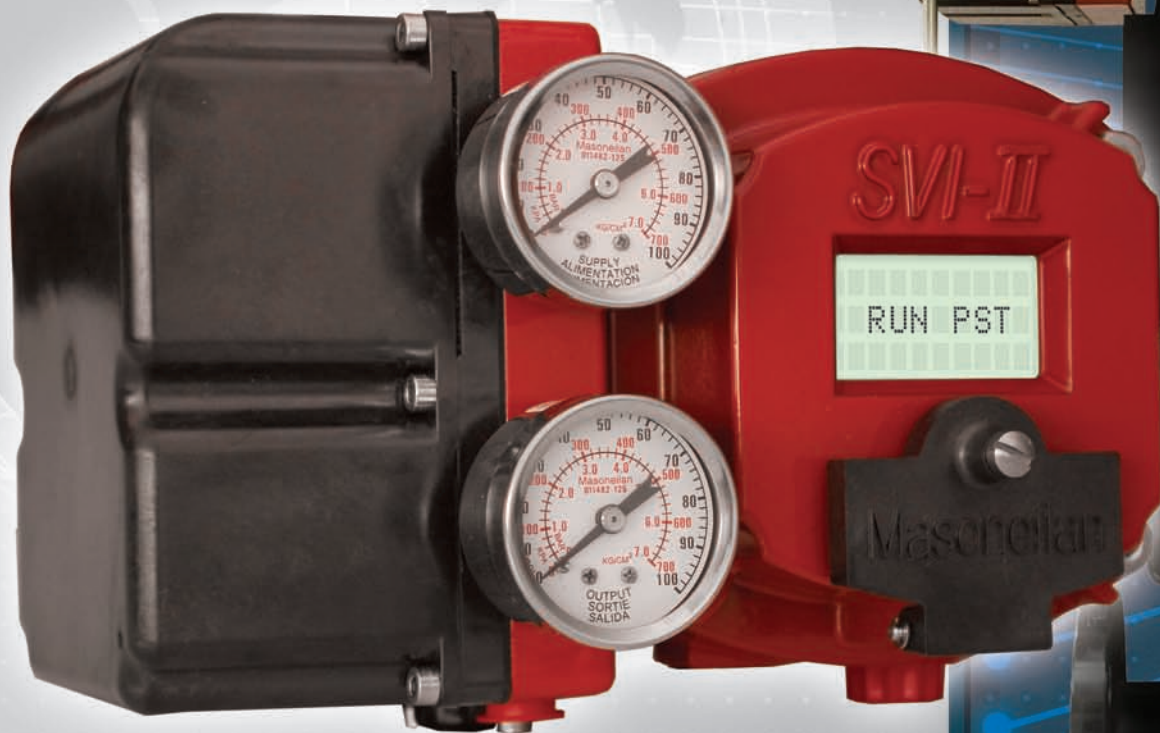# SVI® II ESD

SIL3 Partial Stroke Test Device


▶
▶
▶

"The only SIL3 Smart ESD device that is live during and after a shutdown."

▷
▷
▷
▷
▷
▷

What is the SVI® II ESD?

The SVI II ESD is the latest technology in emergency shutdown valve automation and in-service valve partial stroking. The SVI II ESD is a product extension of the successful and highly reliable SVI II AP valve positioner. The product, SIL3 compliant in accordance with IEC61508 per TUV, is suitable for use in safety instrumented functions.

