

Masoneilan\*

# SVI\* II AP Digital Positioner

Advanced Performance  
Quick Start Guide (Rev. W)



## About this Guide

This Quick Start Guide applies to the following instruments and supported software:

SVI II AP and SVI II AP / AD with

- Firmware version 3.1.1, 3.1.2, 3.2.1, 3.2.3/4.1.1, 3.2.5/5.1.1 and 3.2.7/5.1.3.
- ValVue suite version 2.40.0 or greater (including PRM Plug-In & AMS SNAP-ON)
- DTM version 1.01.0 or greater
- A handheld communicator with DD published for SVI II AP

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PN 055201-167 REV W.

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## Document Changes

| Version/Date | Changes  |
|--------------|--|
| H/12-2010    | Changes ES-699 doc to Rev N. See Appendix A  |
| J/03-2011    | Changes ES-699 doc to Rev P. See Appendix A  |
| K/12-2011    | Added description and procedures relevant to introduction of the high throughput version. ES-699 updated.  |
| L/10-2012    | Changed the specifications to reflect single acting supply pressure of up to 100 and double-acting up to 150 psi.  |
| M/09-2013    | Added the Load Limits sections and a cross reference to it from the wiring installation.<br>Updated ES-699 to Rev. Y.  |
| N/10-2015    | Updated the Load Limits section.<br>Updated ES-699 to Rev. AA.<br>Updated Disclaimer statement.<br>Added information on position retransmit switches.<br>Removed Remote Positioner Installation.   |
| P/12-2015    | Added section and Warning on installation in a natural gas environment.<br>Update the ES-699 to Rev. AB.<br>Added instructions for wiring Position Retransmit.<br>Changed references to ValVue software to reflect ValVue 3.<br>Added Device Identification information. |
| R/04-2016    | Made changes to indicate upgrades for HART <sup>®</sup> 7 (Squawk command and firmware areas).   |
| T/09-2016    | Changed firmware references for 3.2.7/5.1.3.<br>Changed download site throughout.<br>Note: Rev S skipped.  |
| U/03-2017    | Added section on compliance voltage testing.<br>Changed references to HART <sup>®</sup> Foundation to Field Comm.<br>Changed software download section.<br>Added Notes on Aggressiveness.<br>Added note on DI and PV switch use.<br>Updated ES-699 to Rev AC.            |
| V/12-2017    | Updated Optional Switches section.<br>Updated Intrinsic Safety images.<br>Added notes for PV and DI to card interface drawing.<br>Change ESS-699 to Rev AD.  |
| W/01-2018    | Updated Optional Switches section.   |

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# 1. Safety Information

This section provides safety information and defines the documentation symbols.

## Safety Symbols

**WARNING**



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

**CAUTION**



*Indicates a potentially hazardous situation, which if not avoided could result in instrument or property damage, or data loss.*

**NOTE**



*Indicates important facts and conditions.*

## SVI II AP Product Safety

The SVI II AP digital valve positioner is intended for use with industrial compressed air or, natural gas systems only.

### NOTE



See “*Hazardous Location Installation*” on page 76 for natural gas safety information.

Ensure that an adequate pressure relief provision is installed when the application of system supply pressure could cause peripheral equipment to malfunction. Installation must be in accordance with local and national compressed air and instrumentation codes.

### *General installation, maintenance or replacement*

- Products must be installed in compliance with all local and national codes and standards by qualified personnel using safe site work practices. Personal Protective Equipment (PPE) must be used per safe site work practices.
- Ensure proper use of fall protection when working at heights, per safe site work practices. Use appropriate safety equipment and practices to prevent the dropping of tools or equipment during installation.
- Under normal operation, compressed supply gas is vented from the SVI II AP to the surrounding area, and may require additional precautions or specialized installations.

### *Intrinsically Safe Installation*

Products certified as explosion proof or flame proof equipment or for use in intrinsically safe installations **MUST BE**:

- Installed, put into service, used and maintained in compliance with national and local regulations and in accordance with the recommendations contained in the relevant standards concerning potentially explosive atmospheres.
- Used only in situations that comply with the certification conditions shown in this document and after verification of their compatibility with the zone of intended use and the permitted maximum ambient temperature
- Installed, put into service and maintained by qualified and competent professionals who have undergone suitable training for instrumentation used in areas with potentially explosive atmospheres.

### WARNING



*Before using these products with fluids/compressed gases other than air or for non-industrial applications, consult the factory. This product is not intended for use in life support systems.*



## WARNING



*Under certain operating conditions, the use of damaged instruments could cause a degradation of the performance of the system which may lead to personal injury or death.*

*Under certain operating conditions the SVI II AP High Flow unit can produce noise levels greater than 85 dBA. Perform proper site monitoring and testing to verify the need for engineering or administrative controls to eliminate or reduce hazardous noise levels.*

*Installation in poorly ventilated confined areas, with any potential of gases other than oxygen being present, can lead to a risk of personnel asphyxiation.*

Use only genuine replacement parts which are provided by the manufacturer, to guarantee that the products comply with the essential safety requirements of the European Directives.

Changes to specifications, structure, and components used may not lead to the revision of this manual unless such changes affect the function and performance of the product.

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# 2. Installation and Set Up

## Introduction

The SVI II AP provides for reliable operations of control valves with utmost simplicity in setup and commissioning. It is uniquely equipped with a non-contact travel sensor allowing for accurate positioning and maintenance free operations. The pneumatic train of the SVI II AP is a dual-stage amplification system with stainless steel wetted parts for durability. *Intrinsically Safe, Flameproof and Explosion proof* designs are offered as standard. The High Flow version is capable of 2.2 Cv air throughput. Some of the SVI II AP options include marine grade construction, local indicating LCD with push buttons for local calibration, position transmitter, discrete outputs, double-acting (not available for the High Flow version) and a remote mount position-sensing mechanism. Using HART® eDDL and FDT-DTM technologies, the Masoneilan SVI II AP digital valve positioner provides interoperability with leading control systems suppliers.



Figure 1 SVI II AP Digital Positioner

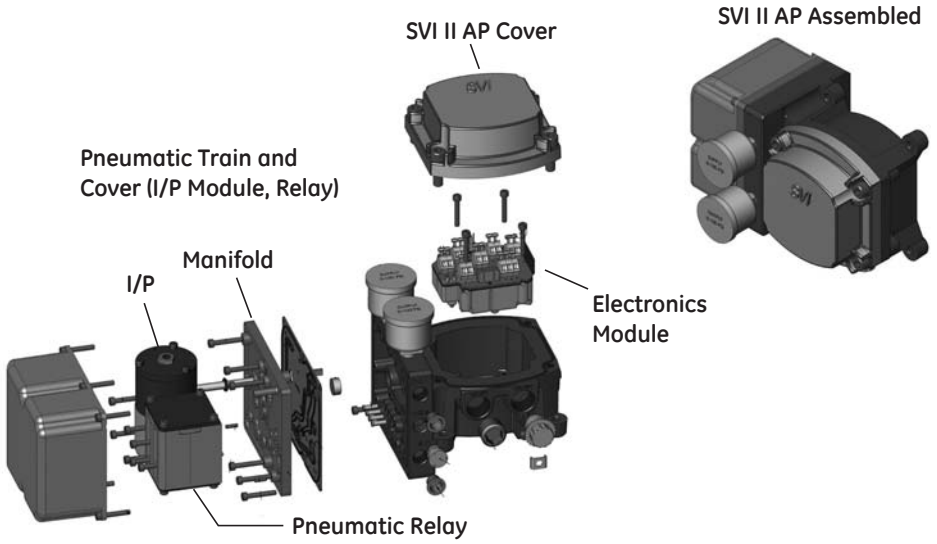


Figure 2 SVI II AP Components

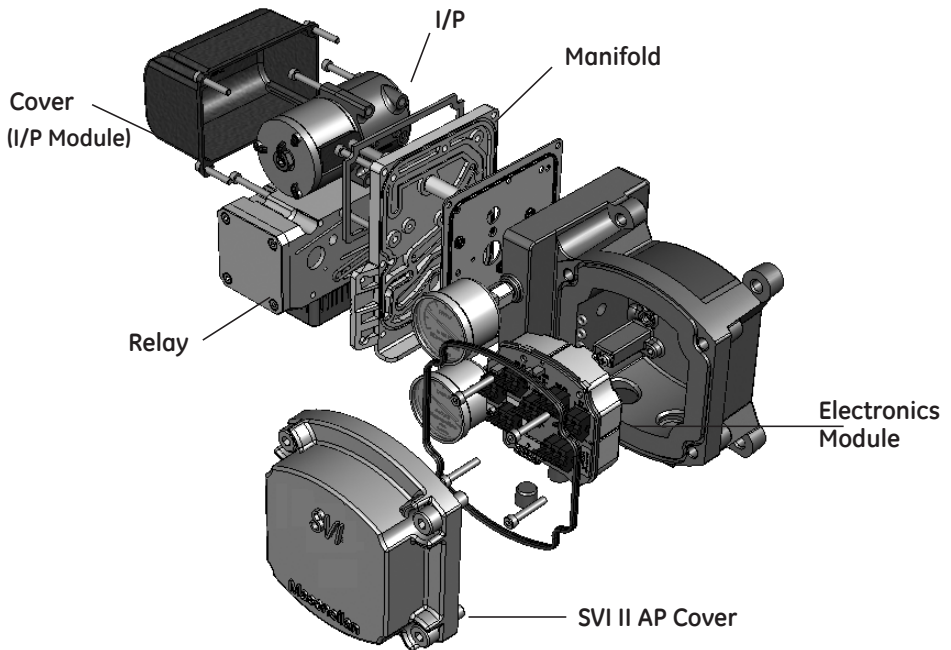


Figure 3 SVI II AP High Flow Components

# Using the Quick Start Guide

The SVI II AP Quick Start Guide is intended to help experienced field personnel install, setup, and calibrate an SVI II AP in an efficient manner. This document provides basic installation and setup instructions and is not intended to replace the in-depth information contained in the SVI II AP Instruction Manual, downloadable at <https://www.geoilandgas.com/file-download-search>.

If you experience problems that are not documented in this guide refer to the SVI II AP Instruction Manual, call your local representative, or go to [www.ge-energy.com/valves](http://www.ge-energy.com/valves). Sales offices are listed on the last page of this document

Compliance voltage testing is best done before installation. See “Determining an SVI Positioner Compliance Voltage in a Control System” on page 103.

The steps necessary to complete the SVI II AP installation and software setup are outlined in Table 1.

**Table 1: SVI II AP Installation Steps**

| Step No. | Procedure  | Reference   |
|----------|--|---|
| 1        | Attach mounting bracket to the actuator.   | See page 26 for rotary valve and reciprocating valve instructions.  |
| 2        | Install the SVI II AP magnetic assembly (rotary valves only).                                | See page 26 for instructions.   |
| 3        | Assemble the SVI II AP on the bracket that is mounted to the valve actuator.                 | See page 26 for rotary valve and reciprocating valve instructions.  |
| 4        | Install the Remote Position Sensor, if necessary.  | See <i>Masoneilan Valve Solutions Remote Position Sensor Quick Start Guide</i> (GEA31195 or P/N 011525100-888-0000) for instructions. |
| 5        | Connect the pneumatic tubing to the SVI II AP.   | See page 38 for instructions. See “Natural Gas Supply Considerations” on page 38 for notes on naturals gas installation.              |
| 6        | Connect the air supply to the SVI II AP.   | See page 41 for instructions.   |
| 7        | Connect the positioner to the HART® Control Loop segment by installing the SVI II AP wiring. | See page 42 for instructions.   |

**Table 1: SVI II AP Installation Steps (Continued)**

| Step No. | Procedure   | Reference                                 |
|----------|---|---|
| 8        | Configure/calibrate using ValVue*.                        | See page 54 and page 59 for instructions. |
|          | Configure/calibrate using a HART® Hand Held Communicator. | See page 63 for instructions.             |

**WARNING**



*Failure to adhere to the requirements listed in this manual may cause loss of life and property.*

*Before installing, using, or carrying out any maintenance tasks associated with this instrument, READ THE INSTRUCTIONS CAREFULLY. Refer to "Hazardous Location Installation" on page 76 of this guide for detailed instructions.*

# Single Acting Positioner

The supply and output connections for the SVI II AP, located on bottom of the pneumatic block, are tapped 1/4" NPT. The output port 1 is toward the front while the supply is toward the back. Two pressure gauges, output on top, supply port on bottom, are located on the front of the pneumatic block.

The supply and output connections for the SVI II AP High Flow (Figure 5 on page 16), located on bottom and leftside of the pneumatic block, are tapped 1/2" NPT.

Maximum allowable air supply pressure to the SVI II AP varies according to actuator, valve size, and valve type. Refer to the serial plate of the valve to know the specified supply pressure; it must never be less than the maximum spring pressure +5 psi.

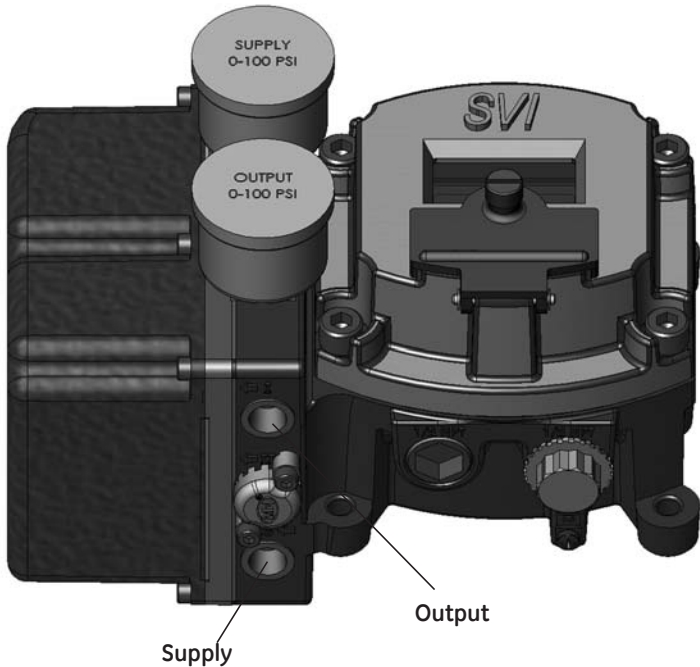


Figure 4 Air Ports on Single Acting Positioner

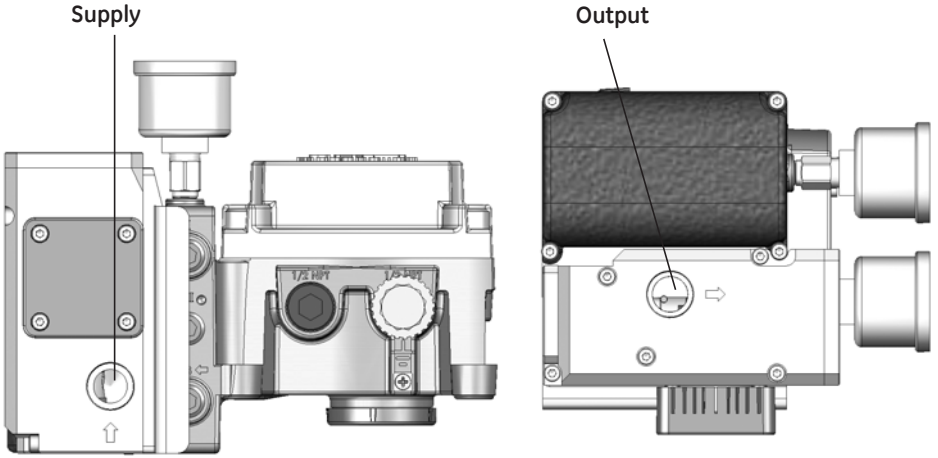


Figure 5 SVI II AP High Flow Air Ports on Single Acting Positioner

## Double Acting Positioner

Connect Output 1, labeled (←I) to the inlet port of the actuator and Output 2, labeled (←II) to the opposing actuator port (see Figure 6).



Figure 6 Air Ports on Double Acting Positioner



# Pushbuttons and Local Display

This section covers the optional local interface consisting of the LCD alphanumeric display and pushbuttons. Operation of the SVI II AP Digital Valve Positioner as a local device is controlled through the optional device-mounted pushbuttons and digital display, shown in Figure 7 on page 18. Using the display you can read the input signal, valve position, and actuator pressure. The display sequences from one variable to the next every 1.5 seconds.

Using the pushbuttons you can exit from operating mode at any time and step through a menu structure to perform a wide range of manual operation, calibration, configuration, and monitoring functions that are described later in this section. ValVue is used to perform all diagnostics functions. The pushbuttons do not support diagnostics functions.

The SVI II AP has two operational modes: Normal Operating mode and Manual mode and two set-up modes, Configuration and Calibration. The SVI II AP also has two modes for handling of faults and power-up: Reset and Failsafe. When commissioning or checking a control valve with SVI II AP fully installed the following steps are recommended:

- Change mode to Manual mode
- Examine and adjust all CONFIGURATION items
- Enter Calibration mode
- Run STOPS to automatically calibrate stroke
- Run autoTUNE to set dynamic response
- Examine the device STATUS
- Introduce manual set point changes to verify dynamic performance

## Pushbuttons

The local pushbuttons are located behind a hinged cover, directly below the display window. To open the cover loosen the screw and swing the cover down. Always re-fasten the cover after use to protect the pushbuttons from environmental contamination.

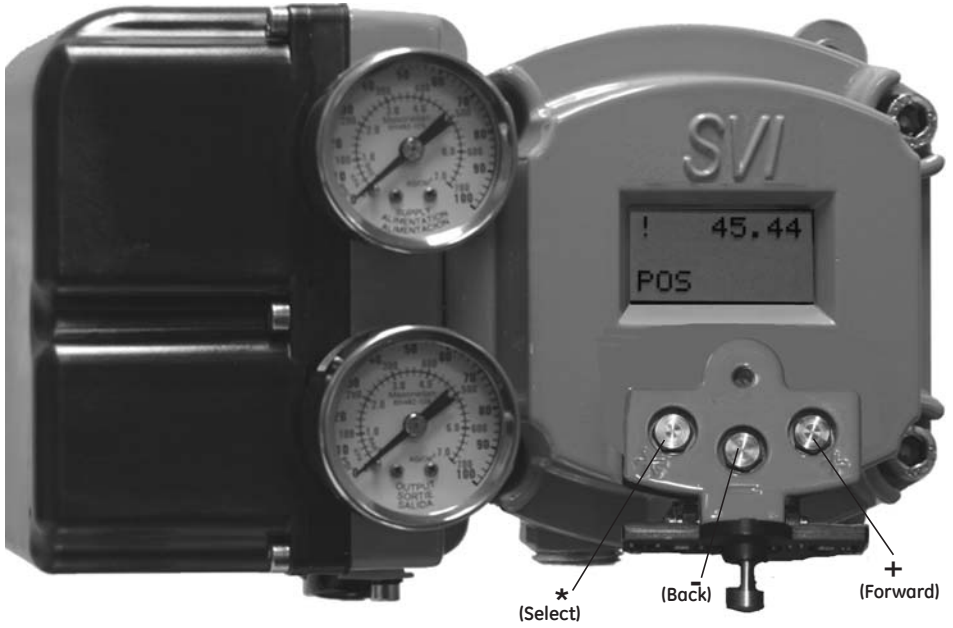
The three pushbuttons perform the following functions:

- Left Button* - Marked with **\***, permits you to *select* or *accept* the value or parameter option currently displayed.
- Middle Button* - Marked **←**, permits you to move back through the menu structure to the previous item in the menu or decrement the value currently shown in the digital display. When used to decrease a displayed value, holding the button down causes the value to decrease at a faster rate.
- Right Button* - Marked **→**, permits you to move forward through the menu structure to the next item in the menu, or to increment the value currently shown in the digital display. When used to increase a displayed value holding this button down causes the value to increase at a faster rate.

**NOTE**



*When an exclamation point (!) appears in the SVI II AP display window, it indicates that there is instrument status available.*



**Figure 7 SVI II AP Display Pushbuttons**

## Pushbutton Locks and Configuration-Lock Jumper

Before performing any of these functions with the local display you must first ensure that the pushbuttons are placed in the unlocked mode using ValVue. The positioner is provided in the unlocked mode. See ValVue documentation for more details.

