TRICONEX EMERGENCY SHUTDOWN SYSTEMS

Triconex® is the world's leading supplier of safety and critical control systems. Our Emergency Shutdown (ESD) Systems are found in a wide variety of industries protecting personnel, equipment, and the environment.

WHY IS A RELIABLE ESD SYSTEM VITAL?

Government regulatory agencies such as the U.S. Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA), as well as insurance companies, place the highest criteria on the safety of company personnel, communities, and the environment. Consequently, they require companies to perform process hazards analyses to determine the measures necessary for maximum safety.

Although safety is of primary concern, in today's environment it is also important to have an ESD system designed for availability. The economic impact of a spurious or nuisance trip of an ESD system can be disastrous. Unlike a process control system, which is designed to control process variables, an ESD system represents a layer of protection that mitigates and prevents a hazardous situation from occurring. An ESD system must be extremely reliable and function on demand. During an emergency, it must shutdown the process in a safe and orderly fashion.

When selecting or replacing an ESD system, consider the following:

• Is it more cost-effective to run and maintain than your current system?
• Does it comply with current government regulations and industry standards?
• What would it cost your company if inferior technology causes a shutdown of your operation?
• Can you, with conviction, say that your employees, equipment, and the environment will be protected in the event of an emergency?
• What litigation costs could you incur in the event of an accident due to the use of inadequate safety technology?

Internationally recognized standards such as ANSI/ISA S84.01 and IEC 61508 serve as guidelines to insure proper instrumentation is in place to mitigate or avoid hazardous situations. In order to meet these requirements, exceptional equipment availability, reliability, experience, and record of accomplishment are required, a combination only Triconex technology can provide. By choosing Triconex safety systems, you will receive a solution, which ensures that no single point of failure will cause a nuisance trip or unwanted shutdown.
UNPRECEDENTED EXPERIENCE AND KNOWLEDGE

Triconex has more than 8,000 safety and critical control installations worldwide with more than 500 millions hours of safe operation. Our unsurpassed experience and knowledge provides your plant with the safest and most reliable solution available.

Triconex actively participates and contributes in national and international standards committees (NFPA-72, IEC61508/61511, ANSI/ ISA, S84.01, and others) that provide Triconex with firsthand knowledge of the issues affecting plant safety. As a result, you are assured that our system designs incorporate state-of-the-art safety technology.

Triconex won Control magazine’s 2009 Reader’s Choice Award for Safety and Critical Control Systems — 12 times in the last 13 years.

TRICONEX ESD SYSTEM IMPROVES YOUR BOTTOM LINE

A Triconex ESD system substantially reduces project implementation time and provides a highly cost-effective instrumented solution:

• Triconex ESD systems are fault tolerant — certified to function safely in the presence of one or several faults, thereby eliminating nuisance trips attributed to other safety systems with lower redundancy.
• Using the Triconex TriStation 1131™ application development tool, you can implement your project at a fraction of the time it would take with competitive systems. TriStation 1131 features a library of ESD function blocks and CEMPLE™, our easy-to-use Cause & Effect Matrix Programming Editor. CEMPLE allows the user to define the complete processing of sensor inputs, shutdown logic, and outputs to the final control elements on one CEM editor screen.
• The Triconex controller’s remote input/output (I/O) capability, using fiber optics, dramatically reduces costs associated with long cable runs, making it superior to conventional systems.
• Outstanding diagnostics capabilities quickly identify failed instruments, load faults or faulted modules, simplifying replacement and improving overall safety and availability of your process.
Triconex

Functionality of an Emergency Shutdown System

TRICONEX INPUTS:
- Analog Inputs:
  - 0-5VDC, 0-10VDC, thermocouple
- Digital Inputs:
  - 115V AC/DC, 48V AC/DC, 24V AC/DC, pulse input

Digital / Analog Inputs:
- Manual Activation
- Level
- Fire Detection
- Vibration
- Gas Detection
- Temperature
- Flow
- Other Controller
- Pressure

Digital / Analog Outputs:
- Proportional Devices
- Motor Starter
- Solenoid Valves
- Alarm Systems
- Pilot Lights
- Actuators

Avantis  Eurotherm  Foxboro  IMServ  InFusion
TÜV RHEINLAND-CERTIFIED

With a Triconex ESD solution, you receive a system that is certified by the most respected authority on safety-instrumented systems, and will not shutdown your plant accidentally. Triconex TMR technology allows the system to operate safely for an indefinite period following a single processor failure when operating in TÜV SIL 3. This allows your personnel the opportunity to fix the problem at a suitable time.

VIRTUALLY MAINTENANCE FREE

One of the most powerful features of Triconex TMR technology is its ease of maintenance. The state-of-the-art diagnostics capability quickly directs personnel to the location of the problem. Field instrument point faults can be located and addressed immediately. Because of the technology's modular redundant architecture, I/O and processor modules can be replaced online – no system shutdown required, no sensor wiring deactivation, no reprogramming, and no reloading of logic.