Partial Stroke Test

ESD Signature Data

User Friendly Valve-Health Summary
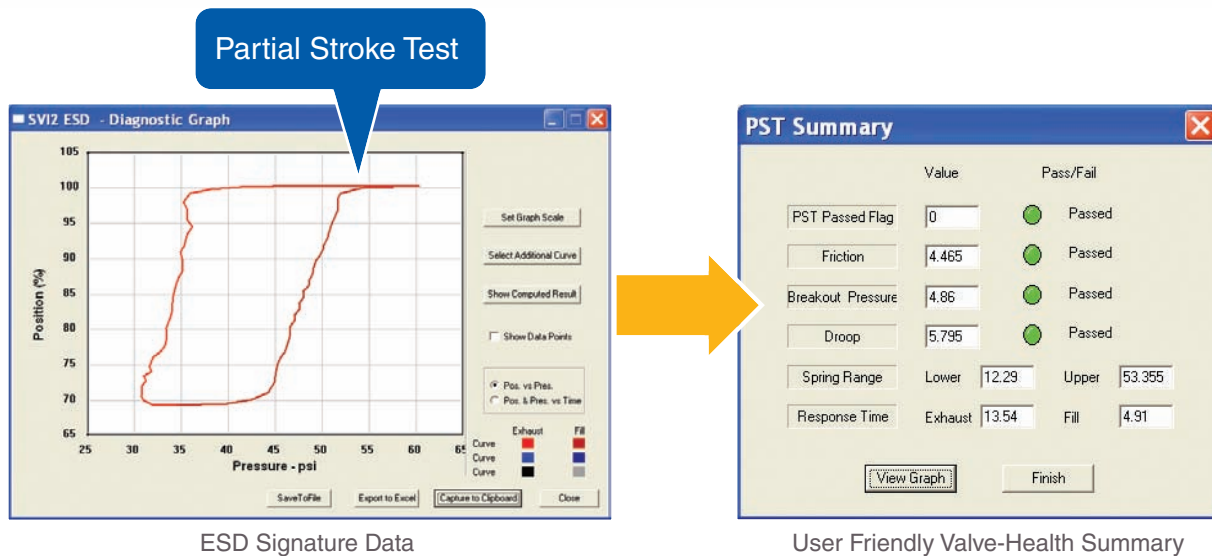
The designated function of the SVI II ESD can be implemented using a 4/20mA signal, 0-24Vdc or a combination of both. The single 4/20mA solution is ideal as it is SIL3 while at 4mA, allowing the device to execute the safety function while still being active. The benefits are substantial such as capturing shutdown events as a full-proof test, allowing continuous HART® communications during a trip, providing local panel annunciation using the built-in discrete outputs, etc.

Masoneilan's Unique Solution Provides:

ESD Function and PST[1] Function on a Single Wire Pair

- Reduced Installation Cost
- Execution of ESD Valve PST from Any Logic Solver

SIL3 While at 4mA

- Shutdown Event Captured
- Confirm ESD Operations

Automatic Analysis of ESD Valve Health

- Software Automatically Captures PST Signatures
- Integration of Diagnostics with Logic Solvers
- High Diagnostic Coverage Factor

What is SIL?

It stands for Safety Integrity Level, a standard governed by the International Electrical Committee (IEC). Its purpose is to:

- Establish risk reduction requirements
- Set probabilistic limits for hardware random failure
- Establish engineering procedures to prevent systematic design errors

Low Demand Mode Operations

The SVI II ESD has a SIL3 level

SIL	PFD	RRF
4	10^{-5} to 10^{-4}	100,000 to 10,000
3	10^{-4} to 10^{-3}	10,000 to 1,000
2	10^{-3} to 10^{-2}	1000 to 100
1	10^{-2} to 10^{-1}	100 to 10

The SVI® II ESD - Designed Exclusively for ON/OFF ESD Valve Applications

Logic Solver

Output Pressure

Air Supply

RUN PST

Vent

Hall Sensor / True Position Feedback

The SVI II ESD design is revolutionary in providing a designated safety function completely independent from the Partial Stroke Testing function. The architecture of the product is designed with separation of the two functions. The built-in microprocessor and the built-in shutdown stage are independent. This design architecture offers a sophisticated platform while being Type A (simple device) compliant.

The SVI II ESD is a smart ESD valve device with partial stroking functionality. It includes self-diagnostics and is designed to annunciate a fault via its built-in discrete output (DO) or using the HART® protocol. The SVI II ESD device can be used with single or double acting actuators. Four possible launching methods for partial valve stroke test (PVST) are standard. For safety instrumented systems usage it is assumed that annunciation is performed via discrete output or HART® interface. The safety input can either be a 4/20mA current loop (trip when current <= 5.6mA) or a 24Vdc discrete input (trip on 0Vdc). Power to the unit is supplied by the 4/20mA current loop, except in a 2-wire discrete input configuration, in which case the power is supplied by the 24V input.

