



## Machine Safety Essentials

**Matt Higgs**  
**Industrial Automation Specialist**  
FS Tech (TÜV Rheinland) # 4418 / 23 -Machinery

**Products and Solutions for the Electrical Industry**

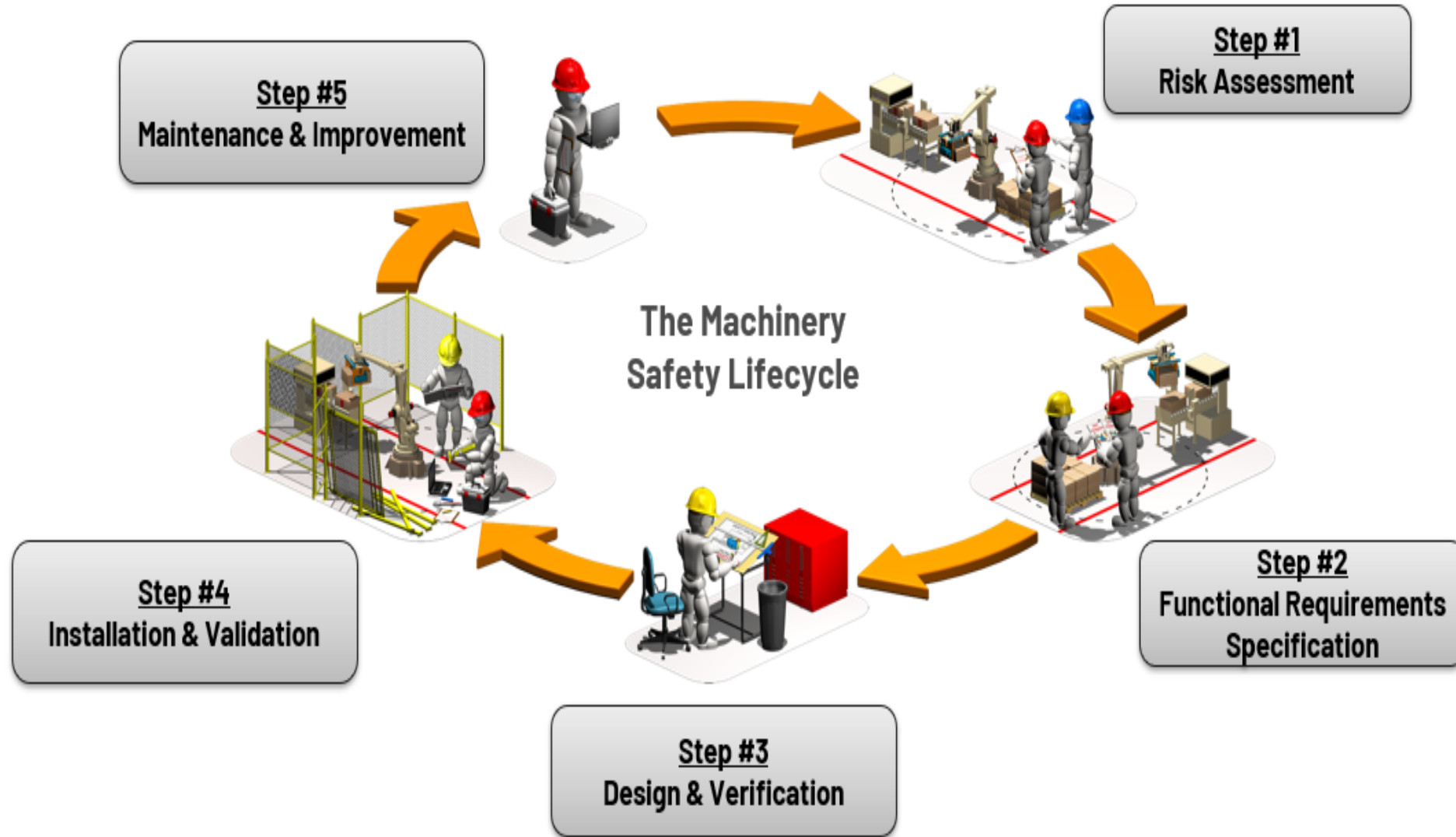
# Old Faithful 700-P relay aka “Master Control Relay”

