Take a modern approach to increase safety integrity while improving process availability.

DeltaV SIS™ Process Safety System

Whether standalone or integrated, choose a smart, cyber-defendable, modern safety system designed for the life of your plant.

DELTA V™

EMERSON™

The DeltaV SIS™ takes a modern approach

to increase safety integrity while improving process availability. The proven DeltaV safety instrumented systems (SIS) continuously monitors your plant's safety devices' status and diagnoses the health of the entire safety loop–dramatically reducing your risk. The logic solver, certified to safety integrity level (SIL) 3 uses electronic marshalling technology to reduce your installation, commissioning and maintenance costs while substantially reducing your equipment footprint.

Improve Safety Integrity
Know your safety system will perform when called upon

The modern DeltaV SIS takes into account devices' predicted lifespan and pre-empts end of lifecycle with maintenance notifications and testing, so your SIS integrity stays stable longer.

Maintain Project Schedule, While Adapting to Project Changes
Manage late changes with Electronic Marshalling's flexibility

DeltaV SIS with Electronic Marshalling lets you maintain safe operations without putting production at risk every time you make a system change. Simplify design, installation, wiring, and commissioning while eliminating traditional system re-work and redesign.

Look at Space Differently
Mixed I/O and wiring in a single cabinet

DeltaV SIS enables you to mix I/O, and bring homerun cables straight from the field into a standard cabinet. So small spaces are less limiting—even during hot cutovers when cabinet contents are being reorganized and the system seems to grow ten-fold.

Reduce Undetected Failures
Optimize diagnostics for the entire safety loop

Be confident that every safety loop will operate when needed. DeltaV SIS provides an integrated, constant monitoring approach for the complete safety loop–from sensor, to logic solver, to final control element.

Defendable Cybersecurity
Strong defense-in-depth posture

Cybersecurity relies, in part, on multiple layers of protection. Comprehensive cybersecurity features make the DeltaV SIS a defendable safety system deployed in either an interfaced or integrated architecture.

Overcome Complicated Integration
Smooth integration based on open communition standards

Whether you require a standalone or integrated safety system, your DeltaV SIS solution will meet IEC 61508 and IEC 61511 requirements for physical separation and independence of safety and control. Integrate smoothly with other vendors' control systems using standard communications interfaces.

Reduce Engineering Effort
Reduce engineering complexity with TÜV- and exida-certified function blocks

The IEC 61508-certified SIS function blocks deliver functionality right out of the box, simplifying the implementation of complex SIS applications. No custom code is required to implement common SIS tasks. The result is faster configuration and troubleshooting of SIS logic.

Streamline Proof Tests
Reduce field testing and planned shutdowns

Proof tests ensure effective system operation and integrity. The DeltaV SIS system offers alternatives to traditional proof testing. Partial stroke testing on HART-enabled devices can give you the option to extend the time between full proof tests on valves.

Simplify Safety Lifecycle Management
Built for IEC 61511 compliance

DeltaV SIS is built for IEC 61511 compliance, providing stringent change management, security management, and documentation tools. The system is certified by TÜV and exida for use in SIL 3 applications without restriction.

A Smart SIS includes:
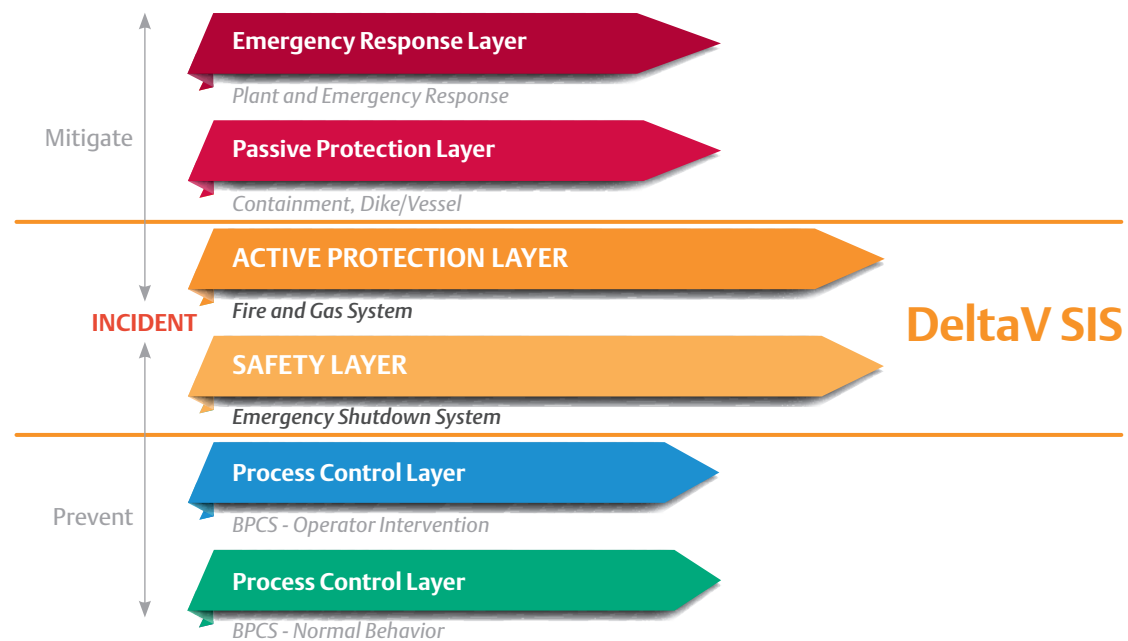
- Sensors
- Logic Solvers
- Final Control Elements