• The SVI II ESD is unique in that it is SIL3 at 4mA and therefore allows for HART diagnostics whenever the safety function is engaged. In contrast, other devices on the market require the signal to be 0mA to provide a safety function with a SIL3 compliance. Such solutions do not provide benefits from an active microprocessor being active during a shutdown event.

• Furthermore, the SVI II ESD has a configurable latching feature whenever a trip occurs.

Possibilities and Beyond

Safety Function / PST / Diagnostic on One-Wire Pair

Integration shown with a typical Logic Solver and HART® Analog Output Card[1]
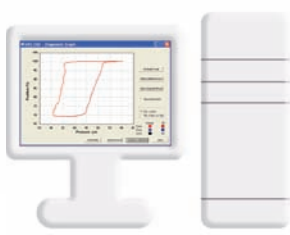
Example of a Logic Solver

ValVue® ESD Features:
• ESD Health Monitoring
• PST Auto-Archiving
• Full-Proof Testing
• Setup / Commission / Diagnose

ESD Signal
HART Diagnostics
Analog PST[2]

ESD Status
PST Status
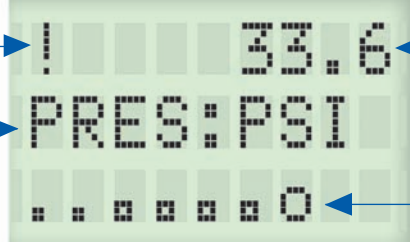Position Feedback
Local PST[2]

Local Field Panel

SIL3

SVIII ESD
DRESSER Masoneilan

SVI-II

!   33.6
PRES:PSI
...○○○○○○

24Vdc Power required for Local Lights

70+ ESD Warnings

!   33.6
PRES:PSI
..○○○○○○

Alternating Readings of Dynamic Variables

7-Language Display

English
French
German
Italian
Japanese
Portuguese
Spanish

Safety Demand Signal Strength

1. The integration is shown with Yokogawa's ProSafeRS™
   The SVI II ESD is also integrated with other logic solvers.

2. Analog PST is patent pending.

4

SVI® II ESD Models and Safety Demand Implementation
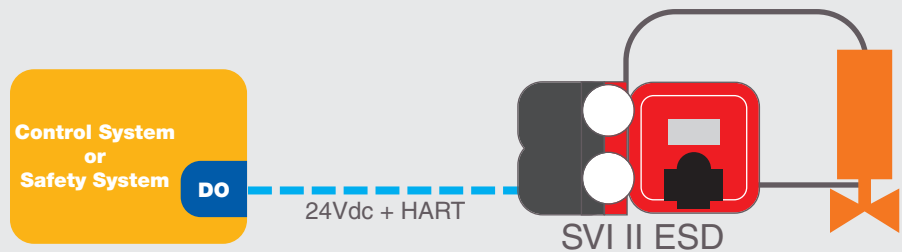
2-Wire Analog Safety Demand (ASD)

This ASD model utilizes a 4/20mA signal, where the safety function of de-energizing the pneumatic actuator is achieved with a value of 4mA. This cutting-edge solution provides greatest value as it eliminates wiring while providing the safety function, partial stroke testing and diagnostics on 1 pair of wires.

Twisted Pair

Control System or Safety System | AO

4/20mA[1] + HART®

SVI II ESD

2-wire solution – Safety function triggered by current sensing (i.e. 4mA = Safety Trip)

2-Wire Discrete Safety Demand (DSD)

This DSD model utilizes a 0-24Vdc signal where the safety function of de-energizing the pneumatic actuator is achieved with a value of 0Vdc. This solution is ideal when retrofitting a solenoid fitted on an actuator.

