## Safety functions

## and solutions

## using Preventa

Catalogue
2011


Schneider


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| 0239Q | TeSys K -Contacteurs et contacteurs-inverseurs : Guide de choix |
| 0247Q | TeSys D-Contacteurs et contacteurs-inverseurs basse conso. : guide de choix |
| 0290Q | TeSys GV - Disjoncteurs magnéto-thermiques : guide de choix |
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| 38816 | Safety of personnel and equipment |

## Safety functions <br> Selection of protective functions

On the basis of the risk estimation established, the designer will select one or more protective functions that will meet the needs.
The standards classify these functions into two distinct groups.

## Emergency stops

This function, required on all machines, is not considered as a principal method of risk reduction. It supplements other protective measures (standard EN ISO 12100).

Depending on the type of stop, the standard recognises three categories (see details below):

- emergency stop categories 0 or 1 ,
- controlled stop categories 1 or 2, generally used with variable speed drives (please refer to our specific Variable Speed Drive catalogues)


## Selection of safety function families


Access to hazardous zones:
Free, frequent to continuous
Occasional
(e.g.: once per shift)
or frequent (1)

(1) in case of risk of ejection.
$\qquad$ The function provides the solution as long as the recommended use limits are complied with.
The use of this function is possible but is not recommended.
The function does not provide the solution.

## Protection methods

The functions selected, as shown in the chart above, are based on two criteria:

1 persons may occasionally enter the hazardous zones or may work continuously within a hazardous zone,
2 the methods adopted to reduce the risks involve the use of defined functions.


Presentation

## Safety functions

Emergency stop function
and Principal protective functions
Guards without guard locking device
Guards with guard locking device


Stop category 0
Emergency stop function


Sub-elements of the emergency stop function


Guard with guard locking device
Guard without guard locking


Stop category 1

## Emergency stop function

International standard EN/ISO 13850 (which replaces standard EN 418) specifies the functional requirements and design principles of emergency stop devices. It applies to all machines, whatever type of energy is used to control this function.

When the emergency stop instruction ceases, the effect must be maintained until it is reset. Manual resetting must only be possible in the location where the instruction was given.
Resetting must not start the machine, but simply enable the starting cycle. Restarting of the machine must not be possible until the emergency stop has been reset.

The standard allows two types of stop:

- category 0 : stopping by immediate cutting-off of power or mechanical disconnection between the dangerous components,
- category 1 stop: controlled stopping with power maintained to the actuator to achieve stopping (braking for example), then cut-off of power when standstill is reached
The choice between these two stopping methods is determined by an evaluation of the machine-related risks

This function includes several sub-functions but is generally represented by the drawings opposite.

The operator interface may be:

- a pushbutton equipped with a mushroom head,
- a cable actuated switch,
- a foot switch.


## Guards without guard locking device

On a large number of potentially dangerous machines, the operator must be kept at a distance during operation, but needs to take action when the machine is stopped to position a part, remove a product or adjust a tool.

An effective means of protection is to install a guard which, according to the type of installation, will cut-off the power to the motor if an attempt is made to open it during the machine operating phase.
In all cases, it must not be possible to restart the machine until the guard is closed.

Depending on the level of protection required, the system will comprise two conventional limit switches or a combination of protected, actuator operated guard switches to prevent tampering.

## Guards with guard locking device

This type of guard is necessary for potentially dangerous machines with high inertia (long rundown time).
The guard is interlocked (by a solenoid for example); it cannot be opened until the machine has come to a complete standstill.


## Safety functions

Principal protective functions (continued)
Coded magnetic guard switch and system
Safety light curtains


Coded magnetic guard switch


Functions of coded magnetic guard switches



Safety light curtain


## Coded magnetic guard switch and system

A non-contact solution is often used on industrial machines fitted with a door or guards with imprecise guiding.
It is particularly suitable for machines subjected to frequent washing or splashing of liquids as well as small machines with a single guard for self-contained systems.

Depending on the models used, the sensing distance will be between 5 and 10 mm .
The reed contacts used for the coded magnetic switches cannot withstand shortcircuits and the switches always incorporate a resistor in series. Their operation can therefore only be guaranteed with the associated processing module.

The Hall-effect self-contained systems with integral processing do not require any further processing of the signal.

The illustrations opposite show the functions of coded magnetic guard switches and of a system.

## Safety light curtains

Safety light curtains are electro-sensitive systems (Electro-Sensitive Protective Equipment) designed to protect persons working in the vicinity of machinery, by stopping dangerous movements when a light beam is broken.

The absence of a door or guard reduces loading, inspection or tool changing times.
This type of system, defined by standards EN/IEC 61496-1 and EN/IEC 61496-2, is frequently used with machines such as:

- presses,
- machine tools,
- assembly lines, etc.

The machine must be designed so that it is impossible to gain access to dangerous movements without breaking one or more of the light beams.
In addition, the movement must be stopped whatever the entry speed of the operator into the hazardous zone.

The diagram opposite illustrates the operation of a light curtain.

# Safety functions <br> Principal protective functions (continued) <br> Safety mats <br> Two-hand control stations 



Safety mat


Example of a safety mat application


Two-hand control station


Functions of a two-hand control station


[^0]
## Safety mats

Safety mats are used to detect persons walking across or standing on the mat or objects falling onto the mat.
Standards EN 1760-1/ISO 13856 define their performance.
Any detection of an object on the mat initiates stopping of any dangerous machine movement.
Restarting can be controlled manually or automatically, depending on the configuration of the associated processing unit.

When pressure is applied, the mat distorts locally and the integrated sensors are short-circuited.
The special design of these sensors requires that the mat and the detection module be matched.

In general, several mats are used to cover the safety zone.
The safety distance $\mathbf{S}$, defined by the standard, takes into account the speed at which a person can cross the safety zone to reach the hazardous zone.

## Two-hand control stations

Standards ISO 13851 and EN 574 define this device.
It requires simultaneous operation by both hands in order to start and maintain operation of a machine.
It therefore provides protection exclusively for the person operating it.

A diagram representing the function is given opposite; it must meet the following requirements:

- concurrent, maintained operation of the two input controls for the same period of time,
- synchronous operation; the delay between the two signals must not exceed 0.5 s ,
- prevention of accidental operation (mechanical guard),
- protection against tampering.


Enabling switch


Marking identifying an enabling switch


Enabling switch XY2 AU1:
2 enabling functions,
3 positions + 1 N/C

## Enabling switch

Enabling switches, allow authorised personnel to carry out maintenance, adjustment or programming operations within hazardous zones of machines, provided certain conditions are met.
These devices conform to standards EN/IEC 60947-5-8 and EN/IEC 60204-1. In effect, to gain access, these operations, often performed at reduced speed, must be selected by authorised personnel using selectors with key or equivalent.

Important note: the enabling switch alone must not lead to the actuation of any dangerous movements associated with the machine; a secondary, intentional, control action is required from the operator.

All devices which conform to the standard must be identified by the marking scheme shown opposite.

## Operating principle

The three possible states are:

- position 0: contact open (control operator at rest),
- position 1: contact closed (control operator depressed to normal enabling position),
- position 2: contact open (control operator fully depressed).

When the switch is depressed in position 1, it must return to position 0 when released.
The switch must change from position 1 to position 2 when pressed more firmly. When it is released from position 2 to position 0 , the switching contact must not close.


Operating principle of an enabling switch

Safety functions
Selection of Preventa safety solutions

The table below indicates the associated control solutions for each safety function.
The Schneider Electric range of safety control solutions comprises four product families:

- dedicated safety modules with one or two safety functions,
- configurable controllers managing several safety functions,
- safety monitors and interfaces dedicated to the AS-Interface system, allowing use of a single medium for control and safety,
- safety PLCs used within complex safety systems.

| Architecture |
| :--- |
| Setting-up |
| Diagnostics |
|  |

## Functions Emergency stop monitoring

Monitoring of emergency stop and of a guard with timer

Monitoring of a guard with safety switch
Monitoring of a guard with coded magnetic switch
Monitoring of safety mats and sensitive edges

Two-hand control station (type IIIC acc. EN 574)

Two-hand control station (type IIIA acc. EN 574)

Monitoring of type 4 safety light curtains solid-state outputs and test function
Monitoring of single-beam photo-electric sensors (transmitter + receiver) with test input and built-in muting function
Monitoring of a type 4 light curtain with relay output

Monitoring muting function of 2 light curtains with transistor outputs

Monitoring of an enabling switch

Zero speed detection on motor

Monitoring the position of a lift cabin

Safety foot switch

Product families
Safety modules
Configurable safety controllers


| Simple machines | Machines with several safety functions |  |
| :--- | :--- | :--- |
| Wired link | Configurable by pushbuttons | Configurable by software |
| LED | LED | LED |
| - | - | PC |
| Solid-state outputs | Solid-state outputs | Modbus serial link (RTU), <br> CANopen, Profibus DP |


| XPSAC, XPSAF, XPSAK, XPSAR, XPSAXE | X | X |
| :---: | :---: | :---: |
| XPSATE, XPS AV, XPSABV | X | X |
| XPS AC, XPSAF, XPSAK, XPSAR, XPSAXE | X | X |
| XPS DMB, XPS DME | X | X |
| XPSAK | X | X |
| XPS BCE, XPS BF | - | X |
| XPS BA | - | - |
| XPS AFL, XPS AR, XPS AK | X | X |
| XPS CM | - | - |
| - | - | X |
| XPS LCM | - | - |
| XPS VC | X | X |
| XPS VNE | - | X |
| XPS EDA | - | X |
| - | - | X |

The product family provides the function.


The product family provides the function after programming (by means of pushbutton or software, depending on the product).
: The product family does not provide the function.


| Machines using AS-Interface |  |  |
| :---: | :---: | :---: |
| Interface to be connected | Built-in interfaces | Monitor library configurable by software |
|  |  | LED |
|  |  | PC |
|  |  | AS-Interface |
| ASI SSLB4, ASI SSLE4, ASI SSLE5 | ASI SEA1C, ASI SSK1C, ASI SSLE4, ASI SSLE5 | X |
| - | - | - |
| ASI SSLC1, ASI SSLC2, ASI SSLLS | - | X |
| ASI SSLC1, ASI SSLC2, ASI SSLLS | - | X |
| - | - | X |
| $2 \times$ ASISSLC2 | - | X |
| - | - | X |
| - | - | X |
| - | - | - |
| ASI SSLC1, ASI SSLC2, ASI SSLLS | - | X |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| ASI SSLC1, ASI SSLC2, ASI SSLLS | - | X |

Safety functions
Selection of Preventa safety products

This selection table indicates which safety products to select, according to the required safety functions

Final selection will be made by consulting the specific catalogue pages for each of these products.

## Safety control solution

| Emergency stop |  | Prevention functions |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Control of access to hazardous zones |  |  |  |  |
| Stop category 0 | $\begin{aligned} & \text { Stop } \\ & \text { category } \\ & 0+1 \end{aligned}$ | Interlocking guard with and without guard locking | Coded magnetic switch | ESPE light curtains | ESPE light curtains with muting function | Safety mats |
|  |  |  |  |  |  |  |


|  | ENIISO 13849 | EN/IEC 62061 |
| :--- | :--- | :--- |
| Safety <br> modules <br> One safety <br> function, <br> Hard wired. | max. Category 1, <br> PL b | max. Category 2, <br> PL c |
|  | max. Category 3, <br> PLd | SIL 2 |
|  | max. Category 4, <br> PLe | SIL 3 |
|  |  |  |


| - | - | - | - | - | - | - |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - | - | - | - | XPS CM | XPS CM | - |
| XPSAC, XPSAFL | XPS ATE <br> (cat. 1 stop), <br> XPS ABV | XPS AC | XPS DMB, XPS DME | XPS AFL | - | XPS AK |
| XPSAF, <br> XPSAK, <br> XPSAR, <br> XPSAXE | XPSATE <br> (cat. 0 stop), <br> XPSABV, <br> XPSAV | XPSAF, XPSAK, XPSAR, XPSAXE | XPS DMB, XPS DME | XPSAFL, if OSSDs are tested by ESPE | XPS CM, <br> XPS LCM | - |


| Configurable safety Several safety functions controllers, Hard wired, Fieldbus for diagnostics (only for XPS MC). | $\begin{aligned} & \max . \text { Category 1, } \\ & \text { PLb } \end{aligned}$ | SIL 1 |
| :---: | :---: | :---: |
|  | $\begin{aligned} & \text { max. Category 2, } \\ & \text { PLc } \end{aligned}$ | SIL 1 |
|  | max. Category 3, PLd | SIL 2 |
|  | $\begin{aligned} & \text { max. Category 4, } \\ & \text { PLe } \end{aligned}$ | SIL 3 |


| AS-Interface <br> "safety at work" <br> safety <br> monitors and <br> interfaces | mL bax. Category 1, | PIL 1 |
| :--- | :--- | :--- |
| Several safety | max. Category 2, | SIL 1 |
| functions, | mategory 3, | SIL 2 |
| Safety Network, <br> Feidbus for <br> diagnostics. | PLd | PLe |


| - | - | - | - | - |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| $x$ | $x$ | $x$ | $x$ | $x$ | - | - |
| $x$ | $x$ | $x$ | $x$ | $x$ | $x$ | $x$ |
| $x$ | $x$ | $x$ | $x$ | $x$ | $x$ | $x$ |
| $x$ | $x$ | $x$ | $x$ | $x$ | $x$ | $x$ |
|  |  | $x$ | $x$ | $x$ | $x$ |  |


| Starting and enabling of dangerous movements |  | Safety monitoring functions |  |  |  | Functions for specific machines |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Two-hand control station | Enabling switch (grip switch) | Zero speed detection (remanent voltage) | Zero speed detection/safety speed reduction | Safety timer | Increasing the number of safety contacts | Safety valve monitoring | Safety function for presses | Lift cabin levelling and door monitoring |
|  |  |  |  |  |  |  |  |  |
| XPS BA | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | XPS VNE | - | XPS TSA <br> XPS TSW | - | - | - | - |
| XPS BCE, <br> XPS BF | XPS VC | - | - | - | XPS ECME, XPS ECPE | - | - | XPS EDA |
| XPS BA | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| XPS MC | XPS MP, <br> XPS MC | - | XPS MC | XPS MC | - | XPS MC | XPS MC | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - |
| X | - | - | - | X | - | - | - | - |
| X | X | - | X | X | X | X | X | X |
| X | X | - | X | X | X | X | X | X |
| X | X | - | X | X | X | X | X | X |
| X | X | - | X | X | X | X | X | X |



Typical application: compact packaging machine


Scheme of the safety-related part of a packaging machine control circuit


Channel 2
Functional representation of the scheme conforming to EN/ISO 13849-1

## Optimised compact machine

To aid understanding, we are presenting three application examples covering typical cases encountered in machines.
Similar examples can be extract from the "Safety Chain Solutions" files proposed by Schneider Electric.
For clarity, only the safety functions will be detailed and, in all cases, the calculation methods corresponding to the following two standards will be used:

- standard EN/ISO 13849-1 defines Performance Levels PL,
- standard EN/IEC 62061 defines Safety Integrity Levels SIL

A detailed presentation of these two standards is given on page 38816/10.

## Typical applications

Compact and repetitive machines, hard wired. We will choose a packaging machine as an example.

## Description of safety functions

This application uses several motors which must be stopped when the safety guard is opened.
The estimated level of risk reduction for this function of the machine requires a performance level PL d or a safety integrity level SIL 2.
It will therefore be necessary to use:

- an XCS A guard switch 2-pole N/C + N/C,
- an XPS AC safety module,
- two LC1 D contactors in series.

Connections are by means of conventional wiring.

## Calculation and component selection for a PLr d

To achieve the required performance level, two redundant channels must be used, corresponding to category 3 . Fault exclusion is considered for the guard switch device as we assume that the key guard will not be damaged. The calculation is shown in the table below.

| Cycle time (s) |  |  | 180 |  |
| :---: | :---: | :---: | :---: | :---: |
| Number of hours' operation per day (h) |  |  | 24 |  |
| Number of days' operation per year |  |  | 365 |  |
| Number of operations per year |  |  | 175200 |  |
|  |  | Requirement: PLd | Channel 1 | Channel 2 |
| Input (sensors) XCS A | $\mathrm{B}_{10}$ | - | 1000000 | 1000000 |
|  | \% dangerous failure | - | 20\% | 20\% |
|  | B10 ${ }_{\text {d }}$ | - | 5000000 | 5000000 |
|  | MTTF $_{\text {d }}$ | - | 285.39 | 285.39 |
|  | DC | - | 60\% (1) | 60\% (1) |
| Processing unit (safety module) XPS AC | MTTF ${ }_{\text {d }}$ | - | 210.4 | 210.4 |
|  | DC | - | 99\% | 99\% |
| Output (actuator) LC1 D | $\mathrm{B}_{10}$ | - | 1000000 | 1000000 |
|  | \% dangerous failure | - | 73\% | 73\% |
|  | $\mathrm{B}_{10 \mathrm{~d}}$ | - | 1369863 | 1369863 |
|  | MTTF ${ }_{\text {d }}$ | - | 78.19 | 78.19 |
|  | DC | - | 99\% (2) | 99\% (2) |
| Safety function | MTTF ${ }_{\text {dc }}$ | $30 \leqslant \mathrm{MTTF}_{\mathrm{d}}<100$ | 47.51 | 47.51 |
|  | DC avg | 60\% $\leqslant$ DC < 99\% | 92.5\% |  |
|  | MTTF $_{\mathrm{d}}$ for the different channels | Category 3 | 47.51 |  |

(1) Due to short-circuit detection of the XPS AC safety module.
(2) Due to the feedback loop of the mechanically-linked auxiliary contacts built-into the LC1 D contactor.

## Presentation

## Safety functions

Application examples (continued)
Optimised compact machine (continued)


Functional representation of the scheme conforming to EN/IEC 62061


Architectures selected for the sub-systems

## Optimised compact machine (continued) Calculation and component selection for a SIL 2

For sub-system 1, we will use a type B architecture: the safety guard switch contains redundant contacts.
Sub-system 3 is type D : diagnostics are performed by the mechanically-linked auxiliary contacts built-into the contactors and connected to the XPS AC safety module (sub-system 2) that incorporates this function.

The calculation method is shown in the table below.
The result conforms to the requirements.

| Cycle time (s) | 60 |
| :--- | :--- |
| Cycle time in hours $(\mathrm{h})$ | 0.01667 |
| Number of cycles per hour | 60 |


|  |  | Type of sub-system | Requirement | Element 1 | Element 2 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Input (sensor) XCS A | $\begin{aligned} & \mathrm{B}_{10} \\ & \text { (operations) } \end{aligned}$ | - | - | 1000000 | 1000000 |
|  | Portion of dangerous failures \% | - | - | 20\% | 20\% |
|  | $\lambda$ | - | - | $6.00 \mathrm{E}^{-06}$ | $6.00 \mathrm{E}^{-06}$ |
|  | $\lambda_{\text {D }}$ | - | - | $1.20 \mathrm{E}^{-06}$ | $1.20 \mathrm{E}^{-06}$ |
|  | $\beta$ | - | - |  | \% |
|  | Life expectancy in years |  |  |  | 10 |
|  | Life expectancy or test interval T1 (h) | - | - |  | 333 |
|  | DC | - | - | 60\% (1) | 60\% (1) |
|  | PFH ${ }_{\text {DSSB }}$ | Sub-system B HFT = 1 no diagnostic function | SILCL 2 | 1.59 | $9 \mathrm{E}^{-07}$ |
| Processing unit (safety module) XPS AC | ${ }^{\mathrm{FFH}} \mathrm{Dsso}$ | Sub-system D HFT = 1 diagnostic function | SILCL 3 | 3,56E-09 |  |
|  | DC | - | - | 99\% |  |
| Output (actuator) LC1 D | $\begin{aligned} & \mathrm{B}_{10} \\ & \text { (operations) } \\ & \hline \end{aligned}$ | - | - | 1000000 | 1000000 |
|  | Portion of dangerous failures \% | - | - | 73\% | 73\% |
|  | $\lambda$ | - | - | $6.00 \mathrm{E}^{-06}$ | $6.00 \mathrm{E}^{-06}$ |
|  | $\lambda_{\text {D }}$ | - | - | $4.38 \mathrm{E}^{-06}$ | $4.38 \mathrm{E}^{-06}$ |
|  | $\beta$ | - | - | 5 \% |  |
|  | Life expectancy in years |  |  | 20 |  |
|  | Life expectancy or test interval T1 (h) | - | - | 22831 |  |
|  | DC | - | - | 99\% (2) | 99\% (2) |
|  | PFH ${ }_{\text {DSSB }}$ | Sub-system D HFT = 1 diagnostic function | SILCL 3 | $2.23 \mathrm{E}^{-07}$ |  |
| Safety-related control function | PFH ${ }_{\text {dSRECS }}$ |  | $10^{-7} \leqslant \ldots<10^{-6}$ | $3.85 \mathrm{E}^{-07}$ |  |

[^1]Presentation
Safety functions
Application examples (continued)
Upgradable compact machine


Printing machine


Safety-related part of a printing machine scheme (the calculation is made on the portion of circuit surrounded in grey)


Functional analysis of the scheme conforming to EN/ISO 13849-1

## Upgradable compact machine <br> Typical applications

This type of machine is generally integrated into a manufacturing process and must be suited to the customer's process. To facilitate upgrading, a CanOpen fieldbus is used
Examples: woodworking machines, printing machines, packaging machines.

## Description of safety functions

Protection systems will limit the possibility of access to hazardous areas. As the risk for operators is high, a performance level PLe or a safety integrity level SIL 3 will be required.
It will therefore be necessary to use protective systems (partially represented on the scheme) such as guards, light curtains, etc.

The complexity of the circuit leads to selection of a controller to provide all the emergency stop and safety functions. It offers the advantage of being able to communicate the operating states and diagnostics on the fieldbus.
Contactors in series cut-off the power in variable speed drives.
Safety connections are made by means of conventional wiring.
The control system is monitored via a CanOpen fieldbus.

