



# **SIL Solver® Enterprise**

## **V1.2.5**

# **User Instructions**

SIS-TECH Solutions, LP

**We're Proven-in-Use®**

# Welcome

- Welcome to SIL Solver® Enterprise.
- This presentation is sectioned to make it easier to navigate. You can collapse the slides to the sections using the tool bar.
- **If you need assistance or would like to provide us with feedback, contact:**
  - Eloise Roche
    - [eroche@sis-tech.com](mailto:eroche@sis-tech.com) 713-909-2123
  - Angela Summers
    - [asummers@sis-tech.com](mailto:asummers@sis-tech.com) 713-909-2114

# SIL Solver®

## We are Proven in Use

- More than 100 companies have chosen SIL Solver® for their functional safety verification since 2002

## We Build upon Field Experience

- The built-in SIL Solver® database uses field failure data as a basis, reflecting real-world device performance

## We are Internationally Recognized

- SIL Solver® uses internationally recognized methods for PFD and STR calculation
- SIL Solver® is used by companies worldwide

# User Instructions

## Table of Contents

1. Accessing the Application
2. Creating a new project and functions
3. Editing, Copying or deleting a project
4. Generating reports
5. Importing/Exporting projects and functions
6. Datasheets
7. Troubleshooting

# 1. ACCESSING THE APPLICATION

- Licensing
- Assigning username and password for new user
- Logging in

# Licensing

- SIL Solver® is licensed software
  - Each enterprise license includes one administrator account and two user licenses
  - Additional user licenses can be purchased
- To request a quote for a new license, contact SIS-TECH at:  
<http://sis-tech.com/applications/sil-solver>

# Assigning username and password to new user

- Assignment/re-assignment of usernames and passwords is performed through the *application's administrator account*.
  - This is addressed in the ADMIN Guide

# Logging In: Username and Password

Companies purchasing a license to a SIL Solver® application will typically have their own server locations.

For training classes provided by SIS-TECH, a link to a training server location will be provided.

Log in with your assigned Username and Password

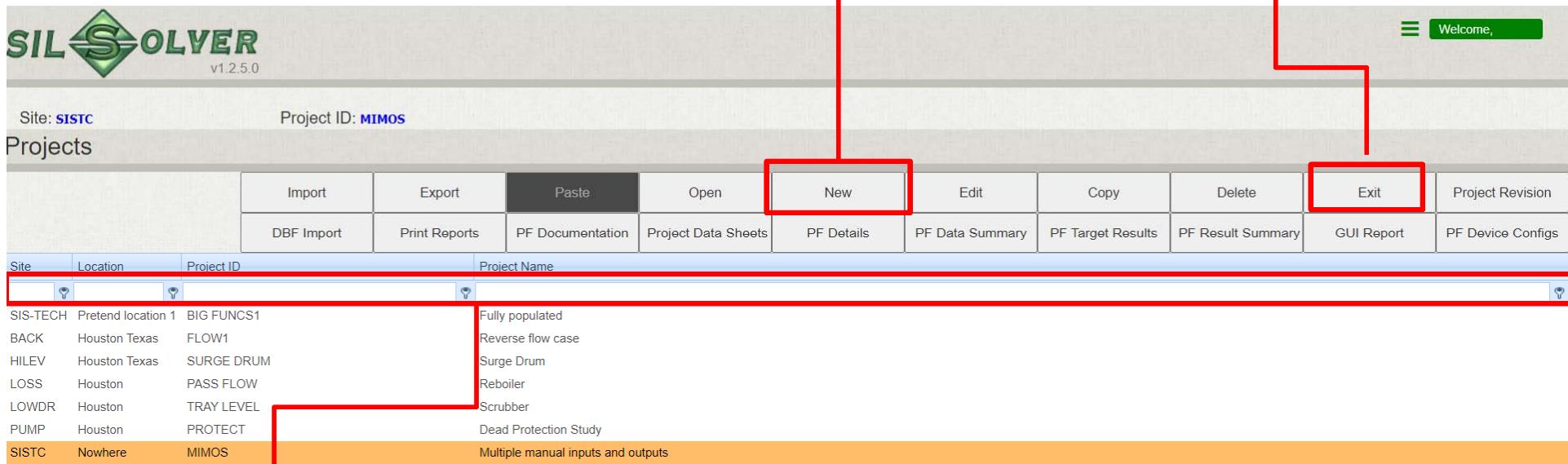


## 2. CREATING A NEW PROJECT

- Setting up the project information
- Creating a safety function
- Copying a safety function
- Editing a safety function

Starting a new project

Exit the software



Project List

Filters may be useful to users with long project lists



Welcome,

 Site: **SISTC** Project ID: **MIMOS**
**Projects**

			Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	Project Revision
			DBF Import	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs
Site	Location	Project ID	Project Name									
SIS-TECH	Pretend location 1	BIG FUNCS1	Fully populated									
BACK	Houston Texas	FLOW1	Reverse flow case									
HILEV	Houston Texas	SURGE DRUM	Surge Drum									
LOSS	Houston	PASS FLOW	Reboiler									
LOWDR	Houston	TRAY LEVEL	Scrubber									
PUMP	Houston	PROTECT	Dead Protection Study									
SISTC	Nowhere	MIMOS	Multiple manual inputs and outputs									

Click to create a new project

 The window below pops up,  
 type in relevant information  
 and click "Save"

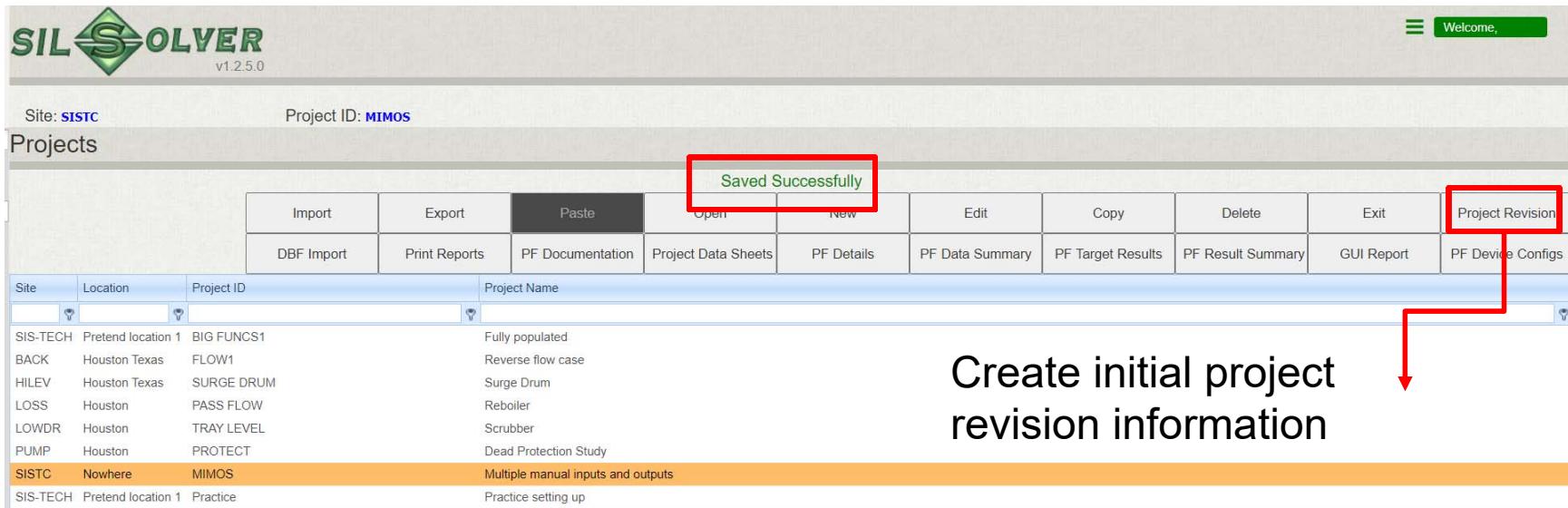
**Add New Project**

<b>Site:</b>	<input type="text"/>
<b>Location:</b>	<input type="text"/>
<b>Project ID:</b>	<input type="text"/>
<b>Name:</b>	<input type="text"/>
<input type="button" value="Save"/> <input type="button" value="Close"/>	

**Add New Project**

<b>Site:</b>	<input type="text" value="SIS-TECH"/>
<b>Location:</b>	<input type="text" value="Pretend location 1"/>
<b>Project ID:</b>	<input type="text" value="Practice"/>
<b>Name:</b>	<input type="text" value="Practice setting up"/>
<input type="button" value="Save"/> <input type="button" value="Close"/>	

# Project Revision Data



Site: SISTC Project ID: MIMOS

Projects

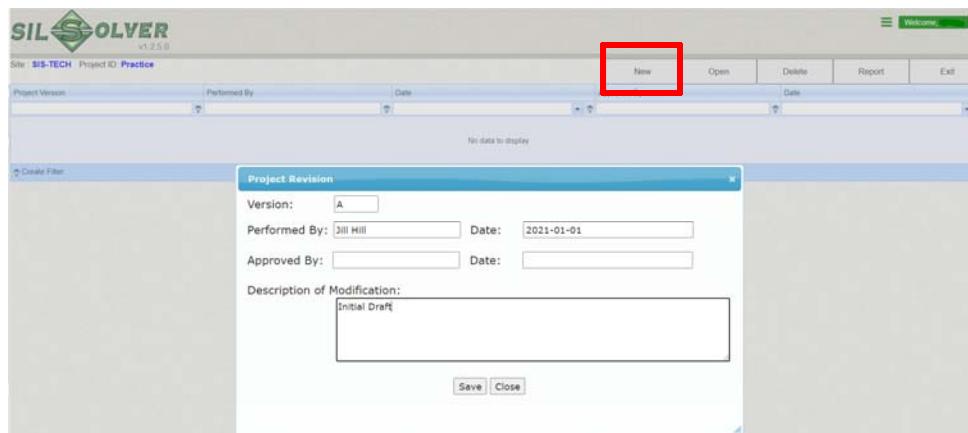
Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	Project Revision
DBF Import	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs

Site Location Project ID Project Name

SIS-TECH	Pretend location 1	BIG FUNCS1	Fully populated
BACK	Houston Texas	FLOW1	Reverse flow case
HILEV	Houston Texas	SURGE DRUM	Surge Drum
LOSS	Houston	PASS FLOW	Reboiler
LOWDR	Houston	TRAY LEVEL	Scrubber
PUMP	Houston	PROTECT	Dead Protection Study
<b>SISTC</b>	<b>Nowhere</b>	<b>MIMOS</b>	Multiple manual inputs and outputs
SIS-TECH	Pretend location 1	Practice	Practice setting up

**Saved Successfully**

**Create initial project revision information**



Site: SIS-TECH Project ID: Practice

New Open Delete Report Exit

Project Revision

Version: A

Performed By: Jill Hill Date: 2021-01-01

Approved By: Date:

Description of Modification: Initial Draft

Save Close

Click “New” to open dialog box, enter data, and Save

# Steps for adding a safety function

1. Obtain functional description from Hazard and Risk Analysis (H&RA) documentation
2. Open Project
3. Select new function and enter function identification fields
4. Enter performance targets
5. Enter function architecture through GUI interface and populating the architecture with devices
6. Perform calculation
7. Re-iterate with design modifications if necessary to get successful design

# Example SIF

Information from H&RA and related process requirement specification (PRS) information

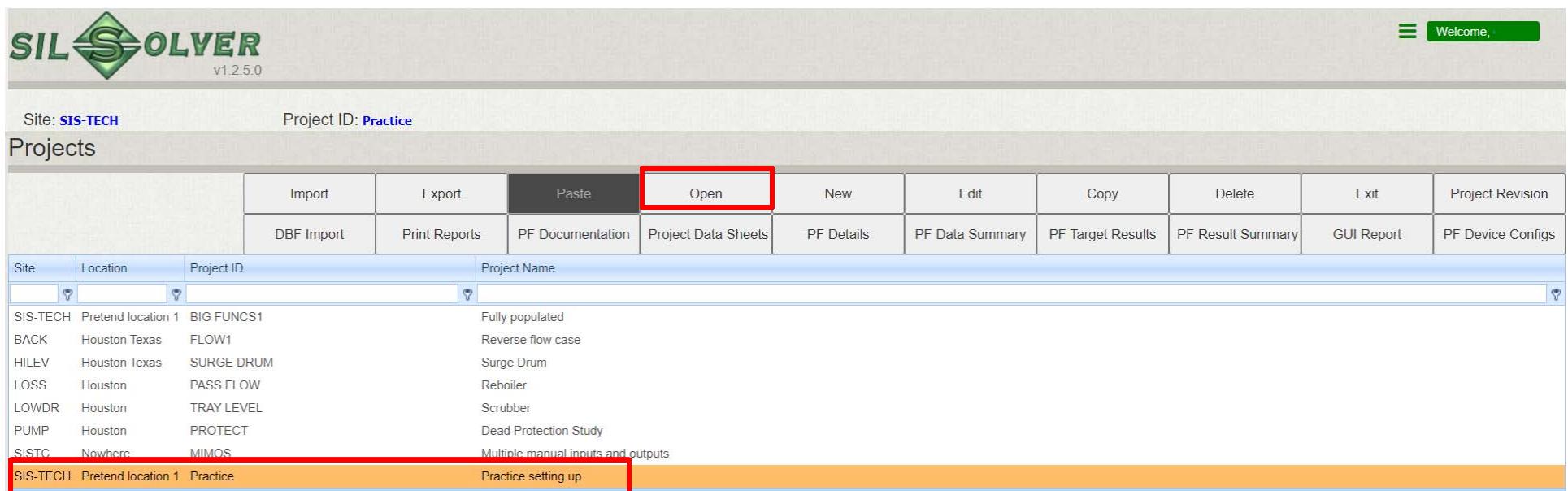
- SIF 01
- SIL-1 (20% design margin)
- Low Demand mode
- Spurious trip target = 20 yrs
- Desired test interval = 5 yrs
- V-101 High DP (2oo3,DP-101A/B/C) trip closes XV-101A and XV-101B (1oo2) ball valves spring loaded to the closed position, each with a single ETT solenoid (XY-101A and XY-101B)
- Power supply is monitored and is tested at 5 yr interval
- Existing logic solver (SIS-A) is safety configured system with 1oo2D CPU and simplex I/O
- Assume no sensor diagnostic response will be implemented, so no DC credit should be taken

# Opening the project

Start from Project home page

Select the Project you want to open by left-click (first project in list is selected by default)

Click Open

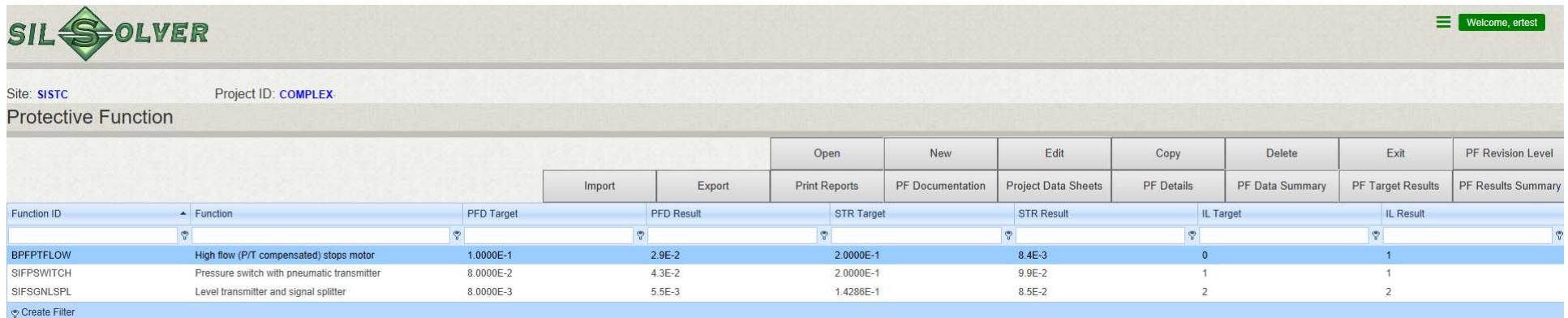


The screenshot shows the SIL SOLVER v1.2.5.0 software interface. The top bar includes the logo 'SIL SOLVER v1.2.5.0', a 'Welcome' button, and a menu icon. The main area is titled 'Projects' and displays a table of projects. The 'Open' button in the toolbar is highlighted with a red box. The 'Practice' project in the list is also highlighted with a red box. The table columns are: Site, Location, Project ID, and Project Name. The rows list various projects with their details:

Site	Location	Project ID	Project Name
SIS-TECH	Pretend location 1	BIG FUNCS1	Fully populated
BACK	Houston Texas	FLOW1	Reverse flow case
HILEV	Houston Texas	SURGE DRUM	Surge Drum
LOSS	Houston	PASS FLOW	Reboiler
LOWDR	Houston	TRAY LEVEL	Scrubber
PUMP	Houston	PROTECT	Dead Protection Study
SISTC	Nowhere	MIMOS	Multiple manual inputs and outputs
SIS-TECH	Pretend location 1	Practice	Practice setting up

# Protective Function Level

- The general layout is the same as the main page with list of projects



The screenshot shows the SIL-SOLVER software interface. At the top, there is a header with the logo 'SIL-SOLVER', the site name 'SISTC', the project ID 'COMPLEX', and a 'Welcome, erest' message. Below the header, the title 'Protective Function' is displayed. The main content is a table with the following data:

Function ID	Function	PFD Target	PFD Result	STR Target		STR Result		IL Target		IL Result	
				Import	Export	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results
BPFPTFLOW	High flow (P/T compensated) stops motor	1.0000E-1	2.9E-2	2.0000E-1	8.4E-3	0				1	
SIFPSWITCH	Pressure switch with pneumatic transmitter	8.0000E-2	4.3E-2	2.0000E-1	9.9E-2	1				1	
SIFSGNLSPL	Level transmitter and signal splitter	8.0000E-3	5.5E-3	1.4286E-1	8.5E-2	2				2	

Project information.

