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#### Logic

## Selection Flowchart



## $\mathbf{1}_{\mathbf{0}}$ is This a

## Is This a Multizone Application?

In order to comply with safety standards and remain productive, machine builders have begun building functional safety features into machines using what has been termed the "Zone Concept." The Zone Concept increases both safety and productivity by allowing a portion of the production line to slow or stop while the rest of the line remains active. The safety hazard, whether a minor malfunction of line equipment or an obstruction, can be removed or corrected without taking the entire line down, eliminating lengthy production shut downs and worker downtime. When the hazard is cleared, the line can quickly return to normal operation. Single function and/or expandable relays systems are suited only for single-zone control, while multizone control for 2...3 zones is best served through a configurable system such as MSR300 relays or a SmartGuard packaged controller. Any applications involving control of more than three zones (and therefore more complex logic) is better suited for a programmable safety controller—SmartGuard, GuardPLC or GuardLogix.

## <sup>(2)</sup> Diverse Inputs—Number and Type

For single- and multizone applications ( $\leq$  3 zones), the number and type of inputs (e.g. interlock switches, safety mats, light curtains) will dictate the use of either safety relays (MSR100, MSR200 and MSR300) or a small packaged safety controller such as SmartGuard. For 1...2 inputs, dedicated standalone relays (MSR100) are a simple and cost effective solution, but for applications involving a high number of input devices, the hard wiring associated with individual relays can be restrictive. Therefore, in applications requiring a moderate input device count (20 or less), an expandable relay system with modular design and plug-in connections (MSR200, MSR300) is an ideal solution. In any case with safety relays, the types of input devices used will dictate the relay modules that must be selected; thus relay selection for a wide range of input devices can be complex. Applications requiring greater than 20 diverse inputs and a degree of complex logic lend themselves to the SmartGuard Controller in combination with Distributed I/O. Larger installations—those with a high number and wide variety of input device types—are best served with a safety PLC system as their programmable nature allows safety applications to be solved in software rather than hard-wiring large, cascaded relay systems.

## <sup>(3)</sup>, Is Standard Control Using a Logix Controller?

A safety control system can be a dedicated (safety only) system or integrated, where standard and safety control are combined to maximize the re-use of components and tools.

GuardLogix brings together the benefits of a Logix platform—common programming environment, common networks, and common control engine—with integrated safety control in an easy-to-use environment while providing Safety Integrity Level (SIL) 3 control. By partnering with the Logix5000<sup>™</sup> processor, GuardLogix users can benefit from common programming software, controller and I/O to help reduce development time and application cost.

GuardPLC and SmartGuard are the recommended platforms for applications requiring safety to be physically separated from standard control.

## <sup>(4)</sup> Do You Need Communications?

On-board communications allow the relay to deliver output and error status over an RS232/RS485 or fieldbus network (such as DeviceNet) to an HMI or other device. While the MSR200 series of modular safety relays does offer communications compatibility, it is not the most economical solution—MSR300 configurable safety relays are the best choice for applications requiring communications. Programmable safety controllers offer network connectivity and a high level of diagnostics, with SmartGuard and GuardPLC having DeviceNet and Ethernet capabilities, respectively.

## 5ي Do You Need Muting?

Sometimes the process requires that the machine stop when personnel enters the area, yet remains running when automatically-fed material enters or exits—this is a situation where a muting function is necessary. Muting requires the combination of a light curtain, two or four muting sensors and a control unit to process the signals and determine if and when to activate the muting function. Muting sensors are mounted in front of and behind the light curtain and only a specific sequence of sensor outputs will initiate the muting function. For example, when the two sensors in front of the light curtain change state within a predetermined timeframe, the light curtain is "muted" and will not send a stop signal to the machine as the material enters. The MSR300 modular safety monitoring relay offering includes a module specifically designed to control the muting function in applications that do not require a specific sequence or timing requirement. Muting of the MSR42 can be conveniently set up using configuration software. If sequence and timing is required, then the MSR22LM may be better suited for your application.