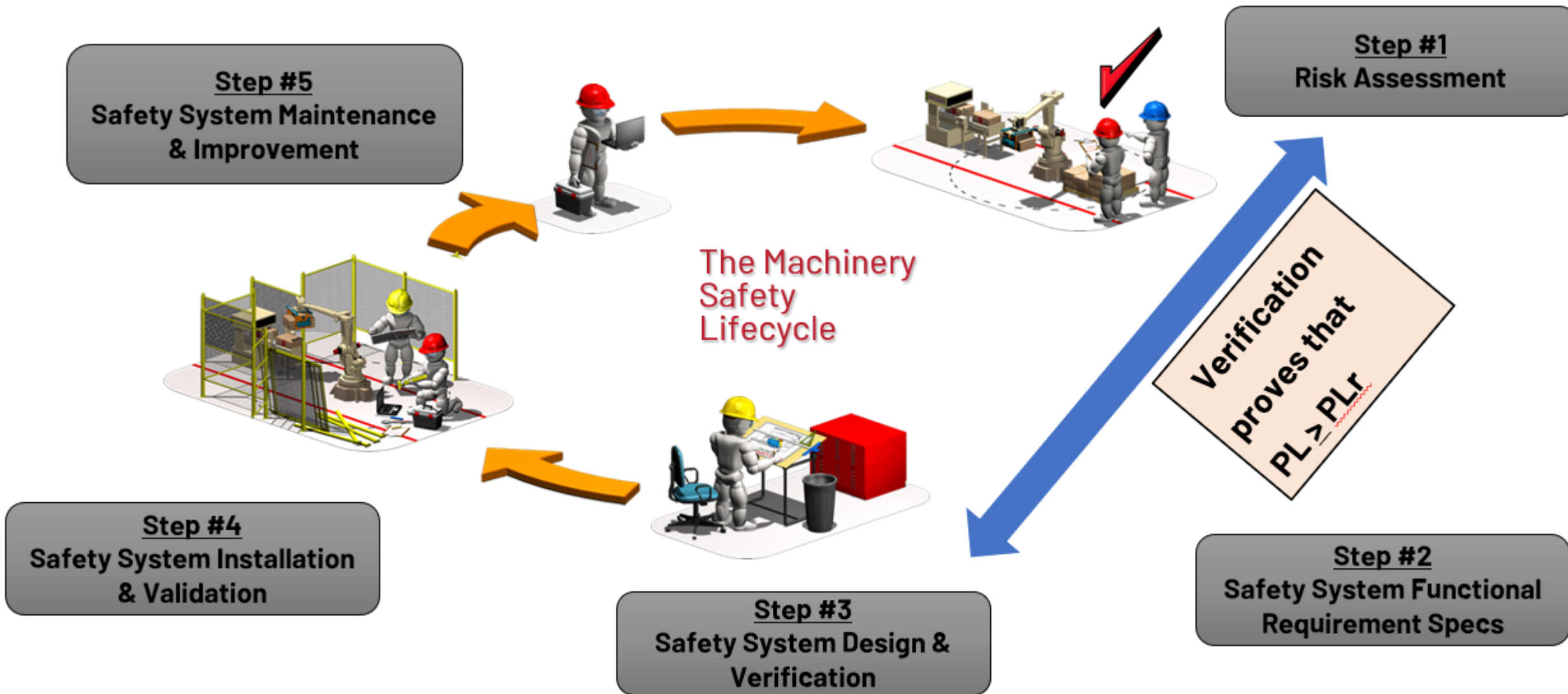


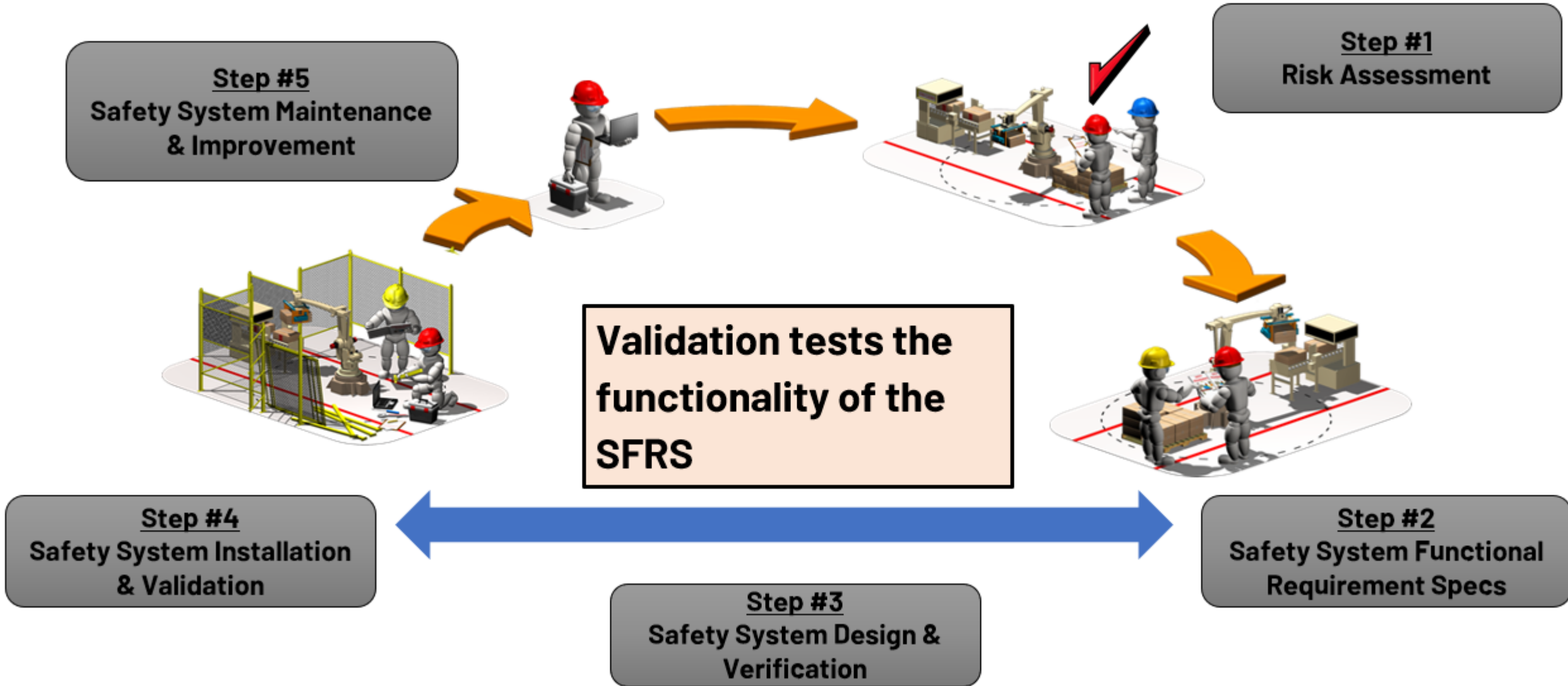


## Machine Safety Lifecycle









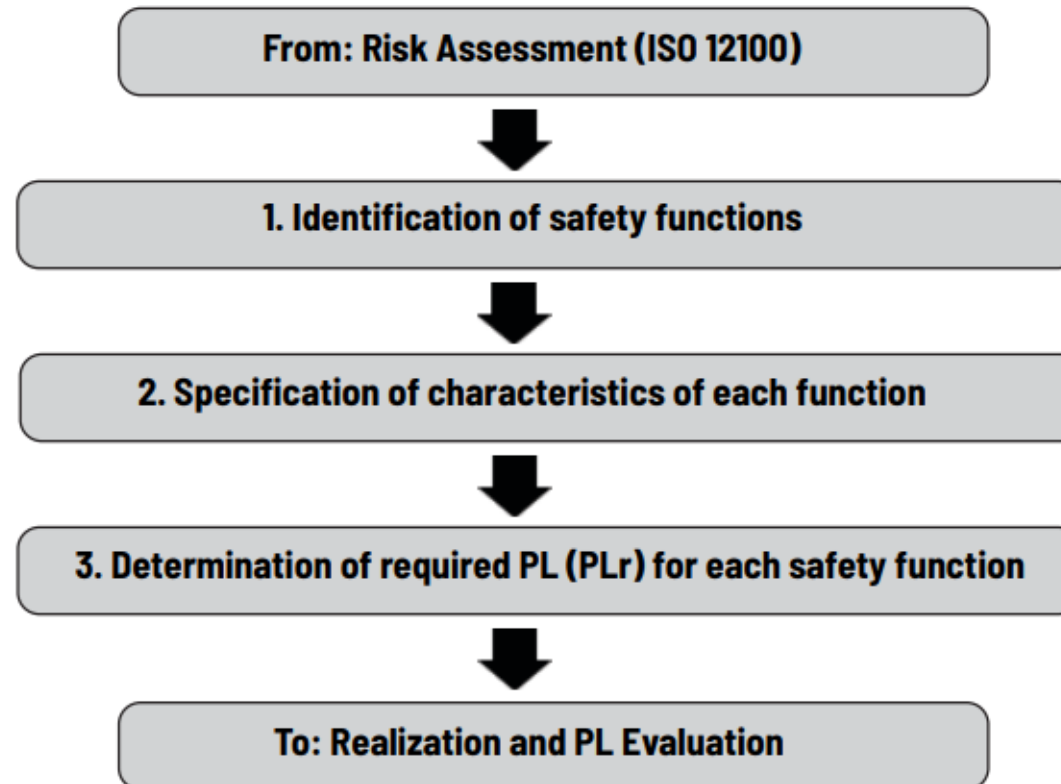


## Application Techniques



## Safety Function Realization: Risk Assessment

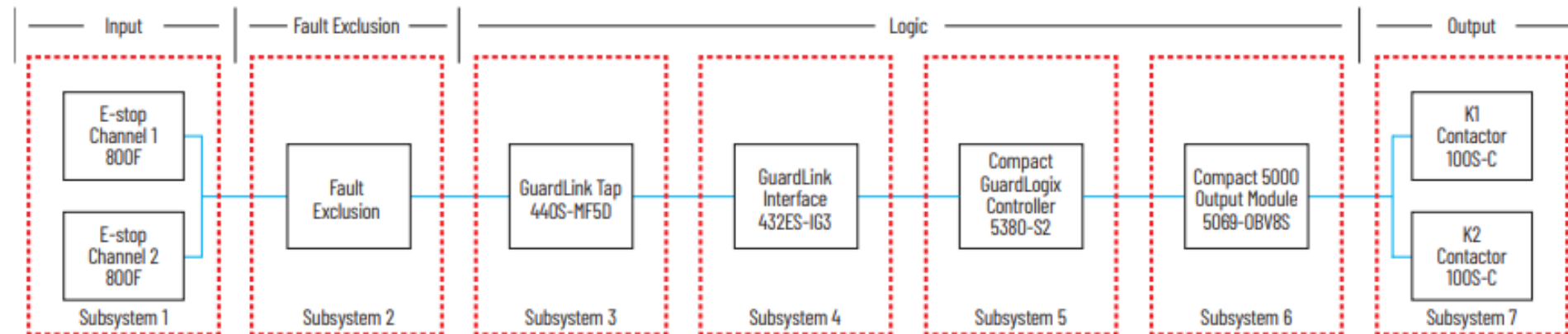
The Performance Level required (PLr) is the result of a risk assessment and refers to the amount of the risk reduction to be conducted by the safety-related parts of the control system. Part of the risk reduction process is to determine the safety functions of the machine. In this application, the Performance Level required by the risk assessment is category 3, Performance Level d (cat. 3, PLd), for each safety function. A safety system that achieves cat. 3, PLd, or higher, can be considered control reliable. Each safety product has its own rating and can be combined to create a safety function that meets or exceeds the PLr.





## Safety-related Stop Function Initiated by an Emergency Stop

The emergency stop (E-stop) function is complementary to other safeguards on the machine. When the E-stop is pressed, the safety system de-energizes the two safety contactors, which removes power from the motor that generates hazardous motion. Power removal causes the hazardous motion to coast uncontrolled to a stop (category 0 stop). Hazardous motion cannot be restarted until the E-stop is released and the Reset button on the HMI is pressed and released. The contactor coils energize and close their N.O. safety contacts. After the safety contactors are energized, pressing the HMI Start button starts the motor. A detected fault in the safety system opens the two safety contactors to create a category 0 stop.



