Section 25

Machine Safety Products

XPS Safety Relay

XPSMCM Modular Safety Controller

XUSL Light Curtain

XCSDM Non-Contact Safety Interlock Switches

XYZCED Double Cable Pull Switches

25 MACHINE SAFETY PRODUCTS

Schneider Electric

Introduction

Many different architectures for safety related solutions are available in Schneider Electric's product offering, from safety relays to safety PLCs. The architecture can determine what SIL level or performance level can be achieved with the safety related solution. Various architectures may have inherent benefits such as simple selection or increased levels of diagnostics, but their cost effectiveness can depend on the size and complexity of the safety related system and the features and functions required.

Safety Relays—XPS

To tie the whole safety system together, XPS safety relays are used to monitor the safety inputs, outputs, and feedback from the system to determine when the system is safe to start and when the system should be shut down.

Modular Safety Controllers—XPSMCM

Modular safety controllers are used in applications where multiple safety relays would be required to control the safety-related system, or where the interaction between the individual safety relays would require significant inter-wiring. Ethernet based communication allows you to provide status to the control system without additional I/O wiring. The simple-to-use software allows you to easily develop the safety-related control system, providing a cost effective solution.

Light Curtains—XUSL

Some machine operations may not allow gates or guards to be used, and other applications require high visibility of the process or easy accessibility. For these applications, XUSL light curtains may be the best choice and are available in many protected heights, minimum object sensitivities, and configurations.

Safety Interlock Switches—XCS

To protect operators, maintenance, and other personnel, safety systems may require the interlocking of mechanical gates or guards. We provide both locking and non-locking mechanical XCS safety interlock switches in many body styles and contact arrangements.

Non-Contact Safety Interlock Switches—XCSDM

For certain applications, such as food and beverage, no contact between the safety interlock switch and its actuating key is desired, so we provide several different types of XCSDM non-contact safety interlock switches.

Safety Limit Switches—XCS

In some applications, the position of components is important to the safety of the machine. Devices such as safety interlocks or light curtains are impractical. These applications are ideal for safety limit switches. They can also be used on gates and guards to verify a closed position or a fully open or overtravel position.

Cable Pull Switches—XY2

In most applications, emergency stopping is required to shut the machine down in case an emergency or problem arises. Where an individual emergency stop is required, the XB4/XB5 emergency stop push buttons are available in various types, sizes, and nameplates. On large machines or conveyors, a high number of emergency stop operators may need to be installed. As more individual e-stop buttons are required, using an XY2 cable pull switch becomes a more economical solution based on ease of use, installation time, and cost effectiveness.

Other products for use in safety-related systems

We offer many other products that are suitable for use in safety-related circuits, such as:

- XB4/XB5 emergency stop push buttons—See Section 19, XB4–XB5 Common Operators, page 19-8
- XV tower lights—See Section 19, XVC Tower Lights and Accessories, page 19-118
- TeSys contactors and relays—See Section 18, Contactors and Relays, page 18-2
- Limit switches with positive/direct opening N.C. contacts—See Section 21, Limit Switches, page 21-2

All of the machine safety products in this section are designed to work together to allow you to meet your various safety requirements. When properly applied, these products will allow you to meet SIL 3 per IEC 61508, Category 4 per ISO 13849-1, and performance level "e" per ISO 13849-1, and help you meet domestic and international safety requirements, standards, and codes.

The following pages give an overview of our wide offering of machine safety products. **MKTED208051EN-US** gives a detailed description of our offering, including safety PLCs, safety controllers, safety relays, safety interlocks, light curtains, safety interlocks, non contact safety interlocks, and cable pull switches. This catalog also provides additional information on domestic and international safety standards and codes, and additional information to help you develop safety systems for the protection of personnel.
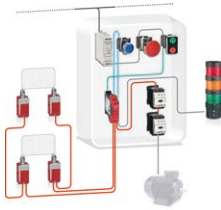
Guard Monitoring with Safety Module, Limit Switch, and Contactor

XPS Safety Relay

XPSMCM Safety Modular Controller

Safety Chain Solutions and Functions

Machine builders are looking to improve machine safety without compromising production targets in dynamic industrial environments. Safety has a direct impact on user productivity and company reputation. However, building the right level of safety on your machine can be difficult due to regulations, a large portfolio of offers, and being sure you have the right safety application knowledge.