The SVI II AP offers several levels of accessibility. It may be desirable, after initial setup, to lock the pushbuttons so that the SVI II AP parameters cannot be inadvertently changed by the buttons. Several levels of pushbutton locks are provided.

**Table 2: Pushbutton Lock Security Level**

| Level            | Access  |
|------------------|---|
| Security Level 3 | Allow Local Buttons: Buttons on the SVI II AP are fully enabled.  |
| Security Level 2 | Lock Out Local Calibration and Configuration: Use the buttons to perform operations in normal operating mode and manual mode. Do not go to configure or calibrate mode.       |
| Security Level 1 | Lock Out Local Manual: Examine variables in normal operating mode but do not put the valve in manual operating mode. Access to calibrate or configure modes is not available. |
| Security Level 0 | Lock Out All Buttons: The buttons are disabled (level 0).   |

## Hardware Configuration Lock

Additional security is achieved using the hardware configuration-lock jumper shown in Figure 8. When set to the secure position, shorting the two-pin header, configuration and calibration are not permitted by the local interface or by remote communications. Pushbuttons, ValVue and handheld are locked out, except to examine configuration, calibration, and position. This is similar to Security Level 1 shown in the Pushbutton Lock Security Level table.

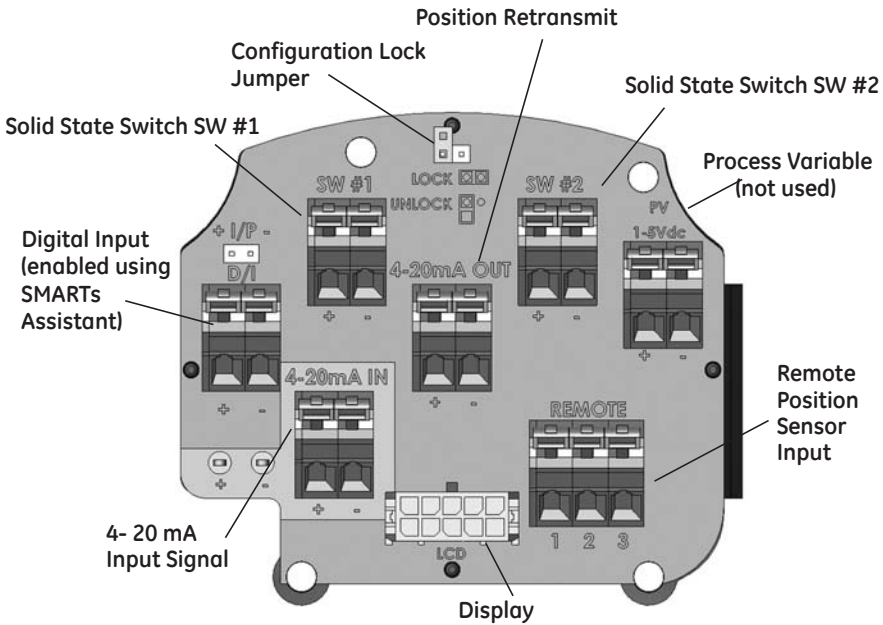


Figure 8 Connections to Electronics Module (via Terminal Board)

### NOTE



The PV (Process Variable) is not used for the SVI II AP. The Digital Input (DI) is activated using SMARTs Assistant, which is downloaded at <https://www.geoilandgas.com/file-download-search>.

The DI switch is a dry contact switch. As an example, the switch may be utilized as a mechanical limit switch backup. The most common way to read the switch status is via the DTM or DD. The input to the switch can be automated by sending Device Variable 8 (DI) via CMD 9 or CMD 33 from a DCS.

# ValVue\* Software

Not only does ValVue provide the ability to quickly and easily set up the SVI II AP you can also monitor operation and diagnose problems with ValVue's advanced diagnostic capabilities.

## NOTE



*You must use the ValVue3 software and the SVI II AP DTM software to support HART® 7. ValVue 2.x will not work.*

## System Requirements

Minimum requirements for all versions of ValVue software are Windows® 2003 Server (SP3), Windows® 2008 Server (SP2), XP, Windows® 7, Windows® 8, Windows® Server 2012, 64 MB RAM, and a serial or USB port connected to a HART® modem. For software installation, a connection to the internet to download ValVue and the SVII AP DTM.

## ValVue and SV II AP DTM DTM Trial Version

You must download the ValVue software and the SVII AP DTM software and install to configure and use the SVI II AP. For the most recent software visit our SVI II AP web site at: <https://www.geoilandgas.com/file-download-search>.

The SVI II AP DTM software and the Valve software comes with a trial version of ValVue. For 60 days after the initial installation, The ValVue software provides the FDT frame capability in which the SVI II AP DTM software operates. The SVI II AP DTM software provides the capability of configuring, calibrating, diagnosing, trending and much more. After the 60 trial period ValVue must be registered for use. ValVue Functionality includes:

- Setup Wizard
- Set calibration parameters
- Monitor status/error indicators
- Remote calibration of the SVI II AP
- Remote operation of the SVI II AP
- Trend setpoint, valve position, actuator pressure
- Perform diagnostic test procedures (full version only)
- Remote display of valve position, actuator pressure(s)
- Set configuration parameters
- Input/Output configuration
- Remote configuration of the SVI II AP
- Backup and restore configuration (clone device)
- Display comparative test results (full version only)

## Advanced and Online Diagnostics

The SVI II AP offers various levels of control valve diagnostics. Up to five pressure sensors that detect circuit board temperature, loop current, and reference voltage, are available for diagnostics.

For more details on the use of ValVue software, refer to the ValVue User's Guide. Contact the factory or your local representative to obtain licensing information.

## Masoneilan Software Download

### Download and Install ValVue3

1. Go to the *Resource Library* (<https://www.geoilandgas.com/file-download-search>) and enter *ValVue* in the search field (arrow in Figure 9).

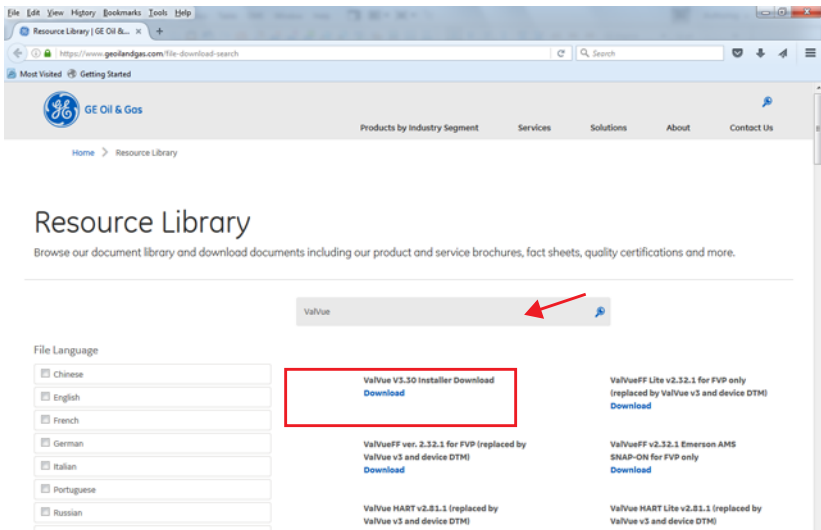


Figure 9 Download Center: Search for ValVue

The results appear (red box in Figure 9).

2. Use the arrows to move through the selections. Select **Download** below *ValVue V3.30 Installer Download* and Figure 10 appears.

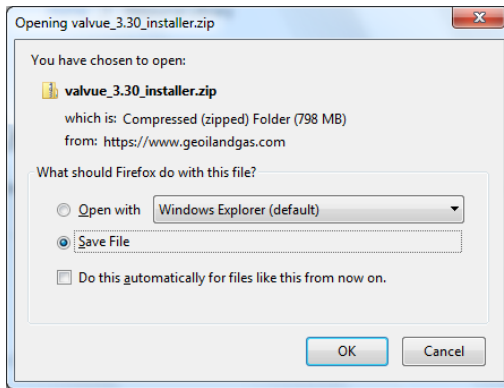


Figure 10 Opening Dialog

**NOTE**



*The dialog that appears for download varies by the program used.*

3. Click **Save File**, click **OK** and it saves to the *Windows Downloads* folder.

**NOTE**



*For fastest installation, save the download file to your laptop/PC. Don't install from the website.*

4. Open *Windows Explorer* and click the **Windows Downloads** folder.

**NOTE**



*If you have a previous install of ValVue3 you are prompted to uninstall first and then you must run the installer again to finish the upgrade.*

**NOTE**



*If you are upgrading from ValVue 2.x you must update the SQL database location to match ValVue3's.*

5. Double-click on the installer and follow the instructions to install.

## Download and Install the SVI II AP DTM

1. Go to the *Resource Library* (<https://www.geoilandgas.com/file-download-search>) and enter *SVI II AP DTM* in the search field (red arrow in Figure 11).

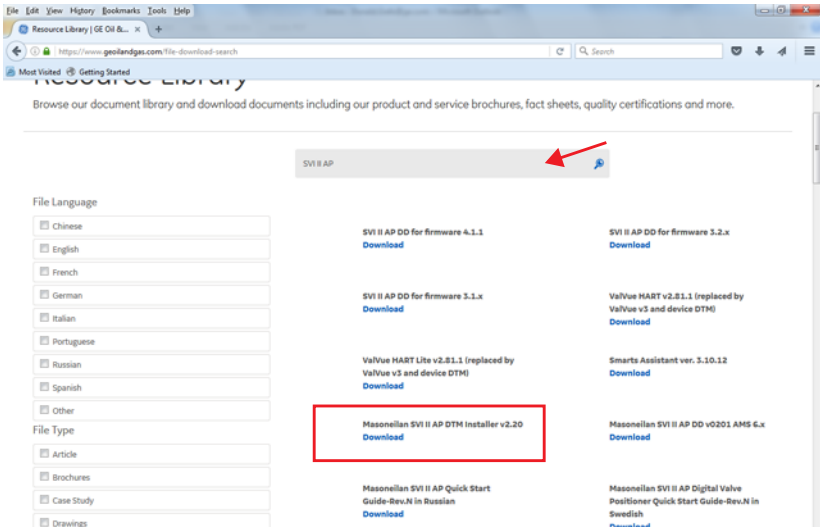


Figure 11 Download Center: Search for SVI II AP DTM

The results appear (Figure 11).

2. Select **Download** below *SVI II AP DTM* and Figure 12 appears.

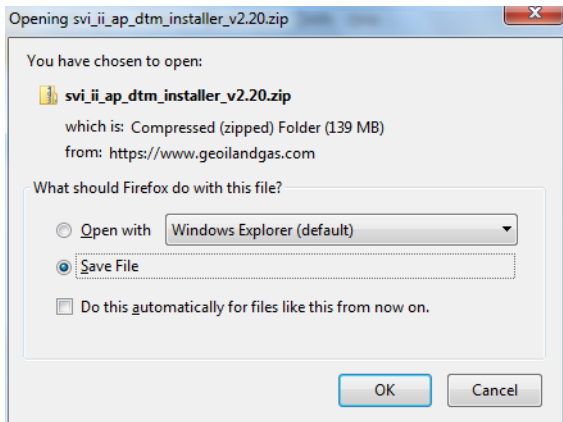


Figure 12 Opening Dialog



**NOTE**



*The dialog that appears for download varies by the program used.*

3. Click **Save File**, click **OK** and it saves to the *Windows Downloads* folder.

**NOTE**



*For fastest installation, save the download file to your laptop/PC. Don't install from the website.*

4. Open *Windows Explorer* and click the **Windows Downloads** folder.

**NOTE**



*If you have a previous install of the SVI II AP DTM you are prompted to uninstall first and then you must run the installer again to finish the upgrade.*

5. Double-click on the installer and follow the instructions to install.

# Mounting the SVI II AP

This guide provides installation instructions for mounting an SVI II AP on both rotary and reciprocating actuated valves. The mounting process can be broken down into the following:

- Attach the mounting bracket to the actuator.
- Install the magnetic assembly.
- Assemble the SVI II AP on the mounting bracket.

## NOTE



*The SVI II AP should be mounted with the conduit connections down in order to facilitate drainage of condensate from the conduit.*

## Necessary Precautions

To avoid injury or the process being affected when installing or replacing a positioner on a control valve, ensure that:

- If the valve is located in a hazardous area make sure the area has been certified as *safe* or that all electrical power to the area has been disconnected before removing any covers or disconnecting any leads.
- Shut off air supply to the actuator and to any valve mounted equipment.
- Ensure the valve is isolated from the process by either shutting off the process or using bypass valves for isolation. Tag shutoff or bypass valves to guard against a *turn-on* while work is in progress.
- Bleed air from actuator and check that valve is in its unenergized position.

It is now safe to disconnect and remove any valve mounted equipment that is being replaced.

For the procedure to mount rotary and reciprocating valves, refer to the Mounting Instructions contained in the valve's Mounting Box kit.

## Mounting the SVI II AP on Rotary Valves

This section describes the procedure for mounting the SVI II AP on rotary control valves that have less than 60° rotation, such as a Masoneilan Camflex<sup>®</sup> II or a Masoneilan Varimax<sup>®</sup>. Figure 13 shows a side view of a Camflex actuator and the SVI II AP actuator mounting brackets.

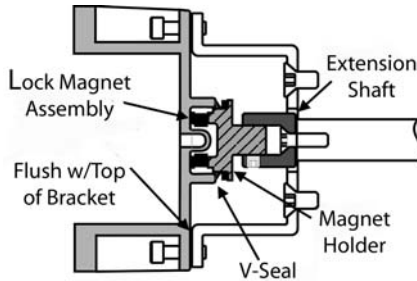


Figure 13 Camflex with Mounting Bracket (Side View)

## Mounting the SVI II AP on a Rotary Actuator

Tools required:

- 3/16" Hex Key
- 5/32" Hex Key
- 3 mm, 4 mm, 5 mm Hex Key
- 7/16" Wrench

To mount the SVI II AP:





1. Attach the SVI II AP rotary mounting bracket to the valve actuator using two (2) 5/16 - 18 UNC flat-head cap screws. In the preferred mounting position, the long end of the mounting bracket is on your left when facing the actuator, for any position of the valve and actuator.
2. Bolt the extension shaft to the valve position take-off shaft using a 1/4 - 28 UNF socket flathead screw. Secure the machine screw holding the extension shaft with a torque of 144 in-lbs (16.269 N-m).
3. On internal valve pressure the thrust shaft is pushed out to the mechanical stops, usually a thrust bearing. On valves where the valve position take-off is mounted directly on the end of the plug shaft, a Camflex for example, the shaft must be bearing on its stop to properly set up the SVI II AP Controller. During hydrostatic testing the shaft is thrust to its stop and a normally tightened packing retains it in that position.
4. On vacuum service, the valve shaft may be drawn into the body by the vacuum acting on the shaft, but the magnetic coupling must be assembled flush with the mounting bracket with the shaft pulled fully out to its thrust bearing. Check that the endplay from the vacuum position to the fully extended position is less than 0.06 in. (1.524 mm).

5. Slide the magnet holder into the extension shaft. The location of the magnets is in the ring of the magnet holder. The magnetic axis is the imaginary line through the center of both magnets.
6. Rotate the magnet holder so that the magnet axis is vertical when the valve is in the closed position.
7. Align the end of the magnet holder flush with the end of the mounting bracket. Secure the magnet holder with two M6 set screws.
8. Slide the V-Seal over the magnet holder.
9. Secure the SVI II AP onto the mounting bracket using four M6 x 20 mm socket head cap screws.
10. Ensure no interference exists with the position sensor protrusion.
11. Ensure that the V-Seal makes contact with the skirt around the position sensor protrusion on SVI II AP housing.

## Travel Sensor Alignment

Table 3 shows the general guidelines for travel sensor alignment. Review the table prior to installing the SVI II AP on a rotary valve actuator for proper alignment of the magnet.

**Table 3: Travel Sensor Alignment**

| Rotary Mounting System                | Stroke Direction   | Magnet Orientation   | Valve Position                 | Sensor Counts                          |
|---------------------------------------|--|--|--------------------------------|--|
| Rotary                                | <60° Rotation<br>Clockwise or counter-clockwise rotation             | <br>(0°)    | Closed (0%)                    | 0 +/- 1000                             |
|                                       | >60° Rotation<br>Clockwise with increasing setpoint                  | <br>(-45°)  | Full Open<br>or<br>Full Closed | -8000 +/- 1500<br>or<br>+8000 +/- 1500 |
|                                       | >60° Rotation<br>Counter Clockwise rotation with increasing setpoint | <br>(+45°) | Full Open<br>or<br>Full Closed | -8000 +/- 1500<br>or<br>+8000 +/- 1500 |
| General Rule for other configurations | Any amount of rotation<br>Clockwise or counter-clockwise             | <br>(0°)  | 50% Travel<br>(Mid-Stroke)     | 0 +/- 1000                             |

## Dismantling the SVI II AP from Rotary Valves

Before carrying out any work on the device, power off the instrument or ensure that the device's location conditions for potentially explosive atmosphere permit the safe opening of the cover.

To remove the SVI II AP Controller from a rotary valve perform Steps 1 - 9 on page 27 in reverse.

## Mounting the SVI II AP on Reciprocating Valves

The process of mounting the SVI II AP on a reciprocating valve consists of mounting the unit on the actuator that is attached to the valve. This section describes the procedure for mounting the SVI II AP on Reciprocating Valves (using Masoneilan's 8788 Multi-Spring actuators as an example).

### Mounting the SVI II AP on a Reciprocating Actuator

Tools required:

- 7/16" Combination Wrench (2 required)
  - 3/8" Combination Wrench
  - 1/2" Combination Wrench
  - Phillips Head Screw Driver
  - 5 mm Hex Key Wrench
1. Ensure that the lever is pinned to the magnet assembly and held securely by an M5 flat head screw to ensure that the magnet axis is vertical when the lever is in the valve closed position. Tighten the lever screw securely. Refer to Figure 14.

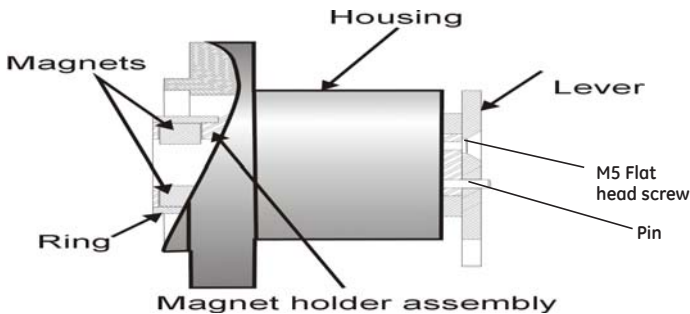
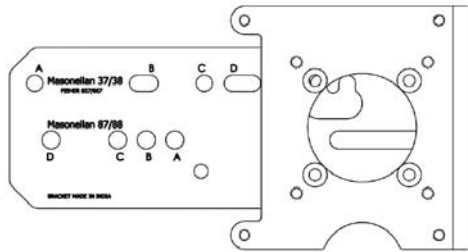


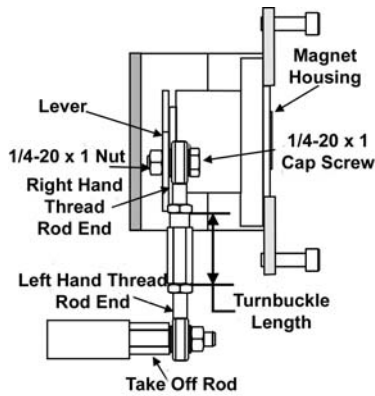
Figure 14 Magnet Holder for Reciprocating Valves

2. Mount the SVI II AP reciprocating mounting bracket to the actuator using two (2) 516 - 18 UNC cap screws. The mounting location of the bracket depends on the size and stroke of the actuator. Refer to Figure 15 and Figure 4 on page 33.



