

Refer to standards
EN/ISO 12100 and
EN 1088/ISO 14119

Removable protective guards covering hazardous machine functions must be used in conjunction with an interlocking device.

Application: high inertia machines.

An interlocking guard with card locking must be used when the rundown time is greater than the time it takes for a person to reach the danger zone.

This device ensures that the guard remains locked until the hazardous movement has stopped.

Safety switches

The key operated safety switches, specifically designed for machine guarding applications, provide an ideal solution for the locking or interlocking of movable guards associated with industrial machinery. They meet the requirements of the standards EN/ISO 12100, EN 294/ISO 13852, EN 1088/ISO 14119 et IEC/EN 60204-1.

The start control circuit of the machine is opened (switched-off) when the guard is removed or opened, using **positive opening operation contacts**.

The removal/opening of the guard (after hazardous movements have stopped) can either be:

- at the time the machine is switched-off for low inertia machines (machines whose rundown time is less than the time it takes for the operator to access the danger zone), or
- delayed for high inertia machines (machines whose rundown time is greater than the time it takes for the operator to access the danger zone).

Control circuit
categories

Safety limit switches used in conjunction with PREVENTA safety module, enable designers, with reference to EN 954-1/ISO 13849-1, to develop category 4 control systems.

Safety related parts of control systems should be developed taking into account the results of an appropriate Risk Assessment (EN 1050/ISO 14121 - EN/ISO 12100 - 1 and 2)

Safety of personnel

The machine starting circuit is not closed until the safety switch is fully operated. When it is released, the N/C contact or contacts is/are opened by **positive action** or a change of state in the case of encoded magnetic switches **necessarily monitored by a PREVENTA safety module**.

Safety of operation

The safety switches incorporate slow-break or snap-action contacts with **positive opening operation** (except for encoded magnetic switches which cannot be fitted with positive opening contacts). When the guard is closed, the multiple interlocking device is actuated thereby closing the N/C contacts and causing the contacts of encoded magnetic switches to change state.

Safety in use

The safety device is designed to accept small movements (a few millimetres) to compensate for mechanical play, vibration, etc.

Design to minimise
defeat

Key operated and encoded magnetic safety switches are designed to be operated by specific actuators so that they cannot be defeated in a simple manner using common tools, metal plates, a simple magnet, etc.

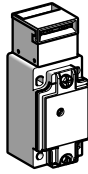
When loosening the fixing screws for re-orientation of the turret head (key operated switches), the head itself remains attached to the switch body and the contact states remain unchanged.

Safety limit switches are also designed to ensure that it is not possible to adjust the head setting, remove the product or gain access to the contact block without the appropriate tool.

There are various methods for obtaining a higher level of tamper proofing, for example:

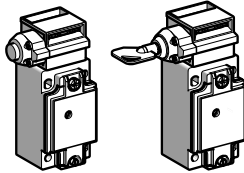
- using a cage device to prevent the insertion of a spare part, a key, a magnet or any other foreign body,
- fixing the operating key or the encoded magnet to the guard by means that make it very difficult to remove (welding, riveting).

Key operated metal case safety switches



Without locking of the operating key

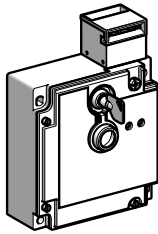
Metal case limit switches for use on machines **without inertia** and operating in **normal conditions** (no vibration or shock and guard mounted vertically, without risk of rebound on closing), thus eliminating unintentional opening of the guard.



With locking of the operating key and manual unlocking

Metal case limit switches for use on heavy machines **without inertia** and operating in **arduous conditions** (shock or vibration exist), whereby the guard could open unintentionally.

A key operated lock or a pushbutton enables the positive locking of the guard and its subsequent unlocking.



With interlocking and locking of the operating key by electromagnet

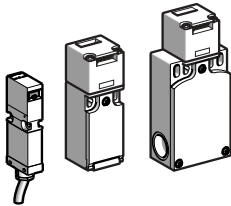
Metal case limit switches for use on machines **with inertia** or necessitating a controlled opening of the protective guard.