Schneider Electric is a complete safety chain provider. Schneider Electric's safety chains cover all the safety functionality and scalability you need to improve efficiency and profitability. The Preventa range offers an extensive selection of safety products, compliant with international standards, to provide the most comprehensive protection for personnel and equipment.

Learn more about our complete machine safety chain solutions in catalog DIA3ED2140902EN, available at www.schneider-electric.com. This catalog contains a list of machine safety solutions, including sensors, operators, and logic devices designed to meet a variety of specific needs and performance levels for typical machine safety applications.

XPS Safety Relays

XPS safety relays monitor various safety inputs, start sequences, and feedback from starters and relays to allow machinery operation only when all safety controls are in their appropriate state and are functioning properly. Inputs can be from emergency stop push buttons, cable pull switches, limit switches, light curtains, safety interlock switches, or two hand control stations.

XPS safety relays give users increased functionality and flexibility when designing equipment to meet safety requirements and standards in the U.S., for the European Safety Directive, IEC safety requirements and meet Category 4 of EN/ISO 13849-1. Most devices can be configured for single or dual channel inputs, and for either monitored start, non-monitored start, or automatic start. Removable wiring terminals or non-removable wiring terminals are available on most module types.

The XPS product family complements our broad safety product offering with modules for many specific safety functions and applications, as well as devices for use in general types of applications. There are even devices whose safety functions can be configured at the time of installation.

Preventa XPS Includes the Following Types of Safety Relay Modules:

- Specific purpose modules such as limit switch monitoring, zero speed, timing, two-hand control, press control, and others
- Multifunctional configurable devices with multiple sets of inputs whose functions can be configured from 15 pre-defined functions, allowing greater flexibility and functionality
- Broad range of devices for emergency stop applications
- Expansion modules to increase the number of safety outputs
- Many devices compatible with light curtains
  Features and Benefits
- LEDs are provided to indicate power, input, output, and feedback loop status.
- Solid state outputs provide compatibility with system controllers for diagnostics, troubleshooting, and correct system operation.
- Most devices are available with either removable or non-removable terminals.
- Most devices are available with a monitored start function to detect welded contacts or incorrect status in the start function and also to detect tampering with the start circuit.
- Dual voltage devices are available for use with either 120 V or 24 V power to reduce your inventory and increase flexibility.

XPSMCM Modular Safety Controllers

XPSMCM Modular Safety Controllers are designed to monitor multiple safety functions on and around a machine to minimize the risk of people accessing dangerous moving parts. This modular safety controller is designed for monitoring safety functions such as:

- Emergency stop
- Guard monitoring
- Perimeter guarding
- Position monitoring
- Speed monitoring
- Enabling movement

This is achieved with input devices such as:

- Emergency stop push buttons
- Safety guard and limit switches
- Safety foot switches
- Safety light curtains and laser scanners
- Safety mats
- Safety encoders and proximity sensors
- Two-hand control stations
- Enabling switches

MACHINE SAFETY PRODUCTS

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Safety Chain Solutions and Preventa™
XPS/XPSMCM Safety Relays

For Monitoring Safety Functions

Schneider
Electric

Refer to Catalog **8501CT9801**

schneider-electric.us

XPSMCM System Applications

XPSMCM systems offer numerous advantages compared to traditional safety modules, such as:

- The ability to design expansion module hardware architecture and layout according to the machine specification. This reduces the number of components, the footprint, and wiring.
- Simplification of input and output wiring by software configuration combining multiple functions
- Machine scalability from 8 inputs and 2 outputs up to 128 inputs,16 outputs, and 32 diagnostic status outputs with the expansion modules connected directly to the controller or distributed among 6 islands
- A wide range of communication expansion modules
- Intuitive software for logical configuration, offline simulation, and online visualization, testing, and commissioning
- Simplification of machine maintenance through a removable memory card, which can be used to transfer the configuration to a new controller without software

XPSMCM System Components

An XPSMCM system is composed of:

- A safety controller CPU, which can be used as standalone or together with expansion modules
- Safe expansion modules: digital input modules, solid state and relay output modules, or mixed input/output modules
- Safe speed monitoring modules for proximity sensors and safety encoders: Sin/Cos, HTL, TTL
- Safe communication expansion modules for safe island creation
- Non-safe communication modules: interfaces to machine network (Modbus TCP and Ethernet IP)
- A memory card, available for saving configuration data for ease of maintenance and controller setup
- Backplane expansion connectors for connecting the modules to the safety controller CPU

Configuration Software

The XPSMCM modular safety controller is supported by SoSafe Configurable software. This sofware is available as a free download at: http://www.schneider-electric.com/en/download/document/SoSafe+Configurable/. The software uses a simple drag and drop function block approach to configuration and has a library of configurable safety and logical functions, as well as easy to use tools for:

- Online configuration monitoring
- Offline simulation
- Configuration validation
- Hardware device scanner
- Printable schematics and documentation

SoSafe Configurable software supports quick and easy setup of the machine.