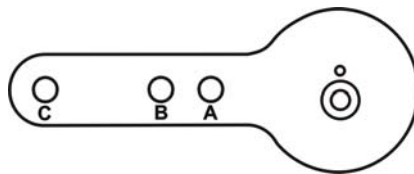
**Figure 15 Reciprocating Valve Mounting Bracket**

3. Select mounting hole A, B, C or D for the stroke of the valve. For example, hole B is shown in Figure 17 on page 32 for a size 10 actuator with 1.0" stroke. Unless otherwise specified, the SVI II AP mounting assumes that the actuator is in the normal upright position. The mounting hole in the slotted opening of the mounting bracket must be left when facing the actuator, with the actuator in the upright position.
4. Move the valve to its closed position. For air to extend, this requires using air pressure in the actuator to fully stroke the actuator. For air to retract, actuators vent the actuator of air pressure.
5. Thread the take-off rod to the actuator stem connector. Refer to Figure 16 on page 32. Ensure that the travel pointer located on the coupling is correctly positioned.
6. Attach the right hand threaded rod end to the SVI II AP lever using a 1/4 - 20 x 1" cap screw and nut as shown. The lever hole position to be used depends upon the specific valve stroke. Refer to Figure 17 on page 32 and the Reciprocating Valve Linkage Selection, Table 4 on page 33.
7. Thread the right hand lock nut and turnbuckle onto the right hand rod end approximately two turns. Turnbuckle length is a function of actuator size. (Refer to Table 4 on page 33.)
8. Secure the magnet housing assembly, including the lever and right hand rod end, to the bracket using four M5 X 10 mm flat head screws.
9. Attach the left hand threaded rod end to the take-off rod with 1/4 - 20 UNC nut and thread the left hand lock nut onto the rod end.



**Figure 16 Reciprocating Linkage**

10. Thread the turnbuckle onto the left hand threaded rod end (Figure 16).
11. Adjust the turnbuckle until the hole in the SVI II AP lever is aligned with the indicating hole in the bracket. Tighten both turnbuckle lock nuts. Refer to Figure 15.
12. For reciprocating valves the adjustable link turnbuckle must be parallel to the valve stem. To ensure linearity in positioning, verify that the hole in the lever aligns with the indicating hole in the bracket when the valve is in the closed position. Check that the bracket is mounted using the proper holes. (Refer Table 4 on page 33.)
13. Mount the SVI II AP to the bracket and secure with four M6 socket head cap screws.



**Figure 17 Lever for Masoneilan Model 87/88 Multispring Actuator**



**Table 4: Reciprocating Valve Mounting Hole and Turnbuckle Length**

| Masoneilan Actuator Size | Stroke                           | Mounting Hole | Lever Hole | Turnbuckle Length    |
|--------------------------|----------------------------------|---------------|------------|----------------------|
| 6 and 10                 | 0.5 - 0.8"<br>(12.7 - 20.32 mm)  | A             | A          | 1.25"<br>(31.75 mm)  |
| 10                       | 0.5 - 0.8"<br>(12.7 - 20.32 mm)  | A             | A          | 1.25"<br>(31.75 mm)  |
| 10                       | >0.8 – 1.5"<br>(20.32 - 41.5 mm) | B             | B          | 1.25"<br>(31.75 mm)  |
| 16                       | 0.5 - 0.8"<br>(12.7 - 20.32 mm)  | B             | A          | 2.90"<br>(73.66 mm)  |
| 16                       | >0.8 – 1.5"<br>(20.32 - 41.5 mm) | C             | B          | 2.90"<br>(73.66 mm)  |
| 16                       | >1.5 – 2.5"<br>(41.5 - 63.5 mm)  | D             | C          | 2.90"<br>(73.66 mm)  |
| 23                       | 0.5 - 0.8"<br>(12.7 - 20.32 mm)  | B             | A          | 5.25"<br>(133.35 mm) |
| 23                       | >0.8 – 1.5"<br>(20.32 - 41.5 mm) | C             | B          | 5.25"<br>(133.35 mm) |
| 23                       | >1.5 – 2.5"<br>(41.5 - 63.5 mm)  | D             | C          | 5.25"<br>(133.35 mm) |

## Dismantling the SVI II AP from Reciprocating Valves

### WARNING



*Before carrying out any work on the device, power off the instrument or ensure that the local conditions for potentially explosive atmosphere permit the safe opening of the cover.*

To remove the SVI II AP Controller from a reciprocating valve perform Steps 1 - 12 on page 30 in the reverse order.

## Checking the Magnet

There are two methods of checking the SVI II AP magnet:

- Perform a visual inspection
- Use ValVue to check the magnet

## Performing a Visual Inspection

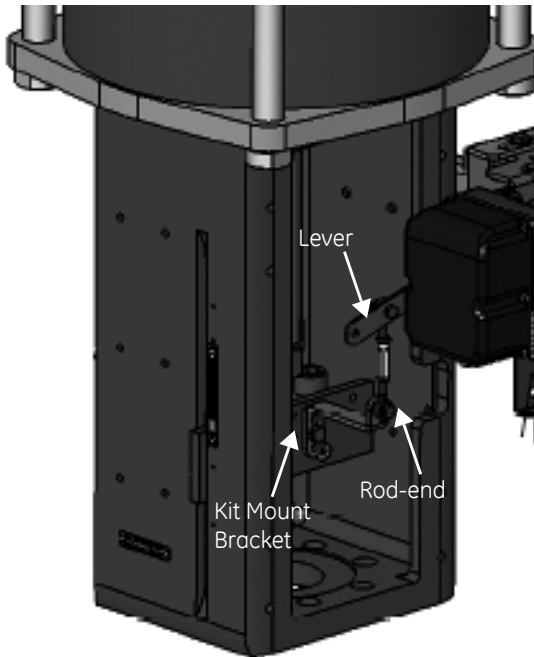
To perform a visual inspection refer to Table 3 on page 29 and ensure that the magnet is correctly oriented for the actuator/valve configuration.

# Installing the SVI II AP for Double- Acting Operation

This section explains how to mount the SVI II AP for the 84/85/86 kit for double-acting valve positioner configurations.

To mount the kit:

1. Set valve to the closed position.
2. Install the mounting assembly to the yoke (Figure 18) using helical spring washer 5/16, flat washer 5/16 and hex screw 5/16-18x44.5 [1.75] LG.



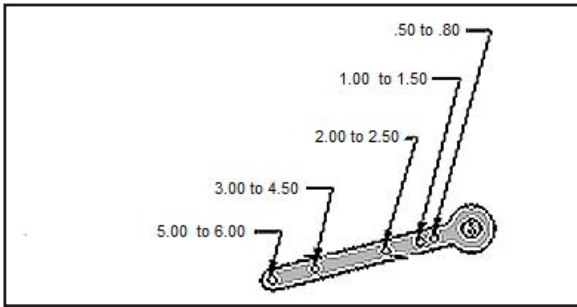
**Figure 18** 84/85/86 Actuator

## NOTE



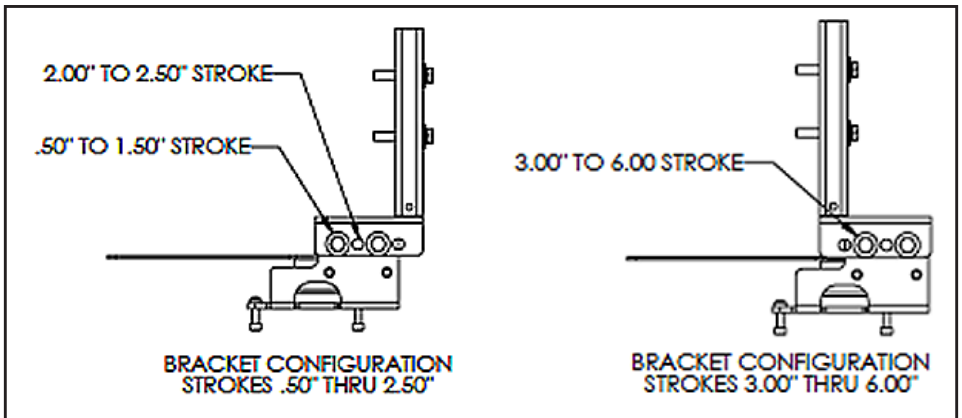
*Mount all components snug enough to stay in place but loose enough to tap with rubber hammer into final position.*

3. Set rod-ends and brackets to stroke and size of actuator. The default setting is a 4.00" stroke. Other stroke settings are as in Figure 19.



**Figure 19 Stroke Settings**

4. Mount take-off bracket to stem block at angle which keeps turnbuckle assembly parallel to stem (Figure 20) using:
  - a. For top: two plain 5/16 flat washers, helical spring washer 5/16, two hex nuts 5/16-18 regular.
  - b. For bottom: hex nut regular 1/4-20 and hex screw 1/4-20 UNC x 22.2 [.88] LG.



**Figure 20 Bracket Configuration Strokes .5 - 2.50" and 3-6"**

5. Ensure the turnbuckle assembly is parallel to the stem and the magnets are in the valve closed position (Figure 21) and connect to take-off bracket.

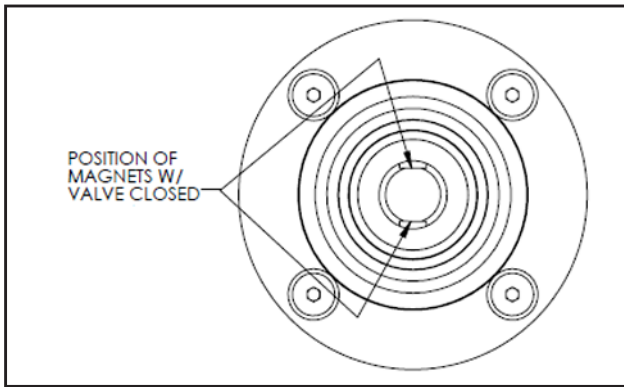


Figure 21 Magnet Position with Valve Closed

6. Verify lever is in correct position with valve closed. Adjust rod-ends, if necessary.

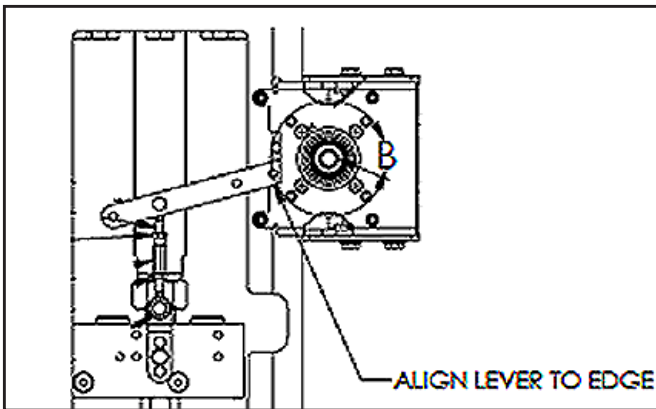


Figure 22 Lever Alignment

7. Mount the SVI-II with M6-1 screws.
8. Cycle the valve open to close verifying proper components movement and that rod-ends move free and clear from other components.

# Connecting the Tubing and Air Supply

The last step in hardware installation for the SVI II AP is to connect the air supply to the positioner. This section describes the process for connecting the tubing and air supply to a single and double acting positioner.

## Natural Gas Supply Considerations

If the pneumatic system is connected to natural gas, the pneumatic control system constantly bleeds a small amount of the natural gas into the area around the SVI II AP. Also, during a vent cycle (actuator pressure relief), natural gas from the actuator is released into the area around the SVI vent port. Consider both sources of natural gas when evaluating the Hazardous Classification for the area (See GEA19681 Masoneilan Valves SVI II AP Installation and Maintenance Manual for further discussion on installing an SVI II AP in a natural gas environment).

Remote piping of the actuator venting is possible to reduce the amount of natural gas released into the area around the SVI II AP (See GEA19681 Masoneilan Valves SVI II AP Installation and Maintenance Manual for further discussion on installing an SVI II AP in a natural gas environment). Installing remote actuator vent gas piping does not capture all gas emitted. A small amount of natural gas still bleeds constantly in the area around the SVI II AP. Consider the bleeding and releasing of natural gas when evaluating the Hazardous Clarification for the area.

### NOTE



*Area classification is the responsibility of the end user.*

The interior of the SVI II AP is positively pressurized with supply medium. Appropriate safety measures must be taken to handle pressurized natural gas that may enter the electrical conduit or cable system.

### WARNING



*Do not remove the instrument cover or connect to an electrical circuit unless the power is disconnected. Natural gas will escape into the surrounding atmosphere upon disconnecting any of the pneumatic connections or removing any cover or pressure containing component.*

### WARNING



*EXPLOSION HAZARD - Do not disconnect equipment or remove cover unless power has been de-energized or the area is know to be non-hazardous. Natural gas may be contained within the SVI II AP. Even after disconnecting the SVI II AP from all the pneumatic connections Natural Gas may still be present within the SVI II AP.*

**WARNING**



*EXPLOSION HAZARD - Natural gas may escape from the SVI II AP upon removal of any cover or component. Ensure the cover is correctly installed before putting this unit into service.*

**WARNING**



*EXPLOSION HAZARD - An improperly installed cover could leak natural gas into the area. The interior of the SVI II AP is positively pressure with supply medium. Appropriate safety measures must be taken to handle pressurized natural gas that may enter the electrical conduit or cable system.*

**WARNING**



*EXPLOSION HAZARD - A missing or improperly installed conduit seal, cable seal, or cable gland could leak natural gas into the conduit/cable system, and/or into any area where the conduit/cabling system is present or connected to.*

**WARNING**



*Natural gas will constantly bleed and possibly vent from the SVI II AP if connected to a natural gas supply. Hazardous area clarification is the responsibility of the end user. area ventilation and other safety measures may be required to maintain a safe environment.*

**WARNING**



*Installation in poorly ventilated confined areas, with any potential of gases other than oxygen being present, can lead to a risk of personnel asphyxiation.*

**WARNING**



*Isolate the valve from the process and disconnect air tubing from the positioner. Disconnect air fully to avoid injury or process damage.*

## Installation Procedure

1. Install the tubing to the air supply port  $\leftarrow$  (arrow only for High Flow).
2. For  $\alpha$ :
  - Single acting actuator: Pipe the outbound air from the output pressure port  $\leftarrow$  **I** (arrow only for High Flow) to the actuator.
  - Double acting actuator: Pipe output pressure port one  $\leftarrow$  **I** for one side of the actuator and output pressure port two  $\leftarrow$  **II** for the other side of the actuator.
3. Air supply:
  - Supply pressure for single acting SVI II and AP High Flow: 20 -100 psi (1.4 - 6.9 bar) (138 - 690 kPa)
  - Supply pressure for double acting SVI II AP: 25 - 150 psi (1.73 - 10.4 bar) (172.4 - 1034 kPa)
  - Minimum tubing diameter 1/4" (6 mm x 4 mm)

### NOTE



*The SVI II AP Digital Valve Positioner is designed to operate with clean, dry, oil-free, instrument grade air to ANSI-ISA-57.3 1975 (R1981) or ISA-S7.3-1975 (R1981) or with clean, dry, oil-free sweet natural gas supply ( $H_2S$  content not to exceed 20 ppm) (SVI II AP models SVI II AP/SD through SVI II AP/AD).*

**Table 5: Air Supply Requirements**

|                    |  |
|--------------------|--|
| Dew Point          | At least 18° F (-7° C) below minimum anticipated ambient temperature |
| Particulate Matter | Filtered to 5 microns  |
| Oil Content        | Less than 1 ppm w/w  |
| Contaminants       | Free of all corrosive contaminants                                   |

### CAUTION



*The SVI II AP High Flow digital valve positioner cannot be placed in parallel with another volume booster. Contact the factory for further instructions regarding configuration with boosters as well as other non-standard configurations.*



## Connecting the Air Supply

After the tubing is installed, use the following procedure to connect the air supply.

1. Supply clean, dry compressed air to the filter regulator.
2. Turn on the air supply.
3. Adjust the filter regulator.  
Supply pressure must be 5 - 10 psi greater than the spring range of the actuator but may not exceed the rated actuator pressure. Refer to the valve or actuator instruction manual.

## Wiring the SVI II AP

In order for the SVI II AP to communicate the positioner data the SVI II AP positioner must be physically connected to a HART® communication. The procedure below outlines wiring the SVI II AP.

### WARNING



*Comply with current national and local regulations for electrical installation work.*

*Comply with national and local explosive atmosphere regulations. Before carrying out any work on the device, power off the instrument or make sure that the local conditions for potentially explosive atmosphere permit the safe opening of the cover.*

### CAUTION



*Refer to "Optional Switch Load Limits" on page 95 for guidelines on safely wiring switch load limits.*

## Connecting to the Control Loop

The SVI II AP digital valve positioner *MUST BE* grounded according to local regulations. It is important to maintain correct polarity at all times, otherwise the positioner may not operate properly. Physically connect the SVI II AP to the HART® loop using a cable specified by the Field Comm® Group. A shielded cable is recommended. To connect the Control Loop to the SVI II AP:

1. Connect one end of the cable to the control loop's 4 - 20mA output
2. Remove the threaded wiring covers on the positioner.
3. Connect the other end of the cable to the SVI II AP. There are two threaded openings on the positioner. Use the opening with the red plastic insert.
4. Maintain polarity + and - respectively.

## Wiring a Position Retransmit

### CAUTION



*For proper operation, maintain signal polarity + and - respectively.*

To connect:

1. Strip the insulation at the end of the wires. Strip approximately 1/4" (6.35 mm) of the insulation at the end of wires (wire size 14 to 28 AWG, 2.5 mm<sup>2</sup> to .08 mm<sup>2</sup>).
2. Connect the +/- terminals from the 4-20 mA Out to the position retransmit input signal: + to + and - to -. See Figure 8 on page 20.

To troubleshoot retransmit connections:

- Ensure that the retransmit circuit has a minimum voltage of 10 V (maximum 30 V).
- Ensure the minimum AO current is 3.2 mA. If the module loses power and the AO circuit remains powered, the AO signal will be 3.2 mA.

## Wiring Guidelines

Guidelines for a successful implementation of DC current signal, DC power, and HART<sup>®</sup> communication to the SVI II AP:

- Compliance voltage at the SVI II AP is approximately 9 V at 20 mA, 11 V @ 4 mA. See “Determining an SVI Positioner Compliance Voltage in a Control System” on page 103.
- Signal to the SVI II AP must be a regulated current in the range 3.2 to 22 mA.
- Controller output circuit must be unaffected by the HART<sup>®</sup> tones which are in the frequency range between 1200 and 2200 Hz.
- In the frequency range of the HART<sup>®</sup> tones, the controller must have a circuit impedance of more than 220 Ohms, typically 250 Ohms.
- HART<sup>®</sup> tones may be imposed by the positioner and a communication device located anywhere on the signaling circuit.
- Cabling must be shielded to prevent electrical noise that would interfere with the HART<sup>®</sup> tones, with the shield grounded.
- Shield must be properly grounded in only one place.
- For details and calculation methods for wiring resistance, and capacitance and for calculation of cable characteristics, refer to the HART<sup>®</sup> FSK Physical Layer Specification.
- For split range installations the output voltage must be sufficient to operate two positioners (11 V @ 4 mA, 9 V @ 20 mA) and the expected voltage drop in the cable.
- Use of a low impedance voltage source damages the SVI II AP The current source must be a true high impedance current limiting device. A proper current source explicitly enables adjustment of the current, not the voltage.
- When wiring a position retransmit:
  - Use the same gauge wires as the 4-20 mA control loop.
  - Ensure that the position retransmit signal is connected to the control system’s analog input card.
  - Ensure the control loop is powered while making make measurements with a meter.

## SVI II AP Setups

Control Systems using Explosion Proof or Conventional I/O Systems must have a compliance voltage greater than 9 V at 20 mA including wiring losses. See “Determining an SVI Positioner Compliance Voltage in a Control System” on page 103.

Typical Control Systems using Intrinsic Safety methods must have a compliance voltage greater than 17.64 V.

Typical system setups are shown in Figure 23 on page 46, General Purpose and Explosion Proof (EEx d) Installation Schematic and Figure 24 on page 46, Intrinsically Safe Installation Schematic. The SVI II AP digital valve positioner can be located in a general-purpose or hazardous area protected by Explosion Proof (EEx d) methods. Wiring diagrams are generalized, actual wiring must adhere to Electrical Installation section of manual and local electrical codes. The use of a Hand-held Communicator or a HART<sup>®</sup> modem is not permitted in the Hazardous Area protected by Explosion Proof (EEx d) methods. In Figure 24 on page 46 the SVI II AP digital valve positioner is located in a hazardous area that is protected by Intrinsically Safe wiring practices.