Control System or Safety System | DO

24Vdc + HART

SVI II ESD

Safety function triggered by discrete 0-24Vdc signal (i.e. 0Vdc = Safety Trip)

4-Wire Analog Setpoint with Discrete Safety Demand (A/DSD)

This A/DSD model utilizes the 4/20mA to position the valve (Open or Close) and a separate 0-24Vdc signal which provides the safety function of de-energizing the actuator. This solution combines On/Off control and the emergency shutdown function in one device.

Control System | AO

Setpoint 4/20mA[1] + HART

Safety System | DO

Safety Trip Signal Discrete 0-24Vdc
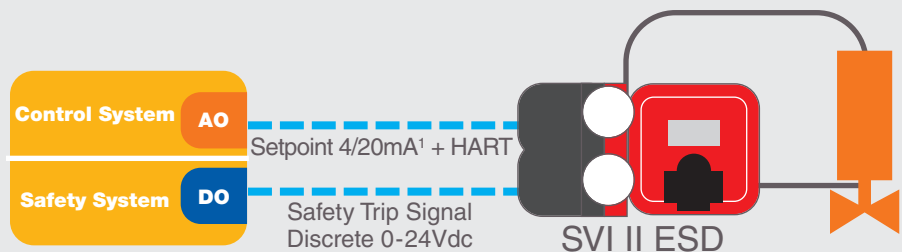
SVI II ESD

4-wire solution – Safety function triggered by discrete 0-24Vdc signal (i.e. 0Vdc = Safety Trip)

1. The SVI II ESD provides On/Off valve positioning. Throttling capability is available in HART mode only.

Valve Diagnostics

The SVI® II ESD is equipped with five pressure sensors, one travel sensor and a multitude of internal sensors. It is therefore capable of diagnosing the health of the valve as well as monitoring online its own various sub-components.

The SVI II ESD provides more than 70 possible alarm/warnings including:

- Valve Stuck Open / Closed
- Feedback Linkage Drift
- Pneumatic Train Integrity
- Air Supply Low / High
- Breakout Force Exceeded

The database-driven companion software, ValVue® ESD, continuously monitors the health of the ESD valves and provides a global view of the health of all ESD valves in a plant, facilitating the planning and resources to properly maintain ESD valves. The database driven ValVue ESD software provides for the SVI II ESD setup, device alarms and PST settings, partial stroke test execution and monitoring the installed base of ESD valves. The PST signatures are automatically stored in software database with the built-in PST Monitor.

Additionally, the software allows for Proof Testing signatures, stroking speed calculation signatures. The diagnostic analysis is graphically plotted over time to easily identify performance degradation.
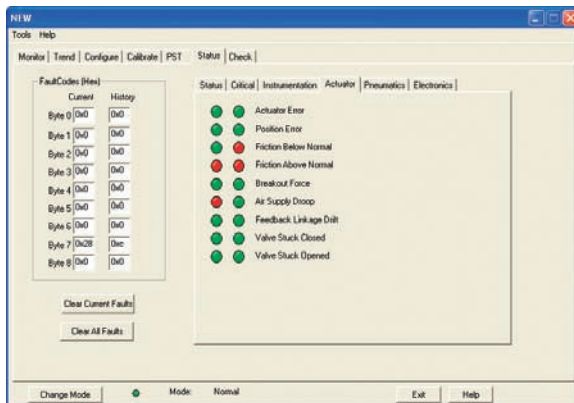
User friendly dashboard of ESD Valve condition.
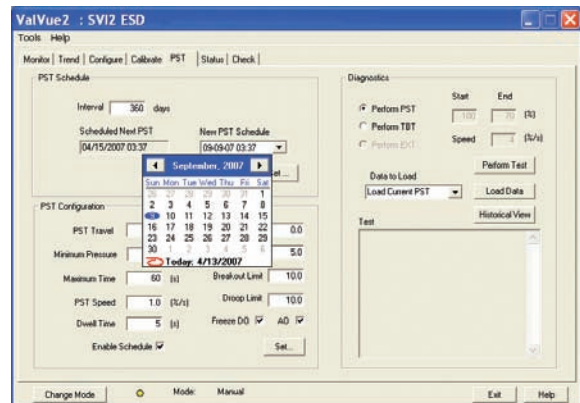
PST configuration page with the scheduler functionality.

