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**Safety PLC**

XPSMF Safety PLC for use in safety systems where multiple functions are required, or where the interaction between the various components of the safety system is more complicated. **25-4**

**Safety Controller**

XPSMC safety controllers for use where multiple safety relays and multiple safety functions are required, or where there is a greater interaction between the various safety functions required on the machine. **25-4**

**Safety Relays**

XPS safety relays for controlling individual safety functions of the system. **25-5**

**AS-Interface Safety at Work**

AS-Interface for use where multiple safety functions and their interaction need to be monitored. All safety information is transmitted using a safety communication bus. **25-5**

**Light Curtains**

XUSL light curtains for use in point of operation guarding and perimeter guarding. Available in 14 mm (finger) or 30mm (hand) minimum object sensitivity (MOS) as well as perimeter or body detection, all with a wide range of protected heights. **25-6**

**Safety Interlock Switches**

XCS safety interlock switches for mechanical interlocking of gates and guards. Locking and non-locking versions are available. **25-7**

**Non-Contact Safety Interlock Switches**

XCSDM non-contact safety interlock switches for interlocking of gates and guards, where no contact is desired between switch and actuator. **25-7**

**Safety Limit Switches**

XCS safety limit switches for a wide variety of safety related functions, including end of travel notification, over-travel indication, safety related positioning of machinery/tooling or component parts, as well as gates and guards. **25-8**

**Cable Pull Switches**

XY2 cable pull switches for Emergency Stop control around conveyors, assembly lines, and large machines. **25-8**

**Palm Operators**

9001 Type P palm operators for applications such as power operated presses, and two hand control applications. **See catalog MKTED208051EN-US**

Safety systems are comprised of many components, and no one safety component will ensure the safety of the system. The design of the complete safety system and level of safety desired must be considered before choosing products. The whole safety system needs to be integrated as part of the initial design, not added on after the machine is built. Schneider Electric can provide a wide range of products for the protection of personnel for machine guarding applications and safety system architectures.

#### Safety PLCs—XPSMF

Safety PLCs are used where the safety solution is complicated, or where there are a greater number of safety inputs or outputs required. They are also used where safety inputs and outputs need to be distributed around the machine or production area.

#### Safety Controllers—XPSMC

Safety controllers are used in applications where multiple safety relays would be required to control the safety system, or where the interaction between the individual safety relays would require significant inter-wiring. The simple-to-use software allows the user to easily develop the safety control system, providing a cost effective solution.

#### 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.

#### AS-Interface Safety at Work—AS-i

AS-Interface provides the safety solution of multiple safety relays on a communication bus that can transmit both standard and safety relevant data. The safety solution is simply configured with the easy to use configuration software.

#### 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

Sometimes no contact between the safety interlock switch and its actuating key is desired, such as in food and beverage applications, 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, and 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.

#### Palm Buttons—9001 P

Press applications demand two hand control units for operator protection that are large and easy to operate while wearing gloves. Other press applications, such as stop and inch, also need large buttons for operators wearing gloves. The 9001 P palm buttons offer a variety of operators to meet these needs.

#### Other products for use in safety systems

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

- XB4/XB5 emergency stop push buttons—See **Section 19**
- XV indicating banks—See **Section 19**
- TeSys contactors and relays—See **Section 18**
- Limit switches with positive/direct opening N.C. contacts—See **Section 21**

All of the machine safety products discussed 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 EN 954-1 and ISO 13849-1, and performance level “e” per ISO 13849-1, and help you meet domestic and international safety requirements, standards, and codes.

The next few pages give an overview of our wide offering of machine safety products. Catalog #MKTED208051EN-US gives a detailed description of our offering, including safety PLCs, safety controllers, safety relays, AS-Interface, safety interlocks, light curtains, safety interlocks, non contact safety interlocks, cable pull switches, and palm buttons. This catalog also provides additional information on domestic and international safety standards and codes, and much more information to help you develop safety systems for the protection of personnel.

Many different safety architectures are available in Schneider Electric's product offering, from safety relays to safety PLCs. The safety architecture can determine what SIL level or safety category can be achieved with the safety 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 system and the features and functions required. Some of the features and benefits of these Various architectures are:



XPS Safety Relays

**XPS Safety Relays**

- Local diagnostics (LEDs)
- Remote diagnostics (solid-state outputs)
- Plug-in connectors simplify maintenance
- Select only the safety functions needed
- Simple installation
- Simple replacement
- Proven electromechanical reliability
- No software to learn or use



XPSMC Safety Controller

**XPSMC Safety Controllers**

- Simplicity and flexibility
  - 16 or 32 inputs and 10 safety outputs
  - A wide library of predefined and certified safety functions
  - User-friendly software configuration
  - Reduced wiring
  - Only one product to install and implement
- Local and remote diagnostics via serial link to PC or PLC
  - Reduced implementation time and downtime
  - Reduced troubleshooting time