"With the increased visibility of our smart SIS, we have reduced burner startup from 4 hours to 20 minutes, along with quicker troubleshooting and burner restart after an upset."

Operations Manager, large mining company, Latin America

Improve Safety Integrity

Know your safety system will perform when called upon. Ensure high availability

Safety applications are designed to protect your plant and personnel from hazardous conditions and provide a rapid and coordinated operational response to emergency situations. However, traditional safety systems don't deliver comprehensive SIF diagnostics to the control program to ensure SIS reliability and availability. The modern DeltaV SIS takes into account the entire safety loop, evaluating measurement system performance, and extending diagnostics beyond the device to provide process diagnostics. The DeltaV SIS takes into account devices' predicted lifespan and pre-empts end of lifecycle with maintenance notifications and device alerts, so your SIS integrity stays stable longer.

Mitigate

Emergency Response Layer
Plant and Emergency Response

Passive Protection Layer
Containment, Dike/Vessel

INCIDENT

ACTIVE PROTECTION LAYER
Fire and Gas System

SAFETY LAYER
Emergency Shutdown System

DeltaV SIS

Prevent

Process Control Layer
BPCS - Operator Intervention

Process Control Layer
BPCS - Normal Behavior

Prevent incidents from occurring

The DeltaV SIS has been widely used for emergency shutdown (ESD) applications to prevent hazardous situations from occurring, and can initiate the orderly shutdown of a plant, unit, or piece of equipment should it be required. Sensors detect certain conditions, and the DeltaV SIS logic solver is configured to take your plant to a safe state, by manipulating the required final elements (valves and pumps).

Mitigate the Consequences of events when they occur

IEC 61511 recognizes fire and gas systems (FGS) as mitigative SIS systems. The major focus of a FGS is to mitigate an incident AFTER it has occurred. By monitoring process areas where fire, or potentially flammable gas or toxic gas buildup may occur, modern safety systems like DeltaV SIS offer the option of tight integration between the FGS and ESD.

Permit the system to operate when safe

In addition to FGS and ESD, DeltaV SIS is used for burner management system (BMS) applications. Through proper sequencing and interlocks, the DeltaV SIS BMS application allows the burner unit(s) to go safely through all relevant states, from start-up to operation and shutdown when needed.

Maintain Project Schedule, While Adapting to Project Changes

Flexibility with Electronic Marshalling

A modern change management approach

Modifying or adding to your control system can mean excessive engineering re-work to your safety system—not to mention the time to verify those changes for standards and regulations compliance.

The modern DeltaV SIS builds in unprecedented flexibility so you can evolve your safety system confidently and cost-effectively. It does this with Electronic Marshalling and CHARM technologies, which let you separate safety loop installation from logic configuration. That means you can start hardware design earlier in the engineering process—before HazOps completion.

CHARMs Smart Logic Solver

Each DeltaV SIS CHARMs smart logic solver (CSLS) provides I/O processing, SIL 3-capable logic solving, and diagnostics in a single logic solver. The CSLS supports individually configurable channels and allows for safety rated communication with other CSLSs through a dedicated local safety network. Combine multiple local safety networks up to 30,000 I/O, and integrate across a global safety network (GSN) between your assets over great distances. All communications are completely redundant from the channel (LS-CHARM) to the CSLS. Integrated HART I/O and device alerts, brings field diagnostics into the CSLS. CSLS key features include:
- quad-modular redundant logic processing
- quad-voting on output channels
- separate power
- same input data for each logic solver
- continuously drives output channels if a redundant partner fails
- automatic online proof testing
- in-situ hardware and software upgrades.