The SVI II AP requires an electrical input from a 4-20 mA current source. The SVI II AP input signal can carry a HART<sup>®</sup> communication protocol signal from ValVue software and a HART<sup>®</sup> modem, or from a HART<sup>®</sup> Hand Held Communicator. Since the process control system, the source of the input signal, is located in a non-hazardous location, setup requires an intrinsic safety barrier be placed between the process control system and the SVI II AP. If the SVI II AP is located in a hazardous area with Intrinsically Safe protection a barrier is not required for a flameproof installation. Alternatively the system can be installed as Explosion Proof/flameproof.

SVI II AP can communicate with a remote PC running ValVue software via a modem connected to the PC's serial or USB port. The PC, which is not intrinsically safe, must be connected to the circuit on the safe area side of the intrinsic safety barrier if the valve is located in a hazardous area.

The SVI II AP can be operated, calibrated, configured, and interrogated either by using local pushbutton and display, or by using a PC running ValVue software, HART<sup>®</sup> Handheld Communicator, or any registered HART<sup>®</sup> Host that supports DDs. The HART<sup>®</sup> Handheld Communicator is approved for Intrinsically Safe use in accordance with FM and ATEX standards. Read and observe all handheld labeling. The SVI II AP is polarity sensitive so the positive lead must be connected to the positive (+) terminal and the negative lead to the negative (-) terminal. Reversing the input will not cause damage but the unit will not function.

## Grounding Practices

There must never be more than one ground point for the shield wiring. Normally ground is connected at the controller or at the intrinsic safety barrier.

The case grounding screws are located on the outside of the case at the lower right of the display cover and inside the cover. The case is isolated from all circuitry and can be grounded locally in accordance with applicable codes.

If noise or instability is present, set the positioner to MANUAL mode of operation and manually position the valve over its entire range. If the valve is stable in MANUAL mode then the problem can be noise in the control system. Recheck all wiring connections and ground points.

## Compliance Voltage in Single Drop Current Mode

The SVI II AP requires 9.0 V at 20 mA and 11.0 V at 4 mA. Typical HART® devices require MORE Voltage at higher current and MORE current source have LESS Voltage available at higher current. The SVI II AP is noteworthy in that it requires LESS Voltage at higher current that complements the characteristic of the source requiring only 9 V at 20 mA. See “Determining an SVI Positioner Compliance Voltage in a Control System” on page 103.

## Verify Wiring and Connections

### NOTE



*For split range installations the compliance voltage must be capable of the minimum span being 5 mA; the upper range value must be 8 mA to 20 mA; the lower range values must be 4 mA to 14 mA.*

Use the following procedure to ensure that the SVI II AP is properly powered:

1. Connect a DC voltmeter across the input terminals.
  - For an input current between 4 and 20 mA the voltage varies between 11 V and 9 V respective. See “Determining an SVI Positioner Compliance Voltage in a Control System” on page 103.
  - When voltage exceeds 11 V check that polarity is correct.
  - If voltage is less than 9 V and polarity is correct, voltage compliance of current source is inadequate.
2. Connect a milliampmeter in series with the current signal.
3. Verify that source can supply 20 mA to SVI II AP input. If 20 mA is not attainable, troubleshoot the source and set up.

### NOTE



*Improperly or inadequately grounded installations can cause noise or instability in the control loop. The internal electronic components are isolated from ground. Grounding the case is unnecessary for functional purposes but grounding the case may be necessary to conform to local codes.*

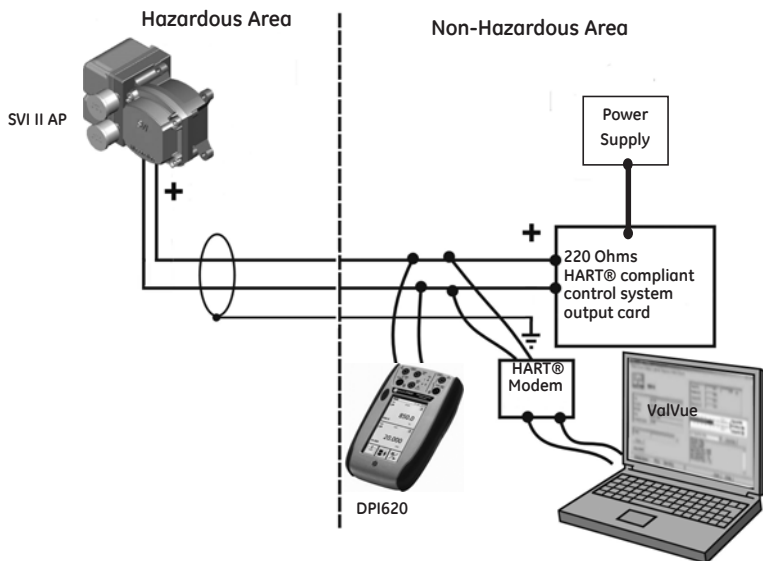


Figure 23 General Purpose and Explosion Proof Installation

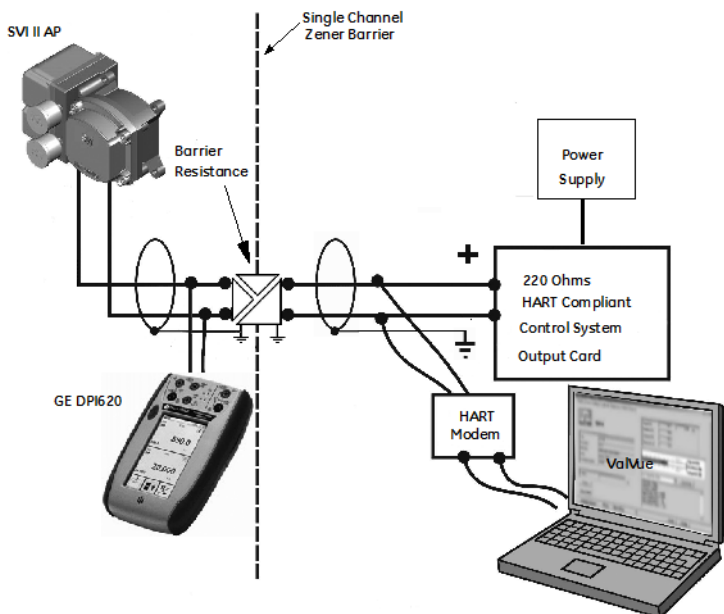


Figure 24 Intrinsically Safe Installation

# 3. Check Out, Configuration and Calibration

## Overview

This section provides the calibration procedures to ensure proper valve positioning. Operational checkout, configuration and calibration procedures are described using an SVI II AP that has a display with pushbuttons.

### NOTE



*Perform all procedures in this section before putting the SVI II AP into operation.*

## Check Out Procedures

SVI II AP checkout consists of physical and operational checkout procedures. The physical checkout procedures include:

- “Inspecting Actuator, Linkages, or Rotary Adapter” on page 48
- “Verifying Mounting and Linkage Adjustment” on page 48
- “Checking the Magnet” on page 48
- “Checking the Air Supply” on page 50
- “Checking the Electronic Module Connections” on page 50

### CAUTION



*The SVI II AP cover must be in place and secured using all four screws during operation.*

## Inspecting Actuator, Linkages, or Rotary Adapter

Verify that the mounting has not been damaged in shipment for a pre-mounted SVI II AP, physically inspect the actuator, linkage. Record the following information for the configuration check-out:

1. Valve Air to Open (ATO) or Air to Close (ATC)
2. Actuator pressure rating
3. Actuator bench range
4. Inherent trim characteristic of the control valve; linear, equal percentage, or other.

### NOTE

*Refer to the valve data sheet or model number of control valve.*



## Verifying Mounting and Linkage Adjustment

Inspect the mounting and make any needed adjustments before running the positioner and checking the digital configuration.

## Checking the Magnet

There are two methods of checking the SVI II AP magnet:

- Perform a visual inspection
- Use ValVue to check the magnet

## Performing a Visual Inspection

You must remove the positioner from the bracket to visually inspect the magnet orientation.

For rotary valves, such as a Camflex, or for actuators with rotation of less than 60°, the magnet assembly must be aligned as shown in Figure 25.

For rotary valves with rotations greater than 60°, the magnet assembly must be aligned as shown in Figure 26 on page 49.

### NOTE

*For a reciprocating globe valve, it is not necessary to remove the positioner from the bracket. Details are given below.*



For reciprocating valves the adjustable link turnbuckle must be parallel to the valve stem. To ensure linearity in positioning, verify that the hole in the lever aligns with the indicating hole in the bracket when the valve is in the closed position. Check that the bracket is mounted using the proper holes (refer to Table 4 on page 33).



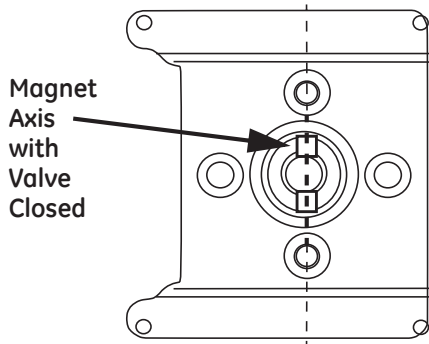


Figure 25 Magnet Orientation for Camflex and Varimax with Valve Closed

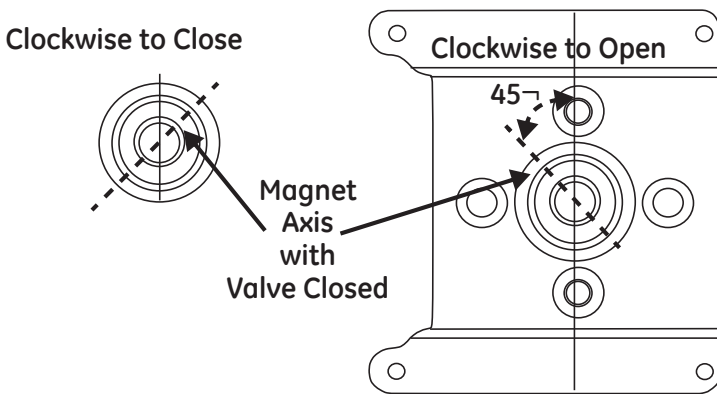


Figure 26 Magnet Orientation for 90° Valve Rotation with Valve Closed

## Using ValVue to Check Magnet Position

Use this procedure to check the magnet using ValVue.

1. Connect to the positioner in accordance with the ValVue instructions.
  - a. Ensure the positioner has been installed and set up with a HART<sup>®</sup> Modem in a HART<sup>®</sup> compliant communications loop; if required, install ValVue on the computer that is connected to the HART<sup>®</sup> modem.
  - b. Run ValVue.
  - c. Select the installed positioner from the list of connected devices.
  - d. Select the **Raw Data** tab to view the current operating conditions of the selected positioner.
2. Read Raw Position data. When the valve is:
  - Closed, the value should be between - 1000 and +1000 for a reciprocating valve or a 60° rotation rotary valve.
  - At mid-travel, the value should be between -1000 and +1000 for a greater than 60° rotation rotary valve.

## Checking the Air Supply

Use this procedure to check the air supply.

1. Turn on the air supply.
2. Adjust the filter regulator.  
Supply pressure must be a minimum of 10 psi greater than the spring range of the actuator but may not exceed the rated actuator pressure. Refer to the valve or actuator instruction manual.
3. Inspect the tubing connections between the filter-regulator and the positioner for leaks.
4. Verify that the tubing is not bent or crushed.
5. Verify that all fittings are leak tight.

### NOTE



*Do not use Teflon pipe seal tape. The Teflon tape can shred into particles that are harmful to the pneumatic components.*

## Checking the Electronic Module Connections

### WARNING



*Do not remove the instrument cover or connect to an electrical circuit in a Hazardous Area unless the power is disconnected.*

All connections to electronic module in the SVI II AP are made through the terminal board. The SVI II AP terminal board has a terminal block with cage clamp connectors. Confirm that all applicable connections to the electronics module connectors are correct. Not all options are available for every model. Refer to Table 6 for available functionality.

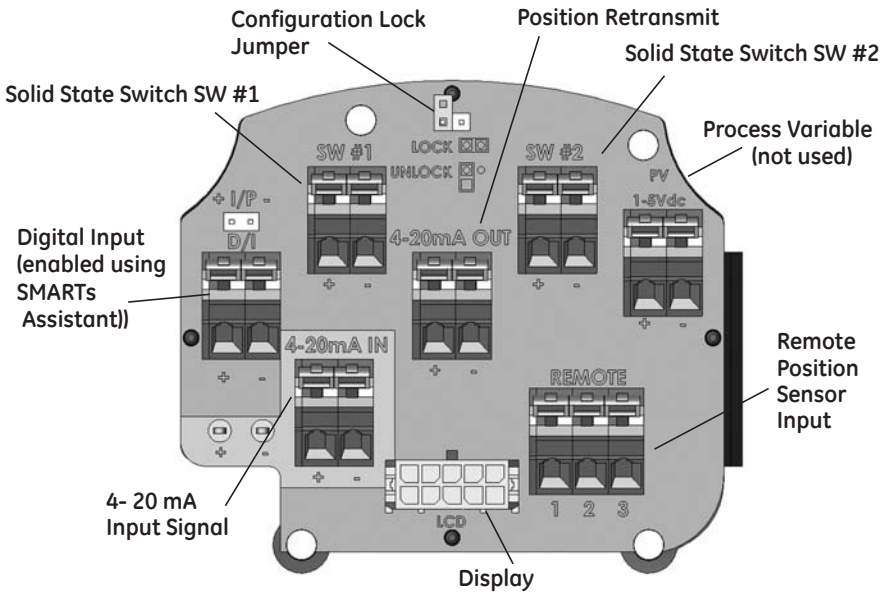
**Table 6: SVI II AP Models and Functionality**

| Available Functionality  | Positioner Model Number |             |
|--------------------------|-------------------------|-------------|
|                          | SVI II AP-2             | SVI II AP-3 |
| 4 - 20 mA Input Setpoint | √                       | √           |
| Display/ Pushbuttons     | Optional                | Optional    |
| Remote Mount Input       | √                       | √           |

**Table 6: SVI II AP Models and Functionality (Continued)**

| Available Functionality        | Positioner Model Number |          |
|--------------------------------|-------------------------|----------|
| Solid State Switch #1 and #2   | Optional                | Optional |
| 4- 20 mA Out Position Transmit | Optional                | Optional |

- Confirm the correctness of all applicable connections to the electronics module.



**Figure 27 Connections to Electronics Module (via Terminal Board)**

**NOTE**



When an SVI II AP is turned on it is advisable to apply the air supply before applying the electrical input signal.

**NOTE**



The PV (Process Variable) is not used for the SVI II AP. The Digital Input (DI) is activated using SMARTs Assistant, which is downloaded at <https://www.geoilandgas.com/file-download-search>.

# Operational Checkout

The operational checkout of the SVI II AP consists of:

- Connecting the SVI II AP to a current source
- Checking the pushbutton locks
- Powering up the SVI II AP

## Connecting to the Current Source

Connect to a DC mA current source then check and configure with the local display and push-buttons, if so equipped. The following section describes configuration and calibration with the optional local display and pushbuttons. If the SVI II AP is not equipped with local display use ValVue and a PC with a HART® modem or a HART® Handheld Communicator.

### NOTE



*When an SVI II AP is turned on it is advisable to apply the air supply before applying the electrical input signal.*

## Powering Up the SVI II AP

### WARNING



*This process can cause the valve to move. Before proceeding be sure the valve is isolated from the process. Keep hands clear from moving parts.*

### NOTE



*When an SVI II AP is turned on it is advisable to apply the air supply before applying the electrical input signal.*

### CAUTION



*Use of a low impedance voltage source will damage the SVI II AP. The current source must be a true high impedance current limiting device. A proper current source explicitly enables adjustment of the current in mA, not V.*

To power up the SVI II AP:

1. Loosen the four (4) cover screws and remove the cover of the SVI II AP. Connect the +/- terminals to the current source + to + and - to -. See Figure 27 on page 51. Reinstall the cover and display.
2. Adjust current to 12 mA. On initial power up of a newly installed SVI II AP, the positioner runs in NORMAL mode using the default instrument parameters installed at the factory. The positioner cycles through the NORMAL cycle menu and LCD displays the following values:
  - PRES: Pressure - unit of measurement and value\*
  - SIGNAL
  - POS (Position)
  - An exclamation point (!) appears in the top left corner of the display window to indicate that there is further instrument status available.
3. Proceed to Configuration and Calibration.

\* For firmware version 3.2.1, the supply pressure appears on the LCD. Additionally, Stops results and Autotune results, stay displayed until cleared.

**NOTE**



*If the SVI II AP is specified without local pushbuttons and display, local operation is not available. Configure and calibrate with ValVue and a HART® modem.*

# Configuration

Use the procedures that follow to: calibrate, tune, view configuration data and status messages for the SVI II AP. Observe all warnings as the valve moves during these procedures.

## WARNING



*These procedures can cause the valve to move. Before proceeding be sure the valve is isolated from the process. Keep hands clear from moving parts.*

## NOTE



*All calibration and configuration procedures are described using an SVI II AP with pushbuttons and display and ValVue software.*

## NOTE



*Starting with firmware version 3.2.7/5.1.3, if Autotune is unsuccessful the message TuneERR appears on the pushbutton display or when using the DD. Previous firmware versions reported this as TuneFail. These messages do not mean the positioner is defective but indicate a need to perform a manual tune.*

## Notes on Aggressiveness

### Setting Aggressiveness

While the SVI II AP DTM and the DD allow you to set Aggressiveness, the pushbuttons do not. In all three methods, however, the Aggressiveness value is inherited from any previously performed tuning (Autotune or manual). Once Aggressiveness, and other tuning values are determined, they are stored in NVRAM.

The SVI II AP provides a user define *Aggressiveness Level* for auto-tuning, the allowable range varies from -9 to +9 where 0 (Zero) is consider normal tuning. The Aggressiveness Level influences stroking speed and over-shoot. A negative value will SLOW stroking speed and help minimized over-shoot. A positive value will INCREASE stroking speed and may add some over-shoot. The recommended values for *Aggressiveness* is 0 for control valves without volume boosters.

In applications with volume boosters and/or quick exhaust valves are used the *Aggressiveness Level* is not as influential. For Auto-tuning it is usually between 0 and 3. Reduce the volume boosters sensitivity by opening the integral bypass needle valve about 1 to 2 turns. Use caution when adjusting the needle valve so as to not to damage the seat, close gently to seat and then open 1 or 2 turns.

### Aggressiveness Dynamic

Lower values of aggressiveness lead to lower PID values and slower response and less overshoot.

Higher values lead to higher PID values and quicker response and more overshoot.

Once you have a preferred aggressiveness and you tune once, all future autotunes automatically use that same value, until user-changed.

## Configuration with Pushbuttons

Prior to changing the SVI II AP configuration, check the existing configuration.

### Viewing Configuration Data

To view SVI II AP configuration data:

1. Access the VIEW DATA menu from the MANUAL menu by pressing the + button.
2. In the VIEW DATA menu, press \* to examine the configuration.
3. Press + to scroll through and observe the factory configuration.
4. Press + until MANPOS appears.
5. Select with \*.
6. When the adjustment screen appears stroke the valve open by holding + down. The rate of set point change is slow to begin, but increases speed while the + is pressed.
7. Stroke the valve to several values.
8. Verify the action is as desired.
9. Press + to move to the *SETUP* menu.
10. In the *SETUP* menu press the \* button to access the *CONFIGuration* menu.
11. In the **CONFIG** menu set the configuration parameters.
12. When in **CONFIGure** or *CALIBrate*, pressing \* changes values.
13. Return to *NORMAL* mode. The valve moves to the value set by the current calibrator.
14. Stroke the valve through its range to verify that the movement is as desired.

### Configuration Menu

Because calibration depends on certain configuration options you must perform Configuration before you perform Calibration when installing the SVI II AP for the first time.

If a change is made in the Air-to-Open / Air-to-Close configuration option or if you move the SVI II AP to a different valve or make any change to the valve position linkage, you must run the find STOPS calibration again.



