA RP12.06.01, Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations for guidance on the installation of intrinsically safe apparatus and systems.


HAZARDOUS (CLASSIFIED) LOCATION
CL I, II, III, DIV 1, GPs A, B, C, D, E, F, & G T4
CL I, II, III, DIV 2, GPs A, B, C, D, F, & G T4
CL I, ZONE 0, AEx ia IIC T4
NON-HAZARDOUS LOCATION
SFC160
OR SFC260
+RED
-BLACK
SVX102
(INTRINSICALLY SAFE APPARATUS)
UP
TRAVEL SW
DOWN
SFC
SFC+
SFC-
AUTO
MAN
HART COMMUNICATOR MODEL 375
+ 4-20mA
NON-IS APPARATUS
(CONTROLLER)
ASSOCIATED APPARATUS
(BARRIER)
NOTES
1) The intrinsically safe apparatus (SVX102) can be connected only with associated apparatus separately approved by FM Approvals.
2) When installed in any of the Class I and II, Division 2, and Class III, Divisions 1 and 2 locations, SVX102 need not be accompanied by the associated apparatus.
3) Maximum entity parameters of the IS apparatus :
Vmax (or Ui) = 30V, Imax (or Ii) = 100mA, Pi = 1W, Ci = 15nF, Li = 0.22mH
Maximum entity parameters permitted for the associated apparatus are referred to its marking or specification.
4) To make the whole electrical loop intrinsically safe, the following entity parameter matching formulas must be satisfied.
·Uo (or Voc or Vt) ≤ Vmax (or Ui)
·Io (or Isc or It) ≤ Imax (or Ii)
·Ca (or Co) ≥ Ci + Cc
·La (or Lo) ≥ Li + Lc
where Uo (or Voc or Vt), Io (or Isc or It) :
maximum output voltage and current taken from the associated apparatus,
Ca (or Co), La (or Lo) :
maximum capacitance and inductance allowed to be connected to the associated apparatus,
Cc, Lc :
specific capacitance and inductance given by the interconnecting cable.
REV.
RECORD
DATE
BY
APPD.
Revised
04-5-27
TITLE
SVX102
External Wiring
FM I.S.
DWG.NO.
80391837
REV.
01
SHT.
1/2
A3
80391837 1/2

図番 DWG.NO. 80391837 2/

改番 REV.	来歴 RECORD	年月日 DATE	担当 BY	検図 APPD.

5) Relevant wiring method of those for hazardous locations specified by the National Electrical Code (ANSI/NFPA70), chapter 5 should be applied to the installation of SVX102.

6) The FM Approvals approved handy communicators : Smart Field Communicator Model SFC160 and HART Field Communicator Model 375, can be connected as indicated by the above connection diagram.

7) When the HART communicator is connected to the IS loop, the communicator must be regarded as another associated appatus. (The entity parameters of the HART communicator used for the following calculation are given in the marking or specification of the communicator.)

-By applying Isum = [Io (HART comm.) + Io (associated apparatus)] to the attached table, determine 'Modified La'.
Then, the below relationship must be satisfied.
·Modified La ≥ Li (HART comm.) + Li (IS apparatus) + Lc

-By applying Vsum = [Uo (HART comm.) + Uo (associated apparatus)] to the attached table, determine 'Modified Ca'.
Then, the below relationship must be satisfied.
·Modified Ca ≥ Ci (HART comm.) + Ci (IS apparatus) + Cc

Table-Modified values of La and Ca

Isum (mA)	Modified La (mH)			Vsum (V)	Modified Ca (μF)		
	A/B	C	D		A/B	C	D
90	5.0	18.0	35.1	10	3.21	9.64	25.69
100	4.0	15.0	28.5	15	0.78	2.35	6.26
110	3.0	12.0	23.6	20	0.34	1.01	2.7
120	2.5	10.0	19.8	22	0.26	0.78	2.09
130	2.0	9.0	16.9	24	0.21	0.63	1.67
140	1.6	8.0	14.6	26	0.17	0.51	1.37
150	1.3	7.0	12.7	28	0.14	0.43	1.14
160	1.0	6.2	11.2	30	0.12	0.36	0.97
170	0.8	5.5	9.9	32	0.11	0.32	0.84
180	0.6	5.0	8.8	34	0.09	0.28	0.73
200	0.5	4.0	7.2	36	0.08	0.24	0.65
220	0.4	3.2	5.9	38	0.08	0.22	0.58
				40	0.06	0.19	0.52
				42	0.06	0.18	0.47

A/B, C, and D denote Material Group for area classification

8) The Model SFC260 communicator can be used only in the Class I and II, Division 2, and Class III, Divisions 1 and 2 locations.

名称 TITLE	SVX102 External Wiring FM I.S.		
図番 DWG.NO.	80391837	改番 REV.	00
		シート SHT	2/
			A3

ATEX/KEMA Intrinsic Safety Approval (English)

Marking information

CE 0344

II 1 G Ex ia IIC T4
-40°C ≤ Tamb ≤ +60°C
Certificate No.: KEMA 04ATEX1176 X

Supply / input circuit
(terminals +/- IN)
Ui = 29V, Ii = 95 mA, Pi = 690 mW
Ci =10 nF, Li = 220 µH

Applicable standards

European Standards:

EN 60079-0:2006

EN 60079-11 :2007

EN 60079-26:2007

Special conditions for safe use

(1) Because the enclosure of the Smart Valve Positioner is made of aluminum, if it is mounted in an area where the use of category 1 G apparatus is required, it must be installed such, that, even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded.

(2) Because part of the enclosure of the Smart Valve Positioner is made of plastic, if it is mounted in an area where the use of 1 G and apparatus group lie is required, precautions have to be taken to avoid static charges.H/m if a conventionally constructed cable (with or without a screen) is used.

ATEX/KEMA Intrinsic Safety Approval (French)
Certificat de sécurité intrinsèque ATEX

Informations

CE **0344**

II 1 G Ex ia IIC T4

-40°C ≤ Tamb ≤ +60°C

N° de certificat: KEMA 04ATEX1176 X

Circuit d'alimentation/d'entrée
(bornes +/ -IN)
Ui = 29V, Ii = 95 mA, Pi = 690 mW
Ci = 10 nF, Li = 220 µH

Normes applicables

Normes européennes:

EN 60079-0:2006

EN 60079-11:2007

EN 60079-26:2007

Conditions spéciales pour une utilisation en toute sécurité

1. Le boîtier du Smart Valve Positioner (positionneur de vanne intelligent) étant en aluminium, si celui-ci est monté dans une zone où un dispositif de catégorie 1 G est nécessaire, il doit alors être installé de façon à ce que, même en cas d'accidents rares, les sources d'inflammation dues aux impacts et aux étincelles résultant de frictions soient exclues.
2. Une partie du boîtier du Smart Valve Positioner (positionneur de vanne intelligent) étant en plastique, si celui-ci est monté dans une zone où un dispositif de catégorie 1 G et de groupe IIC est nécessaire, des précautions doivent être prises pour éviter les charges statiques.

ATEX/KEMA Intrinsic Safety Approval (German)
ATEX Intrinsische Sicherheitszertifizierung

Kennzeichnung

CE **0344**

II 1 G Ex ia IIC T4

-40°C ≤ Tamb ≤ +60°C

Zertifikat-Nr.: KEMA 04ATEX1176 X

Versorgung / Eingangskreis
(Anschlüsse +/ -IN)
Ui = 29V, Ii = 95 mA, Pi = 690 mW
Ci = 10 nF, Li = 220 µH

Geltende Normen

Europäische Normen:

EN 60079-0:2006

EN 60079-11:2007

EN 60079-26:2007

Sonderbedingungen für eine sichere Verwendung

1. Da das Stellungsreglergehäuse „Smart Valve Positioner“ aus Aluminium besteht, muss es bei einer Installation in einem Bereich, in dem eine Ausrüstung der Kategorie 1 G erforderlich ist, so installiert werden, dass selbst im Ausnahmefall eine Funkenbildung aufgrund von Stößen oder Reibung ausgeschlossen ist.
2. Da Teile des Stellungsreglergehäuses „Smart Valve Positioner“ aus Plastik bestehen, muss es bei einer Installation in einem Bereich, in dem eine Ausrüstung der Kategorie 1 G und der Gruppe IIC erforderlich ist, so installiert werden, dass statische Aufladungen vermieden werden.

ATEX/KEMA Intrinsic Safety Approval (Spanish)
Certificación ATEX de seguridad intrínseca

Información sobre regulaciones

CE **0344**

II 1 G Ex ia IIC T4

-40°C ≤ Tamb ≤ +60°C

Nº de certificado: KEMA 04ATEX1176 X

Circuito de suministro/entrada
(terminales +/ -IN)
Ui = 29V, Ii = 95 mA, Pi = 690 mW
Ci = 10 nF, Li = 220 µH

Estándares aplicables

Estándares europeos:

EN 60079-0:2006

EN 60079-11:2007

EN 60079-26:2007

Condiciones especiales para un uso seguro

1. Como el cierre del Smart Valve Positioner está hecho de aluminio, si se monta en una zona donde se requiere el uso de aparatos de categoría 1G, deberá instalarse de tal manera que, incluso en caso de que ocurra un incidente anómalo, las fuentes de ignición debidas a las chispas de fricción e impacto queden alejadas.
2. Como parte del cierre del Smart Valve Positioner está hecho de plástico, si se monta en una zona donde se requiere el uso de aparatos de categoría 1 G y del grupo IIC, se tomarán las precauciones necesarias para evitar cargas estáticas.

ATEX/KEMA Intrinsic Safety Approval (Italian)
Certificazione sicurezza intrinseca ATEX

Informazioni marcatura

CE **0344**

II 1 G Ex ia IIC T4

-40°C ≤ Tamb ≤ +60°C

Certificato N.: KEMA 04ATEX1176 X

Circuito di ingresso / alimentazione
(terminali +/ -IN)
Ui = 29V, Ii = 95 mA, Pi = 690 mW
Ci = 10 nF, Li = 220 µH

Standard applicabili

Standard europei:

EN 60079-0:2006

EN 60079-11:2007

EN 60079-26:2007

Condizioni particolari per un utilizzo sicuro

1. Dato che il rivestimento del Smart Valve Positioner (posizionatore valvola intelligente) è fatto di alluminio, se viene montato in un' area dove è richiesto l'uso di apparati di categoria 1 G, deve essere installato in modo che, anche in caso di rari incidenti, le fonti della combustione siano escluse per via dell'impatto e delle scintille di frizione.
2. Dato che il rivestimento del Smart Valve Positioner (posizionatore valvola intelligente) è fatto di plastica, se viene montato in un' area dove è richiesto l'uso di apparati 1 G e di gruppo IIC, devono essere prese le necessarie precauzioni per evitare cariche statiche.

ATEX/KEMA Intrinsic Safety Approval (Dutch)
ATEX-certificering voor intrinsieke veiligheid

Markeringen

CE **0344**

Ex **II 1 G Ex ia IIC T4**

-40°C ≤ Tamb ≤ +60°C

Certificaat nr.: KEMA 04ATEX1176 X

Voeding/ingangscircuit
(aansluitingen +/- IN)
Ui = 29V, Ii = 95 mA, Pi = 690 mW
Ci = 10 nF, Li = 220 µH

Toepasselijke normen

Europese normen:

EN 60079-0:2006

EN 60079-11:2007

EN 60079-26:2007

Bijzondere voorwaarden voor veilig gebruik

1. Omdat de behuizing van de Smart Valve Positioner van aluminium is gemaakt, moet deze, indien hij gemonteerd wordt in een omgeving waarin het gebruik van categorie 1 G-apparatuur vereist is, zo worden geïnstalleerd dat ontstekingsbronnen als gevolg van impact en wrijvingsvonken uitgesloten zijn, en dit zelfs in geval van zeldzame incidenten.
2. Omdat een deel van de behuizing van de Smart Valve Positioner van plastic gemaakt is, moeten voorzorgsmaatregelen tegen statische ladingen genomen worden als deze geplaatst wordt in een ruimte waar het gebruik van apparatuur van categorie 1 G en groep IIC vereist is.

ATEX/KEMA Intrinsic Safety Approval (Polish)
Certificação de Segurança Intrínseca ATEX

Informações sobre a marcação

CE **0344**

II 1 G Ex ia IIC T4

-40°C ≤ Tamb ≤ +60°C

Nº. do certificado: KEMA 04ATEX1176 X

Alimentação/circuito de entrada
(terminais +/ -IN)
Ui = 29V, Ii = 95 mA, Pi = 690 mW
Ci = 10 nF, Li = 220 µH

Normas aplicáveis

Normas Europeias:

EN 60079-0:2006

EN 60079-11:2007

EN 60079-26:2007

Condições especiais para utilização segura

1. Dado que o invólucro do Smart Valve Positioner (posicionador inteligente de válvula) é feito de alumínio, se o posicionador for montado numa área onde seja necessária a utilização de um aparelho de categoria 1 G, este tem de ser instalado de forma a que, mesmo na eventualidade de incidentes raros, as fontes de ignição devido a impacto e faíscas de fricção sejam excluídas.
2. Dado que parte do invólucro do Smart Valve Positioner (posicionador inteligente de válvula) é feito de plástico, se o posicionador for montado numa área onde seja necessária a utilização de um aparelho de categoria 1 G e do grupo IIC, é necessário tomar as devidas precauções para evitar cargas estáticas.

Unpacking

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

- Smart Valve eXplorer model SVX100, SVX102
- Feedback lever
- Two hex socket bolts (only for stroke lever type)
- Hex bolt and spring washer (only for fork lever type)
- Hex wrench (for feedback lever - only for stroke lever type)
- Mounting kit (option)
- Manual (Option)

Verifying the specifications

The Smart Valve eXplorer 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 Smart Valve eXplorer 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)

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 call in your question.

Storage

Ideally, the SVX should be stored in the original packaging. However, if the original packaging is not available, store the SVX indoors at normal temperature (25°C {77°F}) and humidity (60% RH) in a place free from vibration and shock and not exposed to rain or water. If you are storing the SVX after it has been used, clean the SVX and then firmly tighten the terminal box cover and seal the wiring, piping connections and bleed hole in the pilot cover using the Azbil Corporation-supplied caps or tape to prevent entry of moisture.

Table of Contents

Chapter 1: Introduction

Chapter 2: Installation

Chapter 3: Operation

Table of Contents

Chapter 4: Configuration using a CommPad

Chapter 5: Configuration using a HART Communicator

Chapter 6: Maintenance and Troubleshooting

Table of Contents

List of Figures & Tables

List of Figures & Tables

Chapter 1: Introduction

1-1: Overviews

The SVX is an intelligent valve positioner that can be connected to a 4-20 mA controller output signal line. Since all adjustments can be performed electrically, the relationship between the input signal and the position of the control valve can be set arbitrarily. Split range and other special settings are also easy to set up.

An overview of an SVX system is shown below.

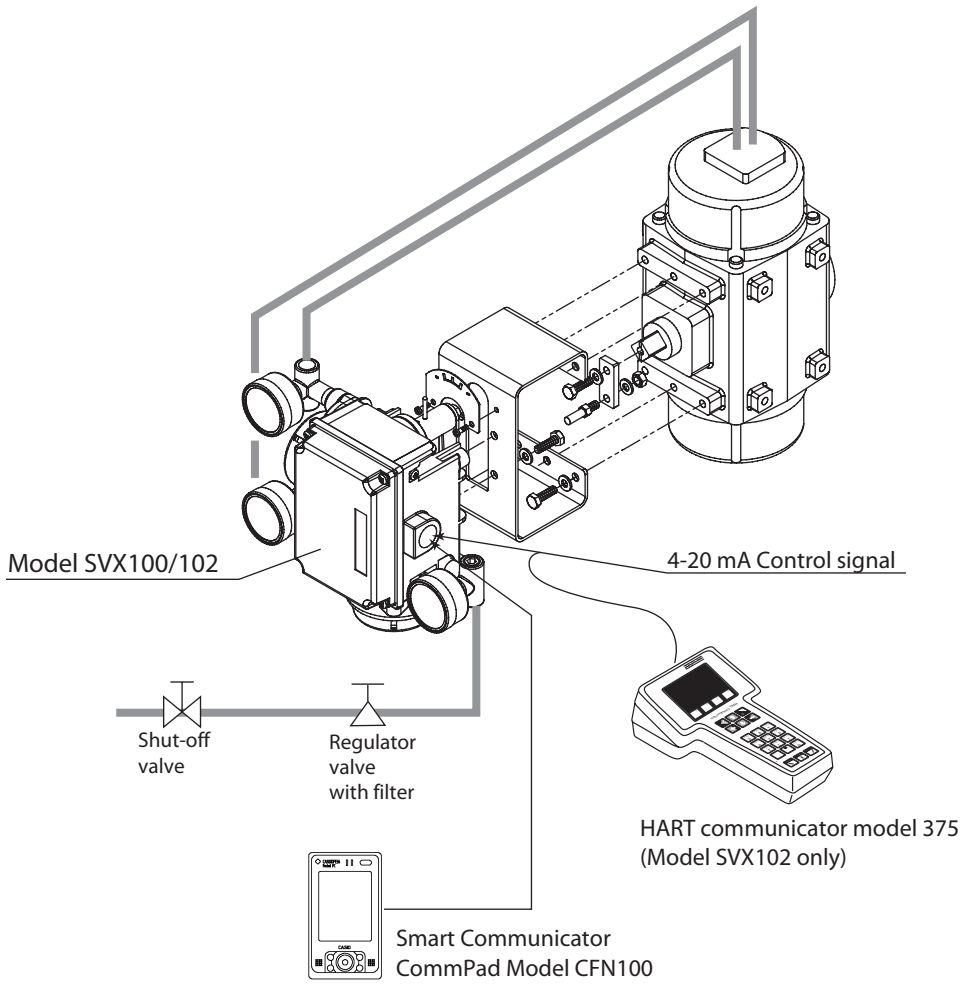


Figure 1-1 SVX overview

Models

Model SVX100: Analog signal (4 to 20 mA DC)

Model SVX102: Analog signal (4 to 20 mA DC) with HART communication protocol

1-2: System structures

Model SVX100

Data can be written to and read from the SVX database by using the CommPad in a system structure as illustrated below.