Simplify Compliance

Modern DeltaV SIS is built for IEC 61511 to simplify regulatory compliance, with documentation tools that can eliminate risk of error and improper implementation. Simplify change management, asset management, security management and documentation control.

Protected composite templates

For reduced complexity in global engineering and IEC 61508 compliance, the DeltaV SIS system includes protected composite templates. The templates are protected from modification by only allowing changes to occur on the master system.

CHARM smart logic solvers (CSLS) are interchangeable according to your device signal type, so late project changes won't hold up project schedules.

Easily track changes

Change management of your traditional SIS is expensive, complex, and introduces risk of error–errors that ripple through your documentation. Comprehensive version control is automatically tracked and updated. The new version is time-stamped and a history comment can be recorded when the item is checked back in. By keeping detailed historical information on configuration items, the system automatically maintains data for regulatory compliance requirements and troubleshooting.

Ensure authorized configuration changes

The DeltaV SIS security system gives you the ability to grant privileges to individual users. Items may be checked out for editing only by approved users.

Look at Space Differently

Mixed I/O and wiring in either a single field enclosure or multiple I/O junction boxes

The DeltaV system's Electronic Marshalling and CHARM technologies were developed in response to customers with moving, space-limited offshore oil platforms where home run wiring means crucial added weight and high installation costs.
Now you can land groups of safety loops in nearby field enclosures connected by a redundant Cat5E or fiber optic cable. CHARMs take up about 1/3 the space of traditional I/O and marshalling cabinets.

Distributed CHARMs enables you to install CHARMs even closer to field devices and can eliminate costly engineering and installation efforts. The need for traditionally loop sheet disappears and the effort to perform instrument loop checks is greatly reduced.

Architectural flexibility reduces footprint constraints

CHARMs require less space
Electronic Marshalling and CHARMs eliminate cross-marshalling wires; all of the work, design, and engineering associated with cross-marshalling simply goes away, because each individual I/O channel is electronically marshalled to a specific logic solver, and inputs can be used in any other logic solver on the network.

More options for hazardous locations
Want to install your I/O systems in the field, in a hazardous location? Emerson offers standard designed field enclosures that can accommodate up to 96 physical safety I/O and can be networked using standard redundant Cat5E or fiber optic cable. You save on installation costs and valuable climate-controlled space.

No Marshalling. Period.
As an additional option for traditional rack room and field wiring termination configurations, you can install logic solvers and electronically marshalled I/O in the rack room–with no need for marshalling–period.

Each CHARM smart logic solver (CSLS) provides I/O processing, SIL 3–certified logic solving, and diagnostics, with redundancy and single channel integrity.

"Electronic Marshalling allowed us to install field enclosures on each floor of the building, which was needed because there simply wasn't enough room in the control room for an additional marshalling cabinet. When we had to add a new device, the amount of wiring from the device to a field enclosure was very small, and the flexibility allowed us to put a digital I/O right below an analog I/O."

Process controls engineer, International specialty chemical manufacturer

Reduce Undetected Failures

Optimized diagnostics for the entire safety loop

Because safety systems are designed to perform only when an abnormal situation occurs, they raise the question: "How can I be sure it will perform reliably when needed?"

Uncertainty of asset health

Are your safety system assets operating as they should? Are you sure? Based on industry research, over 92% of all faults in SIS applications occur in field instruments and control elements. Therefore, it is critical to consider the entire safety instrumented function (SIF) as a complete entity. DeltaV SIS continuously monitors the ability of sensors, logic solvers and final elements to perform on demand by diagnosing faults before they cause spurious trips or fail to perform. This approach increases process availability and reduces lifecycle costs.

24/7 Safety

Pressure to keep your plant safe 24 hours a day, 7 days a week is relentless. Equipping your safety instrumented system with today's digital technologies is your best requirement. DeltaV SIS is a comprehensive solution for your safety system with the power of embedded digital communications–all day, every day.