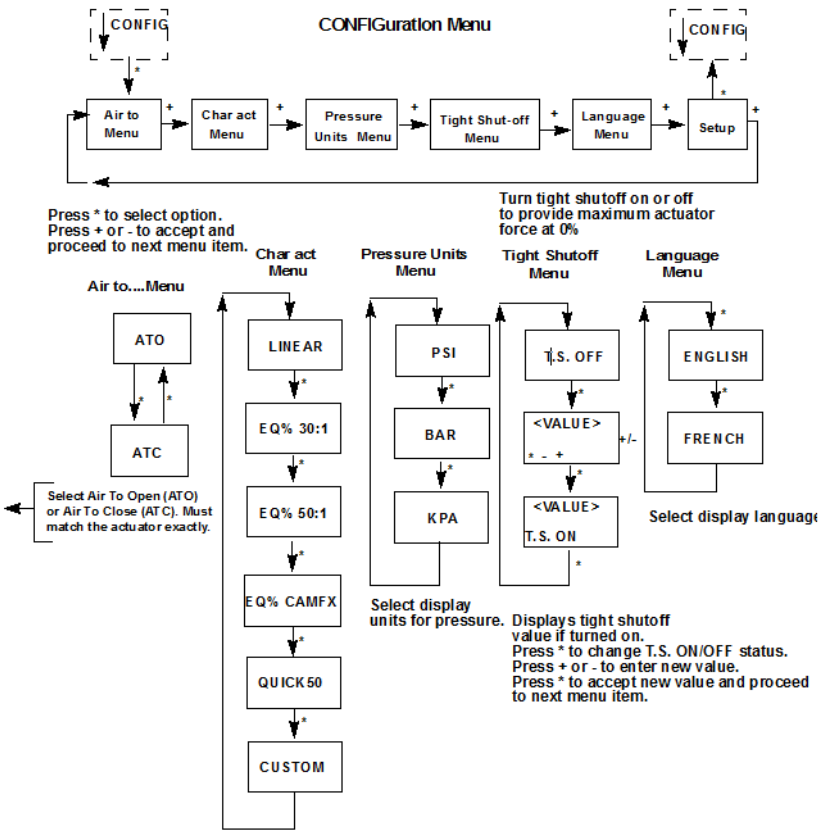


Figure 28 CONFIGure Menu

## Viewing Status Messages

To view SVI II AP status messages:

1. Press **+** and **\*** to select VIEW ERR.
2. Observe any internal errors. For example, there should be a RESET status caused by powering up. If the positioner was powered without air a *Position Error* or *POSERR* can appear.
3. Press **+** to view all faults.
4. Press **\*** to return to *MANual* menu.
5. Press **+** until *CLR ERR* appears.
6. Press **\*** *CLR ERR. WAIT* appears for a second or two.

## VIEW DATA Settings

**Table 7: VIEWDATA Settings**

| Typical Setting | Optional Setting |          |          |        |         |
|-----------------|------------------|----------|----------|--------|---------|
| SINGLE          | DOUBLE           |          |          |        |         |
| ATO             | ATC              |          |          |        |         |
| LINEAR          | EQUAL 30         | EQUAL 50 | QUICK 50 | CUSTOM | CAMFSEQ |
| PSI             | BAR              | KPA      |          |        |         |
| 0.00<br>TS OFF  | 2.00<br>TS ON    |          |          |        |         |
| 4.00<br>SIG LO  | 4.00<br>SIG LO   |          |          |        |         |
| 20.00<br>SIG HI | 12.00<br>SIG HI  |          |          |        |         |
| English         | French           |          |          |        |         |

# Calibration

## CAUTION



*Pilot Trim Valve Applications require the use of the Manual Stop calibration procedure (refer to Configuration and Calibration of the SVI II AP Instruction Manual, GEA19681). Do not run Find Stops or the ValVue Setup Wizard on valves with Pilot Trim or damage to the valve will occur.*

To calibrate the SVI II AP:

1. Observe the display following power-up. The SVI II AP powers up in the previously active mode either MANUAL or NORMAL (operating) mode:
  - In NORMAL mode, the display alternates between POS and SIGNAL.
  - In MANUAL, the display alternates between POS -M and SIG.
2. With *MANUAL* mode displayed, press \* to select the MANUAL mode.
3. Press + again; ↓*CONFIG* appears. Pressing + again brings ↓*CALIB*.
4. Select *CALIB* by pressing \*. *STOPS* appears. The valve moves full open and back to full closed. Observe all warnings.
5. Press \* to cause the valve to stroke and to automatically calibrate valve travel.
6. After the *STOPS* procedure finishes, press + twice until *TUNE* appears.

# Calibration Menu

The Calibration menu shown in Figure 29 provides access to all the calibration functions for the SVI II AP. If a change is made in the Air-To-Open/Air-To-Close configuration option or if you move the SVI II AP to a different valve or make any change to the valve position linkage, you must run the find STOPS calibration again.

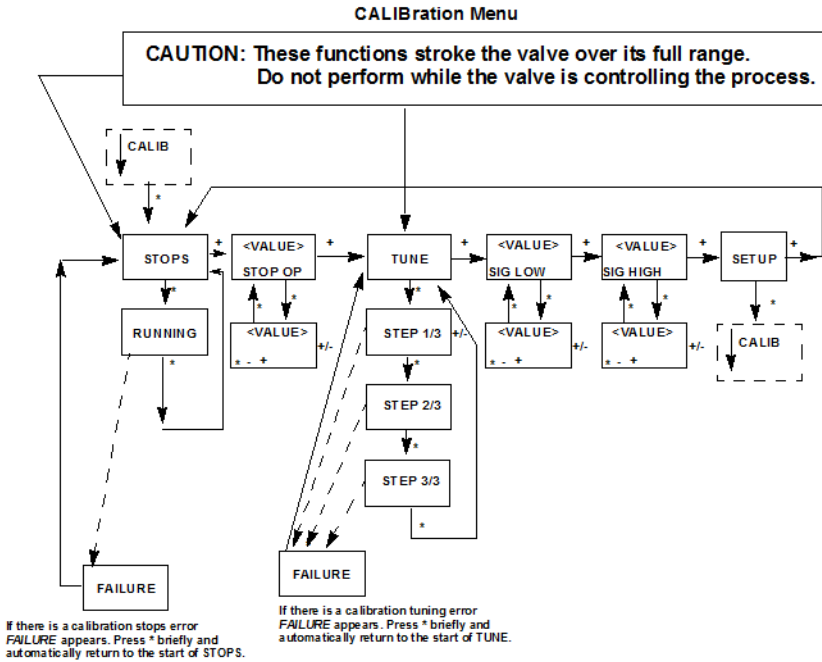


Figure 29 CALIBration Menu

## Auto Tune

This process takes 3 to 10 minutes and strokes the valve in large and small steps to set the PID parameters for best positioning response.

### WARNING



*DO NOT perform STOPS while the valve is controlling the process.  
DO NOT perform Auto Tune while the valve is controlling the process.*

To auto tune the SVI II AP:

1. Press \* to begin the autoTUNE procedure.  
As autoTUNE proceeds, numerical messages display, indicating the procedure is working.
2. When autoTUNE is complete, *TUNE* appears.
3. Press + repeatedly until ↑ *SETUP* appears.
4. Press \* to return to SETUP menu; ↓ *CALIB* appears.

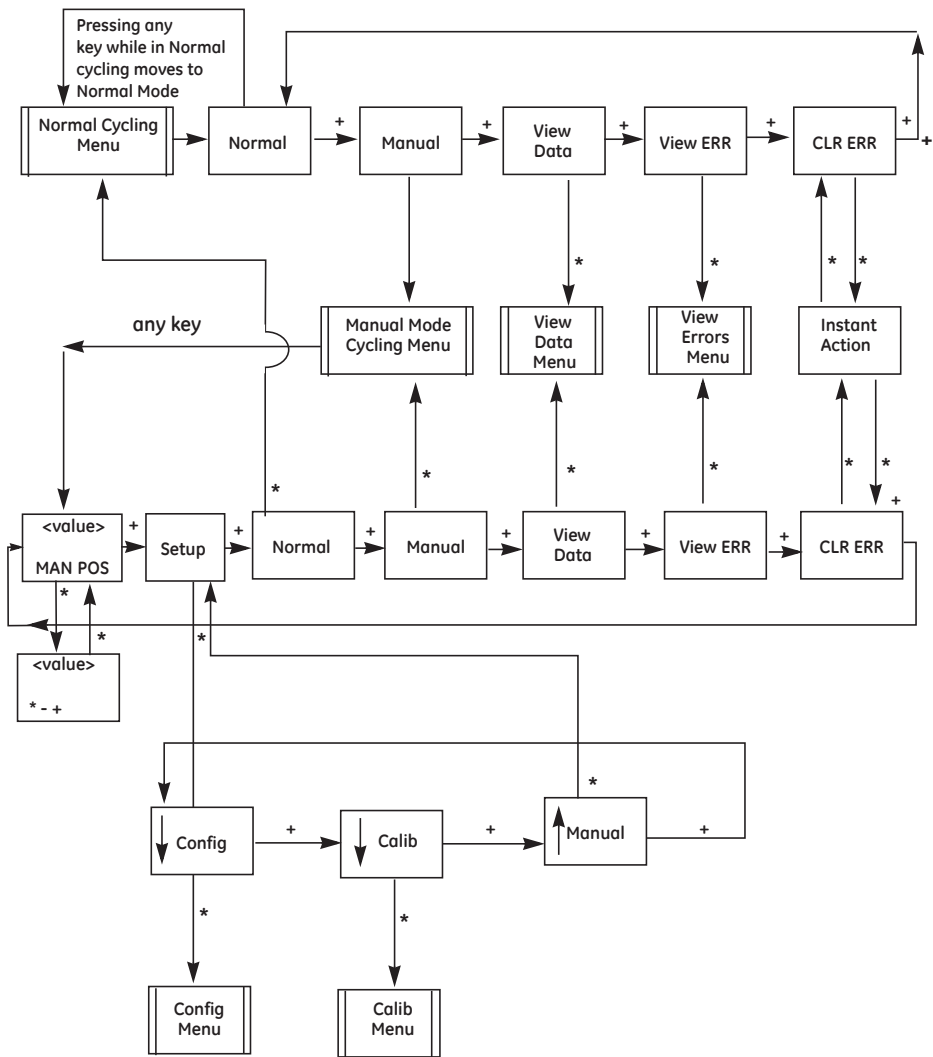
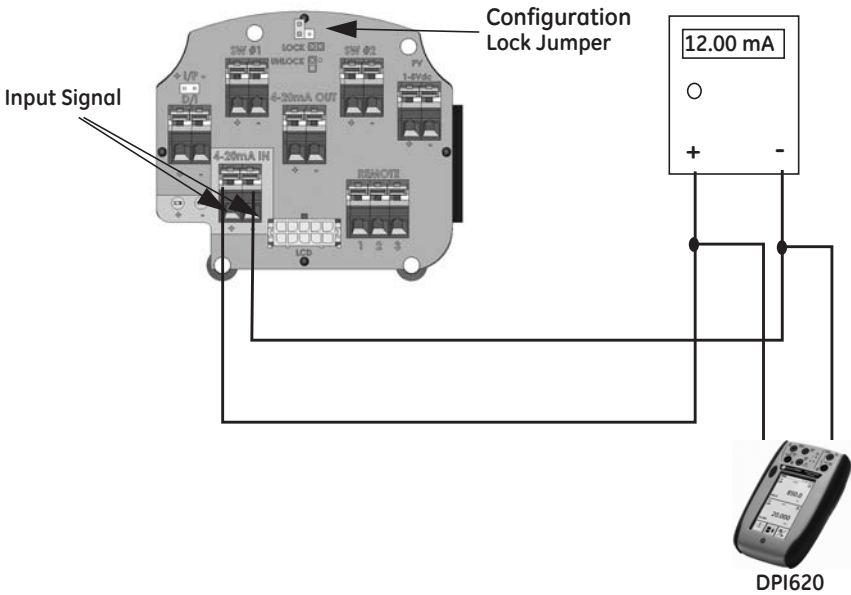


Figure 30 NORMAL Operation and MANUAL Menu Structures

## Check-out with a HART® Handheld Communicator

If the SVI II AP is not equipped with optional push buttons and local display the checkout and configuration is performed using the standard HART® communications interface.

Connect the HART® handheld communicator to the SVI II AP as shown in Figure 31. Refer to the product manual for the HART® communicator in use.



**Figure 31 SVI II AP HART® Communicator Connections**

Be sure that the configuration lock jumper is in the unlock position. When the jumper is in the lock position (shorting the two-pin header) the handheld is not permitted to make any changes. However, parameters are readable. If fault messages appear, they must be handled before proceeding with HART® communications. Before communications proceeds all error messages must be cleared. For example, the following message is displayed if the instrument has been serviced and the air is not connected.

*Process applied to the non-primary variable is outside the operating limits of the field device*

Proceed with the following steps:

1. Press **NEXT**.
2. Field device has more status available
3. Press **NEXT**
4. **Ignore next 50 occurrences** of status?
5. Press **YES**
6. Change to **MANual** mode
7. Scroll to line **6 EXAMINE**, press **->**
8. Scroll down to **5 read status**.
9. Read message.
10. Press **OK**.
11. Repeat **OK** to read all messages until the display returns to *read status*.
12. Scroll down to **6 clear status**, press **->**
13. If **clear fault codes not completed** appears, press **OK** and read the message (**Position Error**, for example) or go to the troubleshooting guide.
14. Correct the problem (Is the air supply on?), and then go to clear status until **Clear Fault codes Completed** appears.
15. Press **OK**.



# 4. Maintenance

## SVI II AP Maintenance

The SVI II AP was designed based on a modular concept. All components are interchangeable allowing for easy, quick component swapping.

The only maintenance procedures recommended for the SVI II AP are:

- Remove and install the cover
- Remove and install the I/P module
- Remove and install the pneumatic relay
- Upgrade to display cover

### WARNING



*Do not remove the instrument cover or connect to an electrical circuit in a Hazardous Area unless the power is disconnected.*

*If natural gas is supplied, natural gas may escape from the SVI II AP on removal of the cover or components.*

## Repair

Replacement of the Pneumatic Relay, I/P and cover (with or without display) are the only field repairs permitted.

Only qualified service personnel are permitted to make repairs.

Only factory-supplied parts are permitted. This includes not only the major assemblies but also mounting screws and O-rings. No substitutions with non-Masonellan parts are permitted.

Detailed replacement procedures are described in the Instruction Manual. The following summary assures the integrity of the SVI II AP.

## Tools Needed for Cover Replacement

- 5 mm hex key for the cover
- 3 mm hex key for the lanyard

## Display Cover Removal and Installation

The cover with display (shown in Figure 32) is an option for the SVI II AP. If you have an SVI II AP with a solid cover and would like to upgrade to a display cover, follow the instructions below for removal and installation.

### Removing the SVI II AP Display Cover

To remove the SVI II AP display cover:

1. Using a 5 mm Hex key unscrew the four screws around the perimeter of the SVI II AP cover.
2. Lift the cover off the positioner.



Figure 32 SVI II AP Pneumatic and Display Covers

## Installing the SVI II AP Display Cover

### NOTE



*After replacing the SVI II AP display cover you must power up the unit (see "Powering Up the SVI II AP" on page 52).*

The replacement display cover is shipped with a lanyard to prevent the cable (that connects from the display to the terminal board) from breaking. The lanyard must be inserted under the screw in the lower left corner that attaches the terminal board to the SVI II AP housing.

To install the cover:

1. Install the lanyard and tighten the screw to 5 in/lb.
2. Using the 3 mm hex key, remove the screw from the lower left corner, connecting the terminal board to the SVI II AP housing.
3. Connect the cable from the display into the LCD connector on the terminal board.
4. Ensure that the gasket is in its groove in the housing.
5. Place the cover over the screw mounts.
6. Tighten the four screws with the 5 mm hex key.
7. After installing the new display, power up the unit (refer to "Powering Up the SVI II AP" on page 52 for further information).

### NOTE



*The cover of the SVI II AP is a critical component for safety in Hazardous Areas. To ensure safe operation the flat surfaces of the cover and the housing must be clean and absolutely free of particles or dents. There must be no gap between the housing and cover; torque spec is 50 in/lb.*

Ensure that:

1. The gasket is seated in the groove in the housing flange.
2. No wires or retaining cable can be trapped under the cover flange.
3. The flange area is not corroded and the surface is not scarred.
4. The four cover bolts are securely tightened to 50 in/lb.

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# A. Specifications and References

## Physical and Operational Specifications

This section provides the physical and operational specifications for the SVI II AP.

Specifications are subject to change without notice.

**Table 8: Environmental Specifications**

|  |  |
|--|--|
| Operating Temperature Limits                         | -58° F to 185° F (-50° C to 85° C)   |
| Storage Temperature Limits                           | -58° F to 200° F (-50° C to 93° C)   |
| Temperature Effect                                   | < 0.005% / °F typical; -40° F to 180° F (< 0.01% / °C typical; -40° C to 82° C)  |
| Supply Pressure Effect                               | 0.05% per psi (.73% per bar)   |
| Relative Humidity                                    | 10 to 90% non-condensing   |
| Humidity Effect                                      | Less than 0.2% after 2 days at 104 °F (40° C), 95% Relative Humidity.  |
| Insulation Resistance                                | Greater than 10 G Ohms at 50% RH.  |
| MTBF   | 49 years based on MIL handbook calculation for electronic parts and field data on mechanical parts   |
| Electromagnetic Compatibility<br>Electrostatic       | <input type="checkbox"/> Electrostatic discharge — No effect with contact discharge level of 4kV and air discharge level of 8 kV (IEC 1000-4-2)<br><input type="checkbox"/> Radio frequency interference — Less than 0.2% at 10 V per meter (EN 50140) |
| Fast Transient Burst                                 | No effect at 2 kV (Coupling clamp IEC 1000-4-4).   |
| Vibration Influence<br>Measured at SVI II AP Housing | <input type="checkbox"/> 4 mm at 5 - 15 Hz - Negligible<br><input type="checkbox"/> 2 G at 15 - 150 Hz Less than 2 % of span<br><input type="checkbox"/> 1 G at 150 - 2000 Hz - Less than 2% of span   |
| Magnetic Field Influence                             | Negligible at 30 A/m (EN61000-4-8)<br>CE MARK certified to EN50081-2 and EN50082-2   |

### Table 9: Operational Specifications

|   |  |
|---|--|
| Accuracy  | +/- 0.5% (typical +/-0. 10% or less) Full Span   |
| Hysteresis and Deadband   | +/- 0.3% Full Span   |
| Repeatability   | +/- 0.3% Full Span   |
| Conformity  | +/- 0.5% Full Span   |
| Start-Up Drift  | Less than 0.02% in first hour  |
| Long Term Drift   | Less than 0.003% per month   |
| Position Travel Limits  | <input type="checkbox"/> Rotary: 18 - 140°<br><input type="checkbox"/> Reciprocating: 0.25" - 2.5" (6 mm - 64 mm)<br><b>Note:</b> Above 2.5" (64 mm) consult factory for mounting instructions.  |
| Flow Characteristics<br>Applied in addition to the control valve's inherent characteristic.   | <input type="checkbox"/> Linear<br><input type="checkbox"/> Equal Percentage (of 50:1 or 30:1)<br><input type="checkbox"/> Camflex<br><input type="checkbox"/> Quick Opening (inverse of 50:1 equal percentage)<br><input type="checkbox"/> User Configurable<br><input type="checkbox"/> Tight Shut Off (0 -20% of input)   |
| Auto Tune<br>SVI II AP performs automatic determination of the optimal valve positioner control parameters. In addition to P, I, D, the position algorithm uses damping, symmetry for exhaust and fill time constants, dead zone and magnitude characterization parameters. Auto Tune is optimized for 5% step changes with negligible overshoot. After the Auto Tune process is completed, the user can further adjust the positioner tuning parameters to more conservative or to more responsive values. | <input type="checkbox"/> Proportional gain: 0 to 5, displayed as 0 to 5000<br><input type="checkbox"/> Integral time: 0 to 100 seconds - displayed as 0 to 1000 (1/10s)<br><input type="checkbox"/> Derivative time: 0 to 200 milliseconds<br><input type="checkbox"/> Dead Zone: 0 to +/-5% (0 to 10% deadband)<br><input type="checkbox"/> Padj: +/- 3000 (depends on P)<br><input type="checkbox"/> Beta (non-linear gain factor): -9 to +9<br><input type="checkbox"/> Stroking Time: 0 to 250 seconds<br><input type="checkbox"/> Position compensation coefficient: 1 to 20<br><input type="checkbox"/> Boost: 0 to 20 |
| Full open position adjustment   | 60 to 100% of actual stop  |
| Start Up Time (from no power)   | Less than 200 ms   |
| Minimum current to maintain HART®   | 3.0 mA   |
| HART® Command #3 Mapping  | <input type="checkbox"/> HART® 4-20 mA input signal<br><input type="checkbox"/> PV = Valve Position, 0-100%<br><input type="checkbox"/> SV = Actuator Pressure (P1-P2) (N/A for standard diagnostic version; units sends zero)<br><input type="checkbox"/> TV = Supply Pressure<br><input type="checkbox"/> QV = P2 for double acting units (N/A for standard diagnostic version; units sends zero)  |