## Application Technique

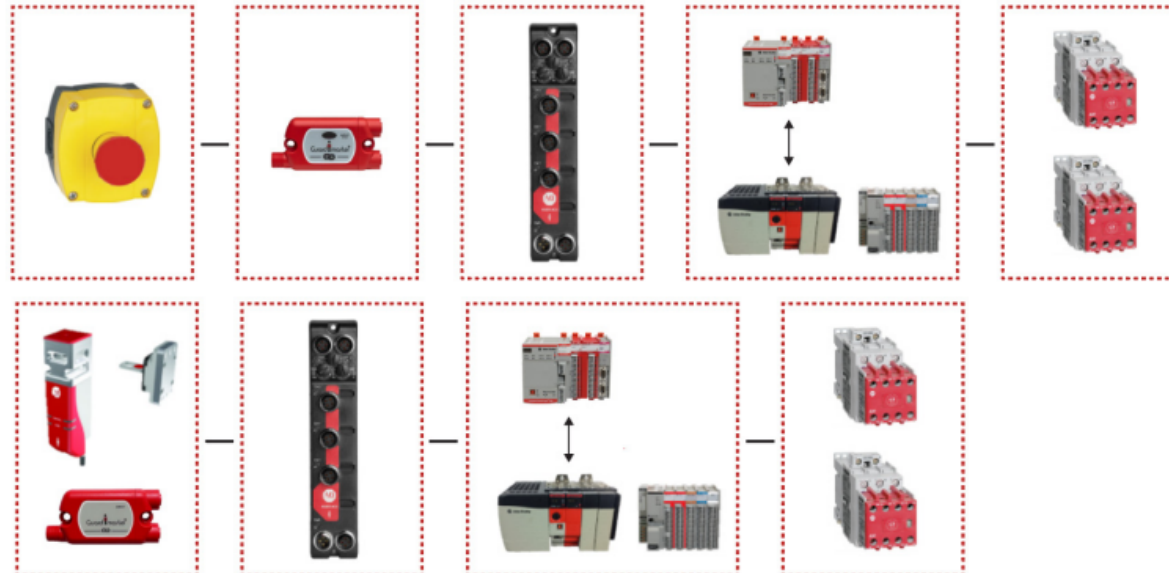
Original Instructions



## GuardLink Emergency Stop and Door Monitoring Via GuardLogix Safety Controller Safety Function

Products: 800F E-stop, 440G-MZ Interlocking Switch, 440S GuardLink Taps, 432ES-IG3 GuardLink Interface, GuardLogix 5580 or Compact GuardLogix 5380 Controller, Compact 5000 I/O Safety Modules, 100S-C Contactors