## Calculation and component selection for a PLr e

The required Performance Level of safety necessitates the use of category 4 products (redundancy and self-monitoring).
In compliance with standard EN/ISO 13849-1, the functional analysis is performed by splitting into channels. The figure opposite represents channels 1 to 8 which ensure operation of the scheme.
It should be noted that the contactors are common to several channels:

- C1 is common to channels $1,3,5$
- C2 is common to channels 2, 4, 6
- C3 is common to channels 3,7
- C4 is common to channels 4,8

For clarity, the calculation shown below only relates to channels 7 and 8.

| Cycle time (s) |  |  | 360 |  |
| :---: | :---: | :---: | :---: | :---: |
| Number of hours' operation per day (h) |  |  | 24 |  |
| Number of days' operation per year |  |  | 365 |  |
| Number of operations per year |  |  | 87600 |  |
|  |  | Requirement: PLe | Channel 7 | Channel 8 |
| Input (sensors) XCS A, XCS D | $\mathrm{B}_{10}$ |  | 1000000 | 10000000 |
|  | \% dangerous failures |  | 20\% | 20\% |
|  | $\mathrm{B}_{10 \mathrm{~d}}$ |  | 5000000 | 50000000 |
|  | MTTF ${ }_{\text {d }}$ |  | 570.78 | 5707.76 |
|  | DC |  | 99\% (1) | 99\% (1) |
| Processing unit (controller) XPS MC | MTTF ${ }_{\text {d }}$ |  | 71 | 71 |
|  | DC |  | 99\% | 99\% |
| $\begin{aligned} & \hline \text { Output } \\ & \text { (actuator) } \\ & \text { LC1 D } \end{aligned}$ | $\mathrm{B}_{10}$ |  | 1000000 | 1000000 |
|  | \% dangerous failures |  | 73\% | 73\% |
|  | $\mathrm{B}_{10 \mathrm{~d}}$ |  | 1369863 | 1369863 |
|  | MTTF ${ }_{\text {d }}$ |  | 156.38 | 156.38 |
|  | DC |  | 99\% (2) | 99\% (2) |
| Safety function | MTTF ${ }_{\text {dc }}$ | $30 \leqslant$ MTTF $_{\text {d }}<100$ | 44.98 | 48.42 |
|  | $\underline{\text { D }{ }_{\text {avg }}}$ | DC $\geqslant 99 \%$ | 99\% |  |
|  | MTTF $F_{d}$ for the different channels | Category 4 | 46.72 |  |

(1) Due to diversity of the components and contact switch input monitoring of the XPS MC configurable controller.
(2) Due to the feedback loop of the mechanically-linked auxiliary contacts built-into the LC1D contactor.

Presentation

Functional representation of the scheme conforming to ENIIEC 62061


Architecture of a type $\boldsymbol{D}$ sub-system


Safety functions
Application examples (continued)
Upgradable compact machine (continued)

## Upgradable compact machine (continued) Specification of SRECS and calculation and component selection for a SIL 3

As in the previous calculation, we will analyse the safety functions associated with motors M1.
On the figure representing the break-down into sub-systems, the required level SIL 3 necessitates a type D architecture for each sub-system: in addition to redundancy of the circuits, it includes a diagnostic function.

It should be noted that the diagnostic functions are provided by the XPS MC controller: it monitors operation of the sensors and contactors.

The calculation method is shown in the table below.
The result conforms to the SIL3 requirements.

| Cycle time (s) |  |  |  | 360 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Cycle time in hours (h) |  |  |  | 0.1 |  |
| Number of cycles per hour |  |  |  | 10 |  |
|  |  | Type of sub-system | Requirement | Element 1 | Element 2 |
| Input (sensors) XCS PA, XCS PM | $\begin{aligned} & \mathrm{B}_{10} \\ & \text { (operations) } \end{aligned}$ |  |  | 1000000 | 10000000 |
|  | Proportion of dangerous failures \% |  |  | 20\% | 20\% |
|  | $\lambda$ |  |  | $1.00 \mathrm{E}^{-06}$ | $1.00 \mathrm{E}^{-07}$ |
|  | $\lambda_{\text {D }}$ |  |  | $2.00 \mathrm{E}^{-07}$ | $2.00 \mathrm{E}^{-08}$ |
|  | $\beta$ |  |  | 5\% |  |
|  | Life expectancy in years |  |  | 10 |  |
|  | Life expectancy or test interval T1 (h) |  |  | 87600 |  |
|  | DC |  |  | 99\% (1) | 99\% (1) |
|  | $\mathrm{PFH}_{\text {osso }}$ | Sub-system D HFT = 1 diagnostic function | SILCL 3 | $5.50 \mathrm{E}^{-09}$ |  |
| Processing unit (controller) XPS MC | $\mathrm{PFH}_{\text {Dsso }}$ | Sub-system D HFT = 1 diagnostic function | SILCL 3 | $1.29 \mathrm{E}^{-08}$ |  |
|  | DC |  |  | 99\% |  |
| Output (actuators) $2 \times$ LC1 D | $\begin{aligned} & \mathrm{B}_{10} \\ & \text { (operations) } \\ & \hline \end{aligned}$ |  |  | 1000000 | 1000000 |
|  | Proportion of dangerous failures \% |  |  | 73\% | 73\% |
|  | $\lambda$ |  |  | $1.00 \mathrm{E}^{-06}$ | $1.00 \mathrm{E}^{-06}$ |
|  | $\lambda_{\text {D }}$ |  |  | $7.30 \mathrm{E}^{-07}$ | $7.30 \mathrm{E}^{-07}$ |
|  | $\beta$ |  |  | 5\% |  |
|  | Life expectancy in years |  |  | 20 |  |
|  | Life expectancy or test interval T1 (h) |  |  | 100000 |  |
|  | DC |  |  | 99\% (2) | 99\% (2) |
|  | PFH ${ }_{\text {DSsd }}$ | Sub-system D HFT = 1 diagnostic function | SILCL 3 | $3.70 \mathrm{E}^{-08}$ |  |
| Safety-related control function | $\mathrm{PFH}_{\text {DSRECS }}$ |  | $10^{-8} \leqslant \ldots<10^{-7}$ | $5.54 \mathrm{E}^{-08}$ |  |

(1) Due to diversity of the components and contact switch input monitoring of XPS MC configurable controller.
(2) Due to the feedback loop of the mechanically-linked auxiliary contacts built-into the LC1 D contactor.

|  | EN/ISO 13849-1 |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Category for the device internal |  | MTTF $_{\mathrm{d}}$ (mean time to dangerous failure. in years) |  | PL (Performance Level): up to... |  |
|  | Device + outputs in Stop category 0 | Device + outputs in Stop category 1 | Single channel with output in Stop category 0 | Single channel with output in Stop category 1 | Device + outputs in Stop category 0 | Device + outputs in Stop category 1 |
| Preventa safety Modules |  |  |  |  |  |  |
| XPS ABV1133P | 4 | \|3 | 53 | 53 | e | d |
| XPS ABV11330P | 4 | 3 | 53 | 53 | e | d |
| XPS ABV1133C | 4 | 3 | 53 | 53 | e | d |
| XPS ABV11330C | 4 | 3 | 53 | 53 | e | d |
| XPS AC3421P | 4 | - | 210.4 | - | e | - |
| XPS AC3721P | 4 | - | 210.4 | - | e | - |
| XPS AC5121P | 4 | - | 210.4 | - | e | - |
| XPS AC3721 | 4 | - | 210.4 | - | e | - |
| XPS AC1321 | 4 | - | 210.4 | - | e | - |
| XPS AC5121 | 4 | - | 210.4 | - | e | - |
| XPS AC3421 | 4 | - | 210.4 | - | e | - |
| XPS AC1321P | 4 | - | 210.4 | - | e | - |
| XPS AF5130 | 4 | - | 243.0 | - | e | - |
| XPS AF5130P | 4 | - | 243.0 | - | e | - |
| XPS AFL5130P | 4 | - | 172.1 | - | e | - |
| XPS AFL5130 | 4 | - | 172.1 | - | e | - |
| XPS AK371144P | 4 | - | 154.5 | - | e | - |
| XPS AK351144P | 4 | - | 154.5 | - | e | - |
| XPS AK371144 | 4 | - | 154.5 | - | e | - |
| XPS AK351144 | 4 | - | 154.5 | - | e | - |
| XPS AK361144 | 4 | - | 154.5 | - | e | - |
| XPS AK311144 | 4 | - | 154.5 | - | e | - |
| XPS AK311144P | 4 | - | 154.5 | - | e | - |
| XPS AK361144P | 4 | - | 154.5 | - | e | - |
| XPS AR351144 | 4 | - | 277.8 | - | e | - |
| XPS AR371144 | 4 | - | 277.8 | - | e | - |
| XPS AR311144 | 4 | - | 277.8 | - | e | - |
| XPS AR351144P | 4 | - | 277.8 | - | e | - |
| XPS AR371144P | 4 | - | 277.8 | - | e | - |
| XPS AR311144P | 4 | - | 277.8 | - | e | - |
| XPS AT5110 | 4 | 3 | 139.7 | 54.0 | e | d |
| XPS AT3410 | 4 | 3 | 139.7 | 54.0 | e | d |
| XPS AT3710 | 4 | 3 | 139.7 | 54.0 | e | d |
| XPS AT5110T100 | 4 | 3 | 139.7 | 54.0 | e | d |
| XPS ATE5110 | 4 | 3 | 134.8 | 54.5 | e | d |
| XPS ATE5110P | 4 | 3 | 134.8 | 54.5 | e | d |
| XPS ATE3410 | 4 | 3 | 134.8 | 54.5 | e | d |
| XPS ATE3410P | 4 | 3 | 134.8 | 54.5 | e | d |
| XPS ATE3710 | 4 | 3 | 134.8 | 54.5 | e | d |
| XPS ATE3710P | 4 | 3 | 134.8 | 54.5 | e | d |
| XPS AV11113P | 4 | 4 | 75.8 | 75.8 | e | e |
| XPS AV11113T050 | 4 | 4 | 75.8 | 75.8 | e | e |
| XPS AV11113 | 4 | 4 | 75.8 | 75.8 | e | e |
| XPS AX5120 | 4 | - | 222.2 | - | e | - |
| XPS AXE5120P | 4 | - | 457.0 | - | e | - |
| XPS AXE5120C | 4 | - | 457.0 | - | e | - |
| XPS BA5120 | 1 | - | 160.8 | - | C | - |
| XPS BC1110 | 4 | - | 63.9 | - | e | - |
| XPS BC3110 | 4 | - | 63.9 | - | e | - |
| XPS BC3410 | 4 | - | 63.9 | - | e | - |
| XPS BC3710 | 4 | - | 63.9 | - | e | - |
| XPS BCE3110P | 4 | - | 37.0 | - | e | - |
| XPS BCE3110C | 4 | - | 37.0 | - | e | - |
| XPS BCE3410P | 4 | - | 37.0 | - | e | - |
| XPS BCE3410C | 4 | - | 37.0 | - | e | - |
| XPS BCE3710P | 4 | - | 37.0 | - | e | - |
| XPS BCE3710C | 4 | - | 37.0 | - | e | - |
| XPS BF1132 | 4 | - | 50.1 | - | e | - |
| XPS BF1132P | 4 | - | 50.1 | - | e | - |
| XPS CM1144P | 2 | - | 16.6 | - | c | - |
| XPS CM1144 | 2 | - | 16.6 | - | c | - |


|  |  | EN/IEC 62061 (EN/IEC 61508) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| DC (diagnostic capability) for the device internal |  | $\mathrm{PFH}_{\mathrm{d}}$ (Dangerous Failure per Hour) |  | SILCL (Safety Integrity Level Claim Level) |  | HFT (Hardware Fault Tolerance) |
| Device + outputs in Stop category 0 | Device + outputs in Stop category 1 | Device + outputs in Stop category 0 | Device + outputs in Stop category 1 | Device + outputs in Stop category 0 | Device + outputs in Stop category 1 |  |
| > $99 \%$ | 60... $90 \%$ | $3.00 \times 10^{-8}$ | $2.00 \times 10^{-7}$ | \|3 | 2 | \|1 |
| > $99 \%$ | 60... $90 \%$ | $3.00 \times 10^{-8}$ | $2.00 \times 10^{-7}$ | 3 | 2 | 1 |
| > $99 \%$ | 60... $90 \%$ | $3.00 \times 10^{-8}$ | $2.00 \times 10^{-7}$ | 3 | 2 | 1 |
| > 99 \% | 60... 90 \% | $3.00 \times 10^{-8}$ | $2.00 \times 10^{-7}$ | 3 | 2 | 1 |
| > $99 \%$ | - | $3.56 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.56 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.56 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.56 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.56 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.56 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.56 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.56 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $4.62 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $4.62 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $5.61 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $5.61 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $7.39 \times 10^{-9}$ | - | 3 | - | 1 |
| > 99 \% | - | $7.39 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $7.39 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $7.39 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $7.39 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $7.39 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $7.39 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $7.39 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $2.22 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $2.22 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $2.22 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $2.22 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $2.22 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $2.22 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | 96.9 \% | $6.84 \times 10^{-9}$ | $2.05 \times 10^{-8}$ | 3 | 2 | 1 |
| > $99 \%$ | 96.9 \% | $6.84 \times 10^{-9}$ | $2.05 \times 10^{-8}$ | 3 | 2 | 1 |
| > $99 \%$ | 96.9 \% | $6.84 \times 10^{-9}$ | $2.05 \times 10^{-8}$ | 3 | 2 | 1 |
| > $99 \%$ | 96.9 \% | $6.84 \times 10^{-9}$ | $2.05 \times 10^{-8}$ | 3 | 2 | 1 |
| > $99 \%$ | 98.4 \% | $6.81 \times 10^{-9}$ | $1.96 \times 10^{-8}$ | 3 | 2 | 1 |
| > $99 \%$ | 98.4 \% | $6.81 \times 10^{-9}$ | $1.96 \times 10^{-8}$ | 3 | 2 | 1 |
| > $99 \%$ | 98.4 \% | $6.81 \times 10^{-9}$ | $1.96 \times 10^{-8}$ | 3 | 2 | 1 |
| > $99 \%$ | 98.4 \% | $6.81 \times 10^{-9}$ | $1.96 \times 10^{-8}$ | 3 | 2 | 1 |
| > $99 \%$ | 98.4 \% | $6.81 \times 10^{-9}$ | $1.96 \times 10^{-8}$ | 3 | 2 | 1 |
| > $99 \%$ | 98.4 \% | $6.81 \times 10^{-9}$ | $1.96 \times 10^{-8}$ | 3 | 2 | 1 |
| > $99 \%$ | > $99 \%$ | $7.95 \times 10^{-9}$ | $7.95 \times 10^{-9}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $7.95 \times 10^{-9}$ | $7.95 \times 10^{-9}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $7.95 \times 10^{-9}$ | $7.95 \times 10^{-9}$ | 3 | 3 | 1 |
| > $99 \%$ | - | $1.90 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.00 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.00 \times 10^{-8}$ | - | 3 | - | 1 |
| - | - | $7.10 \times 10^{-7}$ | - | no SILCL | - | 0 |
| > 99 \% | - | $1.75 \times 10^{-8}$ | - | 3 | - | 1 |
| > 99 \% | - | $1.75 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $1.75 \times 10^{-8}$ | - | 3 | - | 1 |
| > 99 \% | - | $1.75 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.00 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.00 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.00 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.00 \times 10^{-8}$ | - | 3 | - | 1 |
| > 99 \% | - | $3.00 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.00 \times 10^{-8}$ | - | 3 | - | 1 |
| > 99 \% | - | $1.30 \times 10^{-8}$ | - | 3 | - | 1 |
| > 99 \% | - | $1.30 \times 10^{-8}$ | - | 3 | - | 1 |
| 95.5 \% | - | $3.12 \times 10^{-7}$ | - | 1 | - | 1 |
| 95.5 \% | - | $3.12 \times 10^{-7}$ | - | 1 | - | 1 |


|  | ENISO 13849-1 |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Category for the device internal |  | MTTF $_{\mathrm{d}}$ (mean time to dangerous failure in years) |  | PL (Performance Level): up to... |  |
|  | Device + outputs in Stop category 0 | Device + outputs in Stop category 1 | Single channel with output in Stop category 0 | Single channel with output in Stop category 1 | Device + outputs in Stop category 0 | Device + outputs in Stop category 1 |
| Preventa safety Modules (continued) |  |  |  |  |  |  |
| XPS DMB1132P | 4 | - | 83.1 | - | e | - |
| XPS DMB1132 | 4 | - | 83.1 | - | e | - |
| XPS DME1132TS220 | 4 | - | 82.4 | - | e | - |
| XPS DME1132 | 4 | - | 82.4 | - | e | - |
| XPS DME1132P | 4 | - | 82.4 | - | e | - |
| XPS ECM3431 | 4(1) | - | 346.2 | - | e (1) | - |
| XPS ECM5131 | 4(1) | - | 346.2 | - | e (1) | - |
| XPS ECM3731 | 4 (1) | - | 346.2 | - | e (1) | - |
| XPS ECME5131P | 4 (1) | - | 45 | - | e (1) | - |
| XPS ECME5131C | 4 (1) | - | 45 | - | e (1) | - |
| XPS ECP5131 | 4(1) | - | 346.2 | - | e (1) | - |
| XPS ECP3431 | 4(1) | - | 346.2 | - | e (1) | - |
| XPS ECP3731 | 4 (1) | - | 346.2 | - | e (1) | - |
| XPS ECPE5131P | 4(1) | - | 30 | - | e (1) | - |
| XPS ECPE5131C | 4(1) | - | 30 | - | e (1) | - |
| XPS ECPE3910P | 4(1) | - | 30 | - | e (1) | - |
| XPS ECPE3910C | 4 (1) | - | 30 | - | e (1) | - |
| XPS FB3411 | 4 | - | 55.8 | - | e | - |
| XPS FB3711 | 4 | - | 55.8 | - | e | - |
| XPS FB5111 | 4 | - | 55.8 | - | e | - |
| XPS FB5311 | 4 | - | 55.8 | - | e | - |
| XPS TSA3442P | 3 | - | 126 | - | d | - |
| XPS TSA3742P | 3 | - | 126 | - | d | - |
| XPS TSA5142P | 3 | - | 126 | - | d | - |
| XPS TSW3742P | 3 | - | 126 | - | d | - |
| XPS TSW3442P | 3 | - | 126 | - | d | - |
| XPS TSW5142P | 3 | - | 126 | - | d | - |
| XPS VC1132 | 4 | - | 50.0 | - | e | - |
| XPS VC1132P | 4 | - | 50.0 | - | e | - |
| XPS VNE1142P | 3 | - | 124.1 | - | d | - |
| XPS VNE1142HSP | 3 | - | 124.1 | - | d | - |
| XPS VNE1142LFP | 3 | - | 124.1 | - | d | - |
| XPS VNE3442P | 3 | - | 124.1 | - | d | - |
| XPS VNE3442HSP | 3 | - | 124.1 | - | d | - |
| XPS VNE3442LFP | 3 | - | 124.1 | - | d | - |
| XPS VNE3742P | 3 | - | 124.1 | - | d | - |
| XPS VNE3742HSP | 3 | - | 124.1 | - | d | - |
| Preventa safety controllers |  |  |  |  |  |  |
| XPS MP11123P | 4 | - | 75.8 | - | e | - |
| XPS MP11123 | 4 | - | 75.8 | - | e | - |
| XPS MC•*Z• (transistor outputs) | 4 | 4 | 76.6 | 76.6 | e | e |
| XPS MCeəZ®(Relay outputs) | 4 | 4 | 71.0 | 71.0 | e | e |
| Safety monitors and interfaces on AS-Interface cabling system |  |  |  |  |  |  |
| ASI SAFEMON1 | 4 | \| 4 | \|451 | 451 | e | e |
| ASI SAFEMON1B | 4 | 4 | 451 | 451 | e | e |
| ASI SAFEMON2 | 4 | 4 | 451 | 451 | e | e |
| ASI SAFEMON2B | 4 | 4 | 451 | 451 | e | e |
| ASI SSLB5 | 4 | 4 | 103.4 | 103.4 | e | e |
| ASISSLB4 | 4 | 4 | 103.4 | 103.4 | e | e |
| ASI SSLC1 | 4 | 4 | 103.6 | 103.6 | e | e |
| ASI SSLC2 | 4 | 4 | 103.6 | 103.6 | e | e |
| ASI SSLLS | 4 | 4 | 103.6 | 103.6 | e | e |
| ASI SEA1C | 4 | 4 | 103.9 | 103.9 | e | e |
| ASI SEK1C | 4 | 4 | 103.9 | 103.9 | e | e |
| ASI SSLE4 | 4 | 4 | 103.9 | 103.9 | e | e |
| ASI SSLE5 | 4 | 4 | 103.9 | 103.9 | e | e |


|  |  | EN/IEC 62061 (EN/IEC 61508) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| DC (diagnostic capability) for the device internal |  | PFH ${ }_{\text {d }}$ (Dangerous Failure per Hour) |  | SILCL (Safety Integrity Level Claim Level) |  | HFT (Hardware Fault Tolerance) |
| Device + outputs in Stop category 0 | Device + outputs in Stop category 1 | Device + outputs in Stop category 0 | Device + outputs in Stop category 1 | Device + outputs in Stop category 0 | Device + outputs in Stop category 1 |  |
| > $99 \%$ | - | $3.92 \times 10^{-9}$ | - | 3 | - | \|1 |
| > $99 \%$ | - | $3.92 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.97 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $3.97 \times 10^{-9}$ | - | 3 | - | 1 |
| > 99 \% | - | $3.97 \times 10^{-9}$ | - | 3 | - | 1 |
| 0...99 \% (1) | - | $7.51 \times 10^{-9}$ | - | 3 (1) | - | 1 |
| 0... $99 \%$ (1) | - | $7.51 \times 10^{-9}$ | - | 3 (1) | - | 1 |
| 0... $99 \%$ (1) | - | $7.51 \times 10^{-9}$ | - | 3 (1) | - | 1 |
| 60... 90 \% | - | $2.00 \times 10^{-7}$ | - | 3 (1) | - | 1 |
| 60... 90 \% | - | $2.00 \times 10^{-7}$ | - | 3 (1) | - | 1 |
| 0... $99 \%$ (1) | - | $7.51 \times 10^{-9}$ | - | 3 (1) | - | 1 |
| 0... $99 \%$ (1) | - | $7.51 \times 10^{-9}$ | - | 3 (1) | - | 1 |
| 0... $99 \%$ (1) | - | $7.51 \times 10^{-9}$ | - | 3 (1) | - | 1 |
| 0... 99 \% (1) | - | $3.00 \times 10^{-9}$ | - | 3 (1) | - | 1 |
| 0... 99 \% (1) | - | $3.00 \times 10^{-9}$ | - | 3 (1) | - | 1 |
| 0... $99 \%$ (1) | - | $3.00 \times 10^{-9}$ | - | 3 (1) | - | 1 |
| 0... $99 \%$ (1) | - | $3.00 \times 10^{-9}$ | - | 3 (1) | - | \| |
| > 99 \% | - | $1.13 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $1.13 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $1.13 \times 10^{-8}$ | - | 3 | - | 1 |
| > 99 \% | - | $1.13 \times 10^{-8}$ | - | 3 | - | 1 |
| 60... $90 \%$ | - | $1.30 \times 10^{-7}$ | - | 2 | - | 1 |
| 60... $90 \%$ | - | $1.30 \times 10^{-7}$ | - | 2 | - | 1 |
| 60... 90 \% | - | $1.30 \times 10^{-7}$ | - | 2 | - | 1 |
| 60... $90 \%$ | - | $1.30 \times 10^{-7}$ | - | 2 | - | 1 |
| 60... 90 \% | - | $1.30 \times 10^{-7}$ | - | 2 | - | 1 |
| 60... $90 \%$ | - | $1.30 \times 10^{-7}$ | - | 2 | - | 1 |
| > 99 \% | - | $1.30 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $1.30 \times 10^{-8}$ | - | 3 | - | 1 |
| > $99 \%$ | - | $9.26 \times 10^{-9}$ | - | 2 | - | 1 |
| > $99 \%$ | - | $9.26 \times 10^{-9}$ | - | 2 | - | 1 |
| > $99 \%$ | - | $9.26 \times 10^{-9}$ | - | 2 | - | 1 |
| > $99 \%$ | - | $9.26 \times 10^{-9}$ | - | 2 | - | 1 |
| > $99 \%$ | - | $9.26 \times 10^{-9}$ | - | 2 | - | 1 |
| > $99 \%$ | - | $9.26 \times 10^{-9}$ | - | 2 | - | 1 |
| > $99 \%$ | - | $9.26 \times 10^{-9}$ | - | 2 | - | 1 |
| > $99 \%$ | - | $9.26 \times 10^{-9}$ | - | 2 | - | \| 1 |
|  |  |  |  |  |  |  |
| > 99 \% | - | $7.95 \times 10^{-9}$ | - | 3 | - | 1 |
| > 99 \% | - | $7.95 \times 10^{-9}$ | - | 3 | - | 1 |
| > $99 \%$ | > $99 \%$ | $1.29 \times 10^{-8}$ | $1.29 \times 10^{-8}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $1.40 \times 10^{-8}$ | $1.40 \times 10^{-8}$ | 3 | \|3 | \| 1 |
|  |  |  |  |  |  |  |
| > $99 \%$ | > 99 \% | $9.00 \times 10^{-9}$ | $9.00 \times 10^{-9}$ | 3 | 3 | \|1 |
| > $99 \%$ | > $99 \%$ | $9.00 \times 10^{-9}$ | $9.00 \times 10^{-9}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $9.00 \times 10^{-9}$ | $9.00 \times 10^{-9}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $9.00 \times 10^{-9}$ | $9.00 \times 10^{-9}$ | 3 | 3 | 1 |
| > $99 \%$ | > 99 \% | $1.82 \times 10^{-8}$ | $1.82 \times 10^{-8}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $1.82 \times 10^{-8}$ | $1.82 \times 10^{-8}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $1.82 \times 10^{-8}$ | $1.82 \times 10^{-8}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $1.82 \times 10^{-8}$ | $1.82 \times 10^{-8}$ | 3 | 3 | 1 |
| > $99 \%$ | > 99 \% | $1.82 \times 10^{-8}$ | $1.82 \times 10^{-8}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $1.82 \times 10^{-8}$ | $1.82 \times 10^{-8}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $1.82 \times 10^{-8}$ | $1.82 \times 10^{-8}$ | 3 | 3 | 1 |
| > $99 \%$ | > 99 \% | $1.82 \times 10^{-8}$ | $1.82 \times 10^{-8}$ | 3 | 3 | 1 |
| > $99 \%$ | > $99 \%$ | $1.82 \times 10^{-8}$ | $1.82 \times 10^{-8}$ | 3 | 3 | 1 |

Selection guide
Machine safety
Preventa safety controllers

## Applications



Pages


Controllers for monitoring 2 independent safety functions simultaneously. User selection of 2 functions from a choice of 15, programmable from front face of controller.


