DRESSER Masoneilan

Putting You In Control

SVI II ESD

SIL3 Partial Stroke Test Device

HART FIELD COMMUNICATIONS PROTOCOL

FDT

RELIABLE DIGITAL TECHNOLOGY ENGINEERED FOR SAFETY APPLICATIONS

EXPERIENCE,
KNOWLEDGE,
TECHNOLOGY.

The Only SIL3 Smart ESD Device That is Live During and After a Shutdown

What is a SMART Shutdown Device?

The SVI II ESD is the latest technology in emergency shutdown valve automation and in-service valve partial stroking. The SVI II ESD is designed using the proven electronic and pneumatic technology from the SVI II AP valve positioner. The product, SIL3 compliant in accordance with IEC61508 per TUV, is suitable for use in safety instrumented functions.

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 key benefits are 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 Function on a Single Wire Pair

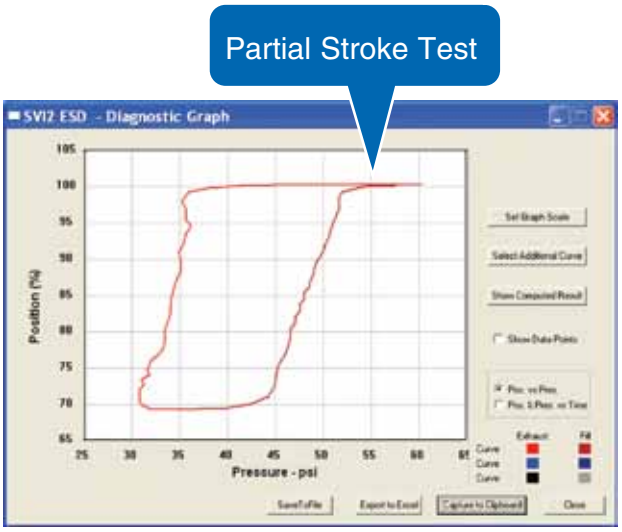
- Reduced Installation Cost
- Execution of ESD Valve PST (partial stroke test) from Any Logic Solver

SIL3 While at 4mA

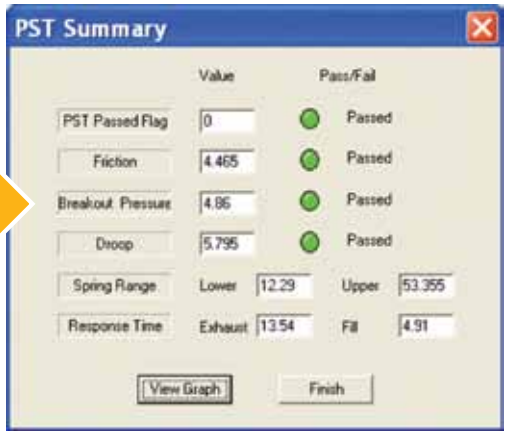
- Shutdown Event Captured
- Confirm ESD Operations

Automatic Analysis of ESD Valve

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



ESD Partial Signature Data



Automated Signature Analysis With Pass/Fail

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

Safe Failure Fraction and SIL - Type A

Solenoid Solutions Two (2) or more For SIL3 With a Low SFF

One (1) SVI II ESD Provides High SIL and High SFF

Safe Failure Fraction (SFF)	Hardware Fault Tolerance (HFT)		
	0	1	2
< 60%	SIL 1	SIL 2	SIL 3
60% < 90%	SIL 2	SIL 3	SIL 4
90% < 99%	SIL 3	SIL 4	SIL 4
> 99%	SIL 3	SIL 4	SIL 4