The locking of the moving guard can either be on de-energisation or energisation of the electromagnet.

A key operated lock enables manual unlocking of the guard in the event of an interlocking circuit malfunction, and also provides extra safety for maintenance personnel likely to be working on the machine.

The switches incorporate 2 LEDs: one indicating guard "open/closed" and the other, guard "locked/unlocked".

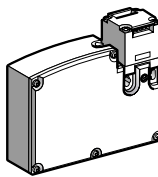
Key operated plastic case safety switches



Without locking of the operating key

Plastic case limit switches for use on light machines **without inertia**.

For use in arduous conditions (shock or vibration exist, guard not vertical or risk of rebound on closing) where the guard could open unintentionally, a **guard retaining device** is available as an accessory (**XCS PA** or **XCS TA**).



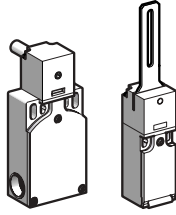
With interlocking and locking of the operating key by electromagnet

Plastic case limit switches for use on machines **with inertia** or necessitating a controlled opening of the protective guard.

The locking of the moving guard can either be on de-energisation or energisation of the electromagnet.

A special tool enables manual unlocking of the guard in the event of an interlocking circuit malfunction, and also provides extra safety for maintenance personnel likely to be working on the machine.

Rotary lever or spindle operated safety switches for hinged guards

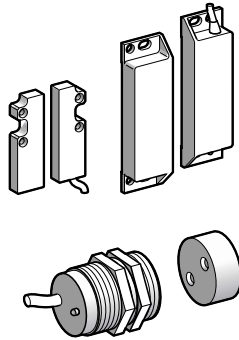


With rotary operator

Plastic case limit switches with straight or elbowed operating lever or spindle operator. Specifically designed for small industrial machines fitted with small sized **hinged doors, covers or protective guards**.

They protect the operator by immediately stopping the dangerous movement of the machine as soon as the rotary lever or spindle displacement reaches an angle of 5°.

Coded magnetics safety switches



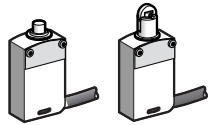
With an associated coded magnet

Plastic case switches for use on machines without inertia. Specifically designed for industrial machines fitted with doors, covers or **guards with imprecise guiding**.

They are ideally suited for machines subjected to frequent washing.

They protect the operator by immediately stopping any dangerous movement, as soon as the distance between the switch and its magnet is greater than 8 or 5 mm, depending on model.

Safety switches

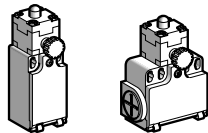


With plunger or rotary operator

Metal case limit switches.

They are used with machines without inertia or with inertia in conjunction with key operated switches for monitoring access doors and/or guards. When used on their own, they are always installed in "positive mode". Combined in pairs, one switch is installed in "positive mode" and the other in "negative mode".

Manually reset limit switches



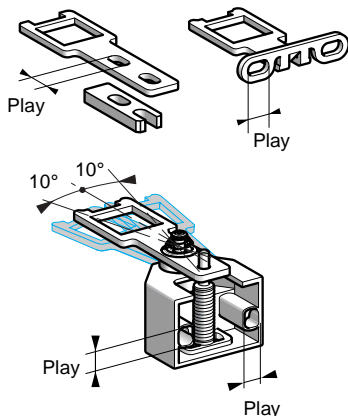
With plunger or rotary operator

Plastic case limit switches.

For use with hoisting and lift equipment.

The open position of the N/C contact is maintained until manually reset by the operating knob on the front of the switch.