# Start a new safety function

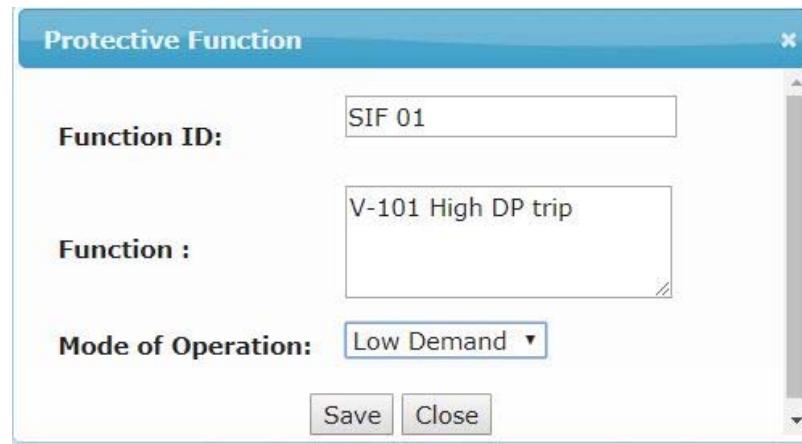
Site: SIS-TECH Project ID: Practice Function ID:

Protective Function

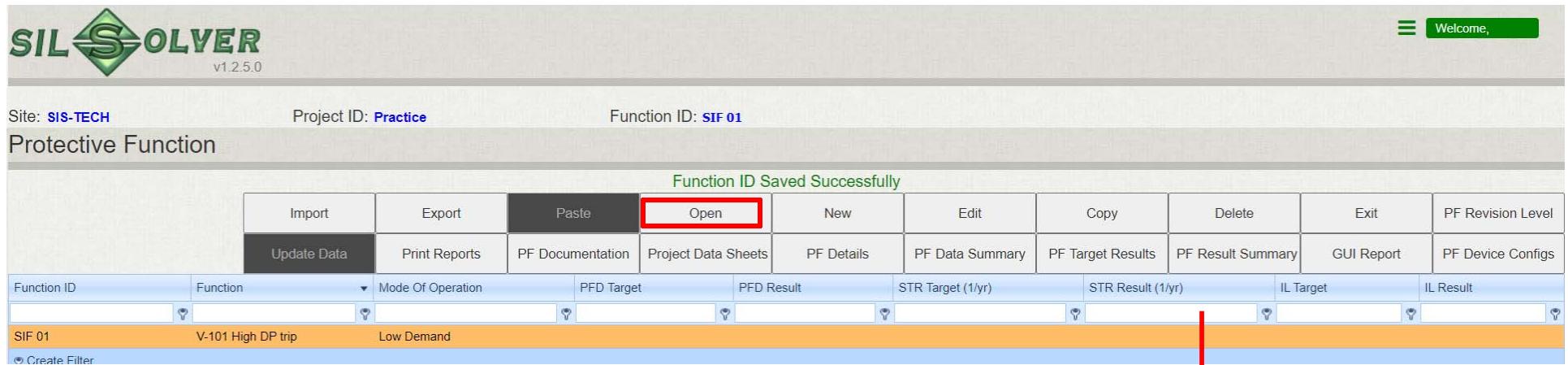
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result

No data to display

- Enter Function ID, brief version of function description (e.g., from H&RA), Mode of Operation, and Save



# Select and Open Function



SIL SOLVER v1.2.5.0

Welcome, [User]

Site: SIS-TECH Project ID: Practice Function ID: SIF 01

Protective Function

Function ID Saved Successfully

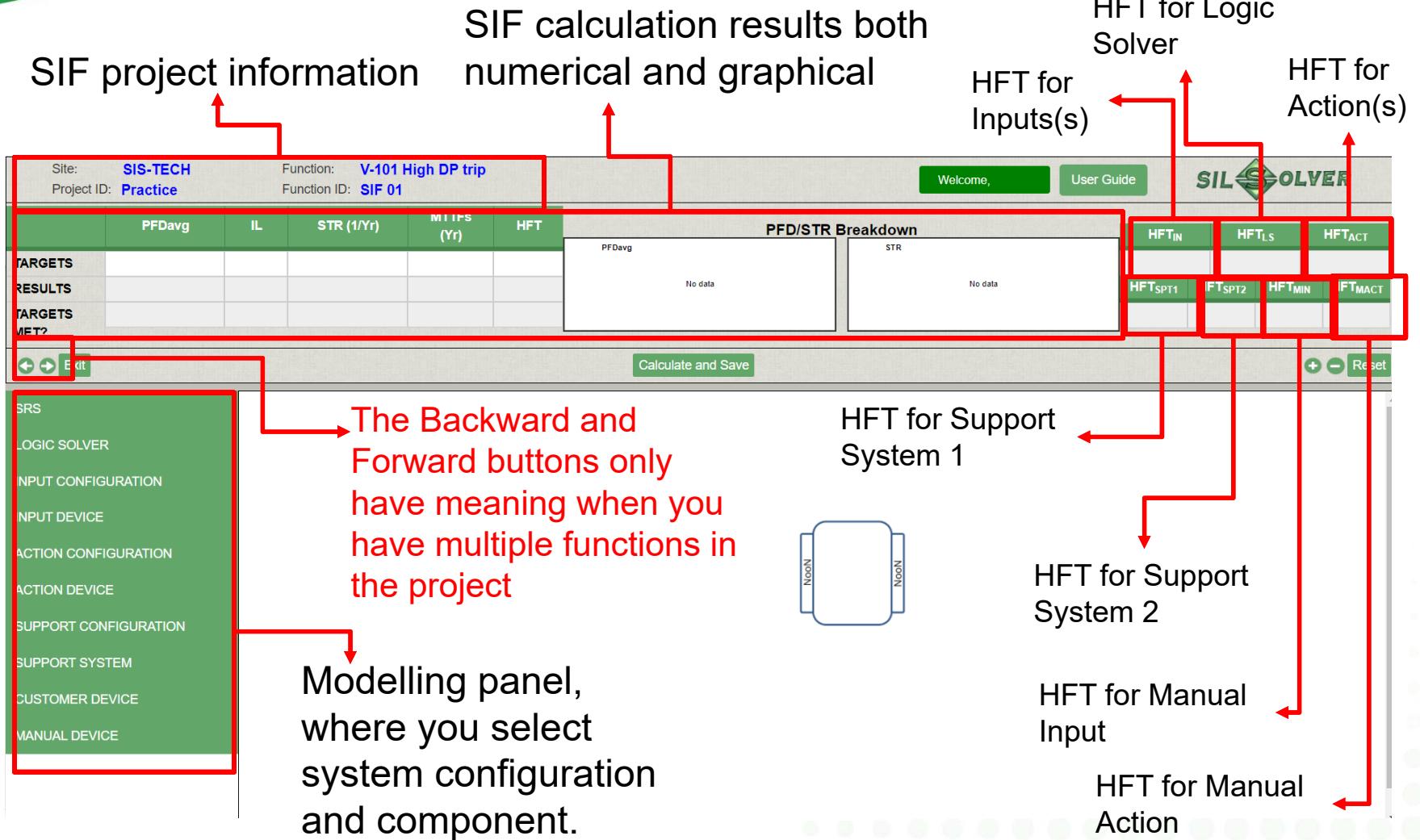
Import	Export	Paste	Open	New	Edit	Copy	Delete	Exit	PF Revision Level
Update Data	Print Reports	PF Documentation	Project Data Sheets	PF Details	PF Data Summary	PF Target Results	PF Result Summary	GUI Report	PF Device Configs
Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result	
SIF 01	V-101 High DP trip	Low Demand							

Create Filter

- Select function and click Open to begin configuring SIF

Fields for filtering can be useful for projects with long lists of protective functions

# Function GUI Interface



# Zooming

Use the + and – buttons to zoom in and out on the figure  
*You cannot interact with certain features in a zoomed state*

Site: SIS-TECH Function: V-101 High DP trip  
Project ID: Practice Function ID: SIF 01

Welcome, User Guide SIL SOLVER

	PFDAvg	IL	STR (1/Yr)	MTTFs (Yr)	HFT	PFD/STR Breakdown		HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
TARGETS						PFDAvg	STR			
RESULTS						No data	No data			
TARGETS MET?								HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>
										HFT <sub>ACT</sub>

Calculate and Save

Exit + - Reset

SRS  
LOGIC SOLVER  
INPUT CONFIGURATION  
INPUT DEVICE  
ACTION CONFIGURATION  
ACTION DEVICE  
SUPPORT CONFIGURATION  
SUPPORT SYSTEM  
CUSTOMER DEVICE  
MANUAL DEVICE

NoON NoON

Use the Reset to  
return to the base  
view required for  
editing

# Entering Performance Targets

Click any cell in Targets row of table to open dialog box

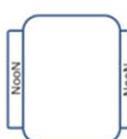
Site: **SIS-TECH** Function: **V-101 High DP trip**  
 Project ID: **Practice** Function ID: **SIF 01**

**SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT	PFD/STR Breakdown		HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
<b>TARGETS</b>						PFDavg	STR			
<b>RESULTS</b>						No data	No data			
<b>TARGETS</b>								<b>HFT<sub>SPT1</sub></b>	<b>HFT<sub>SPT2</sub></b>	<b>HFT<sub>MIN</sub></b>
<b>MET?</b>										<b>HFT<sub>MACT</sub></b>

**Calculate and Save** **Reset**

**SRS**  
**LOGIC SOLVER**  
**INPUT CONFIGURATION**  
**INPUT DEVICE**  
**ACTION CONFIGURATION**  
**ACTION DEVICE**  
**SUPPORT CONFIGURATION**  
**SUPPORT SYSTEM**  
**CUSTOMER DEVICE**  
**MANUAL DEVICE**



**Target Specification**

PFDavg: 0.08  
 MTTFs (Yr): 20  
**Update**

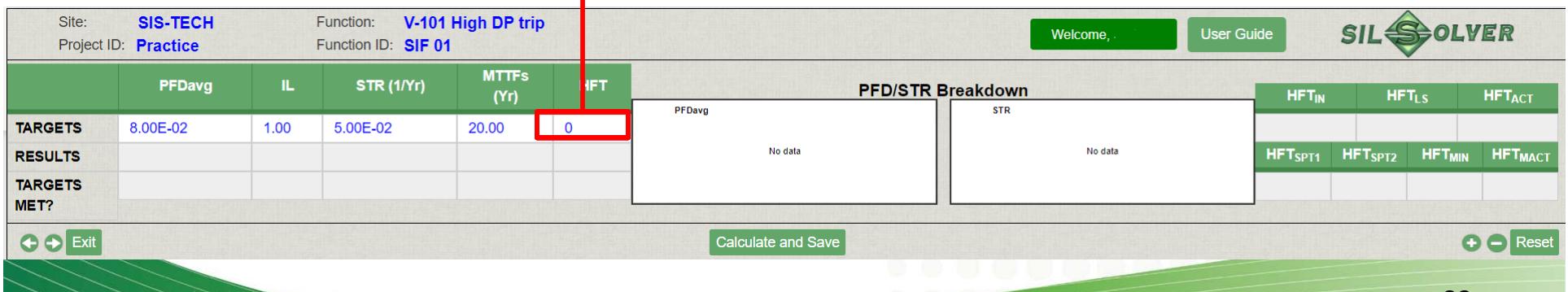
**Enter performance targets and update**

# HFT Target

HFT target is based on the SIL Target and SIS Mode of Operation, following ANSI/ISA61511-1:2018 requirements. If no PFDavg target has been entered (which would result in no SIL target), HFT target will be set to null.

SIL Target	Mode of Operation	HFT target for each subsystem
1	Low Demand	0
1	High Demand	0
2	Low Demand	0
2	High Demand	1
3	Low Demand	1
3	High Demand	1

## HFT Target



The screenshot shows the SIL SOLVER software interface. At the top, it displays the site as 'SIS-TECH Practice' and the function as 'V-101 High DP trip Function ID: SIF 01'. On the right, there are 'Welcome' and 'User Guide' buttons, and the 'SIL SOLVER' logo. Below this, the 'PFD/STR Breakdown' table is shown. The 'TARGETS' row has a 'PFDavg' value of '8.00E-02', an 'IL' value of '1.00', an 'STR (1/Yr)' value of '5.00E-02', an 'MTTFs (Yr)' value of '20.00', and an 'HFT' value of '0'. A red arrow points to the 'HFT' cell. The 'RESULTS' and 'TARGETS MET?' rows are empty. At the bottom, there are 'Calculate and Save' and 'Reset' buttons.

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
<b>TARGETS</b>	8.00E-02	1.00	5.00E-02	20.00	0
<b>RESULTS</b>					
<b>TARGETS MET?</b>					

PFD/STR Breakdown

	PFDavg	STR	HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
PFDavg	No data				
STR	No data				
			<b>HFT<sub>SPT1</sub></b>	<b>HFT<sub>SPT2</sub></b>	<b>HFT<sub>MIN</sub></b>
					<b>HFT<sub>MACT</sub></b>

Calculate and Save

+ - Reset

# Picking Logic Solver (LS)

Select Logic Solver header on left to begin configuration

Left click desired logic solver to copy and then click in middle box to paste.

Site: **SIS-TECH** Function: **V-101 High DP trip**  
 Project ID: **Practice** Function ID: **SIF 01**

Welcome, . . . User Guide **SIL S SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT	PFD/STR Breakdown		HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
<b>TARGETS</b>	8.00E-02	1.00	5.00E-02	20.00	0	PFDavg	STR			
<b>RESULTS</b>								HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>
<b>TARGETS MET?</b>										HFT <sub>MACT</sub>

**Exit** **Calculate and Save** **Reset**

**SRS**

**LOGIC SOLVER**

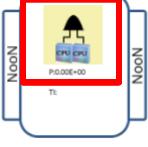
Search **Clear**

 GENERIC 2004D DUAL MP. DUAL I/O

 **GENERIC 1002D DUAL MP. SIMPLEX I/O**

 NON-SC D/D

 NON SC PES DUAL MP. DUAL I/O

 CPU CPU P.0.00E+00

Wrong one?

To delete the logic solver, move the mouse to icon, right click to make the delete option appear, left click on the delete option

# Adding LS details

Left click the logic solver icon on in the center box. Enter a logic solver tag name, select the voting (may be only one option), and enter the test interval (TI)

**Note:** the voting needs to be selected before test interval.

**Caution:** Logic Solver test interval may be prescribed in vendor safety manual or prior use justification documentation

Tool will automatically calculate LS contributions to PFDavg and STR

Logic Solver

Logic Solver ID: DMSIO

Logic Solver Type: GENERIC 1002D DUAL MP; SIMPLEX I/O

Configurations:

Logic Solver Tag: SIS-A

Voting: 1oo2D

Proof Testing Interval (yr): 5

PFDavg: 4.92E-04 STR: 4.50E-02

Note:

Boundary Description: Boundary includes 1002D logic solver with dual main processors, 1 simplex digital input module, 1 simplex analog input module, and 1 simplex digital output module.