Logic

## Safety Relay Overview

#### Safety Relay Selection Navigator

					Т			Immediate Outputs					Delayed Outputs						
	Cat.			$\left[ + \right]$	ð-é				Saf	ety		Auxiliary	/		Safety			Auxiliary	/
	per EN			1 NC & 1			LC/		EM	SS	EM	SS	SS	EM	EM	SS	EM	SS	SS
Relay Model	954-1	1 NC	2 NC	NO	THC	SM	SG	SE	NO	NO	NC	NC	NO	NO	NC	NO	NC	NC	NO
Single Funct	ion Saf	ety Rela	ays						-										
MSR9T	3	_		1				_	2		1	—							
MSR30RT/RTP	4	1	1			_		_	_	2			1	_	_		_		
MSR33RT/RTP	4	_	_	1			_	_	_	2		_	1	_	_		_		
MSR41	4	_	_		_	_	1	_	_	2	_	2		_	_		_		
MSR117	4	1	_	-	_	_	_	_	3	_	1	_		_	_		_		
MSR126R/T	4	1	1	_			1	_	2										
MSR12/RP/TP	4	1	1	_	_	_	1	_	3		1	_							
MSR131RP/TP	4	1	1	_	_	1	1	_	3		2	2							
MSR142RTP	4	1	1		_	1	1	_	/		4	2							
MSR144RTP	4	1	1		_	1	1	_	2		2	2				—			
Delayed Out	puts													0	4				
	3	_	_			-	_						-	2	-				
MSR38D/DP	4	-	1			I	-						I			2			
MSR138DP	4/3	1	1	_			1	_	2			_		3	-				
MSR130.TDP	4/3	1	1	_	-		- 1	_	2					2	1				
Specialty Se	4 foty Do		1		I		1							3			2		
MSR35H/HP	1	_		2	1					2			1	_			_		
MSB125H/HP	4	_	_	2	1				2	2			-						
Muting Light	Curtai	n		-					-										
MSB22I M	4	_	_	_	_		3		2		1	2							
MSR42	4	_	1	_	_		3	_	_	2		2							
Stop Motion	Monito	rs					-					_							
CU2	1	_	_	1	_	_	_	_			_	_		2	_	1	_		_
Speed Monit	ors			1															
MSR57P	4	1	1	1	_	1	1	_		6	_	_	_	_	_	_	_		_
Back EMF M	onitors	;		1															
CU3	1	_	_	_	_		_	_	2	_	1	_	_	_	_	_	_		_
Mat Controll	ers																		
MSR23	3	_	_	_	_	1	_	-	2	_	1	_	_	_	_	_	_		
440F-C4000P	3	_	_	_	_	1	_	_	2		1	_		_			_		_
440F-C4000S	3	_	_	_		1	_	_	2		1			_			_		
Mat Manage	r																		
C280**	3	_	_		_	8*	_	_	6\$		1	_			_	_			_
Safedge™ C	ontrolle	ers		1															
251D	3	_	_	_	_	_	_	1‡	2	_	1	_	_	_	_	_	_	_	
252D	3	_	_	_	_	_	_	1‡	1		1	_		_	_	_	_		
C251P	3	_	_	_	_	—	_	1‡	2		1	_			_	_	_		_
Sipha Contro	ollers																		
Sipha 1	3	—	-	1	_	-	_	-	1	_	-	1	_	_	_	_	_	_	_
Sipha 2	3	_	_	6	_	_	_	_	2		1	_		_	_	_	_		_
Sipha 6	4	—	_	6		—	_	—	2		1			1					

Note: THC= Two-hand Control, SM = Safety Mat, LC = Light Curtain, SG = SensaGuard, SE = Safedge, EM = Electromechanical, SS = Solid State, and • = included

\* Up to eight mats can be monitored.

\* Up to six mats can be monitored.

‡ Can support more than one edge in series or parallel.