**Table 10: Input Signal, Power, and Display Specifications**

|  |   |
|--|---|
| Power Supply                                 | Loop powered from 4-20 mA control signal  |
| Compliance Voltage Rating                    | 9.0 V at 20 mA, 11.0 V at 4.0 mA  |
| Minimum Current Signal to Start Up           | 3.2 mA  |
| Impedance Range                              | Low: 450 Ohms; High: 275 Ohms   |
| Minimum Input Span for Split Range Operation | 5 mA  |
| Upper Range Value for Split Range Operation  | 8 mA to 20 mA   |
| Lower Range Value for Split Range Operation  | 4 mA to 14 mA   |
| Wire Size                                    | 14/28 AWG   |
| Strip Length                                 | 0.22 in / 6 mm  |
| Digital Communication                        | HART® Communication protocol revision 5, 6 or 7   |
| Local Display                                | LCD, Explosion proof with two lines of nine alpha numeric characters.<br>Display becomes unreadable between 0 °C and -10 °C. Display is shutdown at -15 °C. |
| Push Buttons                                 | External, Three Explosion Proof / Flameproof push buttons   |

**Table 11: Construction Material Specifications**

|                    |  |
|--------------------|--|
| Housing and Cover  | <input type="checkbox"/> Aluminum ASTM B85 SG100A standard<br><input type="checkbox"/> Stainless Steel optional  |
| Weight             | Standard Flow Model:<br><input type="checkbox"/> Aluminum - 7.4 lbs./ 3.3 kg<br><input type="checkbox"/> Stainless Steel - 16 lbs/ 7.3 kg<br><br>High Flow Model:<br><input type="checkbox"/> With Display: 9.4 lbs./ 4.2 kg<br><input type="checkbox"/> Without Display: 8.9 lbs./ 4.0 kg   |
| Relay and Manifold | Standard Flow Model:<br><input type="checkbox"/> Single Acting - PPS, 300 Series Stainless Steel, nitrile diaphragms<br><input type="checkbox"/> Double Acting - 300 Series Stainless Steel, Ryton; Aluminum 6061 T6, Ryton<br><br>High Flow Model:<br><input type="checkbox"/> 300 Series Stainless Steel, Ryton; Aluminum 6061 T6, Ryton |
| I/P Motor          | 430 stainless steel, PPS, 300 series stainless steel   |
| Mounting Bracket   | 300 series stainless steel   |
| Magnet Holder      | Corrosion Protected Anodized Aluminum 6061 T6  |

**Table 11: Construction Material Specifications**

|           |                            |
|-----------|----------------------------|
| Pole Ring | 416 stainless steel        |
| Levers    | 300 Series stainless steel |

**Table 12: System Connectivity**

|   |   |
|---|---|
| HART® Physical Device Type                        | <p>Actuator Device Type:</p> <input type="checkbox"/> Rev 1: HART®5: CA (202); HART®6: 65CE (206), HART®7: 65EE (238)<br><input type="checkbox"/> Rev 2: HART®5: CA (202)   |
| DD Registered with HART® Communication Foundation | Yes   |
| Integration with HART® Host software              | ValVue AMS SNAP-ON application available, Plug-In Application For Yokogawa® PRM, ValVue For Honeywell® FDM, Device Type Manager (DTM) for FDT Host  |
| Diagnostics                                       | <p>Standard:<br/>Alarms, cycle counter, travel accumulator, time open, time close, time near close, Step Test, Positioner Test</p> <p>Advanced:<br/>Includes Standard Diagnostics and the following: Low Air Supply alarm, Valve Signature (Friction, spring range, seat profile)</p> |

**Table 13: Pneumatics Single Acting Standard Flow**

|                                    |  |
|------------------------------------|--|
| Air Supply                         | Dry, oil-free, 5 micron filtered air (per ISA S7.3)  |
| Action                             | Direct Acting  |
| Supply Pressure                    | 20-100 psi max. (1.4 to 6.9 bar)<br>Regulate 5 to 10 psi above actuator spring range. Do not exceed actuator rating.   |
| Air Delivery - Single Acting Relay | <input type="checkbox"/> 10.0 scf/min. (283 L/min) at 30 psi (2.1 bar) supply<br><input type="checkbox"/> 16.6 scf/min. (470 L/min) at 60 psi (4.2 bar) supply<br><input type="checkbox"/> 23.3 scf/min. (660 L/min) at 90 psi (6.3 bar) supply  |
| Air Capacity (flow coefficient)    | <input type="checkbox"/> Loading CV = 0.57<br><input type="checkbox"/> Venting CV = 0.53   |
| Air Consumption                    | <input type="checkbox"/> 0.2 scf/min. (5.7 L/min) at 30 psi (2.1 bar) supply<br><input type="checkbox"/> 0.26 scf/min. (7.4 L/min) at 45 psi (3.1 bar) supply  |
| Air Supply Failure                 | <p>Single Acting Relay</p> <p>On supply failure the actuator output fails to atmosphere. Some overshoot may occur when air pressure returns after a period without air supply pressure. Always set control set point to 0%, and put the process control system in manual, for smooth recovery from air supply failure.</p> |
| Loss of Input Signal               | Actuator Output fails to atmosphere  |
| Output Pressure                    | 0-150 psi (10.3 bar) max.  |



**Table 14: High Flow Pneumatics Single Acting High Flow**

|                                    |  |
|------------------------------------|--|
| Air Supply                         | Dry, oil-free, 5 micron filtered air (See ISA S7.3)  |
| Action                             | Direct Acting  |
| Supply Pressure                    | 20 -100 psi max. (1.4 - 6.9 bar)<br>Regulate 5 - 10 psi (.345 bar - .69 bar) above actuator spring range. Do not exceed actuator rating.   |
| Air Delivery - Single Acting Relay | <input type="checkbox"/> 39.0 scf/min. (1104 L/min) at 30 psi (2.1 bar) supply<br><input type="checkbox"/> 70.6 scf/min. (2000 L/min) at 60 psi (4.2 bar) supply<br><input type="checkbox"/> 102.0 scf/min. (2888 L/min) at 90 psi (6.3 bar) supply  |
| Air Capacity (flow coefficient)    | <input type="checkbox"/> Loading CV = 2.2<br><input type="checkbox"/> Venting CV = 2.8   |
| Air Consumption                    | <input type="checkbox"/> 0.28 scf/min. (8.0 L/min) at 30 psi (2.1 bar) supply<br><input type="checkbox"/> 0.35 scf/min. (10.5 L/min) at 45 psi (3.1bar) supply   |
| Air Supply Failure                 | <p>Single Acting Relay</p> <p>On supply failure the actuator output drops. Some overshoot may occur when air pressure returns after a period without air supply pressure. Always set control set point to 0%, and put the process control system in manual, for smooth recovery from air supply failure.</p> |
| Loss of Input Signal               | Output drops to low pressure.  |
| Output Pressure                    | 0-150 psi (10 bar) max   |

**Table 15: Pneumatics Double Acting Standard Flow**

|                                   |  |
|-----------------------------------|--|
| Air Supply                        | Dry, oil-free, 5 micron filtered air see ISA S7.3  |
| Action                            | <input type="checkbox"/> Output 1 increases with increasing signal<br><input type="checkbox"/> Output 2 decreases with increasing signal   |
| Supply Pressure for Double Acting | 25 - 150 psi max. (1.73 to 10.3 bar)<br>Do not exceed actuator rating.   |
| Air Delivery for Double Acting    | <input type="checkbox"/> 7.2 scf/min. (204 L/min) at 30 psi (2.1 bar) supply<br><input type="checkbox"/> 12.8 scf/min. (362 L/min) at 60 psi (4.2 bar) supply<br><input type="checkbox"/> 18.3 scf/min. (518 L/min) at 90 psi (6.3 bar) supply<br><input type="checkbox"/> 23.8 scf/min. (674 L/min) at 120 psi (8.3 bar) supply   |
| Air Capacity (flow coefficient)   | <input type="checkbox"/> Loading CV = 0.39<br><input type="checkbox"/> Venting CV = 0.33   |
| Air Consumption for Double Acting | <input type="checkbox"/> 0.4 scf/min. (11.3 L/min) at 30 psi (2.1 bar) supply<br><input type="checkbox"/> 0.85 scf/min. (24.1 L/min) at 80 psi (5.52 bar) supply   |
| Air Supply Failure                | Positioner cannot control the failure position of an actuator without a spring. The actuator can, under different conditions, fail in place, fail open, or fail close. In cases where the valve must fail to a required position additional accessories are required.<br>Some overshoot can occur when air pressure returns after a period without air supply pressure. Always set control set point to 0%, and put the process control system in manual, for smooth recovery from air supply failure. |
| Loss of Input Signal              | <input type="checkbox"/> Output 1 fails to atmosphere<br><input type="checkbox"/> Output 2 fails to supply pressure.   |

# Series Identification SVI II AP-abcdefgh

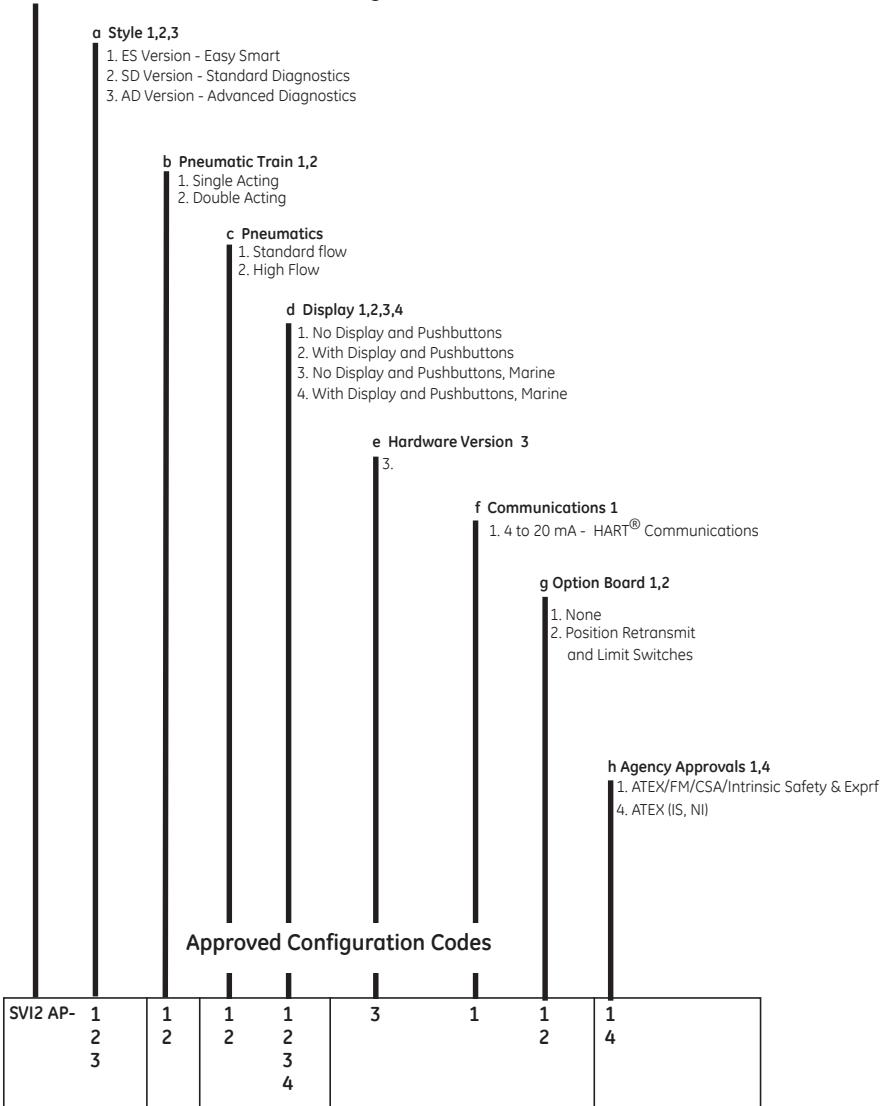


Figure 33 SVI II AP Model Numbering

# Hazardous Location Installation

The following pages provide the agency approved installation procedure for hazardous locations.

## NOTE



*The installation procedure is accurate at time of print. For further hazardous installation information please consult the factory.*



## ES-699

### **SPECIAL INSTRUCTIONS FOR INSTALLING MASONEILAN SVI-II AP IN AREAS WHERE THERE IS A POTENTIAL FOR EXPLOSIVE GAS ATMOSPHERE OR INFLAMMABLE DUST**

## 1 INTRODUCTION

This manual covers the requirements for safe installation, repair, and operation of the SVI-II AP as it relates to operation in areas where there is a potential for explosive atmosphere or inflammable dust. Adherence to these requirements assures that the SVI-II AP will not cause ignition of the surrounding atmosphere. Hazards related to *control* of the process are beyond the scope of this manual. For mounting instructions on specific valves refer to the mounting instructions supplied with the mounting kit. Mounting does not affect the suitability of the SVI-II AP for use in a potentially hazardous environment. The SVI-II AP is manufactured by:

Dresser LLC.  
12970 Normandy Blvd  
Jacksonville FL 32221 USA

## 2 GENERAL REQUIREMENTS

**!WARNING!**  
Failure to adhere to the requirements listed in this manual may cause loss of life and property.

Installation and maintenance must be performed only by qualified personnel. Area Classification, Protection Type, Temperature Class, Gas Group, and Ingress protection must conform to the data indicated on the label.

Wiring and conduit must conform to all local and national codes governing the installation. Wiring must be rated for at least 5°C above the highest expected ambient temperature.

Approved wire seals against ingress of water and dust are required and the NPT fittings must be sealed with tape or thread sealant in order to meet the highest level of ingress protection.

Where the protection type depends on wiring glands, the glands must be certified for the type of protection required.

The metal housing is a die-casting alloy which is predominately aluminum.

Before powering the SVI-II AP:

1. Verify that the pneumatic and electronic cover screws are tightened. This is important to maintain the ingress protection level and the integrity of the flameproof enclosure.
2. If the Installation is Intrinsically Safe, then check that the proper barriers are installed and the field wiring meets local and national codes for an IS installation. Never install a device, which was previously installed without an intrinsically safe barrier, in an intrinsically safe system.
3. Under normal operation, compressed supply gas is vented from the SVI II AP to the surrounding area, and may require additional precautions or specialized installations.
4. If the Installation is Non-Incendive, then check that all the electrical connections are made to approved devices and wiring meets local and national codes.
5. Verify that the markings on the label are consistent with the application.
6. Verify that the air supply pressure cannot exceed the marking on the respective label.

### 3 MODEL NUMBER DESCRIPTION OF SVI-II AP

“SVI2-abcdefgh” (Not all combinations are available)

| SVI2- | a  | b                 | c               | d                                      | e                                | f                    | g                                    | h  |
|-------|--|-------------------|-----------------|--|----------------------------------|----------------------|--------------------------------------|--|
| 0     |  |                   |                 |  |                                  |                      |                                      | Generic ( National Labeling as Required)                 |
| 1     |  | Single Acting     | Standard Flow   | No Display<br>No Buttons<br>Industrial |                                  | Hart<br>4 to 20 MADC | None                                 | FM, CSA, ATEX,<br>IEC, Regional (4)<br>(XP, DIP, IS, NI) |
| 2     | SD - Standard<br>Diagnostics<br>Remote Sensing | Double Acting     | High Capacity   | Display<br>Buttons<br>Industrial (1)   |                                  |                      | Retransmit<br>and Digital<br>Out (2) |  |
| 3     | AD - Advanced<br>Diagnostics<br>Remote Sensing |                   |                 | No Display<br>No Buttons<br>Offshore   | Plug-in<br>Electronics<br>Module |                      | Retransmit<br>(3)                    | FM, CSA ATEX (IS,<br>NI)                                 |
| 4     | OD - On-Line<br>Diagnostics<br>Remote Sensing  |                   |                 | Display<br>Buttons<br>Offshore (1)     |                                  |                      |                                      |  |
| 5     | PC - Process<br>Controller<br>Remote Sensing   |                   |                 |  |                                  |                      |                                      |  |
| 6     |  |                   |                 |  |                                  |                      |                                      | FM, CSA, ATEX, IEC<br>(XP, DIP, IS, NI)<br>Nuclear       |
|       | <b>Style</b>                                   | <b>Pneumatics</b> | <b>Capacity</b> | <b>Display</b>                         | <b>Electronics</b>               | <b>Communication</b> | <b>Option</b>                        | <b>Hazardous<br/>Certification</b>                       |

- (1) The SVI-II AP may be up-graded in the field by the addition of a display and buttons.
- (2) Not available on SVI2-abcdefgh0
- (3) Retransmit without digital output is available only on SVI2-abcdefgh0
- (4) Regional certifications include: CU-TR, Nepsi, CCOE, Inmetro, Kosha, IA

### 4 FLAMEPROOF and DUST IGNITION PROOF REQUIREMENTS

#### 4.1 General

The 1/2 inch NPT fittings must enter the housing at least five full turns. The cover flange must be clean and free of corrosion products.

#### 4.2 Cable Glands

Certified cable glands are required based on the hazardous area the device is installed in. That is, the particular cable gland used must have the same certification as the tick-box checked off on the label (see Section 6).

#### 4.3 Bolting

**“X” Marking on label** - M8 X 1.25-6g cover screws must be supplied by Masoneilan. No substitution allowed. Minimum yield stress to be 296 N/mm<sup>2</sup> (43,000 psi)

#### 4.4 Carbon Disulphide Exclusion

Carbon Disulphide is excluded. (IEC 60079-1, Clause 15.4.3.2.2., carbon disulphide is excluded for enclosures with a volume greater than 100cm<sup>3</sup>)

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## 4.5 Electrostatic Discharge

**"X" Marking on label** - Potential Electrostatic Charge Hazard – For safe operation use only wet cloth when cleaning or wiping device, and only when local conditions around the device are free of potentially explosive atmospheres. Do not use dry cloth. Do not use solvent.

## 4.6 Dust

**"X" Marking on label** - Instruments installed in dusty hazardous areas, Zones 20, 21 and 22; must be cleaned regularly to prevent the buildup of dust layers on any surface. To avoid the risk from electrostatic discharge, you must follow the guidance as detailed in EN TR50404. For safe operation, use only wet cloth when cleaning or wiping the device. Cleaning must only be done when local conditions around the device are free of potentially explosive atmospheres. Do not use dry cloth or any solvents.

# 5 INTRINSICALLY SAFE REQUIREMENTS

## 5.1 Div 2

WARNING: EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

## 5.2 Category II 1 (Zone 0)

For operation in hazardous area category II 1, over-voltage protection of the electrical connections need to be installed according to EN 60079-14  
For operation in hazardous area category II 1 the ambient temperature needs to be lowered according to the requirements of EN 1127-1 (reduction factor of 80%). The max. allowed ambient temperature for category 1 inclusive the requirement of EN1127-1 is:

T6 : Ta = -40°C to +43°C

T5 : Ta = -40°C to +55°C

T4 : Ta = -40°C to +83°C

## 5.3 Category II 1 (Zone 0)

**"X" Marking on label** - Since the SVI2-abcdefghijklm ("SVI-II AP") contains greater than 10% aluminum; care must be taken during installation to avoid impacts or friction that could create an ignition source.