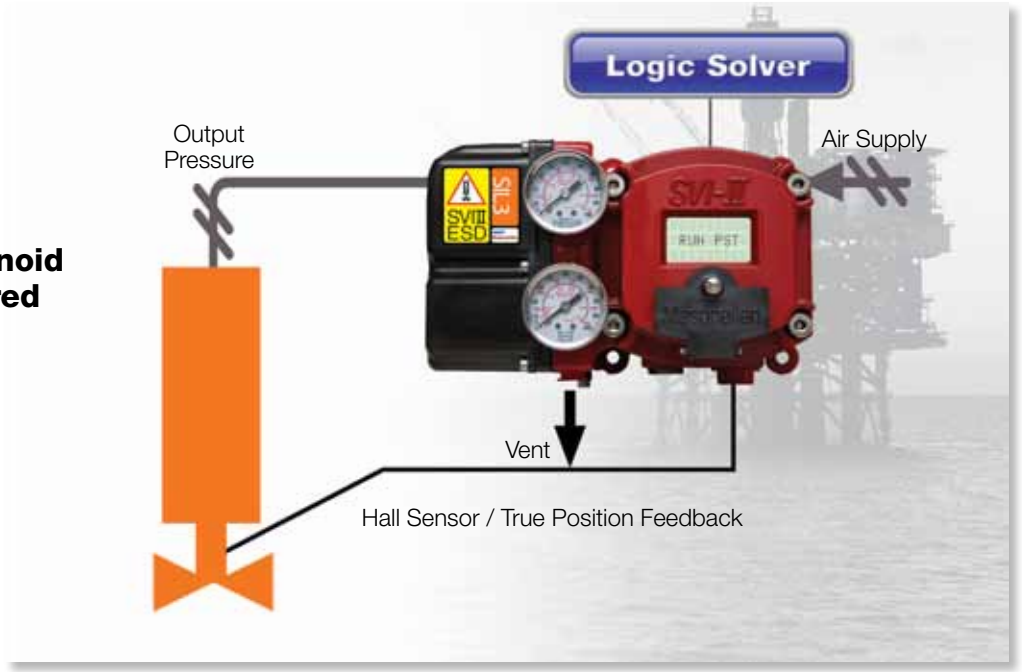
The SVI II ESD - Designed Exclusively for ON/OFF ESD Valve Applications

The SVI II ESD design is revolutionary in providing a designated safety function completely independent from the Partial Stroke Testing function. The product is designed with the two functions independent of one another. The embedded microprocessor and the safety shutdown circuitry are separate. 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 digital output (DO) as well as using the HART® protocol. Four (4) possible launching methods for partial stroke test (PST) are built-in. For safety instrumented systems usage it is assumed that annunciation is performed via the built-in digital output or using the HART® protocol. The safety input can either be a 4/20mA current loop (trip when current <= 5.6mA) or a 24Vdc discrete input (trip on < 3Vdc). 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.

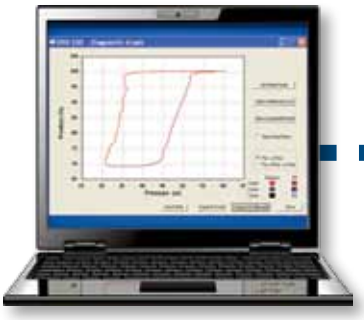
- The SVI II ESD is unique in that it is SIL3 at 4mA and therefore allows the built-in microcontroller to capture HART diagnostics whenever the safety function is engaged. In contrast, other devices on the market require the signal to be 0mA to provide a safety function with a SIL3 compliance. Such solutions do not allow the microprocessor to be available and active during a shutdown event.
- Furthermore, the SVI II ESD has a configurable latching feature whenever a trip occurs.

No Solenoid Required



Safety Function / PST / Diagnostic on One-Wire Pair

Integration shown wth a typical Logic Solver and HART® Analog Output Card.



Logic Solver

ValVue® ESD Features

- ESD Health Monitoring
- PST Auto-Archiving
- Full-Proof Testing
- Setup / Commission / Diagnose

ESD Signal
HART Diagnostics
Analog PST[1]

ESD Status
PST Status
Position Feedback
Local PST[1]

Local Field Panel

24Vdc Power required for Local Lights

70+ ESD Warnings

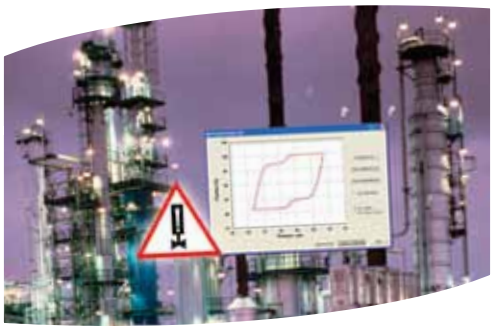
7-Language Display

English, French, German, Italian, Japanese, Portuguese, Spanish

Alternating Readings of Dynamic Variables

Safety Demand Signal Strength

1. Analog PST is patent pending.

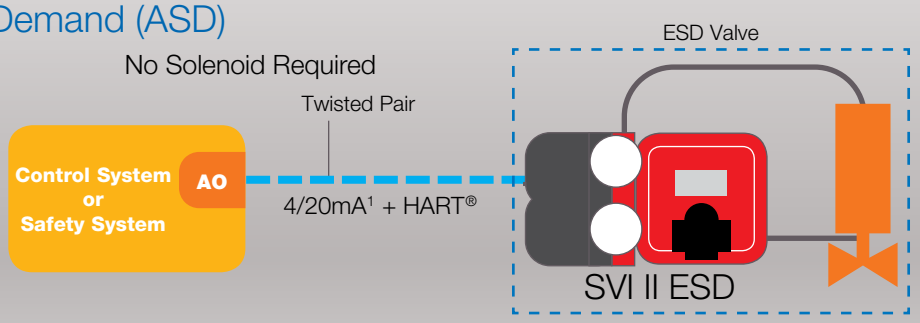


SVI II ESD Models & Safety Demand Implementaton

No Solenoid Required

2-Wire Analog Safety Demand (ASD)

