

## ■ PROBLEM

*Industrial processing facilities are coming under mounting pressure to adhere to regulations requiring them to monitor their safety performance, produce detailed reports and support the ongoing assessments of their safety regime. The challenge is to determine if real-time operating data supports the analysis, design, and assumptions used in the safety design. This is a manual process that can be difficult to manage effectively e.g. what happens when something changes, or the initial assumptions just aren't accurate? What about new risks, that were not considered initially, but occur during plant operation? Omissions in the safety performance evidence can lead to punitive measures and enforcement notices from the regulatory authorities and increases the exposure to liability with major business impact. Industrial processes may include large and/or complex Safety Instrumented Systems, the performance of which has to be assessed. A means to efficiently monitor these systems in an effective way which satisfies both technical authorities and regulators is desirable.*

## ■ SOLUTION

Exaquantum Safety Function Monitoring (Exaquantum/SFM; hereafter referred to as 'SFM') is Yokogawa's Safety Function Monitoring solution. SFM is a management tool developed to monitor safety performance in response to the growing pressure from regulations and legislation regarding safety reporting and assessments. SFM collects, processes and presents safety data to enable monitoring and analysis of key safety KPIs such as SIF (Safety Instrumented Functions) activations, IPLs (Independent Protection Layers), SIF maintenance (Proof testing), initiating causes and overrides. This information assists users to:

- Quickly identify assumptions that fail to meet design targets
- Verify operational safety performance
- Identify safety issues
- Facilitate the recording of new risk during plant operation
- Improve safety solution designs and eliminate risk from the business
- Maintain the validity of the safety system

## ■ BENEFITS

### **Improve Safety**

To provide the data and tools necessary to improve the safety design philosophy or make changes to the safety philosophy throughout the plant lifecycle.

### **Streamline Safety Compliance**

To automatically collect and present safety performance information via a single access point that reduces manual overheads and errors, which simplifies compliance to safety standards.

### **Optimize Safety Instrumented Systems (SIS) Costs**

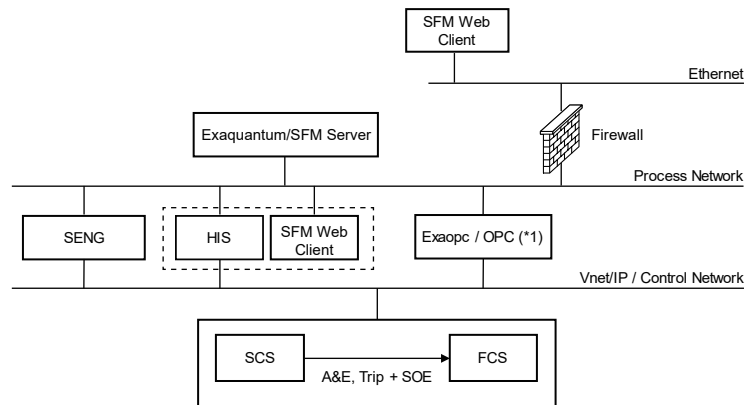
To optimize OPEX costs of maintaining safety excellence; an over-engineered SIS may exceed safety requirements but not be cost-effective, similarly an under engineered SIS maybe cost effective but may compromise safety.

### **Reduce Operational Risk**

To validate the assumption made during the design phase and collection of new risk during operation.

## ■ SYSTEM CONFIGURATION

System Configuration described as follows.



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\*1: SFM can handle 3rd Party OPC systems as long as they can generate A&E messages for the monitored events via OPC A&E and the A&E messages are descriptive enough to allow a clear identification of the event.