How to launch a PST

In terms of PST execution, the SVI II ESD includes the broadest launching capabilities on the market. The following are standard: Local using the LCD display, or using a local panel wired in-line with SVI II ESD, remote using HART®, remote using the 4/20mA analog signal, and finally automated with the built-in scheduler. The SVI II ESD automatically captures the PST in its non-volatile memory and stores the analysis. Two signatures can be stored, allowing the PST Monitor functionality with ValVue ESD software to automatically synchronize its database with the field data. This software can be standalone or integrated.

PST Parameters

The SVI II ESD contains in its non-volatile memory, the settings to execute a PST. Therefore, the PST is reliably executed regardless of the launching method. The parameters include boundaries to prevent undesirable valve movements of the valve during a partial stroke test.

PST Launching Methods	
Analog Loop Current (Patent Pending)	
Local Button	
Built-In Scheduler	
Host System via HART (DD or ValVue ESD)	

Applications and Specifications

Inputs/ Outputs \ Model	Model ASD (Analog Safety Demand)	Model DSD (Discrete Safety Demand)	Model A/DSD (Analog Power with Discrete Safety Demand)
Analog In (4/20mA)	Safety Trip Trigger + HART® + Analog PST	–	Device Power + Analog PST + HART
Analog Out (4-20mA)	Position Transmitter	Position Transmitter	Position Transmitter
ESD In (0-24Vdc)	–	Safety Trip Trigger + HART	Safety Trip Trigger
DO1 (1A, 24Vdc)	ESD Status	ESD Status	ESD Status
DO2 (1A, 24Vdc)	Configurable Status	Configurable Status	Configurable Status
DI (switch input)	Unlatch the SVI II ESD[1]	Unlatch the SVI II ESD[1]	Unlatch the SVI II ESD[1]
PV (1-5Vdc)	Read Tight Shutoff Flow[2]	Read Tight Shutoff Flow	Read Tight Shutoff Flow
Local LCD / Buttons	ESD Status PST Configuration Local PST	ESD Status PST Configuration Local PST	ESD Status PST Configuration Local PST

The SVI® II ESD can be installed on linear or rotary actuators, single or double-acting type.
1. The latching function is software configurable.
2. This variable is sent via HART Command 3 as a Tertiary Variable.

IEC61508 Up to SIL3 per TUV
Type A Device (Simplex, Low Demand)
SIL3 Safety Shutdown Function
Safe Failure Fraction with PVST : 99.1%

Performance

Hysteresis + Deadband ±0.3%
Operating Temperature Range -40°F to +185°F (-40°C to +85°C)

Input Power and Signal

Signal 4/20mA with HART® Communication Protocol
Power Supply Taken from 4/20mA Control Signal (ASD & A/DSD)
Minimum Terminal Voltage 9.5 Volts DC @ 20mA
Current Signal < 5.6mA = de-energized output,
> 15mA = energized output
ESD in Voltage: 0 (trip), 24Vdc energized output
ESD IN current draw < 9.5mA

Pneumatics

Regulated and Filtered Air required
Single Acting: Supply Pressure 30-120 psi max.
Double-Acting (pending): Supply Pressure 30-120 psi max.
Air supply regulated 10 psi above actuator spring range.
Air Delivery 11.55 scfm (325 nl/m) at 30 psi (2.1 bar) supply 27 scfm (765 nl/m) at 90 psi (3.1 bar) supply
Air Consumption 0.2 scfm (5.7 nl/m) at 30 psi (2.1 bar) supply
C_V=0.72 (Venting) C_V=0.59 (Filling)

Control Valve Mounting System

Non-contact Hall Effect Position Sensor (18º to 140º rotation)
Rotary NAMUR Mounting Kit per VDI/VDE 3845
Reciprocating Kits Available

System Connectivity

Device Description (DD) HART Registered
ValVue ESD Application
ValVue ESD PRM Plug-In Application (Yokogawa Systems)