# Logic Safety Relay Overview

	Operatin	g Voltage		Res	set*	Output S Curre	Switching ent, A				
24 DC	24 AC	115 AC	230 AC	Auto./ Man.	Mon. Man.	250V AC	24V DC	Housing Width (mm)	Removable Terminals	Additional Information	Relay Model
				1			1		1		
•	•	•	•	•		4	3	45.5		5-14	MSR9T
•				•	•		2	22.5	•	5-16	MSR30RT/RTP
•				•	•		2	22.5	•	5-18	MSR33RT/RTP
•	_		_	•			4	22.5	•	5-22	MSR41
•	•	_	—	•	-	5	3	22.5	—	5-22	MSR117
•	•	•	•	•	•	6	3	22.5		5-24	MSR126R/T
•	•	•	•	•	•	5	3	22.5	•	5-26	MSR127RP/TP
•	•	•	•	•	•	6	3	45.0	•	5-28	MSR131RP/TP
	•	•	•	•	•	6	3	67.5	•	5-30	MSR142RTP
•			_	•	•	5	3	45.0	•	5-32	MSR144RTP
•	•			•		5	3	22.5		5-34	CU4
•				•	•		2	22.5	•	5-36	MSR38D/DP
•	•	•	•	•	•	6	3	45.0	•	5-38	MSR138DP
•	•	•	•	•	•	6	3	45.0	•	5-38	MSR138.1DP
•	•	•	•	•	-	4	2	35.0	•	5-40	MSR178DP
•	_		_	_	_	_	2	22.5	•	5-44	MSR35H/HP
•	_	•	•	_	_	6	3	22.5	•	5-46	MSR125H/HP
					·				·		
•	_			_	•	3	3	45.0	•	5-48	MSR22LM
•				•	•	_	4	22.5	•	5-48	MSR42
•	٠	•	•	•	_	4	3	45	_	5-56	CU2
•	—	—	_	•	•	—	2	67.5	•	5-60	MSR57P
•	•	•	•	•	—	4	3	45	—	5-64	CU3
•	•	•		•	•	3	3	22.5 & 45.0	•	5-66	MSR23M
•	•	•	•	•	•	4	2	210	—	5-66	440F-C4000P
•	•	•	•	•	•	4	2	210	_	5-66	440F-C4000S
•	•	•	•	•	•	4	2	210	_	5-70	C280
•	•	•	•	•	-	2	1	45		5-72	251D
•	•	—	—	•	-	2	1	22.5	-	5-72	252D
•	•	•	•	•	-	2	1	130		5-72	C251P
•	•			•	-	4	2	22.5		5-74	Sipha 1
•	•	•	•	•	-	4	2	45		5-74	Sipha 2
•	•	•	•	•	-	4	2	90		5-74	Sipha 6

Note: Auto./Man. = Automatic/Manual and Mon. Man. = Monitored Manual, and • = included



### Logic Safety Relay Overview

										Imme	diate O	utputs		Delayed Outputs					
	Cat.	9					Saf	ety		Auxiliary		Safety			Auxiliary				
	per EN			1 NC & 1			LC/		EM	SS	EM	SS	SS	EM	EM	SS	EM	SS	SS
Relay Model	954-1	1 NC	2 NC	NO	THC	SM	SG	SE	NO	NO	NC	NC	NO	NO	NC	NO	NC	NC	NO
Expansion Re	lays			1				-	1		-	1		-					
MSR45E	4								2									—	
MSR132E/EP	4	1	1	_		—	—		4		2		_			—	—	—	
Delayed Outputs																			
MSR132ED/EDP	3	1	1	—	_	—	—	—	_	_	—		—	4		—	2	—	
Modular Safety Relays (Series 200)																			
MSR210P	4	2	2	2		2	_		2	_	1	—	2	_	_	_	_	—	—
MSR211P	4	2	2	_	_	_	2	_	2	_	1	—	2	_	_	_	_	_	
MSR220P	4	2	2	2	_	2	_	_	_	_	_	_	_	_	_	_	_	_	
MSR221P	4	2	2	_	_	_	2		_	_		_	_	_	_	_	_	_	
MSR230P	4	_	_	_	_	_	_		4	_		_	_	_	_	_	_	_	
MSR238P	3	_	_	_	_				_	_		_		2	_		1	_	
MSR240P	_	_	_	_	_	_	_		_	_		_	_	_	_	_	_	_	
MSR241P	_			_	_	_			_	_	_	_	2		_	_		_	_
MSR245P	_	_	_	_	_				_			_		_	_			_	
Configurable Safety Relays (Series 300)																			
MSR310P	4		_	_		_	_		_	_		_	3		_	_	_	_	
MSR312P	4		_	_	_				_			_	4	_	_			_	—
MSR320P	4	2	2	2	1	2	2		_	_		_	2	_	_	_	_	_	
MSR329P	4	_		_	—	—	—		—			_	4		_	—	—	-	
MSR330P	4	_		_	_	_	_		3		1	_	_		_	_	_	_	_
MSR338DP	3	_	—	_	_	—	—		—	_	—	_	—	3	_	—	1	_	

Note: THC= Two-hand Control, SM = Safety Mat, LC = Light Curtain, SG = SensaGuard, SE = Safedge, EM = Electromechanical, and SS = Solid State