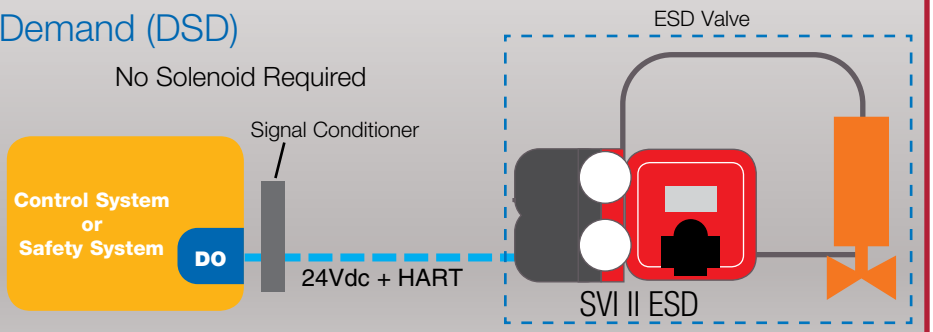
This ASD model utilizes a 4/20mA signal, where the safety function of de-energizing the pneumatic actuator is achieved with a value of < 5.6mA. This cutting-edge solution provides greatest value as it simplifies to one single wire pair for the safety function, partial stroke testing and diagnostics.



2-wire solution – Safety function triggered by current sensing (i.e. <5.6mA = Safety Trip)

2-Wire Discrete Safety Demand (DSD)

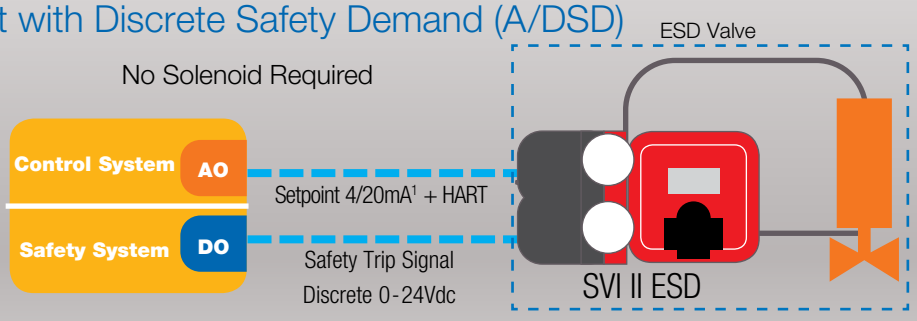
This DSD model utilizes a 0-24Vdc signal where the safety function of de-energizing the pneumatic actuator is achieved with a value of <3Vdc. This solution is ideal when retrofitting an actuator fitted with a 24Vdc solenoid.



Safety function triggered by discrete 0-24Vdc signal (i.e. <3Vdc = 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), allow for HART communications and start a PST using specific analog signal while a separate 0-24Vdc signal provides the safety function of de-energizing the actuator.



4-wire solution – Safety function triggered by discrete 0-24Vdc signal (i.e. <3Vdc = Safety Trip)

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

ESD Valve Diagnostics

The SVI® II ESD is equipped with five pressure sensors, one non-contact travel sensor, one temperature sensor and one loop current sensor. It is therefore capable of diagnosing the health of the valve as well as real-time monitoring of its 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, PST settings, partial stroke test execution and monitoring the installed base of ESD valves. The PST signatures are automatically stored in the software database with the built-in PST Monitor. Additionally, the software allows for Proof Testing signatures and 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® capable interfaces, remote using a specific 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 (EDDL, DTM or ValVue ESD)	

Applications & Specifications

Model / Inputs/ Outputs	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		
ESD In (0-24Vdc)	–	Safety Trip Trigger + HART	Safety Trip Trigger
Switch1 (1A, 24Vdc)	ESD Status		
Switch2 (1A, 24Vdc)	Configurable Status[3]		
DI (switch input)	Unlatch the SVI II ESD[1]		
PV (1-5Vdc)	Read Tight Shutoff Flow[2]		
Local LCD / Buttons	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
3. The switch can be configured as:
   - Normally Open (NO) or Normally Closed (NC)