The system redundancy is completely transparent to the user. Your programmer, operator, and maintenance staff can treat the TMR system like a single controller, which results in reduced programming, installation, and minimum long-term maintenance costs.

TRICONEX INTERFACES:
- Honeywell: UCN and Data Highway Interfaces
- Foxboro: I/A Series Nodebus
- 802.3 Interface
- OPC Protocol
- Field device integration via HART Protocol and interface with market leading Instrument Asset Management applications

TRICONEX OUTPUTS:
- Digital Outputs:
  115V AC, 120V DC, 24V DC, 48V DC, relay output
- Analog Outputs:
  4-20mA, 8-320mA

SIL3 Certified Safety Rating
Because of the large number of I/O and interface modules, a Triconex ESD application allows users to interface to essentially any third-party system, as well as connect to any sensor and actuator.

Shutdown signals and defined system and discrepancy alarms are transmitted to the Distributed Control System (DCS) for operators and maintenance personnel. Triconex products communicate this information over a serial data link (such as Modbus) via specially developed interface modules to Foxboro® and Honeywell systems or to external hosts over IEEE 802.3 networks with support of the TCP-IP/UDP-IP protocol. Triconex products are OPC (OLE for process control) compliant and support Modbus TCP protocol.

The ESD system can be activated manually or automatically from a third-party system such as a fire and gas system or process sensors. Once activated, it initiates customer-defined actions, either partial or total plant shutdown procedures.

For example:

- Shutdown all transport of flammable fluids/gases in case of fire or leakage of hydrocarbons
- Vent to flare waste gases resulting from process halt
- Depressurize the process to reduce the possibility of vessel or pipe rupture
- Perform electrical isolation or kill power to the field
- Start emergency generators or power supplies
- Halt turbines or rotating machinery due to a vibration, high bearing temperature, or lubrication failure
- Start backup pumps or other auxiliary safety equipment

A standard personal computer together with Triconex TriStation 1131 software is used for program development, program storing, fault diagnostics, system monitoring, and application documentation. The IEC 1131 Part 3 compliant development workbench supports function block diagram, ladder diagram, and structured text languages. Using a standard library of IEC 1131-3 and Triconex-developed function blocks provides a powerful and intuitive environment. With CEMPLE, the Cause & Effect Matrix Programming Editor, implementing the ESD logic is easy and virtually eliminates programming errors.

TriStation 1131 has powerful emulation capability for testing and troubleshooting the application program. Software changes are done offline, tested, and then downloaded into the running application. The program development package is self-documenting and provides printouts of logic diagrams with tagname identifiers and user comments, I/O module (hardware) configuration, tagname lists with descriptions, and cross references, and others.
THE TECHNOLOGY THAT MAKES IT WORK

The ultra-high reliability and availability of a Triconex ESD system is based on Triple Modular Redundancy (TMR) featuring:

- Triplicated 2-out-of-3 voting principle for high integrity, error-free and uninterrupted process operation with no single point of failure.
- Three isolated main processor boards performing extensive internal diagnostics. Each processor can be replaced online with automatic reprogramming upon insertion in a running system.
- Input and output modules that consist of three isolated independent legs, each module can be removed from service for maintenance or repair without interrupting or stopping the process or disturbing field wiring.
- System diagnostics that indicate a failure of any single active component without causing a shutdown action. Thereby, allowing maintenance personnel to take necessary action while the process is still running.

The system can be customer configured for different modes of operation. For example, in a 3-2-1-0 mode of operation, where one of the triplicated channels fails, it transfers to a dual fail-safe operation. A failure of a second triplicated channel results in a transfer to single fail-safe operation.

CERTIFIED AND TESTED

Triconex rigorously tests its system hardware and software to meet or exceed the highest national and international standards for reliability and availability:

- ANSI/ISA, IEC, API, and HSE
- Factory Mutual (FM) and Underwriters Laboratories (UL) listings
- Electromagnetic compatibility (CE Mark)
- Certified by TÜV Rheinland* to SIL 3 applications and by CSA/NTRL/C

*Many safety system suppliers are certified by TUV. Be sure to ask which modules are certified and request a copy of restrictions and requirements (safety guidelines) issued by TÜV. Triconex is pleased to provide you with a list of all our certified modules.

INVEST IN THE RIGHT SOLUTION

With a Triconex ESD system, you will get the most reliable system in the world. Triconex Fail Safe and Fault Tolerant technology can reduce your operating expenses and frequent production stops. For more information on how you can implement ESD or other solutions with Triconex TMR technology, please contact your nearest Triconex office or visit our website at iom.invensys.com.

ABOUT TRICONEX

Triconex is an operating unit of Invensys, plc. and is a global leader in the supply of products, systems, and services for safety, turbomachinery control, and critical control applications. Since 1983, we have supplied thousands of systems in a variety of industries and applications worldwide. Today, our patented Triple Modular Redundant (TMR) technology is utilized in over 8,000 installations, making Triconex the largest and most successful Safety and control supplier in the world. For more information, visit the Invensys web site at iom.invensys.com.