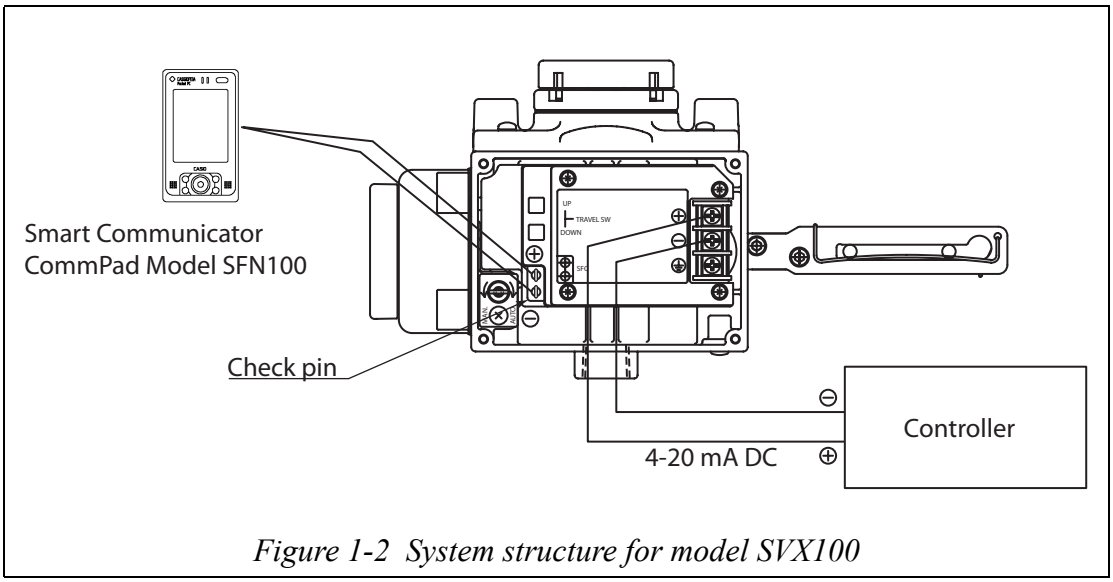


Figure 1-2 System structure for model SVX100

Model SVX102

Data can be written to and read from the SVX database by using the HART communicator in a system structure as illustrated below.

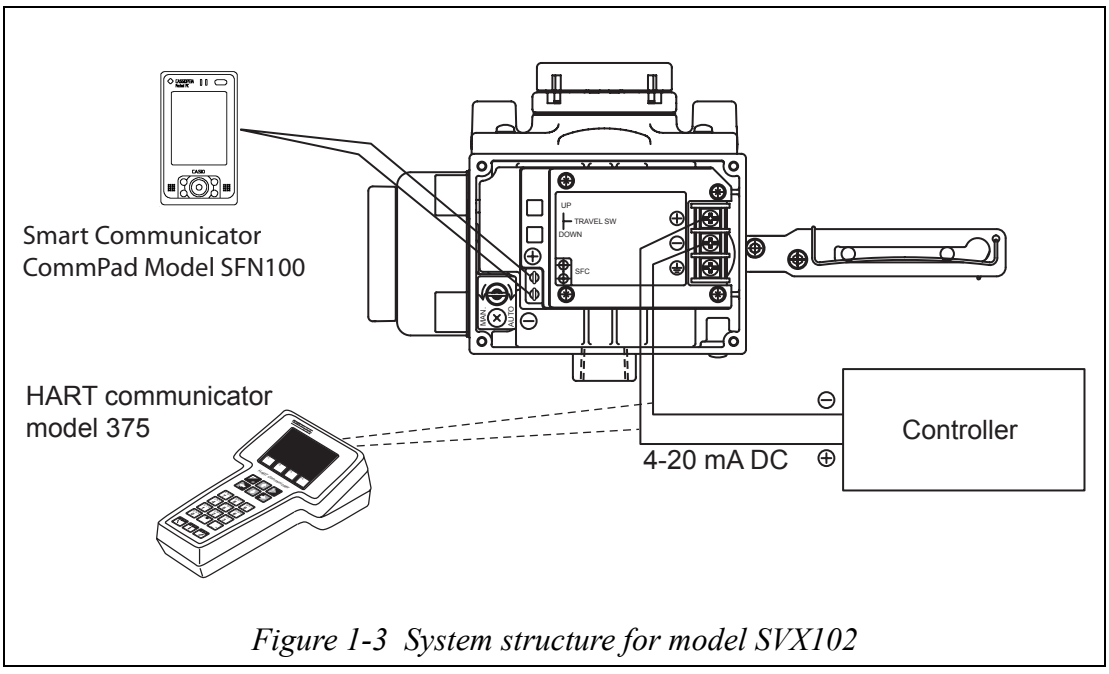


Figure 1-3 System structure for model SVX102

1-3: Communication

There are three ways to communicate with the SVX: manually, using a Smart Communicator (CommPad) or using a HART communicator.

Manual configuration

Initial SVX configuration is typically performed using a switch Auto-Setup, which detect the characteristics of the valve, as well as zero and span adjustment can all be performed automatically.

Using a Smart Communicator Commpad (Mode CFN100)

Azbil Corporation's model CFN100 Smart Communicator CommPad can be used for all configuration, calibration and maintenance of the SVX. SVX-original communicator functions are documented fully in this manual. See the CommPad Smart Communicator Manual to learn more about the CommPad.

Figure 1-4 Azbil Corporation's Smart Field Communicator CommPad (Model CFN100)

Using a HART communicator

Emerson Electric HART communicator model 375 can be used for all configuration, calibration and maintenance of model SVX102. SVX-original communicator functions are documented fully in this manual. See the HART communicator manual to learn more about the HART communicator.

According to need, update a software and device description files of HART communicator model 375.

1-4: Structures and functions of SVX

Main components

The main SVX components are shown below.

Integral type (model SVX100/102)

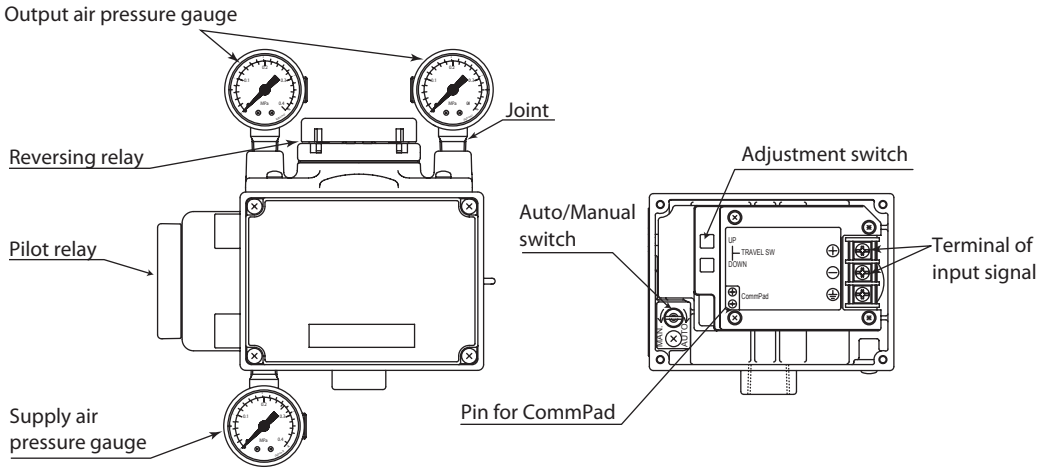


Figure 1-5 Front view

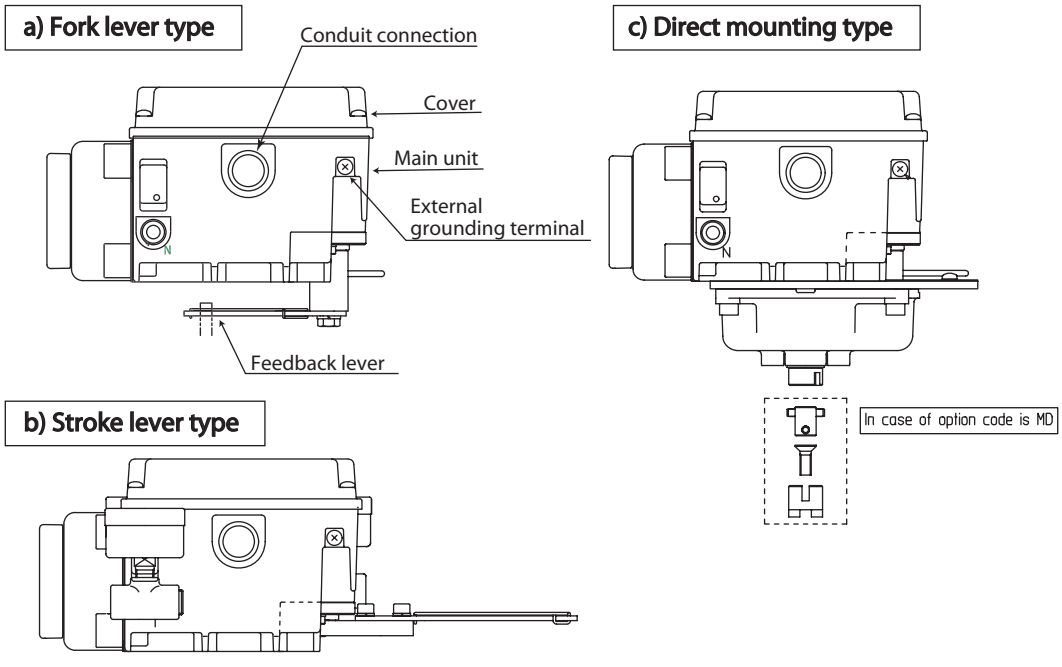


Figure 1-6 Under view

Names parts and functions of main components

Part	Description
Main unit	Holds the electronics module, EPM (electro-pneumatic converter module), and VTD (position sensor).
Pilot relay	Amplifies the pneumatic signal from the EPM (electro-pneumatic converter module) and converts it to a pneumatic signal for the actuator.
Feedback lever	Acquires the motion of the control valve 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 “6-2-1: Auto/Manual selection switch” on page 6-5. for information on operating procedures.
Zero and span adjustments Auto-setup switch	Allows the zero and span to be adjusted and auto setup to be performed with just a switch without using the communicator. **~Note** *Do not operate when supply air pressure is not supplied in normal condition.*
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 (OUT1)	The air output from this connector is delivered to the actuator “1” is written on the reversing relay.
Output air connection (OUT2)	The air output from this connector is delivered to the actuator. “2” is written on the reversing relay.
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 SVX, use either the internal or the external ground terminal, but be sure not to create a 2-point ground.
Conduit connection	Port for connection cables.
Pin for CommPad	The SVX can communicate with CommPad if the CommPad communication cable hooks are connected to these pins.
Cover	Waterproof construction.

Chapter 2: Installation

2-1: Site selection

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

- Ambient temperature range of -40 to +80°C (-40 to 176°F).
- In relative humidity of 10 to 90% RH.
- 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)

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

2-2: Installing SVX

Smart Valve eXplorer are designed for use in combination with rotary valve. The SVX weighs about 1.8 kg. It should be attached in the same way you would attach a conventional current-pneumatic positioner.

⚠ CAUTION

- Do not install the SVX near a large transformer, high-frequency furnace, or other equipment that generates a magnetic field. Unexpected operation can result.
- Incorrect settings can reduce the SVX's effectiveness and cause damage to or failure of the SVX.
- When installing a control valve, provide adequate clearance around the valve for maintenance (piping, wiring, and adjustment), and verify that the valve is oriented correctly.
- Transport the SVX in its original packing to as close to the point of installation as possible.
- Do not apply excessive force to the feedback lever or bend the feedback pin when installing the valve.
- Be sure to tighten bolts and nuts securely on the SVX and control valve.

⚠ WARNING

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

Procedure for fork lever type

step	Procedure
1	The SVX comes with an actuator mounting kit appropriate to your control valve and actuator. Fasten the mounting plate to the rear of the SVX securely, using the four hexagon head bolts (M6 × 12) and spring washers provided.
2	Fasten the SVX (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 SVX feedback lever.

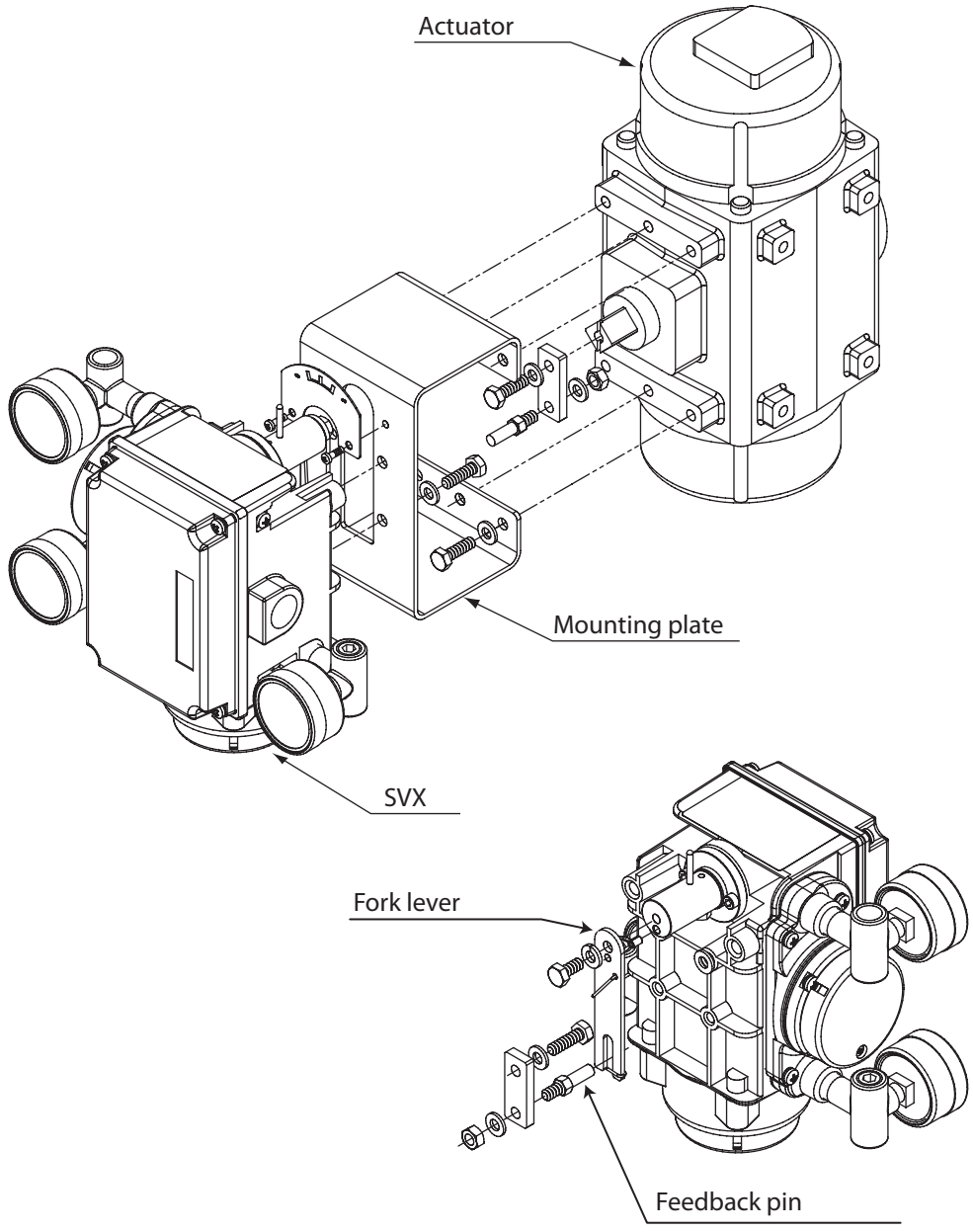


Figure 2-1 Mounting the rotary cylinder actuator (fork lever type)

Procedure for stroke lever type

step	Procedure
1	The SVX comes with an actuator mounting kit appropriate to your control valve and actuator. Fasten the mounting plate to the rear of the SVX securely, using the two hexagon head bolts (M8 × 20) and spring washers provided.
2	Fasten the SVX (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 SVX feedback lever.