Safety Rating: Cat. 3, PLd to ISO 13849-1:2023

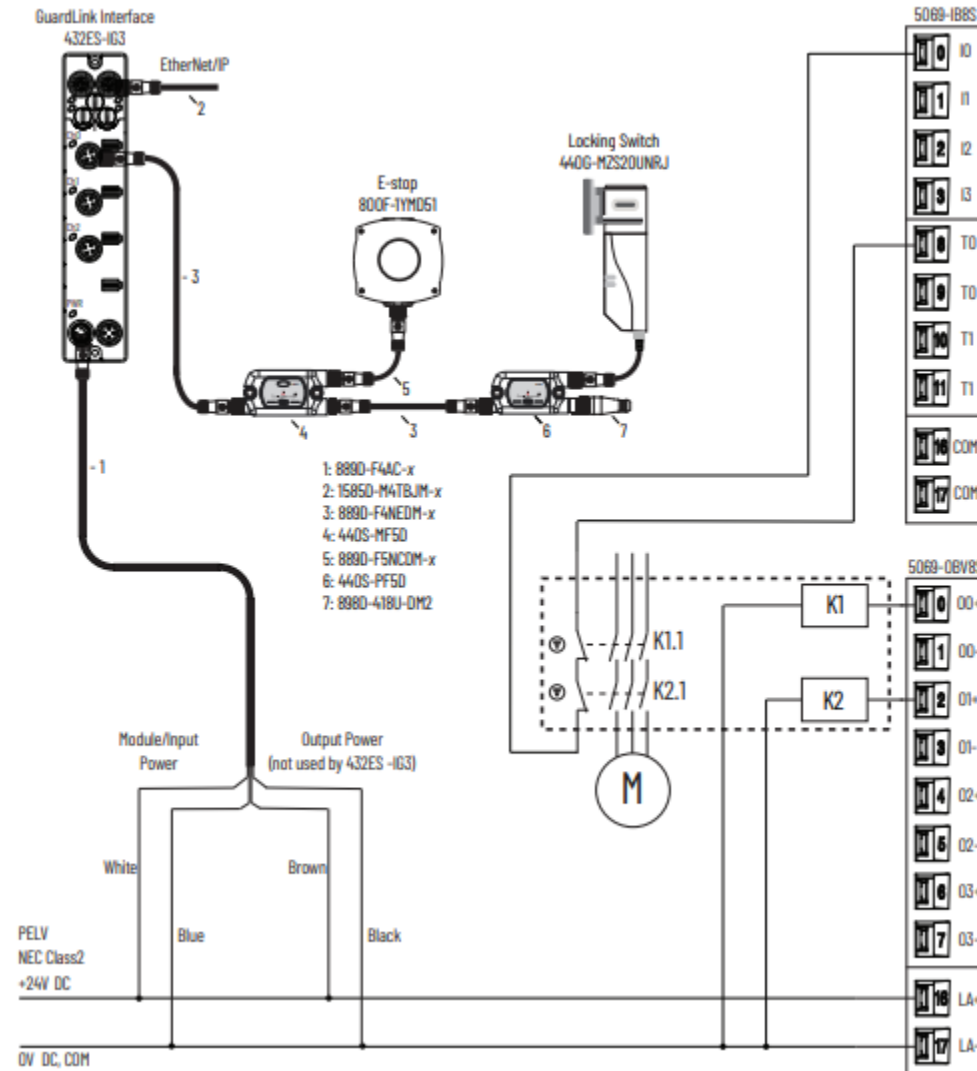


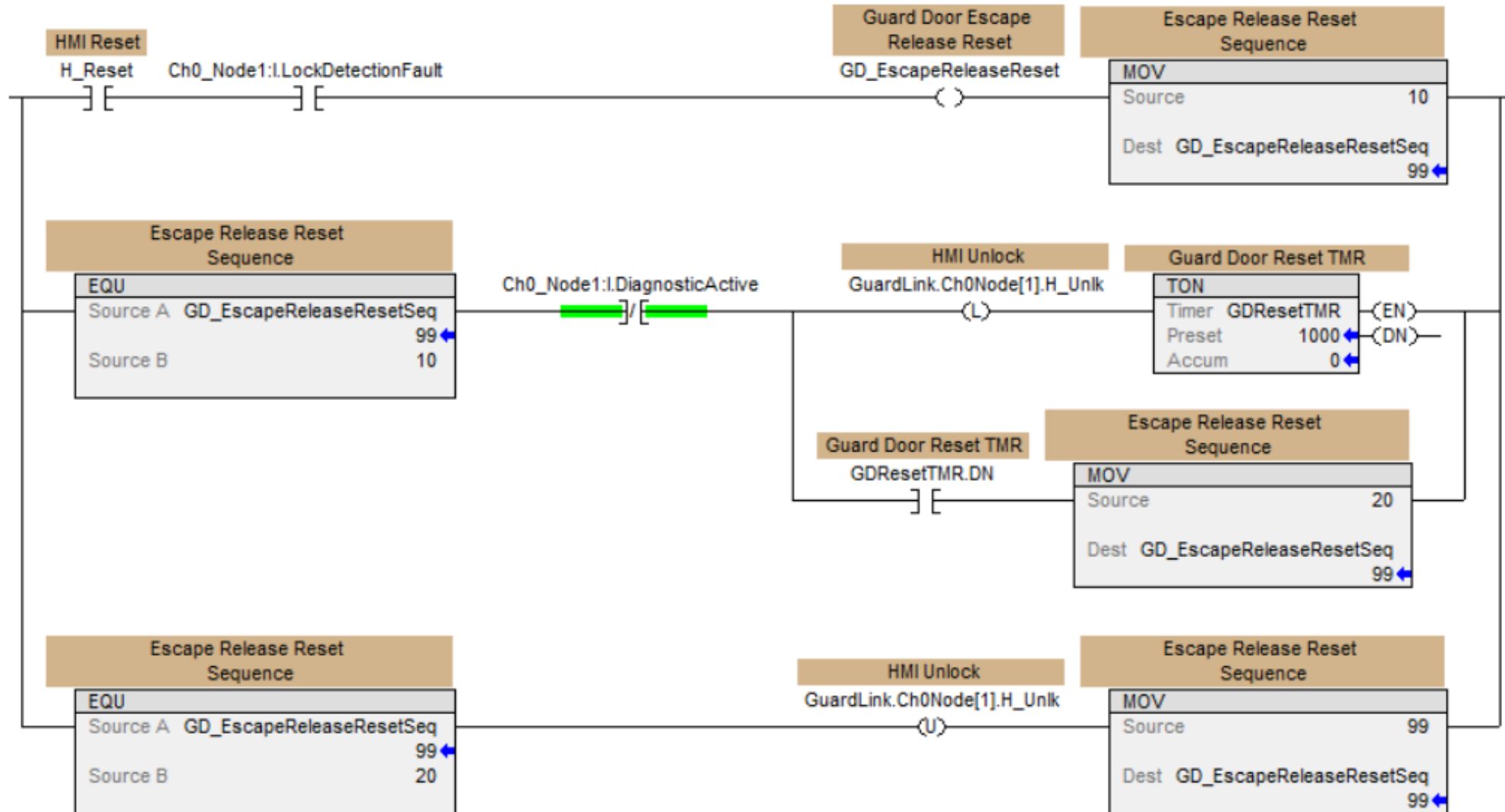
## Bill of Materials

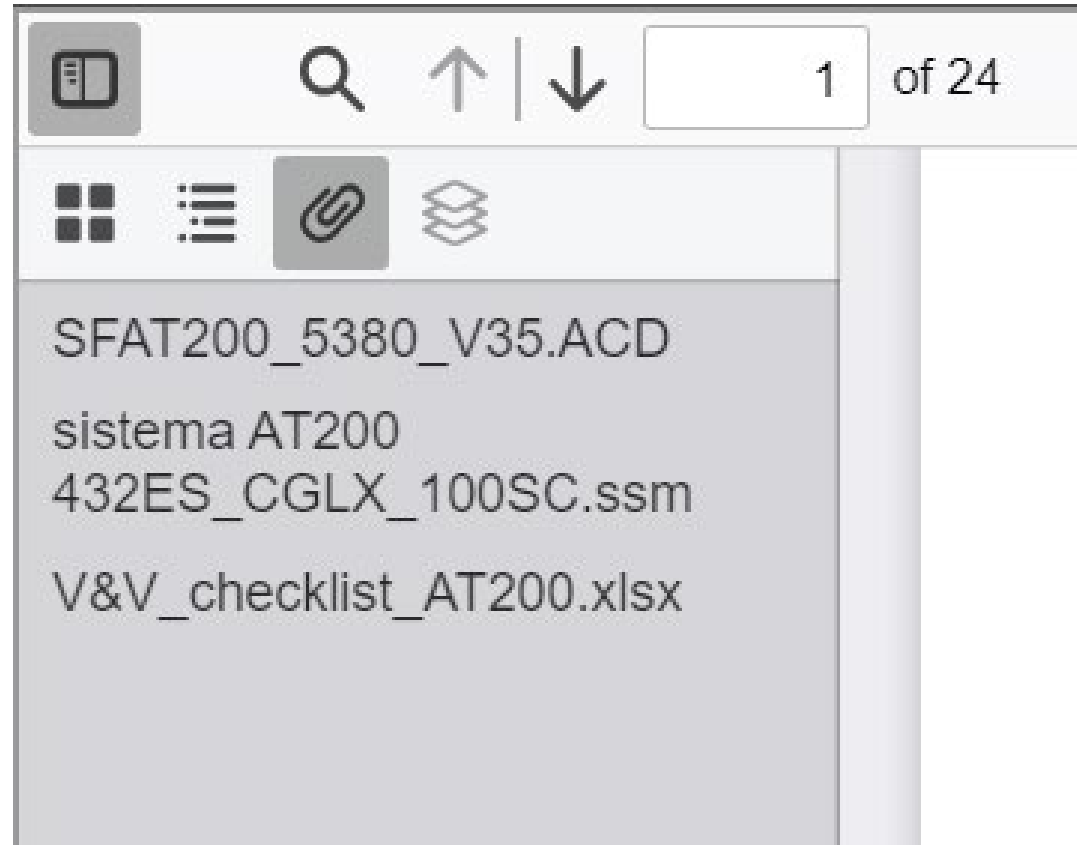
This application technique uses these products.

Cat. No.	Description	Quantity
432ES-IG3	432ES GuardLink EtherNet/IP™ interface, 3-channel safety input	1
440S-MF5D	5-pin EMSS (Electromechanical Safety Switch) GuardLink-enabled tap	1
440S-PF5D	5-pin GuardLink passive tap (for use with GuardLink-embedded devices)	1
440G-MZS20UNRJ	Guard locking switch - Power to Release, 6 in. (150 mm) pigtail, M12 male 5-pin QD	1
800F-1YMD5I	800F enclosed E-stop station, twist-to-release yellow plastic, M12 male 5-pin QD	1
1585D-M4TBJM-5	Ethernet Cable Cat5e, 100 Mbit/s, 4 Conductors, M12, Straight Male, Standard, RJ45, Straight Male	1
889D-F4AC-5	Cordset: Quick disconnect 16.4 ft (5 m) cable, yellow, M12 female (4-pin), no connector	1
889D-F4NEDM-1	Patchcord: M12, straight socket, 4-pin, red, straight plug, 3.3 ft (1 m), 18 AWG	2
889D-F5NCDM-1	Patchcord: M12, straight socket, 5-pin, red, straight plug, 3.3 ft (1 m), 22 AWG	1
898D-418U-DM2	GuardLink terminator	1
5069-IB8S	Compact 5000 I/O 8-channel 24V DC safety input module	1
5069-OBV8S	Compact 5000 I/O 8-channel 24V DC safety configurable output module	1
5069-RTB18-SCREW	5069 Compact I/O™ 18 pins screw-type terminal block	2
100S-C09EJ23C	100S-C safety contactor, 9 A, 24V DC electronic coil	2
1606-XLP72E	Compact power supply, 24...28V DC, 72 W, 120/240V AC input	1

## Electrical Schematic







[Safety Application Techniques Linked Here](#)

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**Rockwell  
Automation**



**Safety Services**

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Deliverable	End User	OEM SI	Options (scalable)
Safety specification document for new equipment	X		
Conformity Audit	X		Number of machines
Training - TUV 0,1,2	X	X	1-6, 7-9, or 10-12 students
Team based risk assessment	X	X	Small, Medium, Large
Safety functional requirements specification	X	X	Small, Medium, Large
SISTEMA training with project verification	X	X	Up to 15 students Small, Medium, Large
Validation document and on-site validation	X	X	Small, Medium, Large
40-hour safety block of time	X		
RASWIN – 1 year subscription with server option	X	X	