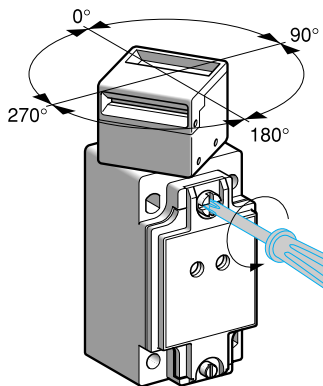
Operating keys



The operating keys are common to all metal case safety switches

Their oblong fixing holes enable simple adjustment when mounting on moving guards.
 A pivoting operating key (both horizontally and vertically) is available when using safety switches in conjunction with hinged guards or guards with imprecise guiding.
 Straight operating keys are supplied with an adaptor shank for simple replacement of an **XCK J** limit switch by an **XCS** switch, without the need to drill additional fixing holes.

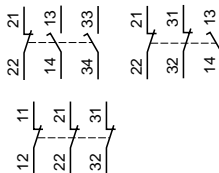
Turret head



All metal case safety switches are fitted with a square turret head which can be rotated through 360° in 90° steps

8 directions of actuation are possible for the operating key:
 - 4 in the horizontal plane,
 - 4 from above the switch (4 alternative positions of the key slot, depending on the orientation of the head).
 On removal of the fixing screw for re-orientation of the operating head, the head itself remains attached to the body and the contact states remain unchanged.

Safety contacts



Metal case safety switches incorporate a **3-pole contact block**, with positive opening operation, which is actuated by insertion or withdrawal of the operating key.
 The withdrawal of the operating key opens the N/C safety contact(s), even in the event of the contact sticking or welding.
 The 3-pole contact block enables redundant safety circuits to be established (for example: N/C + N/C or N/C + N/O) and also, to provide signalling (for example: PLC, illuminated beacon, ...).

LED indicators

An orange LED (optional for switches types XCS A, XCS B and XCS C, standard for switches type XCS E) **indicates the position of the machine guard:**



LED illuminated: operating key not inserted in head of switch, N/C contact(s) open, guard open.



LED not illuminated: operating key inserted in head of switch, N/C contact(s) closed, guard closed.

A green LED (incorporated on limit switches type XCS E) **indicates the locking of the machine guard:**



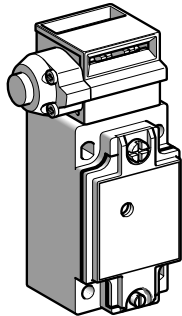
LED not illuminated: operating key not inserted in head of switch: the machine cannot be operated,



LED illuminated: operating key inserted in head of switch **and key locked**. The machine is either ready for starting, running or decelerating to a standstill.

Manual locking/
unlocking by
pushbutton or key
operated lock on
XCS B and XCS C

The pushbutton or key operated lock fitted to switches type XCS B or XCS C allows manual locking/unlocking of the machine guard.



Their use is not necessary for the normal operation of the limit switch.

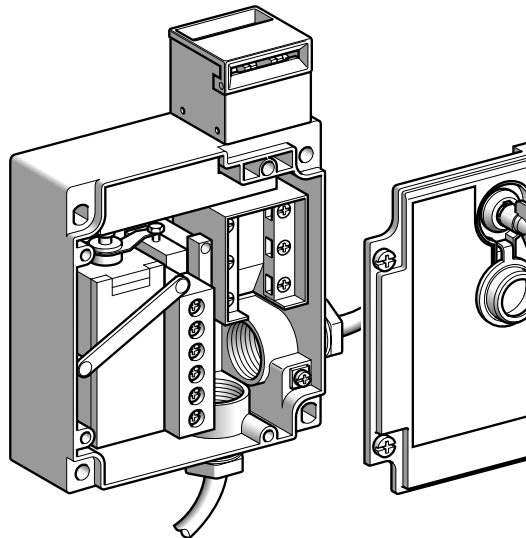
For ease of access, the pushbutton or lock may be mounted on the right or the left of the limit switch head.

For limit switches type XCS C, when the machine guard is locked (key in position "LOCK"), the resistance to forcible withdrawal of the operating key fitted to the guard is **150 daN**.

The key is removable from the locking device in the "LOCK" position.

