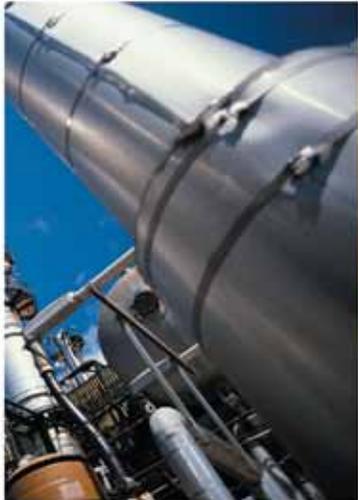
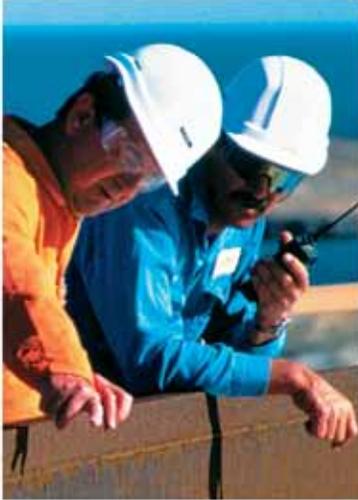


Fisher® FIELDVUE™ Instrumentation

Improving Safety Instrumented System Reliability





Safety Instrumented Systems

Meant to Protect

Safety instrumented systems are intended to help protect against the risks posed by hazardous processes.

Processes that involve toxic or highly flammable fluids typically rely upon safety instrumented systems (SIS) to protect against upsets or failures that might threaten worker safety, cause environmental concerns, or damage operating equipment.

A safety instrumented system typically consists of sensors to monitor the process, logic solvers that compare process conditions to predetermined process limits, and final control elements that shut down or vent the process should conditions reach a trip point.



Will the Shutdown Valve Work?

All SIS components must work on demand so that the system operates as planned.

The operating integrity of the SIS most often depends upon its final control elements. These valves typically remain in one position until called upon to respond. In fact, they may never be instructed to stroke from a standby position, which means they eventually may become stuck, unable to operate.

If a shutdown valve fails, the safety instrumented system may not be able to take the process to a safe state.

Determining Shutdown Valve Readiness.

Traditional ways of checking valve readiness can create problems.

The periodic stroke testing of the final control element gives an indication that the valve will perform when needed. Traditional test methods, however, pose several problems:

- The process must be shut down, or the shutdown valve bypassed, to allow a full-stroke test of the final control element. Either approach proves time-consuming and costly.
- Partial-stroke testing requires a manual device or other method to limit the movement of the shutdown valve. If the device is not removed following a test, the valve's range of movement may be restricted, making the SIS ineffective should a demand arise.
- Emergency valves must be taken "off-line" during a stroke test, which makes them unavailable should an event occur.
- Worker safety becomes a concern since most tests require direct involvement with the SIS on the plant floor.
- The testing procedure is labor intensive and therefore, costly.

Automated Partial Stroke Testing: The FIELDVUE™ Digital Solution

Emerson's industry-leading Fisher® FIELDVUE™ digital valve controller brings significant new advantages to performance testing of safety shutdown valves.

Emerson's FIELDVUE instruments, with their microprocessor based capabilities, provide automated performance monitoring and testing.

As part of the emergency valve package, the FIELDVUE instrument enables partial stroke testing while the valve is online.

Importantly, test personnel can remain within the safety of a control room or maintenance facility to initiate the test sequence. They can communicate with the FIELDVUE instrument using a handheld communicator or a personal computer, without having to go onto the plant floor. Using a LCP100 local control panel (shown below), they can initiate the test locally. The visual indicators and manual controls make it easy for personnel to assess and change the status of the valve.



The LCP100, partnered with the DVC6000 SIS instrument, initiates partial stroke tests and resets the valve and trip after an emergency.

Diagnostic Data: A Key to Improved SIS Performance.

FIELDVUE instruments help take the guesswork out of valve maintenance.

Determining when an emergency valve needs to be maintained is often a guessing game.

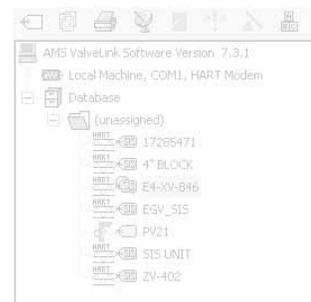
The traditional approach to SIS valve maintenance relies upon the full or partial stroke test to indicate whether or not the valve will operate upon demand. Little to no additional insight is gained about the overall mechanical condition of the valve.

The FIELDVUE instrument automatically checks the condition of the final control element during each partial stroke test. It evaluates the pneumatic supply, the actuator pressure values, and the valve position to determine whether or not valve components, including solenoid valves, are in proper working condition.

As the FIELDVUE instrument receives a test command from the logic solver, it applies a time and date stamp to the partial stroke test and solenoid valve test. This information is saved automatically within the device or a PC workstation, making regulatory compliance efforts much easier.