PL e/Category 4 conforming EN ISO 13849-1,
SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061

## EN/IEC 60204-1,

EN/IEC 60947-1
EN/IEC 60947-5-1

| UL, CSA, TÜV |
| :--- |
| 6 NO (3 NO per function) |
| 3 solid-state outputs for signalling to PLC |
| 12 LEDs |
| 24 V --- |
| - |
| - |
| - |

## XPS MP

## 38784/2



Configurable controllers using software, for several independent safety functions: selection of safety functions using configuration software running on Windows (16 or 32 inputs and 8 independent safety outputs)


- Emergency stop monitoring

ㅁ Limit switch monitoring

- Two-hand control monitoring
- Safety light curtain monitoring, with or without "muting" function

E Enabling switch monitoring, coded magnetic switch monitoring

- Safety mat monitoring
- Hydraulic press solenoid valve monitoring
- Eccentric press safety stop at top dead centre monitoring. Zero speed detection
- Hydraulic press monitoring
- Eccentric press monitoring
- Foot switch monitoring
$\square$ Chain shaft breakage monitoring
- Safe tool
- Position selector

PL e/Category 4 conforming EN ISO 13849-1,
SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061
EN/IEC 60204-1,
EN 1760-1/ISO 13856-1
EN/IEC 61496-1,
EN 574/ISO 13851
EN/IEC 60947-1,
EN/IEC 60947-5-1
UL, CSA, TÜV

4 NO (2 NO per function) +6 solid-state
1 "muting" signalling output

LED display on front face
$24 \mathrm{~V}=$

Via SUB-D 9-pin male connector, only on XPS MC16ZC and XPS MC32ZC
Via SUB-D 9-pin female connector, only on XPS MC16ZP and XPS MC32ZP
Via RJ45 connector, on all controllers XPS MC・ゃZ•

## XPS MC

# Safety automation solutions <br> Preventa safety controllers type XPS MP With pre-de ned functions 

## Presentation

## Operating principle

Preventa safety controller modules XPS MP are designed for a Performance Level of up to PL e/ Category 4 conforming to standard EN/ISO 13849-1.

They enable two independent safety functions (selected from a choice of 15 pre-de ned con gurations) to be performed using the same product. Con guration selection is easily made using 3 buttons on the front face of the module.

These 15 pre-programmed safety functions provide a solution for the majority of safety applications, for example: monitoring Emergency stops, limit switches, safety mats and sensing edges, enabling switches, coded magnetic switches, type 4 safety light curtains conforming to EN 61496-1.

Safety controllers XPS MP incorporate 6 safety outputs (3 per function) and 3 solidstate signalling outputs for signalling to the process PLC.

To aid diagnostics, the modules have LEDs on the front face which provide information on the monitoring circuit status. They also indicate and assist selection of the 2 required con gurations.

(1) Automatic start: there is no contact or it is shunted.

Unmonitored start: The output is activated on closing of the start contact.
Monitored start: the start input is monitored so that there is no start-up in the event of the start contact being shunted or the start circuit being closed for more than 10 seconds.
Start-up is triggered following activation of the start button (push-release function) on opening of the contact
(2) Tool zone guard with $3^{\text {rd }}$ switch.

Additional rear guard (optional) with automatic start. The opening of the guard cuts all outputs.

| Presentation: <br> page 38784-EN/2 | Characteristics: <br> page 38784-EN/3 | References: <br> page 38784-EN/4 | Dimensions: <br> page 38784-EN/5 |
| :--- | :--- | :--- | :--- |

## Characteristics <br> Safety automation solutions <br> Preventa safety controllers type XPS MP With pre-de ned functions

| Characteristics |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Module type |  |  | XPS MP11123 | XPS MP11123P |
| Maximum achievable safety level |  |  | PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 62061 |  |
| Reliability data | Mean Time To dangerous Failure ( $\mathrm{MTTF}_{\mathrm{d}}$ ) | Years | 75.8 |  |
|  | Diagnostic Coverage (DC) | \% | > 99 |  |
|  | Probability of dangerous Failure per Hour $\left(\mathrm{PFH}_{\mathrm{d}}\right)$ | 1/h | $7.95 \times 10^{-9}$ |  |
| Product certifications |  |  | UL, CSA, TÜV |  |
| Conformity to standards |  |  | EN/IEC 60204-1, EN/IEC 60947-1, EN/IEC 60947-5-1 |  |
| Supply voltage |  | V | 24 -- |  |
| Voltage limits |  |  | $-20 \ldots+20 \%$ |  |
| Consumption |  | w | $\leqslant 5$ |  |
| Module inputs fuse protection |  |  | Internal, electronic |  |
| Start button monitoring |  |  | Yes/No (depending on con guration selected) |  |
| Control unit voltage <br> Between input terminals C1-I1, C2-I2, C3-I3, C4-I4, C5-15 or C6-I6 |  | V | 24 (at nominal supply voltage) |  |
| Calculation of wiring resistance RL between input terminals |  | $\Omega$ | 100 max. Maximum cable length: 2000 m |  |
| Synchronisation time between inputs |  | s | $0.5,1.5$ or unlimited, depending on con guration selected |  |
| Outputs | Voltage reference |  | Volt-free |  |
|  | Number and type of safety circuits |  | 3 NO per function (6 NO total) (13-14, 23-24, 33-34, 43-44, 53-54, 63-64) |  |
|  | Number and type of additional circuits |  | 3 solid-state |  |
|  | Breaking capacity in AC-15 | VA | C300: inrush 1800, maintained 180 |  |
|  | Breaking capacity in DC-13 |  | $24 \mathrm{~V} / 1.5 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ |  |
|  | Breaking capacity of solid-state outputs |  | $24 \mathrm{~V} / 20 \mathrm{~mA}$ |  |
|  | Max. thermal current (Ithe) for each group of 3 outputs |  | 3.3 A for all 3 outputs, or 6 A for 1 output and 2 A for the other 2 outputs, or 2 A for 1 output and 4 A for the other 2 outputs |  |
|  | Max. total thermal current | A | 20 |  |
|  | Output fuse protection |  | 4 gG or 6 fast acting, conforming to IEC/EN 60947-5-1, DIN VDE 0660 part 200 |  |
|  | Minimum current | mA | 10 |  |
|  | Minimum voltage | V | 17 |  |
| Electrical durability |  |  | See page 38610-EN/2 |  |
| Response time on input opening |  | ms | < 30 |  |
| Rated insulation voltage (Ui) |  | V | 300 (degree of pollution 2 conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |
| Rated impulse withstand voltage (Uimp) |  | kV | 4 (overvoltage category III, conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |
| LED display |  |  | 12 |  |
| Operating temperature |  | ${ }^{\circ} \mathrm{C}$ | -10... +55 |  |
| Storage temperature |  | ${ }^{\circ} \mathrm{C}$ | -25... +85 |  |
| Degree of protection conforming to IEC 60529 | Terminals |  | IP 20 |  |
|  | Enclosure |  | IP 40 |  |
| Connections | Type |  | Captive screw clamp terminals | Captive screw clamp terminals, removable terminal block |
|  | 1-wire connection, without cable end |  | Solid or exible cable: $0.14 \ldots 2.5 \mathrm{~mm}^{2}$ | Solid or exible cable: $0.2 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  | 1-wire connection, with cable end |  | Without bezel, exible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |
|  |  |  | With bezel, exible cable: $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ | With bezel, exible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  | 2-wire connection, without cable end |  | Solid or exible cable: $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ | Solid cable: $0.2 \ldots 1 \mathrm{~mm}^{2}$ Flexible cable: $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ |
|  | 2-wire connection, with cable end |  | Without bezel, exible cable: $0.25 \ldots 1 \mathrm{~mm}^{2}$ |  |
|  |  |  | Double, with bezel, exible cable: 0.5..1.5 | $\mathrm{mm}^{2}$ |

## Safety automation solutions

Preventa safety controllers type XPS MP
With pre-de ned functions
XPS MP11123P

| Removable | 3 NO per <br> from module | 3 solid-state | $24 \mathrm{~V}=-$ | XPS MP11123P | 0.320 |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  | (6 NO total) |  |  |  |  |
|  |  |  |  |  |  |


| Presentation: <br> page 38784-EN/2 | Characteristics: <br> page 38784-EN/3 | References: <br> page 38784-EN/4 | Dimensions: <br> page 38784-EN/5 | Connections: <br> page 38784-EN/6 |
| :--- | :--- | :--- | :--- | :--- |
| 4 |  | Schneider |  | 38784-EN_Ver7.0 |



LED details


[^2]
## XPS MP

## Emergency stop monitoring, 1-channel wiring

Con guration 1 (1-channel Emergency stop, automatic or unmonitored start) = function 1
Con guration 2 (1-channel Emergency stop, monitored start) = function 2 .

(1) Automatic start.
(2) Function 1 safety outputs.


## Configuration 2

Monitored start


| Presentation: <br> page 38784-EN/2 | Characteristics: <br> page 38784-EN/3 | References: <br> page 38784-EN/4 | Dimensions: <br> page 38784-EN/5 | Connections: <br> page 38784-EN/6 |
| :--- | :--- | :--- | :--- | :--- |
| 6 |  | Schneider |  | 38784-EN_Ver7.0 |

## XPS MP

Guard monitoring with start test
Con guration 3 (locking of guard with start test, automatic or unmonitored start) = function 1 .
Con guration 4 (locking of guard with start test, monitored start) = function 2 .

(2) Function 1 safety outputs.


## Configuration 3

Unmonitored start

(1) Prevention of start-up necessary: to check the sensors connected, open and reclose the guard.

Safety automation solutions
Preventa safety controllers type XPS MP With pre-de ned functions

XPS MP
Guard monitoring with start test and synchronisation time $=\mathbf{1 . 5} \mathbf{~ m s}$
Con guration 5 (locking of guard with start test, automatic or unmonitored start) = function 1.
Con guration 6 (locking of guard with start test, monitored start) = function 2 .

(1) Automatic start.
(2) Function 1 safety outputs.

## Functional diagrams

## Configuration 5

Automatic start


## Configuration 6

Monitored start
Key $0-1$

Input 1 C1-I1, (C4-I4)
Input 2 C2-12, (C5-15)
Start button C3-13, (C6-16)
NO output 13-14/23-24/ 33-34, (43-44/53-54/63-64) Signalling output Y84, (Y94)
(1)

## Configuration 5

Unmonitored start


[^3]XPS MP
Emergency stop monitoring, 2-channel wiring
Con guration 7 (2-channel Emergency stop, automatic or unmonitored start) = function 1.
Con guration 8 (2-channel Emergency stop, monitored start) = function 2.


Functional diagrams

## Configuration 7 <br> Automatic start



## Configuration 8

Monitored start
Key $\quad 0=1$
Key $\quad 0$
Input 1 C1-11, (C4-14)

Input 2 C2-12, (C5-15)
Start button C3-13, (C6-16)
NO output 13-14/23-24/ 33-34, (43-44/53-54/63-64) Signalling output Y 84 , (Y94)


Configuration 7
Unmonitored start
 (Y94)
(1) Start button control: the start button must not be activated on power-up.

Safety automation solutions
Preventa safety controllers type XPS MP With pre-de ned functions

XPS MP
Guard monitoring for injection press or blowing machine
Con guration 9 (this con guration uses both functions of the controller. Only function 1 is con gured).

(1) If sensors S4 and S5 are not used, terminals C4-14 and C5-15 must be linked.
(2) Safety outputs for tool zone.
(3) Safety outputs for rear access safety doors.

In con guration mode 9 , the NC contacts of the relays or contactors controlled via outputs 43-44, 53-54, 63-64 cannot be monitored by the feedback loop (ESC).
ESC $=$ External start conditions.
Functional diagrams
Configuration 9


End of travel 1 C1-I1 End of travel 2 C2-I1

End of travel 3 C3-I3 End of travel 4 C4-I4 End of travel 5 C5-I5

Start button C6-I6
NO output
13-14/23-24/33-34 Signalling output Y84
NO output
(43-44/53-54/63-64)
Signalling output Y94

(1) Prevention of start-up necessary: to check the sensors connected, open and reclose the guard.

XPS MP
Enabling switch monitoring, safety mat monitoring
Con guration 10 (enabling switch monitoring, with or without start-up preparation) = function 1.
Con guration 11 (safety mat monitoring, automatic or unmonitored start) = function 2 .

(1) Automatic start.
(3) Function 2 safety outputs.
(2) Function 1 safety outputs.
ESC = External start conditions.


Safety automation solutions
Preventa safety controllers type XPS MP With pre-de ned functions

XPS MP
Safety mat monitoring, safety light curtain monitoring
Con guration 12 (sensing mat monitoring, monitored start) = function 1 .
Con guration 13 (light curtain monitoring, monitored start; synchronisation time $=0.5 \mathrm{~s}$ ) = function 2 .

(1) Function 1 safety outputs.
(2) Function 2 safety outputs.

ESC = External start conditions.

(1) Start button control: the start button must not be activated on power-up.

| Presentation: <br> page 38784-EN/2 | Characteristics: <br> page 38784-EN/3 | References: <br> page 38784-EN/4 | Dimensions: <br> page 38784-EN/5 | Connections: <br> page 38784-EN/6 |
| :--- | :--- | :--- | :--- | :--- |
| 12 |  | Schneider <br> SElectric | 38784-EN_Ver7.0 |  |

XPS MP
Coded magnetic switch monitoring
Con guration 14 (automatic or unmonitored start, synchronisation time $=1.5 \mathrm{~s}$ ) = function 1 .
Con guration 15 (monitored start, synchronisation time $=1.5 \mathrm{~s}$ ) = function 2 .

(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.

ESC = External start conditions.

Configuration 14
Unmonitored start


## Configuration 14

Automatic start

| Key | Power-up (Self-test accomplished) |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Actuator part present | Actuator part absent | Actuator part present |  |
| Input 1 C1-11, (C4-14) |  |  |  |  |
| Input 2 C2-12, (C5-15) |  |  |  |  |
| Automatic start C3-13, (C6-16) |  |  |  |  |
| NO output 13-14/23-24I 33-34, (43-44/53-54/63-64) |  |  |  |  |
| Signalling output Y 84 , (Y94) |  |  | ${ }^{\text {t }<1,5 ~ s}$ |  |

Configuration 15
Monitored start



XPS MC16ZC


XPS MC32ZC

## Presentation

Con gurable safety controllers XPS MCeeZ• are designed to provide a solution for safety applications requiring conformity to Performance Level PL e/Category 4 in accordance to standard EN/ISO 13849-1 and SIL 3 requirements of standard EN/IEC 61508.
The range of con gurable safety controllers comprises 6 products, each with different technical characteristics.

| Configurable <br> controllers | Safety <br> inputs | Safety <br> outputs (1) | Communication via <br> CANopen bus Profibus bus | Modbus serial <br> link |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| XPS MC16Z | 16 | $6+2 \times 2$ | - | - | Yes, slave |
| XPS MC16ZC | 16 | $6+2 \times 2$ | Yes, slave | - | Yes, slave |
| XPS MC16ZP | 16 | $6+2 \times 2$ | - | Yes, slave | Yes, slave |
| XPS MC32Z | 32 | $6+2 \times 2$ | - | - | Yes, slave |
| XPS MC32ZC | 32 | $6+2 \times 2$ | Yes, slave | - | Yes, slave |
| XPS MC32ZP | 32 | $6+2 \times 2$ | - | Yes, slave | Yes, slave |

## Line control

The safety inputs are supplied by the various control outputs (2), in such a manner so as to monitor for short-circuits between the inputs, short-circuits between each input and earth or the presence of residual voltages.
The controller, assisted by the control outputs, continuously tests all the connected inputs. As soon as an error is detected on an input, all the outputs associated with this input are disconnected. Safety outputs associated with other inputs remain active.

## Configuration

Safety controllers XPS MC•eZ• are con gurable and addressable using software XPS MCWIN running on a PC. Connection accessories required: see page 38789-EN/9.

## Connections

For connection of safety inputs and outputs, safety controllers XPS MCeeZ• can be tted with a choice of:

- screw connectors type XPS MCTSe», or
$\square$ spring clip connectors type XPS MCTCe๑.
These connectors are to be ordered separately, see page 38789-EN/8.

[^4]| Presentation: page 38789-EN/2 | Characteristics: page 38789-EN/6 | References: page 38789-EN/8 | Dimensions: page 38789-EN/2 | Functions: page 38788-EN/2 |
| :---: | :---: | :---: | :---: | :---: |
| 2 |  | chneider Electric |  | 38789-EN_Ver11.0 |

# Safety automation solutions <br> Preventa con gurable safety controllers Type XPS MC 

## Safety functions

Con guration of the safety functions is carried out using software XPS MCWIN which is available on the Safety Suite V2 CD-ROM.

30 certi ed safety functions are available with this software and they are easily assignable to the safety outputs. The safety functions have multiple combination possibilities and various starting conditions.

The safety functions are:
ㅁ certi ed in accordance with EN/ISO 13849-1 and IEC 61508,
$\square$ con gurable in controller XPS MC using software XPS MCWIN which is available on the Safety Suite V2 software pack.

All 8 safety outputs are suitable for use in safety related parts of control systems conforming to Performance Level PL e/Category 4 in accordance to EN/ISO 13849-1.

## Main safety functions

- Emergency stop monitoring, with or without time delay, 1 or 2-channel wiring

■ Two-hand control (type III-C conforming to EN 574/ISO 13851)

- Guard monitoring with 1 or 2 limit switches
- Guard monitoring for injection presses and blowing machines
- Magnetic switch monitoring
- Sensing mat monitoring

■ Light curtain (type 4 conforming to EN/IEC 61496, relay or solid-state output) monitoring
■ Zero speed detection

- Dynamic monitoring of hydraulic valves on linear presses

■ Monitoring safety stop at top dead centre on eccentric press

- Safety time delays

■ "Muting" function of light curtains

- Enabling switch monitoring, 2 or 3 contact
- Hydraulic press
- Eccentric press
- Foot switch monitoring

■ Chain shaft breakage monitoring

- Position selector

Application schemes and functional diagrams
See page 38788-EN/2 onwards.


Con gurable controller
XPS MC16ZP MC32ZP
XPS MC16ZP, MC32ZP


## Communication CANopen fieldbus

Con gurable safety controllers XPS MCeeZC incorporate a SUB-D 9-pin male connector for direct connection on CANopen bus.

CANopen bus is a open bus that ensures deterministic and reliable access to the real-time data of automation equipment. The bus uses a shielded dual twisted pair on which a maximum of 127 devices can be connected by chaining.
The baud rate varies between 10 Kbps and 1 Mbps depending on the length of the bus ( 5000 m to 20 m ).

## Profibus bus

Con gurable safety controllers XPS MCeeZP incorporate a SUB-D 9-pin male connector for connection on Pro bus bus. Con gurable safety controllers XPS MCeeZP are slaves on the Pro bus bus.

Pro bus bus is a eldbus that meets industrial communication requirements. The topology of the Pro bus bus is of the linear type with a centralised master/slave type access procedure. The physical link is a single shielded twisted pair.