Smart logic solver

The DeltaV SIS logic solver, built for digital communications with safety sensors and final control elements, uses the power of predictive field intelligence to increase the overall reliability of the entire SIF. It is TÜV- and exida-certified for SIL 1, SIL 2 and SIL 3 safety applications as defined by IEC 61508.

Smart devices deliver predictive and health diagnostics

Replacing switches with transmitters is your first step toward reducing undetected failures. Emerson's smart sensors, such as Rosemount™ and Micro Motion™ devices, go beyond detecting component failures. They evaluate the performance of the complete measurement system, extending diagnostics outside of the transmitter–to provide process diagnostics.

Smart SIS

"Over 92% of all faults in SIS applications occur in field instruments and control elements."

OREDA (Offshore Reliability Database)

Overcome Complicated Integration

Familiar, intuitive applications for greater availability

Safety systems can be very complex to integrate–often with limited interface options. DeltaV SIS offers several integration options based on standard protocols. Whether you require a standalone or integrated safety system–from a single or multiple manufacturers, your DeltaV SIS integration solution will be effective and streamlined. Even in the absence of common operator consoles, communications protocols and engineering databases, DeltaV SIS provides seamless integration with any control system. DeltaV SIS can be fully integrated into DeltaV distributed control system while maintaining full IEC 61511 compliance for physical seperation. Additionally, DeltaV SIS supports multiple site locations with the global safety network (GSN).

DeltaV SIS Integrated Architecture

Application Station   Operator Station   Engineering   Operator Station

GSN
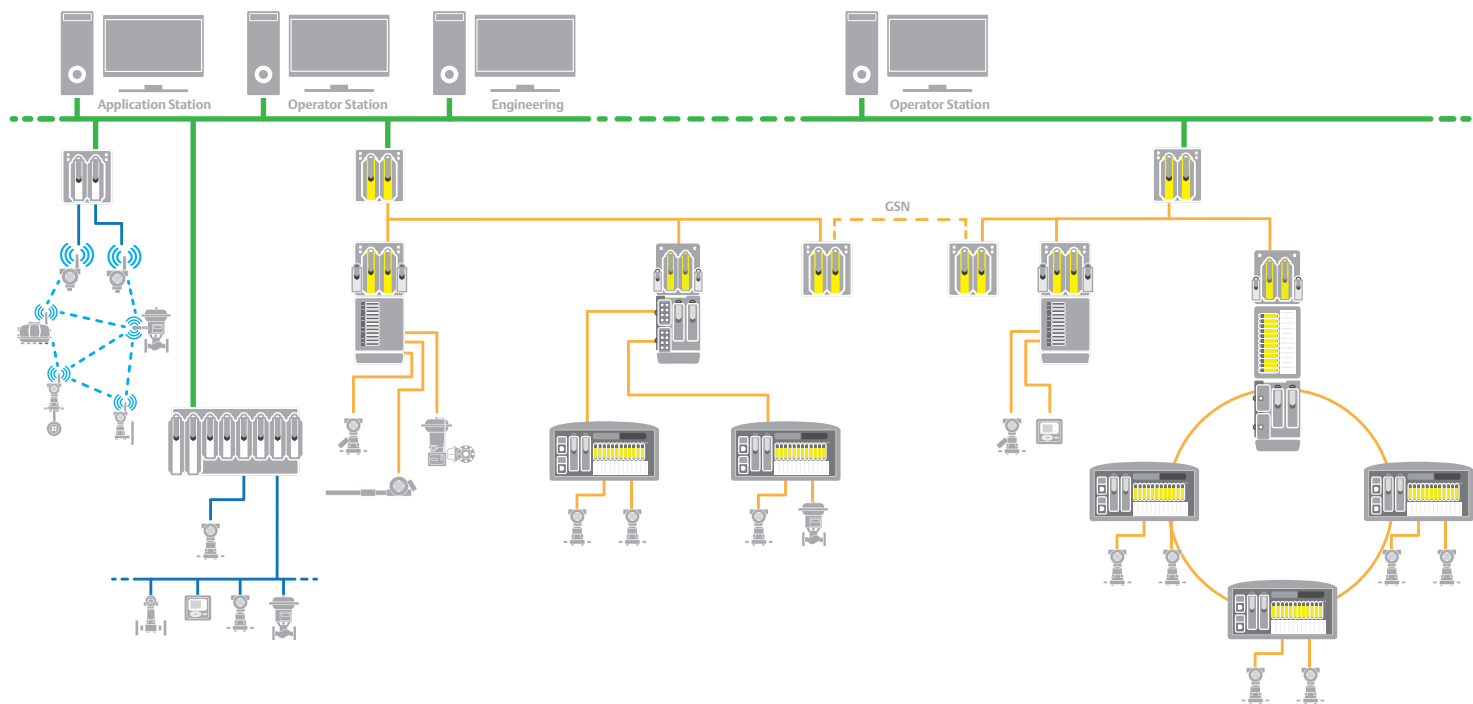
Reduce Engineering Effort
Certified Function Blocks