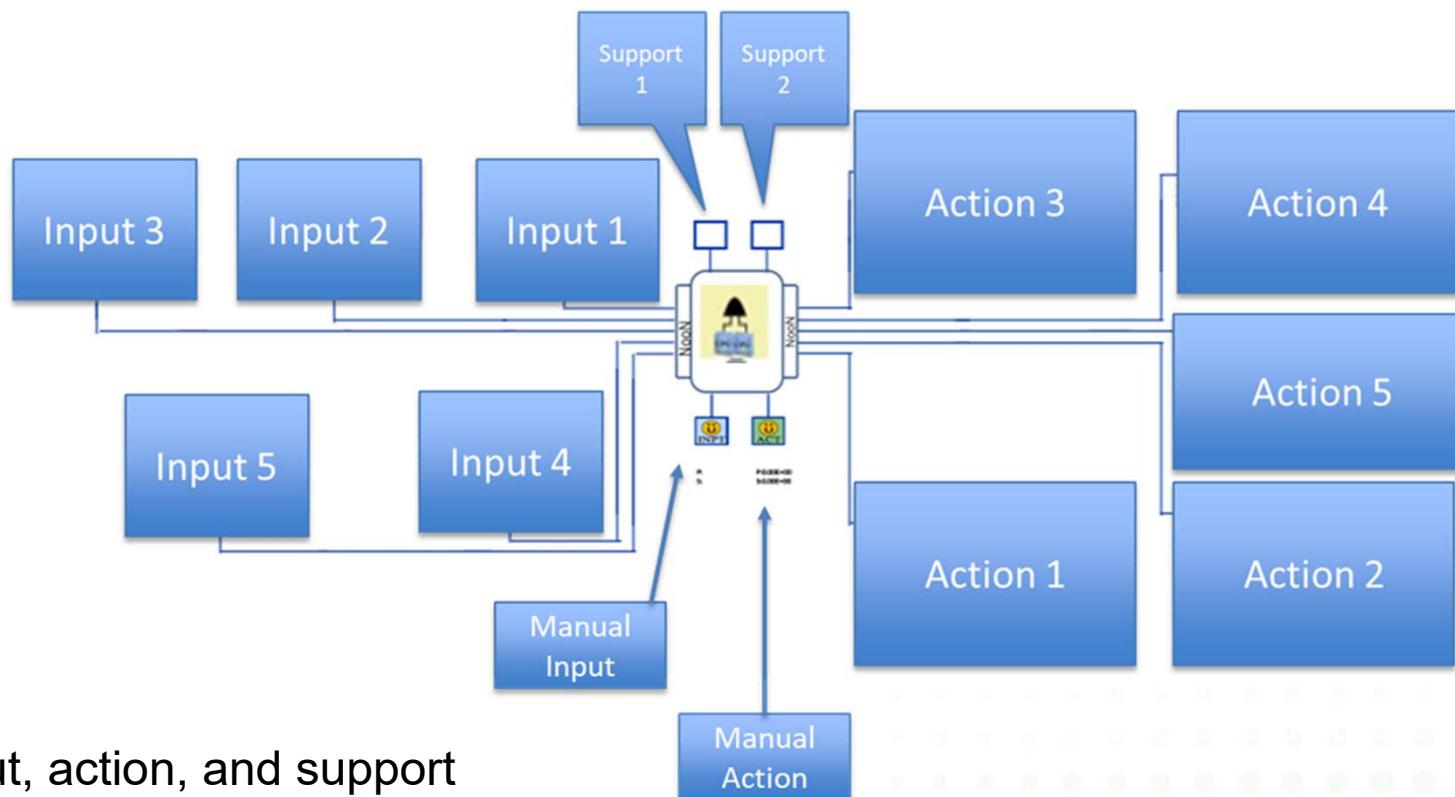
Implementation Limitations and Exclusions: Refer to the SIL Solver manual for a discussion of "1oo2D" and "2oo2D" architectures. The logic solver is certified to IEC 61508 SIL 3 or TUV AK 5-6.

Data Source: SIL HFT: 1

Update

Click Update to return to GUI page

# Screen locations of the other subsystems



Input, action, and support system locations are filled in the order entered

# Adding Inputs (aka Sensors)

Adding an input is divided into two steps

1. add the input configuration
2. add each device.

# Input Configuration

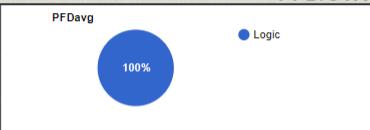
Click “Input Configuration” to open selection list

Select the desired voting grouping.

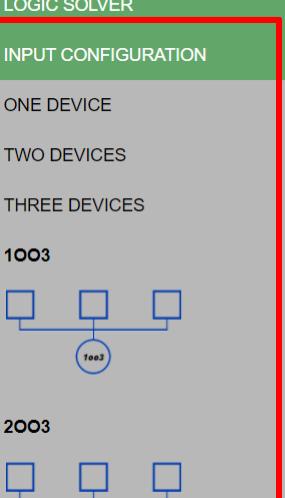
Left-click the selected configuration to add to the GUI.

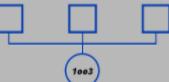
Site: SIS-TECH      Function: V-101 High DP trip  
 Project ID: Practice      Function ID: SIF 01

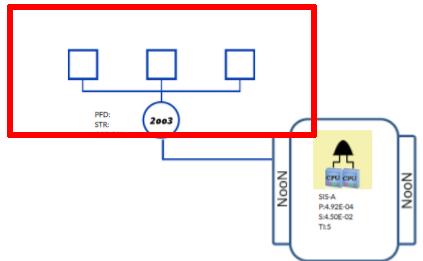
Welcome,  User Guide 

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT	PFD/STR Breakdown		HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
<b>TARGETS</b>	8.00E-02	1.00	5.00E-02	20.00	0					
<b>RESULTS</b>										
<b>TARGETS MET?</b>										

 Exit  

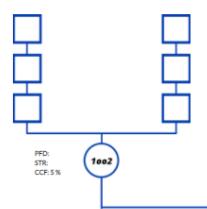
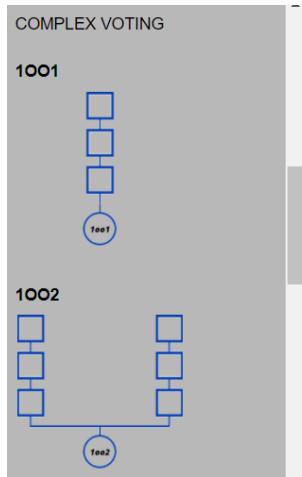
SRS  
 LOGIC SOLVER  
**INPUT CONFIGURATION** 

ONE DEVICE  
 TWO DEVICES  
 THREE DEVICES  
 1003  
  
 2003  

Wrong choice? Hover over that portion of the architecture until grey location field appears, right-click to get option to copy or delete, left-click delete.

# Complex Voting Architectures



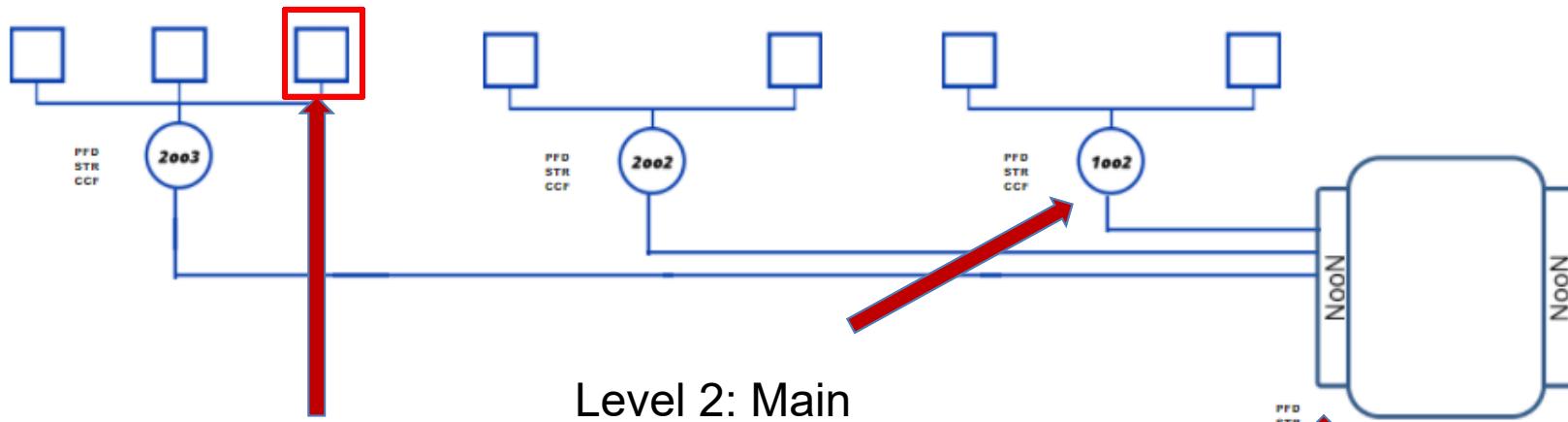
Common examples:

- Sensor Transmitter with a Signal Splitter, Trip Amp, or a Relay
- Pressure/Temperature compensated flow

- If a single variable value is made up of multiple devices, use a **Complex Voting Architecture**
- All the devices for each separate value go in a single vertical channel

# Three levels of Input Architecture

Best Practice: Only use Level 3 if you must for the complexity of the function (some details will not show on the GUI)



Level 3: Device level architecture, with fixed CCF from datasheet

Level 2: Main architecture of an Input Subsystem, with user entered CCF

Level 1: 1ooN or NooN **VOTING** between Input Subsystems, with no CCF

# Picking Sensor Technology

Click “input device” to access to the list of device categories  
Left-click the relevant category to access the list of devices technology

Site: **SIS-TECH** Function: **V-101 High DP trip**  
Project ID: **Practice** Function ID: **SIF 01**

Welcome, User Guide **SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT		HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
<b>TARGETS</b>	8.00E-02	1.00	5.00E-02	20.00	0			1	
<b>RESULTS</b>									
<b>TARGETS MET?</b>									

**PFD/STR Breakdown**

PFDavg: 100% Logic  
STR: 100% Logic

**INPUT DEVICE**

Search Clear

TRIP AMPLIFIER

ANALYZER

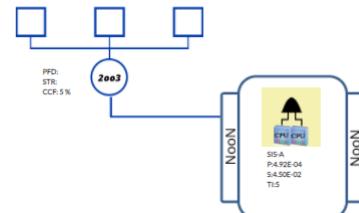
PRESSURE

**DIFFERENTIAL PRESSURE TRANSMITTER**

**PNEUMATIC PRESSURE SWITCH**

**PNEUMATIC PRESSURE TRANSMITTER**

**Calculate and Save** **+ - Reset**



# Selecting the Device

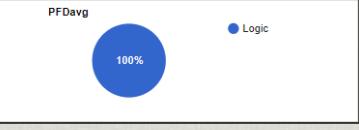
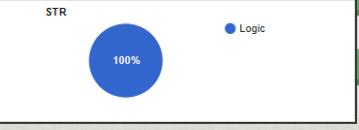
Scroll to the desired device

Left click device in list to copy (right-click to open datasheet – more later)

Left click in device box on diagram to add device to the input subsystem

Site: **SIS-TECH** Function: **V-101 High DP trip**  
 Project ID: **Practice** Function ID: **SIF 01**

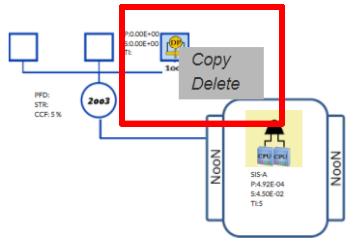
Welcome, User Guide **SIL SOLVER**

	PFDAvg	IL	STR (1/Yr)	MTTFs (Yr)	HFT	PFD/STR Breakdown		HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>	
<b>TARGETS</b>	8.00E-02	1.00	5.00E-02	20.00	0				1		
<b>RESULTS</b>								<b>HFT<sub>SPT1</sub></b>	<b>HFT<sub>SPT2</sub></b>	<b>HFT<sub>MIN</sub></b>	<b>HFT<sub>MACT</sub></b>
<b>TARGETS MET?</b>											

**INPUT DEVICE**

Search  Clear

- TRIP AMPLIFIER
- ANALYZER
- PRESSURE
- DP** DIFFERENTIAL PRESSURE TRANSMITTER
- P** PNEUMATIC PRESSURE SWITCH
- PT** PNEUMATIC PRESSURE TRANSMITTER



To delete or copy the device, move the mouse to device icon in function diagram and right click the desired option.

# Adding Device Details

White boxes are editable fields. Some are pre-populated

×

**Device**

**Device ID:** DPTR      **Device Type:** DIFFERENTIAL PRESSURE TRANSMITTER

**Configurations:**

Display Tag for Device(s):

Proof Testing Interval (yr):

Voting:

Subsystem Diagnostic Level: [?](#)

**Maintenance:**

Mean Time to Repair (hr):

Diagnostic Interval (hr):

Overhaul Interval (yr):

Proof Testing Coverage (%): [?](#)

User Specified

**Note:**

Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.

Process Severity Assumption: Clean

Implementation Limitations and Exclusions: No limitations beyond standard assumptions (see SIL Solver Enterprise User Guide)

**Data Source:** SIL      Update

# Filled In

Test Interval is in years

Define Voting of one device. Use 1oo1 most of the time

Define Diagnostic Level that will be implemented

Default OI is 20Year

Default PTC is 100 %

Device

Device ID:	DPTR	Device Type:	DIFFERENTIAL PRESSURE TRANSMITTER
------------	------	--------------	-----------------------------------

Configurations:

Display Tag for Device(s):	Individual Tags	DP-101A
Proof Testing Interval (yr):	5	
Voting:	1oo1	
Subsystem Diagnostic Level:	?	NO DC

Properties:

Failure Dangerous Failure Rate (1/yr):	8.00E-03
Failure Spurious Failure Rate (1/yr):	1.67E-02
Common Cause Factor CCF Dual (%):	2
Common Cause Factor CCF Triple (%):	2
Diagnostic Coverage Simplex DC1 (1/yr):	60
Diagnostic Coverage Dual DC2 (1/yr):	80
Diagnostic Coverage Triple DC3 (1/yr):	90

Maintenance:

Mean Time to Repair (hr):	72
Diagnostic Interval (hr):	0.5
Overhaul Interval (yr):	20
Proof Testing Coverage (%):	100
User Specified:	<input type="checkbox"/>

Note:

Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.

Process Severity Assumption: Clean

Data Source: SIL

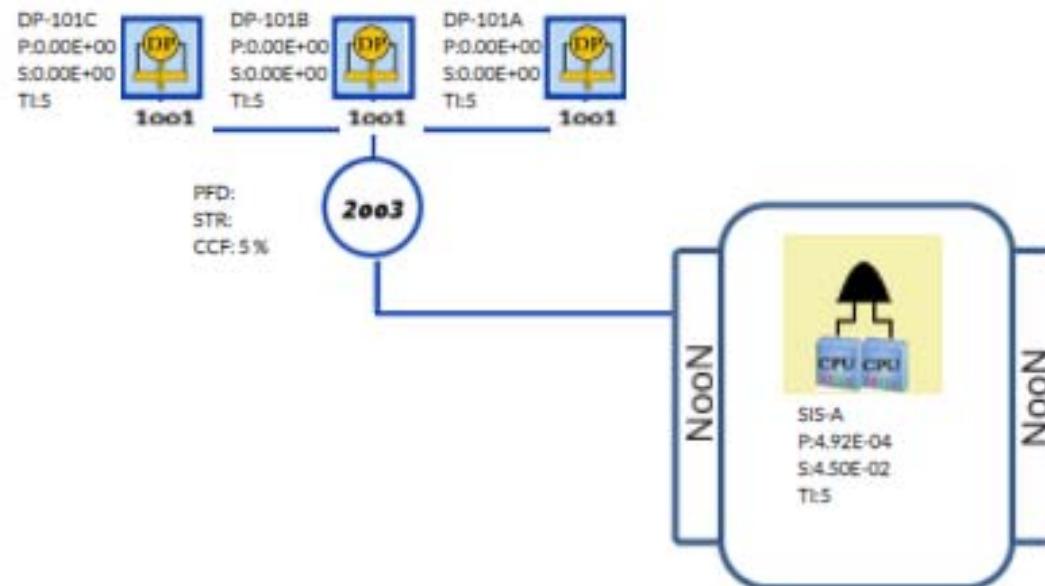
Update

Will updated once SIF is calculated

Update button will activate once minimum date is entered.