## Modbus serial link

Con gurable safety controllers XPS MC•eZ७ incorporate a Modbus communication interface (RJ45 connector) for con guration and diagnostics.
This interface enables connection of the controllers to: ㅁ aPC (con guration),
$\square$ a PLC (diagnostics), or
$\square$ an operator dialogue terminal (diagnostics).
The Modbus serial link comprises a master station (Premium automation platform) and slave stations (con gurable controllers XPS MC16/32Z•).
Two exchange mechanisms are possible:
■ Question/response: the questions from the master are addressed to a given slave. The response is expected by return from the interrogated slave.
■ Distribution: the master distributes a message to all the stations of the Modbus serial link. The latter execute the order without transmitting a reply.
$\left.\begin{array}{llll}\hline \begin{array}{l}\text { Presentation: } \\ \text { page 38789-EN/2 }\end{array} & \begin{array}{l}\text { Characteristics: } \\ \text { page 38789-EN/6 }\end{array} & \begin{array}{l}\text { References: } \\ \text { page 38789-EN/8 }\end{array} & \begin{array}{l}\text { Dimensions: } \\ \text { page 38789-EN/9 }\end{array} \\ \hline 4 & & \text { Schneider } & \\ \text { Sane 38788-EN/2 }\end{array}\right]$

## Description



Configurable safety controller XPS MCe®Z•,
with screw connectors


## Safety automation solutions Preventa con gurable safety controllers Type XPS MC

## Description <br> Configurable safety controllers XPS MC••Z• <br> Front face of controllers:

1 LED display and system diagnostics.
2 Two LEDs for CANopen or Pro bus (1) connection status.
3 SUB-D 9-pin male connector for connection on CANopen bus (XPS MC16ZCI
MC32ZC) or SUB-D 9-pin female connector for connection on Pro bus bus
(XPS MC16ZP/MC32ZP).
4 Solid-state safety output and "muting" indicator light terminals.
5 Power supply ( 24 V ---) and relay safety output terminals.
6 Control output terminals for power supply to safety inputs and safety input terminals.
7 RJ45 connector for connection on Modbus serial link.
8 RESET button (resetting of controller).
Rear face of controllers:
9 Fixing plate for mounting on rail.
(1) Depending on controller model.

| LED details |  |  |  |
| :---: | :---: | :---: | :---: |
| LED | Colour | Status | Meaning |
| 1 PWR | Green | On | Supply voltage present. |
| CNF | Yellow | On | In con guration mode. |
|  |  | Flashing | Not con gured, initial power-up. |
| 3 Eln | Red | On | Internal error: all safety outputs deactivated. |
| 4 EEx | Red | On | External error: all safety outputs associated with the defective circuit are deactivated. |
| 5 COM | Green | On | Controller communicating via the TER (RJ45) connection. |
| 6 R1, R2 | Green | On | Relay outputs 13/14, 23/24, 33/34 and 43/44 activated. |
|  |  | Flashing | Fault on these outputs. |
| 7 RUN | Green | Off | Hardware OK for the Pro bus bus or the CANopen bus. |
|  |  | On | Communicating on Pro bus bus or on CANopen bus. Normal status. |
| 8 ERR | Red | On | Communication impossible, con guration error, damaged cabling or absence. <br> Bus deactivated |
|  |  | Off | Communicating on CANopen or Pro bus bus. Normal status. |
|  |  | Flashing $(\mathrm{x} 1)$ | Warning limit reached. |
|  |  | Flashing $(x 2)$ | Control event error on CANopen bus. |
|  |  | Flashing $(\times 3)$ | Synchronisation error on CANopen bus. |
| $\begin{array}{ll} \hline 9 & 1 \ldots 16 \\ & 1 \ldots 32 \\ \hline \end{array}$ | Green | On | Input circuit closed. |
|  |  | Flashing | Error detected on input relating to LED. |
| 1001... 06 | Green | On | Solid-state output activated. |
|  |  | Flashing | Short-circuit, fault on output. |
| 11 RUN | Green | On | Run mode. |
|  |  | Flashing | Changing from run mode to stop mode. |


| Characteristics |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Configurable safety controller type |  |  |  | XPS MC16Z and MC32Z, XPS MC16ZC and MC32ZC, XPS MC16ZP and MC32ZP |
| Maximum achievable safety level |  |  |  | PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 |
| Reliability data | Mean Time To dangerous Failure ( $\mathrm{MTTF}_{\mathrm{d}}$ ) |  | Years | Transistor outputs: 76.6 Relay outputs: 71 |
|  | Diagnostic Coverage (DC) |  | \% | > 99 |
|  | Probability of dangerous Failure per Hour ( $\mathrm{PFH}_{\mathrm{d}}$ ) |  | 1/h | Transistor outputs: $1.29 \times 10^{-8}$ Relay outputs: $1.40 \times 10^{-8}$ |
| Product certifications |  |  |  | UL, CSA, TÜV |
| Conformity to standards |  |  |  | EN/IEC 60204-1, <br> EN 1760-1/ISO 13856-1, <br> EN/IEC 61496-1, <br> EN 574/ISO 13851, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 |
| Supply voltage |  |  | v | $24-\mathrm{-} \pm 20 \%$ |
| Maximum consumption |  |  | W | 12 |
| Fuse protection |  |  | A | 16 gL max. |
| Start button monitoring |  |  |  | Con gurable |
| Control circuit voltage |  |  |  | $28.8 \mathrm{~V} / 13 \mathrm{~mA}$ (between input terminals C1-I1 to C8-I16, resp.I32) |
| Calculation of wiring resistance RL |  |  | $\Omega$ | 100 max, maximum cable length: 2000 m (between input terminals) |
| Synchronisation time between inputs |  |  | s | Depending on con guration selected |
| Outputs | Relay | Voltage reference |  | Volt-free |
|  |  | Safety circuit |  | 2 NO per function (4 NO total) (13-14, 23-24, 33-34, 43-44) |
|  |  | Breaking capacity in AC-15 | VA | C300: inrush 1800, maintained 180 |
|  |  | Breaking capacity in DC-13 |  | $24 \mathrm{~V} / 1.5 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ |
|  |  | Thermal current (Ithe) for each group of 2 outputs | A | 6 for 1 output and 2 for the other, or 4 for both outputs. |
|  |  | Current limit | A | Ith $\leqslant 16$ (with several relay output circuits simultaneously loaded) |
|  |  | Output fuse protection | A | 4 gL or 6 quick blow |
|  |  | Minimum current | mA | 10 (1) |
|  |  | Minimum voltage | V | 17 (1) |
|  | Solid-state | Breaking capacity |  | $24 \mathrm{~V} / 2 \mathrm{~A}$ |
|  |  | Safety circuit |  | 6 solid-state (01, O2, O3, 04, 05, O6) |
|  |  | Current limit | A | Ith $\leqslant 6.5$ (with several solid-state output circuits simultaneously loaded) |
| Electrical durability |  |  |  | See page 38788-EN/2 |
| Response time on input opening |  |  | ms | Response time $=20$ or 30, con gurable using software XPS MCWIN <br> - if 20 for controllers XPS MC••Z॰: 30 for a safety mat <br> - if 30 for controllers XPS MC $\bullet \bullet Z \bullet$ : 45 for a safety mat |
| Rated insulation voltage (Ui) |  |  | V | 300 (degree of pollution 2 conforming to EN/IEC 60647-5-1, DIN VDE 0110 part 1) |
| Rated impulse withstand voltage (Uimp) |  |  | kV | 4 (overvoltage category III, conforming to EN/IEC 60647-5-1, DIN VDE 0110 part 1) |
| LED display |  |  |  | 30 (XPS MC16Z), 46 (XPS MC32Z) <br> 32 (XPS MC16ZC/MC16ZP), 48 (XPS MC32ZC/MC32ZP) |
| Temperature | Operating |  | ${ }^{\circ} \mathrm{C}$ | -10... 55 |
|  | Storage |  | ${ }^{\circ} \mathrm{C}$ | -25...+85 |
| Degree of protection |  |  |  | IP 20 conforming to EN/IEC 60529 (connector and enclosure) |

(1) The controller is also capable of switching low power loads (17 V/10 mA minimum) provided that the contact has not been used for switching high power loads (possible contamination or wear of the gold layer on the contact tips).

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 |
| :--- | :--- | :--- | :--- |
| 6 |  | Schneider |  |
| Salectric | page 38788-EN/2 |  |  |

## Safety automation solutions Preventa con gurable safety controllers Type XPS MC

| Communication |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Modbus serial link |  |  |  |  |
| Compatibility |  |  | XPS MC16Z, XPS MC32Z, XPS MC16ZC, XPS MC32ZC, XPS MC16ZP, XPS MC32ZP |  |
| Serial link ports | Number and type |  | $1 \times$ RJ45 |  |
|  | Status |  | Slave |  |
| Data exchange |  |  | 14 words |  |
| Addressing |  |  | 1 ... 247 |  |
| Baud rate |  | bps | 1200, 2400, 4800, 9600 or 19200 |  |
| Parity |  |  | Even, odd, none |  |
| Fixed parameters |  |  | RTU (Remote Terminal Unit) mode 1 start bit/8 data bits <br> 1 stop bit stop with "even" or "odd" parity <br> 2 stop bits without parity |  |
| Functions supported |  |  | 01: 8 -bit output data/32-bit input data ( $0=O F F, 1=O N$ ) 02: 32 -bit input data/8-bit output data ( $0=O F F, 1=O N$ ) 03: information and errors |  |
| CANopen bus |  |  |  |  |
| Compatibility |  |  | XPS MC16ZC, XPS MC32ZC |  |
| Serial link ports | Number and type |  | $1 \times$ SUB-D 9-pin male |  |
|  | Status |  | Slave |  |
| Data exchange |  |  | 14 words By included dual port memory: address and diagnostic data, but no baud rates |  |
| Parameters <br> (adjustable using software <br> XPS MCWIN) | Baud rate | Kbps | 20, 50, 125, 250, 500, 800 |  |
|  |  | Mbps | 1 |  |
|  | Address |  | 1... 127 |  |
| Profibus bus |  |  |  |  |
| Compatibility |  |  | XPS MC16ZP, XPS MC32ZP |  |
| Serial link ports | Number and type |  | $1 \times$ SUB-D 9-pin female |  |
|  | Status |  | Slave |  |
| Data exchange |  |  | 14 words <br> By included dual port memory: only address data |  |
| Parameters | Baud rate | Mbps | 12 |  |
|  | Address |  | 1... 125 |  |
| Connections |  |  |  |  |
| Type |  |  | Removable screw connector XPS MCTS•• (1) | Removable spring clip connector XPS MCTC•• (1) |
| Power supply and relay output terminals |  |  |  |  |
| 1 conductor | Without cable end |  | Solid or exible cable: $0.2 \ldots 2.5 \mathrm{~mm}^{2}$, AWG 24-12 |  |
|  | With cable end | mm ${ }^{\text {2 }}$ | Without bezel, exible cable: $0.25 \ldots 2.5$ |  |
|  |  | $\mathrm{mm}^{2}$ | With bezel, exible cable: $0.25 \ldots 2.5$ |  |
| 2 conductors | Without cable end | $\mathrm{mm}^{2}$ | Solid or exible cable: $0.2 \ldots 1.5$ | - |
|  | With cable end | $\mathrm{mm}^{2}$ | Without bezel, exible cable: $0.25 \ldots 1.5$ | - |
|  |  | $\mathrm{mm}^{2}$ | Double, with bezel, exible cable: 0.5..1.5 | Double, with bezel, exible cable: $0.5 \ldots 1$ |
| Tightening torque of screw terminals |  | Nm | 0.5...0.6 | - |
| Wire stripping length |  | mm | 10 |  |
| Other terminals |  |  |  |  |
| 1 conductor | Without cable end |  | Solid or exible cable: $0.14 \ldots 1.5 \mathrm{~mm}^{2}$, AWG 28-16 |  |
|  | With cable end | mm ${ }^{2}$ | Without bezel, exible cable: $0.25 . .1 .5$ |  |
|  |  | $\mathrm{mm}^{2}$ | With bezel, exible cable: $0.25 \ldots 0.5$ |  |
| 2 conductors | Without cable end | mm ${ }^{2}$ | Solid cable: 0.14...0.5 <br> Flexible cable: $0.14 \ldots 0.75$ | - |
|  | With cable end | mm ${ }^{2}$ | Without bezel, exible cable: $0.25 \ldots 0.34$ | - |
|  |  | mm ${ }^{2}$ | Double, with bezel, exible cable: 0.5 | - |
| Enclosure fixing (conforming to DIN EN 50022) |  |  | Metal adaptor for xing on ப 35 mm metal rail |  |

[^5]

XPS MC16Z


XPS MC16ZC


XPS MC16ZP


XPS MC32Z


XPS MC32ZC


XPS MC32ZP


| Modbus, CANopen XPS MC32ZC $\quad 0.840$ |
| :--- | :--- |


| Modbus, Pro bus | XPS MC32ZP | 0.840 |
| :--- | :--- | :--- |


| Plug-in connectors for configurable safety controllers (1) |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | For use with | Reference | Weight kg |
| Screw connectors | XPS MC16Z, MC16ZC, MC16ZP | XPS MCTS16 | 0.080 |


|  | XPS MC32Z, MC32ZC, MC32ZP | XPS MCTS32 | 0.110 |
| :--- | :--- | :--- | :--- |
| Spring clip <br> connectors | XPS MC16Z, MC16ZC, MC16ZP | XPS MCTC16 | 0.080 |
|  |  |  |  |
|  | XPS MC32Z, MC32ZC, MC32ZP | XPS MCTC32 | 0.110 |

## Configuration software

■ Reference XPS MCWIN is the full version of con guration software XPS MCWIN version 2.10 and must be installed if no previous version of this software has been installed.

- Reference SSVXPSMCWINUP is an update for con guration software XPS MCWIN and can be used if XPS MCWIN has been installed using Safety Suite V1. An update from version 2.0 to 2.10 for the software XPS MCWIN will then be performed.

| Description | Operating system | Characteristics (2) | Languages | Reference | Weight kg |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Configuration software for controllers XPS MC••Z• CD-ROM + user manual | Windows 2000, <br> Windows XP | Software available on Safety Suite V2 software pack | FR, <br> EN, <br> DE, <br> IT, <br> ES, <br> PT | XPS MCWIN | 0.520 |
| XPS MCWIN software update CD-ROM + user manual | Windows 2000, Windows XP | Software update available on Safety Suite V2 software pack | FR, <br> EN, <br> DE, <br> IT, <br> ES, <br> PT | SSVXPSMCWINUP | 0.520 |

## (1) To be ordered separately to the controllers.

(2) EDS and GSD files are available on the XPS MCWIN configuration software CD-ROM.

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 |
| :--- | :--- | :--- | :--- |

## Safety automation solutions Preventa con gurable safety controllers Type XPS MC



XPS MCCPC


TSX PCX 1031


TSX CAN TDM4


ABL 8RPS24100

(1) 153 mm with screw connector XPS MCTS••. 151.4 mm with spring clip connector XPS MCTC $\bullet$ •
(2) Metal adaptor for fixing on Ч 35 mm metal rail.
(2) Metal adaptor for fixing on Ч 35 mm metal rail.

Emergency stop monitoring, with or without time delay, 1-channel wiring, with automatic start
Category 4 achieved with necessary precautions taken to eliminate input circuit faults.

## Application scheme


(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

Functional diagram


Key $0=1$
tv = delay time

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 |
| :--- | :--- | :--- | :--- |
| 2 |  | Schneider |  |
| SaElectric | page 38788-EN/2 |  |  |

Emergency stop monitoring, with or without time delay, 2-channel wiring, with start button
Category 4 conforming to standard EN/ISO 13849-1.
Application scheme

(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

Functional diagram


Key 0 - 1
tv = delay time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Two-hand control (type III-C conforming to EN 574-1)
Category 4 conforming to standard EN/ISO 13849-1.
Application scheme

(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

Functional diagram


```
Key 0=1
```

tv = delay time

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/9 | Dimensions: <br> page 38789-EN/9 |
| :--- | :--- | :--- | :--- |
| 4 |  | Schneider |  |
| Salectric | page 38788-EN/2 |  |  |

Guard monitoring with 1 limit switch
Category 1 conforming to standard EN/ISO 13849-1.
Application scheme

(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•


Rising edge monitored start


Rising edge monitored start


Falling edge monitored start

$\qquad$

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Guard monitoring with 2 limit switches
Category 4 conforming to standard EN/ISO 13849-1.
Application scheme


ESC = external start conditions
EDM = external devices monitoring
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 |
| :--- | :--- | :--- | :--- |
| 6 |  | Schneider |  |
| Selectric |  |  |  |

Guard monitoring with 2 limit switches (continued)

## Functional diagrams

## Start test = NO

Automatic start


## Start test = YES

Automatic start

Input
Limit switch 1
Input
Limit switch 2

Input
EDM
Output


## Rising edge monitored start



Input
Limit switch 1
Input
Limit switch 2
Input
Start
Input
EDM
Output
Rising edge monitored start
Sers.
-
$\square$


Falling edge monitored start


## Falling edge monitored start



Key $\quad 0=1$
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices
t sync. $=$ synchronisation time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Guard monitoring with 2 limit switches, with guard locking
Category 4 conforming to standard EN/ISO 13849-1.
Application scheme


0 V $\qquad$
ESC = external start conditions
EDM = external devices monitoring
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

Guard monitoring with 2 limit switches, with guard locking (continued)
Functional diagrams

## Start test = NO

Automatic start


## Rising edge monitored start



Rising edge monitored start

- G

Input
Limit switch 1
Input
Limit switch 2
Input
Locking
Input
Start
Output


Falling edge monitored start
Falling edge monitored start


Input
Limit switch 1
Input
Limit switch 2
Input
Locking
Locking
Input
Start
Output

Key $\quad 0=1$
t sync. $=$ synchronisation time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Guard monitoring for injection presses and blowing machines
Category 4 conforming to standard EN/ISO 13849-1.

## Application scheme



ESC $=$ external start conditions
EDM = external devices monitoring
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•.

| Presentation: page 38789-EN/2 | Characteristics: page 38789-EN/6 | References: page 38789-EN/8 | Dimensions: page 38789-EN/9 | Functions: page 38788-EN/2 |
| :---: | :---: | :---: | :---: | :---: |
| 10 |  | chneider Electric |  | 38788-EN_Ver5.2 |

Guard monitoring for injection presses and blowing machines (continued)

## Functional diagrams

## Start test = NO

Automatic start

Input
Limit switch 1
Input
Limit switch 2

Input
Valve monitoring

Output


Start test = YES
Automatic start

Input
Limit switch 1
Input
Limit switch 2

Input
Valve monitoring

Output


## Rising edge monitored start



## Falling edge monitored start

Input
Limit switch 1
Input
Limit switch 2

Input
Valve monitoring
Input
Start

Output


Falling edge monitored start

Input
Limit switch 1
Input
Limit switch 2

Input
Valve monitoring
Start

Output

Rising edge monitored start
Input
Limit switch 1
Input
Limit switch 2
Input
Valve
Input
Start
Output


No start-up



Key $\quad 0=1$
t sync. $=$ synchronisation time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Magnetic switch monitoring
Application scheme

ESC = external start conditions
EDM = external devices monitoring
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

## Magnetic switch monitoring (continued) <br> Functional diagrams

## Start test = NO

Automatic start


Rising edge monitored start


Falling edge monitored start


Start test = YES
Automatic start


Rising edge monitored start


Falling edge monitored start


Key $\quad 0=1$
EDM = external devices monitoring
t EDM $=$ maximum monitoring time of external devices t sync. $=$ synchronisation time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

## Sensing mat monitoring

■ Category 3 conforming to standard EN/ISO 13849-1.
■ Control outputs connected to a sensing mat cannot be used for other items.


ESC = external start conditions
EDM = external devices monitoring
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Functions: <br> pagensions: <br> page 38789-EN/9 |
| :--- | :--- | :--- | :--- |
| 14 |  | Schneider |  |
| Sectric |  |  |  |

## Sensing mat monitoring (continued)

## Functional diagrams

## Start-up test

Automatic start


## Rising edge monitored start



Falling edge monitored start


Key $0=1$
EDM = external device monitoring
t EDM = maximum monitoring time of external devices

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Light curtain monitoring, relay output type
Category 4 conforming to standard EN/ISO 13849-1.
Application scheme


ESC = external start conditions
ESPE = electro-sensitive protection equipment
OSSD1/OSSD2 = output signal switching device
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•.

| Presentation: |  |  |  |
| :--- | :--- | :--- | :--- |
| page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 |
| 16 |  | Schneider |  |
| Relectric | page 38788-EN/2 |  |  |

Light curtain monitoring, relay output type (continued)
Functional diagrams


## Start test = YES

Automatic start


Rising edge monitored start

Falling edge monitored start



Key $\quad 0=1$
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices t sync. $=$ synchronisation time

Falling edge monitored start


Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Light curtain monitoring, solid-state output type
Category 4 conforming to standard EN/ISO 13849-1.
Application scheme


ESC = external start conditions
ESPE = electro-sensitive protection equipment
OSSD1/OSSD2 = output signal switching device
(1) Technical characteristics for maximum rating of fuses, see page38789-EN/6.
(2) Only applicable to XPS MC32Z•

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 | Functions: <br> page 38788-EN/2 |
| :--- | :--- | :--- | :--- | :--- |
| 18 |  | Schneider <br> SeElectric | 38788-EN_Ver5.2 |  |

Light curtain monitoring, solid-state output type (continued)
Functional diagrams


Rising edge monitored start


Start test = YES
Automatic start


Rising edge monitored start


Falling edge monitored start


Key $0 \longleftarrow 1$
EDM = external device monitoring
t EDM = maximum monitoring time of external devices
t sync. $=$ synchronisation time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

## Zero speed detection

Category 4 conforming to standard EN/ISO 13849-1.
Application scheme

$\frac{0 \mathrm{~V}}{\text { The zero speed signal (validation of the output) will be activated only if: }}$
1: one input is in a high state,
2: the other input is in a low state,
3: the frequency of the two inputs is less than the stated value.
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•
(3) Only one "Zero speed detection" function can be connected to an XPS MC controller, and only to the inputs i1 and i2.

## Functional diagram

Sensor control


| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/2 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 |
| :--- | :--- | :--- | :--- |
| 20 |  | Schneider |  |
| Salectric | page 38788-EN/2 |  |  |

## Dynamic monitoring of hydraulic valves on linear presses

Category 4 conforming to standard EN/ISO 13849-1.


ESC = external start conditions
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

Valve B2 (opening)
Input - Valve B3 (closing/opening)

Output
Closing of press
Output
Opening of press


Note: The valve sensor signals must function as described above.

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Monitoring safety stop at top dead centre on eccentric press
■ Category 4 conforming to standard EN/ISO 13849-1.

- This function comprises several monitoring modes including:
$\square$ Safety stop at top dead centre (1),
$\square$ monitoring braking travel,
$\square$ as an option, dynamic monitoring of doubled-bodied solenoid valves (2).