The data gathered allows diagnostic interpretation and analysis using AMS ValveLink™ software. For instance, a valve signature test generated by a FIELDVUE instrument provides insight to valve packing friction, air path leakage, valve sticking, shaft integrity, stick slip, actuator spring rate, and bench set. Comparing current data to previous test values may identify a potential valve failure long before the valve quits working. Armed with this knowledge, maintenance personnel can schedule repair activities rather than having to react to an unexpected valve failure.

Should a valve become stuck, the FIELDVUE instrument through its AMS ValveLink software generates an Event Messenger alert. Critical alerts can be sent to personnel via email, pager, or phone.



Greater Safety at Less Cost

FIELDVUE instruments bring money-saving advantages to SIS design, implementation, and operation.

Consider the potential time and cost-savings offered by partial stroke testing:

Lower Cost of Ownership - Unlike full-stroke tests, partial stroke testing does not require a bypass around the emergency valve, which avoids the cost of additional piping and full-size bypass valves.

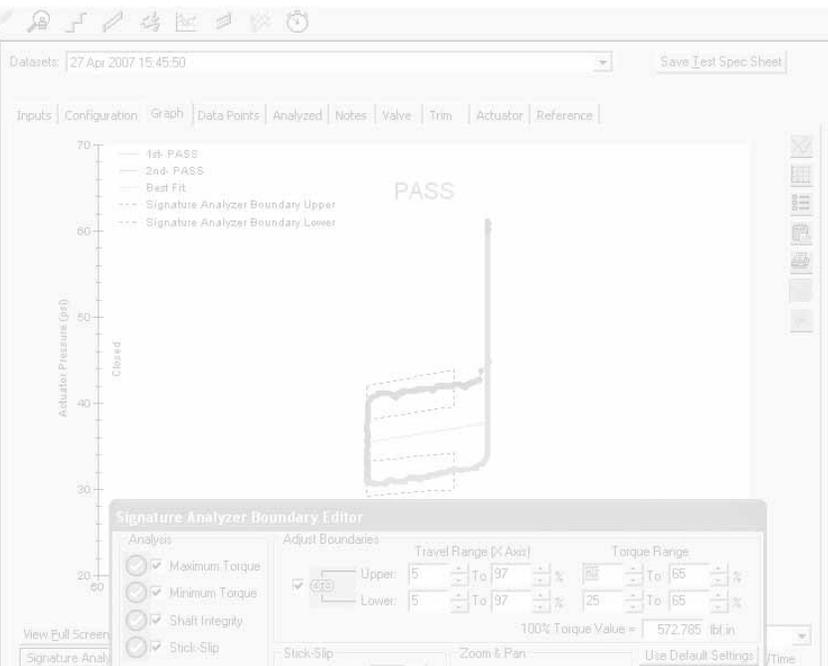
Automated testing eliminates the expensive, pneumatic panels typically required by manual test procedures. And maintenance diagnostics help avoid unnecessary and costly valve repair.

Reduced Labor Requirements - Valve testing from the control room eliminates the time-consuming and labor-intensive manual testing of emergency valves.

For instance, manual testing often involves the installation and subsequent removal of mechanical valve interlocks. Repeated trips onto the plant floor are no longer required to conduct the SIS performance test, thus helping to increase personnel safety.

Increased System Availability - The simple and secure method of partial stroke testing allows more frequent assessment of a valve's ability to move. These tests can be conducted at a time best suited to operators' schedules. The need to stop the process completely for full-stroke testing is minimized, increasing system availability.

To avoid spurious trips, FIELDVUE pneumatic relays allow instruments to improve loop availability upon loss of instrument signal.



Proof of Performance

Saudi Aramco facilities use FIELDVUE instruments to enhance SIS performance.

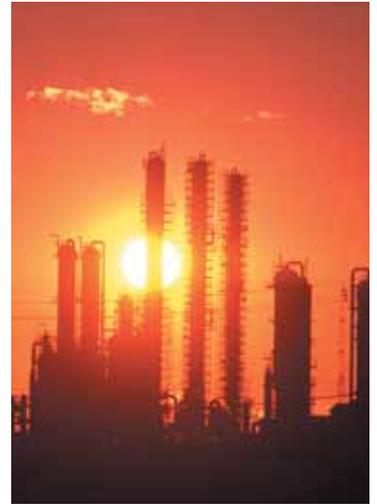
Production and processing operations at Saudi Aramco gas plants and refineries use FIELDVUE instruments on critical, emergency isolation valves.

Online since early 2000, the FIELDVUE units have exceeded system operators' expectations by enabling the systematic, partial stroke testing of emergency shutdown valves without impacting production rates.

Partial stroke testing helps operations personnel determine that shutdown valves within safety systems are capable of operating should a demand occur. Patrick Flanders, instrument engineer at Saudi Aramco, credits FIELDVUE instruments with bringing a new level of security to safety instrumented systems.