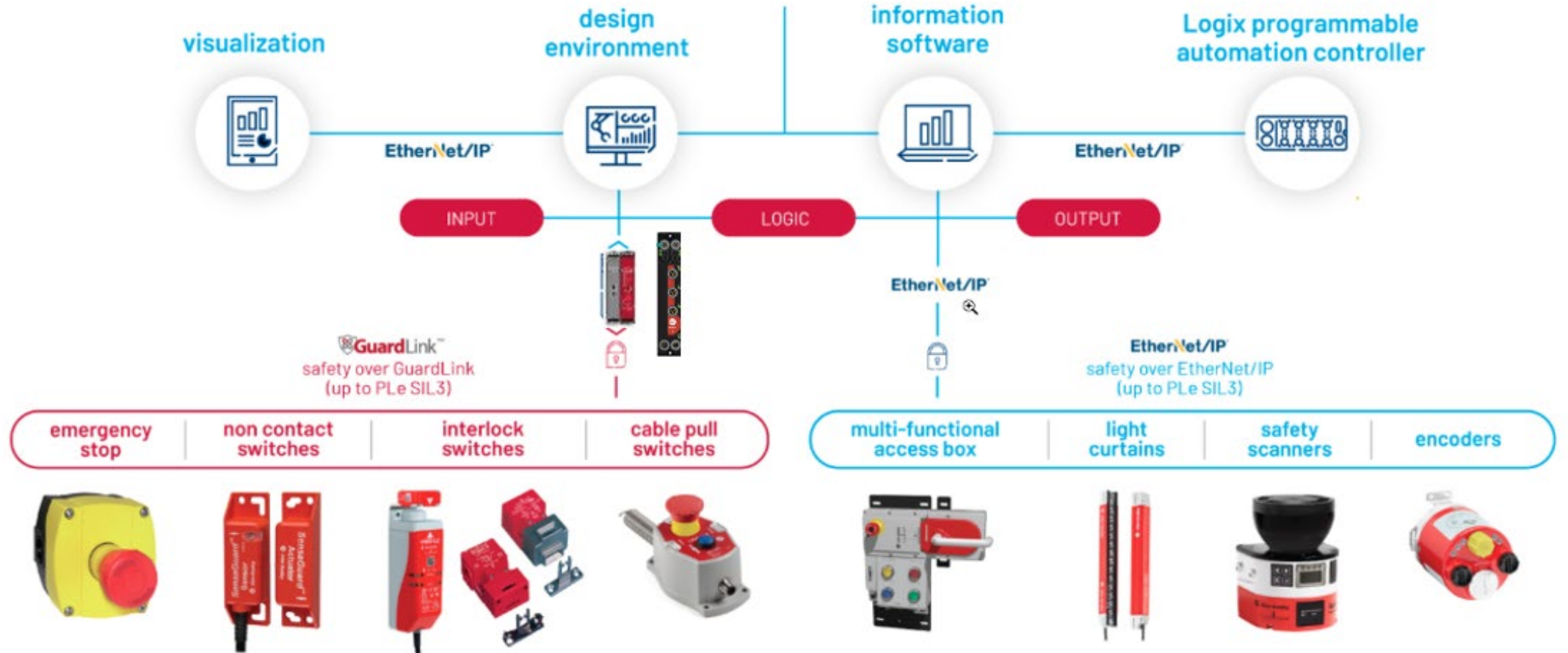
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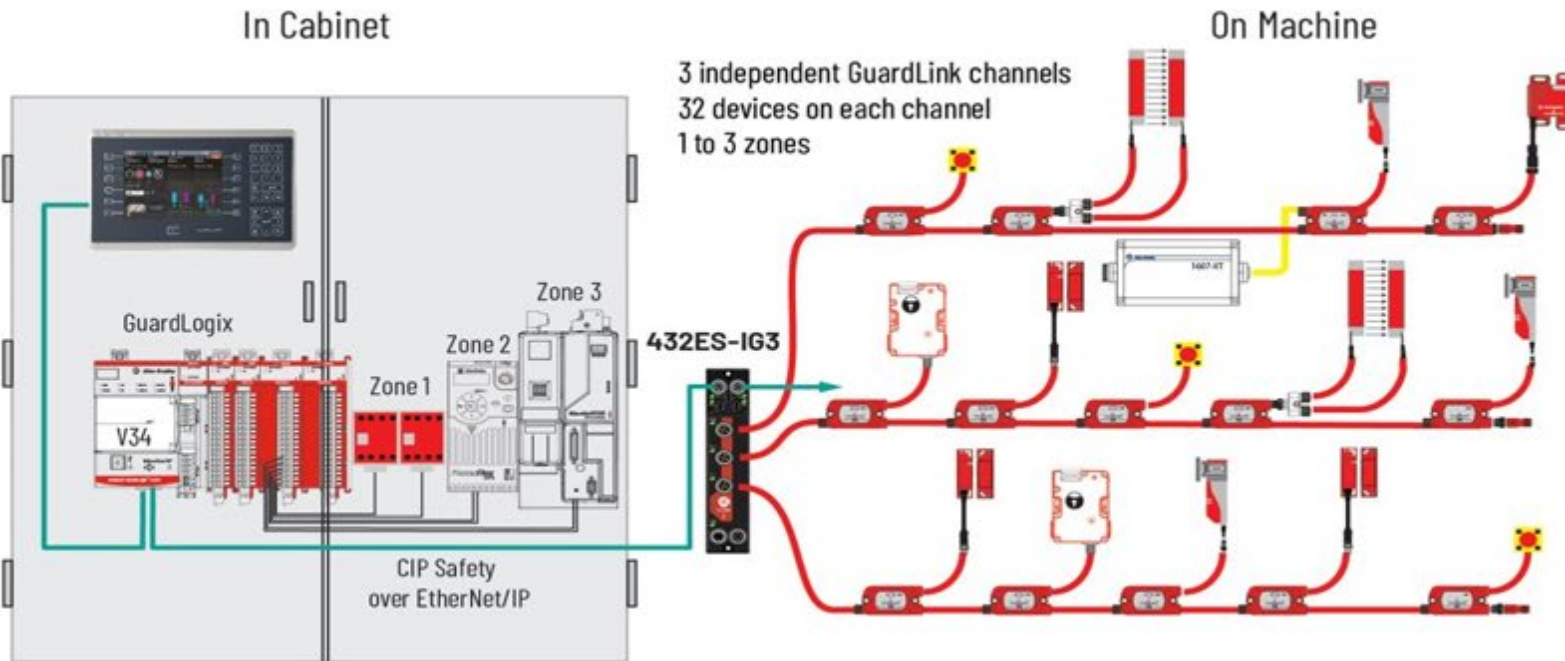
**Integrated Architecture**

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## THE CONNECTED ENTERPRISE/INDUSTRY 4.0



Cable reduction of up to 38%



### Key characteristics

432ES-IG3 on machine

Taps and safety devices on machine

Three independent GuardLink® channels

Up to 32 devices on each channel

One to three zones

Uses GuardLogix® (Studio 5000® version 34)