## Application scheme



S8: Operating modes:
0 - stop,
1 - adjust,
2 - jog,
3 -automatic continuous run.
OTS = Limit switch associated with top dead centre (TDC)
UN = Limit switch associated with bottom dead centre (BDC)
PSV = safety valve
(3) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(4) Only applicable to XPS MC32Z•

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 | Functions: <br> page 38788-EN/2 |
| :--- | :--- | :--- | :--- | :--- |
| 22 |  | Schneider <br> Selectric | 38788-EN_Ver5.2 |  |

Monitoring safety stop at top dead centre on eccentric press (continued)
Functional diagram in adjust mode


Key $\quad 0=1$
OTS = Limit switch associated with top dead centre (TDC)
UN = Limit switch associated with bottom dead centre (BDC)
PSV = safety valve
t sync $=$ synchronisation time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Monitoring safety stop at top dead centre on eccentric press (continued)
Functional diagram in jog mode

Key $0=1$

## BDC $=$ Bottom Dead Centre

TDC $=$ Top Dead Centre
OTS = Limit switch associated with top dead centre (TDC)
UN = Limit switch associated with bottom dead centre (BDC)
PSV = safety valve
t sync = synchronisation time

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 |
| :--- | :--- | :--- | :--- |

Monitoring safety stop at top dead centre on eccentric press (continued)
Functional diagram in automatic continuous run mode


Key $\quad 0 \_1$

## BDC $=$ Bottom Dead Centre

TDC = Top Dead Centre
OTS = Limit switch associated with top dead centre (TDC)
UN = Limit switch associated with bottom dead centre (BDC)
PSV = safety valve
t sync = synchronisation time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Safety time delays
Category 4 conforming to standard EN/ISO 13849-1.
Application scheme

(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6. (2) Only applicable to XPS MC32Z•

## Functional diagrams

Control signal
Output signal for EV function
Output signal for AV function
Output signal for EW function

Output signal for AW function

On-delay


Output


Off-delay


Pulse on de-energisation
Pulse on energisation


Key $0=1$

| Presentation: page 38789-EN/2 | Characteristics: page 38789-EN/6 | References: page 38789-EN/8 | Dimensions: page 38789-EN/9 | Functions: page 38788-EN/2 |
| :---: | :---: | :---: | :---: | :---: |
| 26 |  | chneider <br> 2 Electric |  | 38788-EN_Ver5.2 |

"Muting" function for light curtains
Category 4 conforming to standard EN/ISO 13849-1.

## Application scheme



ESC = external start conditions
EDM = external devices monitoring
ESPE = electro-sensitive protection equipment
OSSD1/OSSD2 = output signal switching device
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z $\bullet$.
(3) A light curtain with relay outputs can also be used with the "Muting" function.
(4) Only one "Muting" function can be connected to an XPS MC controller.
(5) Example using 2 safety outputs to control 2 contactors linked to one safety function.

tM = "Muting" time
tF = free passage activation time
t sync. $=$ synchronisation time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

## Enabling switch monitoring, 2 contact type

Category 1 conforming to standard EN/ISO 13849-1.
Application scheme

(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

## Functional diagram

Input
Closing enabling switch 13-14

Input
Opening enabling switch 21-22

Output
Key $\quad 0=1$
t $Z=$ enabling time


| Presentation: page 38789-EN/2 | Characteristics: page 38789-EN/6 | $\begin{aligned} & \hline \text { References: } \\ & \text { page 38789-EN/8 } \\ & \hline \end{aligned}$ | Dimensions: page 38789-EN/9 | Functions: page 38788-EN/2 |
| :---: | :---: | :---: | :---: | :---: |
| 28 |  | chneider <br> Electric |  | 38788-EN_Ver5.2 |

Enabling switch monitoring, 3 contact type
Category 4 conforming to standard EN/ISO 13849-1.

(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z

## Functional diagram


$t Z=$ enabling time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Hydraulic press
Category 4 conforming to standard EN/ISO 13849-1.
Application scheme


S8: Operating modes:
0 - stop,
1 - adjust,
2 - jog.
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z• (I17...I32).

Functional diagram
Hydraulic press, adjust mode
Emergency stop
Adjust mode
Jog mode
Automatic mode
Hydraulic pump (1) Opening command Closing command (1) Safety device OT
NWK (1)
UT
Closing valve (1)
Opening valve (1)
Closing + Opening valve (1)
Output-opening
Output - closing
Overtravel OK
(1) Not used.

AUF = open, to be used in inching.
OT = Limit switch associated with top dead centre (TDC).
UT = Limit switch associated with bottom dead centre (BDC).
NWK = overtravel monitoring.


Hydraulic press, mode = automatic, with overtravel monitoring and
opening and closing control coming from the automation platform


## Hydraulic press, mode = automatic



Key $0 \_1$
(1) Not used.

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

## Eccentric press

Category 4 conforming to standard EN/ISO 13849-1.

Application scheme


## S8: Operating modes:

0 - stop,
1 - adjust,
2 - jog,
3 -automatic continuous run.
OTS = Limit switch associated with top dead centre (TDC)
UN = Limit switch associated with bottom dead centre (BDC)
PSV = safety valve
B1 = sensor at tooth wheel in cam switch mechanism.
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z• (I17...I32).

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 | Functions: <br> page 38788-EN/2 |
| :--- | :--- | :--- | :--- | :--- |
| 32 |  | Schneider <br> SElectric | 38788-EN_Ver5.2 |  |

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Eccentric press (continued)
Functional diagrams

## Eccentric press: Jog

Emergency stop
Adjust mode
Jog mode
Continuous mode
Continuous mode


Eccentric press: Continuous


Eccentric press: automatic continuous

t sync. = synchronisation time
t tot. = dead time
(1) Not used.

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Foot switch monitoring
Application scheme

(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

Functional diagrams
Without start interlock
With start interlock


Key 0 - 1
t sync. $=$ synchronisation time

| Presentation: <br> page 38789-EN/2 | Characteristics: <br> page 38789-EN/6 | References: <br> page 38789-EN/8 | Dimensions: <br> page 38789-EN/9 | Functions: <br> page 38788-EN/2 |
| :--- | :--- | :--- | :--- | :--- |
| 34 |  | Schneider |  | 38788-EN_Ver5.2 |

Chain shaft breakage monitoring
Application scheme

(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6. (2) Only applicable to XPS MC32Z•

Functional diagrams


Key $0-1$
tp = pulse time

Safety automation system solutions
Preventa con gurable safety controllers
Type XPS MC

Position selector
Application scheme
(1) Technical characteristics for maximum rating of fuses, see page 38789-EN/6.
(2) Only applicable to XPS MC32Z•

## Position selector (continued)

Functional diagrams
Position of position selector
Status required of component $n^{\circ} 1$ in the selected position

Status required of component $\mathrm{n}^{\circ} 2$ in the selected position

Output


Key
$0-1$

Selection guide
Machine safety
Preventa safety modules

## Applications



For Emergency stop and switch monitoring


## Conformity to standards

Product certifications


Module type

Pages
 to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061


| EN/IEC 60204-1, |
| :--- |
| EN 1088/ISO 1411 |

EN 1088/ISO 14119,
EN/ISO 13850,
EN/IEC 60947-1,
EN/IEC 60947-5-1
UL, CSA, TÜV

| 3 NO | 3 NO | 2 NO instantaneous +3 NO time delay |
| :---: | :---: | :---: |
| 1 solid-state output for signalling to PLC | 1 relay output for signalling to PLC | 4 solid-state outputs for signalling to PLC |
| 2 LEDs | 2 LEDs | 4 LEDs |
| $\begin{aligned} & \sim \text { and } 24 \vee=- \\ & 48 \vee \sim \\ & 115 \vee \sim \\ & 230 \vee \sim \end{aligned}$ | $\sim$ and 24 V --- | $\begin{aligned} & \sim \text { and } 24 \mathrm{~V}=- \\ & 115 \mathrm{~V} \sim \\ & 230 \mathrm{~V} \sim \end{aligned}$ |
| Unlimited | Unlimited | 75 ms (automatic start) |
| $\sim$ and $24 \mathrm{~V}-\mathrm{-} / 48 \mathrm{~V} \sim$ | $24 \mathrm{~V}=-$ | 24 V --/- |
| $115 \mathrm{~V} \sim / 230 \mathrm{~V}$ | - | $48 \mathrm{~V} \sim / 48 \mathrm{~V}$ |

## XPS AC

XPS AXE XPS AXE

PL e/Category 4 (instantaneous safety outputs) and PL d/ Category 3 (time delay safety outputs) conforming to EN/ISO 13849-1, SILCL 3 (instantaneous safety outputs) and SILCL 2 (time delay safety outputs) conforming to EN/IEC 61508 and EN/IEC 62061
EN/IEC 60204-1, EN/IEC 60204-1,

EN 1088/ISO 14119, EN/ISO 13850,
EN/ISO 13850
EN/IEC 60947-1,
EN/IEC 60947-5-1

UL, CSA, BG
UL, CSA, TÜV
EN 1088/ISO 14119,
EN/IEC 60947-1,
EN/IEC 60947-5-1

2 NO instantaneous

+ 3 NO time delay
4 solid-state outputs for signalling to PLC
~ and 24 V -..
115 V ~
230 V ~

75 ms (automatic start)

24 V $-=/-$
$48 \mathrm{~V} \sim / 48 \mathrm{~V}$

XPS ATE


| PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061 | PL e/Category 4 (instantaneous safety outputs) and PL d/Category 3 (time delay safety outputs) conforming to EN/ISO 13849-1, SILCL 3 (instantaneous safety outputs) and SILCL 2 (time delay safety outputs) conforming to EN/IEC 61508 and EN/IEC 62061 | PL e/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061 | PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061 | PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061 | PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| EN/IEC 60204-1, <br> EN 1088/ISO 14119, <br> EN/ISO 13850, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 | EN/IEC 60204-1, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1, <br> EN/ISO 13850, <br> EN 1088/ISO 14119 | EN/IEC 60204-1, <br> EN 1088/ISO 14119, <br> EN/ISO 13850, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 | EN/IEC 60204-1, <br> EN 1088/ISO 14119, <br> EN/ISO 13850, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1, <br> EN/IEC 61496-1 (type 4) | EN/IEC 60204-1, <br> EN 1088/ISO 14119, <br> EN/ISO 13850, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 | EN/IEC 60204-1, <br> EN 1088/ISO 14119, <br> EN/ISO 13850, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 |
| UL, CSA, TÜV | UL, CSA, BG | UL, CSA, TÜV | UL, CSA, TÜV | UL, CSA, TÜV | UL, CSA, TÜV |


| 3 NO instantaneous +3 NO time delay | 2 NO instantaneous <br> +1 NO time delay | 3 NO | 7 NO | 3 NO instantaneous |
| :---: | :---: | :---: | :---: | :---: |
| 3 solid-state outputs for signalling to PLC | - | - | 2 NC +4 solid-state outputs for signalling to PLC | 1 NC + 4 solid-state outputs for signalling to PLC |
| 11 LEDs | 3 LEDs | 3 LEDs | 4 LEDs | 4 LEDs |
| 24 V --- | $24 \mathrm{~V}=-$ | $\sim$ and 24 V -.- | ~ and 24 V =- <br> $115 \mathrm{~V} \sim$ and $24 \mathrm{~V}=$ <br> $230 \mathrm{~V} \sim$ and $24 \mathrm{~V}=$ | $\begin{aligned} & \sim \text { and } 24 \mathrm{~V}=- \\ & 48 \mathrm{~V} \sim \\ & 110 \mathrm{~V} \sim \text { and } 24 \mathrm{~V}=- \\ & 120 \mathrm{~V} \sim \text { and } 24 \mathrm{~V}=- \\ & 230 \mathrm{~V} \sim \text { and } 24 \mathrm{~V}=- \end{aligned}$ |
| Unlimited or 1.5 s (depending on wiring) | Unlimited | Unlimited |  | Unlimited or $2 \mathrm{~s}, 4 \mathrm{~s}$ (depending on wiring) |
| $24 \vee=-$ | $24 \vee=-$ | =-. 24 VI | 24 V ---/- | $24 \vee=-$ |
| - | - | - | $24 \mathrm{~V} \sim / 24 \mathrm{~V}$ | $24 \mathrm{~V}=-/ 24 \mathrm{~V} / 24 \mathrm{~V}$ |


| XPS AV | XPS ABV | XPS AF | XPL | XPS AR |
| :--- | :--- | :--- | :--- | :--- |
|  | 387812 | $38781 / 2$ | $38786 / 2$ | $38791 / 2$ |

Selection guide (continued)
Machine safety
Preventa safety modules

Applications
Modules
Maximum achievable safety level

Product certifications


Module type


For enabling switch monitoring
 SILCL 3 1380rming to EN/IEC 61508 and EN/IEC 62061

| EN/IEC 60204-1, | EN/IEC 60204-1, | EN/IEC 60204-1, |
| :--- | :--- | :--- |
| EN 61326, | EN/IEC 60947-1, | EN/IEC 60947-1, |
| EN/IEC 60947-1, | EN/IEC 60947-5-1, | EN/IEC 60947-5-1, |
| EN/IEC 60947-5-1 | EN 574 type III A/ISO 13851 | EN 574 type III C/ISO 13851 |
|  |  |  |
| UL, CSA, TÜV | UL, CSA, TÜV | UL, CSA, BG |
|  |  |  |


| 2 NO | 1 NO | 2 NO |
| :--- | :--- | :--- |
| 2 solid-state outputs for <br> signalling to PLC | 1 NC | 1 NC |
| 3 LEDs | 2 LEDs | 3 LEDs |
| $24 \mathrm{~V}=-$ | $\sim$ and $24 \mathrm{~V}=-$ <br> $115 \mathrm{~V} \sim$ <br> $230 \mathrm{~V} \sim$ | $\sim$ and $24 \mathrm{~V}=-$ <br> $115 \mathrm{~V} \sim$ <br> $230 \mathrm{~V} \sim$ |
| - | 500 ms | 500 ms |
| $24 \mathrm{VI}-$ | $24 \mathrm{~V}=-/-$ | $24 \mathrm{~V}=-$ |
| - | $24 \mathrm{~V} \sim / 24 \mathrm{~V}$ | - |


| XPS VC | XPS BA | XPS BCE |
| :--- | :--- | :--- |
|  | $38790 / 2$ | $38790 / 2$ |



For control of 1 to 4 single-beam photo-electric sensors XU2 S (transmitterreceiver pair)


PL c/Category 2 conforming to EN/ISO 13849-1, PL e/Category 4 confo
EN/ISO 13849-1,
SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061

SILCL 1 conforming to EN/IEC 61508 and EN/IEC 62061


EN/IEC 60204-1,
EN/IEC 60947-1,
EN/IEC 60947-5-1,
EN 574 type III C/ISO 13851

EN/IEC 61496-1, EN/IEC 61496-2, EN/IEC 60204-1, EN/IEC 60947-1, EN/IEC 60947-5-1

UL, CSA, TÜV
UL, CSA, IFA

For monitoring type 2 and type 4 light curtains Compact and slim ranges

PL e/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061

PL e/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061 (when connected to the appropriate module)

EN/IEC 60204-1
EN/IEC 60947-5-1
EN/IEC 60204-1,
EN/IEC 60947-1,
EN/IEC 60947-5-1

UL, CSA, TÜV

For extending the number of safety contacts


PL e/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 and EN/IEC 62061 (when connected to the appropriate module)

EN/IEC 60204-1,
EN/IEC 60947-1,
EN/IEC 60947-5-1

UL, CSA, TÜV

| 2 NO | 2 NO | 2 solid-state | 4 NO | 8 NO |
| :---: | :---: | :---: | :---: | :---: |
| 2 solid-state outputs for signalling to PLC | 4 solid-state PNP NO outputs for signalling to PLC | 1 PNP + 1 NPN output for signalling to PLC | 2 NC | 1 NC |
| 3 LEDs | 4 LEDs | 14 LEDs + 2-digit display | 2 LEDs | 3 LEDs |
| $24 \mathrm{~V}=$ | $24 \mathrm{~V}=-$ | $24 \mathrm{~V}=-$ | $\sim$ and $24 \vee$-. | $\begin{aligned} & \sim \text { and } 24 \vee=- \\ & 115 \vee \sim \\ & 230 \vee \sim \end{aligned}$ |
| 500 ms | - | 3 s or infinite | - | - |
| 24 V ---/- | - | - | - | - |
| - | - | - | - | - |

## Applications



Maximum achievable safety level

Conformity to standards

Product certifications


Synchronisation time between inputs

Module type


For the monitoring of applications requiring safety time delays


| PL d/Category 3 conforming <br> to EN/ISO 13849-1, <br> SILCL 2 conforming to EN/IEC 61508 <br> and EN/IEC 62061 | PL d/Category 3 conforming <br> to EN/ISO 13849-1, <br> SILCL 2 conforming to EN/IEC 61508 <br> and EN/IEC 62061 |
| :--- | :--- |
|  |  |
|  |  |
|  |  |
| EN/IEC 60204-1, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 | EN/IEC 60204-1, <br>  <br>  <br>  <br> EN/IEC 60947-1, <br>  <br> EN/IEC 60947-5-1 |


| 1 NO time delayed | 1 NO pulse type |
| :--- | :--- |
| 2 NC + 2 solid-state outputs for signalling to PLC |  |
| 4 LEDs |  |
| $\underset{\sim}{\sim \text { and } 24 \mathrm{~V}--}$ |  |
| $115 \mathrm{~V} \sim$ <br> $230 \mathrm{\sim}$ |  |
| - | - |

XPS TSA XPS TSW

## 38785/2




XPS ABV



# Safety automation system solutions <br> Preventa safety modules 

Electrical durability (continued)
Electrical durability curves of safety contacts conforming to EN 60947-5-1, table C2

Number of operating cycles


## Definition of tests

| Determination of electrical durability conforming to EN 60947-5-1 (table C2) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Type of current | Utilisation category | Start-up |  |  | Breaking |  |  |
|  |  | Current | Voltage | $\operatorname{Cos} \varphi$ | Current | Voltage | $\operatorname{Cos} \varphi$ |
| a.c. supply | AC-15 | $10 \times \mathrm{le}$ | Ue | 0.7 | le | Ue | 0.4 |
| Type of current | Utilisation category | Start-up |  |  | Breaking |  |  |
|  |  | Current | Voltage | T0.95 | Current | Voltage | T0.95 |
| d.c. supply | DC-13 | le | Ue | 50 ms | le | Ue | 50 ms |

le: operational current measured. Ue: operational voltage measured. $\operatorname{Cos} \varphi$ : power factor. T0.95: time taken to reach $95 \%$ of nominal current.
Notes
The tests are carried out with a frequency of 6 switching operations per minute and with no additional protection of the components connected to the safety outputs.
The use of additional protection for the components connected to the safety outputs signi cantly increases the durability of the safety outputs.

le: operational current measured. Ue: operational voltage measured. $\operatorname{Cos} \varphi$ : power factor. T0.95: time taken to reach $95 \%$ of nominal current.

## Notes

The maximum values for the breaking capacity of the safety outputs in the various utilisation categories are not xed and depend on the power factor and on the switching frequency. The test de nition for the "breaking capacity" and "durability" tables in the European standard EN 60947-5-1 uses different values for the power factor and the switching frequency.
The power factor $(\cos \varphi)$ in the "breaking capacity" table (0.3) is greater than that in the "durability" table (0.7).
In the "breaking capacity" table, the switching frequency of the safety outputs is higher for the rst 1000 switching operations ( 60 per minute) than that for 1001 to 6050 switching operations ( 6 per minute).
Consequently, the maximum breaking capacity values determined using the "breaking capacity" table are lower than those in the "durability" table.

Operating principle, characteristics

## Safety automation solutions <br> Preventa safety modules types XPS AC, XPS AXE <br> For Emergency stop and switch monitoring

Operating principle
Safety modules XPS AC and XPS AXE are used for monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN/IEC 60204-1 and also meet the safety requirements for the electrical monitoring of switches in protection devices conforming to standard EN 1088/ISO 14119. They provide protection for both the machine operator and the machine by immediately stopping the dangerous movement on receipt of a stop instruction from the operator, or on detection of a fault in the safety circuit itself.
To aid diagnostics, the modules have LEDs which provide information on the monitoring circuit status.
The XPS AC module has 3 safety outputs and a solid-state output for signalling to the PLC.
The XPS AXE module has 3 safety outputs and a relay output for signalling to the PLC.
Characteristics

| Module type |  |  | XPS AC, XPS AC***๑P | XPS AXEゃゃ७๑P, XPS AXE $-\bullet \bullet$ C |
| :---: | :---: | :---: | :---: | :---: |
| Maximum achievable safety level |  |  | PLe/Category 4 conforming to EN/ISO 13849-1, <br> SILCL 3 conforming to EN/IEC 62061 | PL e/Category 4 conforming to EN/ISO 13849-1 <br> SILCL 3 conforming to EN/IEC 62061 |
| Reliability data | Mean Time To dangerous Failure (MTTF ${ }_{\mathrm{d}}$ ) | Years | 210.4 | 457 |
|  | Diagnostic Coverage (DC) | \% | >99 | >99 |
|  | Probability of dangerous Failure per Hour ( $\mathrm{PFH}_{\mathrm{d}}$ ) | 1/h | $3.56 \times 10^{-9}$ | $3 \times 10^{-8}$ |
| Conformity to standards |  |  | EN/IEC 60204-1, EN 1088/ISO 14119, <br> EN/ISO 13850, <br> EN/IEC 60947-1, EN/IEC 60947-5-1 | EN/IEC 60204-1, EN 1088/ISO 14119, EN/ISO 13850, <br> EN/IEC 60947-1, EN/IEC 60947-5-1 |
| Product certifications |  |  | UL, CSA, TÜV | UL, CSA, BG |
| Supply | Voltage | V | $\sim$ and 24 --, $48 \sim, 115 \sim, 230 \sim$ | $\sim$ and 24 -. |
|  | Voltage limits |  | $\begin{aligned} & -20 \ldots+10 \%(24 \vee \sim) \\ & -20 \ldots+20 \%(24 \vee \underset{\sim}{\sim}) \\ & -15 \ldots+10 \%(48 \vee \sim) \\ & -15 \ldots+15 \%(115 \vee) \\ & -15 \ldots+10 \%(230 \vee) \\ & \hline \end{aligned}$ | -15...+10\% |
|  | Frequency | Hz | 50/60 | 50/60 |
| Consumption |  | W | $<1.2$ (24V =--) | - |
|  |  | VA | $\begin{aligned} & <2.5(24 \vee \sim) \\ & <6(48 \vee \sim) \\ & <7(115 \vee \sim) \\ & <6(230 \vee \sim) \end{aligned}$ | < 4 |
| Start button monitoring |  |  | No | No |
| Control unit voltage (at nominal supply voltage) |  |  | Identical to supply voltage |  |
|  | 24 V version | V | $24 \sim$ (approx. 90 mA ), 24 --- (approx. 40 mA ) | 24 -- |
|  | 48 V version | V | $48 \sim$ (approx. 100 mA ) | - |
|  | 115 V version | V | 115 ~ (approx. 60 mA ) | - |
|  | 230 V version | V | $230 \sim$ (approx. 25 mA ) | - |
| Outputs | Voltage reference |  | Volt-free | Volt-free |
|  | Number and type of safety circuits |  | 3 NO (13-14, 23-24, 33-34) | 3 NO (13-14, 23-24, 33-34) |
|  | Number and type of additional circuits |  | 1 solid-state | 1 NC relay (41-42) |
|  | Breaking capacity in AC-15 | VA | C300: inrush 1800, maintained 180 | B300 |
|  | Breaking capacity in DC-13 |  | $24 \mathrm{~V} / 2 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ | $24 \mathrm{~V} / 1.5 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ |
|  | Max. thermal current (Ithe) | A | 6 | 8 |
|  | Max. total thermal current | A | 10.5 | - |
|  | Output fuse protection, using fuses conforming to IEC/EN 947-5-1, DIN VDE 0660 part 200 | A | 4 gG (gl) or 6 fast acting | 6 gG |
|  | Minimum current | mA | 10 | 10 |
|  | Minimum voltage | V | 17 | 17 |
| Electrical durability |  |  | See page 38610-EN/2 |  |
| Response time on input opening |  | ms | < 100 | <80 |
| Rated insulation voltage (Ui) |  | V | 300 (degree of pollution 2 conforming to IEC/ | EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |
| Rated impulse withstand voltage (Uimp) |  | kV | 3 (overvoltage category III, conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) | 4 (overvoltage category III, conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |
| LED display |  |  | 2 | 2 |
| Operating temperature |  | ${ }^{\circ} \mathrm{C}$ | $-10 \ldots+55$ | $-25 \ldots+55$ |
| Storage temperature |  | ${ }^{\circ} \mathrm{C}$ | -25... +85 | -25... 75 |
| Degree of protection conforming to IEC/EN 60529 | Terminals |  | IP 20 | IP 20 |
|  | Enclosure |  | IP 40 | IP 40 |

Characteristics (continued), references

Safety automation solutions
Preventa safety modules types XPS AC, XPS AXE
For Emergency stop and switch monitoring


## XPS AC <br> Module XPS AC associated with an Emergency stop button with 1 NC contact

$\underline{L 1(+)}$


Module XPS AC associated with an Emergency stop button with 2 NC contacts (recommended application)


Functional diagram of module XPS AC


## LED details



XPS AXE
Module XPS AXE associated with an Emergency stop button with 1 NC contact


Module XPS AXE associated with an Emergency stop button with 2 NC contacts (recommended application)

S1: Emergency stop S2: Start
Y1-Y2: Feedback loop
ESC: External start conditions
(1) Automatic reset
(2) Maximum fuse rating: see technical characteristics.