## 5.4 Category II 1 (Zone 2)

When installing in Category 3 (Zone 2) areas using 'ic' protection, 'ic' safety barriers are required.

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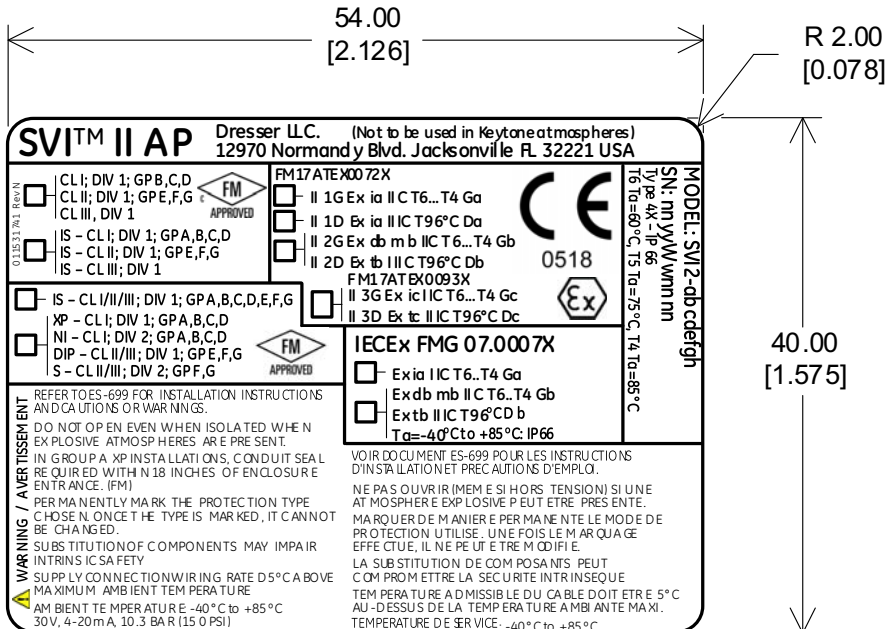
## 6 DESCRIPTION OF FLAMEPROOF AND INTRINSICALLY SAFE MARKINGS

Applicable Model Numbers:

SVI2-abcdefgh, where “a” thru “h” can take on the following values:

a = 2,3,4,5 ; b = 1,2 ; c = 1,2 ; d = 1,2,3,4 ; e = 3 ; f = 1 ; g = 1,2,3 ; h = 1,6

The label may not appear exactly as shown, but must contain the following information listed below. Other information is allowed on the label.



## 6.1 Manufacturers Name and Location

Dresser LLC.  
12970 Normandy Blvd.  
Jacksonville FL 32221 USA

## 6.2 Summary of Agency Markings (Factory Mutual)



{Certifying Agency}

IN GROUP A XP INSTALLATIONS CONDUIT SEAL REQUIRED WITHIN 18 INCHES OF ENCLOSURE

|   |                       |
|---|-----------------------|
| IS – CL I/II/III; DIV 1; GP A, B, C, D, E, F, G | {Intrinsically Safe}  |
| XP – CL I; DIV 1; GP A, B, C, D                 | {Explosionproof}      |
| NI – CL I; DIV 2; GP A, B, C, D                 | {Non-Incendive}       |
| DIP – CL II/III; DIV 1; GP E, F, G              | {Dust Ignition proof} |
| S – CL II/III; DIV 2; GP F, G                   | {Special Protection}  |



{Certifying Agency}

|                                 |                             |
|---------------------------------|-----------------------------|
| CL I; DIV 1; GP B, C, D         | {Explosionproof, gas}       |
| CL II; DIV 1; GP E, F, G        | {Explosionproof, dust}      |
| CL III, DIV 1                   | {Explosionproof, fiber}     |
| IS – CL I; DIV 1; GP A, B, C, D | {Intrinsically Safe, gas}   |
| IS – CL II; DIV 1; GP E, F, G   | {Intrinsically Safe, dust}  |
| IS – CL III; DIV 1              | {Intrinsically Safe, fiber} |

### (ATEX)



{Explosion Protected Mark}



{CE Conformity Marking, QAN  
Notified Body Number}

FM17ATEX0072X

{Certificate Number}

II 1G Ex ia IIC T6..T4 Ga

{Intrinsically Safe, gas}

II 1D Ex ia IIIC T96°C Da

{Intrinsically Safe, dust}

II 2G Ex db mb IIC T6..T4 Gb

{Flameproof/Encapsulation, gas}

II 2D Ex tb IIIC T96°C Db

{Protection by Enclosure, dust}

FM17ATEX0093X

{Certificate Number}

II 3G Ex ic IIC T6..T4 Gc

{Intrinsically Safe, gas}

II 3D Ex tc IIIC T96°C Dc

{Protection by Enclosure, dust}

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**(IEC)**

IECEX FMG 07.0007X  
Ex ia IIC T6..T4 Ga  
Ex db mb IIC T6..T4 Gb;  
Ex tb IIIC T96°C Db  
Ta=-40°C to +85°C  
IP66

{Certificate Number}  
{Intrinsically Safe}  
{Explosion proof, gas}  
{Protection by enclosure, dust}  
{Operating Temperature}  
{Ingress Protection}

**6.3 Operating Ranges**

- 6.3.1 Temp: -40°C to +85°C
- 6.3.2 Voltage: 30 Volts
- 6.3.3 Pressure: 150 psig (1.03MPa)
- 6.3.4 Current: 4-20mA

**6.4 Enclosure Type**

Type 4X-IP66

**6.5 Temperature Code**

T6 Ta=60°C, T5 Ta=75°C, T4 Ta=85°C

**6.6 Notes Related to Explosionproof Rating**

DO NOT OPEN EVEN WHEN ISOLATED WHEN EXPLOSIVE ATMOSPHERES ARE PRESENT

**6.7 Notes Related to Intrinsic Safety**

- 1) REFER TO ES-699 FOR ADDITIONAL CAUTIONS OR WARNINGS
- 2) Supply Connection Wiring Rated for 5°C above Max Ambient
- 3) PERMANENTLY MARK THE PROTECTION TYPE CHOSEN. ONCE THE TYPE HAS BEEN MARKED, IT CAN NOT BE CHANGED

**6.8 Model Code:**

SVI2-abcdefgh

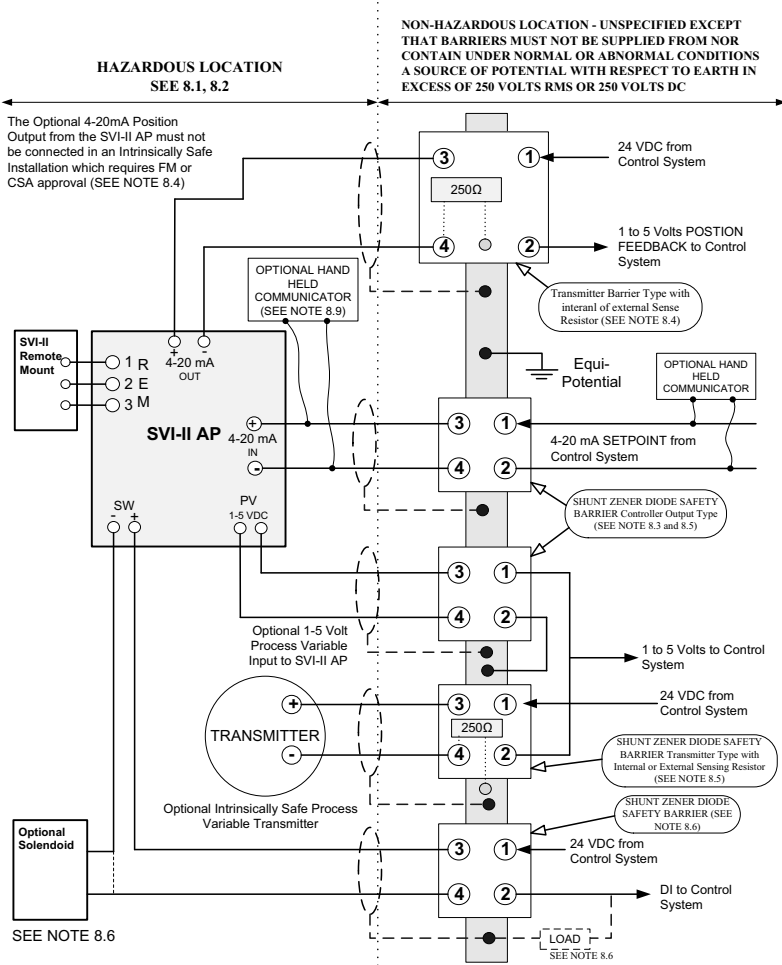
(see section 3 above for explanation)

**6.9 Serial Number:**

SN-nnyywwnnn

## 7 \*Intrinsically Safe Installation Wiring Requirements

Each intrinsically safe cable must include a grounded shield or be run in a separate metal conduit.



\*Applies to 'ia' and 'ic'

## 8 Notes for Intrinsically Safe Installation and Division 2

### 8.1 HAZARDOUS LOCATION

Refer to the device label for the description of the environment in which the device may be installed.

### 8.2 FIELD WIRING

Intrinsically Safe wiring must be made with grounded shielded cable or installed in grounded metal conduit. The electrical circuit in the hazardous area must be capable of withstanding an A.C. test voltage of 500 volts R.M.S. to earth or frame of the apparatus for 1 minute. Installation must be in accordance with Masoneilan guidelines. The installation including the barrier earthing requirements must comply with the installation requirements of the country of use.

Factory Mutual requirements (USA): ANSI/ISA RP12.6 (Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations) and the National Electrical Code, ANSI/NFPA 70. Division 2 installations must be installed per the National Electrical Code, ANSI/NFPA 70. See also, note 4.

CSA requirements (Canada): Canadian Electrical Code Part 1. Division 2 installations must be installed per the Canadian Electrical Code Division 2 Wiring Methods. See also note 4.

ATEX requirements (EU): Intrinsically safe installations must be installed per EN60079-10 and EN60079-14 as they apply to the specific category.

### 8.3 SVI-II AP (+) and (-) 4-20 mA IN Terminals

These terminals power the SVI-II AP. The barrier is the Controller Output Type, for example MTL 728.

Entity/NIFW Parameters:  $V_{max} = 30 \text{ Vdc}$ ;  $I_{max} = 125 \text{ mA}$ ;  $C_i = 6.5 \text{ nF}$ ;  $L_i = 1 \text{ uH}$ ;  $P_{max} = 900 \text{ mW}$

### 8.4 SVI-II AP (+) and (-) 4-20mA OUT Terminals

These terminals provide a 4 to 20 mA signal related to valve position. The 4 to 20 OUT terminals behave much like the terminals of a transmitter so a Transmitter type barrier with 250 Ohm series resistance (internal or external) is used for this connection. For example, MTL 788 or 788R.

Use of the 4-20 OUT feature is certified to ATEX intrinsically safe requirements and is approved for use in Zone 0. Use of the 4-20 mA OUT feature has not been certified by FM or CSA. The 4-20 mA OUT feature may not be used in an intrinsically safe installation when FM or CSA intrinsically safe approval is required. The 4-20 mA OUT feature is certified by FM and CSA for use in a DIV 2 area and in a DIV 1 area when the SVI2 is installed in accordance with flameproof requirements. Entity/NIFW Parameters:

$V_{max} = 30 \text{ Vdc}$ ;  $I_{max} = 125 \text{ mA}$ ;  $C_i = 8 \text{ nF}$ ;  $L_i = 1 \text{ uH}$  max = 900 mW.

### 8.5 SVI-II AP (+) and (-) PV 1-5VDC Terminals

The Process Transmitter and the SVI-II AP PV Input are both barrier protected. The transmitter 4 to 20 mA signal is converted to 1 to 5 Volts at the Transmitter barrier. The 1 to 5 volt signal is monitored by the DCS and used by the SVI-II AP for the embedded process controller. The sense resistor may be in the barrier or in the Digital Control System.

The Process Transmitter must be approved for use with the Process Transmitter Barrier. An example of a suitable barrier is MTL 788 or 788R. An example of the PV INPUT barrier is MTL 728.

Entity/NIFW Parameters of the SVI-II AP PV terminals:

$V_{max} = 30 \text{ Vdc}$ ;  $I_{max} = 125 \text{ mA}$ ;  $C_i = 1 \text{ nF}$ ;  $L_i = 0 \text{ uH}$ ;  
 $P_{max} = 900 \text{ mW}$

### 8.6 SVI-II AP (+) and (-) SW Terminals

There are two independent isolated solid state switch contact outputs on the SVI-II AP. They are labeled SW#1 and SW#2. The switches are polarity sensitive – that is, conventional current flows INTO the plus terminal. An examples of suitable barriers are MTL 707, MTL 787 and MTL 787S. Entity/NIFW parameters:

$V_{max} = 30 \text{ Vdc}$   $I_{max} = 125 \text{ mA}$   $C_i = 5 \text{ nF}$   $L_i = 10 \text{ uH}$   
 $P_{max} = 900 \text{ mW}$

### 8.7 SVI-II AP (1) and (2) and (3) REMOTE Terminals

The REMOTE terminals deliver reference Voltage to an optional remote position sensing potentiometer. Current, Voltage, and Power are limited by the SVI-II AP. The REMOTE terminals entity parameters are the parameters of the 4 to 20 mA INPUT barrier.

The SVI-II REMOTE MOUNT is approved for use as a remote position sensing device with the SVI-II AP.

SVI-II AP Entity/NIFW parameters:

$U_o/V_{oc} = 6.5 \text{ Volts}$   $I_o/I_{sc} = 9.6 \text{ mA}$   $C_a = 22 \text{ uF}$   $L_a = 300 \text{ mH}$   
Connect only to suitable potentiometer

SVI-II REMOTE MOUNT Entity parameters/Energy Limitation Parameters are:

$U_i/V_{max} = 6.5 \text{ Volts}$ ,  $I_i/I_{max} = 10.5 \text{ mA}$ ,  $C_i = 0.066 \text{ uF}$ ,  $L_i = 0$ ,  $P_i = 68 \text{ mW}$

### 8.8 Digital In Terminals

The Digital In terminal is suitable for direct connection to a passive switch.

Entity/NIFW Parameters:

$U_o/V_{oc} = 6.5 \text{ Volts}$   $I_o/I_{sc} = 72 \text{ mA}$   $C_a = 1.25 \text{ uF}$   $L_a = 2 \text{ mH}$

Connect only to passive (Un-powered) switch.

## 8.9 Entity Requirement

Cable capacitance and inductance plus the I.S. apparatus unprotected capacitance (Ci) and inductance (Li) must not exceed the allowed capacitance (Ca) and inductance (La) indicated on the associated apparatus. If the optional Hand Held Communicator is used on the Hazardous Area side of the barrier, then the capacity and inductance of the communicator must be added and the communicator must be agency approved for use in the hazardous area. Also, the current output of the Hand Held Communicator must be included in the current output of the associated equipment.

The barriers may be active or passive and from any certified manufacturer as long as the barriers comply with the listed entity parameters.

### 8.10 Use in dust atmosphere

Dust-tight conduit seal must be used when installed in dust hazard environments.

### 8.11 A device which has previously been installed without an approved IS barrier must NEVER be used subsequently in an intrinsically safe system. Installing the device without a barrier can permanently damage the safety related components in the device making the device unsuitable for use in an intrinsically safe system.

## 9 REPAIR

THE FLAMEPATHS OF THE EQUIPMENT ARE NOT INTENDED TO BE REPAIRED. CONSULT THE MANUFACTURER OF REPAIR OF A FLAMEPATH JOINT IS NECESSARY.

WARNING: EXPLOSION HAZARD – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR USE IN A HAZARDOUS LOCATION.

Only qualified service personnel are permitted to make repairs

On the SVI II AP, replacement of the pneumatic cover, electronics module, the pneumatic relay, the I/P, and the main cover (with or without display) are the only field repairs permitted. Replace ONLY with genuine Masoneilan parts. Only parts supplied by Masoneilan are permitted. This includes not only the major assemblies but also mounting screws and "O" rings. No substitutions with non-Masoneilan parts are permitted. Detailed replacement procedures are described in the SVI-II AP Quick Start Guide. The following summary assures the safe operation of the SVI-II AP. For more information, contact Masoneilan Dresser LLC. 50 Thomas Patten Dr. Randolph MA 02368 USA.

### 9.1 Main Cover

Make sure that:

The gasket is seated in the groove in the housing flange.

No wires or retaining cable can be trapped under the cover flange.

The flange area is not corroded and the surface is not scarred.

The four cover bolts are securely tightened.

Secure the four cover bolts by applying a torque of 55±5 in-lbs.

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## **9.2 Electronics Module**

Make sure that:

The 4 O-rings are seated on the base of the electronics assembly and are not damaged.

The four retaining screws are snug

## **9.3 I/P**

Make sure that:

The wire is not damaged when feeding it through the housing.

A single O-ring is in place on the wire-sleeve and is not damaged.

The four retaining screws are snug.

Inserting the wire sleeve through the housing does not require force.

## **9.4 Relay**

Make sure that:

The five O-rings are seated in the base of the relay and are not damaged

The three mounting screws are snug.

## **9.5 Pneumatic Cover**

Make sure that:

The gasket is seated in the groove.

The retaining screws are snug.