## Logic Safety Relay Overview

	Operatin	g Voltage		Res	et≉	Output S Curre	Switching ent, A	Housing	Removable	Additional	
24 DC	24 AC	115 AC	230 AC	Auto./Man.	Mon. Man.	250V AC	24V DC	Width (mm) Termi		Information	Relay Model
	—	—	_	_	_	3	6	22.5	•	5-78	MSR45E
•	•	_			_	6	3	22.5	•	5-78	MSR132E/EP
•	_	_	_	_	_	6	3	22.5	•	5-78	MSR132ED/EDP
•	_	_	_	•	•	3	2.5	45.0	•	5-82	MSR210P
•	_	_	_	•	•	3	2.5	45.0	•	5-84	MSR211P
•	_	_		_	_	_		17.5	•	5-86	MSR220P
•	_	_		_	_	_		17.5	•	5-88	MSR221P
•	_	_	_	_	_	3	2.5	22.5	•	5-90	MSR230P
•	_	_	_	_	_	5	3	22.5	•	5-92	MSR238P
•	_	_		_		_	_	17.5	•	5-94	MSR240P
•	_	_	_	_	_	_	2	45	•	5-96	MSR241P
•	_	_	_	_	_	_	_	144	•	5-98	MSR245P
•	_	_		•	•		_	35	•	5-102	MSR310P
•	_	_	_	•	•	_	_	35	•	5-104	MSR312P
•	_	_		_		_	50 mA	17.5	•	5-106	MSR320P
•	_	_	_	-			30200 mA	17.5	•	5-108	MSR329P
•	_	_	_		_	6	3	22.5	•	5-110	MSR330P
•	_	_	_	_	_	5	3	22.5	•	5-112	MSR338DP

Note: Auto./Man. = Automatic/Manual and Mon. Man. = Monitored Manual, and • = included



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## **Technology Overview**

## **MSR100 Single Function Safety Relays**



#### Features/Benefits

A simple and cost-effective solution for a wide variety of applications, MSR100 single function safety relays support a wide variety of input devices and output configurations. Ideal for relatively small safety applications and single zone control, MSR100 relays are designed in a compact package with removable terminal for ease of installation and maintenance. These relays are also available in electromechanical versions, or solid-state models for applications involving high cycle rates.

#### Applications

- Wide range of general purpose applications
- Automotive
- Packaging
- Food and beverage
- Semiconductor
- Material handling
- OEM machines

#### **Common Misapplications**

- · Complex safety solutions
- Applications requiring a high level of diagnostics
- Driving high current loads
- Electromechanical relays used for high cycle rates

## MSR200 Modular Safety Relays



#### Features/Benefits

Using plug-and-play digital I/O expansion modules, the MSR200 expandable modular relay system supports up to 22 diverse inputs (mats, light curtains, switches, etc.) to allow safety control of larger, more complex manufacturing equipment with a single relay system. The MSR200 family's microprocessor-based design offers enhanced diagnostic and communication functionality over multiple protocols. It also allows the relay to deliver output and error status over a fieldbus network to an HMI. Simple plug-in connectivity between modules provides simple system expansion with reduced wiring. Offering SIL3, delayed output support and an optional dedicated display module, the MSR200 system provides substantial cabinet space savings over dedicated single-function relays.

#### Applications

- Wide range of general purpose applications
- Automotive
- Packaging
- · Food and beverage
- Semiconductor
- Material handling
- PLC controlled applications
- Medium size machines

#### **Common Misapplications**

- Dedicated input connections for input devices
- Not economical when communication is needed (MSR300 recommended)

### Logic Technology Overview

## MSR300 Configurable Safety Relays



#### Features/Benefits

The MSR300 family of expandable modular safety relays handles larger, more complicated safety systems by allowing connection of multiple input modules to a single base unit. It offers a logic configuration with multiple inputs and the control of multiple independent outputs. The system supports up to 20 diverse inputs and can control up to 3 zones, performing simple function block logic configurations through rotary switch settings as opposed to software configuration. Modules can be mixed and matched to work with various input device types, reducing the need for multiple single-purpose relays, simplifying setup, wiring, maintenance and saving valuable panel space. The MSR300's diagnostic capabilities over multiple protocols provide input, output and error status. Offering SIL3, two-hand control support and monitoring through HMI, the MSR300 is easily customized and expanded thanks to plug-in connections that reduce wiring for the addition of inputs and outputs.