S1: Emergency stop S2: Start
Y1-Y2: Feedback loop
ESC: External start conditions
(1) Automatic reset
(2) Maximum fuse rating: see technical characteristics.
Functional diagram of module XPS AXE

|  | Start button not | Start button activated | Emergency stop | Emergency stop activated |
| :---: | :---: | :---: | :---: | :---: |
|  | activated |  | not activated |  |
| Emergency stop "A1" (01) |  |  |  |  |
| Emergency stop "A2" (02) |  |  | (1) |  |
| Feedback loop Y1-Y2/Y3 |  |  |  |  |
| Output 13-14 (NO) |  |  |  |  |
| Output 23-24 (NO) |  |  |  |  |
| Output 33-34 (NO) |  |  |  |  |
| Relay output 41-42 (NC) |  |  |  |  |

(1) Only for Emergency stop button with 2 NC contacts.

LED details


2 K1-K2 status (NO safety outputs closed).

Operating principle， characteristics

## Safety automation solutions Preventa safety modules types XPS AV， XPS ABV，XPS ATE <br> For Emergency stop and switch monitoring

## Operating principle

Safety modules XPS AV，XPS ABV and XPS ATE are used for monitoring Emergency stop circuits conforming to standards EN／ISO 13850 and EN 60204－1 and also meet the safety requirements for the electrical monitoring of switches in protection devices conforming to standard EN 1088.
They provide protection for both the machine operator and the machine by immediately stopping the dangerous movement on receipt of a stop instruction from the operator，or on detection of a fault in the safety circuit itself．

In addition to the stop category 0 instantaneous opening safety outputs（ 3 for XPS AV， 2 for XPS ABV and 2 for XPS ATE），the modules incorporate stop category 1 time delay outputs（ 3 for XPS AV， 1 for XPS ABV and 3 for XPS ATE）which allow for controlled deceleration of the motor components until a complete stop is achieved（for example，motor braking by variable speed drive）．

At the end of the preset delay，the supply is disconnected by opening the time delay output circuits．
For module XPS AV，the time delay of the 3 output circuits is adjustable，in 15 preset values，between 0 and 300 seconds using selector buttons．
For module XPS ABV，the time delay of the 3 output circuits is adjustable between 0.15 and 3 seconds or 1.5 and 30 seconds，depending on the model，using a selector switch．
For module XPS ATE，the time delay of the 3 output circuits is adjustable between 0 and 30 seconds using a 12－position selector switch．
Module XPS AV also incorporates 3 solid－state signalling outputs for signalling to the process PLC． Module XPS ATE incorporates 4 solid－state signalling outputs for signalling to the process PLC．
To aid diagnostics，the modules have LEDs which provide information on the monitoring circuit status．
The Start button monitoring function is con gurable depending on the wiring．

| Characteristics |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  | XPS AV11113， XPS AV11113P | XPS ABV•・ゃ०C， XPS ABV•••॰P | XPS ATE・ゃゃゃ， XPS ATE•••॰P |
| Maximum achievable safety level |  |  | PLe／Category 4 conforming to EN／ISO 13849－1 SILCL 3 （instantaneous safety outputs and time delay safety outputs） conforming to EN／IEC 62061 | PL e／Category 4 （instantaneous safety outputs）and PL d／Category 3 （time delay safety outputs）conforming to EN／ISO 13849－1， SILCL 3 （instantaneous safety outputs）and SILCL 2 （time delay safety outputs） conforming to EN／IEC 62061 | PL e／Category 4 （instantaneous safety outputs）and PL d／Category 3 （time delay safety outputs） conforming to EN／ISO 13849－1， SILCL 3 （instantaneous safety outputs）and SILCL 2 （time delay safety outputs）conforming to EN／IEC 62061 |
| Reliability data （instantaneous safety outputs） | Mean Time To dangerous Failure （ $\mathrm{MTTF}_{\mathrm{d}}$ ） | Years | 75.8 | 53 | 134.8 |
|  | Diagnostic Coverage（DC） | \％ | ＞99 | ＞99 | ＞ 99 |
|  | Probability of dangerous Failure per Hour（ $\mathrm{PFH}_{\mathrm{d}}$ ） | 1／h | $7.95 \times 10^{-9}$ | $3 \times 10^{-8}$ | $6.81 \times 10^{-9}$ |
| Reliability data （time delay safety outputs） | Mean Time To dangerous Failure （ $\mathrm{MTTF}_{\mathrm{d}}$ ） | Years | 75.8 | 53 | 54.5 |
|  | Diagnostic Coverage（DC） | \％ | ＞ 99 | $>60$ and $<90$ | 98.4 |
|  | Probability of dangerous Failure per Hour（ $\mathrm{PFH}_{\mathrm{d}}$ ） | 1／h | $7.95 \times 10^{-9}$ | $2 \times 10^{-7}$ | $1.96 \times 10^{-8}$ |
| Conformity to standards |  |  | EN／IEC 60204－1， <br> EN／IEC 60947－1， <br> EN／IEC 60947－5－1， <br> EN／ISO 13850， <br> EN 1088／ISO 14119， | EN／IEC 60204－1， <br> EN／IEC 60947－1， <br> EN／IEC 60947－5－1， <br> EN／ISO 13850， <br> EN 1088／ISO 14119 | EN／IEC 60204－1， <br> EN／IEC 60947－1， <br> EN／IEC 60947－5－1， <br> EN／ISO 13850， <br> EN 1088／ISO 14119 |
| Product certifications |  |  | UL，CSA，TÜV | UL，CSA，BG | UL，CSA，TÜV |
| Supply | Voltage | V | 24 －－－ | 24－－－ | $\sim$ and $24-$－ $115 \sim, 230 \sim$ |
|  | Voltage limits |  | －20．．．$+20 \%$ | －15．．．＋10\％ | $\begin{aligned} & -20 \ldots+10 \%(24 \mathrm{~V}) \\ & -15 \ldots+15 \%(115 \mathrm{~V}) \\ & -15 \ldots+10 \%(230 \mathrm{~V}) \\ & \hline \end{aligned}$ |
|  | Frequency | Hz | － | － | 50／60 |
| Consumption |  | W | ＜ 5 | ＜3 | ＜ 8 |
| Module inputs fuse protection |  |  | Internal，electronic |  |  |
| Adjustable time delay |  | s | 0．．． 300 | 0．15．．． 3 or 1，5．．． 30 | 0．．． 30 |
| Start button monitoring |  |  | Yes／No（con gurable by terminal connections） |  |  |
| Control unit voltage （at nominal supply voltage） |  |  | Between input terminals S21－S22，S31－S32 or S11－S12 | Between input terminals S11－S12，S21－S22 or S11－S31 | Between input terminals S11－S12，S21－S22 or S11－B1 |
|  | 24 V version | V | 24 | 24 | 24 |
|  | $115 \mathrm{~V}, 230 \mathrm{~V}$ version | V | － |  | 48 |


| References： | Connections： | Dimensions： |
| :--- | :--- | :--- |
| page 38783－EN／4 | page 38783－EN／5 | page 38730－EN／2 |

Characteristics（continued）
Safety automation solutions
Preventa safety modules types XPS AV，
XPS ABV，XPS ATE
For Emergency stop and switch monitoring

| Characteristics（continued） |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  | XPS．．． | AV11113 | AV11113P | ABV••＊＊P | ABV•••＊C | ATE•••• | ATEゃゃゃ०P |
| Calculation of wiring resistance RL between input terminals |  |  | $\Omega$ | 100 max． <br> Maximum cable length： 2000 m |  | $R L=\frac{U e}{U n} \times 160-127$ <br> $\mathrm{Ue}=$ true voltage applied to terminals A1－A2 Un＝nominal supply voltage |  | RL max．$=$ $\qquad$ <br> Ue＝true volta to terminals A1 U int（terminal supply voltage （ 24 V version） U int between with typical va （115 V， 230 V Calculated max equal to or gre true value | int－U min． <br> I min． <br> age applied 1－A2 <br> s S11－S21）＝ <br> Ue－3V <br> 42 V and 45 V ， $\text { lue }=45 \mathrm{~V}$ <br> version） <br> ax．RL must be ater than the |
| Synchronisation time between inputs |  |  | s | For guard： 1.5 For Emergency stop： unlimited |  | ＜ 0.5 |  | Approx． 0.075 <br> For automatic start，terminals S33－Y2 and Y3－Y4 linked |  |
| Outputs | Voltage reference |  |  | Volt－free |  |  |  |  |  |
|  | Number and type of instantaneous opening safety circuits |  |  | 3 NO（03－04，13－14，23－24） |  | 2 NO（13－14，23－24） |  | 2 NO（13－14，23－24，33－34） |  |
|  | Number and type of time delay opening safety circuits |  |  | 3 NO（37－38，47－48，57－58） |  | 1 NO（37－38） |  | 3 NO（57－58，67－68，77－78） |  |
|  | Number and type of additional circuits |  |  | 3 solid－state |  | － |  | 4 solid－state |  |
|  | Breaking capacity in AC－15 | Instantaneous outputs | VA | C300：inrush 1800， maintained 180 |  | B300：inrush 3600， maintained 360 |  | C300：inrush 1800， maintained 180 |  |
|  |  | Time delay outputs | VA | C300：inrush 1800， maintained 180 |  | B300：inrush 3600， maintained 360 |  | C300：inrush 1800， maintained 180 |  |
|  | Breaking capacity in DC－13 | Instantaneous outputs |  | $24 \mathrm{~V} / 1.25 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ |  | $24 \mathrm{~V} / 1.5 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ |  | $24 \mathrm{~V} / 1.0 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ |  |
|  |  | Time delay outputs |  | $24 \mathrm{~V} / 1.25 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ |  | $24 \mathrm{~V} / 1.5 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ |  | $24 \mathrm{~V} / 1.0 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ |  |
|  | Breaking capacity of solid－state outputs |  |  | $24 \mathrm{~V} / 20 \mathrm{~mA}$ |  | － |  | － |  |
|  | Max．thermal current （Ithe） | Instantaneous outputs | A | 3.3 for all 3 ，or 6 for 1 and 2 for 2 ，or 4 for 2 and 2 for 1 |  | 6 |  | 5 |  |
|  |  | Time delay outputs | A | 3.3 for all 3 ，or 6 for 1 and 2 for 2 ，or 4 for 2 and 2 for 1 |  | 6 |  | 2.5 |  |
|  | Max．total thermal current |  | A | 20 |  | 12 |  | 8 |  |
|  | Output fuse protection， using fuses conforming to IEC／EN 60947－5－1， DIN VDE 0660 part 200 | Instantaneous outputs | A | 4 gG or 6 fast acting |  | 6 gG |  | 6 gG |  |
|  |  | Time delay outputs | A | 4 gG or 6 fast acting |  | 6 gG |  | 4 gG |  |
|  | Minimum current |  | mA | 10 （1） |  | 10 |  | 10 （1） |  |
|  | Minimum voltage |  | V | 17 （1） |  | 17 |  | 17 （1） |  |
| Electrical durability |  |  |  | See page 38610－EN／2 |  |  |  |  |  |
| Response time on instantaneous opening inputs |  |  | ms | ＜ 30 |  | ＜200 |  | ＜20 |  |
| Rated insulation voltage（Ui） |  |  | V | 300 （degree of pollution 2 conforming to IEC／EN 60947－5－1，DIN VDE 0110 parts 1 \＆2） |  |  |  |  |  |
| Rated impulse withstand voltage（Uimp） |  |  | kV | 4 （overvoltage category III，conforming to IEC／EN 60947－5－1，DIN VDE 0110 parts 1 \＆2） |  |  |  |  |  |
| LED display |  |  |  | 11 |  | 3 |  | 4 |  |
| Operating temperature |  |  | ${ }^{\circ} \mathrm{C}$ | －10．．． 55 |  | －25．．． 55 |  | －10．．． 55 |  |
| Storage temperature |  |  | ${ }^{\circ} \mathrm{C}$ | －25．．． 85 |  | －25．．． 75 |  | －25．．．＋ 85 |  |
| Degree of protection conforming to IEC／EN 60529 |  | Terminals |  | IP 20 |  |  |  |  |  |
|  |  | Enclosure |  | IP 40 |  |  |  |  |  |
| Connectio |  | Type of terminals |  | Captive screw clamp terminals |  |  | Spring terminals | Captive screw clamp terminals |  |
|  |  | Type of terminal block |  | $\begin{array}{l}\text { Integrated } \\ \text { in module }\end{array}$ Removable from module <br> $\begin{array}{l}\text { Solid or } \\ \text { exible cable：} \\ 0.14 \ldots 2.5 \mathrm{~mm}^{2}\end{array}$ Solid or exible cable： $0.2 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |  |  |  |
|  | 1－wire connection | Without cable end |  |  |  |  |  | Solid or <br> exible cable： <br> $0.14 \ldots . .2 .5 \mathrm{~mm}^{2}$ | Solid or exible cable： $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  |  | With cable end |  | Without bezel，exible cable： $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |  |  |  |
|  |  |  |  | With bezel， exible cable： $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ | With bezel， exible cable： $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ | With bezel， exible cable： $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ | With bezel， exible cable： $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ | With bezel， exible cable： 0．25．．． $1.5 \mathrm{~mm}^{2}$ | With bezel， exible cable $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  | 2－wire connection | Without cable end |  | Solid or exible cable： <br> $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ | Solid cable： $0.2 \ldots 1 \mathrm{~mm}^{2}$ Flexible cable： $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ | $\begin{aligned} & \text { Solid or } \\ & \text { exible cable: } \\ & 0.2 . .1 \mathrm{~mm}^{2} \end{aligned}$ | － | Solid or exible cable： $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ | Solid cable： <br> $0.2 \ldots 1 \mathrm{~mm}^{2}$ <br> Flexible cable： <br> $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ |
|  |  | With cable end |  | Without bezel，exible cable： $0.25 \ldots 1 \mathrm{~mm}^{2}$ |  |  |  | Without bezel，exible cable： $0.25 \ldots 1 \mathrm{~mm}^{2}$ |  |
|  |  |  |  | Double，with bezel，exible cable： $0.5 \ldots 1.5 \mathrm{~mm}^{2}$ |  | Double，with bezel，exible cable： $0.5 \ldots 1 \mathrm{~mm}^{2}$ |  | Double，with bezel，exible cable： $0.5 \ldots 1.5 \mathrm{~mm}^{2}$ |  |

（1）The module is also capable of switching low power loads（ $17 \mathrm{~V} / 10 \mathrm{~mA}$ ）provided that the contact has not been used for switching high power loads（possible contamination or wear of the gold layer on the contact tips）．


XPS AV11113


XPS AV11113P


XPS ABV $\bullet \bullet \bullet P$


XPS ABV••••C


XPS ATE5110

| References |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Description | Number of safety circuits | Additional outputs | Setting range of time delay | Supply | Connection | Reference | Weight <br> kg |
| Safety modules for Emergency stop and switch monitoring | 6 NO (3 NO time delay) | 3 solid-state | 0...300 s | $24 \mathrm{~V}=$ | Captive screw clamp terminals Terminal block integrated in module | XPS AV11113 | 0.320 |
|  | 6 NO (3 NO time delay) | 3 solid-state | $0 . .300 \mathrm{~s}$ | $24 \mathrm{~V}=-$ | Captive screw clamp terminals Terminal block removable from module | XPS AV11113P | 0.320 |
|  | 3 NO (1 NO time delay) | - | 0.15... 3 s | $24 \mathrm{~V}=-$ | Captive screw clamp terminals Terminal block removable from module | XPS ABV1133P | 0.280 |
|  |  |  |  | 24V =-- | Spring terminals Terminal block removable from module | XPS ABV1133C | 0.275 |
|  |  |  | $1.5 \ldots 30 \mathrm{~s}$ | $24 \mathrm{~V}=-$ | Captive screw clamp terminals Terminal block removable from module | XPS <br> ABV11330P | 0.280 |
|  |  |  |  | 24V =-- | Spring terminals Terminal block removable from module | XPS <br> ABV11330C | 0.275 |


| $\begin{aligned} & 5 \mathrm{NO} \\ & \text { (3 NO time } \\ & \text { delay) } \end{aligned}$ | 4 solid-state | $0 . .30 \mathrm{~s}$ | $\sim / 24 \mathrm{~V}-\mathrm{-}$ | Captive screw clamp terminals Terminal block integrated in module | XPS ATE5110 | 0.280 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Captive screw clamp terminals Terminal block removable from module | XPS ATE5110P | 0.280 |
|  |  |  | 115 V | Captive screw clamp terminals | XPS ATE3410 | 0.380 |

clamp terminals
Terminal block
integrated
in module

| Captive screw <br> clamp terminals | XPS ATE3410P | 0.380 |
| :--- | :--- | :--- |
| Terminal block |  |  |
| removable from |  |  |
| module |  |  |

230 V ~ Captive screw XPS ATE3710 0.380
clamp terminals
Terminal block
integrated
in module
Captive screw XPS ATE3710P 0.380
clamp terminals
Terminal block
removable from
module

XPS AV
Module XPS AV associated with an Emergency stop button with 1 NC contact, automatic start or unmonitored start

(1) Link for automatic start.
(2) Instantaneous opening safety outputs (stop category 0).
(3) Time delay opening safety outputs (stop category 1).

ESC = External start conditions.


## Automatic start

There is no start contact or it is shunted.

## Unmonitored start

The output is activated on closing of the start contact.

## Monitored start

The start input is monitored so that there is no start-up in the event of the start contact being shunted or the start circuit being closed for more than 10 seconds. Start-up is triggered following activation of the start button (push-release function) on opening of the contact.

XPS AV
Module XPS AV associated with an Emergency stop button with 2 NC contacts, monitored start

(1) Instantaneous opening safety outputs (stop category 0).
(2) Time delay opening safety outputs (stop category 1).

ESC = External start conditions.

## Functional diagram

Monitored start


Emergency stop monitoring function configuration
1-channel wiring


2-channel wiring, with short-circuit detection


XPS AV
Monitoring of a movable guard associated with 2 switches
Automatic start (diagram shown for guard closed)

(1) Instantaneous opening safety outputs (stop category 0).
(2) Time delay opening safety outputs (stop category 1).

ESC = External start conditions.
Functional diagram


LED details


1 S12 input status.
2 S22 input status.
3 S32 input status.
4 S34 input status.
5 S14 input status.
6 Y40 input status (time delay stop).
7 K1/K2 status (NO instantaneous opening safety outputs).
8 K3/K4 status (time delay opening safety outputs).
9 Supply voltage A1-A2.
10 Fault.
11 Con guration mode.

Safety automation solutions
Preventa safety modules type XPS ABV
For Emergency stop and switch monitoring

## XPS ABV <br> Module XPS AV associated with an Emergency stop button with 2 NC contacts, monitored start



S1: Emergency stop
S2: Start button
ESC = External start conditions.
(1) With start button monitoring.
(2) Without start button monitoring or automatic start.
(3) Maximum fuse rating: see technical characteristics.

## Emergency stop or switch monitoring function configurations




Switch monitoring: configuration 4


LED details


1 Supply voltage A1-A2
2 K1/K2 status
3 K3/K4 status


S1: Emergency stop button with 2 NC contacts (recommended application).
S2: Start button.
ESC: External start conditions.
Y1 (S33) - Y2: Feedback loop.
F1: 4 A max.
(1) With start button monitoring.
(2) Without start button monitoring.
(3) The outputs must be fuse protected. Technical characteristics for establishing maximum rating of fuses, see page 38783-EN/2.
(4) $115 / 230 \mathrm{~V} \sim$ only.

Functional diagram of module XPS ATE with Emergency stop button monitoring


1 With start button monitoring (Y3-Y5 connection).
2 Without start button monitoring (Y3-Y4 connection).
3 Without start button (connection Y3-Y4 and S33-Y1).
Tv: adjustable time.
LED details


[^6]XPS ATE
Example of a safety circuit combining an Emergency stop module with a variable speed drive


S1: Emergency stop button with 2 NC contacts (recommended application).
S2: Start button
(1) With start button monitoring.
(2) Technical characteristics for establishing maximum rating of fuses, see page 38783-EN/2.


Both input channels are supplied at the same potential.
S1: Emergency stop button with 2 NC contacts
A short-circuit between the 2 inputs is not detected.

Configuration with start button monitoring
(functional diagram for Start button 1, see page 38783-EN/5)

(1) Auxiliary terminal (to be used to separate the feedback loop from the wiring to the start button).

Configuration without start button monitoring
(functional diagram for Start button 2, see page 38783-EN/5)

(1) Auxiliary terminal (to be used to separate the feedback loop from the wiring to the start button).

Connection with multiple Emergency stop buttons


The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

## Monitoring an Emergency stop button with 1 NC contact



S1: Emergency stop button with 1 NC contact. Not all faults are detected: a short-circuit on the Emergency stop pushbutton is not detected.

## Preventa safety modules type XPS AF <br> For Emergency stop and switch monitoring

Operating principle
Safety modules XPS AF meet the requirements of Performance Level PL e/Category 4 conforming to standard EN/ISO 13849-1.