CIP Safety over EtherNet/IP

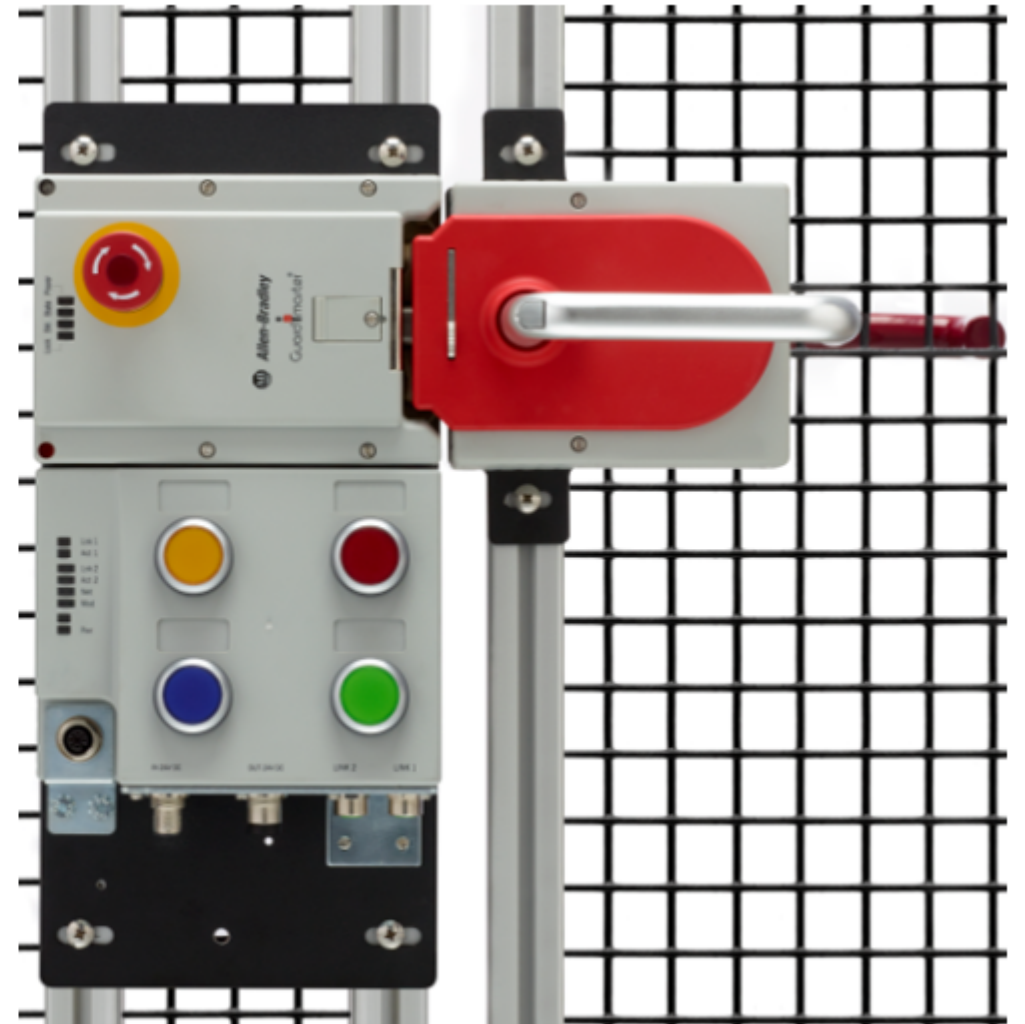
## What can my light curtain tell me?

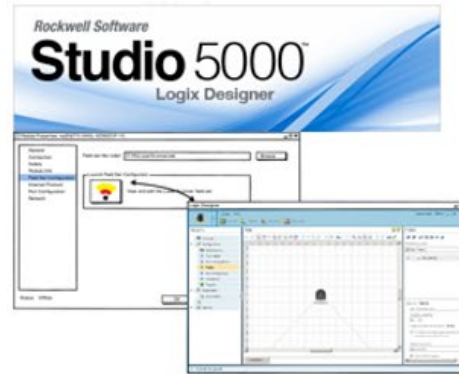
- How well it is aligned
  - Light intensity feedback
- Is the light curtain lens dirty?
- Which beams are blocked
- Is light curtain waiting for a reset
- Status
  - If output channels are shorted
- Change muting / blanking configuration over Ethernet I/P
- Diagnostic codes
- Recall up to 4 configurations



## What can my gate switch tell me?

- Opened, closed, handle position.
- Locked or unlocked
- Status
  - If channels are shorted or open
- E-stop and 4 buttons on/off status
- Diagnostic codes
- Escape release usage











## SafeZone 3 CIP Safety Scanner

- CIP Safety over EtherNet/IP enables integration of the SafeZone 3 safety laser scanner in a GuardLogix Safety Control System
- 442L AOP in Studio 5000 Logix Designer allows for easy integration into a Safety Logix control system
- Configuration program & IP address is stored in removable system plug allowing quick device replacement
- Can be mounted horizontally or vertically to detect personnel in or around machinery hazards

## Superior Value in Fluid Power Safety




- Broadest safety valve portfolio
- Superior pneumatic safety technology
- Internally or externally Monitored
- Soft-start options
- Longest lasting valves in the market

**Pneumatic Safety Valve Systems**

<b>Manual Lockout Valves</b> 	<b>Safe Exhaust</b> 	<b>Safe Dual Pressure Select</b> 
<b>Safe Return</b> 	<b>Safe Load Holding</b> 	<b>Safe Dual Pressure Supply</b> 

Safety Expertise and Global Support

**Hydraulic Safety Valve Systems**

<b>Block &amp; Bleed</b> 	<b>Block &amp; Stop</b> 
<b>Dual Block &amp; Stop</b> 	

Safety Expertise and Global Support



**Thank You!**

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