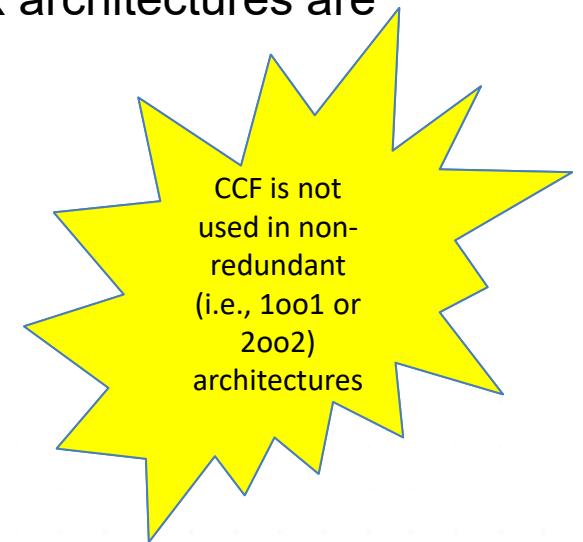
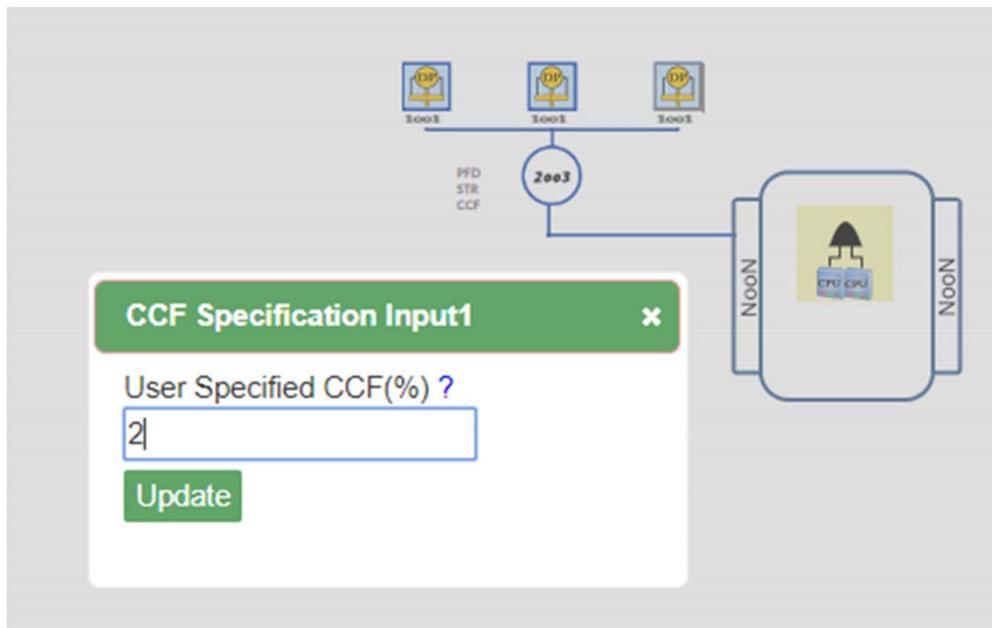
# Completing the subsystem

1. Copy DP-101A Pressure transmitter
2. Paste DP pressure transmitter to each of box in the 2oo3 input configuration
3. Update the tags for DP-101B and DP-101C and any other parameters that were modified for DP-101A.



# Adding Common Cause

- Left-click on the voting 2oo3 circle
- Update the default CCF value as needed (for example, 2%)  
Note: Recommended values for duplex and triplex architectures are shown in the device datasheet under “Properties”
- Click Update to close the dialog box



Note: When using diverse instrumentation in a redundant architecture, there might still be some CCF. A judgement based on the technology and installation details should be made.

# 2oo3D vs. 2oo3

- What if automated diagnostics is going to be used to take safe action on diagnosed failure?
- Enter each device and change the Diagnostic level to DC3 (diagnostic level for inter-comparison of 3 transmitters)
- Click Update to close dialog box

Define Diagnostic  
DC3 is used since 3  
PTs are used for  
comparison. The DC  
used in 90%

**Device**

<b>Device ID:</b> DPTR	<b>Device Type:</b> DIFFERENTIAL PRESSURE TRANSMITTER
<b>Configurations:</b> <div style="background-color: #e0f2f1; padding: 5px;"> <p>Device Tag: DP-101A</p> <p>Proof Testing Interval (yr): 5</p> <p>Voting: 1oo1</p> <p>Subsystem Diagnostic Level: ? <b>DC3</b></p> </div>	
<b>Properties:</b> <div style="background-color: #f2f2ff; padding: 5px;"> <p>Failure Dangerous Failure Rate (1/yr): 8.00E-03</p> <p>Failure Spurious Failure Rate (1/yr): 1.67E-02</p> <p>Common Cause Factor CCF Dual (%): 2</p> <p>Common Cause Factor CCF Triple (%): 2</p> <p>Diagnostic Coverage Simplex DC1 (1/yr): 60.00</p> <p>Diagnostic Coverage Dual DC2 (1/yr): 80.00</p> <p>Diagnostic Coverage Triple DC3 (1/yr): 90.00</p> </div>	
<b>Maintenance:</b> <div style="background-color: #e0f2f1; padding: 5px;"> <p>Mean Time to Repair (hr): 72</p> <p>Diagnostic Interval (hr): 0.500</p> <p>Overhaul Interval (yr): 20</p> <p>Proof Testing Coverage (%): ? 100</p> <p>User Specified</p> </div>	
<b>Note:</b> <div style="background-color: #f2f2ff; padding: 5px;"> <p>Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.</p> <p>Process Severity Assumption: Clean</p> <p>Implementation Limitations and Exclusions: No limitations beyond standard assumptions (see SII_Solver Enterprise User</p> </div>	
<b>Data Source:</b> SIL	<b>Update</b>

The triplex DC  
for this device  
is 90%

## FYI: DC for other architectures

For all other input configurations with safe action on diagnosed failure, the general rule for the selection of Diagnostic level is as below:

1oo1D → DC1 (Diagnostic Coverage Simplex)

1oo2D and 2oo2D → DC2 (Diagnostic Coverage Dual)

1oo3D, 2oo3D and 3oo3D → DC3(Diagnostic Coverage Triplicated)

May need to select a lower DC when diverse devices are used in the same voting.

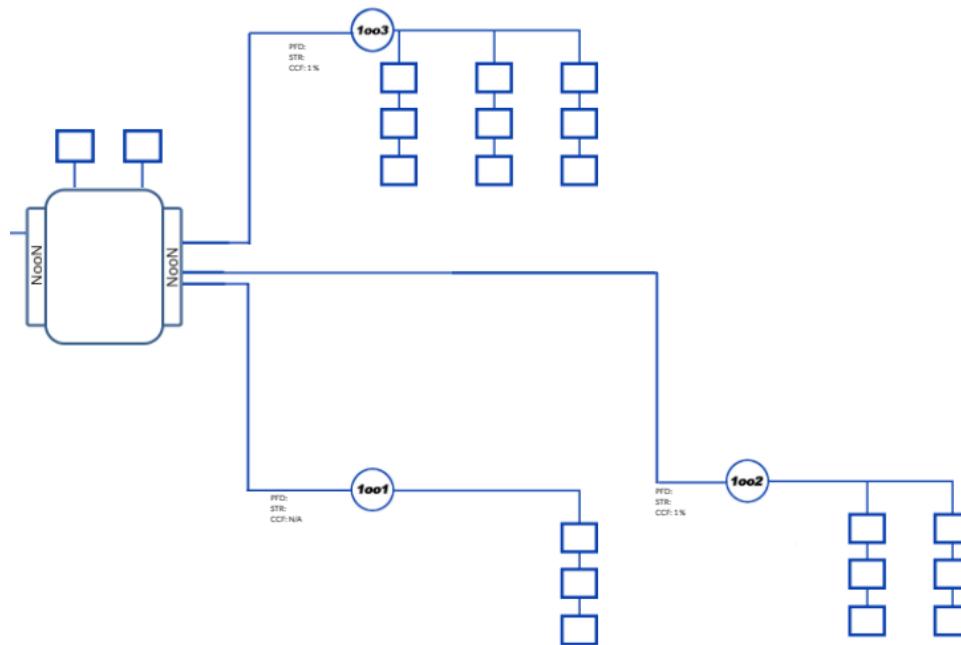
May select a higher DC when an external independent reading can be used for inter-comparison with the SIF sensor.

*Reminder: Credit for diagnostics shouldn't be taken if the diagnostic result isn't going to be used to take prompt safe action, either automatically or manually, to address any risk gap caused by the failure.*

# Adding the rest of the system

The support system and final actions are modelled in a similar way as the input.

1. Select the action configuration
2. Select the action device(s)
3. Specify relevant parameters

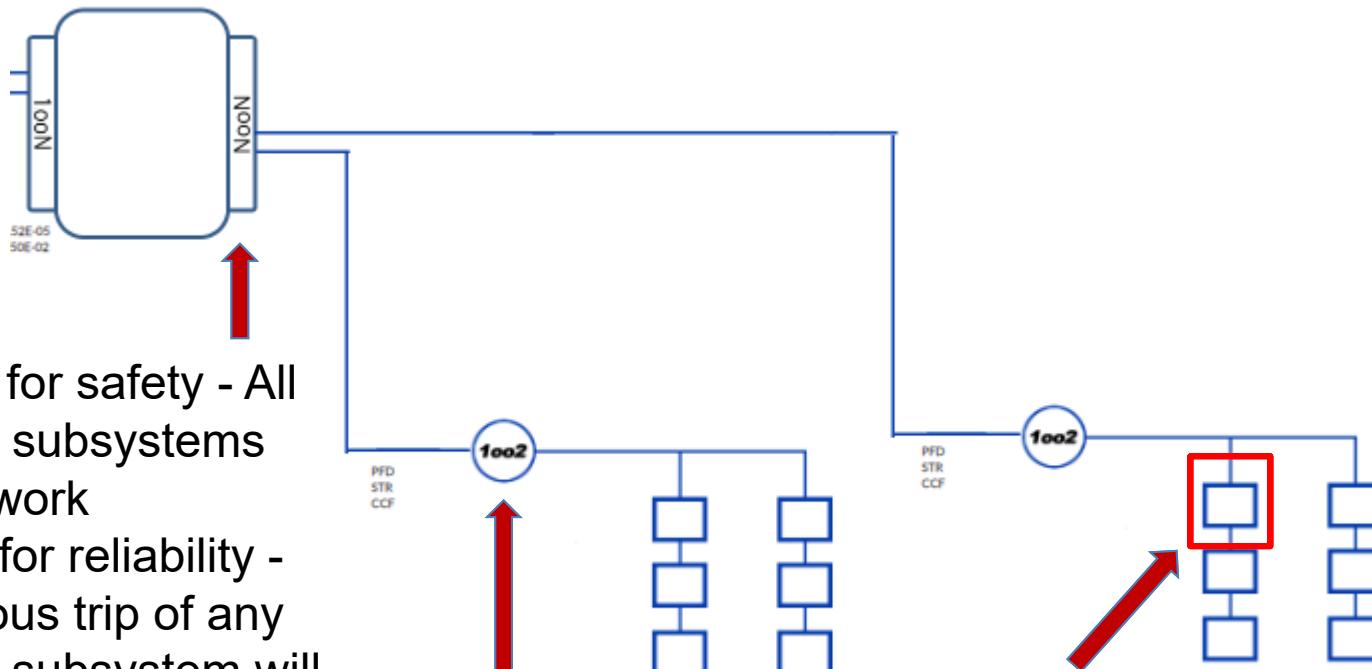


# Two configurable levels of Action Architecture

Best Practice: To show the most information on the GUI, only use Level 2 if you must for the complexity of the function.

## FIXED:

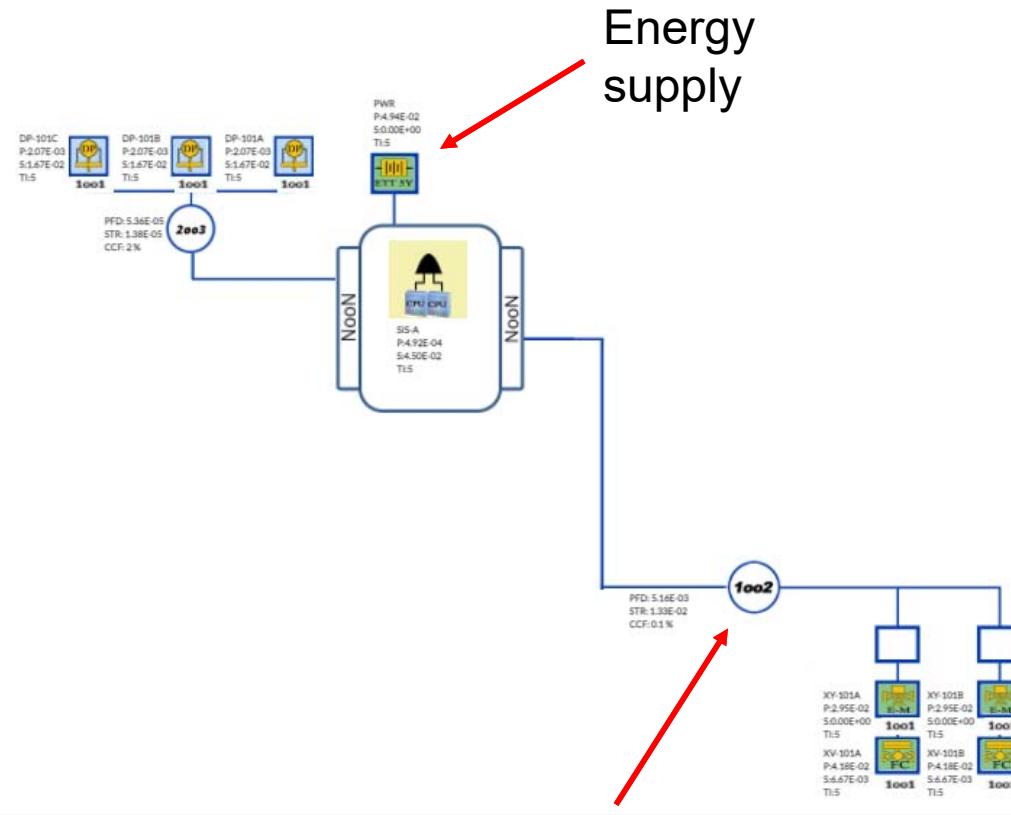
- NooN for safety - All action subsystems must work
- 1ooN for reliability - Spurious trip of any action subsystem will cause an operational problem



Level 1: Main architecture of an Action Subsystem, with user entered CCF

Level 2: Device level architecture, with fixed CCF from datasheet

# Adding valves, solenoids, and support system



Don't forget to update CCF

**Device**

Device ID: SVETM Device Type: SOLENOID VALVE - ETT - MONITORED

**Configurations:**

Device Tag:	XY-101A
Proof Testing Interval (yr):	5
Voting:	1oo1
Subsystem Diagnostic Level:	NO DC

**Properties:**

Failure Dangerous Failure Rate (1/yr):	1.18E-02
Failure Spurious Failure Rate (1/yr):	0
CCF Dual(%):	1
CCF Triple(%):	1
Diagnostic Coverage Simplex(1/yr):	0.00
Diagnostic Coverage Dual(1/yr):	0.00
Diagnostic Coverage Triple(1/yr):	0.00

**Maintenance:**

Mean Time to Repair (hr):	72
Diagnostic Interval (hr):	0.000
Overhaul Interval (yr):	20
Proof Testing Coverage (%):	100
User Specified	<input checked="" type="checkbox"/>

**Note:**  
Boundary Conditions: Boundary includes solenoid and solenoid wiring up to monitoring device.  
Process Severity Assumption: N/A  
Implementation Limitations and Exclusions: Vent port for redundant configurations is unobstructed and protected from debris.