XPSMF Safety PLC

**XPSMF Safety PLCs**

- Increased productivity because of:
  - Reduced machine down time
  - Reduced overall engineering costs incurred during installation and maintenance
  - Reduced system complexity by having a single network solution instead of many
- XPS-MF will simplify the entire system by:
  - Saving space
  - Reducing wiring
  - Increasing overall system flexibility by use of programming and device placement (network capability)
  - Providing complex diagnostics (network capability)
  - Saving time and money due to reduced maintenance
- SafeEthernet protocol



AS-Interface

**AS-Interface Safety at Work**

- Enables safety solutions to be integrated into the distributed architecture
- Reduces wiring requirements and speeds implementation
- Allows quick and flexible connection of safety interfaces via vampire connector
- Provides simple software configuration
  - Drag and Drop
  - On-line diagnostics
- Provides diagnostics without additional wiring
- Lowers costs from design to operation

All of our machine safety products—such as safety interlocks, light curtains, and cable pull switches—can be used with any of the safety devices listed above. The final safety control system could meet the safety levels indicated in Table 25.1, depending upon how the safety circuit is designed.

**Table 25.1: Maximum Safety Levels of the Safety Architecture**

	Category 4 per EN 954-1 and ISO 13849-1	SIL 3 Per IEC 61508
XPS Safety Relays	Yes	No
XPSMC Safety Controllers	Yes	Yes
XPSMF Safety PLCs	Yes	Yes
AS-Interface Safety at Work	Yes	Yes

### XPSMF PLCs



XPSMF PLC

The XPSMF Safety PLCs are programmable logic controllers that can be interfaced with the machine control system to meet US, EN, and IEC safety requirements. All XPSMF Safety PLCs meet the requirements of SIL 3 per IEC 61508, Category 4 per EN 954-1 and ISO 13849-1, and performance level “e” per ISO 13849-1. The XPSMF can perform all of the various safety functions required in today’s machinery. These functions can be programmed by using one or more pre-defined and certified function blocks (CFB) or by creating your own configuration and function blocks.

#### Features and Benefits

- Increased productivity because of:
  - Reduced machine down time
  - Reduced overall engineering costs incurred during installation and maintenance
  - Reduced system complexity by having a single network solution instead of many
- Saving space, reducing complexity
  - Reducing wiring
  - Increasing overall system flexibility by use of programming and device placement (network capability)
  - Providing complex diagnostics (network capability)
  - Saving time and money due to reduced engineering and maintenance

#### Hardware

- Certified to SIL 3 per IEC 61508, Category 4 per EN 954-1 and ISO 13849-1, and performance level “e” per ISO 13849 -1, UL/CSA
- Each Safety PLC contains two processors (redundancy)
- SafeEthernet protocol
- Standard bus communication using Ethernet
- 2 or 4 RJ45 connection points (depending on version)
- Connect hardware in any orientation
- LED diagnostics on PLC housing
- Removable terminals
- Compact range contain DIN rail attachment simplifying installation

### XPSMC Safety Controllers



XPSMC Safety Controller

The XPSMC safety controllers can be used for monitoring all of the different safety tasks for your applications in one safety controller. All of the functions of the various safety relays are built into the hardware and software. The XPSMC safety controllers meet SIL 3 per IEC 61508, Category 4 per EN 954-1 and ISO 13849-1, and performance level “e” per ISO 13849-1. The associated configuration software makes development of the safety solution simple, using drag and drop techniques to configure the safety system. Detailed diagnostics provide an in depth overview of the status of the inputs and outputs.

#### Features and Benefits

- Safety inputs
  - 16 or 32 safety inputs
- Safety outputs
  - Six safety semiconductor outputs
  - Two safety relay outputs, with two relay contacts each (for a total of four relay outputs)
  - One output for muting indicators
- Control outputs
  - Eight control outputs are used to supply the safety inputs in order to detect incorrect wiring or short circuits in the wiring.

#### Configuration Software

- The wide device library of certified safety functions simplifies the development of safety applications.
- Using the simple to use XPSMCWIN software, the configuration can be developed without special training.

#### Diagnostics with PC and Software

- Using the diagnostics mode, the XPSMCWIN software provides an exhaustive overview about the status of the safety functions.
- The status of the inputs, the safety devices and the outputs are indicated by various colored indicators.

#### Diagnostics with LEDs in the Front Cover

- 6 LEDs indicate the status of the controller.
- 8 LEDs indicate the status of the safety outputs.
- 16 or 32 LEDs indicate the status of the safety inputs.
- Input/output errors are indicated by blinking of the corresponding LED.

**XPS Safety Relays**



XPS Safety Relay

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 954-1 and 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.