#### Applications

- Wide range of general purpose applications
- Automotive
- Packaging
- · Food and beverage
- Semiconductor
- Material handling

Reduced inventory

• Wide variety of input types

#### **Common Misapplications**

• Single zone applications with no communications requirements



Logic

## **Technology Overview**

## SmartGuard<sup>™</sup> 600



#### Features/Benefits

The SmartGuard 600 controller is designed for SIL3 applications that require some complex logic. It is a "packaged safety controller" that includes the CPU, 16 Safety Inputs and 8 Safety Outputs and an embedded DeviceNet communications port. Using the DeviceNet communications port, the SmartGuard 600 controller can control additional safety I/O modules including the 1791DS CompactBlock Guard I/O and 1732DS ArmorBlock Guard I/O, as well as 1734 POINT Guard I/O modules via a 1734-PDN module. In addition, the SmartGuard controller can also communicate with standard PLCs and HMIs on DeviceNet or EtherNet/IP networks. SmartGuard 600 systems are programmed using RSNetworx software.

#### Applications

- Wide range of general purpose applications
- Automotive
- Packaging
- · Food and beverage
- Semiconductor
- Material handling

#### **Common Misapplications**

• Simple applications (MSR300 recommended)

Guard I/O™



#### Features/Benefits

Guard I/O is the name for the Rockwell Automation family of Safety I/O modules that communicate via CIP Safety on EtherNet/IP and DeviceNet networks. CompactBlock Guard I/O modules on EtherNet/IP and DeviceNet networks are available in IP20 (in-cabinet) form-factor ArmorBlock Guard I/O modules on DeviceNet networks are available in IP67 (on-machine) form-factors. POINT Guard I/O modules provide EtherNet/IP and Devicenet connectivity in a maximum density in-cabinet I/O solution.

#### Applications

- Wide range of general purpose applications
- Automotive
- Packaging
- · Food and beverage
- Semiconductor
- Material handling

#### **Common Misapplications**

• Simple applications (MSR300 recommended)

5-Selection Criteria AUDIN - 8, avenue de la malle - 51370 Saint Brice Courcelles - Tel : 03.26.04.20.21 - Fax : 03.26.04.28.20 - Web : http://www.audin.fr - Email : info@audin.fr

### Logic Technology Overview

## GuardPLC™



#### Features/Benefits

GuardPLC refers to a family of SIL3 safety controllers that are programmed with the RSLogix Guard software package. Like the SmartGuard 600, the GuardPLC 1600 and GuardPLC 1800 Safety PLCs are "packaged safety controllers" with a CPU, safety I/O and embedded communication networks. In the case of the GuardPLC 1600 and 1800 the embedded communication network is Ethernet for communication to GuardPLC Safety I/O modules as well as EtherNet/IP for communications to standard controllers and HMIs. The GuardPLC 1600 includes 20 safety inputs and 8 safety outputs. The GuardPLC 1800 includes 24 safety inputs, 8 safety outputs, 8 analog safety inputs and 2 safety rated high speed counters.

#### Applications

- Wide range of general purpose applications
- Automotive
- Packaging
- Food and beverage
- Semiconductor
- Material handling

#### **Common Misapplications**

• Simple applications with low I/O counts

**GuardLogix**®



#### Features/Benefits

The GuardLogix system is a SIL3 Logix5000<sup>™</sup> controller that in addition to running all standard control functions like sequential, motion, etc., also has the ability to run a Safety Task and control safety DIO. This enables both safety and standard applications to run simultaneously in a single application project. This significantly reduces integration, spares and training and improves the flow of data to HMI and information systems. A GuardLogix controller communicates to Safety I/O via a standard communication modules. It is programmed with RSLogix 5000, just like a Logix5000 processor.

#### Applications

- Wide range of general purpose applications
- Automotive
- Packaging
- Food and beverage
- Semiconductor
- Material handling

#### **Common Misapplications**

• Simple applications with low I/O counts



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#### Logic Safety Relay Overview Why Use a Minotaur?

With Safety Relay

Power Supply

To Load

Control units provide functions such as time delays, motion sensing and two hand control supervision.

The functional requirements for monitoring safety relay units, such as the Guardmaster Minotaur range, will depend on their use in the system.