Intuitive safety software functions

The DeltaV SIS provides a full palette of smart safety function blocks certified by TÜV and exida for safety applications. Using standard function blocks instead of custom programming reduces configuration effort and makes troubleshooting and maintaining logic easier.

Voter function blocks

Voter function blocks provide advanced features like built-in bypass and deviation alarms to improve plant safety. The voting is configured to ensure the same approach is taken throughout the configuration, regardless of the application size.

Cause-and-effect function blocks

Traditional SIS project requirements are typically detailed using cause-and effect matrices (CEM) and ultimately translated into configuration logic. No more. With the CEM function block, the cause-and-effect diagrams can be deployed directly in the logic solver, enabling fast configuration and reduced testing.

State transition and step sequencer function blocks

Function blocks for state transitions and step sequencing provide powerful functionality out of the box for BMS applications. These function blocks convert complicated custom logic into a simple, intuitive configuration task. Other capabilities that make the certified DeltaV SIS software intuitive include:

- built-in sequence of events handler with automatic first-out trapping with 1msec resolution
- built-in maintenance bypasses
- facilitates compliance to IEC 61511 standard
- built-in alarm management
- standard operator faceplates automatically provide safety information with no configuration

Status handling

Input processing provides status handling–no custom code needed. With integrated HART I/O, device diagnostic information is automatically presented to operations with no additional configuration and is available to the control program.

Sequence of events

Built-in sequence of events handler eliminates hours of engineering while reducing testing and simplifying maintenance. Status information is automatically presented to the operator without mapping data tags, custom templates or faceplates.

Defendable Cybersecurity

DeltaV SIS provides many easy to use, built-in cybersecurity features. You can choose to deploy DeltaV SIS as an Integrated Control and Safety System (ICSS) which offers additional benefits in terms of engineering and operations savings, or you can choose to deploy DeltaV SIS in an interfaced manner – either way, the security posture remains the same. An ICSS is as defendable to cyber threats as an interfaced system but easier to maintain.

Single Point of Entry for Core SIS

One of the key principles within the DeltaV SIS approach is to separate, as much as possible, the most critical components of the safety system: sensors, logic solver, and final elements. These core SIS components are separated even from other parts of the safety system that are not required to execute the safety function (e.g. a SIS engineering station). The core SIS is isolated via a proxy node which provides a single point of entry. All communications to and from the core SIS is via this proxy embedded node. The separation of the core SIS is enforced for both separate and integrated architectures.

Safety-critical components are isolated by a proxy
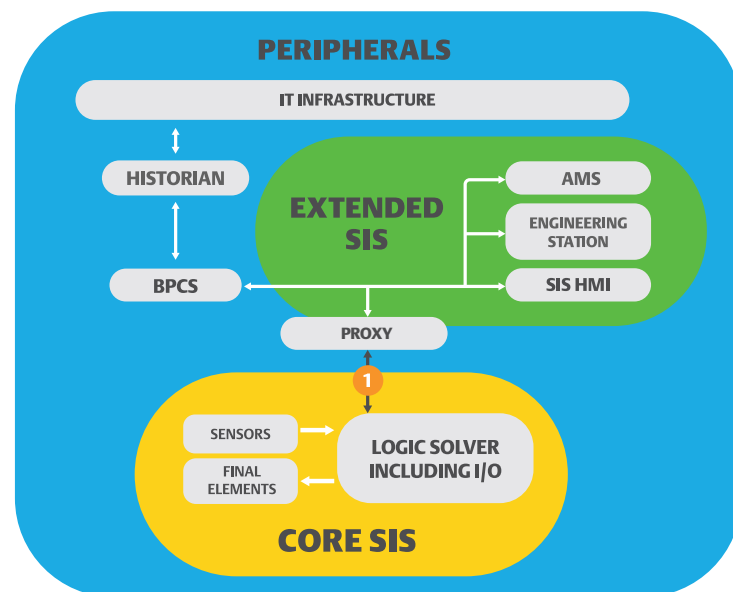
Built-in Safety Functionality that Doubles as Security Protections