They are used for:
■ Monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and
EN/IEC 60204-1.
■ Electrical monitoring of switches activated by protection devices conforming to standard EN 1088.
Housed in a compact enclosure, the modules have 3 safety outputs.
Preventa safety modules XPS AF $\bullet \bullet \bullet$ P incorporate removable terminal blocks, thus optimising machine maintenance
To aid diagnostics, the modules have 3 LEDs on the front face which provide information on the monitoring circuit status.
The Start button monitoring function is configurable depending on the wiring.

| Characteristics |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  |  | XPS AF5130 | XPS AF5130P |
| Maximum achievable safety level |  |  |  | PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 62061 |  |
| Reliability data | Mean Time To dangerous Failure ( $\mathrm{MTTF}_{\mathrm{d}}$ ) |  | Years | 243 |  |
|  | Diagnostic Coverage (DC) |  | \% | > 99 |  |
|  | Probability of dangerous Failure per Hour ( $\mathrm{PFH}_{\mathrm{d}}$ ) |  | 1/h | $4.62 \times 10^{-9}$ |  |
| Conformity to standards |  |  |  | EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/IEC 60947-1, EN/ISO 13850 |  |
| Product certifications |  |  |  | UL, CSA, TÜV |  |
| Supply | Voltage |  | V | $\sim$ and 24 -.- |  |
|  | Voltage limits |  |  | -15...+10\% |  |
|  | Frequency |  | Hz | 50/60 |  |
| Consumption |  |  | VA | $\leqslant 5$ |  |
| Module inputs fuse protection |  |  |  | Internal, electronic |  |
| Start button monitoring |  |  |  | Yes/No (configurable by terminal connections) |  |
| Control unit voltage and current Maximum wiring resistance RL |  |  |  | $24 \mathrm{~V}=-/ 30 \mathrm{~mA}$ approx. (at nominal supply voltage) |  |
|  |  |  | $\Omega$ | 90 |  |
| Synchronisation time between inputs $A$ and $B$ |  |  |  | Unlimited |  |
| Outputs | Voltage reference |  |  | Volt-free |  |
|  | Number and type of safety circuits |  |  | 3 NO (13-14, 23-24, 33-34) |  |
|  | Breaking capacity in AC-15 |  | VA | C300: inrush 1800, maintained 180 |  |
|  | Breaking capacity in DC-13 |  |  | $24 \mathrm{~V} / 1.5 \mathrm{~A}-\mathrm{L} / \mathrm{R}=50 \mathrm{~ms}$ |  |
|  | Max. thermal current (lthe) |  | A | 6 |  |
|  | Max. total thermal current |  | A | 18 |  |
|  | Output fuse protection |  | A | 4 gG or 6 fast acting, conforming to IEC/EN 60947-5-1, DIN VDE 0660 part 200 |  |
|  | Minimum current |  | mA | 10 |  |
|  | Minimum voltage |  | V | 17 |  |
| Electrical durability |  |  |  | See page 38610/2 |  |
| Response time on input opening |  |  | ms | $\leqslant 40$ |  |
| Rated insulation voltage (Ui) |  |  | V | 300 (degree of pollution 2 conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |
| Rated impulse withstand voltage (Uimp) |  |  | kV | 4 (overvoltage category III, conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |
| LED display |  |  |  | 3 |  |
| Operating temperature |  |  | ${ }^{\circ} \mathrm{C}$ | -25...+60 |  |
| Storage temperature |  |  | ${ }^{\circ} \mathrm{C}$ | -40... +85 |  |
| Degree of protection conforming to IEC/EN 60529 |  | Terminals |  | IP 20 |  |
|  |  | Enclosure |  | IP 40 |  |
| Connections | Type | Terminals |  | Captive screw clamp terminals | Captive screw clamp terminals |
|  |  | Terminal block |  | Integrated in module | Removable from module |
|  | 1-wire connection | Without cable end |  | Solid or flexible cable: $0.14 . .2 .5 \mathrm{~mm}^{2}$ | Solid or flexible cable: $0.2 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  |  | With cable end |  | Without bezel, flexible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |
|  |  | With cable end |  | With bezel, flexible cable: $0.25 . .1 .5 \mathrm{~mm}^{2}$ | With bezel, flexible cable: $0.25 . .2 .5 \mathrm{~mm}^{2}$ |
|  | 2-wire connection | Without cable end |  | Solid or flexible cable: $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ | Solid cable: $0.2 \ldots 1 \mathrm{~mm}^{2}$, flexible cable: $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ |
|  |  | With cable end |  | Without bezel, flexible cable: $0.25 \ldots 1 \mathrm{~mm}^{2}$ |  |
|  |  | With cable end |  | Double, with bezel, flexible cable: $0.5 \ldots 1.5 \mathrm{~mm}^{2}$ | Double, with bezel, flexible cable: $0.5 \ldots 1.5 \mathrm{~mm}^{2}$ |



## Connections

## XPS AF

Module XPS AF associated with an Emergency stop button with 2 NC contacts


[^7]ESC $=$ External start conditions.

(1) With start button monitoring.
(2) Without start button monitoring.

Module XPS AF with connection of multiple Emergency stop buttons, combined with a PLC

(1) Other circuits controlled by the XPS AF module. ESC = External start conditions.

## Safety automation solutions <br> Preventa safety modules type XPS AF <br> For Emergency stop and switch monitoring

XPS AF
Emergency stop monitoring function configuration

1-channel wiring


Emergency stop button with a single NC contact. Not all faults are detected: a short-circuit on the Emergency stop pushbutton is not detected.

2-channel wiring


Connection of multiple Emergency stop buttons with 2 NC contacts (recommended application). The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with NO contact, switch 2 with NC contact)


Configuration with automatic or manual start


Automatic start.


Without start button monitoring, manual reset.

LED details


Supply voltage A1-A2, fuse status.
2 Relay K1 energised.
3 Relay K2 energised

Operating principle, characteristics

## Safety automation solutions

Preventa safety modules type XPS AFL
For Emergency stop, switch and safety light curtain monitoring

Operating principle
Safety modules XPS AFL meet the requirements of Performance Level PL e/Category 4 conforming to standard EN/ISO 13849-1.

They are used for:
■ Monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and
EN/IEC 60204-1.

- Electrical monitoring of switches activated by protection devices conforming to standard EN 1088/ISO 14119.

They can also be used for monitoring type 4 light curtains conforming to EN 61496-1 that have solid-state safety outputs (for example, light curtains type XUS L, see page 30304-EN/2). This system would conform to Performance Level PLe/ Category 4 in accordance with EN/ISO 13849-1.

Housed in a compact enclosure, the modules have 3 safety outputs.
Preventa safety modules XPS AFL•••๑P incorporate removable terminal blocks, thus optimising machine maintenance.
To aid diagnostics, the modules have 3 LEDs on the front face which provide information on the monitoring circuit status.

The Start button monitoring function is configurable depending on the wiring.

| Characteristics |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  |  | XPS AFL5130 | XPS AFL5130P |
| Maximum achievable safety level |  |  |  | PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 62061 |  |
| Reliability data | Mean Time To dangerous Failure ( $\mathrm{MTTF}_{\mathrm{d}}$ ) |  | Years | 172.1 |  |
|  | Diagnostic Coverage (DC) |  | \% | > 99 |  |
|  | Probability of dangerous Failure per Hour (PFH ${ }_{d}$ ) |  | 1/h | $5.61 \times 10^{-9}$ |  |
| Conformity to standards |  |  |  | EN/IEC 60204-1, <br> EN 1088/ISO 14119, <br> EN/ISO 13850, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1, <br> EN/IEC 61496-1 (type 4) |  |
| Product certifications |  |  |  | UL, CSA, TÜV |  |
| Supply | Voltage |  | v | $\sim$ and $24 \ldots$ |  |
|  | Voltage limits |  |  | -15... $+10 \%$ |  |
|  | Frequency |  | Hz | 50/60 |  |
| Consumption |  |  | VA | $\leqslant 5$ |  |
| Module inputs fuse protection |  |  |  | Internal, electronic |  |
| Start button monitoring |  |  |  | No (configurable by terminal connections) |  |
| Control unit voltage and current |  |  |  | $24 \mathrm{~V}=-/ 30 \mathrm{~mA}$ approx. (at nominal supply voltage) |  |
| Maximum wiring resistance RL |  |  | $\Omega$ | 90 |  |
| Synchronisation time between inputs $A$ and $B$ |  |  |  | Unlimited |  |
| Outputs | Voltage reference |  |  | Volt-free |  |
|  | Number and type of safety circuits |  |  | 3 NO (13-14, 23-24, 33-34) |  |
|  | Breaking capacity in AC-15 |  | VA | C300: inrush 1800, maintained 180 |  |
|  | Breaking capacity in DC-13 |  |  | $24 \mathrm{~V} / 1.5 \mathrm{~A}-\mathrm{L} / \mathrm{R}=50 \mathrm{~ms}$ |  |
|  | Max. thermal current (Ithe) |  | A | 6 |  |
|  | Max. total thermal current |  | A | 18 |  |
|  | Output fuse protection |  | A | 4 gG or 6 fast acting, conforming to IEC/EN 60947-5-1, DIN VDE 0660 part 200 |  |
|  | Minimum current |  | mA | 10 |  |
|  | Minimum voltage |  | V | 17 |  |
| Electrical durability |  |  |  | See page 38610/2 |  |
| Response time on input opening |  |  | ms | $\leqslant 20$ |  |
| Rated insulation voltage (Ui) |  |  | V | 300 (degree of pollution 2 conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |
| Rated impulse withstand voltage (Uimp) |  |  | kV | 4 (overvoltage category III, conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |
| LED display |  |  |  | 3 |  |
| Operating temperature |  |  | ${ }^{\circ} \mathrm{C}$ | -10... +55 |  |
| Storage temperature |  |  | ${ }^{\circ} \mathrm{C}$ | -25...+85 |  |
| Degree of protection conforming to IEC/EN 60529 |  | Terminals |  | IP 20 |  |
|  |  | Enclosure |  | IP 40 |  |

Characteristics, references

## Safety automation solutions

 Preventa safety modules type XPS AFLFor Emergency stop, switch and safety light curtain monitoring


| Removable from <br> module | 3 | $\sim$ and $24 \mathrm{~V}=-$ | XPS AFL5130P | 0.250 |
| :--- | :--- | :--- | :--- | :--- |

XPS AFL
Module XPS AFL associated with an Emergency stop button with 2 NC contacts

(1) With start button monitoring.
(2) Without start button monitoring.

ESC: External start conditions.
Functional diagrams
Emergency stop function


Key
0 $\qquad$ - 1
(1) With start button monitoring.
(2) Without start button monitoring.

Guard function with automatic start


Safety automation solutions
Preventa safety modules type XPS AFL
For Emergency stop, switch and safety light curtain monitoring

XPS AFL
Emergency stop monitoring function configuration
1-channel wiring
Emergency stop button with a single NC contact


A short-circuit on the Emergency stop pushbutton is not detected.

## 2-channel wiring

Connection of multiple Emergency stop buttons

A short-circuit between the 2 inputs is not detected.

Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with NO contact, switch 2 with NC contact)
Without short-circuit detection


2-channel wiring
Emergency stop button with 2 NC contacts


A short-circuit between the 2 inputs is not detected.


Monitoring of electro-sensitive protection equipment (ESPE)


LED details


1 Supply voltage A1-A2, fuse status.
2 Relay K1 energised.
3 Relay K2 energised.

Operating principle, characteristics

## Safety automation solutions

## Preventa safety modules type XPS AR <br> For Emergency stop, switch or safety light curtain monitoring

Operating principle
Safety modules XPS AR meet the requirements of Performance Level PL e/ Category 4 conforming to standard EN/ISO 13849-1 and are designed for the following safety applications:
■ Monitoring Emergency stop circuits conforming to EN/ISO 13850 and
EN/IEC 60204-1.

- Electrical monitoring of switches activated by protection devices conforming
to standard EN 1088/ISO 14119.
■ Monitoring type 4 light curtains conforming to EN/IEC 61496-1 that have solidstate safety outputs with test function (light curtains XUS L).
In addition to 7 safety outputs, modules XPS AR incorporate 2 relay signalling outputs and 4 solid-state signalling outputs for signalling to the process PLC.

Safety modules XPS AR • • •••P incorporate removable terminal blocks, thus optimising machine maintenance.
To aid diagnostics, the modules have 4 LEDs on the front face which provide information on the monitoring circuit status.
The Start button monitoring function is con gurable depending on the wiring.
Characteristics
Module type
Maximum achievable safety level
Reliability data Mean Time To dangerous Failure ( MTTF $_{d}$ ) Diagnostic Coverage (DC)
Probability of dangerous Failure per Hour $\left(\mathrm{PFH}_{\mathrm{d}}\right)$

## Conformity to standards

| Product certifications |  |  |  |
| :---: | :---: | :---: | :---: |
| Supply | Voltage |  | V |
|  | Voltage limits | 24V =- | \% |
|  |  | $24 \mathrm{~V} \sim$ | \% |
|  |  | $115 \mathrm{~V} \sim$ | \% |
|  |  | $230 \mathrm{~V} \sim$ | \% |
|  | Frequency |  | Hz |
| Consumption |  |  |  |
| Module inputs fuse protection |  |  |  |
| Start button monitoring |  |  |  |
| Control unit voltage and current (between terminals S11-S52 and S21-S22). $24 \mathrm{~V}, 115 \mathrm{~V}$ and 230 V version |  |  | V |
| Maximum wiring resistance RL (between terminals S11-S52 and S21-S22) |  |  | $\Omega$ |
| Synchronisation time between inputs $A$ and $B$ Automatic start, terminals S33, S34 linked |  |  | ms |
| Safety o | Voltage reference |  |  |
|  | Number and type of safety circuits |  |  |
|  | Number and type of additional outputs |  |  |
|  | Number and type of auxiliary contacts |  |  |
|  | Breaking capacity in AC-15 |  | VA |
|  | Breaking capacity in DC-13 |  |  |
|  | Breaking capacity of solid-state outputs |  |  |
|  | Max. thermal current (lthe) |  | A |
|  | Max. total thermal current |  | A |
|  | Output fuse protection |  | A |
|  | Minimum current |  | mA |
|  | Minimum voltage |  | V |
| Electrical durability |  |  |  |
| Response time on input opening |  |  | ms |
| Rated insulation voltage (Ui) |  |  | V |
| Rated impulse withstand voltage (Uimp) |  |  | kV |
| LED display |  |  |  |
| Operating temperature |  |  | ${ }^{\circ} \mathrm{C}$ |
| Storage temperature |  |  | ${ }^{\circ} \mathrm{C}$ |
| Degree of protection conforming to IEC 529 |  |  |  |

$\left.\begin{array}{|l|l}\text { XPS AR3•1144 } \\ \text { PL e/Category } 4 \text { conforming to EN/ISO 13849-1, SILCL } 3 \text { conforming to EN/IEC 62061 }\end{array}\right]$.

| References: | Connections: | Characteristics: | Principle: |
| :--- | :--- | :--- | :--- |
| page 38791-EN/3 | page 38791-EN/4 | page 38791-EN/2 | page 38791-EN/2 |

Characteristics, references

Safety automation solutions
Preventa safety modules type XPS AR
For Emergency stop, switch or safety light curtain monitoring

| Characteristics (continued) |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  | XPS AR3•1144 |  |  | XPS AR3•1144P |  |  |
| Connection | Type | Terminals | Captive screw clamp terminals |  |  | Captive screw clamp terminals |  |  |
|  |  | Terminal block | Integrated in module |  |  | Removable from module |  |  |
|  | 1-wire connection | Without cable end | Solid or exible cable: $0.14 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  | Solid or exible cable: $0.2 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |
|  |  | With cable end | Without bezel, exible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |  |  |  |
|  |  | With cable end | With bezel, exible cable: $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ |  |  | With bezel, exible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |
|  | 2-wire connection | Without cable end | Solid or exible cable: $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ |  |  | Solid cable: $0.2 \ldots 1 \mathrm{~mm}^{2}$, exible cable: $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ |  |  |
|  |  | With cable end | Without bezel, exible cable: $0.25 \ldots 1 \mathrm{~mm}^{2}$ |  |  |  |  |  |
|  |  | With cable end | Double, with bezel, exible cable: $0.5 \ldots 1.5 \mathrm{~mm}^{2}$ |  |  |  |  |  |
| References |  |  |  |  |  |  |  |  |
|  |  | Description | Type of terminal block connection | Number of safety circuits | Additional outputs/ solid-state outputs to PLC | Supply | Reference | Weight |
|  |  |  |  |  |  | V |  | kg |
|  |  | Safety modules for Emergency stop, switch or safety light curtain monitoring | Integrated in module | 7 | $2 / 4$ | $24=$ | XPS AR311144 | 0.300 |



XPS AR3•1144
115 ~ XPS AR351144 0.400

| $230 \sim$ |  |  |
| :--- | :--- | :--- |
| $24=-$ |  |  |


| Removable | 7 | $2 / 4$ | $24 \sim$ | XPS AR311144P | 0.300 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| from module |  |  | $24 \approx$ |  |  |


| 115 ~ $\quad$ XPS AR351144P | 0.400 |
| :--- | :--- | :--- |

230 ~ XPS AR371144P 0.400

## Safety automation solutions

Preventa safety modules type XPS AR
For Emergency stop, switch or safety light curtain monitoring

XPS AR
Emergency stop monitoring function configuration

1-channel wiring
Emergency stop button with a single NC contact

2-channel wiring
Emergency stop button with 2 NC contacts, without short-circuit detection

Emergency stop button with 2 NC contacts, with short-circuit detection (recommended application)

Connection of multiple Emergency stop buttons with 2 NC contacts (recommended application)


Not all faults are detected:
a short-circuit on the Emergency stop pushbutton is not detected


The 2 input channels are supplied at different potentials.
A short-circuit between the 2 inputs is detected

Start configurations
Automatic start


XPS AR

| A2 | B2 |  | Y 1 |  | S 37 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |

With start button monitoring


Without start button monitoring


| References: | Connections: | Characteristics: | Principle: |
| :--- | :--- | :--- | :--- |
| page 38791-EN/3 | page 38791-EN/4 | page 38791-EN/2 | page 38791-EN/2 |

Safety automation solutions
Preventa safety modules type XPS AR
For Emergency stop, switch or safety light curtain monitoring

XPS AR
Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with NO contact, switch 2 with NC contact)

Automatic start, without synchronisation time monitoring


Manual start by start button


Monitoring of a movable guard associated with 2 switches in combined mode and automatic start (shown with guard open)


Module XPS AR associated with an Emergency stop button with 2 NC contacts


Supply connection according to voltage:
$\sim$ across terminals $\mathrm{A} 1 / \mathrm{A} 2$, or 24 V =- across terminals B1/B2

ESC: External start conditions
(1) Operating status of internal electronic fuse

## Safety automation solutions

Preventa safety modules type XPS AR
For Emergency stop, switch or safety light curtain monitoring

XPS AR
Module XPS AR for monitoring electro-sensitive protection equipment (ESPE)


ESC: External start conditions
(1) Operating status of internal electronic fuse
(2) ESPE indicator light deactivated

Example of safety circuit combining module XPS AR for switch monitoring and a PLC


ESC: External start conditions
(1) Operating status of internal electronic fuse

Safety automation solutions
Preventa safety modules type XPS AR
For Emergency stop, switch or safety light curtain monitoring


Emergency stop monitoring or limit switch monitoring function with monitored start


Limit switch monitoring function with automatic start and synchronisation time monitoring


Light curtain monitoring (ESPE) function, curtains with solid-state outputs, and monitored start


## LED details



1 Supply voltage A1-A2, internal electronic fuse status
2 Input S22 (A)
3 Input S52 (B)
4 K1/K2 status (NO safety outputs closed)

## Preventa safety modules type XPS AK <br> For Emergency stop, switch, sensing mat/edges or safety light curtain monitoring

Operating principle
Safety modules XPS AK meet the requirements of Performance Level PL e/Category 4 conforming to standard EN/ISO 13849-1.
They are used for:
■ Monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and
EN 60204-1
■ Electrical monitoring of switches activated by protection devices, with optional selection of synchronisation time between signals.
■ Monitoring 4 -wire sensing mats or edges.
■ Monitoring type 4 light curtains conforming to EN/IEC 61496-1 which have solidstate safety outputs with test function (light curtains XUS L).
Housed in a compact enclosure, the modules have 3 safety outputs, a relay signalling output and 4 solid-state signalling outputs for signalling to the process PLC.