Data Source: SIL

**Device**

Device ID: BVFCC Device Type: BLOCK VALVE-BALL-FTC-CLEAN

**Configurations:**

Device Tag:	XV-101A
Proof Testing Interval (yr):	5
Voting:	1oo1
Subsystem Diagnostic Level:	NO DC

**Properties:**

Failure Dangerous Failure Rate (1/yr):	1.67E-02
Failure Spurious Failure Rate (1/yr):	6.67E-03
CCF Dual(%):	0.1
CCF Triple(%):	0.1
Diagnostic Coverage Simplex(1/yr):	85.00
Diagnostic Coverage Dual(1/yr):	85.00
Diagnostic Coverage Triple(1/yr):	85.00

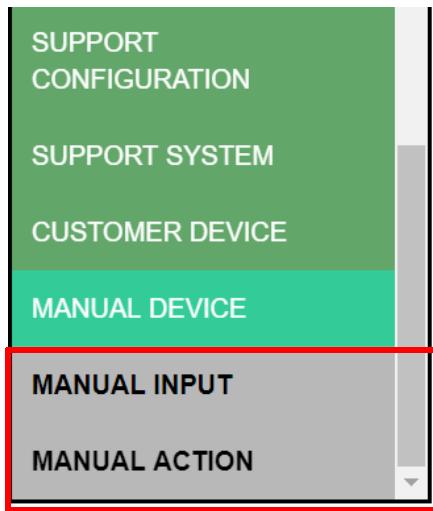
**Maintenance:**

Mean Time to Repair (hr):	72
Diagnostic Interval (hr):	0.000
Overhaul Interval (yr):	20
Proof Testing Coverage (%):	100
User Specified	<input checked="" type="checkbox"/>

**Note:**  
Boundary Conditions: Boundary includes spring return, pneumatically-operated ball valve, operating in a standby (dormant) mode of operation. The solenoid is NOT INCLUDED. Safe-state specified is fail closed.  
Process Severity Assumption: Clean

Data Source: SIL

# What if the design has a complicated “black box” subsystem?



Most commonly used for complex designs where there is a complicated subsystem in the design that is evaluated using an advanced method such as FTA

SIL Solver® allows for a MANUAL ACTION subsystem and a MANUAL INPUT subsystem

**THESE ARE NOT POPULATED LIKE NORMAL DEVICES**

The PFDavg and STR contributions for these subsystems are entered directly into the tool

The performance of these subsystems are additive to the overall PFD and STR analysis

# Manual Inputs

The user can enter two parts of a Manual Input analysis:

If two are used, the user must define whether they are redundant to each other (i.e., EITHER subsystem working will allow the overall Manual Input to work) or non-redundant (i.e., BOTH parts must work for the overall Manual Input to work)

DeviceID, Tag, voting architecture and TI are entered for completeness of reporting. The PFDavg and STR are entered directly for each portion of the Manual Input

Manual Inputs

Redundancy: Non-Redundant

Enable second manual input device

Manual Input Device 1

Device ID	
Device Tag	
Voting	
TI (Yr)	
PFDavg	0
STR (1/Yr)	0
HFT	0

Manual Input Device 2

Device ID	
Device Tag	
Voting	
TI (Yr)	
PFDavg	
STR (1/Yr)	
HFT	0

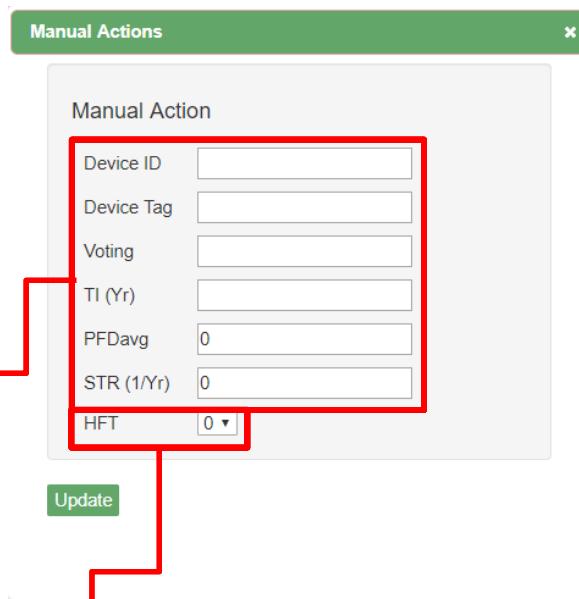
Update

Check to allow entry of the second Manual Input

The user selects the Hardware Fault Tolerance value appropriate for each part of the Manual Input

# Manual Action

DeviceID, Tag, voting architecture and TI are entered for completeness of reporting. The PFDavg and STR are entered directly for each portion of the Manual Input



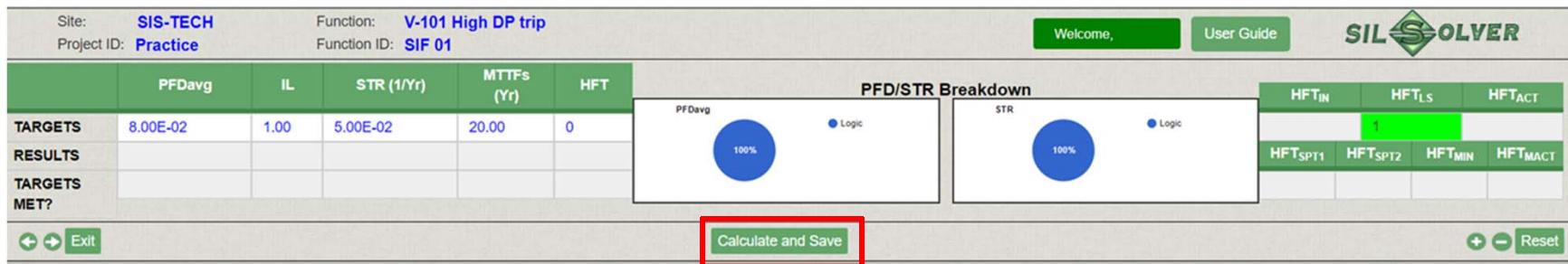
Manual Action	
Device ID	<input type="text"/>
Device Tag	<input type="text"/>
Voting	<input type="text"/>
TI (Yr)	<input type="text"/>
PFDavg	0
STR (1/Yr)	0
HFT	0 ▾

Update

User enters Manual Action HFT Value

# Ready to Calculate?

All devices entered, filled out, and CCF added?  
Click the “Calculate and Save” button

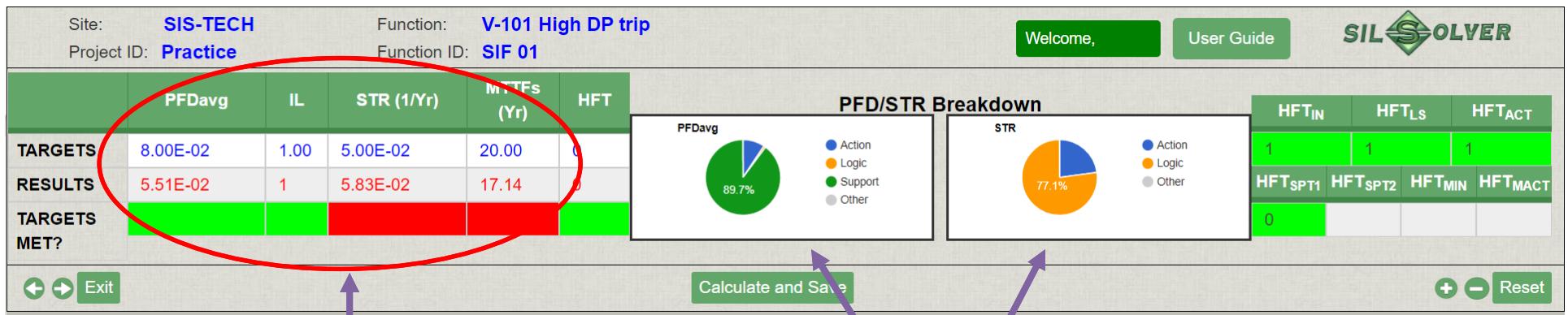


Note any **ERRORS** or **Warnings** that are generated during the calculation:

**ERRORS:** A problem exists in GUI or device configuration that will make the calculated results **INCORRECT**

**Warning:** A value is missing from the configuration that may or may not be a technical issue, depending on the overall design

# Are PFDavg and STR good enough?



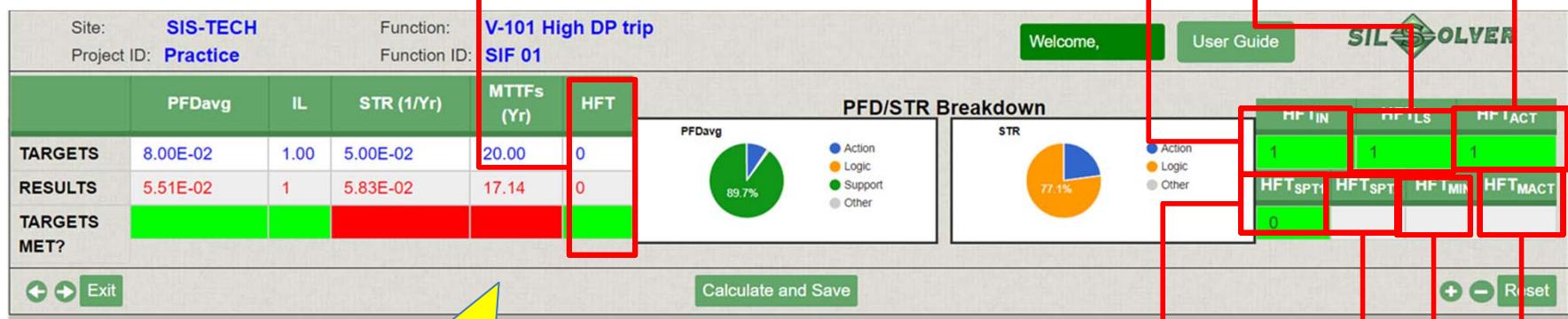
Numerical results and red-green pass-fail indicator on top left of GUI and most SIF reports

Graphical Charts provide information on which components are dominating PFDavg and STR

If necessary, modify design until performance targets are achieved.

# Don't forget Hardware Fault Tolerance (HFT)

HFT Target and  
Overall HFT  
Result



Overall HFT result is the minimum HFT out of the seven main subsystems (see far right side of GUI) for those subsystems that are configured for use in that architecture

HFT for Input(s)

HFT for Logic Solver

HFT for Action(s)

HFT for Support System 1

HFT for Support System 2

HFT for Manual Input

HFT for Manual Action

# HFT for Input and Action Subsystems

The HFT for each field device box (MooN) is determined by the selected architecture within that box as below.

Architecture(s)	HFT = N - M
1oo1, 1oo1D	0
1oo2, 1oo2D	1
2oo2, 2oo2D	0
1oo3, 1oo3D	2
2oo3, 2oo3D	1
3oo3, 3oo3D	0
2oo4, 2oo4D	2
HFAT/HPATD (unused for LS, but used for some action devices)	1

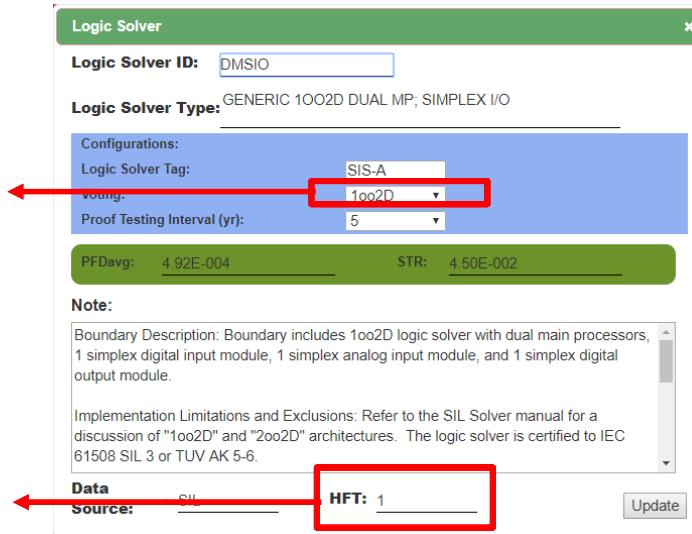
The results of the individual device boxes are combined based on the mid-level architecture.

# HFT for Logic Solver

The HFT value for the logic solver is based on the technology and the selected architecture. The resulting HFT value for the logic solver is shown on the logic solver data sheet and on the GUI as below.

In this case,  
architecture is  
1oo2D

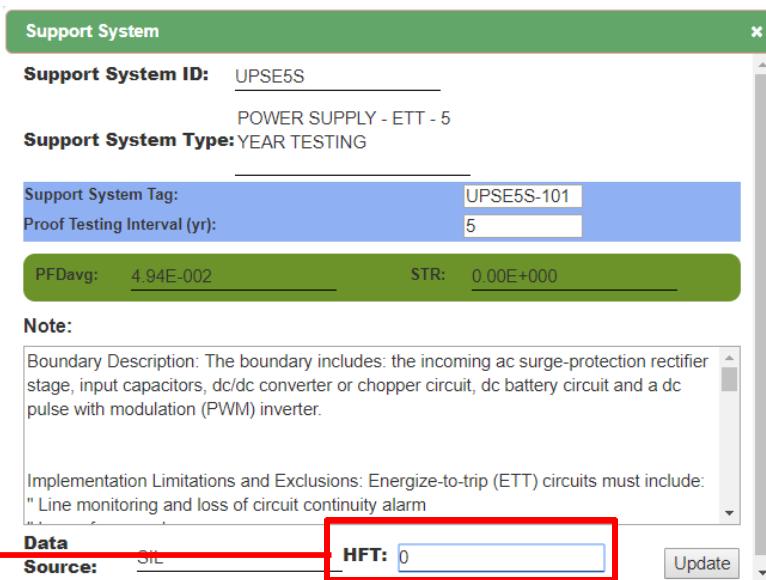
Logic Solver  
HFT Value



*Default value is 0 when importing a logic solver that is not in the current SIL Solver logic solver datasheet.*

# HFT for Support System

The HFT value for the support system is fixed and shown on the support system data sheet and on the GUI as below.



Support System

**Support System ID:** UPSE5S

**Support System Type:** POWER SUPPLY - ETT - 5

**Support System Tag:** UPSE5S-101

**Proof Testing Interval (yr):** 5

**PFDavg:** 4.94E-002      **STR:** 0.00E+000

**Note:**

Boundary Description: The boundary includes: the incoming ac surge-protection rectifier stage, input capacitors, dc/dc converter or chopper circuit, dc battery circuit and a dc pulse with modulation (PWM) inverter.