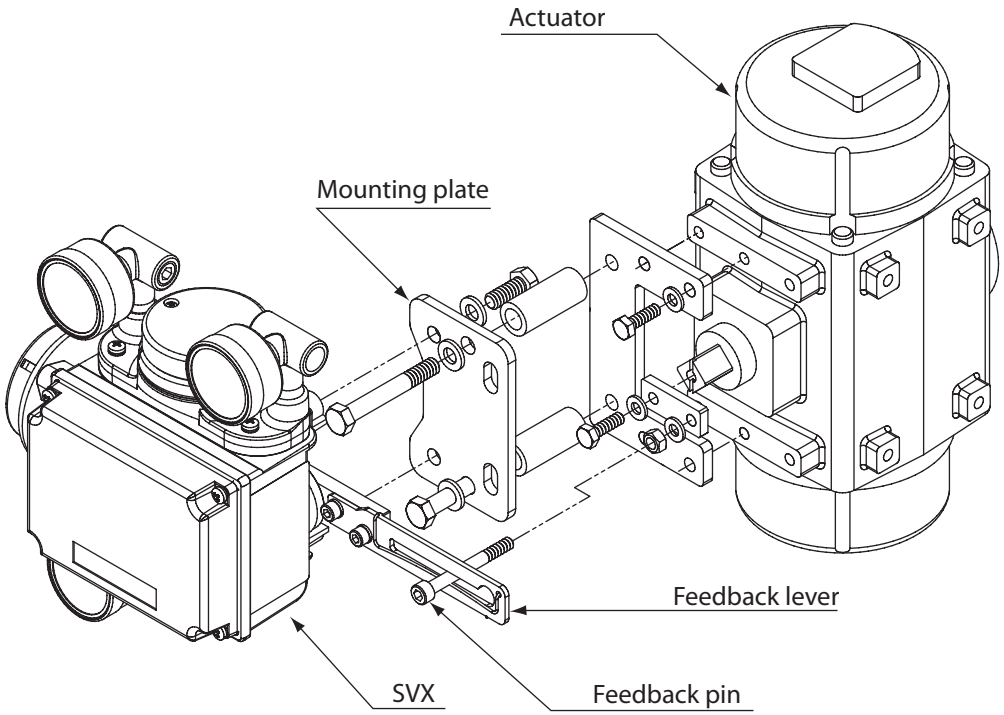


Figure 2-2 Mounting the rotary cylinder actuator (stroke lever type)

~Note *Please avoid mounting the feedback lever pin between the valve stem and the positioner lever rotary shaft.*

Procedure for direct mounting type

step	Procedure
1	The SVX comes with an actuator mounting kit appropriate to your control valve and actuator. Fasten the mounting plate to the rear of the SVX securely, using the four hexagon head bolts (M6×12) and spring washers provided.
2	Fasten the SVX (mounting plate) securely to the actuator's mounting structure using the bolts and washers provided. During this operation, put the SVX feedback stem in actuator stem with a joint.

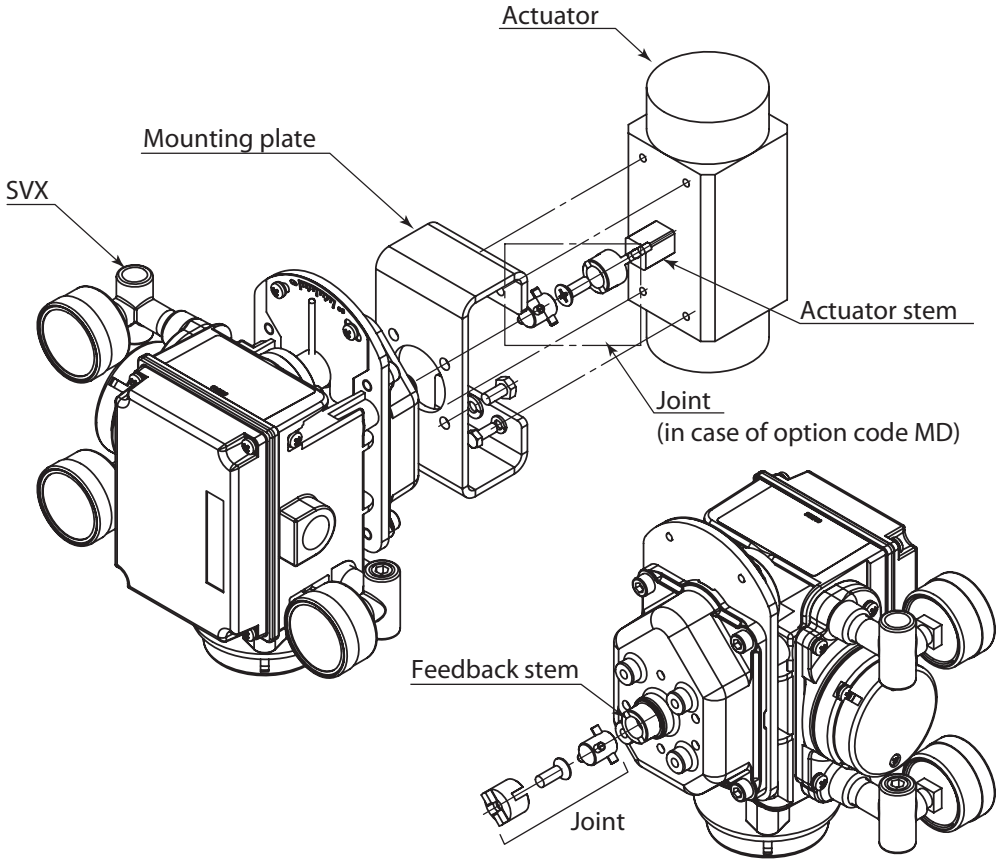


Figure 2-3 Mounting the rotary cylinder actuator (direct mounting type)

⚠ CAUTION

Confirm that the direction of valve stem rotation matches the SVX feedback stem direction, when SVX is mounted on the actuator.

If the direction did not match, the apparatus is broken.

Connecting the feedback pin and the feedback lever

The following points must be observed when connecting the SVX 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 caught between the guide and the spring.

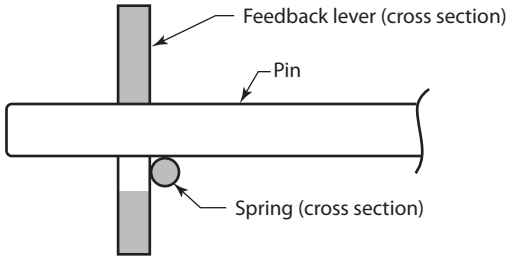


Figure 2-4 Feedback pin and feedback lever connection

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

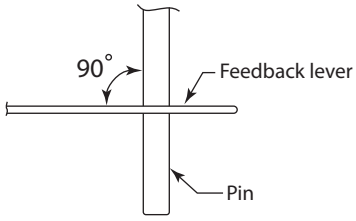


Figure 2-5 Angle between feedback lever and pin

(4) Assemble the feedback lever and the SVX using the two hex socket bolts provided. The feedback lever rotates up to 20° from the horizontal (40° travel). If this limit is exceeded, then the SVX will not operate properly. (Minimum angle of rotation is ±4°)

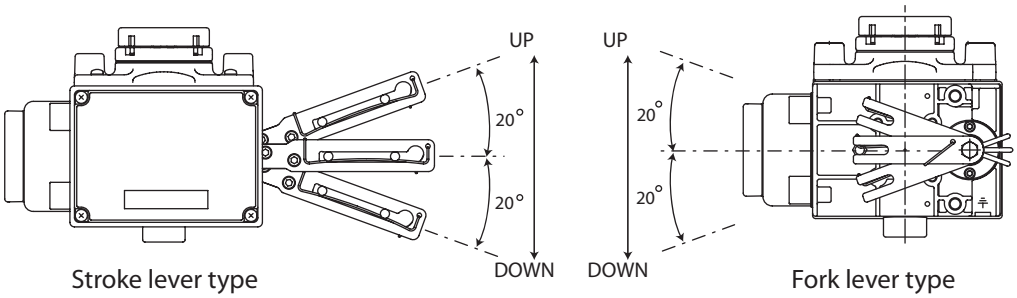


Figure 2-6 Feedback lever maximum range of motion

Connecting the Air Supply

Clean and dry supply air ensures long-term stability of the SVX.

Instrumentation equipment air

Since this flowmeter employs a flapper nozzle mechanism in the electro-pneumatic converter, if the instrumentation equipment air is contaminated or contains oil or moisture, its functioning as a positioner could be disabled or it could cause an unrecoverable failure. Therefore, the quality of the instrumentation equipment air to be supplied to this flowmeter is defined as follows:

- Solid body: there must be no particles whose diameter is over 3 μm.
- Oil: It must be less than 1 ppm in mass.
- Humidity of the supplied air: The dew point temperature must be at least 10 degrees Celsius lower than the temperature of the equipment body.

Taken from JIS C1805-1 (2006)

Follow the specifications described above to select a compressor and a main-line type or end-installation type compressed air cleaner.

(1) Compressed air cleaner for main lines
Select a main line filter and a compressed air cleaner for main lines such as the micro-alescer produced by SMC Corporation or CKD Corporation, which are famous as compressed air cleaner makers, to satisfy the above-mentioned specifications.

(2) End-installation type compressed air cleaner
If fundamental measures for main lines cannot be taken because of any problem related to, for example, the control valve installation, install an end-installation type compressed air cleaner (oil mist removal equipment) to supply instrumentation equipment air to the flowmeter through this compressed air cleaner.

<Examples of recommended equipment>

Products produced by SMC Corporation

Mist separator

AM150, AM250 series

(filtration 0.3 μm, secondary oil mist concentration: 1.0 mg/m^3)

Air combination

Filter regulator + mist separator

AW30 series (filtration rate: 5 μm) + AFM30 series (filtration rate: 0.3 μm)

Products produced by CKD Corporation

Oil mist filter

M1000, M3000 series

Mantle S type (filtration rate: 0.3 μm, residual oil: 1.0 mg/m^3)

~Note *Select specifications of a compressed air cleaner in accordance with the conditions of use.*

Even if the oil mist removal equipment mentioned above is installed, proper inspections and maintenance of the pneumatic circuit are necessary for long-term stable operation. Be sure to conduct periodic inspections and maintenance of the instrumentation equipment along with the installation of oil mist removal equipment.

Any failures of this flowmeter caused by unsatisfactory quality of the instrumentation equipment air are not covered by the warranty.

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 SVX.
- The shutoff valve enables disconnection of the SVX from the control valve for ease of maintenance.

Recommended piping practices

- Air supply pipes should have an inside diameter of 6 mm {1/4 inch} (8 mm {3/8 inch} outside diameter tubing recommended).
- Pipes should match the installation environment, i.e. for a corrosive environment, use vinyl-covered copper pipes.
- Use joints that precisely fit the pipes.
- Sealing tape is preferable to solid or liquid sealants for pipe joints to SVX air connections. Prevent sealing tape/sealant from entering pipes.
- Use the right length of piping; avoid excess lengths.
- Completely flash pipes before use, checking for burrs and other problems.
- Check for leaks after installation.

Connection position

Positioning for the supply air connection and the output air connection are shown below.

The thread size for the connection can be selected to specifications.

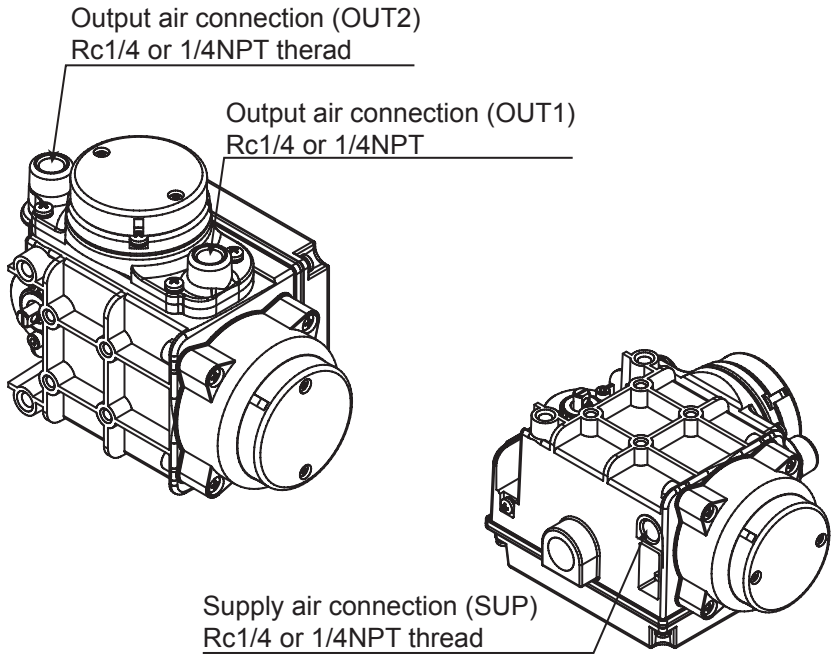


Figure 2-7 Connecting the air supply (without pressure gauge)

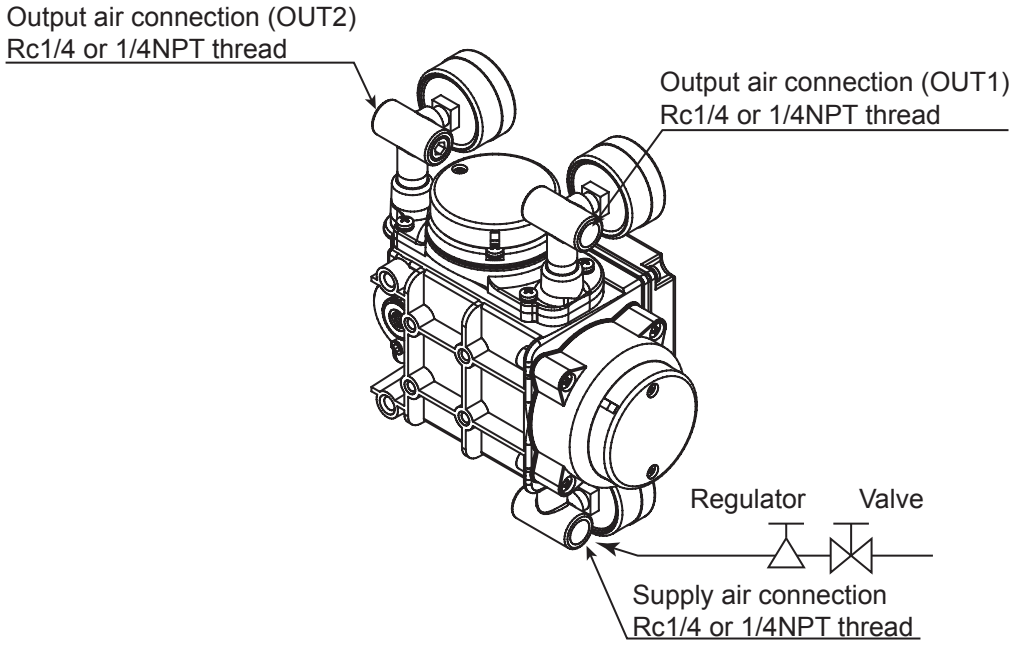


Figure 2-8 Connecting the air supply (with pressure gauge)

Procedure for air pipe connection

Step	Procedure
1	Remove the dust plug from the output air connection on SVX.
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 SVX air connections. Prevent sealing tape/sealant from pipes.*
3	Connect the other air connection to each joints. **~Note** • *Completely flash pipes before use, checking for burrs and other problems.* • *Use the right length of piping avoid access lengths.*
4	Check for leaks after installation.

2-3: Electrical wiring

2-3-1 Wiring

⚠ WARNING

- ELECTRICAL SHOCK HAZARD! Turn off power before performing any wiring.