XUSL4M Light Curtains

XUSL Light Curtain

New! **XUSL Light Curtains**

XUSLM4 Light Curtains

The XUSL4M Type 4 Safety Light Curtains with integrated muting provide efficient protection of machine operators with uninterrupted automation processes.

The XUSL4M Safety Light Curtains come in basic or advanced models and can be fitted with a range of available muting arm options to fit your specific application. This optimized range of light curtains has embedded safety functions such as Automatic or Manual start/restart and External Device Monitoring (EDM) allowing a standalone operation without a safety interface.

The XUSL4M Safety Light Curtains from Telemecanique Sensors are available in Body and Hand detection models in different protected heights

XUSL Type 2 and 4 Light Curtains

XUSL Type 2 and 4 light curtains provide point of operation protection for large areas without the need for gates or guards. They allow excellent visibility of the machine or process and free access to the machine while providing protection for personnel. Light curtains are made up of an array of infrared light beams to form a protected area. Whenever one or more of the light beams is broken, the light curtain sends a stop signal to the machine safety control circuit.

XUSL2E and XUSL4E Light Curtains

XUSL2E and XUSL4E light curtains for point of operation safeguarding are available in either single or multiple segment configurations. Choose the one that best meets your application requirements. These versions are available in either 14 mm or 30 mm minimum object sensitivity (MOS).

Slim and rugged design results in an esthetically pleasing small mounting footprint suitable for aggressive environments.

Two box light curtains are ideal for installations where it is desirable to mount and wire only two components, transmitter and receiver. These devices are self-contained and the receiver provides the safety outputs.

Features and Benefits

- 14 and 30 mm minimum object sensitivity (MOS)
- 14 mm MOS protection heights:160 - 1810 mm (6.3 - 71.3 in.)
- 14 mm MOS sensing range: 6.0 m (19.68 ft.)
- 30 mm MOS protection heights: 160 - 1810 mm (6.3 - 71.3 in.)
- 30 mm MOS sensing range: 8 m or 20 m (26.2 or 65.6 ft.)
- 29 x 31.5 mm housing size (1.1 x 1.2 in.)
- 24 Vdc supply voltage
- Female connector cables sold separately (5 m, 10 m, 15 m, and 30 m)
- Cascadable devices available - up to 3 segments

MACHINE SAFETY PRODUCTS

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Safety Interlock Switches

Safety Interlock Switch Products

Class **9007** / Refer to Catalog **MKTED208051EN-US**

Telemecanique
Sensors
www.tesensors.com

XCSA Safety Interlock Switch

XCSMP

XCS Safety Interlock Switches
For Gate or Guard Interlocking

XCS safety interlock switches verify that the doors, gates, or guards are closed before a process which could be harmful to personnel can start up. The hazards to personnel can be mechanical, electrical, hydraulic, pneumatic, chemical, or thermal. The various sizes and shapes of safety interlock switches are designed for a wide variety of applications. These mechanical devices have two components: a switch and an actuating key. When the gate or guard is closed, the actuating key attached to the gate or guard is inserted into the switch, closing the safety contacts, allowing the machine to be started. When the gate or guard is opened, the actuating key is removed from the switch, and the safety interlock switch contacts open.

XCS safety interlock switches are designed to meet demanding requirements in the US and Europe, as well as the rest of the world. The flexibility of the XCS line allows one XCS device to perform the same functions as several competitor's devices. This means that fewer XCS devices may be required to cover your needs.

Specifically designed for the protection of machine operators, maintenance and other personnel, the XCS switches can be used in a wide range of applications where a gate, door or guard is a part of the safety related system.