Features originally intended for safety purposes also provide effective protections against cybersecurity threats. Examples of these features are:

- Automatic removal of maintenance bypasses
- Limiting the number of bypasses within a safety function
- Management of change solutions such as requiring additional approvers before a change can be implemented
- Status handling for HART instrumentation can detect and automatically react to unauthorized changes in smart field devices
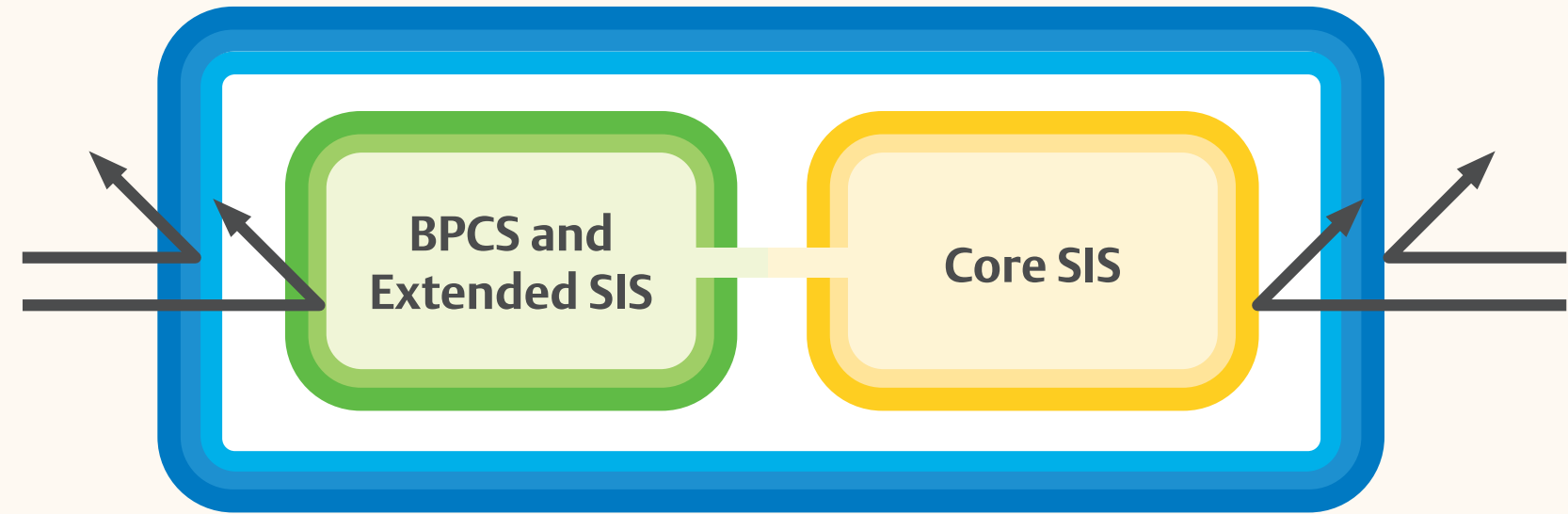
DCS Security Layers   **SIS Security Layers**

Shared Security Layers

The integrated-yet-separate approach delivers a unified defense-in-depth solution while maintaining functional segmentation and independence for SIS.

Coordinated Cybersecurity Approach Between SIS and DCS

Tight integration between SIS and BPCS not only simplifies engineering and operations, but it also reduces maintenance costs. Separating the SIS, by itself, does not provide sufficient protection. Even a separate SIS needs security layers such as anti-virus, application whitelisting, patch management and more. A separate SIS would require duplicating many of those layers. An integrated-yet-separate SIS shares some of the security layers to simplify management while still providing independent, SIS-specific, security layers to ensure the SIS is always defendable. One of these SIS-specific protections is the unique locking mechanism for logic solvers that prevents unauthorized changes that could impact the safety function. The lock mechanism prevents modifications of safety logic, changes in field devices, forces, and firmware upgrades among other tasks. The lock mechanism is based in both software and hardware components. The software portion enables automatic locking of embedded nodes (CSLS and proxy). The hardware portion enforces physical presence to protect the embedded nodes even if credentials were compromised.