Electrical wiring (Model SVX100/102)

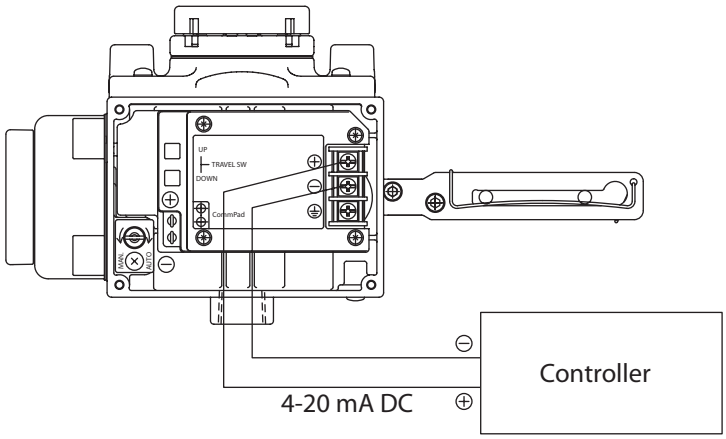


Figure 2-9 Electrical wiring for model SVX100/102

- Use only one of the two ground terminals (internal and external) to ground the SVX. Perform this work according to all local laws and ordinances governing electrical work.

Cables

- Use stranded cables having a conductor cross-section of 1.25 mm^2 and suitable for 600V such as shown in the conductor table in Article 310 of the NEC (National Electric Code). Outside diameter on cables must be 1/4 inch to 7/16 inch {7 mm to 12 mm}. Use shielded wires for locations exposed to noise.
- Select a sheath material that can withstand the cable installation environment (including the ambient temperature, corrosive gasses, corrosive liquids).
- Bring the cable to the terminal box through the conduit connection port (G1/2 internal thread, 1/2NPT internal thread).
- Use cable with an outer diameter between 7 and 12 mm. If a pressure-resistant packing type cable adaptor is used, only use a packing that matches the outer diameter of the cable.
- We recommend the use of M4 screw size crimp-on terminals with an insulating sleeve.
- The maximum cable length is 1500 meters.

⚠ CAUTION

Avoid installing cables near noise-making devices such as large capacity transformers and motors. Do not lay signal/control cables in the same tray or duct with noisy switching power cables.

~Note • *We recommend the use of conduits and ducts to prevent water and mechanical damage to electrical lines.*
Also, always use water-tight adaptors at conduit connection ports.

Electrical wiring procedure

Step	Procedure
1	Unscrew 4 screws and remove the cover. **~Note** *Be careful not to scratch painted surfaces with tools at this time.*
2	Remove blind plugs according to how the wiring for the SVX will be performed.
3	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.*
4	Tighten the terminal screws fully, to a torque of 1.5 N•m (15 kgf•cm).
5	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 silicon resin based non-hardening seal materials.*
6	Screw 4 screws onto the SVX until it is hand-tight. **~Note** *Be careful not to scratch painted surfaces with tools at this time.*

Chapter 3: Operation

3-1: Auto-setup

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

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

There are three ways to perform Auto-Setup.

- Using the Switch.
- Using CommPad

  Refer to the operation manual for Smart Valve Positioner (CM2-CFN100-2003).
- Using HART Communicator

  Refer to "Chapter 5:Configuration using a HART Communicator"

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

• After auto-setup, the SVX 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 SVX, then adjust zero or span manually.

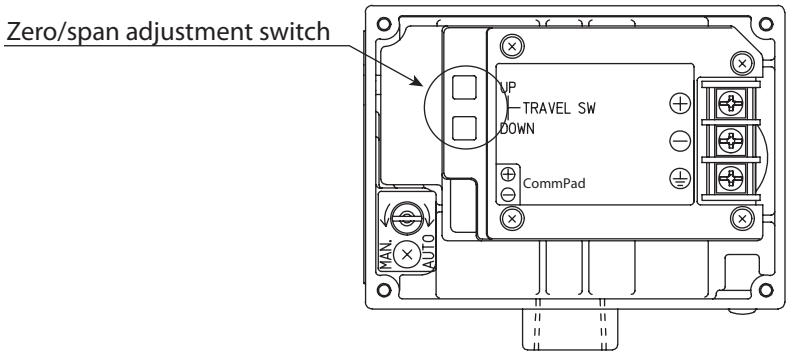


Figure 3-1 Zero and span adjustment switch

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

- Zero and span adjustment

(However, as a default, the span point is taken to be 0% of the overstroke. If a span adjustment is performed after auto-setup completes, 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.

SVX setting

If the valve action parameters set up for the SVX in Table 3-1 is the reverse values, see "5-5-3 :Valve sys config (Valve system configuration)" on page 5-11, in this document and set the valve action to the reverse settings.

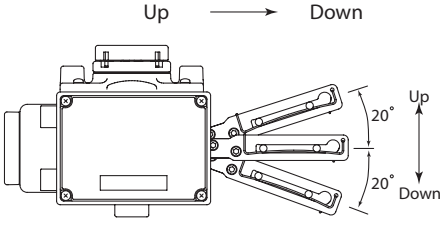
If the valve action parameters set up for the SVX in Table 3-1 is the direct values, no further parameter settings are required. (The SVX is shipped from the factory set to direct mode.)

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

You can also use a portable communicator to initiate auto-setup and initial calibration.

Because auto-setup and zero and span calibration must be observed for accurate valve positioning, these two steps will typically be performed by zero and span adjustment switch. Other functions including loop test, valve travel inquiry and tag number assignment require an a communicator.

Table 3-1 SVX setting

Lever	Valve Direction	Input signal	SVX Setting	
			Actuator Action	Valve Action
	Shut → Open	Direct Close: 20 mA, Open: 4 mA	Reverse	Reverse
		Reverse Close: 4 mA, Open: 20 mA	Direct	Reverse
	Open → Shut	Direct Close: 20 mA, Open: 4 mA	Direct	Direct
		Reverse Close: 4 mA, Open: 20 mA	Reverse	Direct

To initiate auto-setup using the zero and span adjustment switches

Step	Procedure
1	Set the input signal to the SVX to 18 ±1 mA DC
2	Hold the “UP” switch down until the auto-setup program starts (approx. 3 seconds) then release the “UP” switch.
3	The valve moves from fully shut to fully open twice. The valve then opens to about 50% and stays this way for up to three minutes.
4	Confirm that the auto-setup routine is complete by varying the input signals. The entire auto-setup procedure should take about three minutes.
5	If the input signal drops below 4 mA while auto-setup is running, then auto-setup will fail and must be restarted. After completing auto-setup, keep at least 4 mA of signal (power) for at least three seconds to make sure data and parameters are stored in SVX memory.

~Note

- *Do not lower the input signal (4-20 mA) to a level less than 4 mA. (The level of the signal can be set to any level in the 4-20 mA range without problem.)*
- *After the operation has completed, check valve operation by varying the input signal and verifying that the valve goes to the correct position corresponding to the signal. If the span position has shifted, perform a span adjustment operation. (Refer to “3-2: Zero and span adjustment”.)*
- *In some cases, the auto-setup routine will not properly detect your valve, especially if the valve's actuator is smaller than Azbil Corporation's HA1 type actuator (diaphragm capacity of (850 cm³ {52 inches³})) or the operation stroke is smaller than 14.3 mm {9/16 inches}. If this occurs “5-5-4:Dynamic chara (Dynamic characteristics)” on page 5-12.*
- *There is a possibility that the forced open value “5-5-6 : Tvl cut off (Travel cut off)” on page 5-15, may change after performing the auto-setup operation. If necessary, reset the forced fully open value.*
- *If the booster relay is on, and is operating the auto-setup function, there might be a possibility of hunting. In this case, adjust the booster’s sensitivity or refer to “5-5-4: Dynamic chara (Dynamic characteristics)” on page 5-12 and adjust the dynamic characteristic manually.*
- *If PARAM0 is selected for the actuator size selection item, auto setup will be performed once from the fully closed to fully open position and back to fully closed. Also, the actuator size will not be automatically set.*
- *The “DOWN” adjustment switch is only for the auto-setup function of Azbil Corporation’s model VFR. Do not use the “DOWN” adjustment switch with any other actuator.*

3-2: Zero and span adjustment

The SVX provides an zero and span adjustment function.

This method is also useful when the communicator is not available.

There are three ways to perform zero and span adjustment.

- Using the switch
- Using communicator by input signal
- Using communicator by supply air

Zero and span adjustment using the switch

Zero and span adjustments can be made pressing the “UP” or “DOWN” button switch. Once adjustments have been completed, press the button switch a second time to record the new position.

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

- Adjustment direction

  The feedback lever moves up when the “UP” adjustment switch is pressed.

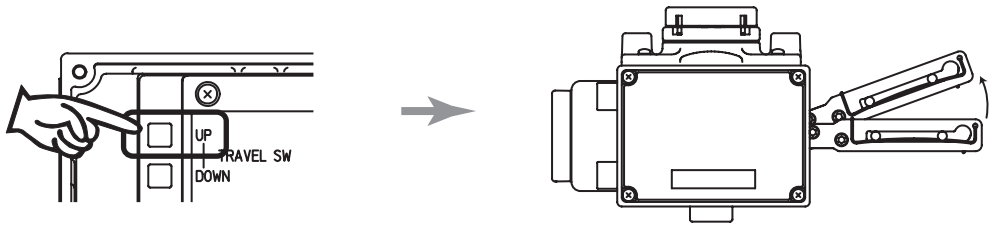


Figure 3-2 Adjusting the lever in the upward direction

The feedback lever moves down when the “DOWN” adjustment switch is pressed.

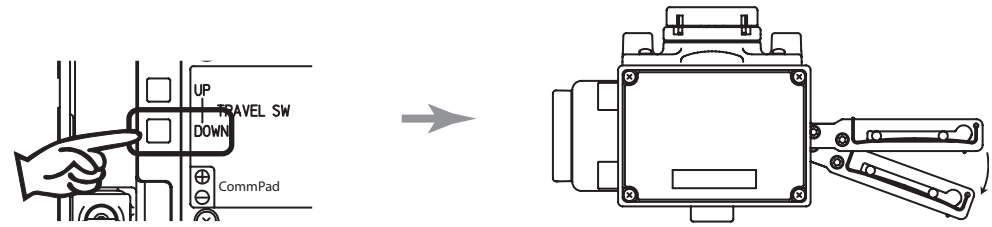


Figure 3-3 Adjusting the lever in the downward direction

~Note

- *The zero and span adjustment function uses the input signal to identify whether a valve fully open position (span) adjustment or a valve fully closed position (zero) adjustment is to be performed. If the input signal is not within the range of ±1 mA of the set current values that correspond to the valve open and closed position, this function will not operate.*
- *Use the adjustment switches only if the supply air pressure is stable and only if the valve can move freely.*

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	Input the setting current value that corresponds to the valve being fully shut from the controller (constant-current supply). (Example: 4 mA)
2	Adjust the valve fully shut position by pressing the “UP” or “DOWN” adjustment button switch. (If the forced ON/OFF function is operating, the valve will not move. To change the forced ON/OFF setting, see “5-5-6 : Tvl cut off (Travel cut off)” on page 5-15. The default value is set to 0.5%.)

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	Input the setting current value that corresponds to the valve being fully open from the controller (constant-current supply). (Example: 20 mA)
2	Adjust the valve fully open position by pressing the “UP” or “DOWN” adjustment button switch. The default value is set to 99%.

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

After completing the adjustments, hold the input signal at a level over 4 mA for at least 3 seconds to write the set positions.

When adjusting the span after the auto-setup, the forced fully open value (refer to “5-5-6 : Tvl cut off (Travel cut off)” on page 5-15) will automatically set to -1% of the overstroke. Reset the fully open value if necessary.

3-3: Starting operation

Items to verify before setup

Before setting up for this adjustment, verify the following.

- The air supply system has been completed and the air supply pressure required by the actuator is being supplied. (See “ Connecting the Air Supply” on page 2-7.)
- Connection with the CommPad has been completed.
- The SVX and the communicator are communicating.

Verifying SVX operation

The procedure for verifying SVX operation is given below.

Step	Procedure
1	Vary the input signal from the controller (constant-current supply) and verify that the position of the control valve changes according to the set characteristics. If the system does not operate correctly, Refer to "Chapter 6: Maintenance and Troubleshooting" on page 6-1
2	If the system does operate correctly, restore the electrical wiring to its original state and tighten down the cover firmly. (Refer to "2-3: Electrical wiring" on page 2-11)

Operation startup procedure

The SVX and the control valve form a manipulator used in process control. Always observe adequate safety precautions when starting control valve operation using the SVX.

~Note *Pay particular attention to how well electrical connection components (adapters, blind plugs, and similar equipment) are tightened down, and to how well covers are tightened down as well. Verify the following points before starting operation.*

The verification procedure is given below.

Step	Procedure
1	Verify that the SVX is installed correctly. Verify that nothing interferes when the control valve operates.
2	Verify that the SVX electrical wiring is installed and connected securely. Also verify that the air lines are installed and connected securely and that there are no air leaks.
3	Verify that the valve operates as set up according to the input signal.

After the above items have been checked, operation of the SVX and control valve may be started.

Stopping operation

The procedure for stopping operation is given below.

Step	Procedure
1	Stop operation of the process. (Move each valve to the air fail position.)
2	Turn off the input signal (power supply) to the SVX.
3	Turn of the air supply to the SVX. **~Note** *If the SVX is installed in an adverse environment, for example, in a corrosive atmosphere, we recommend not turning off the air supply to prevent corrosive gasses from entering the SVX.*

Chapter 4: Configuration using a CommPad

The Smart Communicator CommPad is a communicator used to configure various settings and parameters for Azbil Corporation's smart field instruments.

CommPad communicates with a Azbil Corporation's smart field instrument using a Pocket PC-compatible PDA (CASIO IT-10) with a communication card and communication cable.

Please refer to the user's manual (Common Edition CM2-CFN100-2001) with CommPad for the details operation of the common part of CommPad.Please refer to the operation manual (Smart Valve Positioner Edition CM2-CFN100-2003) of the PDF file in a CD-ROM enclosing in CommPad for the operation method about this SVX.

Chapter 5: Configuration using a HART Communicator

This chapter describes operating the Azbil Corporation's model SVX102 valve positioner using HART protocol communication. A HART Communicator is used for adjustment, setup, data readout from, and other operations on the model SVX102 product. Refer to the user's manual for the HART Communicator from Emerson Electric Co. for information on the use of the HART Communicator itself.

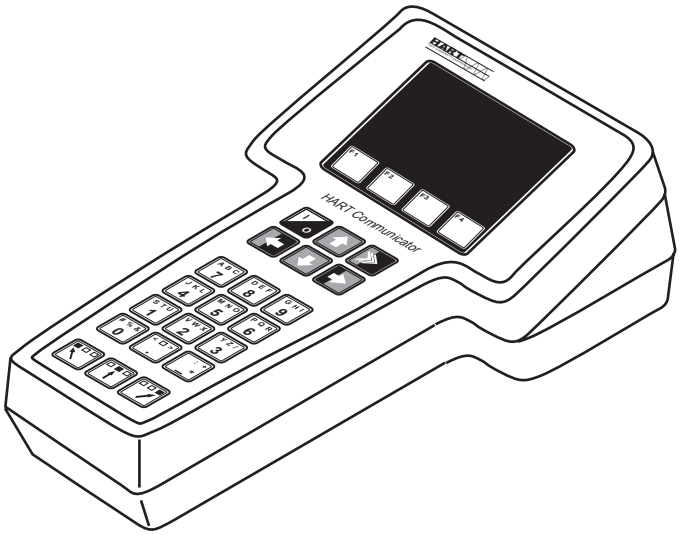
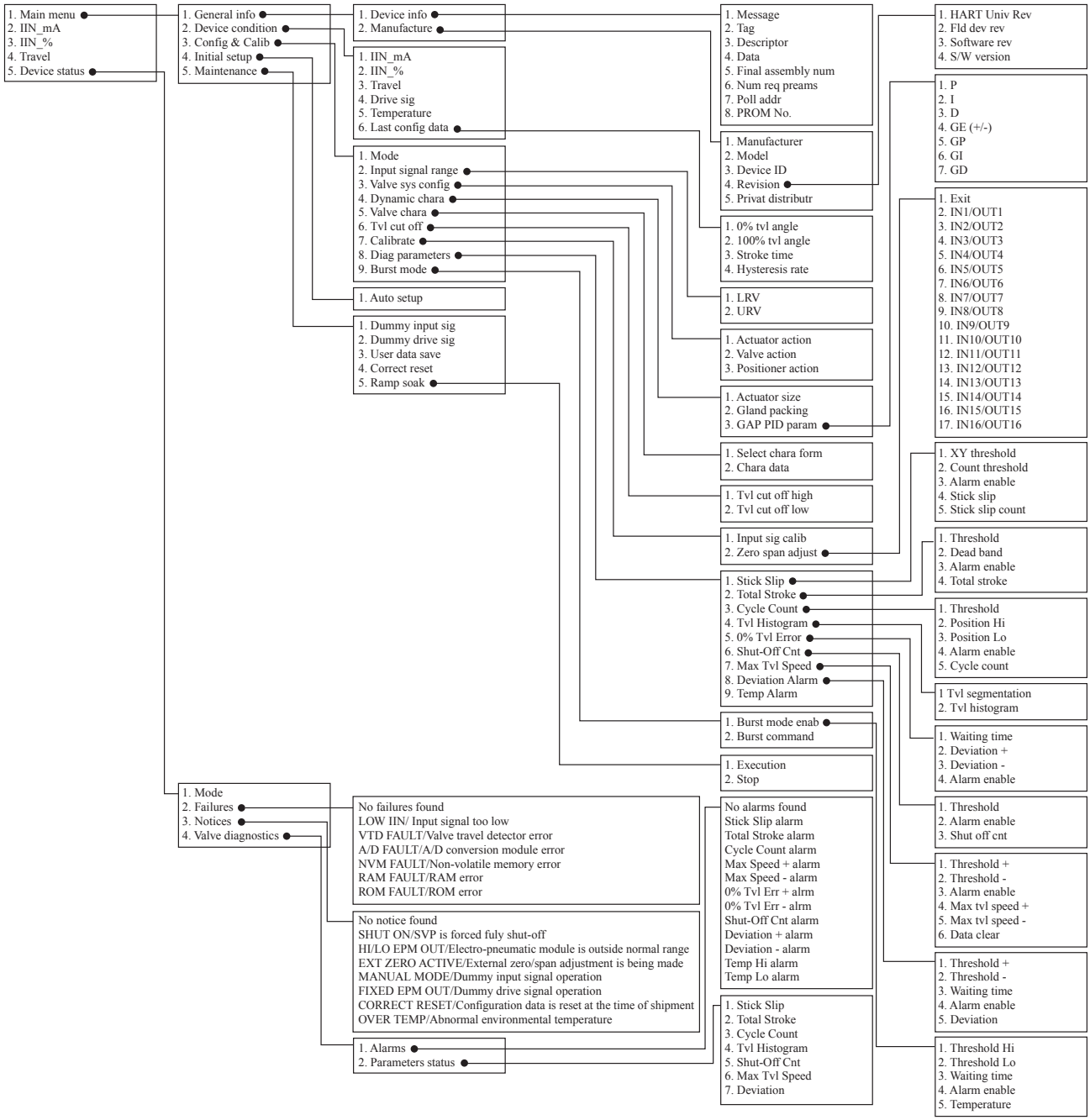


Figure 5-1 HART Communicator

5-1: HART communicator functions

The following operations can be performed using the HART Communicator.