   The switch can be set to change with one of the following events:
   - PST in progress
   - ESD triggered
   - ESD fault annunciation
   - Position low limit
   - Position high limit
   - Failsafe
   - Normal mode
   - Manual or Out-Of-Service mode

IEC61508 Certified 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

ASD & A/DSD Signal 4/20mA with HART® Communication Protocol
Power Supply Taken From 4/20mA Control Signal (ASD, A/DSD)
Power Supply Taken From 24Vdc signal (DSD)
Minimum Terminal Voltage 9.5 Volts DC @ 20mA
Safety function: < 5.6mA (model ASD)
< 3Vdc (A/DSD or DSD)
Energized output: > 15mA (ASD,A/DSD), > 15Vdc (DSD)
ESD IN current draw < 9.5mA (DSD, A/DSD)
HART Over 4/20mA signal (ASD,A/DSD)
HART Over 24Vdc signal (DSD, requires signal conditioner)

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 (6.2 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 Integration

Device Description (EDDL or DTM)
ValVue ESD Application
ValVue ESD PRM Plug-In Application (Yokogawa Systems)
"AMS (Emerson)"
800xA & Asset Optimizer (ABB Systems)

ESD and Diagnostic Capabilities

IEC61508 compliant up to SIL3 certified by TUV and EXIDA
Partial Stroke Testing Initiation (HART, Analog, Local Push-button, 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

Approvals:

IECEx
Intrinsically safe:
Ex ia IIC T6
IECEx FMG-07.007x

Explosion Proof:

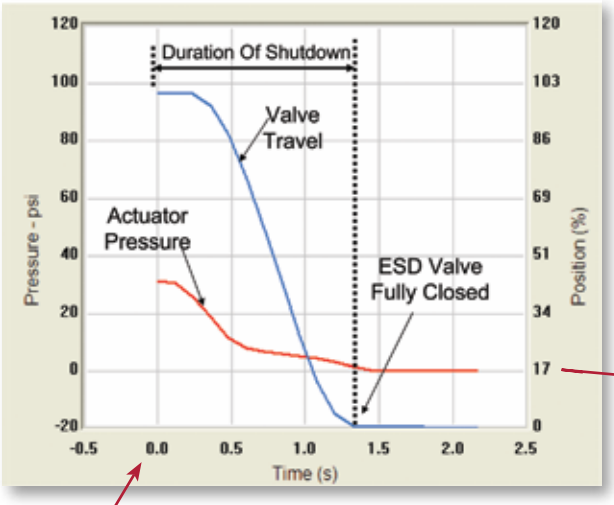
Ex d mb IIB+H2 Gb T5;
Ex tD A21 IP66 T96ºC;
Ta=-40ºC to +85ºC: IP66
IECEx FMG-10.0002x

Emergency Shutdown Signature

The SVI® II ESD is the only SIL3 rated product on the market capable of capturing a shutdown event during a trip using a single wire pair.

This feature is priceless in that it captures the shutdown event in non-volatile memory allowing for investigation of the safety event as well as providing for a complete proof test. Such proof test is therefore automatically documented and the next proof test can be rescheduled according to the required probability of failure on demand (PFD).

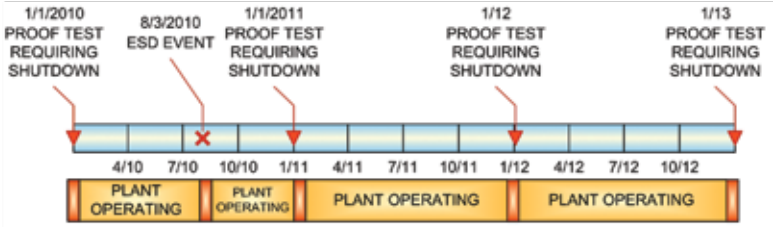
SVI II ESD Shutdown Signature



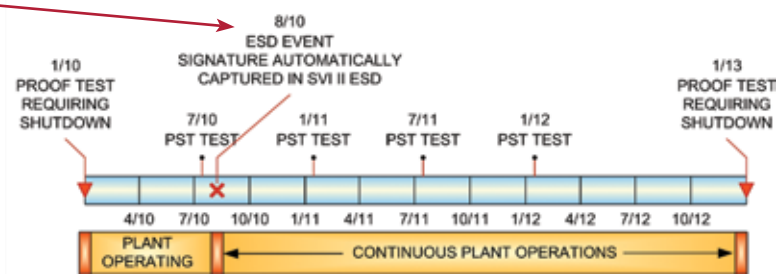
T = 0 sec: Safety Demand Initiated To Close Valve