Features and Benefits

- Simple, rapid installation saves time and labor
- Device flexibility reduces stock requirements
- Wide variety of body styles, contact arrangement, and operators meet a variety of application requirements
- Bodies available in metal or plastic
- Switches are interchangeable between new and older devices, as well as with competitor's devices
- A variety of actuating keys are suitable for all applications
- Pre-wired devices and many connector options available to make wiring and installation easier
  The Following Types of Safety Interlocks are Available:
- Non-locking
- Locking with push button or key release
- Locking by electrical solenoid
- Rotary shaft operation, for use on hinges of doors
- Rotary lever for hinged guards
- Pre-wired compact body

XCSDMP

XCSDM4

XCSDM Non-Contact Safety Interlock Switches
For Non-Contact Gate or Guard Interlocking

XCSDM non-contact safety interlock switches are designed for the same functions as mechanical safety interlock switches. The difference is that the non-contact safety interlock switches are magnetically coded devices and require no contact between the switch and coded magnet. This is a benefit where door or guard mis-alignment is an issue, or where the machine designer does not want to use a mechanical device.

Benefits of Non-contact Devices:

- Food, beverage and pharmaceutical applications require that no contaminants be trapped in or around devices.
- Non-contact devices have no inherent operating force and are well-suited for applications such as lightweight or plexiglass doors, where cracking or breakage is prevalent with standard mechanical safety interlock switches.
- Wash down applications where a standard mechanical safety interlock switch would be more difficult to clean, especially in the actuating key receptacle.
- Where small size is critical or a slim profile is desired
  Features and Benefits of XCSDMC, XCSDMP, and XCSDMR
- Tolerates gate or guard alignment problems
- Wider temperature range for a plastic bodied device than any competitor's products
- Multiple coded-magnet approach directions allow for maximum flexibility of mounting options
- Suitable for Category 4 safety circuits when used with a safety relay or safety controller.
- Available with or without LEDs
- Connector and cabled versions available
  Features and Benefits of XCSDM3 and XCSDM4
- Meets SIL 2 and 3 per IEC 61508, Category 3 and 4 per EN 954-1 and EN/ISO 13849-1 and performance level "e" per EN/ISO 13849-1 without the need for a safety relay or safety controller
- Connector and cabled versions available
- Multicolor LEDs for diagnostics and status
- Multiple coded-magnet approach directions allow for maximum flexibility of mounting options

New!

XCSR Contactless RFiD Safety Sensors

The XCSR contactless RFiD safety sensor from Telemecanique Sensors provides industrial companies with the highest level of safety-certified sensor protection, allowing employers to effectively seal off areas in the work zone that are dangerous. The design of the new XCSR safety sensor safeguards employees against tampering with the protection system.

The XCSR contactless RFiD safety sensor is TüV certified with a Cat4/PLe – SIL3 rating.

The XCSR contactless RFiD safety sensor is virtually tamper-proof. The ready-to-use transponder and reader are factory-paired and sold together with a unique, high-level coding which is virtually impossible to bypass or disrupt. Once this highly effective safety system is in place, its functionality can't be altered.

The XCSR contactless RFiD safety sensor offers three different connection types to fit virtually any type of industrial environment. All three connection types are configured with unique codes and provide a PLe/Cat4 – SIL3 level of protection. The three connection types offered are as follows:

- **Standalone:** The standalone model of the new XCSR contactless RFiD safety sensor allows direct connection to contactors. It has integrated safety functions, such as monitoring of the contactors and manual or automatic start and restart functions.
- **Series:** The series model of the new XCSR RFiD safety sensor allows direct connection to a simple safety relay and series diagnosis through a diagnostic module. There is no programming software needed. The series model comes with integrated M12 series connectors and eliminates the need of T or Y connectors.
- **Single:** The single model of the new XCSR RFiD safety sensor allows point-to-point connections to a safety controller.

XCSR RFiD Safety Sensor

Safety Limit Switches

XCS Safety Limit Switches

Preventa XCS safety limit switches are used in machine safety systems for a wide variety of safety related functions, including end of travel notification, overtravel indication, safety related positioning of machinery/tooling or component parts, as well as interlocking gates and guards. They are often used in conjunction with safety interlock switches for mechanical and electrical redundancy on doors and guards.