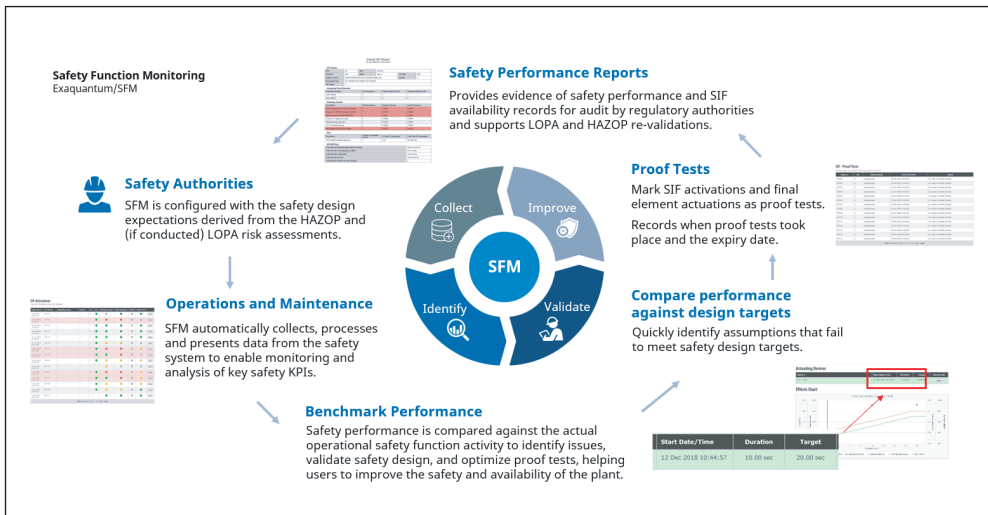
## ■ KEY FEATURES

- Automatic collection and display of safety events - Reduce manual overhead and errors providing dependable information for LOPA and HAZOP revalidations.
- Visualize safety device performance that fail to meet targets - Degradation of hardware, increased awareness of safety risks and highlights when safety performance integrity has been compromised.
- Capture SIF response time and Final Elements transitions time - Determine whether the SIF and Final Element operate within designed response time.
- Mark SIF activations and Final Element actuations as proof tests, as well as associating proof test types with SIFs and Final Elements - Optimizes proof tests by conveniently tracking when trips occur on Final Element (valves, actuators) and recording data before, during and after a trip which can be evaluated to ensure every device performed as intended.
- Monitor expiry dates of proof tests on SIFs and Final Elements - Records when proof tests took place and the expiry date, providing the Safety Engineer with a quick way to maintain the validity of the safety system.
- Assign initiating causes (including new cause) to SIF activations - Facilitates the revalidation of the Process Hazard Analysis (PHA) to take into account actual events that have occurred during plant operations.
- Validate demand frequency - SIL re-classification.
- Capture SIF availability - Prove availability of safety system in plant (good for audits by authority or insurance).
- Easily generate safety performance reports - Provides evidence of safety performance and SIF availability records for audit by regulatory authorities and supports LOPA and HAZOP re-validations.
- Aids the validation of Logic Solver application of safety instrumented systems (SIS) and supports revalidation of HAZOP/LOPA - Cause and effect matrix enables logic verification of SIF activations with associated Final Element actuations.
- Integrates with HAZOP/LOPA - Allows the export of HAZOP/LOPA results from PHA-Pro to SFM.

## ■ INTRODUCTION

SFM is Yokogawa’s plant-wide safety monitoring solution that provides analysis and reporting, helping customers monitor the performance effectiveness of defined SIS (Safety Instrumented Systems) against their design targets. SFM supports the IEC 61511 operation and maintenance process by documenting historical records and associating proof tests to SIF activations and Final Element actuations:

- Automatically collects safety statistics to be used for Safety Instrumented Function (SIF) improvement.
- Collects events from real-time operating data to ensure that risk levels remain tolerable on a regular basis.
- Provides evidence of safety performance and SIF availability records for audit by regulatory authorities.
- The designed safety performance is compared against the actual operational safety function activity to identify issues, validate safety design, and optimize proof test scheduling, in the process helping users to improve the safety and availability of the plant.
- Facilitates the revalidation of the Process Hazard Analysis (PHA) to take into account events that have occurred during plant operations but are not yet included in the safety design.



## ■ CAPABILITIES

### Data Collection

The underlying Exaquantum historian provides SFM with a powerful, integrated, cost-effective platform for collecting and storing data from different sources via OPC DA, OPC A&E and OPC HDA independent of the system vendor. OPC HDA has been expanded within Exaopc (Yokogawa’s OPC server) to allow historical Alarms & Events to be recovered following a communications interruption.

### Risk Assessment (HAZOP, LOPA)

SFM is configured with the safety design expectations derived from the HAZOP and (if conducted) LOPA risk assessments. This information is compared against the actual operational safety function activity that assists users in highlighting issues, helping to support the validation of safety demand rates and can help to optimize test scheduling. These findings can then be checked and verified against the base data within the defined SIS.