HART Communicator menu tree



~Notes

- *Refer to the HART Communicator user's manual provided by Emerson Process Management when using the HART Communicator.*
- *This manual describes the functions of the model SVX102 version listed below.*

  Field device revision: 2
  Software revision:1 (Azbil Corporation Software ver. 4.A)
  HART Universal command revision:5
- *When operating the model SVX102 with a HART Communicator, update the HART Communicator firmware and modules as required.*
- *Also note that the SVX device descriptions are registered at the local programming site in each country.*

5-2: Starting communication

This section describes the wiring used for communication between the HART Communicator and the model SVX102. The input signal line from the controller is used for the communication line between the HART Communicator and the model SVX102.

Before starting communication

Verify the following points before starting communication.

- Verify that the cable connection between the SVX and the HART Communicator is correct and complete. (See Chapter 2: Installation.)
- Verify that an input signal (power supply) from the controller (constant current power supply) is provided.

~Note *If it is not possible to provide a 4-20 mA DC signal from the controller, connect a constant current power supply (3.85 to 21.5 mA DC) to the input signal terminals. The lines from the controller must be removed from the terminals before connecting the constant current power supply.*

Procedure

(1) Connect an input signal line to the HART Communicator.

⚠ WARNING

If the HART Communicator is to be used in an environment with an explosive atmosphere, the communicator itself must have explosionproof specifications and non-incendiary wiring must be used. If the HART Communicator used does not meet these conditions, it must not be in an explosive atmosphere.

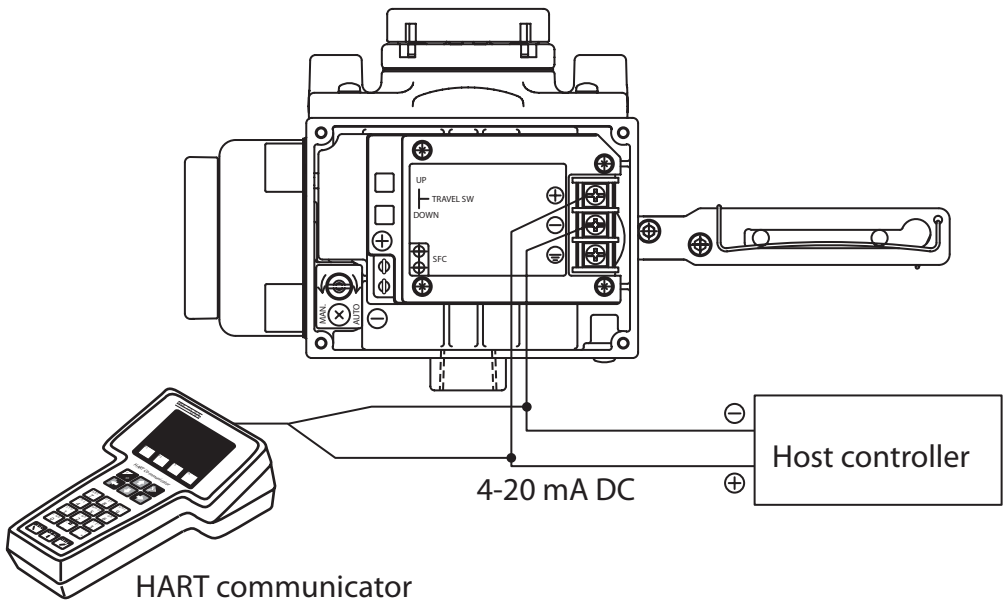


Figure 5-2 HART communication structure

(2) Press the [I/O] button to turn on the HART Communicator power.

The initial screen shown below will be displayed and communication will start.

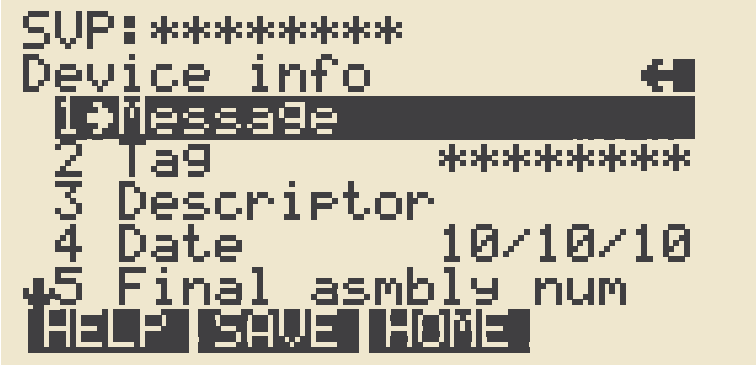
5-3: Verifying and modifying the general information

This section describes verifying and modifying the equipment information for the model SVX102 connected to the HART Communicator.

5-3-1 :Device information

Procedure

Select [Main menu] >> [General info] >> [Device info], and verify and modify the following items as required.

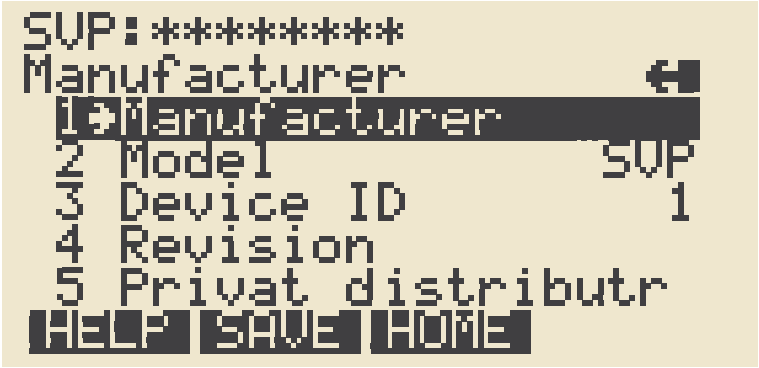


Menu	Function
1 Message	Verifies and/or modifies the messages registered in the SVX.
2 Tag	Verifies and/or modifies the tag number allocated to the equipment.
3 Descriptor	Verifies and/or modifies the equipment type information required for equipment management.
4 Date	Verifies and/or modifies the date of the last setup operation and other special dates in the equipment.
5 Final assembly num (Final assembly number)	Verifies and/or modifies the date of the last setup operation and the special management numbers in the equipment and system.
6 Num req params (Number of requested preambles)	Verifies the number of preambles characteristic to the equipment.
7 Poll addr (Polling address)	Specifies the equipment address when multiple units are connected in the same loop, for example when split range operation is used.
8 PROM No.	Verifies the model SVX102 ID information.

5-3-2 :Manufacturer

Procedure

Select [Main menu] >> [General info], and verify and modify the following items as necessary.



Menu	Function
1 Manufacturer	Verifies the manufacturer of the equipment. “Azbil Corporation” will be displayed.
2 Model	Verifies the name and model number of the equipment. “SVX” will be displayed.
3 Device ID	Verifies the unique ID information for the equipment.
4 Revision	Verifies the version information for the equipment software. The following items can be verified. **HART Universal command revision** Displays the revision number of the HART universal commands supported by the model SVX102. **Fld dev rev** (Field device revision) Displays the version number for the device description. **Software rev** (Software revision) Displays the version number for the software within the same field device revision. **S/W ver.** Displays the version number of the software. This is a Azbil Corporation corporate internal management number, and is in a one-to-one correspondence with the Software revision item described above.
5 Privat distributr (Private label distributor)	Verifies the private label distributor of the equipment

5-4: Device condition

This mode allows the display of measured values during equipment operation and the verification of adjustment data. Use the following procedure to verify and set this data.

5-4-1 :Current input value (units: mA)

Select [Main menu]

>> [Device condition]

>> [IIN_mA].

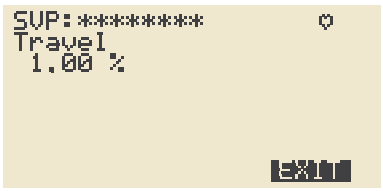
5-4-2 :Input signal% (percentage) value (units:%)

Select [Main menu]

>> [Device condition]

>> [IIN_%].

5-4-3 :Valve travel (units:%)



Select [Main menu]

>> [Device condition]

>> [Travel].

5-4-4 :Drive sig (EPM (Electro Pneumatic converter Module) drive signal) (units:%)

Select [Main menu]

>> [Device condition]

>> [Drive sig].

5-4-5 :Temperature (Equipment internal temperature) (units: °C)

Select [Main menu]

>> [Device condition]

>> [Temperature].

5-4-6 :Last config data

0% tvl angle (VTD sensor angle when fully closed) (units: degrees)

Displays the angle set as the point where the valve is fully closed.

Procedure

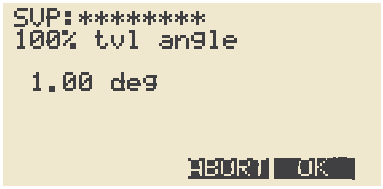
- Select [Main menu]
  >> [Device condition]
  >> [Last config data]
  >> [0% tvl angle].

100% tvl angle (VTD sensor angle when fully open) (units: degrees)

Displays the angle set as the point where the valve is fully open.

Procedure

- Select [Main menu]
  >> [Device condition]
  >> [Last config data]
  >> [100% tvl angle].

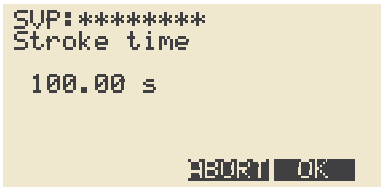


Stroke time (units: seconds)

Displays the valve full stroke time measured when auto setup was run.

Procedure

- Select [Main menu]
  >> [Device condition]
  >> [Last config data]
  >> [Stroke time]

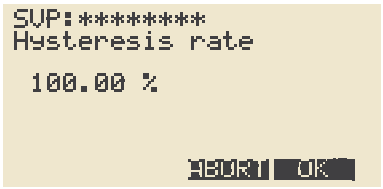


Hysteresis rate (units:%)

Displays the friction level of the gland pack measured when auto setup was run.

Procedure

- Select [Main menu]
  >> [Device condition]
  >> [Last config data]
  >> [Hysteresis rate].



5-5: Config & Calib (Equipment setup and calibration)

The setup and calibration procedure sets up and calibrates the required basic functions for the equipment to operation correctly.

Before setting up the equipment, set the SVX mode to Out of service.

⚠ CAUTION
After completing calibration or adjustment, or after changing settings, return the mode to In service.

5-5-1 :Mode (Switching the SVX mode)

The SVX has two modes: In service and Out of service.

When performing calibration or adjustment, or when changing settings, first verify that these operations will not result in problems that could adversely influence plant operation. Then set the mode to Out of service.

After completing calibration or adjustment, or after changing settings, return the mode to In service. These operations cannot be performed when the SVX mode is In service.

Procedure

- Select [Main menu] >> [Config & Calib] >> [Mode].
- Select the SVX mode (Out of service or In service) from the Mode menu.

5-5-2 :Input signal range (Setting the current input values)

This procedure sets the current input value when the valve is fully closed (LRV) and the current input value when the valve is fully open (URV).

An input in the range 4-20 mA can be used.

A split range can also be set up easily.

⚠ CAUTION
• Set these values so that the current input span (|LRV - URV|) is in the range 4 to 16 mA. • If the span is under 8 mA, the precision will be 1.5% of full scale.

Procedure

- Select [Main menu] >> [Config & Calib] >> [Input signal range] >> [LRV].
- Apply the current input value for the valve fully closed position and press F4.
- Select [Main menu] >> [Config & Calib] >> [Input signal range] >> [URV].
- Apply the current input value for the valve fully open position and press F4.

5-5-3 :Valve sys config (Valve system configuration)

This procedure set the control valve control system.

Actuator action

- Selects the operating direction of the actuator.
- Selects direct or reverse action (DIRECT/REVERSE). Specify direct operation (DIRECT) if the feedback lever is to move from higher to lower positions as the air pressure increases, or specify reverse operation (REVERSE) if the feedback lever is to move from lower to higher positions.

Procedure

- Select [Main menu] >> [Config & Calib] >> [Valve sys config] >> [Actuator action].
- Select the actuator operating direction (Direct or Reverse) and press F4.

Valve action

- Selects the direction of the valve plug.
- Selects direct or reverse plug action (DIRECT/REVERSE). Specify direct operation (DIRECT) if the feedback lever is to move from higher to lower positions when the control valve moves in the open to closed direction, or specify reverse operation (REVERSE) if the feedback lever is to move from lower to higher positions. See “3-2: Zero and span adjustment” on page 3-4., in this section for the method for making this selection.

Procedure

- Select [Main menu] >> [Config & Calib] >> [Valve sys config] >> [Valve action].
- Select the valve operating direction (Direct or Reverse) and press F4.

Positioner action

- Selects the operating direction of the positioner.
- Selects direct or reverse action (DIRECT/REVERSE). Specify direct operation (DIRECT) if the SVX output air pressure should go to zero if the power supply is disconnected, or specify reverse operation (REVERSE) if the SVX output air pressure should go to its maximum pressure.

The operating direction of the position is determined by the main unit hardware. The operating direction cannot be switched with this function. This item must be set to match the direction of the main unit specifications. Contact your Azbil Corporation service representative to change the operating direction.

Procedure

- Select [Main menu] >> [Config & Calib] >> [Valve sys config] >> [Positioner action].
- Select the positioner operating direction (Direct or Reverse) and press F4.

5-5-4: Dynamic chara (Dynamic characteristics)

Actuator size

- Selects the size of the actuator.
- Select one of parameter 0 to parameter 9 (PARAM0 to PARAM9).

~Note *The parameter set here determines PID calculation parameters used to control the control valve (That is, the dynamic characteristics are determined by this setting.)*
If parameter 0 (PARAM0) is selected, it will be possible (and necessary) to perform the settings described in (B) Setting the Dynamic Characteristics Data. Normally, this setting is not used.

Procedure

- Select [Main menu] >> [Config & Calib] >> [Dynamic chara] >> [Actuator size].
- Select the parameter (Param 0 to 9) for the actuator size and press F4.
- If parameter 0 is selected, set the gap PID parameters.

Gland packing

- Selects the magnitude of the hysteresis difference due to friction in the control valve gland packing.
- Select one of heavy, medium, or light (HEAVY, MEDIUM, or LIGHT).
- Refer to Table 5-2: Hysteresis Parameter table and select a parallel appropriate for the gland packing material.