Locking/unlocking by
electromagnet on
XCS E

Switches type XCS E incorporate an electromagnet for locking/unlocking of the machine guard.



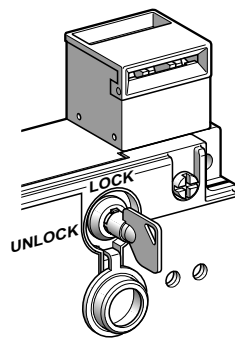
With the machine guard closed and locked, the resistance to forcible withdrawal of the operating key fitted to the guard is **200 daN**.

In addition to the 3-pole contact block positively operated by the operating key fitted to the guard, XCS E switches incorporate a **N/C + N/O contact block mechanically linked to the electromagnet**.

The N/C contact is for use in the safety circuit of the machine and the N/O contact for signalling the status of the electromagnet.

Key operated lock on
XCS E

Switches type XCS E are fitted with a key operated lock allowing the unlocking of the machine guard whilst being held in the locked position by the electromagnet (authorised personnel only).



The manual unlocking of the guard using the key operated lock is useful in the following cases:

- whilst the machine is undergoing maintenance (with the key turned to the "UNLOCK" position and then removed, the degree of safety is higher in preventing an accidental machine restart. The safety for maintenance personnel is thus improved),
- in the event of a power failure,
- in the event of an interlocking circuit malfunction (interlocked condition maintained: positive safety).

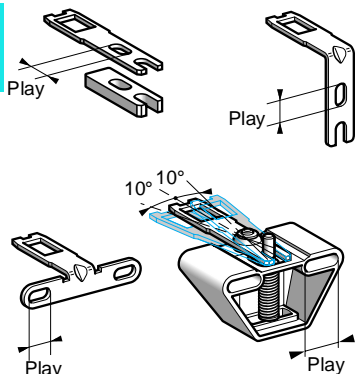
The electrical supply providing the unlocking via the electromagnet always takes priority over manual unlocking using the key operated lock.

The lock fitted to standard limit switches has key withdrawal from the "LOCK" and "UNLOCK" positions.

Example of operation of an XCS E switch with locking on electromagnet de-energisation

Machine state	Stopped de-energised	Stopped energised	Stopped ready to start	Running	Stopping sequence	Stopped energised
Guard position	Open	Open	Closed	Closed	Closed	Closed
Guard state	Free	Free	Free	Locked	Locked	Free
Electromagnet state	"0" (de-energised)	"1" (energised)	"1" (energised)	"0" (de-energised)	"0" (de-energised)	"1" (energised)
3-pole contact state for XCS E5●●●						
3-pole contact state for XCS E7●●●						
Functions	Machine at rest.	Machine cannot be started.	Guard closed, operating key can be locked. It will be locked as soon as the start instruction is given.	Start instruction given, the machine is running.	Stop instruction given, the machine stops gradually (deceleration then complete stop of motor).	Machine has stopped. The guard can be opened.
Contact states of electromagnet						
Orange LED						
Green LED						
Safety circuit of the machine	Open	Open	Open	Closed	Closed	Open

Operating keys



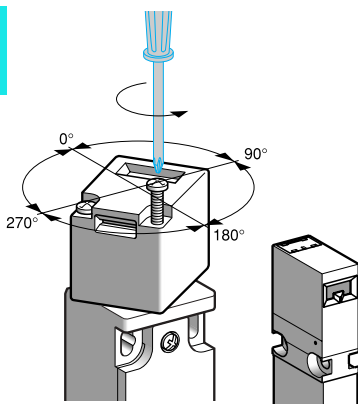
The operating keys are common to all plastic case key operated safety switches.

Their oblong fixing holes enable simple adjustment when mounting on moving guards.

An operating key pivoting both horizontally and vertically is available when using the switches in conjunction with hinged guards or guards with imprecise guiding.

Straight operating keys are supplied with an adaptor shank for simple replacement of an **XCK P** limit switch by an **XCS PA** switch or an **XCK T** limit switch by an **XCS TA** switch, without the need to drill additional fixing holes.