### Web User Interface

SFM provides secure web based displays and reports for user access from local or remote locations and does not require any client software to be installed.

### SIF KPI's

An overview of user filtered SIF KPIs is provided, allowing users to monitor and view the following information:

- SIF Overview by Safety Integrity Level
  - Number of SIFs
  - Number of SIF activations
  - Number of SIF output faults (device failures)
- ICSS (Integrated Control and Safety System) IPL Overview by Integrity Level showing both the number of currently inactive and user filtered date/time inactive IPLs
- MOS (Maintenance Override Switch) Overview by Integrity Level showing both the number of SIFs currently in Maintenance Override and user filtered date/time SIF Maintenance Overrides

**Exaquantum/SFM**  
Safety Function Monitoring

Home SIFs SIF Activations Proof Testing Initiating Causes Cause and Effect Reports Administration

Print 12 Jul 2021 14:59:00

Start Date/Time: 5 Jul 2020 13:00:00  
End Date/Time: 5 Jul 2021 13:00:00  
LOPA Phases: [Dropdown]

RPU: [Dropdown]  
SITE: [Dropdown]  
FACILITY: [Dropdown]  
AREA: [Dropdown]  
SYSTEM: [Dropdown]  
Apply

### SIF Overview

SIL	Total SIFs	Activations	Output Faults
3	1	3	0
2	73	17	7
1	5	6	5
a	5	8	0
0	2	2	0
<b>Totals</b>	<b>86</b>	<b>36</b>	

### ICSS IPL Overview

SIL	Currently Inactive	In Period
3	0	0
2	0	0
1	0	0
a	0	0
0	0	0
<b>Totals</b>	<b>0</b>	<b>0</b>

### MOS Overview

SIL	Currently Active	In Period
3	0	0
2	0	0
1	0	0
a	0	0
0	0	0
<b>Totals</b>	<b>0</b>	<b>0</b>

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**Identification of SIF Activations**

SFM provides comprehensive Alarm & Events monitoring capabilities to assist management in the identification of SIF Activations. These activations are then converted into Reports, Overview screens and SIF Activation lists, all of which provide users with a clear picture as to which SIFs have activated, and more importantly, which activations can be assessed and verified against the SIS base data.

**Exaquantum/SFM**  
Safety Function Monitoring

Home SIFs SIF Activations Proof Testing Initiating Causes Cause and Effect Reports Administration

Print Export Results 7 Jun 2023 11:14:00

Start Date/Time: 1 Jan 2021 00:00:00  
End Date/Time: 31 Dec 2035 00:00:00  
LOPA Phases: [Dropdown]

RPU: [Dropdown]  
SITE: [Dropdown]  
FACILITY: [Dropdown]  
AREA: [Dropdown]  
SYSTEM: [Dropdown]  
Apply

SIF Name: [Text]  
SIF Parent Name: [Text]  
SIL Rating: [Dropdown]  
SIF Response Time Status: [Dropdown]  
Final Element Status: [Dropdown]  
Verification Status: [Dropdown]  
Proof Test Status: [Dropdown]  
 Has parent cause  
 Hide offline SIF Activations  
 Exclude Active Maintenance Override