"Before the FIELDVUE SIS concept evolved, it was difficult to functionally test these valves and very difficult to document any meaningful test results," Flanders explains. "Now, thanks to the FIELDVUE design, it's not only possible to check valves, but we can also do so more safely, at less cost, and with greater efficiency."

Commenting that FIELDVUE technology is easy to apply in safety applications, Flanders states, "This is one product truly based on a customer's requirements and direction for limited valve-travel testing. What was once a very manual process is now semi-automatic. With the FIELDVUE unit in the SIS loop, valve travel is controlled to predetermined limits, and test data are collected during both online partial-stroke tests and during full-stroke tests. The device does automate the testing process, greatly simplifying the testing procedures and reducing the time required of our operators."



FIELDVUE DVC6000 Series digital valve controller in SIS solution mounted on a quarter-turn actuator.

TÜV Certification

Successful product testing by a third-party authority leads to a rigorous review of components for safety instrumented systems.

FIELDVUE DVC6000 SIS instruments have been certified by TÜV Product Services (Germany) to be in accordance with IEC61508 for use in Safety Instrumented Systems up to safety integrity level 3 (SIL). By evaluating devices per IEC and ISA standards, the TÜV certification process determines whether a product is fit for use in a specified safety application.

TÜV certification is issued along with a report explaining how the product was tested and what application criteria must be met for the product to retain its certification. With the report, system analysts and designers can better understand how a product contributes to meeting the required risk reduction level.

To obtain a copy of the TÜV approval report on FIELDVUE instruments, contact your nearest Emerson Process Management sales location.

SIL — Explaining the Acronym.

Current standards and guidelines applicable to the design of safety instrumented systems are performance oriented. The standards do not mandate technology, level of redundancy, or test intervals. Rather, they identify “safety integrity levels.”

IEC61511 has been developed as a process sector implementation of the international standard IEC61508: “Functional safety of electrical, electronic, programmable electronic safety related systems.”

IEC61511 defines four safety integrity levels for safety instrumented system design.

The devices that make up a specific SIS design, from the input units through the logic solver to the final control element, determine a SIL. It reflects device integrity, the architecture of the system, device testing and diagnostics coverage, and the common mode failures inherent to the SIS.

Within IEC61511, SIL 1 represents the highest probability of system failure on demand as shown in the following table. Note that IEC61511 suggests that applications requiring a SIL 4 function are rare in the processing industries.

Safety Integrity Level	Probability of Failure on Demand per Year	Risk Reduction Factor
SIL 4	$\geq 10^{-5}$ to $< 10^{-4}$	100,000 to 10,000
SIL 3	$\geq 10^{-4}$ to $< 10^{-3}$	10,000 to 1000
SIL 2	$\geq 10^{-3}$ to $< 10^{-2}$	1000 to 100
SIL 1	$\geq 10^{-2}$ to $< 10^{-1}$	100 to 10

Sensor to Final Control Element: The Emerson PlantWeb™ Approach to Safety.

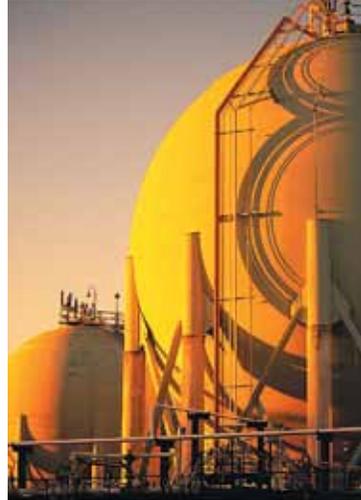
Only Emerson takes a smart SIS approach by continuously diagnosing the sensors, logic solvers, and final control elements as an entity to monitor the ability to operate on demand. The key to this approach is Emerson’s DeltaV™ SIS system, Rosemount® and Micro Motion® sensors, and Fisher and VAD final control elements that are suitable for use up to SIL 1-3 applications. It’s joined by integrated, easy-to-use configuration software and embedded digital communications for safety applications of any size.

The Emerson approach provides improved:

- Risk reduction
- Reduced project capital requirements
- Reduced maintenance costs
- Easier regulatory compliance

When it comes to safety applications such as emergency shutdown, burner management, and fire and gas systems, Emerson’s trained professional safety personnel and global project services organizations have the knowledge to perform process hazard analyses and risk assessment. They also provide safety instrumented system design, implementation and commissioning. Within the framework of PlantWeb SIS Solutions, Emerson provides integrated, reliable, easy to use safety instrumented system for a lower lifecycle cost.





This mark indicates a core component of Emerson's PlantWeb™ digital plant architecture.

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Emerson Process Management
 Marshalltown, Iowa 50158 USA
 Sorocaba, 18087 Brazil
 Chatham, Kent ME4 4QZ UK
 Dubai, United Arab Emirates
 Singapore 128461 Singapore
www.FisherSevereService.com