Turret head



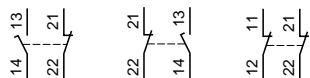
Safety switches **XCS PA**, **XCS TA** and **XCS TE** are fitted with a square turret head which can be rotated through 360° in 90° steps. Safety switches **XCS MP** have a fixed head.

8 directions of actuation are possible for the operating key:
 - 4 in the horizontal plane (1 for **XCS MP**),
 - 4 from above the switch (1 for **XCS MP**), (4 alternative positions of the key slot, depending on the orientation of the head).

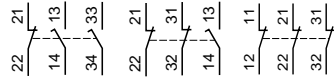
When loosening the 2 fixing screws for re-orientation of the operating head, the head itself remains attached to the body and the contact states remain unchanged (**XCS PA**, **XCS TA**, **XCS TE**).

Safety contacts

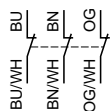
XCS PA, XCS TE



or **XCS TA**



or **XCS MP**



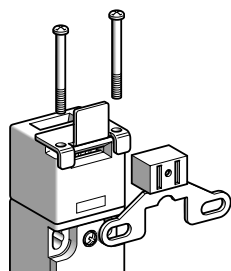
The safety switches incorporate either a 2-pole contact block (**XCS MP**, **XCS PA** and **XCS TE**) or a 3-pole contact block (**XCS MP** and **XCS TA**), with positive opening operation, which is actuated by insertion or withdrawal of the operating key attached to the guard.

In addition, safety switches type **XCS TE** incorporate a N/C contact block (with positive opening operation) actuated by the electromagnet. The N/C contact is for use in the safety circuit of the machine. The withdrawal of the operating key opens the N/C safety contact(s), even in the event of the contact sticking or welding.

The 2-pole N/C + N/C contact block enables category 3 control circuits to be established conforming to EN 954-1/ISO 13849-1 by using both N/C safety contacts in redundancy, or a category 1 control circuit by using one N/C contact in the safety circuit and the other N/C contact for signalling (for example: PLC, illuminated beacon, etc.). Alternatively, these switch(es) used in conjunction with a PREVENTA **XPS** safety module establishes a category 4 control circuit.

Designers should follow the recommendations for enabling switches to EN 956-1

Guard retaining device



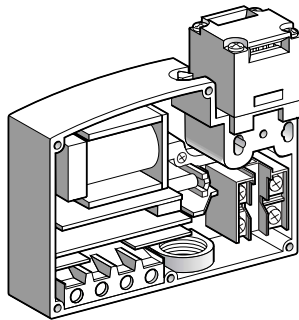
The guard retaining device **XCS Z21** can be used with all plastic case switches **XCS PA** and **XCS TA** that are used in conjunction with either the wide (**XCS Z12**) or pivoting (**XCS Z13**) operating key.

They assist in holding the guard closed by providing an extra retaining force of 5 daN.

It is specially suited for use with light machines operating in arduous conditions (vibration, mechanical shock, guard not vertical, risk of guard rebound on closing, etc.).

It can be used for horizontal operating key actuation directions as well as those from above.

Locking/unlocking by electromagnet on XCS TE

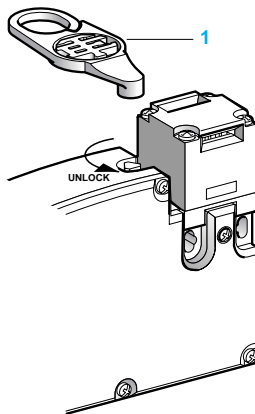


Switches type XCS TE incorporate an electromagnet for locking/unlocking of the machine guard.

With the machine guard closed and locked, the resistance to forcible withdrawal of the operating key fitted to the guard is **50 daN**.

In addition to the 2-pole contact block actuated by the operating key fitted to the guard, XCS TE limit switches incorporate a **N/C contact block** (with positive opening operation) **actuated by the electromagnet**. The N/C contact is for use in the safety circuit of the machine.