Implementation Limitations and Exclusions: Energize-to-trip (ETT) circuits must include: "Line monitoring and loss of circuit continuity alarm"

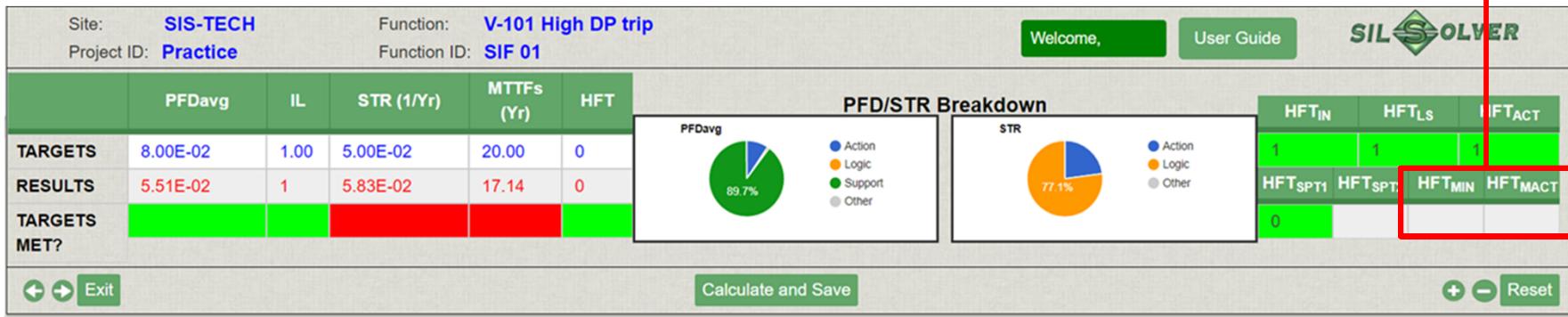
**Data Source:** SIL      **HFT:** 0      **Update**

Support System  
HFT Value

*Default value is 0 when importing support systems that are not in the current SIL Solver support system datasheet.*

# HFT Results for Manual Input and Manual Action

HFT Results from Manual Input  
and Manual Action entries



# Is that all?

- The SIL Calculation is performed within a context of standard SIL evaluation assumptions, such as
  - Sufficient independence exists between the SIF and other functions used in the hazard case the SIF is designed for
  - Functional safety management program meets ISA61511-1 requirements
- The documentation of the SIL calculation should include sufficient SRS information to provide this context

# SRS Info

Site: **SIS-TECH**  
Project ID: **Practice**

Function: **V-101 High DP trip**  
Function ID: **SIF 01**

Welcome,  User Guide

**SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT
<b>TARGETS</b>	8.00E-02	1.00	5.00E-02	20.00	0
<b>RESULTS</b>	5.51E-02	1	5.83E-02	17.14	0
<b>TARGETS MET?</b>	<span style="background-color: green; color: white; padding: 2px;">Met</span>	<span style="background-color: red; color: white; padding: 2px;">Not Met</span>	<span style="background-color: red; color: white; padding: 2px;">Not Met</span>	<span style="background-color: green; color: white; padding: 2px;">Met</span>	<span style="background-color: green; color: white; padding: 2px;">Met</span>

**PFD/STR Breakdown**

PFDavg



Action: 100% (Green)

STR



Action: 100% (Orange)

HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
1	1	1
HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>
0		

Left Right Exit

Calculate and Save

+ Add - Remove Reset

**SRS**

PROCESS HAZARD

DESCRIPTION

DIAGNOSTICS

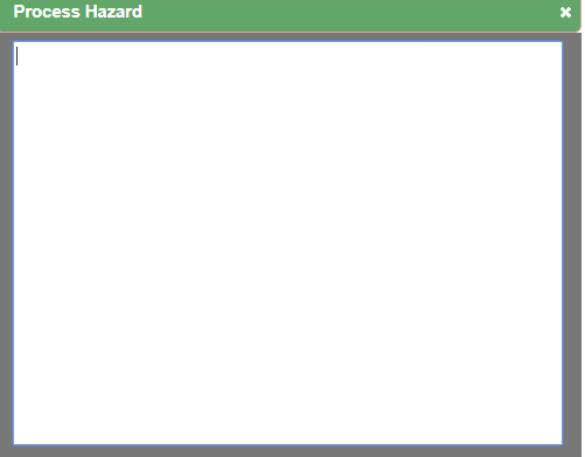
RESET

SHUTDOWN

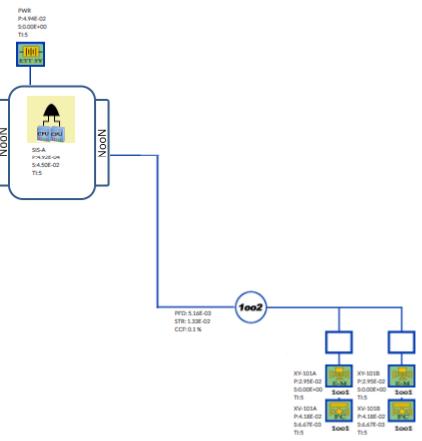
REFERENCE

COMMENTS

**Process Hazard**



Save

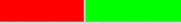
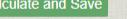


# Done with SIF 01

Site: SIS-TECH      Function: V-101 High DP trip  
 Project ID: Practice      Function ID: SIF 01

Welcome,  User Guide

**SIL SOLVER**

	PFDavg	IL	STR (1/Yr)	MTTFs (Yr)	HFT	PFD/STR Breakdown		HFT <sub>IN</sub>	HFT <sub>LS</sub>	HFT <sub>ACT</sub>
<b>TARGETS</b>	8.00E-02	1.00	5.00E-02	20.00	0		Action	1	1	1
<b>RESULTS</b>	5.51E-02	1	5.83E-02	17.14	0		Logic	HFT <sub>SPT1</sub>	HFT <sub>SPT2</sub>	HFT <sub>MIN</sub>
<b>TARGETS MET?</b>							Other	HFT <sub>MACT</sub>		
						<b>Calculate and Save</b>				

**Exit** 

**SRS**

PROCESS HAZARD

DESCRIPTION

DIAGNOSTICS

RESET

SHUTDOWN

REFERENCE

COMMENTS

**LOGIC SOLVER**

INPUT CONFIGURATION

INPUT DEVICE

ACTION CONFIGURATION

ACTION DEVICE

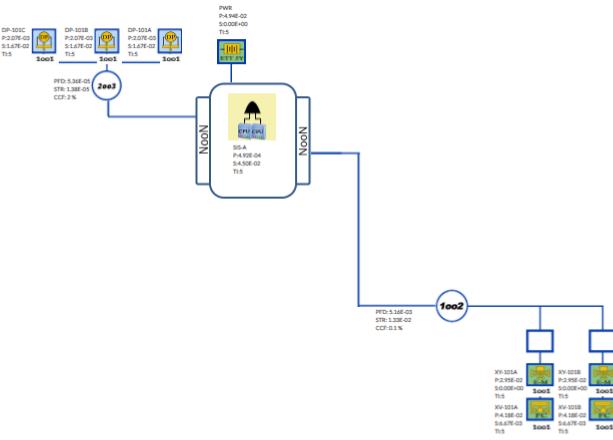
SUPPORT CONFIGURATION

SUPPORT SYSTEM

CUSTOMER DEVICE

MANUAL DEVICE

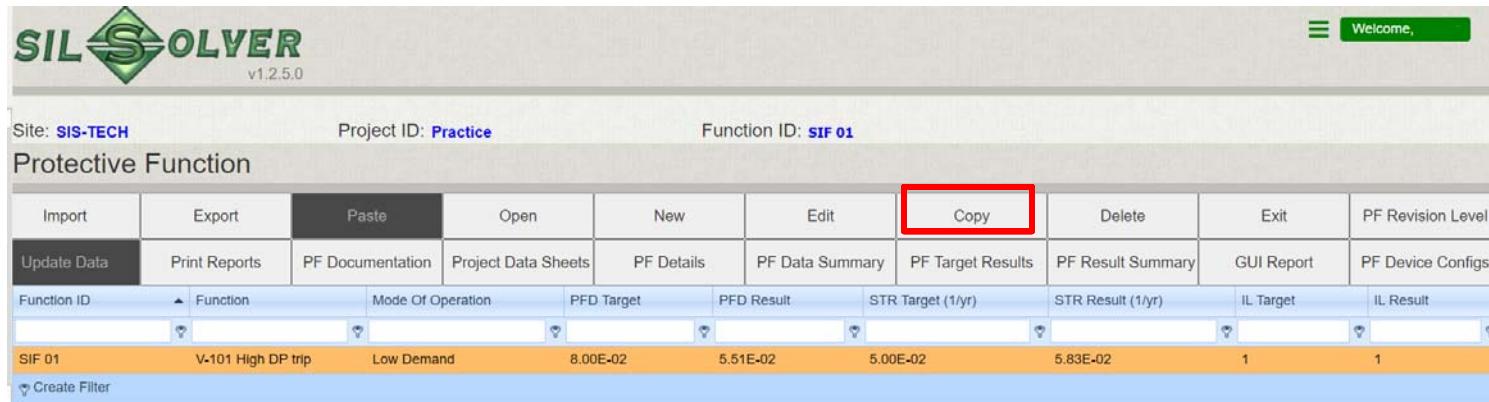
Exit to return to main Protective Function screen for this project



## Second Function

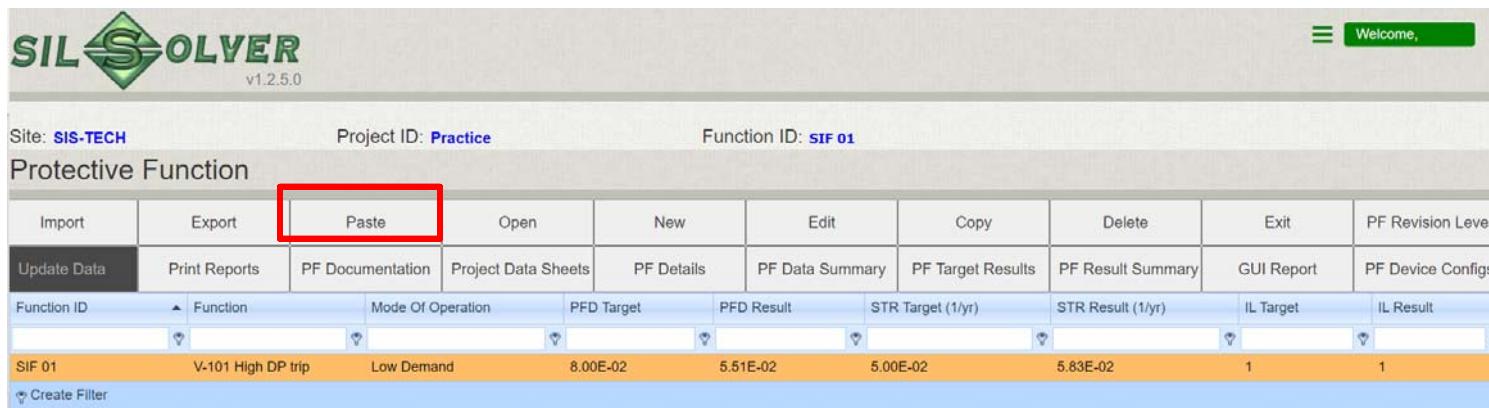
- This project includes V-102 as well
- V-102 has an analogous protective function, SIF 02
- Key difference, SIF 02 uses a single pressure transmitter as the third device, instead of a DP
- Tags: DP-102A/B, PT-102, XV/XY-102A/B

# Copy SIF 01



The screenshot shows the SIL-SOLVER software interface. The top navigation bar includes the logo 'SIL-SOLVER v1.2.5.0', a 'Welcome' button, and a 'Site: SIS-TECH' dropdown. The main title 'Protective Function' is displayed. The toolbar contains buttons for Import, Export, Paste (highlighted with a red box), Open, New, Edit, Copy (highlighted with a red box), Delete, Exit, and PF Revision Level. Below the toolbar is a menu bar with items like Update Data, Print Reports, PF Documentation, etc. The main data area shows a table for 'Function ID: SIF 01' with columns for Function ID, Mode Of Operation, PFD Target, PFD Result, STR Target (1/yr), STR Result (1/yr), IL Target, and IL Result. The data row for SIF 01 is highlighted in orange. A 'Create Filter' link is at the bottom of the table.

From the main Protective Function page, selecting the function to be copied and clicking the Copy button...



The screenshot shows the SIL-SOLVER software interface, similar to the previous one but with a different toolbar configuration. The 'Paste' button in the toolbar is highlighted with a red box. The rest of the interface is identical to the first screenshot, including the 'Protective Function' title, the table for 'Function ID: SIF 01', and the orange-highlighted data row for SIF 01.

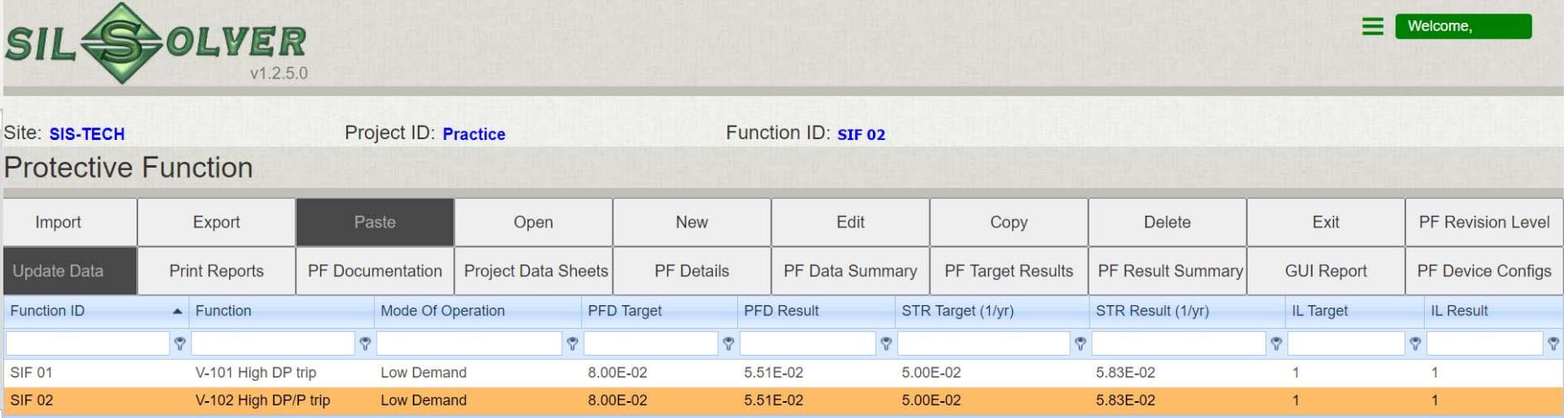
Causes the Paste button to activate...

# Create SIF 02

Clicking the Paste button opens the dialog box to enter the new function ID and description

The screenshot shows the SIL SOLVER software interface. The top bar displays the logo 'SIL SOLVER' and version 'v1.2.5.0'. The top right corner shows a 'Welcome' message. The main menu bar includes 'File', 'Edit', 'View', 'Tools', 'Help', and 'About'. The main window title is 'Protective Function'. The top navigation bar shows 'Site: SIS-TECH', 'Project ID: Practice', and 'Function ID: SIF 01'. The main content area displays a table of protective functions. A 'Protective Function' dialog box is open in the center, containing fields for 'Function ID' (set to 'SIF 02') and 'Function' (set to 'V-102 High DP/P trip'). Below these fields are 'Save' and 'Close' buttons. The table in the background shows columns for 'Function ID', 'Function', 'Mode Of Operation', 'Results', 'PF Result Summary', 'GUI Report', and 'PF Device Configs'. One row is highlighted in orange, showing values: 'SIF 01', 'V-101 High DP trip', 'Low Demand', '5.83E-02', '1', '1', and '1'.

# Address differences in I/O and architecture



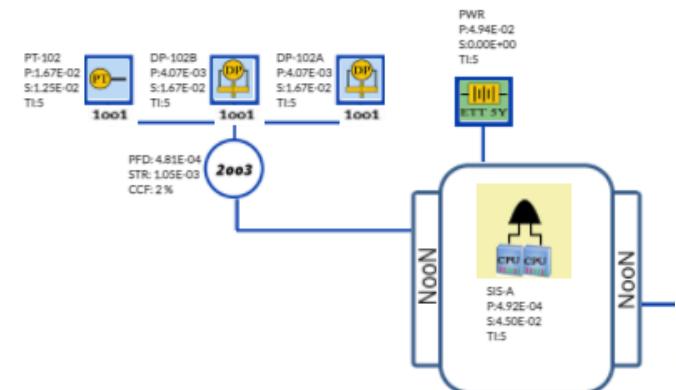
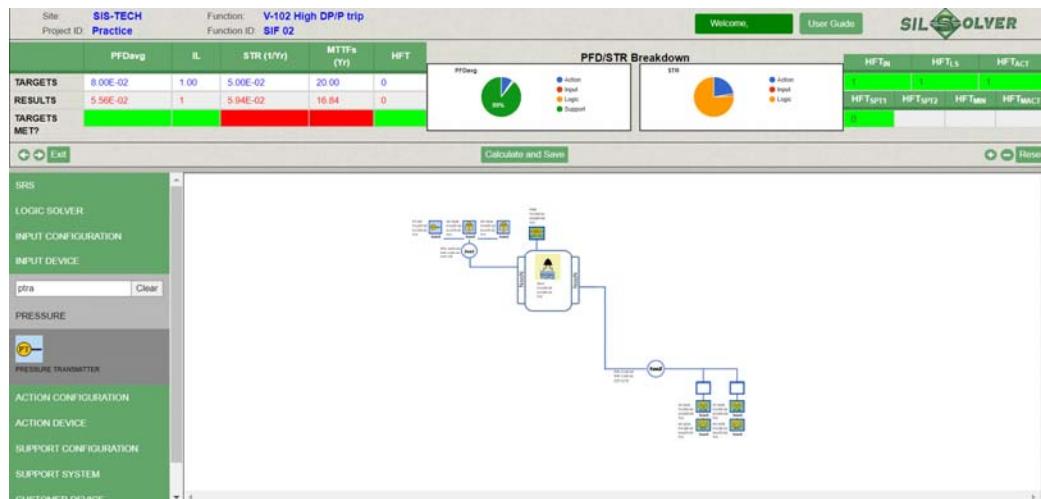
The screenshot shows the SIL SOLVER software interface. The top navigation bar includes the logo 'SIL SOLVER' and version 'v1.2.5.0', a 'Welcome' button, and a menu icon. The main header displays 'Site: SIS-TECH', 'Project ID: Practice', and 'Function ID: SIF 02'. The main content area is titled 'Protective Function' and contains a table with the following data:

Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result
SIF 01	V-101 High DP trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1
SIF 02	V-102 High DP/P trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1

Select and Open the new function  
Update tag ID fields for all devices that are the same

# Modeling diverse sensors

1. Delete the third DP sensor
2. Copy General Pressure transmitter
3. Paste General pressure transmitter to the last box in the 2oo3 input configuration
4. Change Diagnostic level to DC2 for the two DP pressure transmitters and keep the General PT Diagnostic level as NO DC (no device to compare with).