Their basic tasks are:

- 1. To detect faults on safety-related electrical control circuits, e.g. faults in sensors, wiring, contactors, etc.
- 2. To provide an ensured switching action, e.g. to act as an intermediate relay to amplify a signal or distribute it to multiple devices.
- 3. To provide a manual reset facility. They achieve their function by using internal redundancy (e.g. duplication) and monitoring.



From Supply

5-Safety Relays

## Applications



Contactor monitoring circuit Contactor switching circuit Supply inclusive of switching circuit Contactor

Contactor Wiring: Minotaur monitors for

faults that may cause

danger.

Monitored by Minotaur

Contactors:

may cause danger.

Minotaur monitors for faults that



### Logic Safety Relay Overview Selection Guidelines

#### **Selection Guidelines**

There are four safety system architectures available from Rockwell Automation. They are as follows:

**1. Component systems:** At the lowest level, a safety function can be accomplished with an actuating device and a control device. For example, an e-stop button that opens up the coil of a safety control relay performs a simple safety function. Component system architectures are typically used in low risk applications.

**2. Dedicated safety monitoring relay systems:** Dedicated safety relays are used for specific applications. These systems utilize packaged control modules that are designed to interface to common safety devices such as e-stops, safety gates, light curtains, and safety mats. Some dedicated relays provide special functions like timing, two-hand control, muting, and presence sensing device initiation. Since there are many different types of input devices and functions, there are many different types of dedicated safety monitoring relays. Dedicated safety monitoring relays have the ability to provide basic diagnostics in the form of LEDs on their front panels and auxiliary contacts that may be connected to a PLC or indicator lamp. Dedicated safety relays system architectures are typically used in medium to high-risk applications.

3. Expandable safety monitoring relay systems (MSR200): It provides the unique ability to easily add input and output modules to a "basic" safety relay module. Since the modular system is microprocessor based, it also has the ability to provide enhanced diagnostics over a communication connection. For instance, the I/O and error status can be communicated over a field bus network. Being a relatively new architecture, it currently accepts inputs from common types of safety devices: e-stops, safety gates, light curtains and safety mats. Modular safety relay system architectures are typically used in medium- to high-risk applications.

4. Configurable safety monitoring relay systems (MSR300): The MSR300 family of expandable modular safety relays handles larger, more complicated safety systems by allowing connection of multiple input modules to a single base unit. It offers the ability for a logic configuration with multiple inputs and the control of multiple independent outputs. The system can control up to three independent groups of outputs and perform simple function block logic configurations through rotary switch settings—no software needed. Mix and match modules to work with various input device types, reduces the need for multiple single-purpose relays, simplifies setup, wiring, maintenance and saves valuable panel space. The MSR300s diagnostic capabilities and communication functionality also reduces maintenance time by providing input, output and error status.

**5. Safety PLC systems:** Safety PLCs bring programmability, high I/O counts, distributed control and a high level of communications to safety architectures. They also bring some special functions not previously available in dedicated systems: high speed counters and analog signals. Safety PLC architectures are often applied in a variety of complex, high-risk applications.

#### Making the Right Choice

Begin the selection process by evaluating the needs of your application. The *Quick Guide* below can be used to direct you towards the best solution. Some of the guidelines will clearly point you to one type of architecture or another. Some will require further analysis before making a final decision. Due to the diverse nature of machine guarding, it is possible to create a hybrid system or a combination of architectures to provide adequate safeguarding of a particular machine or manufacturing system.

#### **Quick Guide**

Characteristics	Architecture									
Application Complexity										
Low	Dedicated Relays									
Medium	Dedicated or Expandable Relays									
High	Safety PLCs									
Communication										
Status	Expandable Relays									
Control	Safety PLCs									
Diagnostics										
Low	Dedicated Relays									
Medium	Expandable Relays									
High	Safety PLCs									
Expandability										
Low	Dedicated Relays									
Medium	Expandable Relays									
High	Safety PLCs									
Input	Input Types									
Special	Dedicated Relays or Safety PLCs									
Common	Dedicated or Expandable Relays									
I/O (	Count									
Low	Dedicated Relays									
Medium	Expandable Relays									
High	Safety PLCs									
I/O Lo	cation									
Contained	Dedicated or Expandable Relays									
Spread Out	Safety PLCs									
Sequentia	Shutdown									
None	Dedicated or Expandable Relays									
Yes	Safety PLCs									
Zone	Control									
Few	Dedicated or Expandable Relays									
Many	Safety PLCs									