Unlocking by special tool on XCS TE



Switches type XCS TE are supplied with a special tool that enables unlocking of the machine guard whilst being held in the locked position by the electromagnet.

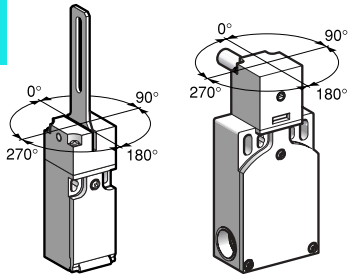
The manual unlocking of the guard using the tool 1 is useful in the following cases:

- whilst the machine is undergoing maintenance (with the tool turned to the "UNLOCK" position and then removed, the degree of safety is higher in preventing an accidental machine restart. The safety for maintenance personnel is thus improved),
- in the event of a power failure,
- in the event of an interlocking circuit malfunction (interlocked condition maintained: positive safety). The electrical supply providing the unlocking via the electromagnet always takes priority over manual unlocking using the special tool.

Example of operation of an XCS TE switch with locking on electromagnet de-energisation

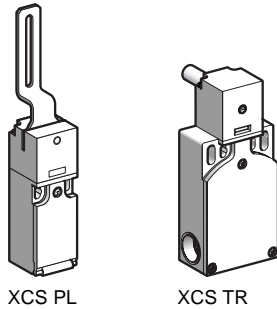
Machine state	Stopped, de-energised	Stopped, energised	Stopped, ready to start	Running	Stopping sequence	Stopped energised
Guard position	Open	Open	Closed	Closed	Closed	Closed
Guard state	Free	Free	Free	Locked	Locked	Free
Electromagnet state	"0" (de-energised)	"1" (energised)	"1" (energised)	"0" (de-energised)	"0" (de-energised)	"1" (energised)
2-pole contact state for XCS TE5●●●						
2-pole contact state for XCS TE7●●●						
Functions	Machine at rest.	Machine cannot be started.	Guard closed, operating key can be locked. It will be locked as soon as the start instruction is given.	Start instruction given, the machine is running.	Stop instruction given, the machine stops gradually (deceleration then complete stop of motor).	Machine has stopped. The guard can be opened.
Contact state of electromagnet						
Safety circuit of the machine	Open	Open	Open	Closed	Closed	Open

Presentation



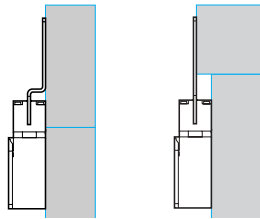
Turret head

Safety switches with rotary lever or spindle operator incorporate a turret operating head that can be rotated through 360° in 90° steps. Two additional self-locking screws are included with each switch for positive fixing of the head.



2 body versions

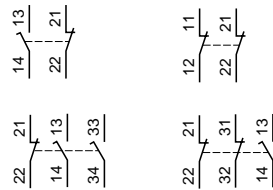
- Plastic case, narrow, with 1 cable entry for **XCS PL** and **XCS PR**.
- Plastic case, wide, with 2 cable entries for **XCS TL** and **XCS TR**.



2 types of operating lever, 2 spindle lengths

- **Levers**
Straight or elbowed (flush with rear of switch), making the lever switches suitable for use with all types of hinged guards, whether:
 - flush with the machine framework (use a switch with an elbowed flush lever),
 - overhanging in relation to the machine framework (use a switch with a straight lever).
 3 alternative operating lever positions allow the limit switches to be used with guards that open to the left, centre or right.

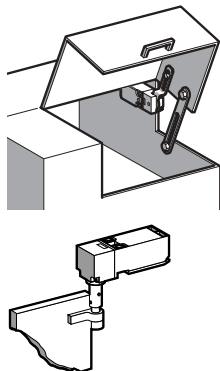
- **Spindle operators**
2 spindle lengths: 30 or 80 mm.