~Note *The parameter set here determines PID calculation parameters used to control the control valve*

This setting is not required if parameter 0 (PARAM0) in item (4) Actuator Size Selection is selected.

Table 5-1: PID parameter table

Actuator diaphragm capacity (cm^3)	Actuator model *i	Parameter (PARAM)
1000	HA1, VA1, PSA1	1
3500	HA2, VA2, PSA2	2
7600	HA3, VA3, PSA3	3
14000	HA4, VA4, PSA4	4
25300	VA5	5
8400	VA6, PSA6	6
760	VR1	7
2200	VR2	8
5800	VR3	9
Values other than the above *ii	——	0 *ii

*~Note *i. This is set according to the specifications and model number when shipped from the factory.*

*~Note *ii. Consult with your Azbil Corporation service representative.*

Table 5-2: Hysteresis Parameter table

Gland packing material example	Hysteresis (HYSTERESIS)
Graphite packing	Heavy (HEAVY)
Yarn packing	Medium (MEDIUM)
Type V PTFE packing	Light (LIGHT)

Procedure

- Select [Main menu] >> [Config & Calib] >> [Dynamic chara] >> [Gland packing].
- Select the gland packing parameter (Light, Medium, or Heavy) and press F4.

Gap PID param (Gap PID parameters)

This item allows you to set the dynamic characteristics data freely.

~Note *It will be possible (and necessary) to perform these settings only if parameter 0 (PARAM0) is selected in the actuator size selection (ACTUATOR SIZE) item in the basic data settings.*

The gap-action type PID method is adopted in the SVX to determine the dynamic characteristics.

In the gap-action type PID method, deviation values (the gap) above and below the target value are set up, and the PID parameters are changed depending on whether the process value is inside or outside the gap.

This method has the advantages that both rapid response characteristics and stability can be achieved with relatively simple tuning.

Procedure

- Select [Main menu] >> [Config & Calib] >> [Dynamic chara] >> [Gap PID parameters].
- Enter the numeric values for the 7 PID parameters (P, I, D, GE, GP, GI, and GD) and press F4.

5-5-5 :Valve chara (Valve characteristics)

Select chara form

This item allows you to select flow characteristics.

The user can also set arbitrary characteristics.

- One of linear, equal percent, quick open, and user (LINEAR, EQUAL%, QUICK OPEN, and USER) can be selected as the flow characteristics.

Procedure

- Select [Main menu] >> [Config & Calib] >> [Valve chara] >> [Select chara form].
- Select the positioner flow characteristics (Linear, Quick opening, EQ%, or User defined).
- If the user defined characteristics option was selected, set up the flow characteristics conversion data.

Chara data

This item, (D) Setting the Flow Characteristics Conversion Data (CNV CONFIG), allows you to set up converted data for arbitrary user flow characteristics.

~Note *It will be possible (and necessary) to perform these settings only it user (USER) is selected in* ***setting the flow characteristics****.*

- There are 16 data points, corresponding to P = 1 to P = 16.
- For each point, both the input signal (IN%) and position (OUT%) are specified.
- The characteristics will consist of the line formed by linearly interpolating between adjacent points.

~Note *All 16 points (input value and valve position) must be set.*

The values P = 1 to P = 16 must be set in order of increasing input values, starting with the smallest value.

The values used must have the property that no inflection points exist, that is, they must be monotonic increasing.

Values in the range -19999 to +19999 can be entered.

Procedure

- Select [Main menu] >> [Config & Calib] >> [Valve chara] >> [Chara data].
- Select IN1/OUT1 from the Chara data menu, and set the input signal (IN1%) and the position (OUT1%).
- Set the values for IN2/OUT2 through IN16/OUT16 in the same manner.

Printing the characteristics curve

The following presents an example of printing the characteristics curve and the input data used.

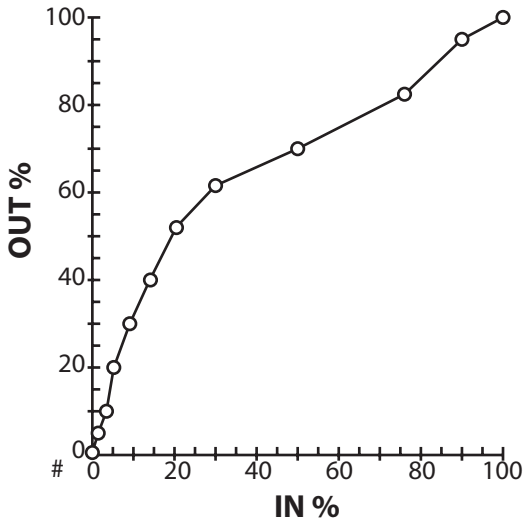


Figure 5-3

Point	IN % ENTRY (Control signal input %)	OUT % ENTRY (Valve travel %)
1	-19999	-19999
2	0.000	0.000
3	2.0	5.0
4	2.9	10.0
5	4.7	20.0
6	7.6	30.0
7	12.4	40.0
8	20.2	50.0
9	32.7	60.0
10	53.1	70.0
11	76.5	80.0
12	90.7	90.0
13	100.0	100.0
14	200.0	200.0
15	400.0	400.0
16	19999	19999

5-5-6 :Tvl cut off (Travel cut off)

This item allows you to set the current input values (%) that forcibly full open and full closed the value.

Forced fully open/fully closed settings

- 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, 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 (SHUT OFF VALUE) is strictly less than the forced fully open value (FULL OPEN VALUE).*

Values in the range -19999 to +19999 can be entered.

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.

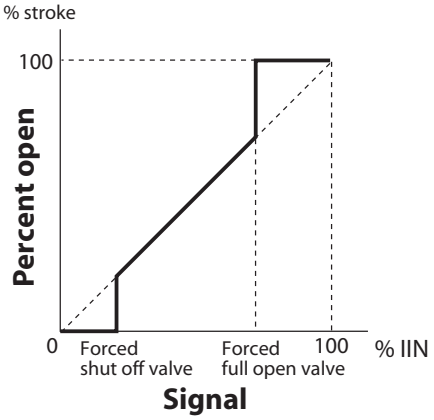


Figure 5-4 Forced fully open and forced fully closed values

Procedure

Tvl cut off high

- Select [Main menu] >> [Config & Calib] >> [Tvl cut off] >> [Tvl cut off high].
- Enter the forced fully open value as a percent of current input value and press F4.

Tvl cut off low

- Select [Main menu] >> [Config & Calib] >> [Tvl cut off] >> [Tvl cut off low].
- Enter the forced fully closed value as a percent of current input value and press F4.

5-5-7 :Calibrate

Input sig Calib (Input signal calibration)

This function corrects for differences between the 4-20 mA current input from the controller and the 4-20 mA input signal certified by the SVX.

Current input 4 mA calibration procedure

- Select [Main menu] >> [Config & Calib] >> [Calib] >> [Input sig calib] >> [4 mA calib].
- Set the current input (controller output) to 4 mA and press F4.
- When the confirm update message is displayed, press F4.
- When the update completed message is displayed, press F4.

Current input 20 mA calibration procedure

- Select [Main menu] >> [Config&Calib] >> [Calib] >> [Input sig calib] >> [20 mA calib].
- Set the current input (controller output) to 20 mA and press F4.
- When the confirm update message is displayed, press F4.
- When the update completed message is displayed, press F4.

Zero span adjust

This section describes the procedures for adjusting zero and span using HART Communicator. See “3-2: Zero and span adjustment” on page 3-4 for an overview of the zero and span adjustments.

Zero and span adjustment using the HART Communicator procedure

<Setting the valve fully closed position>

- Select [Main menu] >> [Config & Calib] >> [Calib] >> [Zero span adjust]>> [Angle adjust]>> [Zero].
- Set up a current input value such that the valve closes fully and press F4.
- Select the combination of the amount of angle by which to adjust the setting from the Zero adjust menu (for example, to increase by 0.006°, select increment/0.006) and press F4.
- Repeat the above operation several times. When the zero point has been adjusted, select [Exit] and press F4.

<Setting the valve fully open position>

- Select [Main menu] >> [Config & Calib] >> [Calib] >> [Zero span adjust] >> [Angle adjust] >> [Span].
- Set up a current input value such that the valve opens fully and press F4.
- Select the combination of the amount of angle by which to adjust the setting from the Zero adjust menu (for example, to increase by 0.006°, select increment/0.006) and press F4.
- Repeat the above operation several times. When the zero point has been adjusted, select [Exit] and press F4.

Changing the air supply pressure while adjusting the position procedure

<Setting the valve fully closed position>

- Apply a current value (any value) in the range 4-20 mA from the controller.
- Use the A/M switch to switch to manual operating mode. (See “6-2-1: Auto/Manual selection switch” on page 6-5.)
- Select [Main menu] >> [Config & Calib] >> [Calib] >> [Zero span adjust] >> [Manual adjust] >> [Zero].
- Adjust the supplied air pressure using a regulator so that the valve closes fully and press F4.
- When the confirm update message is displayed, press F4.
- When the update completed message is displayed, press F4.

<Setting the valve fully open position>

- Apply a current value (any value) in the range 4-20 mA from the controller.
- Use the A/M switch to switch to manual operating mode. (See “6-2-1: Auto/Manual selection switch” on page 6-5.)
- Select [Main menu] >> [Config & Calib] >> [Calib] >> [Zero span adjust] >> [Manual adjust] >> [Span].
- Adjust the supplied air pressure using a regulator so that the valve opens fully and press F4.
- When the confirm update message is displayed, press F4.
- When the update completed message is displayed, press F4.

5-5-8 :Diag parameters (Diagnostic parameters)

1. Stick Slip

Stick Slip is the value that substitute sticky movement of the valve which is broken out by bites or fixation.

XY threshold

When Stick Slip becomes bigger than this value, it is a value to count it.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Stick Slip] >> [XY Threshold].

Enter the XY threshold and press F4.

Count threshold

When the number that the Stick Slip value became bigger than XY value becomes bigger than this value, alarm is sent.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Stick Slip] >> [Count threshold].

Enter the Count threshold and press F4.

Alarm enable

Select the enable/Disable of alarm.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Stick Slip] >> [Alarm enable].

Select the Enable/Disable of alarm and press F4.

Stick Slip

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Stick Slip] >> [Stick Slip].

2. Total Stroke

Total stroke is the totalized distance that the stem has moved.

Threshold

When Total Stroke becomes bigger than this value, alarm is sent.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Total Stroke] >> [Threshold].

Enter the threshold and press F4.

Dead band

Dead band is the smallest value to count Total Stroke.

Procedure Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Total Stroke] >> [Dead band].

Enter the Dead band and press F4

Alarm enable

Select the Enable/Disable of alarm.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Total Stroke] >> [Alarm enable].

Select the Enable/Disable of alarm and press F4.

Total Stroke

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Total Stroke] >> [Total Stroke].

3. Cycle Count

Cycle count is the number that how many times the valve travel is over the Position Hi or Position Lo.

Threshold

When Cycle Count becomes bigger than this value, alarm is sent.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Cycle Count] >> [Threshold].

Enter the threshold and press F4.

Position Hi, Position Lo

Procedure:

Position Hi

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Cycle Count] >> [Position Hi].

Enter the [Position Hi] and press F4.

Position Lo

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Cycle Count] >> [Position Lo].

Enter the [Position Lo] and press F4.

Alarm enable

Select the Enable/Disable of alarm.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Cycle Count] >> [Alarm enable].

Select the Enable/Disable of alarm and press F4.

Cycle count

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Cycle Count] >> [Cycle count].

4. Tvl Histogram (Travel Histogram)

Tvl Histogram shows the frequency of the valve travel position in each band width of max. 16.

Tvl segmentation (Travel segmentation)

Tvl segmentation is the valve travel position in each band width of max. 16.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Tvl Histogram] >> [Tvl segmentation].

Set the Tvl segmentation and press F4.

Tvl histogram (Travel Histogram)

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Tvl Histogram] >> [Tvl histogram].

5. 0% Tvl Error (0% Travel Error)

0% Tvl Error is alarm of the deviation with the current zero position and setting zero position.

Waiting time

When the zero position error continues for a longer time than this waiting time, alarm is sent.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [0% Tvl Error] >> [Waiting time].

Enter the Waiting time and press F4.

Deviation

When the error becomes bigger than this value and the deviation error continues for a longer time than waiting time, alarm is sent.

Procedure:

Deviation +

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [0% Tvl Error] >> [Deviation +].

Enter the Deviation + and press F4.

Deviation -

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [0% Tvl Error] >> [Deviation -].

Enter the Deviation - and press F4.

Alarm enable

Select the enable/Disable of alarm.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [0% Tvl Error] >> [Alarm enable].

Select the Enable/Disable of alarm and press F4.

6. Shut-Off Cnt (Shut-Off Count)

Shut-Off Cnt is a count of valve shut.

Threshold

When Shut-Off Cnt becomes bigger than this value, alarm is sent.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Shut-Off Cnt] >> [Threshold].

Enter the threshold and press F4.

Alarm enable

Select the Enable / Disable of alarm.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Shut-Off Cnt] >> [Alarm enable].

Select the Enable/Disable of alarm and press F4.

Shut-Off Cnt

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Shut-Off Cnt] >> [Shut-Off Cnt].

7. Max. Tvl Speed (Maximum Travel Speed)

Max. Tvl Speed is maximum valve travel speed in unit time.

Threshold

When Max. Tvl Speed becomes bigger than this value, alarm is sent.

Procedure:

Threshold +

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Max Tvl Speed] >> [Threshold +]

Enter the Threshold + and press F4.

Threshold -

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Max Tvl Speed] >> [Threshold -].

Enter the [Threshold -] and press F4.

Alarm enable

Select the Enable/Disable of alarm.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Max Tvl Speed] >> [Alarm enable].

Select the Enable/Disable of alarm and press F4.

Max Tvl Speed (Maximum Travel Speed)

Procedure

Max. Tvl Speed +

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Max tvl speed] >> [Max Tvl Speed +].

Max. Tvl Speed -

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Max tvl speed] >> [Max Tvl Speed -].

Data clear

Max. Tvl Speed is cleared.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Max Tvl Speed] >> [Data clear] and press F4.

8. Deviation Alarm

Deviation alarm is alarm of deviation with control signal input and valve travel.

Threshold

When the travel deviation becomes bigger than this value, alarm is sent.

Procedure

Threshold +

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Deviation Alarm] >> [Threshold +].

Enter the Threshold + and press F4.

Threshold -

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Deviation Alarm] >> [Threshold -].

Enter the Threshold - and press F4.

Waiting Time

When the valve travel error continues for a longer time than this waiting time, alarm is sent.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Deviation Alarm] >> [Waiting time].

Enter the Waiting time and press F4.

Alarm enable

Select the enable/Disable of alarm.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Deviation Alarm] >> [Alarm enable].

Select the Enable/Disable of alarm and press F4.

Deviation

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Deviation Alarm] >> [Deviation].

9. Temp Alarm (Temperature alarm)

Temp Alarm is alarm of abnormal environmental temperature.

Threshold

When the temperature becomes bigger than this value, alarm is sent.

Procedure

Threshold +

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Temp Alarm] >> [Threshold +].

Enter the Threshold + and press F4.

Threshold -

Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Temp Alarm] >>[Threshold]-.

Enter the threshold and press F4.

Waiting Time

When the temperature error continues for a longer time than this waiting time, alarm is sent.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Temp Alarm] >> [Waiting time].

Enter the Waiting time and press F4.

Alarm enable

Select the enable/Disable of alarm.

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Temp Alarm] >> [Alarm enable].

Select the Enable/Disable of alarm and press F4.

Temperature

Procedure: Select [Main menu] >> [Config & Calib] >> [Diag parameters] >> [Temp Alarm] >> [Temperature].

5-5-9 :Burst mode

Burst mode enab

Select the enable/Disable of burst mode.

Procedure: Select [Main menu] >> [Config & Calib] >> Burst mode >> [Burst mode enab].

Select the Enable/Disable of burst mode and press F4.

Burst command

Displays the method of Burst mode.

Procedure: Select [Main menu] >> [Config & Calib] >> [Burst mode] >> [Burst command].

(Burst command is stationary with 3.)

5-6: Initial setup

Auto setup

The following auto setup items are performed.

- Zero and span adjustment
- Actuator direction setting
- Input signal LRV and URV setting
- Actuator size selection
- Hysteresis setting
- Position transmission burnout direction selection

⚠ WARNING

Performing the auto setup operation is dangerous because the valve moves rapidly from the fully closed position to the fully open position. Prepare yourself and the process in advance so that no one is injured and the process is not adversely affected when the valve operates.

~Note *When a model VR actuator is used, set the actuator size to one of PARAM7 to PARAM9 before performing an auto setup operation. (See "5-5-3 : Valve sys config (Valve system configuration)" on page 5-11.)*

Do not lower the input signal (4-20 mA) to a level less than 4 mA. (The level of the signal can be set to any level in the 4-20 mA range without problem.)