**AS-Interface Safety at Work**



ASISAFEMON1B Monitor

AS-Interface, the recognized cabling system for sensors and actuators, has been enhanced. Standard process information and information relating to safety can now be transmitted over the same yellow cable. Certified to SIL 3 per IEC 61508, Category 4 per EN 954-1 and ISO 13849-1, and performance level “e” per ISO 13849-1, the AS-Interface “Safety at work” system meets the needs of the most common safety applications, such as:

- Monitoring of emergency stops with instantaneous break contacts (stop category 0)
- Monitoring of emergency stops with delayed break contacts (stop category 1)
- Monitoring of safety interlocks and limit switches with and without interlocking
- Monitoring of light curtains

**Features and Benefits**

- Simplicity
  - Just add the required safety devices to the standard AS-Interface network.
- Integration
  - Standard data and safety relevant data is transmitted over the same communication bus—no need for a separate safety network.
- Flexibility
  - Monitor multiple devices and control multiple safety sectors.
- Diagnose
  - From one screen, see the status of the safety interfaces and the system.
- Safety
  - Category 4 per EN 954-1 and ISO 13849-1
  - SIL 3 per IEC 61508
- Multifunctional
  - Monitor up to 31 safety interfaces.
  - Available with 1 or 2 independent output groups.
- Segmentation of safety sectors
  - Multiple safety monitors can be connected to the same AS-Interface network.
  - Monitors can be configured to monitor different groups of safety interfaces.

- 45 mm wide housing

**ASISWIN2 Configuration Software**

- Drag and drop methodology
- Predefined, certified safety functions for user selection
- On-line diagnostics of AS-Interface Safety System
- Password protection

XUSLB and XUSLD  
Light Curtain

XUSL Type 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.

XUSLB and XUSLD 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). Fixed and floating blanking is standard on the XUSLD.

XPSLP perimeter guard light curtains detect the presence of a body as it enters a protected area. They are available in single or multiple beam systems.

#### Features and Benefits of All XUSL Light Curtains

- Slim and rugged design results in an esthetically pleasing small mounting footprint suitable for aggressive environments.
- Broken Beam Indicators for EVERY beam on ALL devices (patented).
  - Makes alignment easier, reducing installation time and cost.
  - Identifies which beams are broken.
  - Identifies exact channel (fixed blanking) select beams.
  - Simplifies troubleshooting and re-adjustment, reducing downtime.

#### XUSLB and XUSLD 2-Box Light Curtain

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: 280 - 1360 mm (11.0 - 53.5 in.)
- 14 mm MOS sensing range: 7.0 m (22.9 ft.)
- 30 mm MOS protection heights: 320 - 2120 mm (12.6 - 83.5 in.)
- 30 mm MOS sensing range: 8 m or 20 m (26.2 or 65.6 ft.)
- 38 x 50 mm housing size (1.5 x 1.97 in.)
- 24 Vdc supply voltage
- Broken beam Indicators for EVERY beam on ALL devices
- Female connector cables sold separately (5 m, 10 m, 15 m, and 30 m)
- Configurable by hand held programming and diagnostic module (PDM)
- Cascadable devices available in the XUSLD versions - up to 4 segments



XUSLP Light Curtain

#### XUSLP Perimeter Guard for Body Detection

Perimeter guarding light curtains are used around work cells and for guarding around the perimeter of machinery. They are also used in place of gates or doors. These two box systems simplify installation, since no inter-wiring is required between the emitter and receiver. Installation is further simplified with the passive receiver version, which only needs to have the emitter wired. No wiring is required for the receiver.

#### Features and Benefits

- 1 to 6 beams
- Sensing distance up to 70 m (230 ft.) depending upon configuration
- Height: 750 mm (29 in.) to 1800 mm (68 in.)
- Minimum object sensitivities: 300, 400, 500, or 600 mm (11.8, 15.75, 19.69, or 23.62 in.) and single beam
- Visible, red broken beam Indicators
- Short circuit protected
- IP67
- Display for diagnosis and working mode
- No need of shielded wire up to 120 m (394 ft.)
- Restart and start interlock
- External device monitoring /machine primary control element monitoring (EDM/MPCE)
- Machine test signal (MTS)
- 3 types of coding (A, B, C) by internal switches



XUSLP Light Curtain

**XCS Safety Interlock Switches  
For Gate or Guard Interlocking**



XCSA Safety Interlock Switch



XCSMP

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 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

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



XCSDMP



XCSDM4

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 misalignment 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
- 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 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

## Safety Limit Switches



XCS Safety Limit Switch

### 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 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

### 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 materials. XCSP and XCSD safety limit switches are for use in safety 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 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
- Plastic body
- Pre-wired in various cable lengths
- Tamper resistant cover

## Cable Pull Switches For Emergency Stop Operation



XY2 Cable Pulls

### XY2 Cable Pull Switches

XY2 cable pull switches provide emergency stop signaling at any point along a cable up to 165 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: XY2CE 165 ft. and XY2CH 50 ft.
- Emergency stop versions (available in XY2CE and XY2CH)
  - 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

#### XY2CE

- 165 ft. maximum cable length
- Adjustable tripping force
- Available with 2 N.O. and 2 N.C. contacts

#### XY2CH

- 50 ft. maximum cable length
- Two viewing windows to aid in adjusting the switch
- Manual tripping force adjustment
- Adjustment indicator
- Traction force indicator