# Partial Stroke Testing of Valves

- For valves, the DC selection can be used to model partial stroke testing

1. Set the diagnostic level to DC1

2. Set the diagnostic interval to partial stroke testing interval

Both fields must be configured for correct use of equation

Configurations:	
Device Tag:	BV1
Proof Testing Interval (yr):	5
Voting:	1001
Subsystem Diagnostic Level:	2

Properties:	
Failure Dangerous Failure Rate (1/yr):	1.67E-02
Failure Spurious Failure Rate (1/yr):	6.67E-03
Common Cause Factor CCF Dual (%):	0.1
Common Cause Factor CCF Triple (%):	0.1
Diagnostic Coverage Simplex DC1 (1/yr):	85.00
Diagnostic Coverage Dual DC2 (1/yr):	85.00
Diagnostic Coverage Triple DC3 (1/yr):	85.00

Maintenance:	
Mean Time to Repair (hr):	720
Diagnostic Interval (hr):	720
Overhaul Interval (yr):	20
Proof Testing Coverage (%):	100
User Specified	<input type="checkbox"/>

PFDavg:	0.00E+000
STR:	0.00E+000

Note:  
Boundary Conditions: Boundary includes spring return, pneumatically-operated ball valve, operating in a standby (dormant) mode of operation. The solenoid is NOT INCLUDED. Safe-state specified is fail closed.

Process Severity Assumption: Clean

Data Source: SIL

# Partial Interim Testing of Sensors

- Sometimes an imperfect test is performed on a sensor at a shorter interval, with a 100% proof test (or complete replacement) performed at a longer interval
- Use the Proof Test coverage and Overhaul interval to model this

Example:  
Sensor installation  
with an 85% test  
performed  
annually with  
100% test or full  
replacement done  
every 10 years

Both fields must be  
configured for correct use  
of equation

**Device**

Device ID: THMLS Device Type: THERMOCOUPLE - LOW STRESS ENVIRONMENT

**Configurations:**

Device Tag: TT1  
Proof Testing Interval (yr): 1  
Voting: 1oo1  
Subsystem Diagnostic Level: NO DC

**Maintenance:**

Mean Time to Repair (hr): 72  
Diagnostic Interval (hr): 0.500  
Overhaul Interval (yr): 10  
Proof Testing Coverage (%): 85  
User Specified

**Properties:**

Failure Dangerous Failure Rate (1/yr): 5.00E-03  
Failure Spurious Failure Rate (1/yr): 4.00E-02  
Common Cause Factor CCF Dual (%): 2  
Common Cause Factor CCF Triple (%): 2  
Diagnostic Coverage Simplex DC1 (1/yr): 60.00  
Diagnostic Coverage Dual DC2 (1/yr): 80.00  
Diagnostic Coverage Triple DC3 (1/yr): 90.00

PFDavg: 0.00E+000  
STR: 0.00E+000

**Note:**

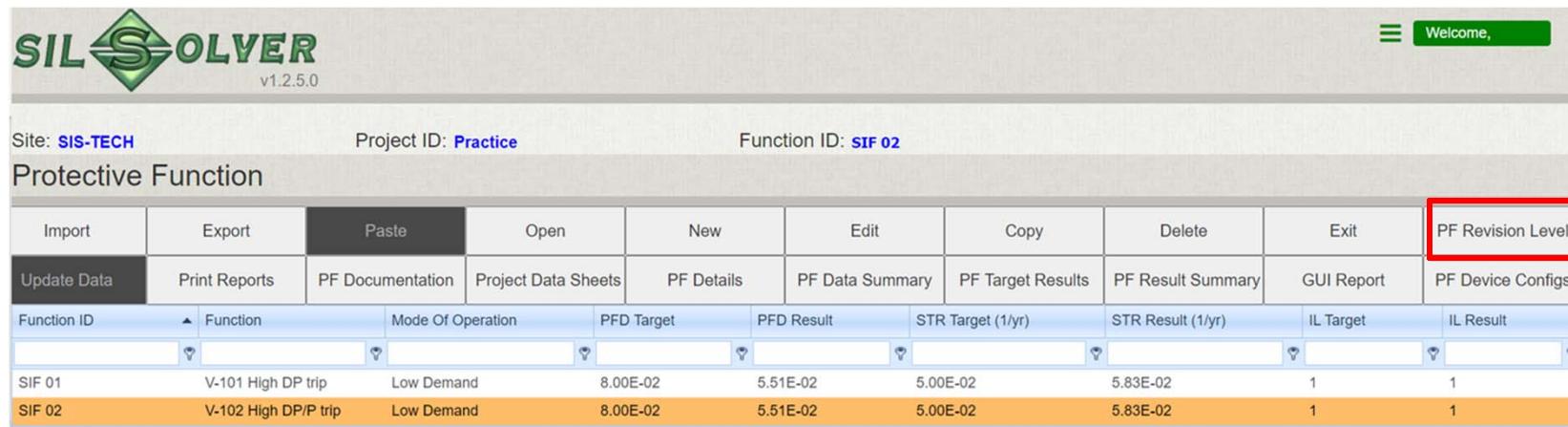
Boundary Conditions: Boundary includes thermocouple element and insulators, terminal head and protecting tube or thermowell.  
Process Severity Assumption: Clean  
Implementation Limitations and Exclusions: A low stress environment does not include the following: high vibration application

Data Source: SIL

### **3. EDITING, COPYING OR DELETING AN EXISTING PROJECT**

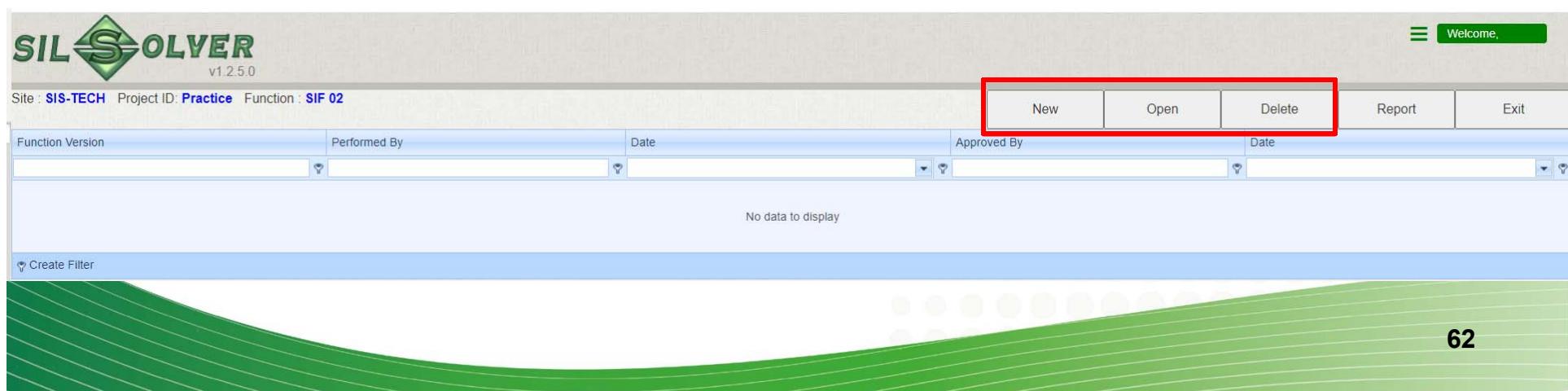
# Function Revision Info

To create/edit function revision information, select the function and click “function Revision level” to get to the editing page, where you can create a new function revision entry, open to edit it, or delete an entry.



The screenshot shows the SIL SOLVER software interface. At the top, it displays "SIL SOLVER v1.2.5.0" and "Welcome". Below that, it shows "Site: SIS-TECH", "Project ID: Practice", and "Function ID: SIF 02". The main area is titled "Protective Function". A navigation bar at the top has buttons for Import, Export, Paste, Open, New, Edit, Copy, Delete, Exit, and "PF Revision Level" (which is highlighted with a red box). Below this is a toolbar with buttons for Update Data, Print Reports, PF Documentation, Project Data Sheets, PF Details, PF Data Summary, PF Target Results, PF Result Summary, GUI Report, and PF Device Configs. The main table displays data for two SIFs:

Function ID	Function	Mode Of Operation	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result
SIF 01	V-101 High DP trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1
SIF 02	V-102 High DP/P trip	Low Demand	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1



The screenshot shows the SIL SOLVER software interface for the "Function Revision Info" page. At the top, it displays "SIL SOLVER v1.2.5.0" and "Welcome". Below that, it shows "Site: SIS-TECH", "Project ID: Practice", and "Function: SIF 02". The main area has buttons for New, Open, Delete, Report, and Exit. Below these buttons is a table with columns for "Function Version", "Performed By", "Date", "Approved By", and "Date". The table is currently empty, showing "No data to display". At the bottom, there is a "Create Filter" button.

# Copying or deleting a project works like copying or deleting a function

Activates when a project is copied

Site	Location	Project ID	Project Name
SIS-TECH	Pretend location 1	BIG FUNCS1	Fully populated
TEST	Pretend site 2	CASE 4	Case 3 for testing import-export
SISTC	Pretend location 1	COMPLEX	Complex Architectures
BACK	Houston Texas	FLOW1	Reverse flow case

Select the project

Copy → Make a copy of the selected project and after that a paste button will appear, when “paste” is click a window will pop up for you to enter new project designation.

Delete → Delete the selected project

## 4. GENERATING REPORTS

# Project Report generation

Print a single report for a whole project by selecting project and click relevant report tab...

or use “Print Reports” and select multiple reports at once

When the project reports are printed, the report will include project revision information

The screenshot shows the SIL-SOLVER software interface. At the top, there is a menu bar with 'Import', 'Export', 'Paste', 'Open', 'New', 'Edit', 'Copy', 'Delete', 'Exit', and 'Project Revision'. The 'Print Reports' button is highlighted with a red box. Below the menu is a toolbar with 'DBF Import', 'Print Reports', 'PF Documentation', 'Project Data Sheets', 'PF Details', 'PF Data Summary', 'PF Target Results', 'PF Result Summary', 'GUI Report', and 'PF Device Configs'. The 'Print Reports' button is also highlighted with a red box. A 'Select Reports to Print' dialog box is open in the foreground, listing report options: 'PF Documentation', 'Project DataSheets', 'PF Details', 'PF Data Summary', 'PF Target Results', and 'PF Results Summary'. At the bottom of the dialog are 'Print' and 'Close' buttons. The background shows a table with project data and a list of sites.

Site	Location	Project ID
TEST	Pretend site 2	CASE 4
SISTC	Pretend location 1	COMPL
BACK	Houston Texas	FLOW1

Project ID: BIG FUNCS1

Site: SIS-TECH

Projects

Project Name: BIG FUNCS1

Project Description: A simulated project for testing import-export, architectures, and flow case.

Report Options:

- PF Documentation
- Project DataSheets
- PF Details
- PF Data Summary
- PF Target Results
- PF Results Summary

Print Close

# Function Report generation

Print a report for an individual function by going to the function list for that project, select a function and click relevant report tab ...

or use “Print Reports” and select multiple reports at once

When the function level reports are printed, the report will include function revision information

Site: SIS-TECH Project ID: Practice Function ID: SIF 02

Function ID	PFD Target	PFD Result	STR Target (1/yr)	STR Result (1/yr)	IL Target	IL Result
SIF 01	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1
SIF 02	8.00E-02	5.51E-02	5.00E-02	5.83E-02	1	1

## 5. IMPORTING/EXPORTING

- Project export from SIL Solver® Enterprise
- SIL Solver® Enterprise project import
- Function Export/Import
- Importing SIL Solver® desktop application files into SIL Solver® Enterprise (DBF Import)

# Import and export

- The way to share a project/function between **SIL Solver® Enterprise** users



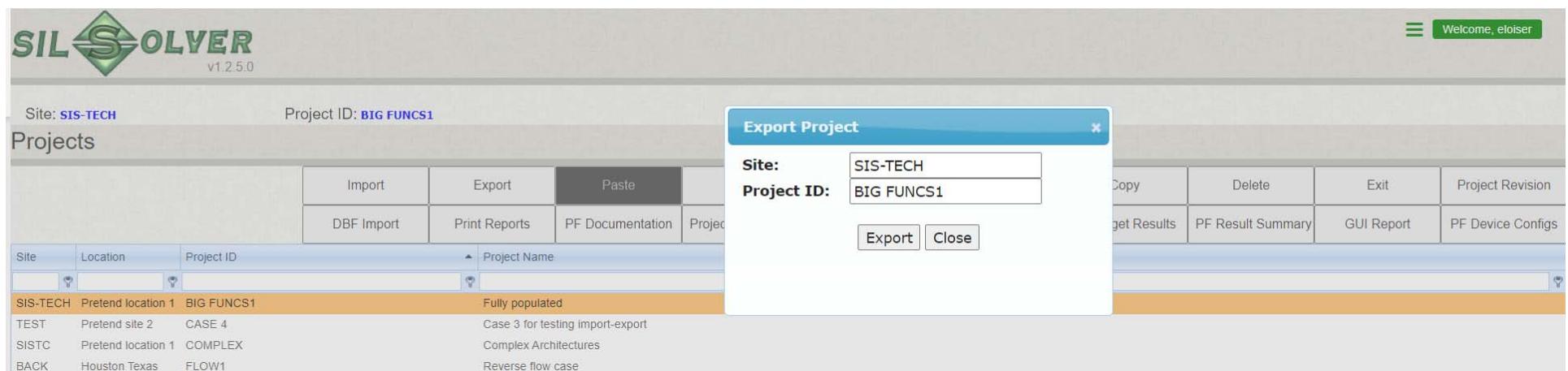
## DBF Import

- The way to transfer a project from a **SIL Solver®** desktop program into **SIL Solver® Enterprise**

# Project export

To export a project:

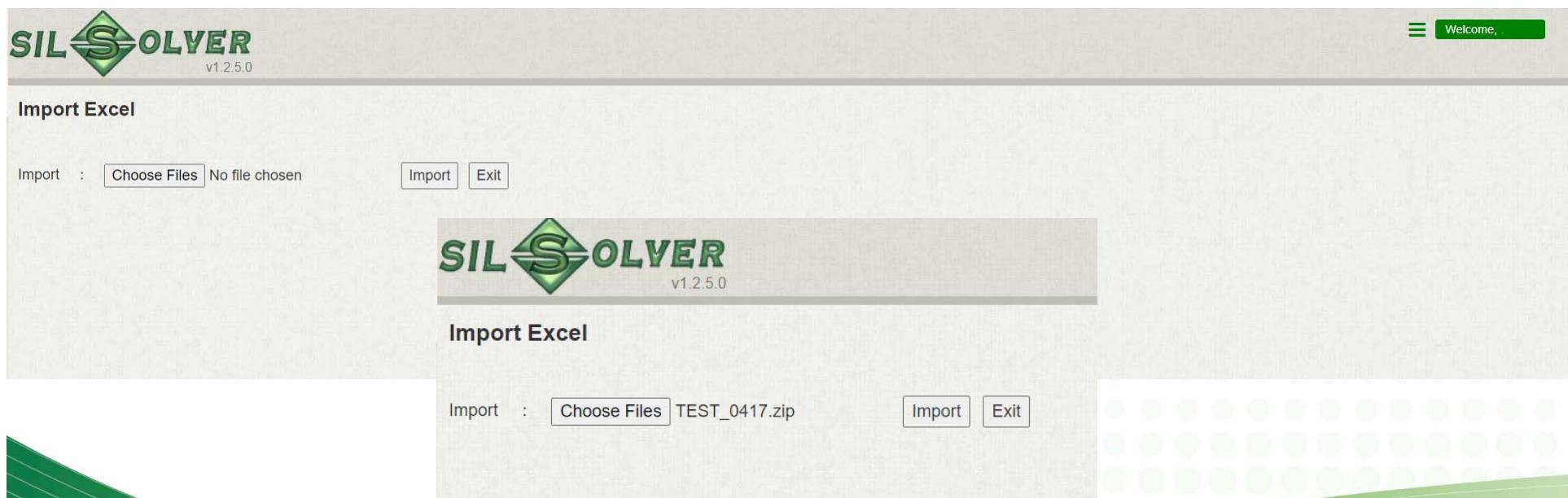
1. Go to the project page
2. Select the project
3. Click “Export” – confirm the Site and ProjectID and click Export in dialog
4. A \*.sifprj file of the project will be created in the download folder