Safety contacts

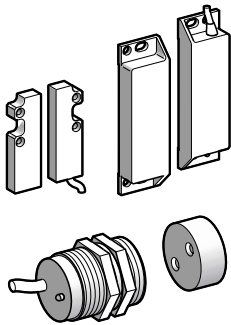
XCS PL and **XCS PR** safety switches incorporate a 2-pole (N/C + N/O break before make or N/C + N/C) contact block with positive opening operation. **XCS TL** and **XCS TR** safety limit switches incorporate a 3-pole (N/C + N/O + N/O or N/C + N/C + N/O) contact block with positive opening operation. Opening of the N/C safety contact(s) occurs when the operating lever or spindle is displaced by an angle equal to or greater than 5°.

Applications



These limit switches provide a solution for monitoring **hinged protective guards** with small opening radius, used on machines with low inertia (no rundown time). They are specially suitable for existing machines which need to be brought in-line with the latest standards and directives since they can be used in conjunction with existing covers, including those whose mounting is somewhat imprecise. Mounting of the limit switch improves the machine operator's level of safety by limiting the opening of the protective guard and reducing the risk of touching any moving parts before they have come to a stop.

Presentation



3 types of cases

- PBT plastic body
- Short and narrow **XCS DMC**
- Flat and wide **XCS DMP**
- Round \varnothing 30 **XCS DMR**
- Output on cable length 2 m, 5 m and 10 m

Contacts

Coded magnetic safety switches are fitted with 2-pole (**XCS DMC/XCS DMR**) and 3-pole (**XCS DMP**) Reed type contacts with or without a closed-door display LED.

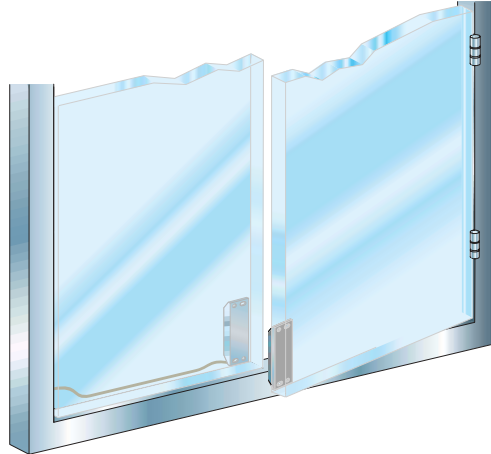
The N/C and N/O contacts open as soon as the magnet is at a distance from the sensor of about 8 mm for **XCS DMP/XCS DMR** and about 5 mm for **XCS DMC**.

Connection

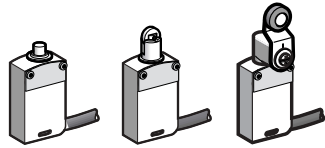
The Reed technology contacts used in the safety circuits must necessarily be connected to the Preventa safety modules.

Applications

These devices provide a solution for the monitoring of cover or guards on inertia-less machines. They are particularly suitable for imprecise installations and difficult environments (dust, liquids,...).



Presentation



With plunger or rotary head

- Metal case.
- Short and narrow **XCS M**.
- With protective plate, preventing both access to the fixing screws or adjustment of the head by unauthorised personnel.
- Torx fixing screws.
- Pre-cabled, length 1 m, 2 m or 5 m.

Contacts

XCS M3 limit switches are fitted with 3-pole contacts and **XCS M4** switches are fitted with 4-pole contacts.

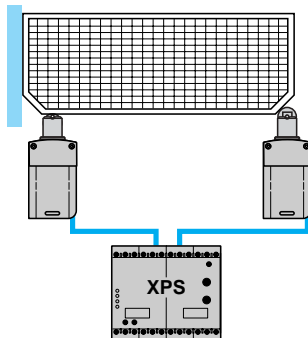
4 versions of complete switches are available incorporating these contacts:

- metal end plunger,
- roller plunger,
- thermoplastic roller lever,
- diameter 16 mm steel roller lever.