ESD and Diagnostic Capabilities

IEC61508 compliant up to SIL3 certified by TUV and EXIDA
Partial Stroke Testing Initiation (HART, Analog, Local Pushbutton, Built-In Scheduler)
Digital Output for PST results and SVI II ESD Health
Non-volatile memory for two (2) PST signature
Non-volatile memory for ESD Shutdown Event Signature
Safety Trip Trigger: 4/20mA or 24Vdc input
Local PST scheduler with built-in calendar
Full Stroke Valve Signature & Positioner Diagnostics
Built-In Explosion Proof External LCD with Pushbuttons
Language Support:
English Japanese
French Portuguese
German Spanish
Italian

Hazardous Area Certifications

Enclosure Rating NEMA 4X / IP 66
Low Copper Aluminum or 316L Housing
Red Electrical Cover and Housing for clear identification as a safety related device

ATEX Approvals:
Intrinsic Safety
Gas: II 1G EEx ia IIC T6 / T5 / T4
Dust: II 1D T96°C
Flameproof
Gas: II 2G EEx dm IIB + H$_2$ T6 / T5 / T4
Dust: II 2D T96°C
Energy Limited
Gas: II 3G EEx nL IIC T6 / T5
Dust: II 3D T96°C
Approval Standards: EN50014: 1997, EN50281-1-1, EN60079-26,
EN50020, EN60069-15, EN1127-1, EN50018, EN50028

CSA International Certifications:
Explosion Proof CL I; Div. 1; GR B, C, D T6 / T5 / T4
Dust Ignition Proof CL II/III; Div. 1; GR E, F, G T6 / T5 / T4
Certified CL II; Div. 2; GR F, G
Certified CL III; Div. 2
Certified CL I; Div. 2; GR , B, C, D
Intrinsically Safe CL I, II, III; Div. 1; GR A, B, C, D, E, F, G T6 / T5 / T4
Approval Standard: CAN/CSA-C22.2 # 94-M91,142-M1987, 157-92, 213-M1987,60529:05

FM Approvals:
Explosion Proof CL I; Div. 1; GR B, C, D   T6 / T5 / T4
Dust Ignition Proof CL II/III; Div. 1; GR E, F, G T6 / T5 / T4
Suitable for CL II, III; Div. 2; GR F, G
Non-incendive CL I; Div. 2; GR A, B, C, D
Intrinsically Safe CL I, II, III; Div. 1; GR A, B, C, D, E, F, G

Approval Standards: Class 3600, 3615, 3810, ANSI/NEMA 250, IEC 60079-18 IEC60529 +A1

Temperature Class:
T6 = 60°C (160°F), T5 = 75 °C (167°F), T4 = 85°C (185°F)

Immunity Performance:
EN61000-4-2, -3, -4, -5, -6, -8
EMC Per IEC61514-2, 61326,61326-3

Radiation Performance:
CISPR 22

HART® FIELD COMMUNICATIONS PROTOCOL

How to Specify the SVI® II ESD

Key Features:
- SIL3 While at 4mA
- Shutdown Event Captured
- Automatic Analysis of ESD Valve Health

b: Pneumatic
1 Single-Acting
2 Double-Acting

c: Capacity
1 Standard Flow

d: Display / Housing
2 XP Buttons / Standard (Al)
4 XP Buttons / Offshore (316L)

e: Hardware
3 SIL3 Shutdown

f: ESD Type
1 ASD w/HART®
2 DSD w/HART
3 A/DSD w/HART

g: Option
2 Position Transmitter + Switches

h: Hazardous Certifications
5 FM, CSA, ATEX, TUV

Base Model Number

SVI II ESD - 6

| 1 2 | 1 | 2 4 | 3 | 1 2 3 | 2 | 5 |

SVI II ESD - 6 b c d e f g h

Customer must select one item from each category
To order please contact your Sales Representative at www.masoneilan.com

Dresser Masoneilan
85 Bodwell Street
Avon, MA 02322-1190
Tele: 508-586-4600 / Fax: 508-941-5497
Email: sales@masoneilan.com

DRESSER **Masoneilan**

www.dresser.com