Features and Benefits

- Meet US and European safety standards requiring that switches used in safety related applications have positive opening contacts
- Tamper resistant covers over mounting screw and head adjustment to reduce potential for tampering
- Red color allows easy visibility and identification of safety related limit switches
- Two body styles available:
  – Compact, pre-wired with cable
  – Compact, with conduit entry

XCS Safety Limit Switch

XCSP/XCSD Safety Limit Switches

The XCSP (plastic body) and XCSD (metal body) safety limit switches are identical in size and features. The only difference is the enclosure and conduit entry. XCSP and XCSD safety limit switches are for use in safety related applications including end of travel notification, overtravel indication, safety related positioning of machinery/tooling or component parts, as well as interlocking gates and guards.

Features and Benefits

- Positive opening contacts standard in all devices
- Snap acting contacts
- Slow make/slow break contacts
- Several head types available
- Metal and Plastic body styles available
- Several conduit types available
- Tamper resistant cover

XCSM Safety Limit Switches

The XCSM safety limit switches come pre-wired in multiple lengths of electrical cable for simplified installation. The XCSM safety limit switches are for use in safety related applications including end of travel notification, overtravel indication, safety related positioning of machinery/tooling or component parts, as well as interlocking gates and guards.

Features and Benefits

- Positive opening contacts standard in all devices
- Snap acting contacts
- Slow make/slow break contacts
- Several head types available
- Metal body
- Pre-wired in various cable lengths
- Tamper resistant cover

MACHINE SAFETY PRODUCTS

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Safety Switches

Safety Limit and Cable Pull Switches

Class **9007** / Refer to Catalog **MKTED208051EN-US**

Telemecanique
Sensors

www.tesensors.com

New!

XY2 Cable Pulls

XY2 Cable Pull Switches for Emergency Stop Operation

XY2 cable pull switches provide emergency stop signaling at any point along a cable up to 656 feet in length. This is preferable to installing many individual emergency stop push button stations along a conveyor or around the machine, providing a more cost effective solution. Typical applications include conveyor systems, packaging, textiles, transfer machines, presses, woodworking equipment and paint lines.

Operation is based on the taut cable principle. The cable must be tight and have appropriate tension applied to set or reset the switch. Once cable tension has been set, the device will open the N.C. control contacts if either the cable is pulled or if it becomes slack due to stretching or breakage of the cable.

Normal stop versions are used where a momentary, non-emergency signal is required at any point along a cable.

Features and Benefits

- Cable lengths: XY2CED: 656 ft.; XY2CE 230 ft.; XY2CH and XY2CJ 98 ft.
- Emergency stop versions (available in XY2CED, XY2CE, XY2CH, and XY2CJ)
  - The N.C. contact opens the control circuit and mechanically latches, and will remain latched in the open position until an operator manually resets it
  - Emergency stop versions have positive/direct opening contacts as standard
  - Device will not reset if out of adjustment
- Normal stop versions (available in XY2CE and XY2CH)
  - Normal stop versions are used where a momentary, non-emergency signal is required
  - Normal stop versions do not latch contacts open or include positive opening contacts
  - Normal stop versions are provided with snap action contacts for momentary stop
- Adjustable tripping force (XY2CE and XY2CED)
- Available with 2 N.O. and 2 N.C. contacts (XY2CE and XY2CED) or
- Available with 2 N.C. and 1 N.O. contacts (XY2CH and XY2CJ)
- Two viewing windows to aid in adjusting the switch (XY2CH)
- Manual tripping force adjustment (XY2CE and XY2CED)
- Adjustment indicator (XY2CE, XY2CH, and XY2CED)
- Traction force indicator (XY2CE, XY2CH, and XY2CED)
- Left, right, and straight cable mount, depending on unit
- UL NSID certified for emergency stop
- Protection level IP65 and IP66 (XY2CED)
- Compliant up to PLe/Cat4–Sil3 safety levels (XY2CED)

XY2CED Features

- Operating temperature range: -13 °F to 158 °F (-25°C to +70°C)
- Suitable for protected outdoor use
- Silicon bellows (extreme temperatures) or nitril as standard bellows
- Different types of reset button (booted, flush, key)
- With or without pilot light
- Cable entries: Compatible ISO M20 and Pg 13.5 cable glands or threaded ½ in. NPT
- Contact blocks : 2 blocks [N.C. + N.O.]
- Protection level: IP65 and IP66
- Certifications
  - CE
  - UL-NISD
  - CSA
  - CCC
- Compliant up to PLe/Cat 4 – SIL3 safety levels (with appropriate safety interface)