Connection

Pre-cabled switches, either 7 x 0.5 mm² or 9 x 0.34 mm².

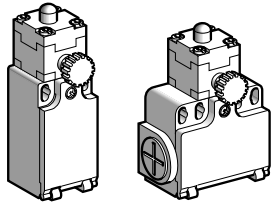
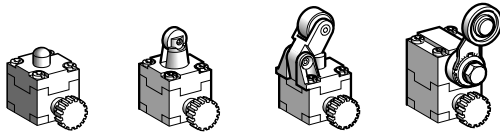
Applications



These switches provide a solution for monitoring covers, guards or grilles on machines without inertia, and in association with key operated switches.

When used on their own, they are always installed in "positive mode" or combined in pairs, with one switch being in "positive mode" and the other in "negative mode", and can, when connected to Preventa modules, provide a category 4 safety control system.

Presentation



Operating heads

Limit switches with manual reset knob are either fitted with a head for linear movement operators (plunger) or a head for rotary movement operators. The various types of operating heads include: plunger, roller plunger and roller lever.

2 body versions

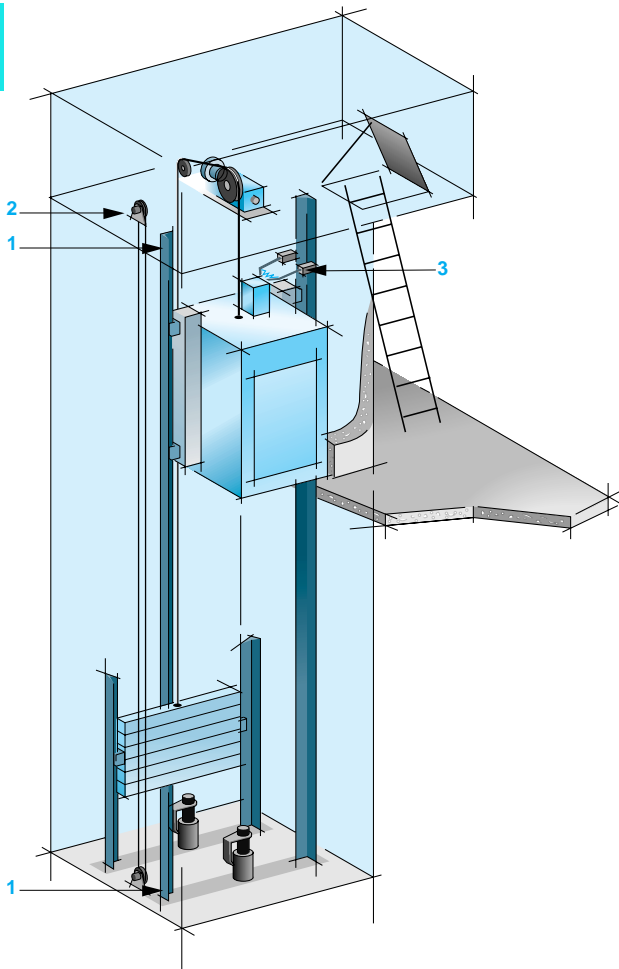
- Plastic case, narrow, with 1 cable entry for XCK P,
- Plastic case, wide, with 2 cable entries for XCK T.

Safety contacts

Limit switches with manual reset knob incorporate a 2-pole contact block with positive opening operation. The contact arrangement can either be N/C + N/O break before make (slow break) or N/C + N/C snap action for the XCK P, N/C + N/O break before make (slow break) for the XCK T.

After actuation, the N/C contact(s) remain tripped in the open position until manually reset using the **reset knob on front of switch**.

Applications



Limit switches with manual resetting are well suited for the detection and control of faults on hoisting equipment, lifts, elevators...

The switches conform to the standard EN 81-1. (with slow-break action contacts only).

They are suitable for detection and control of:

- overtravel of the lift **1**,
- the speed of the lift, using intermediate speed limiter **2**,
- the engagement of the anti-chute block (when an overspeed is detected) **3**.