### SIF Activations

1 Jan 2021 00:00:00 to 31 Dec 2035 00:00:00

Date/Time	SIF Name	Initiating Cause	Parent	SIL	IPD	Response Time	Final Elements	Verify	Proof Test	View
16 Nov 2021 14:49:52	SIF-02	---	---	0	●	●	●	●	●	View
16 Nov 2021 13:49:50	SIF-02	---	---	0	●	●	●	●	●	View
18 Nov 2021 14:49:50	SIF-02	---	---	0	●	●	●	●	●	View
18 Nov 2021 13:49:50	SIF-02	---	---	0	●	●	●	●	●	View
26 Oct 2021 03:00:00	SIF-01	---	---	0	●	●	●	●	●	View
20 Jul 2021 05:06:50	SIF-70	---	---	2	●	●	●	●	●	View
2 Jul 2021 10:00:00	SIF-01	---	---	0	●	●	●	●	●	View
15 Jun 2021 12:00:00	SIF-22	A XXV-0311025 fails closed	---	2	●	●	●	●	●	View
15 Jun 2021 11:00:00	SIF-22	---	---	2	●	●	●	●	●	View
15 Jun 2021 11:00:00	SIF-22	---	---	2	●	●	●	●	●	View
12 Jun 2021 15:00:00	SIF-22	Example - Inconsistent Instrument Reading	---	2	●	●	●	●	●	View
12 Jun 2021 14:00:00	SIF-22	Example - Valve Limit switch Failure or Valve fails to close	---	2	●	●	●	●	●	View
12 Jun 2021 13:00:00	SIF-22	Example - Valve Failure	---	2	●	●	●	●	●	View
12 Jun 2021 12:00:00	SIF-22	Example - Valve Degradation	---	2	●	●	●	●	●	View
12 Jun 2021 11:00:00	SIF-22	Example - Ideal Scenario - Baseline	---	2	●	●	●	●	●	View

First Previous 1 2 3 4 5 ... 15 16 Next Last

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### SIF Activation Analysis

When SIF Activations take place, SFM records key associated data that can be used to better understand the effect of the activation.

SFM records the following information:

- Associated Final Element transitions and travel times to determine the travel times of the Final Element when activated, versus the expected design times as defined in the safety design.
- SIF response time is used in the association of Final Element to a SIF Activation.
- Related process information (pressure, temperature, etc.) is recorded and trended before, during and following the activation. This process information can be compared against baseline data to show variations in the profile signature of any process data deviations.
- Final Element starts and stops are overlaid onto process data trends making it easy to view changes in trends before and during device transitions.

**SIF Activation Details for SIF-22**  
Date/Time: 15 Jun 2021 12:00:00 Response Time: 3.950 sec Target Time: 3.000 sec  
Initiating Cause:

Causes Effects Actuation History

Print Export Results 12 Jul 2021 15:10:01

Start Date/Time: 7 Dec 2017 00:00:00  
End Date/Time: 6 Dec 2022 00:00:00  
LOPA Phases: [dropdown]  
Final Elements:  Device-19,  Device-27,  Device-53  
Final Element Status: [dropdown]  
Type: [dropdown]  
Use as Proof Test: [dropdown]  
Apply

#### Actuating Final Elements

7 Dec 2017 00:00:00 to 6 Dec 2022 00:00:00

Date/Time	Name	Initiating SIF	Type	Target	Actual	Status	Proof Test
15 Jun 2021 12:00:00	Device-19	SIF-22	SIF	3.000 sec	2.250 sec	●	●
15 Jun 2021 12:00:00	Device-27	SIF-22	SIF	3.000 sec	3.000 sec	●	●
15 Jun 2021 12:00:00	Device-53	SIF-22	SIF	3.000 sec	3.450 sec	●	●
15 Jun 2021 11:00:00	Device-19	SIF-22	SIF	3.000 sec	1.500 sec	●	●
15 Jun 2021 11:00:00	Device-27	SIF-22	SIF	3.000 sec	2.000 sec	●	●
15 Jun 2021 11:00:00	Device-53	SIF-22	SIF	3.000 sec	2.250 sec	●	●
12 Jun 2021 15:00:00	Device-19	SIF-22	SIF	3.000 sec	1.500 sec	●	●
12 Jun 2021 15:00:00	Device-27	SIF-22	SIF	3.000 sec	2.000 sec	●	●
12 Jun 2021 15:00:00	Device-53	SIF-22	SIF	3.000 sec	2.250 sec	●	●
12 Jun 2021 14:00:00	Device-19	SIF-22	SIF	3.000 sec	NO END	●	●
12 Jun 2021 14:00:00	Device-27	SIF-22	SIF	3.000 sec	2.000 sec	●	●
12 Jun 2021 14:00:00	Device-53	SIF-22	SIF	3.000 sec	2.250 sec	●	●
12 Jun 2021 13:00:00	Device-19	SIF-22	SIF	3.000 sec	1.500 sec	●	●
12 Jun 2021 13:00:00	Device-27	SIF-22	SIF	3.000 sec	2.000 sec	●	●
12 Jun 2021 13:00:00	Device-53	SIF-22	SIF	3.000 sec	4.750 sec	●	●

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### SIF Activation Verification

SFM can be used as a mechanism to show which SIFs have been activated, which can then be verified against the SIS base data. This verification process establishes the SIF Activation reason(s), which is also known as the 'Initiating Cause'. The Initiating Cause(s) are derived from the safety design and imported into SFM. When an Initiating Cause has not been identified in the safety design, SFM allows a new Initiating Cause(s) to be defined that is displayed in various SFM reports. These reports can be verified against the safety design to initiate improvements.