The operation has completed when after the actuator has followed the input signal and the system has returned to the control state.

After the operation completes, hold the input signal at a level above 4 mA for 30 seconds to write the settings.

There are cases where the dynamic characteristics may not be set correctly due to the size of the actuator (when the actuator is smaller than the Azbil Corporation's model HA1 actuator (diaphragm chamber capacity: 850 cm³)) or the operating stroke (when the stroke is less that 14.3 mm).

In these cases, refer to" Gap PID param (Gap PID parameters)" on page 5-13.

After the auto setup operation completes, vary the input signal manually and verify that the actuator moves to the corresponding position. If the span position is displaced, adjust the span.

Procedure

- Select [Main menu] >> [Initial setup] >> [Auto setup].
- When the confirmation message is displayed, press F4.
- When the execution confirmation message is displayed, press F4.
- When the auto setup completed message is displayed 2 or 3 minutes later, press F4.

5-7: Maintenance

5-7-1 :Dummy input sig (Dummy input signal)

This function uses the HART communicator to set the input signal value regardless of the value of the input signal from the controller.

This function can be effective, for example, in isolating problems during troubleshooting. For example, if the control valve does not move in response to input signals from the controller, if the valve operates correctly in response to the simulated current input, then one can conclude that the problem is somewhere from the wiring to the host system.

Procedure

- Select [Main menu] >> [Maintenance] >> [Dummy input sig].
- When the confirmation message is displayed, press F4.
- Select the simulated input signal (0%, 50%, 100%, or Other) and press F4.
- If you selected Other, enter an arbitrary value (0 to 100%) and press F4.

Cancellation procedure

- Select [Main menu] >> Maintenance >> Dummy input sig
- When the confirmation message is displayed, press F4.
- Select Clear from the Dummy input sig menu and press F4.

5-7-2 :Dummy drive sig (Dummy drive signal)

- Normally, this function is not used.
- This function cuts the drive signal from the PID control unit block, and sets the simulated drive signal to the EPM (electro-pneumatic converter module).

Procedure

- Select [Main menu] >> Maintenance >> Dummy input sig.
- When the confirmation message is displayed, press F4.
- Select the EPM simulated input percentage (0%, 50%, 100%, or Other) and press F4.
- If you selected Other, enter an arbitrary value (0 to 100%) and press F4.

Cancellation procedure

- Select [Main menu] >> [Maintenance] >> [Dummy input sig].
- When the confirmation message is displayed, press F4.
- Select Clear from the Dummy input signal menu and press F4.

5-7-3 :User data save

- Saves all of the SVX internal data in place of the factory shipment data specifications (data set according to the model number).
- Use the “Recall Factory Data” operation to recall the saved data.
- We recommend saving the settings data after installing the SVX and after all settings have been completed.

~Note *All the factory shipment data is lost.*

When the data is written, the settings data is written to the SVX internal nonvolatile memory that is used for normal operation. This means that this data will not be lost even if the SVX power is turned off. This operation copies the contents of the memory used for normal operation to storage memory.

If a communications error occurs during communication (during storing), the data will not be stored. Repeat the store operation if this occurs.

Procedure

- Select [Main menu] >> [Maintenance] >> [User data save].
- When the confirm overwrite message is displayed, press F4.
- When the confirm update message is displayed, press F4.
- When the update completed message is displayed, press F4.

5-7-4 :Correct reset

- This operation returns all the SVX internal data to the default (initial values) state.
- See the “Internal Data Default Values Table” for more information on default data (initial values).

~Note *Since use of this function will require that the SVX be adjusted and set up again, this function should not be used by anyone other than Azbil Corporation service personnel.*

After recalling the data, start using the SVX from the Starting Communication step.

If a communication error occurs during communication (or during initialization), the initialization operation will not be performed. Perform the initialization operation again if this happens.

Procedure

- Select [Main menu] >> [Maintenance] >> [Correct reset].
- When the confirm overwrite message is displayed, press F4.
- When the confirm update message is displayed, press F4.
- When the update completed message is displayed, press F4.

5-8: Device status

This equipment includes a self diagnostics function. This function is convenient for troubleshooting.

See "6-1: Troubleshooting", for the appropriate actions to take for the different messages.

5-8-1 :Failures

Procedure

- Select [Device status] >> [Failures].
- One of the following messages will be displayed if a fault was discovered.

  -No failure found

  -LOW IIN / Input signal too low

  -VTD FAULT / Valve travel detector error

  -A/D FAULT / A/D conversion module error

  -NVM FAULT / Non-volatile memory error

  -RAM FAULT / RAM error

  -ROM FAULT / ROM error

5-8-2 :Notices

Procedure

- Select [Device status] >> [Notices].
- One of the following messages will be displayed if a fault was discovered.

  -No failure found

  -SHUT ON / SVX is forced fully shut-off

  -HI/LO EPM OUT / Electro-pneumatic module is outside normal

  -EXT ZERO ACTIVE / External zero / span adjustment is being made

  -MANUAL MODE / Dummy input signal operation

  -FIXED EPM OUT / Dummy drive signal operation

  -CORRECT RESET / Configuration data is reset at the time of shipment

  -OVER TEMP / Abnormal environmental temperature

5-8-3 :Valve diagnostics

Alarms

Procedure

Select [Device status] >> [Valve diagnostics] >> [Alarms]

One of the following message will be displayed if a valve diagnostic alarm was discovered.

- No alarm found
- Stick Slip alarm
- Total Stroke alarm
- Cycle Count alarm
- Max Speed + alarm
- Max Speed - alarm
- 0% Tvl Err + alarm
- 0% Tvl Err - alarm
- Shut-Off Cnt alarm
- Deviation + alarm
- Deviation - alarm
- Temp Hi alarm
- Temp Lo alarm

Parameters status

Procedure

Select [Device status] >> [Parameters status].

Read the following valve diagnostic parameters

- Stick Slip
- Total Stroke
- Cycle Count
- Tvl Histogram
- Shut-Off Cut
- Max. Tvl Speed
- Deviation

Chapter 6: Maintenance and Troubleshooting

6-1: Troubleshooting

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

A Minor Failure indicates no immediate danger or serious trouble in the operation of the SVX. The SVX will continue to operate normally. Connecting a CommPad or HART Communicator or requesting a self-diagnostic through the supervisory monitoring system (model SVX100/102) is necessary to discover and determine Minor Failures.

A Major Failure indicates serious trouble in the operation of the SVX and, if no action is taken, may lead to damage to the SVX itself. Should serious trouble occur during SVX operations, the SVX will drive the valve to the fail-safe position. a CommPad or HART Communicator, or the supervisory monitoring system (model SVX100/102) are used to determine Major Failures.

6-1-1: Using a CommPad

Refer to the operation manual for Smart Valve Positioner (CM2-CFN100-2003)

6-1-2: Using a HART Communicator

If you have a HART Communicator connected to the SVX, you can perform a self-diagnostic:

Step	Procedure
1	Make sure the HART Communicator is in the Ready State.
2	Select [5. Device Status] >> [2. Failures] or [3. Notices].
3	If a message is displayed, see the following page for a list of error conditions as well as the HART error code and possible solutions.

If after reading this troubleshooting section and solutions, the specifications of the SVX still do not match your requirements, or the SVX fails, contact your local

6-1-3: General troubleshooting

If, after attaching your SVX 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 Azbil Corporation representative.

SVX does not operate (no output air pressure)

Step	Procedure
1	Make sure that the SVX 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.
2	Check for air leaks in air supply.
3	Check electrical input signals.
4	Check Auto/Manual switch in Auto.
5	Check the flapper and the filter clears.
6	If communication can be made with the Communicator, perform self diagnostics and take action based on errors messages. See “Troubleshooting Codes” on page 6-4.

Absence of full stroke or slow response

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

Hunting or Overshoot

Step	Procedure
1	Change hysteresis setting from LIGHT to MEDIUM, or from MEDIUM to HEAVY. If problem persists, set hysteresis at HEAVY and change the actuator size setting to smaller PARAM numbers.
2	If problem persists, PARAM number sets zero (0) and varying the gain may be required for our valve, refer to “Dynamic chara (Dynamic characteristics)” on page 5-12.
3	Check permissible angle of rotation of feedback lever.

Abnormal action of control valve

(although output air is supplied, the control valve does not operate properly)

Step	Procedure
1	Change the A/M switch to manual (See page 6-5) 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 indicated galling or hardening of the valve packing.
2	Confirm that the internal SVX settings for actuator size, hysteresis, etc. are appropriate for your control valve.

No communication possible with a Communicator

Step	Procedure
1	Check input signal wiring. 4 mA is required for the SVX to operate.
2	Check that the Communicator and SVX are wired properly.
3	If the Communicator will not power on, check the batteries.

Troubleshooting Codes

Message	Cause	Correction
LO IIN	Input signal is too low (3.8 mA or lower).	Provide an input signal of at least 3.8mA.
VTD FAULT	(Valve position sensor) Feedback lever has fallen off or has turned beyond the allowable turning angle (± 20°C) • VTD connector has become disconnected. • VTD input line has been disconnected or short-circuited.	Check if feedback lever has fallen off and that it is within permissible turning angle. Contact Azbil Corporation.
A/D FAULT	(Analog/Digital conversion)	Contact Azbil Corporation.
NVM FAULT	(Non-Volatile Memory)	Contact Azbil Corporation.
RAM FAULT	(RAM error)	Contact Azbil Corporation.
ROM FAULT	(ROM error)	Contact Azbil Corporation.
SHUT ON	SVX is forced fully closed	Apply an input signal above the forced fully shut value. Use the communicator to check and/or adjust the forced fully open/close values (%).
HI/LO EPM OUT	Electro-pneumatic Module is outside normal range - No air is being supplied - Valve is closed - Galling of valve stem - Clogged nozzle - Clogged orifice - Input signal is 4 mA or less	• Check air supply pressure • See that the input signal is 4 mA or greater • Confirm A/M switch is Auto • Clean air nozzle • Clean orifice • Adjust the EPM balance (Refer to page 6-9) • Change the input signal and check that the device is operating normally.
EXT ZERO ACTIVE	Zero and span adjustment switch is being made.	Release the zero and span adjustment switch.
MANUAL MODE	Dummy input signal from communicator.	Cancel the dummy current input.
FIXED EPM OUT	Dummy EPM pseudo-drive signal from communicator.	Cancel the dummy EPM signal.
OUTPUT MODE	Dummy pseudo-signal output state for communicator.	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 SVX unit.	Check SVX temp and move it to a cooler location.

6-2: Maintenance

6-2-1: Auto/Manual selection switch

The Auto/Manual switch selects the control method for 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 SVX.
- See Figure 6-2.

Manual operation

- The supplied air pressure is output directly from the positioner.
- This allows manual operation using a pressure regulator.
- See Figure 6-3.

⚠ CAUTION

The double acting actuator has no manual operation function.

⚠ WARNING

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

Structure of the A/M switch

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

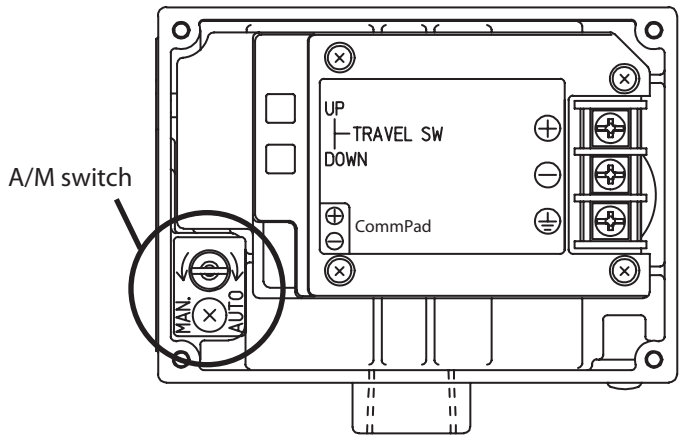


Figure 6-1 Structure of the A/M Switch

Operating procedure

The technique for switching the A/M switch is shown below.

Switching from automatic (normal) operation to manual operation

- Use a flat-bladed screwdriver to turn the A/M switch once fully in the counterclockwise.

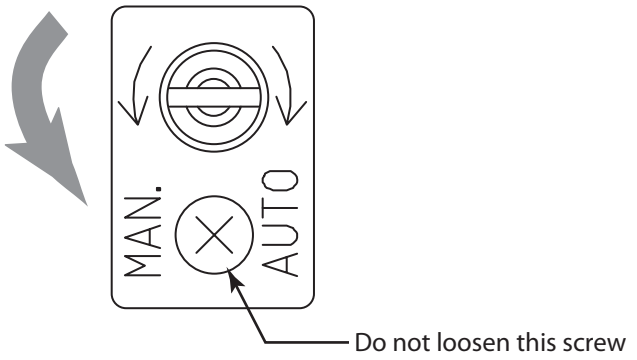


Figure 6-2 Switching from automatic (normal) operating state to manual operating State

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

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.

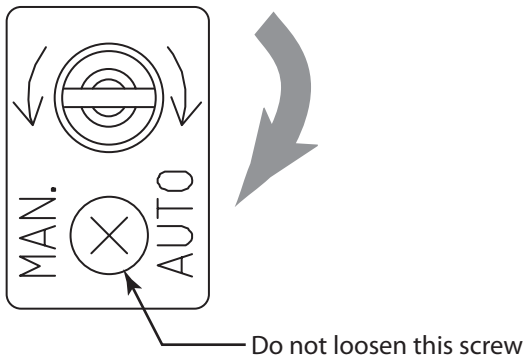


Figure 6-3 Switching from manual operating state to automatic operating state

6-2-2: Filter replacement and restriction maintenance

The contamination from the instrumentation air that collects in the restriction in the SVX can be removed during maintenance. For the 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	Cut off the air supply to the SVX.
2	Remove the setscrews from the A/M switch nameplate section.
3	Turn the A/M switch to the MAN (manual) position.
4	Use nippers or another tool to cut the holder and remove the old filter. **~Note** *Dispose of the old holder and filter appropriately.*
5	Use wire to remove the contamination from the restriction (diameter 0.3 mm). **~Note** *Be careful not to damage the restriction when removing the contamination. Do not use an air gun. Do not allow any oils or greases to contaminate the restriction.*
6	Wrap a new filter around the A/M switch, and press it in place with the holder.
7	Screw down the A/M switch until it stops.
8	Reassemble the A/M switch section by holding the two O-rings and A/M switch cover plate together and then securely tighten using the setscrew.

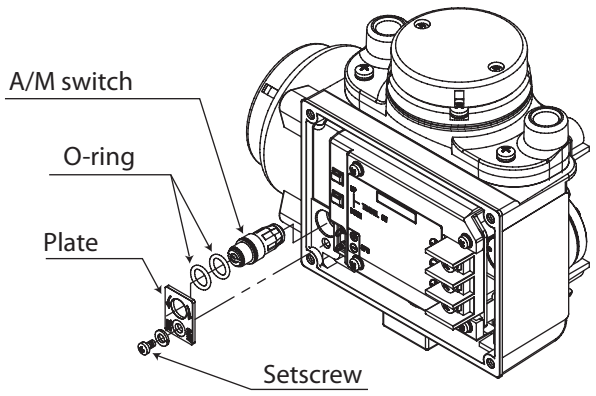


Figure 6-4 A/M switch

6-2-3: 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 SVX, 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 cover.
2	Remove four screws from the cover plate.
3	Remove the plate by sliding it to the left.
4	Provide pieces of paper with a thickness of 0.2 mm. Standard business cards will do.
5	Use the scraps of paper to clean the contamination from the gap between the EPM nozzle and the flapper.
6	After cleaning the gap, reassemble the plate and cover.

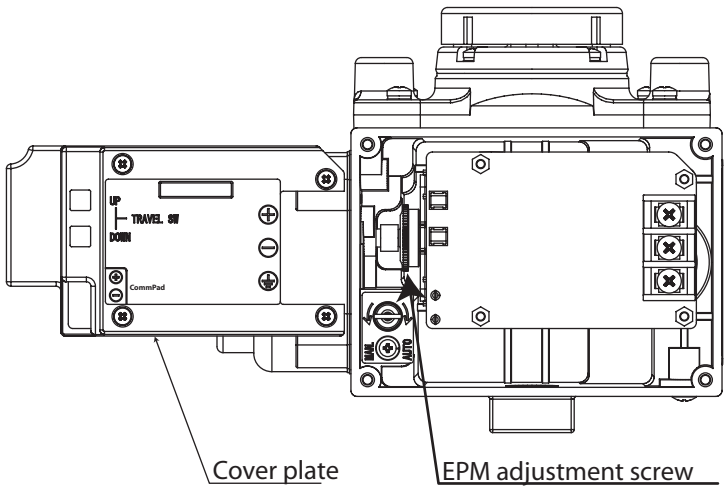


Figure 6-5 EPM balance adjustment

6-2-4: EPM (Electro-pneumatic converter module) balance adjustment

In situations such as when excessive mechanical shocks and other external disturbances have been applied to the SVX itself, or when contamination from the instrumentation air has collected in the nozzle flapper area, the internal EPM (electro-pneumatic converter module) balance point may be displaced and the response characteristics degraded. This can lead to malfunctions occurring. 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 cover and the cover plate.
2	After supplying the stipulated air pressure, set the input signal to 50%.
3	Observe the EPM drive signal using the communicator.
4	Adjust the EPM drive signal to have a 50% ±5% duty by turning the EPM adjustment screw.