Event Timeline With and Without PST and With Shutdown Event Capture

Example 1 - Without PST Proof Test Every Year



Example 2 - With PST & Proof Test Every 2 Years



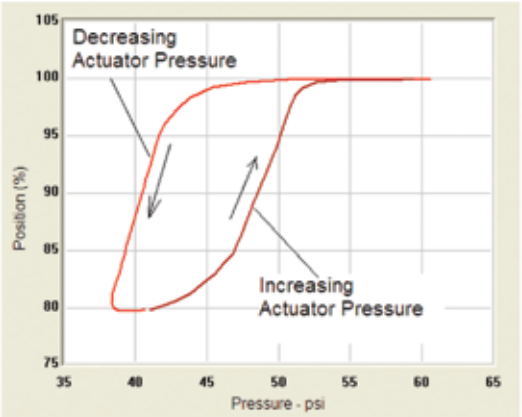
	EXAMPLE 1	EXAMPLE 2	EXPLANATION
# Of Shutdowns for Proof Testing	5	3	The mandatory testing of ESD valves requires process downtime
Cost Per Shutdown	$500,000	$500,000	Average cost of shutdown including poss or production
Possible Shutdown Costs	**$2,500,000**	**$1,500,000**	

Partial Stroke Test Overview

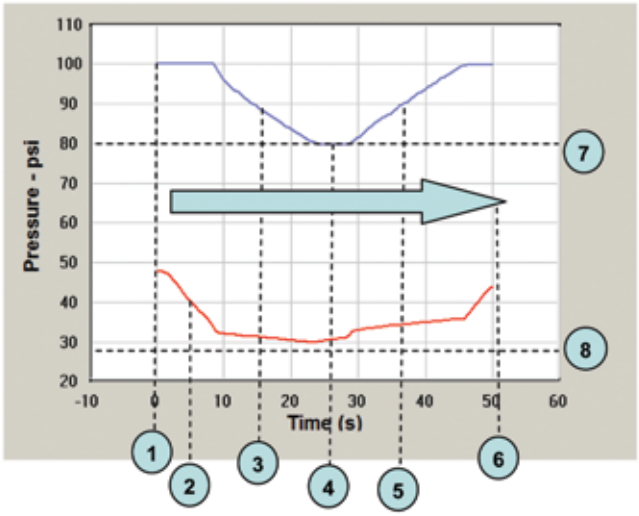
PST Implementation Benefits With SVI® II ESD Technology

Integrated	The test and the results are integrated with the rest of the safety system
Automated	Per IEC61511 requirements, PST execution can be fully automated, preventing human error. Test results are stored in memory of SVI II ESD and automatically communicated to the user, providing actionable information about potential valve performance problems
Versatile & Accessible	PSTs from SVI II ESD can be safely executed locally or remotely, and the results accessed, from the logic solver
User Friendly	Tests are easy to execute and the results are easy to understand. The user does not need to be an expert in ESD valves or digital shutdown devices to complete the test and interpret the results

Partial Stroke Test Signature and Plotting Travel vs. Actuator Pressure



PST signature shown over 20% travel.



SMART Partial Stroke Testing Allows Reliable Testing of Emergency Shutdown Valves and Provides Greater Diagnostic Coverage

PHASES OF A SMART PST

1. The PST is initiated.
2. The actuator pressure ramps down slowly and the test aborts if the pressure reaches the configured low pressure setting (point 8 in the graph above).
3. ESD valve moves at the set PST ramp until it reaches the PST target (point 7 in the graph above).
4. ESD valve pauses to allow stabilization before moving back to the original position.
5. Controlled ramp back to starting position.
6. Test is completed and results are analyzed and transmitted via a digital or discrete signal.

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 (AI)
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: Inputs / Outputs
2 Position Transmitter + Switches

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

Base Model Number

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

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About Dresser, Inc.

Dresser Inc. is a global leader in providing highly-engineered infrastructure products for the global energy industry. Leading brand names within the Dresser portfolio include Dresser Wayne® retail fueling systems, Waukesha® natural gas-fired engines, Masoneilan® control valves, Consolidated® pressure relief valves, and ROOTS® blowers and rotary gas meters. The company has manufacturing and customer service facilities strategically located worldwide and a sales presence in more than 150 countries. www.dresser.com.

About Dresser Masoneilan

Dresser Masoneilan, headquartered in Houston, Texas, has been the leading global partner in process control valves and solutions for more than 100 years. A business segment of Dresser, Inc., the company delivers customized products, services and diagnostic solutions for oil and gas, process and power generation applications. www.dresser.com

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