### Initiating Causes

SIF Initiating Causes are monitored against the safety design. This provides a valuable understanding of the actual demand versus the expected demand. The SFM traffic light system provides users an early warning sign when Initiating Causes have exceeded their expected design frequency.

SIF Name	SIL	Last Initiation	Initiating Cause	Measured Count	Freq. Design	Status
SIF-01	0	—	None LOPA	0	0.00000	●
SIF-02	0	—	None not defined in LOPA	0	0.00000	●
SIF-03	A	—	E Failure of FIC 0350047 causes FV 0350067 to fully close (water)	0	0.10000	●
SIF-03	A	—	D Dirty pump trip	0	0.10000	●
SIF-03	A	—	C Stuck check valve	0	0.10000	●
SIF-03	A	—	B Strainer blocked	0	0.20000	●
SIF-03	A	—	A Closed open manual isolation valves	0	0.00200	●
SIF-04	A	—	F Failure of the controller PIDC-0816045 causing FV-0816045 to fully open	0	0.10000	●
SIF-04	A	—	E Maintenance activities on the WHRU and inadvertent action to leave coil isolation valves closed (SD valves)	0	0.00200	●
SIF-04	A	—	D Failure of the TIC-0816041 causing valve TV-0816041 to close during startup of GT sets	0	0.10000	●
SIF-04	A	—	C Non-return valve in the WHRU coil outlet stuck closed during startup of the duty set	0	0.10000	●
SIF-04	A	—	B Preferential flow through WHRU coils (three operating and one standby GT set)	0	0.10000	●
SIF-04	A	—	A Scaling in the WHRU coils TEST CHANGE FOR SAT	0	0.20000	●
SIF-05	A	—	F Failure of the controller PIDC-0816045 causing FV-0816045 to fully open	0	0.10000	●
SIF-05	A	—	E Maintenance activities on the WHRU and inadvertent action to leave coil isolation valves closed (SD valves)	0	0.00200	●

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### Cause and Effect

Logic verification of SIF activation with associated devices can be verified with the Cause and Effect matrix. SIFs can be easily cross-checked to identify if recorded SIF activations and Final Element actuations match the configured or intended safety design in the current SFM LOPA configuration data.

The Cause and Effect matrix provides the following information:

- The final element is not part of the SIF.
- The final element is part of the SIF, but no final element actuation was linked to the SIF activation.
- The final element is part of the SIF, final element actuation was linked to the SIF activation, and was within target.
- The final element is part of the SIF, final element actuation start was linked to the SIF activation, a target value was not set.
- The final element is part of the SIF, final element actuation was linked to the SIF activation, final element actuation not detected by SFM in full, a target value was set.
- The final element is part of the SIF, final element actuation was linked to the SIF activation, but was outside of target.

Name	SIF Activations A	Device 3	Device 4	Device 5	Device 6	Device 7	Device 8	Device 9	Device 10	Device 11	Device 12
SIF-11	0	[SIF Activations]									
SIF-03	3	[3 Jun 2021 01:01:00]	●								
SIF-04	1	[3 Jun 2021 01:04:00]		●							
SIF-05	1	[3 Jun 2021 01:05:00]			●						
SIF-07	1	[3 Jun 2021 01:07:00]				○					
SIF-08	6	[3 Jun 2021 01:08:00]					●				
SIF-09	3	[3 Jun 2021 01:09:00]						●			
SIF-06	2	[3 Jun 2021 05:48:30]				●					
SIF-10	2	[3 Jun 2021 08:16:00]							●	●	●

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### SIF Conditions

SIF conditions can have sequential or concurrent states. SFM monitors and reports on all SIF conditions including condition tag, condition, safety function, SIL, start and end time and calculated duration. The following conditions are monitored:

- Manual Override (MO) – the start and end of an MO and the total time in MO state.
- Failure – the start and end of a failure with the total time in failure state.
- Degraded – the start and end of a degraded state and the total time in the degraded state.