# Project import

To import a previously exported SIL Solver® Enterprise project:

1. Go to the project page
2. Click “Import”, which will open the import page
3. Click “choose files”, then change the directory to the project (\*.silprj) file you want to import
4. Click Import and the tool will attempt to import the file



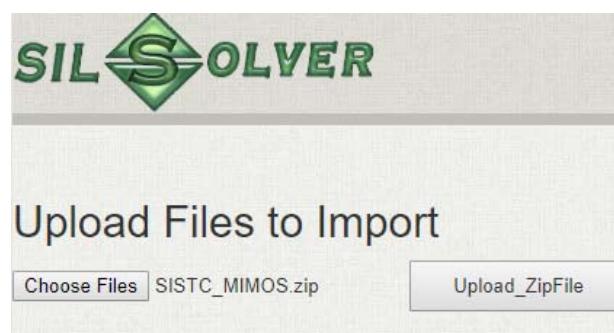
# **SIL Solver® Enterprise Function export/import**

To export/import an Enterprise function is the same as for a project, the only difference is that the operations are on the function level page and the exported file extension is \*.silsif

# DBF import to Enterprise

To import a **project** from SIL Solver® **desktop** versions into SIL SOLVER® Enterprise

1. Go to the folder where you saved the desktop software project
  - For example the default directory: C:\SILSolver\_Projects
2. Make sure the project folder name is correct, the files in the folder have not been modified, and no additional files have been added to the folder
3. Zip the project folder that you want to import to SIL Solver® Enterprise
4. Go to the SIL Solver® Enterprise project page
5. Click “DBF import” button to open the DBF import page
6. Click Choose Files to browse to the Zipped project folder
7. Click “Upload\_ZipFile”
8. When the upload is ready, click import
9. A message will pop up when the import is done, including any warnings



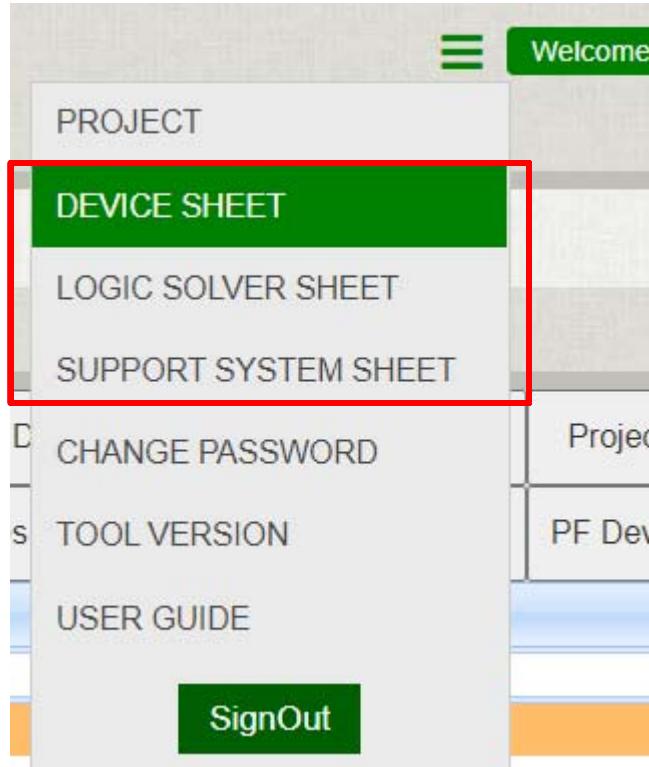
## CAUTION: Know the version the work needs to be performed in!

- Projects/functions from older versions **can** be imported into a newer version of SIL Solver® Enterprise.
- However, projects and functions from a newer version **cannot** be imported back into an older version of SIL Solver® Enterprise or into the desktop application.

## 6. DATASHEETS

- Device
- Logic Solver
- Support System

# Accessing Datasheets



**Device Sheet**

Device ID: DPTR Device Type: DIFFERENTIAL PRESSURE TRANSMITTER

**Configurations:**

- Device Tag:
- Proof Testing Interval (yr):
- Voting:
- Subsystem Diagnostic Level:

**Maintenance:**

- Mean Time to Repair (hr):
- Diagnostic Interval (hr):
- Overhaul Interval (yr):
- Proof Testing Coverage (%):
- User Specified

**Properties:**

- Failure Dangerous Failure Rate (1/yr): 8.00E-03
- Failure Spurious Failure Rate (1/yr): 1.67E-02
- Common Cause Factor CCF Dual (%): 2
- Common Cause Factor CCF Triple (%): 2
- Diagnostic Coverage Simplex DC1 (1/yr): 60
- Diagnostic Coverage Dual DC2 (1/yr): 80
- Diagnostic Coverage Triple DC3 (1/yr): 90

**Note:**

Boundary Conditions: Boundary includes the electronic transmitter, sensing diaphragm and process connection.

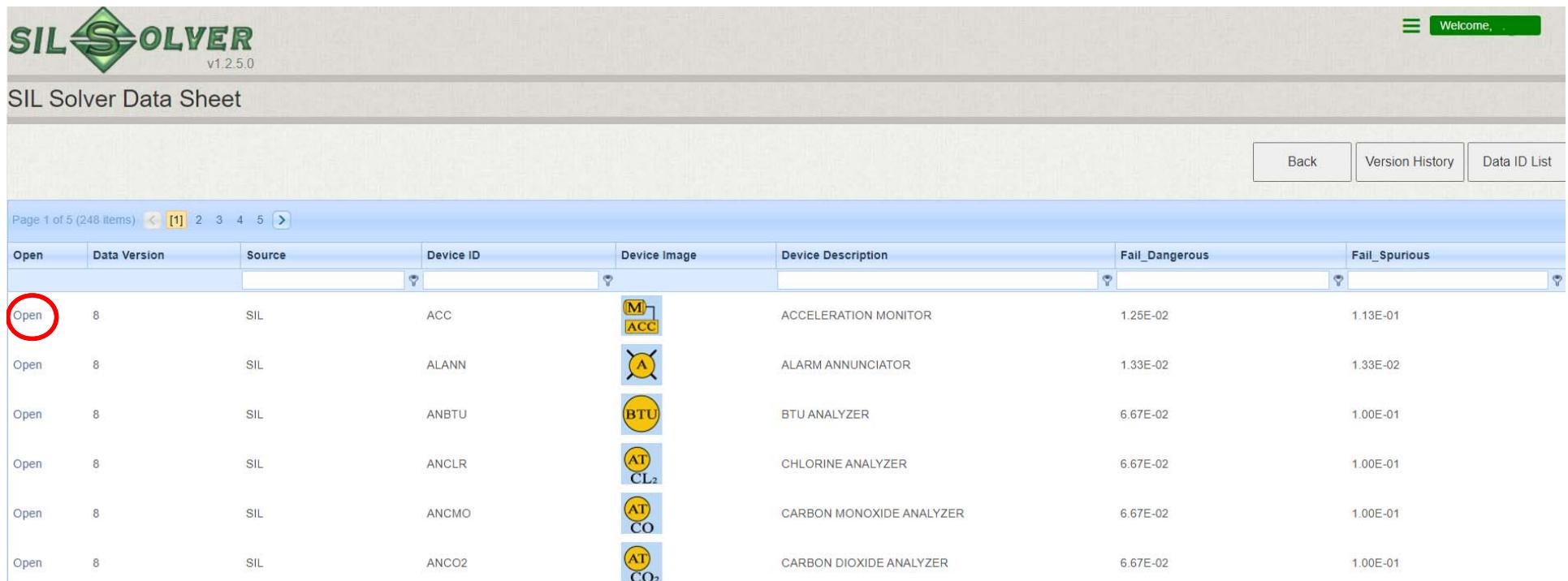
Process Severity Assumption: Clean

Implementation Limitations and Exclusions: No limitations beyond standard assumptions (see SIL Solver Enterprise User Manual).

Data Source: SIL

Access from main page dropdown menu or for individual devices right-click when in device list on GUI

# Device datasheet list



Open	Data Version	Source	Device ID	Device Image	Device Description	Fail_Dangerous	Fail_Spurious
Open	8	SIL	ACC		ACCELERATION MONITOR	1.25E-02	1.13E-01
Open	8	SIL	ALANN		ALARM ANNUNCIATOR	1.33E-02	1.33E-02
Open	8	SIL	ANBTU		BTU ANALYZER	6.67E-02	1.00E-01
Open	8	SIL	ANCLR		CHLORINE ANALYZER	6.67E-02	1.00E-01
Open	8	SIL	ANCMO		CARBON MONOXIDE ANALYZER	6.67E-02	1.00E-01
Open	8	SIL	ANCO2		CARBON DIOXIDE ANALYZER	6.67E-02	1.00E-01

- Click open (far left) to look at the datasheet for that device

# Device Datasheet

**SIL SOLVER**  
v1.2.5.0

Welcome,  

SIL Solver Data Sheet

[DATA SHEET](#) [Back](#)

DataSource	SIL	Device Id	ACC	 	Device Type	ACCELERATION MONITOR
Fail Dangerous Failure Rate(1/yr)	1.25E-02	Fail Spurious Failure Rate(1/yr)	1.13E-01	Diagnostic Interval(hrs)	0.00	
Mean Time to Repair(hrs)	72	Common Cause Factor Dual Mode(%)	2.00	Diagnostic Coverage in Simplex Mode(%)	0	
Common Cause Factor Triple Mode(%)	2.00	Common Cause Factor Triple Mode(%)	2.00	Diagnostic Coverage in Dual Mode(%)	0	
				Diagnostic Coverage in Triplicated Mode(%)	0	

**Notes**

Boundary Conditions: Boundary includes probe/cable assembly and monitor with alarm relay or analog output.

Process Severity Assumption: N/A

Implementation Limitations and Exclusions: For redundant configurations, separate probes and mounting brackets must be used for each monitor. If dual channel monitors are used, the appropriate output voting should be selected from the table.

"D" configuration assumes that each monitor circuit is provided with a means to detect spurious activation of a circuit. "D" configurations can be used when the analog outputs from the monitor are connected to the SIS, providing signal deviation alarming, OR when the relay output from the monitor is used to generate a fault alarm to the operator HMI. This diagnostic does not benefit the PFD so no diagnostic coverage credit is taken in the analysis.

# Same for Logic Solvers and Support Systems

**SIL SOLVER**  
v1.2.5.0

SIL Solver Logic Solver Sheet

Back Version History Logic ID List

Open	Data Version	Source	Logic Solver ID	Logic Solver Image	Logic Solver Description
Open	8	SIL	DMDIO		GENERIC 2004D DUAL MP, DUAL I/O
Open	8	SIL	DMSIO		GENERIC 1002D DUAL MP, SIMPLEX I/O
Open	8	SIL	NSDD		NON-SC D/D
Open	8	SIL	NSDS		NON-SC D/S
Open	8	SIL	NSSS		NON-SC S/S
Open	8	SIL	RELFC		RELAY - FAIL TO CLOSE
Open	8	SIL	RELFO		RELAY - FAIL TO OPEN

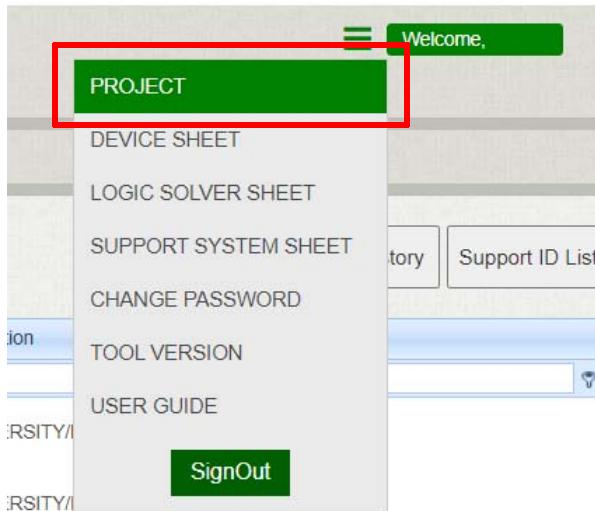
**SIL SOLVER**  
v1.2.5.0

SIL Solver Support System Data Sheet

Back Version History Support ID List

Open	Data Version	Source	Support System ID	Support System Image	Support System Description
Open	8	SIL	IADRMS		INSTRUMENT AIR-DIVERSITY/MONITORED RECEIVER
Open	8	SIL	IADRS		INSTRUMENT AIR-DIVERSITY/RECEIVER
Open	8	SIL	IADS		INSTRUMENT AIR-COMPRESSOR DIVERSITY
Open	8	SIL	IANDVS		INSTRUMENT AIR-NO DIVERSITY
Open	8	SIL	IAWRCS		INSTRUMENT AIR-RECEIVER

# Returning to Project View



Click Project on the dropdown menu or use Back buttons on the datasheet pages

A screenshot of the 'SIL SOLVER' software interface. The title bar says 'SIL SOLVER v1.2.5.0'. The main title is 'SIL Solver Support System Data Sheet'. In the top right corner, there is a 'Welcome,' button. Below the title, there is a table with columns: 'Open', 'Data Version', 'Source', 'Support System ID', 'Support System Image', and 'Support System Description'. At the bottom right of the table, there are three buttons: 'Back' (highlighted with a red box), 'Version History', and 'Support ID List'.

# Adding a Custom Datasheet

- From GUI page, go to bottom of lists to the Customer Device section
- Left-click the header** for the type of sheet to be created
- Enter the data for the new custom device and Save
  - Do not use special characters or spaces in the Data Source or Device ID fields
  - If desired, browse to a new image for this device to replace the default

The screenshot shows the SIL SOLVER software interface. The main window displays a PFD/STR Breakdown chart and various failure rate tables. On the left, a sidebar lists configuration sections: SRS, LOGIC SOLVER, INPUT CONFIGURATION, INPUT DEVICE, ACTION CONFIGURATION, ACTION DEVICE, SUPPORT CONFIGURATION, SUPPORT SYSTEM, and CUSTOMER DEVICE. The CUSTOMER DEVICE section is currently active, as indicated by the red circle around the 'DEVICE' button in the sidebar. A configuration dialog box is overlaid on the main window, titled 'Customer Device'. It contains fields for Data Source, Device Id, Device Type, and various failure rate and coverage parameters. A note at the bottom of the dialog box states 'Data Source is required.'

Once created, custom datasheets cannot be edited!

## 7. TROUBLESHOOTING

- Lost passwords
- Screen settings
- Import challenges
- Disconnects/timing out

# Troubleshooting: Lost Username or Password

- Individual username and password assignment is performed by the company that purchases the license through the ADMIN account for that license

# Troubleshooting: Screen Settings

- Some SIL Solver® Enterprise application screen content may be obscured if
  - Window is not maximized
  - Zoom >100% is used on the window

# Troubleshooting: Import Challenges

- When importing, confirm the final function successfully transferred into SIL Solver® Enterprise
- If warnings are generated during the import, there is an import log file that can be downloaded
- For DBF Import, use the Windows native “Send to” “Compressed (zipped) folder” feature, not any other zip application

# Troubleshooting: Disconnects/Timing Out

- Do not delay too long before saving.
- SIL Solver® Enterprise will time out after a period of inactivity.
- A warning screen will pop up during the last minute.
  - Click “Yes” to extend the session