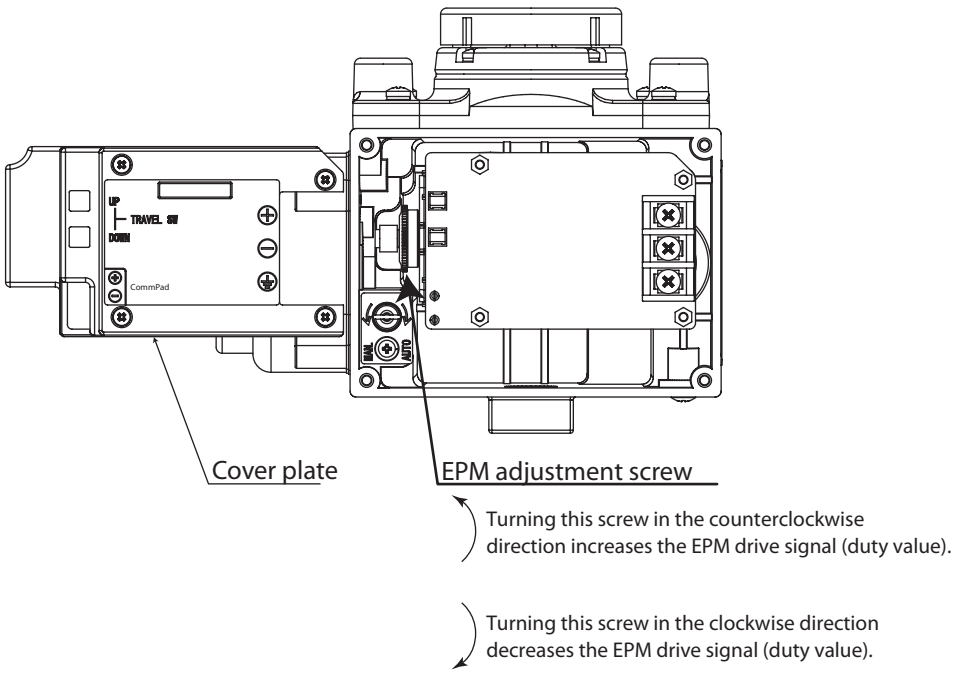


Figure 6-6 EPM balance adjustment

6-2-5: Installation resistance test

⚠ CAUTION

Do not perform the insulation resistance test. By performing this test, the built-in varistor for surge current absorbance will be damaged. If it required to perform this test, please carefully follow the following procedures.

Procedure

- Remove the external wiring.
- Short-circuit both plus and minus input signal terminals.
- Perform the test between these short-circuited sections and the grounding terminal.
- Applied voltage and criterion are listed below. To prevent damaging the instrument, do not apply a voltage of more than the value given below.

Criterion

The criterion of the test is as follows.

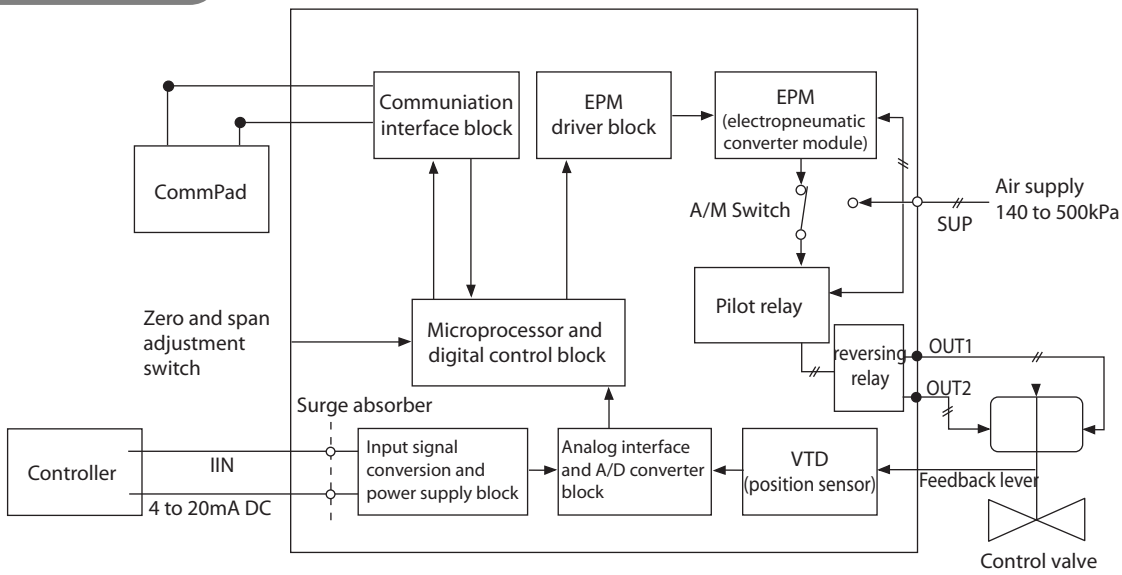
Test	Criterion
Insulation resistance test	2×10^7 Ω or above when test voltage is 25 V DC (25°C, 60% RH or less)

6-2-6: Table of default internal data values

Item		Default value
Tag number		XXXXXXXX
Output format		ANALOG XMTR
Burnout direction		DOWN SCALE
Actuator operation		REVERSE
Positioner operation		DIRECT
Valve operation		DIRECT
Actuator size		PARAM 1
Hysteresis		HEAVY
PID parameters (parameter 0)	P	1.200
	I	4.000
	D	0.5000
	GE	+/-0.000%
	GP	0.7000
	GI	4.000
	GD	0.5000
Flow characteristics		LINEAR
User defined flow characteristics data		(Pressure balance type adjustment valve (ADVB/ADVM) linear characteristics data)
Valve fully closed value (LRV)		4.000mA
Valve fully open value (URV)		20.00mA
Forced fully closed input value		1.000%IIN
Forced fully open input value		99.00%IIN

6-2-7: SVX internal block diagram and SVX I/O flow

Model SVX100



Model SVX102

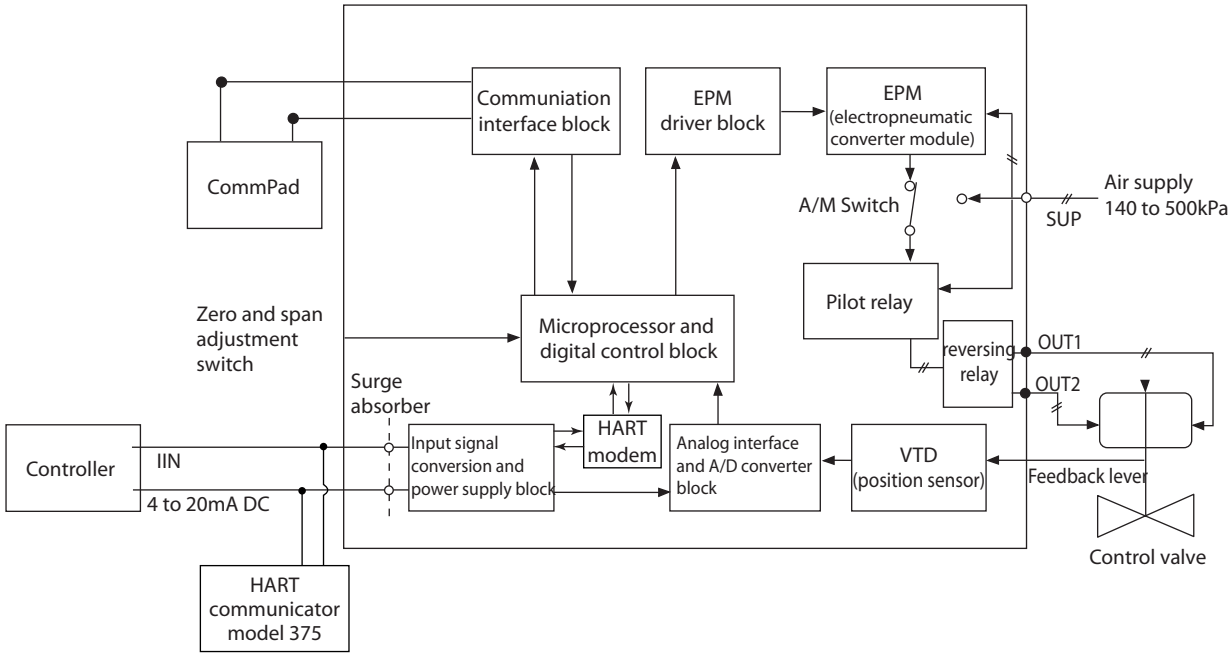


Figure 6-7 SVX block diagram

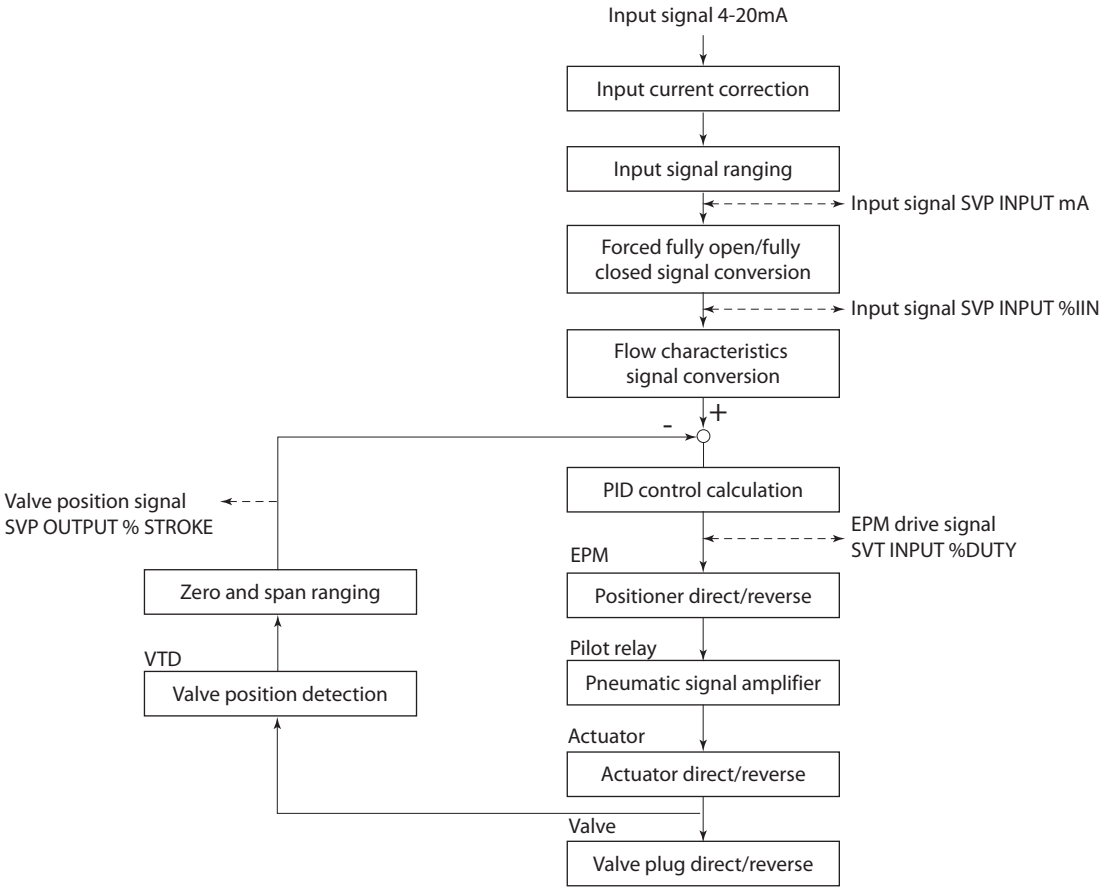


Figure 6-8 SVX I/O flow

6-2-8: Replace parts

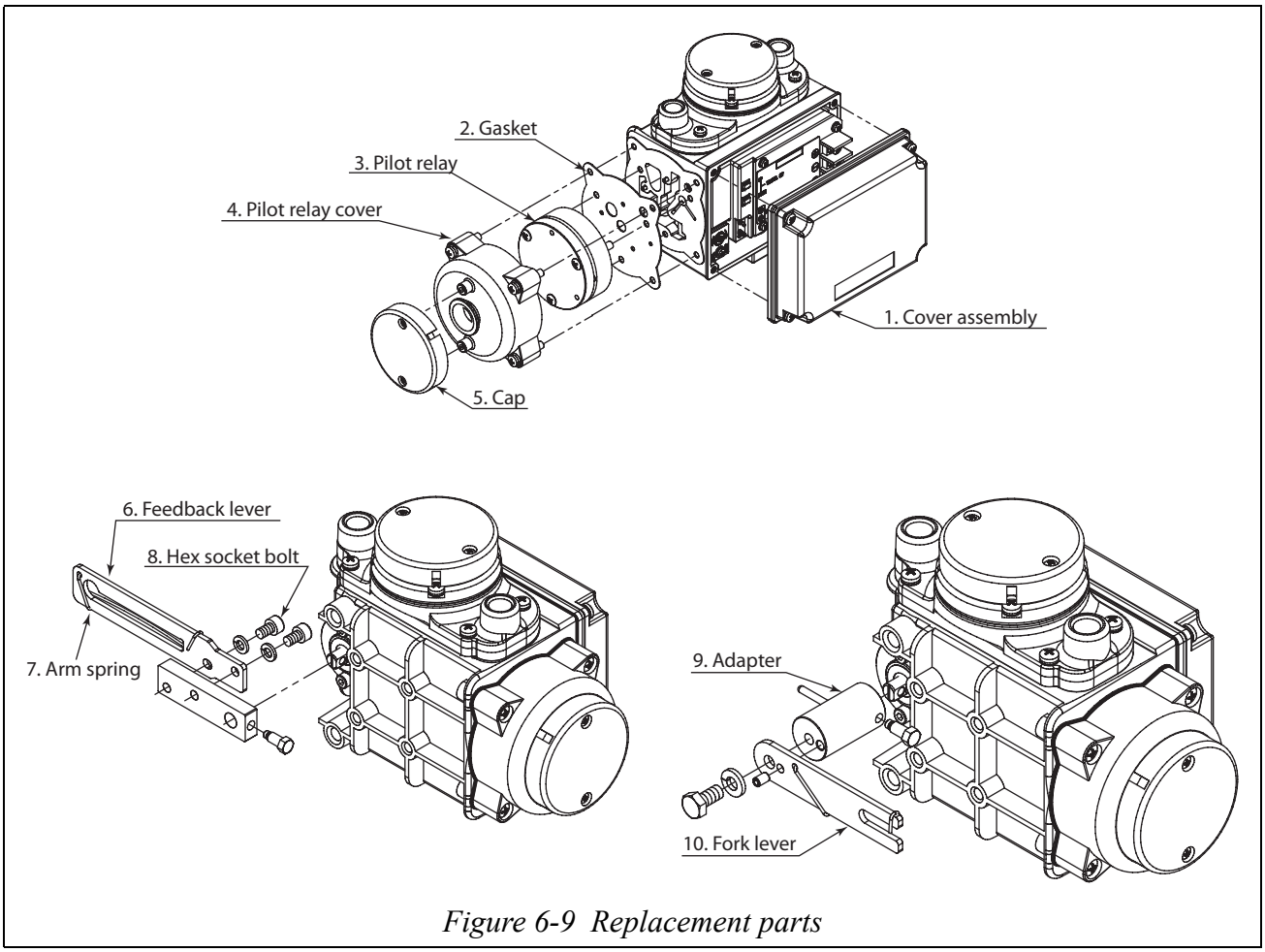


Figure 6-9 Replacement parts

Table 6-1: Replace parts

No.	Parts	Qty.
1	Cover assembly (with screw, packing)	1
2	Gasket (pilot relay)	1
3	Pilot relay	1
4	Pilot relay cover	1
5	Cap	1
6	Feedback lever	1
7	Arm spring	1
8	Hex socket bolt with spring washer (M5)	2
9	Adapter	1
10	Fork lever	1

Document Number:	CM2-SVX100-2001
Document Name:	Smart Valve eXplorer Model: SVX100/102 User's Manual
Date:	Dec. 2002 (First Issue) Apr. 2012 (Rev.3)
Issued/Edited by:	Azbil Corporation

Azbil Corporation