### SIF Response Time

To compare real-time operating data to the safety design, the calculated SIF response time and the SIF response target time will be displayed for a SIF activation. In SFM, this time is calculated to be from the SIF activation to the last Final Element actuation stop of all the Final Elements associated with the SIF activation, plus the fixed 'SIF response adjustment factor' time. The 'SIF response adjustment factor' is provided to hold an adjustment value, in seconds, for parts of the SIS that cannot be monitored in SFM.

### Proof Tests

Proof testing allows users to claim proof test credit based on actual demand on the SIS during operation for SIF activations and Final Element actuations. With the functionality to record when proof tests have taken place and to monitor expiry dates of proof tests on SIFs and Final Elements along with their details, it provides the Safety Engineer with a quick way to maintain the validity of the Safety System.

SFM displays a list of SIFs and Final Element (devices) and the proof test status including:

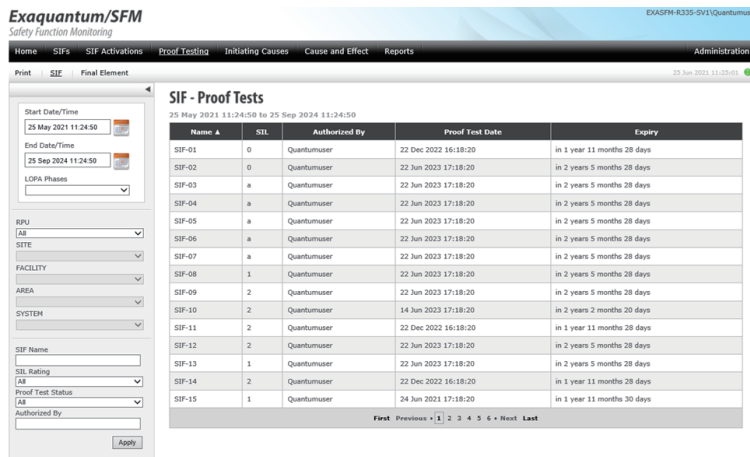
- Last proof test date.
- Expiry date based on the proof test period.

For a SIF activation, proof tests can be added either manually, automatically, or semi-automatically.

For a Final Element, proof test details can be viewed and edited, and committed. Historical records of proof test can also be viewed.

### Upload PHA-Pro Safety Configuration into SFM

Safety configuration data for a LOPA using PHA-Pro software can be used to generate a partially completed SFM LOPA file. A PHA-Pro export template exports information from the LOPA in a format that can be uploaded into SFM. All remaining data fields that need to be populated have been documented.



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### Monitoring Overrides and Inhibits

SFM monitors SIF overrides, inhibits and their protection layers. This provides critical information in the understanding of SIFs having sufficient protection and are maintaining their designed SILs.

### Safety Reports

SFM provides dynamic reports for all information displayed on the web interface with the ability for users to select fields and drill into data as well as filtering and sorting by almost all fields being displayed including listing SIF Activations and associated Final Elements ordered in chronological date/time order.

Reports contain SIS information for the following areas:

- SIF Activations
- IPL Availability
- Final Elements
- Overrides and Inhibits
- Initiating Causes
- SIF Masking
- Trip Investigations

Reports can be exported to multiple formats (such as Excel, Word and PDF) and scheduled to be emailed at configurable periods.

Overall SIF Report  
18 Jun 2018 to 18 Jun 2019

SIF Details			
Region	UK	Site	IOW-001
Facility	Gas	Area	Zone 3
Safety Function	ALZHH-3161820 Flash Gas Compressor High Level		Unit
Associated Tags	ALT-3161820, VZT-3165010, VZT-3165129		Version
IL Rating	1		

Actuating Devices			
Device Name	Total Actuations	Total Actuations by SIF	Actuation Failures by SIF
VZS-3165129	5	3	1
VZX-3165010	3	2	0