## 10 HISTORY:

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| REV | Description   | Date      |
|-----|---|-----------|
| A   | Initial Release   | 16 Aug 05 |
| B   | Revised model code, min XP temp was -20°C; FM/CSA no Analog Out | 27 SEP 05 |
| C   | PDev DR 0208  | 10/12/05  |
| D   | PDev DR 0225  | 11/28/05  |
| E   | ADR-002909  | 5/8/06    |
| F   | ADR-002948  | 9/6/06    |
| G   | ADR-002987  | 12 FEB 07 |
| H   | ADR-003099  | 28MAY08   |
| J   | ADR-003318  | 2FEB10    |
| K   | ADR-003330  | 25MAR10   |
| L   | ADR-003353  | 18MAY10   |
| M   | ADR-003412  | 17SEP10   |
| N   | ADR-003430  | 27OCT10   |
| P   | ADR-003505  | 7MAR11    |
| R   | ADR-003581  | 20SEP11   |
| T   | ADR-003626  | 24FEB12   |
| U   | ADR-003666  | 19APR12   |
| V   | ADR-003737  | 04SEP12   |
| W   | ADR-003833  | 19MAR13   |
| Y   | ADR-003853  | 03JUN13   |
| AA  | ADR-003984  | 22APR15   |
| AB  | ADR-004071  | 06OCT15   |
| AC  | PDR ECO-0026891   | 28OCT16   |
| AD  | PDR ECO-0029774   | 15NOV17   |

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# Spare Parts

## Circuit Board Kits (Standard and Offshore, Non-JIS)

|             |                             |                    |
|-------------|-----------------------------|--------------------|
| SVI II AP-2 | Position Tx. & Switches Off | 011531862-999-0000 |
| SVI II AP-2 | Position Tx. & Switches On  | 011531863-999-0000 |
| SVI II AP-3 | Position Tx. & Switches Off | 011531864-999-0000 |
| SVI II AP-3 | Position Tx. & Switches On  | 011531865-999-0000 |
| SVI II AP-2 | Double-Act.                 | 011531866-999-0000 |
| SVI II AP-2 | Double-Act                  | 011531867-999-0000 |



## Push Button/Display Cover Spare Part Kit

Standard Construction, SVI II AP-2 720003884-999-0000

Offshore Construction, SVI II AP-2 720003885-999-0000

| Item No. | Description                | Quantity |
|----------|----------------------------|----------|
| 1        | ASSY, COVER WINDOW         | 1        |
| 2        | Gasket, Cover, Electronics | 1        |
| 3        | Instructions               | 1        |



## Relay Spare Part Kit, Standard and Offshore Construction

720003880-999-0000

| Item No. | Description             | Quantity |
|----------|-------------------------|----------|
| 1        | RELAY, Single Acting    | 1        |
| 2        | M4 X 0.7 X 80 SHCS      | 3        |
| 3        | Pneumatics Cover        | 1        |
| 4        | Pneumatics Cover Gasket | 1        |
| 5        | M4 X 0.7 X 25 SHCS      | 6        |
| 6        | Instructions            | 1        |



**I/P Spare Part Kit, Single-Acting** (Standard and Offshore)

720003878-999-0000

| Item No. | Description             | Quantity |
|----------|-------------------------|----------|
| 1        | I/P Assembly            | 1        |
| 2        | O-Ring, I/P Stem        | 2        |
| 3        | M4 X 0.7 X 60 SHCS      | 4        |
| 4        | Pneumatics Cover        | 1        |
| 5        | Pneumatics Cover Gasket | 1        |
| 6        | M4 X 0.7 X 25 SHCS      | 6        |
| 7        | Instructions            | 1        |



**I/P Spare Part Kit, Double-Acting** (Standard and Offshore)

720003879-999-0000

| Item No. | Description             | Quantity |
|----------|-------------------------|----------|
| 1        | I/P Assembly            | 1        |
| 2        | O-Ring, I/P Stem        | 2        |
| 3        | M4 X 0.7 X 60 SHCS      | 4        |
| 4        | Pneumatics Cover        | 1        |
| 5        | Pneumatics Cover Gasket | 1        |
| 6        | M4 X 0.7 X 25 SHCS      | 6        |
| 7        | Instructions            | 1        |

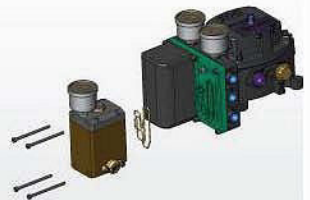


**Relay Spare Part Kit, Double-Acting,**

Standard Construction 720003881-999-0000

Offshore Construction 720003882-999-0000

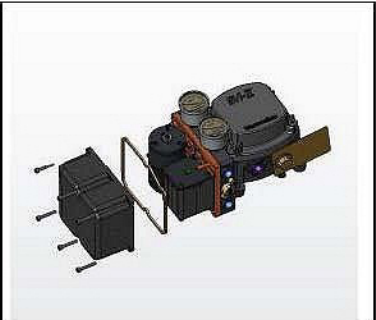
| Item No. | Description                      | Quantity |
|----------|----------------------------------|----------|
| 1        | Relay Double-Acting              | 1        |
| 2        | O-RING, CONTOURED, DA 12-1 RELAY | 1        |
| 3        | M4 X 0.7 X 60 SHCS               | 4        |
| 4        | Instructions                     | 1        |



### Pneumatic Cover Kit, **Single Acting**

720002450-999-0000

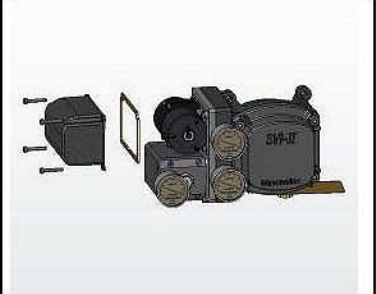
| Item No. | Description                         | Quantity |
|----------|-------------------------------------|----------|
| 1        | LOCTITE 222MS, 0.5mL LOW STRENGTH   | 1        |
| 2        | SCREW M4 X 0.7 X 25 SOCKET HEAD CAP | 6        |
| 3        | GASKET MANIFOLD S/A                 | 1        |
| 4        | PNEUMATICS COVER S/A SVI2AP         | 1        |
| 5        | MINIVALVE 064.001 SILICONE          | 1        |



### Pneumatic Cover Kit, **Double-Acting**

720002451-999-0000

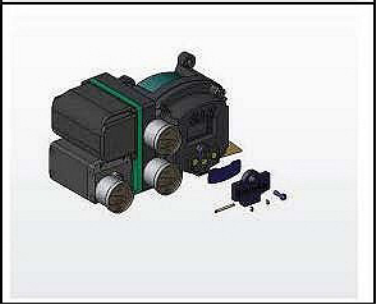
| Item No. | Description                         | Quantity |
|----------|-------------------------------------|----------|
| 1        | LOCTITE 222MS, 0.5mL LOW STRENGTH   | 1        |
| 2        | SCREW M4 X 0.7 X 25 SOCKET HEAD CAP | 4        |
| 3        | GASKET 1/P COVER D/A SVI2AP         | 1        |
| 4        | COVER PNEUMATICS DA                 | 1        |
| 5        | MINIVALVE 064.001 SILICONE          | 1        |



### Pushbutton Door, Kit

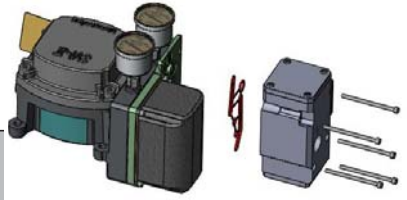
720002448-999-0000

| Item No. | Description                        | Quantity |
|----------|------------------------------------|----------|
| 1        | SCREW CAPTIVE PANEL                | 1        |
| 2        | PIVOT PIN PUSH BUTTON COVER SVI II | 1        |
| 3        | CIRCLIP SHAFT PUSH B               | 2        |
| 4        | COVER PUSHBUTTON SVI2AP            | 1        |
| 5        | GASKET COVER PUSHBUTTON SVI2       | 1        |



**Relay Spare Part Kit, Standard Construction,  
High Flow, Single Acting SVI II AP-2**

**720014541-999-0000**



| Item No. | Part Number        | Description   | Quantity |
|----------|--------------------|---|----------|
| 1        | 720017771-265-0000 | SCR HEX SHCS M4 X 0.7 X 60 MICROSpheres 593 PATCH           | 5        |
| 2        | 971886015-681-0000 | O-RING ID 9.19 [0.362] WIDTH 2.62 [0.103] REF NO 2-110      | 3        |
| 3        | 971886124-681-0000 | O-RING ID 29.87 [1.176] WIDTH 1.78 [0.0703] REF NO 2-025    | 1        |
| 4        | 720020224-681-0000 | O-RING ID 9.137.82 [1.498] WIDTH 1.78 [0.0703] REF NO 2-029 | 1        |
| 5        | 720014540-779-0000 | Instructions  | 1        |
| 6        | 720009638-999-0000 | RELAY SA HCR  | 1        |

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# B. Optional Switch Load Limits

## General Configuration Notes

The SVI II AP supports two identical contact outputs, SW #1 and SW #2 (Digital Output switches), that can be logically linked to status bits.

The switches are polarity sensitive and must be connected only to a DC circuit. The switch (+) terminal must be electrically positive with respect to the (-) terminal. If the (+) terminal is electrically negative with respect to the (-) terminal, then the switch will conduct, regardless of switch state.

**If the switch is connected directly across the power source, the current will be limited only by the capacity of the power source and the switch can be damaged.**

This section discusses the necessary precautions when configuring a system.

Without a load, when the switch is on (closed) the external voltage would be dropped across the switch. **This damages the switch** (Figure 34).

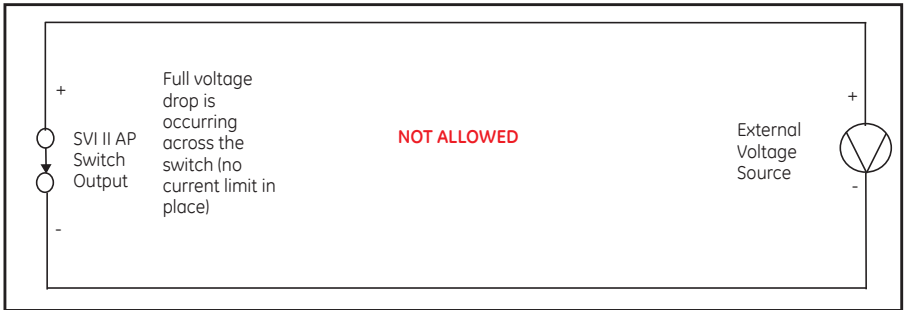


Figure 34 Switch Installation Drawing without Load: Configuration **Not Allowed**

|                     | Switch OFF                               | Switch ON                              |
|---------------------|--|--|
| $V_{\text{SWITCH}}$ | 30 VDC max.                              | $\leq 1$ V (Switch saturation voltage) |
| $I_{\text{SWITCH}}$ | $\leq 0.200$ mA (Switch leakage current) | 1 A max.                               |

**CAUTION**



*Incorrect polarity connection results in an effectively closed connection.*

**CAUTION**



*Consult with qualified personnel to ensure that electrical requirements for the switch are met.*

The maximum voltage that can be applied to the digital switch outputs is 30 VDC. This is an open circuit parameter (the digital switch is in the open state). Under open circuit conditions, the switch current will be less than 0.200 mA.

The switch maximum current rating is 1 A. When the switch is ON, the typical switch voltage is  $\leq 1V$ .

When the switch is on (closed) the external voltage must be dropped across the load (Figure 35).

**CAUTION**



*The load must be designed such that the current in the circuit is  $\leq 1 A$  at all times. Some 3rd party devices, such as incandescent lamps or solenoids, require surge and back EMF protection to prevent voltage spikes.*



## Inductive Load, Solenoid, Incandescent Lamp Configuration

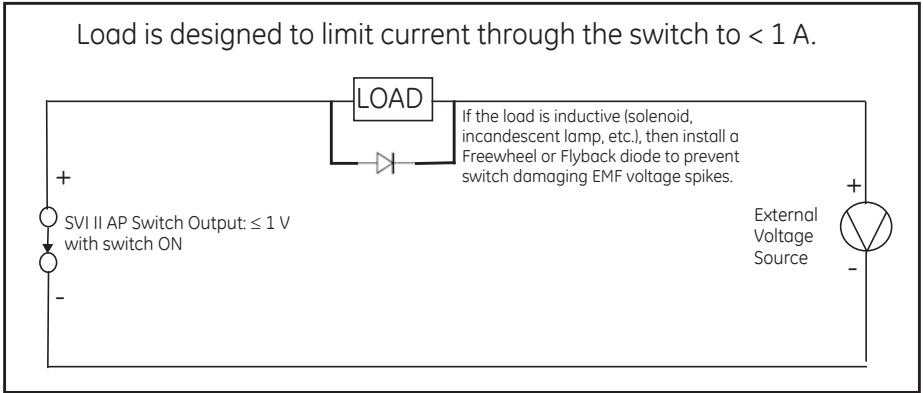


Figure 35 Simplified Switch Installation Drawing: Correct Configuration

## Distributed Control Systems Configurations

This section gives guidance for configuration in a DCS application. Figure 36 gives two generalized drawings that cover DCS applications to ensure switch safety.

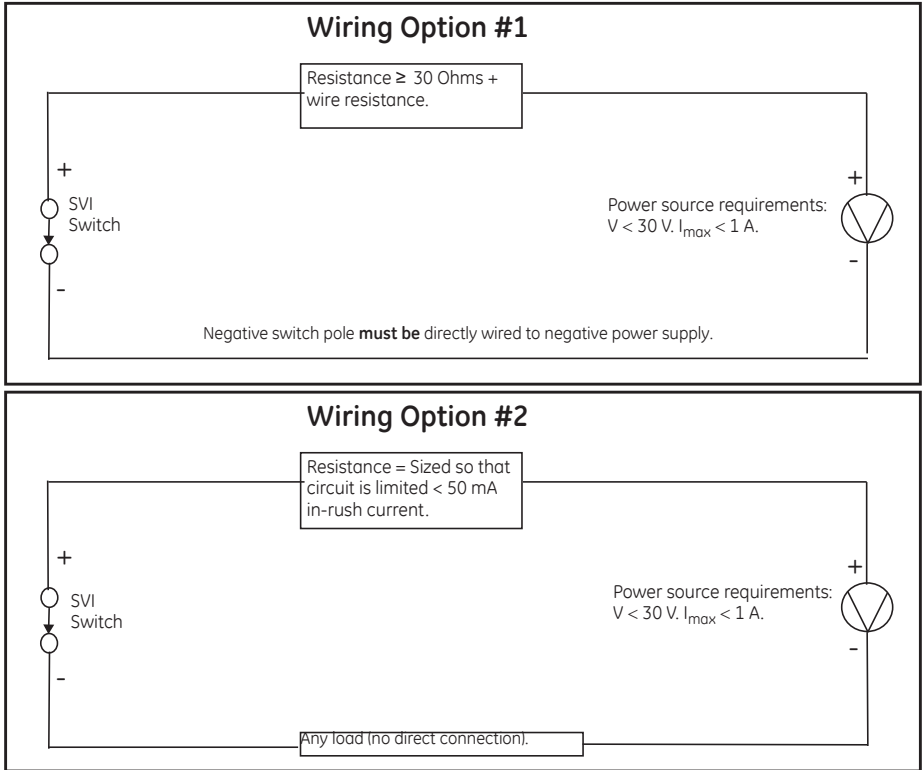


Figure 36 DCS Switches Wiring Options

### Configuration Considerations

- A typical value for 24 AWG cable about 0.025 Ohm/ft (see Wiring Option #1)).
- If IS barrier is a combination of fuse, resistor and Zener diode then the connection is shown in Option #2. The barrier must have adequate resistance to limit inrush current, as the fuse cannot limit inrush current (see Wiring Option #2).

# C. Burst Mode Operations

The Burst mode is when the HART<sup>®</sup> device continuously sends out data for a device not capable of being polled by a Master. Use this mode only for devices that are passive (i.e. not a HART<sup>®</sup> master), such as a HART<sup>®</sup> to Analog converter (SPA from Moore Industries, Tri-Loop by Rosemount). Turning on Burst mode in cases where it is not required affects the communication bandwidth. Burst mode is not available for SVI II AP in HART<sup>®</sup> 7.

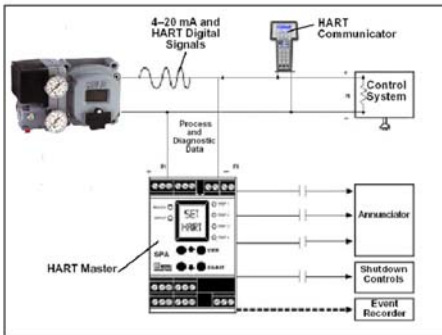
To see how the Burst mode is configured see the ValVue or SVI II AP DTM online help.

The Burst mode can send the following commands:

- Cmd1*: PV
- Cmd2*: %range/current
- Cmd3*: Dyn vars/current
- Cmd9*: Device vars w/status
- Cmd33*: Device variables

Choose the Burst command variables to be returned by referring to list of device variables in Table 16.

## Connecting the SPA with the AP



- must be set as a secondary master if the SPA is in polling mode to be able to connect

- PV = Position
- SV = Actuator Pressure
- TV = Supply Pressure
- QV = Pressure 2

The on/off contacts can be triggered from the status bits sent with every message. The module must be configured to let it know which bit will trigger the contact.

Figure 37 Burst Mode Configuration

Table 16 variables are returned from HART® command 9.

**Table 16: Device Variables**

| Variable Code | Variable Name   | Description  | Unit                          | Availability by Firmware Revision                                      |
|---------------|-----------------|--|-------------------------------|--|
| 0             | Position        | Valve position   | Percent                       | Available for both firm-ware 4.1.1 (in HART® 6) and 5.1.X (in HART® 7) |
| .1            | P1-P2           | Actuator pressure (if single acting)<br>Differential pressure (if double acting) | psi                           | "  |
| 2             | Supply Pressure | Supply pressure  | psi                           | "  |
| 3             | P2              | Pressure on port 2 (for double-acting)   | psi                           | "  |
| 4             | Setpoint        | Valve setpoint   | Percent                       | "  |
| 5             | Signal          | Analog Input current signal  | mA                            | "  |
| 6             | SW1             | Switch 1 (DO1)   | Percent (0% = off, 100% = on) | "  |
| 7             | SW2             | Switch 2 (DO2)   | Percent (0% = off, 100% = on) | "  |
| 8             | DI              | Digital Input  | Percent (0% = off, 100% = on) | "  |
| 9             | Temperature     | Board temperature  | Celsius                       | "  |
| 10            | Reserved        | Reserved   | Reserved                      | "  |
| 11            | Raw Position    | Raw valve position   | Counts                        | "  |

**Table 16: Device Variables (Continued)**

| Variable Code | Variable Name        | Description   | Unit    | Availability by Firmware Revision               |
|---------------|----------------------|---|---------|---|
| 12            | Strokes              | Total valve travel odometer<br>(An accumulated value of 100% travel = 1 stroke. The travel does not need to occur in one movement.)       | Counts  | "   |
| 13            | Cycles               | Number of direction reversals in valve travel   | Counts  | "   |
| 14            | Position Retransmit  | Position retransmit via Analog Output   | Counts  | "   |
| 15            | I/P Current          | Current to pressure transducer current  | mA      | Available for firmware 5.1.X (in HART® 7 only). |
| 16            | Friction             | Static valve friction   | psi     | "   |
| 17            | Position Error Band  | Allowed position deviation range from setpoint; position deviation range from setpoint greater than this value results in position error. | Percent | "   |
| 18            | Open Stop Adjustment | Upper limit for valve travel  | Percent | "   |
| 19            | Percent of Range     | Analog Input current signal in percentage   | Percent | "   |

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# D. Determining an SVI Positioner Compliance Voltage in a Control System

This discussion explains how to determine compliance voltage for an SVI positioner. It applies to the SVI II AP, SVI II ESD, SVI II APN and SVI1000.

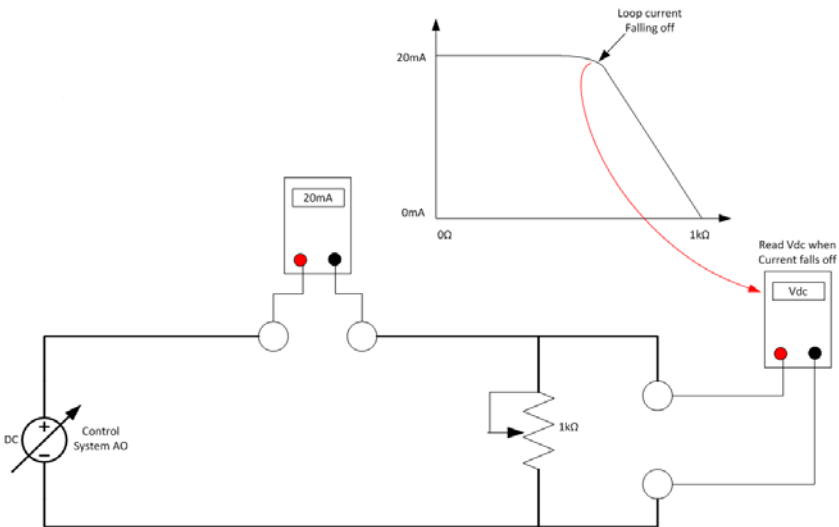
A definition of compliance voltage is: The voltage that must be available at the control system output in order to drive the control current through the SVI II AP and all the resistive devices in series with it.

Measuring the voltage across the SVI II AP terminals doesn't give the true available system compliance voltage as the positioner self-regulates voltage as current flows through it. Additionally, it also doesn't confirm what system voltage is available under load conditions. *Therefore, if compliance testing needs to be done, it is best done before installation.*

Use a 1K potentiometer as this is the maximum for most analog output cards and as at 20 mA this equals 20 VDC, which is a sufficient maximum.

## Compliance Test Set-Up

1. Configure a test set-up as in Figure 38.



**Figure 38 Compliance Voltage Test Set-Up**

2. Send 4 mA to the test set-up.
3. Increase the potentiometer value until the loop current reaches 3.95 mA.
4. Read the voltage across the potentiometer, which should be > 11 VDC. This is the available system voltage at the minimum output.

5. Send 20 mA to the test set-up.
6. Increase the potentiometer value until the loop current reaches 19.95 mA.
7. Read the voltage across the potentiometer, which should be > 9 VDC. This is the available system voltage at the maximum output.

Table 17 lists some compliance voltage readings at positioner terminals at several currents.

**Table 17: Expected Voltage Range at Positioner Terminals**

| <b>Current</b> | <b>Compliance Voltage Requirement at Positioner Terminals</b> | <b>Expected Voltage Measured at Positioner Terminals</b> |
|----------------|---|--|
| 4 mA           | 11 V  | 10 to 11 V   |
| 8 mA           | 10.5 V  | 9.5 to 10.5 V  |
| 12 mA          | 10 V  | 9 to 10 V  |
| 16 mA          | 9.5 V   | 8.5 to 9.5 V   |
| 20 mA          | 9 V   | 8 to 9 V   |



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