

# Trident

## High-integrity + high-availability system

The Trident™ high-integrity/high-availability system meets the needs of safety and critical control applications in oil and gas, power, refining, chemicals, pharmaceutical, and biotech industries. It is based on industry-leading TMR technology, is easy to operate and maintain, and provides a lower total cost of ownership.



# Trident Features



Schneider Electric™ is the only automation company with the experience and track record in safety and critical control with more than 30 years of safety system experience. It is also the only automation company with more than 13,000 safety systems installed in more than 80 countries and operating for more than 1 billion hours.



## KEY BENEFITS:

- Maximizes efficiency through simplicity of design
- Maximizes your return on investment
- Maximizes process/plant uptime, productivity, and yield
- Minimizes operational risks and hazards
- Minimizes unscheduled downtime
- Maximizes reliability, availability, performance, and profitability
- Complies with international standards
- Minimizes cost of compliance and nonconformance to safety standards
- Assists you in avoiding penalties or fines for noncompliance

## Continuously safe and reliable operations

The Trident system is a continuously safe, secure, and highly available Safety Instrumented System (SIS), certified by TÜV Rheinland for use in safety applications up to Safety Integrity Level 3 (SIL3). The fail-safe and fault-tolerant architecture maximizes availability and complies with international safety standards such as IEC61508:2010.

Designed for maximum safety and process uptime, Trident protects your most valuable assets (your people and your equipment) and the environment from hazards and dangerous conditions allowing you to manage operational risks with confidence. The proven technology delivers exceptional levels of availability, fault tolerance, and lowest overall total cost of ownership, leading to increased profitability and productivity throughout the operating life of the asset.

## One platform for all of your safety needs

Trident is approved for use in rigorous applications such as Emergency Shutdown (ESD), Fire and Gas (F&G), Burner Management Systems (BMS), and High Integrity Pressure Protection Systems (HIPPS), as well as Turbomachinery Control (TMC) and other critical control applications.

# Trident

## Features (continued)

### Continuously safe operation without halting production

Trident provides you with the assurance of continuous operation as there are no time restrictions even when running under fault conditions or degraded mode of operation. The unique diagnostic approach in the Trident system allows greater fault coverage and localization. A 32-channel I/O module is capable of tolerating up to 64 faults while preserving full safety levels. A faulty module can be replaced online at any time without halting production, achieving the highest levels of system availability and reliability possible.

### Scalable system for small and large applications

A key feature of the system design is scalability. Trident supports small, localized applications (as low as 32 I/O points per system) up to large, distributed applications in excess of 40,000 I/O points.

### Separation, segregation, and distribution

Up to 63 Trident nodes can be networked together using a highly secure TÜV-certified SIL3 peer-to-peer network. Any node can share data over the same SIS network. This makes it highly suited for applications that require plant unit segregation and separation for operational and maintenance reasons.

### High performance for time-critical applications

Each Trident system is capable of executing the application logic (in and out) as fast as 50 msec making it ideal for mission-critical applications requiring a fast response to process upset conditions.

### Freedom of choice — open connectivity

All of our solutions are easily integrated into all major Distributed Control Systems (DCS), Human Machine Interfaces (HMI), and Programmable Logic Controllers (PLCs). Trident solutions support industry protocols: modbus TCP/IP master and slave, RS485 modbus master and slave, OPC UA (Unified Architecture), and TSAA protocol for tight integration with I/A Series DCS. This freedom of choice allows you to select the best connectivity for your needs without compromising performance.

### Safe and Secure

Trident supports a “defense in depth” approach to ensure that the SIS is immune to the threats of cyberattack. Trident is approved to Achilles level 1 as standard with additional protection using the Triconex® by Schneider Electric Tofino™ firewall. The system can be configured to reject all unauthorized “write” commands from external systems. The TriStation programming environment supports both standards and enhanced security in accordance with stringent NERC cybersecurity standards. The latest communications module also supports X.509 security encryption and user authentication.

### Suitable for harsh environmental conditions

The Trident system operates in extreme ambient temperature conditions, from as low as -20 °C to highs of +70 °C. It is also protected against corrosive environments and is conformal coated as standard to harsh G3 level per ISA S71.04.

### Future-proof your investment

While Trident has the automation industry's longest track record, we also have a commitment to protect your investments and serve your business in the future. Our “Continuously Current” philosophy protects your CAPEX through a clearly defined technology path to ensure that your systems always stay current and adhere to the latest standards.

# Trident

## Key capabilities

### Applications

- Emergency Shutdown (ESD)
- Burner Management Systems (BMS)
- Fire and Gas Systems (F&G)
- High Integrity Pressure Protection Systems (HIPPS)
- Turbomachinery Controls (TMC)
- Control of critical applications

### Key capabilities

- TÜV-certified for SIL3 applications to international standard IEC61508
- High-availability architecture for continuous operation
- Fault-tolerant architecture for continuous operation even under fault conditions
- Online module replacement ensures continuous operation and plant availability
- Online upgrade without process interruption
- Direct integration with Foxboro® Evo™ process automation system
- Easily integrated with all major distributed control systems
- ISA Secure EDSA Level 1 right out of the box
- Works in both centralized and distributed applications
- Expertise available from our TÜV-certified Functional Safety Experts and Engineers
- Continually current technology
- Comprehensive family of I/O modules

## Trident

### Operating principals

- Fail-safe — de-energize to trip
- Energize to trip
- Safe, available, secure

### Communications

- SIL3 Peer to Peer (63 Nodes)
- Modbus TCP/IP Master and Slave
- Modbus Serial Master and Slave
- OPC UA DA
- TSAA
- Copper and Fiber Optic
- ISA Secure EDSA Level 1

### Certification

- IEC 61508, Part 1-7:2010
- IEC61511-1:2003 + Corr,1:2004
- ISA84.00.01-1:2004
- EN51056-1:2004
- IEC61131-2:2007
- IEC61326-3-1:2008
- EN50178:1997
- EN54-2:1997 +AC:1999 +A1:2006
- NFPA71:2010
- NFPA85:2011
- NFPA86:2011
- EN298:2003
- G3 Level per ISA S71.04  
harsh corrosive environments
- Achilles Level 1

### Operating conditions

Operating Temperature:

-20 to +70 °C ambient

Storage Temperature:

-40 to +85 °C

Relative Humidity:

5 to 95%

# Trident

## Specifications

### Trident

MODEL	DIGITAL I/O
5101	Main Processor TriPak
5201	Communication Module TriPak
5211	Communications Module
5352	Analog Input TriPak, RTD/TC/4 – 20 mA
5354	Analog Input TriPak, HART, 4 – 20 mA
5354A	Analog Input TriPak, HART, 4 – 20 mA Hazardous Location
5481-1	Analog Output TriPak, 4 – 20 mA
5482-1	Analog Output TriPak, 0 – 40 mA High-current
5301	Digital Input TriPak, 24 Vdc
5311	Digital Input TriPak, 24 Vdc, High Resolution
5312-F	Digital Input TriPak, High Resolution, High Voltage
5302-F	Digital Input TriPak, High Voltage
5401	Digital Output TriPak, 24 Vdc
5401L	Digital Output TriPak, 24 Vdc, Low Current
5411H	Digital Output TriPak, 24 Vdc Supervised, High Current
5402-F	Digital Output TriPak, High Voltage
5451	Solid-State Relay Output TriPak
5382-1	Pulse Input TriPak, Enhanced
5382A	Pulse Input TriPak, Enhanced, Hazardous Location
5483	Analog Output TriPak, HART, 4 – 20 mA
5483A	Analog Output TriPak, HART, 4 – 20 mA Hazardous Location