Reduced Training Curve

Thanks to the common engineering environment, configuration and daily operation training applies to both the process control and safety functions. Even if DeltaV SIS is deployed as an interfaced system to DeltaV DCS, the common engineering environment will reduce the training curve.

Simpler and Safer Operations

Procedures and culture play key roles in maintaining safety and security. The integrated approach streamlines operations and maintenance, creating a strong and secure environment. In the long term, the ICSS approach provides benefits beyond time and cost savings; it also increases operational efficiencies across the facility.

Streamline Proof Tests

Online testing reduces risk and adds time between proof tests

Periodic proof testing proves the integrity and safe operation of your safety system. To ensure the tests are performed correctly, consistently, and safely, proof tests are conducted according to well-defined procedures.

Proof tests on traditional safety systems require considerable effort and can be prone to errors. Time can be lost in locating devices, moving from location to location, manually testing devices, then creating and storing manual documentation.

Personnel safety is put at risk because technicians must be in the field potentially in hazardous locations longer than needed. Also, due to technician fatigue and error, the device might not be returned to normal operation after the testing is complete.

Proof testing
Using a modern safety system with smart devices makes proof testing safer and more efficient. It lets you perform most of the proof test procedure from the asset management system. Technicians don't need to visually verify devices tags and location. Similarly, a field technician doesn't need to simulate a test signal from the device; the signal is generated from the control operator station as percentage of PV according to test procedures.

Key proof testing benefits the modern DeltaV SIS provides are:
- Prevent procedural errors by automating tests. The software guides users through the process for each device.
- Decrease the proof test duration and effort.
- Reduce proof test frequency without compromising process reliability.
- Reduce safety risk of exposing personnel to hazardous locations by conducting SIS proof testing from the maintenance shop.
- Automatically document all steps online. No more handwritten test results.

People are your plant's most valuable assets. Avoid sending them into potentially hazardous field proof testing—with modern safety system online testing.

Simplify Safety Lifecycle Management
Built for IEC 61511 Compliance

Providing industry leading services throughout the lifecycle of your operations, no matter where on the globe you operate.

Managing risk with global standards
Global Standards and regulations require manufactures to provide comprehensive documentation of their processes. DeltaV SIS Version Control and Audit Trail (VCAT) is a powerful tool that tracks changes and manages revision information for any item in the configuration database–making regulatory compliance simpler.

Certified safety process
Emerson uses a Functional Safety Management System consistent with the most stringent demands for protection, risk reduction and reliability. This TÜV and exida certified system covers:
- Management of functional safety
- Safety lifecycle structure/planning
- Verification
- Design and engineering of SIS up to decommissioning

Consultants and certified safety experts
Emerson is the first safety systems provider to develop certified procedures in alignment with IEC 61511 requirements. All employees involved with safety system engineering and development complete extensive safety training and Emerson certification. Many complete additional training to become Certified Functional Safety Experts (CFSE).

Reducing failures from the start
Having CFSE experts involved early in the process helps in reducing random system and hardware failures. This is critical because 80% of all SIS-related failures can be attributed to design and implementation errors.

Differentiated safety services
Emerson provides solutions with certified hardware, software, and engineering services needed to meet the requirements of the safety system lifecycle. Emerson has extensive global coverage for main automation contractor (MAC) services–providing a single source for all your project needs.

Analysis
Once the safety integrity levels (SIL) are defined, Emerson can compile your safety requirement specification (SRS). We also offer SIS functional safety consulting to help you design the safety loop with components selection.

Implementation
Emerson project services for application software follow our certified processes and provide verification of all design, implementation, and testing, with documentation to help ensure IEC 61511 compliance.

Operation
Emerson's SureService™ program offers support services designed to help you reduce your operating and service costs, and keep your systems running at peak performance. These services include:
- Emergency Onsite Service
- Express Module Replacement
- Critical Data Backup
- Local Spares Management
- Functional Safety Maintenance and Proof-Testing
- Power and Grounding Integrity
- Security Assessment
- Alarm Management
- SIS Modifications
- Extended Software Support

Globally balanced capabilities
For over 100 years, Emerson has provided process automation solutions worldwide–to help you operate your plant safely, reliably, and more efficiently–giving you peace of mind.

Emerson is the automation innovator to take on your toughest challenges and bring predictable success anytime, anywhere. Use DeltaV SIS™ to reliably protect your assets and improve process availability.

To get started today, contact us at:
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Learn more at www.emerson.com/deltavsis

DELTAV™

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