Initiating Causes			
Description	Total Activations	Design Frequency	Actual Frequency
Loss of fuel gas due to XGA-1/2 activation.	1	0.00219	0.52292
Failure of LC-3161821 closing LV-3161821	1	0.00219	0.52292
Spurious opening of NVB-4995098H/C.	1	0.2000	0.52292
Failure of 1st Stage Gas Cooler	0	0.10000	0.00000
High temperature gas relief	0	0.01000	0.00000
ZF7 AC-6544228 blocked.	0	0.25000	0.00000
New Initiating Cause (Enter Details)	1	0.00219	0.52292

ILPs			
Description	Total ILP Unavailable Periods	% Time ILP Unavailable *	Total Time ILP Unavailable
LAH-3161821 will alarm high level	5	1.29	4d 17h 0m 0s

SIF MO/Fault	
Total Time SIF Required (when plant is running)	364d 21h 23m 30s
Total Time SIF not working due to MOS	0d 1h 3m 50s
Total Time SIF is Degraded	1d 3h 5m 30s
Total Time SIF in Fault	2d 10h 14m 10s
Total Number of times SIF was activated	3

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## HARDWARE AND SOFTWARE REQUIREMENTS

### Minimum Hardware and Software Specifications

Component	Minimum Hardware and Software Specification
Exaquantum /SFM Server	For detailed specification information, refer to the following description in "Exaquantum GS (GS 36J04A10-01E)." Hardware: ● Hardware Operating Environment "Exaquantum Server" Software: ● Software Operating Environment "Exaquantum Server"  For detailed supported revision, please refer to "GS 36J40W10-01EN."
Exaquantum /SFM Web Server	For detailed specification information, refer to the following description in "Exaquantum GS (GS 36J04A10-01E)." Hardware: ● Hardware Operating Environment "Web Server" Software: ● Software Operating Environment "Exaquantum Web Server"  For detailed supported revision, please refer to "GS 36J40W10-01EN."
Exaquantum /SFM Web Clients	For detailed specification information, refer to the following description in "Exaquantum GS (GS 36J04A10-01E)." Hardware: ● Hardware Operating Environment "Exaquantum Use PCs" Software: ● Software Operating Environment "User PCs for Exaquantum/Explorer, Exaquantum/Web Client"  For detailed supported revision, please refer to "GS 36J40W10-01EN."

The Exaquantum/SFM Release Notes provide exact details of the supported hardware and software. If SFM will be installed on a different version (\*1) of Exaquantum, please contact Yokogawa for assistance.

\*1: For details, please refer to "GS 36J40W10-01EN".



## ■ MODELS AND SUFFIX CODES

### Exaquantum/SFM Product

		Description
<b>Model</b>	NTPC011	Exaquantum/SFM Product
<b>Suffix Codes</b>	-S	Basic Software License
	1	Always 1
	1	English version
	-SS1	Exaquantum/SFM Server 1 License
	-YYY	Select Option Codes (*1)
<b>Option Codes</b>	/WC□	Enter the number of new or additional per-seat Exaquantum/SFM Web Client Licenses (1 - 9)
	/SF□□	Enter the number of new or additional SIFs or Final Elements in multiples of 10 (01 - 30)

### Maintenance Service for Exaquantum/SFM

		Description
<b>Model</b>	SV3NTMC011	Maintenance Service for Exaquantum/SFM
<b>Suffix Codes</b>	-S	Annual Contract
	1	Always 1
	1	Always 1
	-SS1	Exaquantum/SFM Server 1 License
	-YYY	Select Option Codes (*1)
	-N	New
	-R	Renewal
<b>Option Codes</b>	/WC□	Enter the number of per-seat Exaquantum/SFM Web Client Licenses (1 - 9)
	/SF□□	Enter the number of new or additional SIFs or Final Elements in multiples of 10 (01 - 30)

\*1: "-YYY" is for additional Client, SIFs or Both. A Tokuchu is required. Technical confirmation will be required when the total number of SIFs will be more than 300.

## ■ ORDERING INFORMATION

Specify the model, suffix code(s), and option code(s).

Note: If not already supplied, the following Exaquantum products must be purchased separately.

Exaquantum Data Server (NTPP001)  
Exaquantum Web Server (NTPP003)

## ■ TRADEMARK ACKNOWLEDGMENT

The names of corporations, organizations, products and logos herein are either registered trademarks or trademarks of Yokogawa Electric Corporation and their respective holders.