Preventa safety modules XPS AKeee๑P incorporate removable terminal blocks, thus optimising machine maintenance
To aid diagnostics, the modules have 4 LEDs on the front face which provide information on the monitoring circuit status.
The Start button monitoring function is con gurable depending on the wiring.

| Characteristics |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  |  | XPS AK3•1144 | XPS AK3•1144P |
| Maximum achievable safety level |  |  |  | PL e/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 62061 |  |
| Reliability data | Mean Time To dangerous Failure ( $\mathrm{MTTF}_{\mathrm{d}}$ ) |  | Years | 154.5 |  |
|  | Diagnostic Coverage (DC) |  | \% | $>99$ |  |
|  | Probability of dangerous Failure per Hour $\left(\mathrm{PFH}_{\mathrm{d}}\right)$ |  | 1/h | $7.39 \times 10^{-9}$ |  |
| Conformity to standards |  |  |  | EN/IEC 60204-1, EN 1088/ISO 14119, EN/ISO 13850, EN/IEC 60947-1, EN/IEC 60947-5-1 |  |
| Product certifications |  |  |  | UL, CSA, TÜV |  |
| Supply | Voltage |  | V | $\sim$ and $24-$-, $48 \sim, 110 \sim$ and $24-$-, $120 \sim$ and $24-$--, $230 \sim$ and $24 \ldots$ |  |
|  | Voltage limits |  |  | -15...+10\% |  |
|  | Frequency |  | Hz | 50/60 |  |
| Consumption | 24 V version |  | VA | $\leqslant 5$ |  |
|  | 110/120/230 V versions |  |  | $\leqslant 6$ |  |
| Module inputs fuse protection |  |  |  | Internal, electronic |  |
| Start button monitoring |  |  |  | Yes/No (con gurable by terminal connections) |  |
| Control unit voltage and current between terminals S21-S22, S31-S32 |  |  |  | $24 \mathrm{~V}=-/ 30 \mathrm{~mA}$ approx. (at nominal supply voltage) |  |
| Maximum wiring resistance RL between terminals S21-S22, S31-S32 |  |  | $\Omega$ | 28 |  |
| Synchronisation time between inputs A and B (terminals S21-S22, S31-S32) |  |  | s | Automatic start: 2 or 4 depending on wiring Manual start (start button between S33 and S34): unlimited |  |
| Outputs | Voltage reference |  |  | Volt-free |  |
|  | Number and type of safety circuits |  |  | 3 NO (13-14, 23-24, 33-34) |  |
|  | Number and type of additional circuits |  |  | 1 NC (41-42) +4 solid-state |  |
|  | Breaking capacity in AC-15 |  | VA | C300: inrush 1800, maintained 180 |  |
|  | Breaking capacity in DC-13 |  |  | $24 \mathrm{~V} / 1.5 \mathrm{~A}-\mathrm{L} / \mathrm{R}=50 \mathrm{~ms}$ |  |
|  | Breaking capacity of solid-state outputs |  |  | $24 \mathrm{~V} / 20 \mathrm{~mA}, 48 \mathrm{~V} / 10 \mathrm{~mA}$ |  |
|  | Max. thermal current (Ithe) |  | A | 6 |  |
|  | Max. total thermal current |  | A | 18 |  |
|  | Output fuse protection |  | A | 4 gG or 6 fast acting, conforming to IEC/EN 60947-5-1, DIN VDE 0660 part 200 |  |
|  | Minimum current |  | mA | 10 |  |
|  | Minimum voltage |  | V | 17 |  |
| Electrical durability |  |  |  | See page 38610-EN/2 |  |
| Response time on input opening |  |  | ms | $\leq 40$ |  |
| Rated insulation voltage (Ui) |  |  | V | 300 (degree of pollution 2 conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |
| Rated impulse withstand voltage (Uimp) |  |  | kV | 4 (overvoltage category III, conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |
| LED display |  |  |  | 4 |  |
| Operating temperature |  |  | ${ }^{\circ} \mathrm{C}$ | $-10 \ldots+55$ |  |
| Storage temperature |  |  | ${ }^{\circ} \mathrm{C}$ | -25... 85 |  |
| Degree of protection | Conforming to IEC 60529 | Terminals |  | IP 20 |  |
|  |  | Enclosure |  | IP 40 |  |


| References: | Connections: | Dimensions: |
| :--- | :--- | :--- |
| page 38782-EN/3 | page 38782-EN/PB | page 38730-EN/2 |

Characteristics, references

Safety automation solutions
Preventa safety modules type XPS AK
For Emergency stop, switch, sensing mat/edges or safety light curtain monitoring

| Characteristics (continued) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  | XPS AK3•1144 |  | XPS AK3•1144P |  |  |
| Connections | Type | Terminals | Captive screw clamp terminals |  | Captive screw clamp terminals |  |  |
|  |  | Terminal block | Integrated in module |  | Removable from module |  |  |
|  | 1-wire connection | 1 Without cable end | Solid or exible cable: $0.14 \ldots 2.5 \mathrm{~mm}^{2}$ |  | Solid or exible cable: $0.2 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |
|  |  | With cable end | Without bezel, exible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |  |  |
|  |  | With cable end | With bezel, exible cable: $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ |  | With bezel, exible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |
|  | 2-wire connection | W Without cable end | Solid or exible cable: $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ |  | Solid cable: $0.2 \ldots 1 \mathrm{~mm}^{2}$, exible cable: $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ |  |  |
|  |  | With cable end | Without bezel, exible cable: $0.25 \ldots 1 \mathrm{~mm}^{2}$ |  |  |  |  |
|  |  | With cable end | Double, with bezel, exible cable: $0.5 \ldots 1.5 \mathrm{~mm}^{2}$ |  |  |  |  |
| References |  |  |  |  |  |  |  |
|  |  | Description | Type of terminal Number block connection of safety circuits | Outputs: <br> Additional/ <br> Solid-state <br> for PLC | Supply | Reference | Weight <br> kg |
|  |  | Safety modules for Emergency stop, switch, sensing mat/edges or safety light curtain monitoring | Integratedin module |  | $\begin{aligned} & 24 \mathrm{~V} \sim \\ & 24 \mathrm{~V}=- \end{aligned}$ | XPS AK311144 | 0.300 |
|  |  | $\begin{aligned} & 110 \mathrm{~V} \sim \\ & 24 \mathrm{~V}=- \end{aligned}$ |  |  | XPS AK361144 | 0.400 |
|  |  | $\begin{aligned} & 120 \mathrm{~V} \sim \\ & 24 \mathrm{~V}=- \end{aligned}$ |  |  | XPS AK351144 | 0.400 |
|  |  |  |  |  |  | $\begin{aligned} & 230 \mathrm{~V} \sim \\ & 24 \mathrm{~V}=- \end{aligned}$ | XPS AK371144 | 0.400 |
|  |  |  |  | Removable from 3 module | 1/4 | $\begin{aligned} & 24 \vee \sim \\ & 24 \vee=- \end{aligned}$ | XPS AK311144P | 0.300 |
|  |  |  |  |  | $48 \mathrm{~V} \sim$ | XPS AK331144P | 0.300 |
|  |  |  |  |  | $\begin{aligned} & 110 \mathrm{~V} \sim \\ & 24 \mathrm{~V}=- \end{aligned}$ | XPS AK361144P | 0.400 |
|  |  |  |  |  | $\begin{aligned} & 120 \mathrm{~V} \sim \\ & 24 \mathrm{~V}=- \end{aligned}$ | XPS AK351144P | 0.400 |
|  |  |  |  |  | $\begin{aligned} & 230 \mathrm{~V} \sim \\ & 24 \mathrm{~V}=- \end{aligned}$ | XPS AK371144P | 0.400 |

## Safety automation solutions

Preventa safety modules type XPS AK
For Emergency stop, switch, sensing mat/edges or safety light curtain monitoring

## XPS AK <br> Emergency stop monitoring function configuration

 1-channel wiringEmergency stop button with a single NC contact


Not all faults are detected: a short-circuit on the
Emergency stop pushbutton is not detected.

## Connection of multiple Emergency stop buttons

 with 2 NC contacts (recommended application)2-channel wiring
Emergency stop button with 2 NC contacts, without short-circuit detection short-circuit detection (recommended application)


The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

Start configurations
Automatic start With start button monitoring


XPS AK

| A2 | B2 |  |  | S33 | S34 |
| :--- | :--- | :--- | :--- | :--- | :--- |

The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

## Proximity sensor monitoring

Proximity sensors with PNP outputs
Without short-circuit detection


Proximity sensors with NPN and PNP outputs With short-circuit detection


Sensing mat or edges monitoring


Safety automation solutions
Preventa safety modules type XPS AK
For Emergency stop, switch, sensing mat/edges or safety light curtain monitoring

XPS AK
Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with NO contact, switch 2 with NC contact)
Automatic start, without synchronisation time monitoring
Manual start by Start button


Monitoring of a movable guard associated with 2 switches and automatic start
(shown with guard open)


Module XPS AK associated with an Emergency stop button with 2 NC contacts


Supply connection according to voltage: $\sim$ across terminals $\mathrm{A} 1 / \mathrm{A} 2$, or $24 \mathrm{~V}=$ across terminals $\mathrm{B} 1 / \mathrm{B} 2$.
(1) Operating status of internal electronic fuse.

ESC: External start conditions.

Safety automation solutions
Preventa safety modules type XPS AK
For Emergency stop, switch, sensing mat/edges or safety light curtain monitoring

## XPS AK

Module XPS AK for monitoring electro-sensitive protection equipment (ESPE)

(1) Operating status of internal electronic fuse.
(2) ESPE indicator light deactivated.

ESC: External start conditions.
Example of safety circuit combining module XPS AK for switch monitoring and a PLC

(1) Operating status of internal electronic fuse.

ESC: External start conditions.

Safety automation solutions
Preventa safety modules type XPS AK
For Emergency stop, switch, sensing mat/edges
or safety light curtain monitoring

XPS AK
Functional diagrams

Switch monitoring function with automatic start


Emergency stop monitoring or switch monitoring function


Sensing mat or edge monitoring function, with monitored start


Switch monitoring function with automatic start and synchronisation time monitoring


Light curtain monitoring (ESPE) function, curtains with solid-state outputs


LED details


1 Supply voltage A1-A2, fuse status.
2 Input S22 (A).
3 Input S32 (B).
4 K1/K2 status (NO safety outputs closed).

Operating principle, characteristics, references

## Safety automation solutions

## Preventa safety modules type XPS VC

For enabling switch monitoring

The enabling grip switch system, comprising an enabling switch XY2 AU and a monitoring module XPS VC, enables authorised personnel to carry out adjustment, programming or maintenance operations within hazardous zones of machines providing certain conditions are met.

To be accessible, such operations are often carried out at reduced speed, and must be intentionally selected by authorised persons by means of a selector switch or key switch. Once the selection is made, the enabling switch system temporarily takes over from the hazardous zone's usual protection measures. Caution: The enabling switch system alone must not cause dangerous movements of the machine to be activated; a second intentional control action on the part of the operator is required. In addition, each person remaining in the hazardous zone must be provided with an individual enabling switch to ensure their own safety.

| Characteristics |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  |  | XPS VC1132 \| XPS VC1132P |  |  |  |  |
| Maximum achievable safety level |  |  |  | PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 62061 |  |  |  |  |
| Reliability data | Mean Time To dangerous Failure ( MTTF $_{\text {d }}$ ) |  | Years | 50 |  |  |  |  |
|  | Diagnostic Coverage (DC) |  | \% | > 99 |  |  |  |  |
|  | Probability of dangerous Failure per Hour ( $\mathrm{PFH}_{\mathrm{d}}$ ) |  | 1/h | $1.3 \times 10^{-8}$ |  |  |  |  |
| Conformity to standards |  |  |  | EN/IEC 60204-1, EN 61326, EN/IEC 60947-1, EN/IEC 60947-5-1 |  |  |  |  |
| Product certifications |  |  |  | UL, CSA, TÜV |  |  |  |  |
| Supply (Ue) conforming to IEC 38 | Voltage |  | V | 24 -- |  |  |  |  |
|  | Voltage limits $\quad 24 \mathrm{~V}=-$ |  |  | -20... $+20 \%$ |  |  |  |  |
| Consumption |  |  | W | <2.5 |  |  |  |  |
| Module inputs fuse protection |  |  |  | Internal, electronic |  |  |  |  |
| Maximum wiring resistance RL between the module and the enabling grip switch |  |  | $\Omega$ | 100 |  |  |  |  |
| Control unit voltage and current |  |  |  | $24 \mathrm{~V} / 8 \mathrm{~mA}$ |  |  |  |  |
| Safety outputs | Voltage reference |  |  | Volt-free |  |  |  |  |
|  | Number and type of safety circuits |  |  | 2 NO (terminals 13-14, 23-24) |  |  |  |  |
|  | Number and type of solid-state outputs |  |  | 2 |  |  |  |  |
|  | Breaking capacity in AC-15 |  | VA | C300: inrush 1800, maintained: 180 |  |  |  |  |
|  | Breaking capacity in DC-13 |  |  | $24 \mathrm{~V} / 1.5 \mathrm{AL} / \mathrm{R}=50 \mathrm{~ms}$ |  |  |  |  |
|  | Max. thermal current (lthe) |  | A | 4.2 |  |  |  |  |
|  | Max. total thermal current |  | A | 8.4 |  |  |  |  |
|  | Output fuse protection |  | A | 4 gG or 6 fast acting |  |  |  |  |
|  | Minimum current |  | mA | 10 |  |  |  |  |
|  | Minimum voltage |  | V | 17 |  |  |  |  |
| Electrical durability |  |  |  | See page 38610-EN/2 |  |  |  |  |
| Response time on input opening Rated insulation voltage (Ui) |  |  | ms | <20 |  |  |  |  |
|  |  |  | V | 300 (degree of pollution 2 conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |  |  |  |
| Rated impulse withstand voltage (Uimp) |  |  | kV | 4 (overvoltage category III, conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |  |  |  |
| LED display |  |  |  | 3 |  |  |  |  |
| Ambient air temperature |  |  | ${ }^{\circ} \mathrm{C}$ | For operation: - 10... +55 , for storage - 25...+ 85 |  |  |  |  |
| Degree of protection conforming to IEC/EN 60529 |  |  |  | Terminals: IP 20, enclosure: IP 40 |  |  |  |  |
| Connection | Type | Terminals |  | Captive screw clamp term | minals | Captive | clamp termina |  |
|  |  | Terminal block |  | Solid or exible cable: $0.14 \ldots 2.5 \mathrm{~mm}^{2}$ |  | Remov | om module |  |
|  | 1-wire connection | Without cable end |  |  |  | Solid or exible cable: $0.2 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |
|  |  | With cable end |  | Without bezel, exible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |  |  |
|  |  | With cable end |  | With bezel, exible cable | : $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ | With be | exible cable: 0.2 | $2.5 \mathrm{~mm}^{2}$ |
|  | 2-wire connection | Without cable end |  | Solid or exible cable: $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ |  | Solid cable: $0.2 \ldots 1 \mathrm{~mm}^{2}$, exible cable: $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ |  |  |
|  |  | With cable end |  | Without bezel, exible cable: $0.25 . .1 \mathrm{~mm}^{2}$ |  |  |  |  |
|  |  | With cable end |  | With bezel, exible cable: $0.5 . .1 .5 \mathrm{~mm}^{2}$ |  |  |  |  |
| References |  |  |  |  |  |  |  |  |
|  |  | escription | Type of terminal Number of block connection safety circuits |  | Solid-state outputs for PLC | Supply (V) | References | Weight |
|  |  | Safety modules for enabling switch monitoring | Integrate module <br> Remova module | din 2 NO | 2 | 24 -- | XPS VC1132 | 0.250 |
|  |  |  |  | le from 2 NO | 2 | 24 -- | XPS VC1132P | 0.250 |

XPS VC1132
Dimensions:
page 38730-EN/2


# Safety automation solutions 

Preventa safety modules types XPS BA, XPS BCE, XPS BF
For electrical monitoring of two-hand control stations

## Operating principle

Two-hand control stations are designed to provide protection against hand injury. They require machine operators to keep their hands clear of the dangerous movement zone.

The use of two-hand control is an individual protective measure, which can safely protect only one operator. Separate two-hand control stations must be provided for each operator in a multiple-worker environment.

Safety modules XPS BA, BCE and BF for two-hand control stations comply with the requirements of European standard EN 574/ISO 13851 for two-hand control systems.

The control stations must be designed and installed such that they cannot be activated involuntarily or easily rendered inoperative. Depending on the application, the requirements of type C standards speci c to the machinery involved must be met (additional personal protection methods may have to be considered).

To initiate a dangerous movement, both operators (two-hand control pushbuttons) must be activated within an interval $\leqslant 0.5 \mathrm{~s}$ (synchronous activation). If one of the two pushbuttons is released during a dangerous operation, the control sequence is cancelled. Resumption of the dangerous operation is possible only if both pushbuttons are returned to their initial position and reactivated within the required time interval.

The safety distance between the control units and the hazardous zone must be suf cient to ensure that when only one operator is released, the hazardous zone cannot be reached before the dangerous movement has been completed or stopped.

## Characteristics <br> Safety automation solutions <br> Preventa safety modules types XPS BA, <br> XPS BCE <br> For electrical monitoring of two-hand control stations



Safety automation solutions
Preventa safety modules type XPS BF For electrical monitoring of two-hand control stations

| Characteristics |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  |  | XPS BF1132 | XPS BF1132P |
| Maximum achievable safety level |  |  |  | PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 62061 |  |
| Reliability data | Mean Time To dangerous Failure ( $\mathrm{MTTF}_{\mathrm{d}}$ ) |  | Years | 50.1 |  |
|  | Diagnostic Coverage (DC) |  | \% | > 99 |  |
|  | Probability of dangerous Failure per Hour$\left(\mathrm{PFH}_{\mathrm{d}}\right)$ |  | 1/h | $1.3 \times 10^{-8}$ |  |
| Conformity to standards |  |  |  | ```EN 60204-1, \\ EN 60947-1, \\ EN 60947-5-1, \\ EN 574 type III C/ISO 13851``` |  |
| Product certifications |  |  |  | UL, CSA, TÜV |  |
| Supply |  | Voltage | V | 24 --- |  |
|  |  | Voltage limits |  | -20... $+20 \%$ |  |
| Consumption |  |  | W | <2.5 |  |
| Module inputs fuse protection |  |  |  | Internal, electronic |  |
| Inputs |  |  |  | S1: 1 NC + NO, S2: 1 NC + NO |  |
| Two-hand control type Synchronisation time |  |  |  | III C conforming to EN 574 |  |
|  |  |  | s | 0.5 maximum |  |
| Control unit voltage |  |  | V | $24 \mathrm{~V} / 8 \mathrm{~mA}$ |  |
| Outputs | Voltage reference |  |  | Volt-free |  |
|  | Number and type of safety circuits |  |  | 2 NO (13-14, 23-24) |  |
|  | Number and type of additional circuits |  |  | 2 solid-state (type 24 V - 20 mA ) |  |
|  | Breaking capacity in AC-15 |  | VA | C300: inrush 1800, maintained 180 |  |
|  | Breaking capacity in DC-13 |  |  | $24 \mathrm{~V} / 1.5 \mathrm{~A}-\mathrm{L} / \mathrm{R}=50 \mathrm{~ms}$ |  |
|  | Max. thermal current (Ithe) |  | A | 4.2 |  |
|  | Max. total thermal current |  | A | 8.4 |  |
|  | Output fuse protection, using fuses conforming to IEC/EN 60947-5-1, VDE 0660 part 200 |  | A | 4 gG or 6 fast acting |  |
|  | Minimum current |  | mA | 10 |  |
|  | Minimum voltage |  | V | 17 |  |
| Electrical durability |  |  |  | See page 38610-EN/2 |  |
| Response time |  |  | ms | <20 |  |
| Rated insulation voltage (Ui) |  |  | V | 300 (degree of pollution 2 conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |
| Rated impulse withstand voltage (Uimp) |  |  | kV | 4 (overvoltage category III, conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |
| LED display |  |  |  | 3 |  |
| Operating temperature |  |  | ${ }^{\circ} \mathrm{C}$ | $-10 \ldots+55$ |  |
| Storage temperature |  |  | ${ }^{\circ} \mathrm{C}$ | -25... 85 |  |
| Degree of protection conforming to IEC/EN 60529 |  | Terminals |  | IP 20 |  |
|  |  | Enclosure |  | IP 40 |  |
| Connection | Type | Terminals |  | Captive screw clamp terminals | Captive screw clamp terminals |
|  |  | Terminal block |  | Integrated in module | Removable from module |
|  | 1-wire connection | Without cable end |  | Solid or exible cable: $0.14 \ldots 2.5 \mathrm{~mm}^{2}$ | Solid or exible cable: $0.2 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  |  | With cable end |  | Without bezel, exible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |
|  |  | With cable end |  | With bezel, exible cable: $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ | With bezel, exible cable: $25 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  | 2-wire connection | Without cable end |  | Solid or exible cable: $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ | Solid cable: $0.2 \ldots 1 \mathrm{~mm}^{2}$, exible cable: $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ |
|  |  | With cable end |  | Without bezel, exible cable: $0.25 \ldots 1 \mathrm{~mm}^{2}$ |  |
|  |  | With cable end |  | Double, with bezel, exible cable: $0.5 \ldots 1.5 \mathrm{~mm}^{2}$ |  |

Selection, references

Safety automation solutions
Preventa safety modules types XPS BA, XPS BCE, XPS BF
For electrical monitoring of two-hand control stations

## Selection




XPS BCE••••P XPS BCE••••C

| Spring terminals 2 NO | 1 NC relay | $\sim$ and $24 \mathrm{~V}=-$ | XPS BCE3110C | 0.272 |
| :--- | :--- | :--- | :--- | :--- |

Terminal block
removable from
module

| $115 \mathrm{~V} \sim$ | XPS BCE3410C | 0.322 |
| :--- | :--- | :--- |



| Captive screw <br> clamp terminals | 2 NO | 2 solid-state | $24 \mathrm{~V}=-$ | XPS BF1132 | 0.150 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Terminal block <br> removable from <br> module |  |  |  |  |  |
|  2 NO 2 solid-state $24 \mathrm{~V}=-$ XPS BF1132P | 0.150 |  |  |  |  |

XPS BF1132

XPS BA
Module XPS BA associated with a two-hand control station
Type III A conforming to EN 574


S1 and S2: pushbuttons. Must not be used for applications (presses) which require a type III C module (XPS BCE or XPS BF).
Functional diagram of module XPS BA


LED details (XPS BA)


1 Supply voltage A1-A2.
2 K1 status (NO safety output 11-14 closed).

## XPS BCE

Module XPS BCE associated with a two-hand control station
Type III C conforming to EN 574/ISO 13851
~ and 24 V -.

$115 \sim$ and 230 V



LED details (XPS BCE)


1 Supply voltage A1-A2.
2 K1 status (NO safety outputs closed).
3 K2 status (NO safety outputs closed).

XPS BF
Module XPS BF associated with a two-hand control station


ESC: External start conditions.
Y1-Y2: feedback loop

## Functional diagram of module XPS BF


Key $\quad$ Activated Deactivated

LED details (XPS BF)


1 Supply voltage A1-A2 (fuse status).
2 Fault signalling.
3 K1-K2 status (NO safety outputs closed).

Operating principle, characteristics

Safety automation solutions
Preventa safety modules types XPS ECME, XPS ECPE
For extending the number of safety contacts

Operating principle

| Characteristics |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  |  | XPS ECME••••P | XPS ECME••••C | XPS ECPE•・ゃ๑P | XPS ECPE•••๑C |
| Maximum achievable safety level |  |  |  | PL e/Category 4 conforming to EN/ISO 13849-1, <br> SILCL 3 conforming to EN/IEC 62061 (when connected to the appropriate module) |  |  |  |
| Reliability data | Mean Time To dangerous Failure (MTTF ${ }_{\mathrm{d}}$ ) |  | Years | 45 |  | 30 |  |
|  | Diagnostic Coverage (DC) |  | \% | 60... 90 |  | 99 |  |
|  | Probability of dangerous Failure per Hour $\left(\mathrm{PFH}_{\mathrm{d}}\right)$ |  | 1/h | $2.00 \times 10^{-7}$ |  | $3.00 \times 10^{-9}$ |  |
| Conformity to standards |  |  |  | EN/IEC 60204-1, EN/IEC 60947-1, EN/IEC 60947-5-1 |  |  |  |
| Product certifications |  |  |  | UL, CSA, BG |  | UL, CSA, TÜV |  |
| Supply | Voltage |  | V | $\sim$ and 24 --- |  | $\sim$ and $24-$--, 115... $230 \sim$ |  |
|  | Voltage limits |  |  | -15...+10\% |  | -15...+10\% |  |
|  | Frequency |  | Hz | 50/60 |  |  |  |
| Consumption | 24 V |  | VA | < 5 |  | 4 |  |
|  | $115 \mathrm{~V} / 230 \mathrm{~V}$ |  | VA | - |  | 6 |  |
| Module inputs fuse protection |  |  |  | Internal, electronic |  | Internal PTC |  |
| Outputs | Voltage reference |  |  | Volt-free |  |  |  |
|  | Number and type of safety circuits |  |  | 4 NO |  | 8NO |  |
|  | Number and type of additional circuits |  |  | 2 NC |  | 1 NC |  |
|  | Breaking capacity in AC-15 |  | VA | B300: inrush 3600, maintained 360 |  |  |  |
|  | Breaking capacity in DC-13 |  |  | $24 \mathrm{~V} / 1.5 \mathrm{~A}-\mathrm{L} / \mathrm{R}=50 \mathrm{~ms}$ |  | $24 \mathrm{~V} / 3 \mathrm{~A}-\mathrm{L} / \mathrm{R}=50 \mathrm{~ms}$ |  |
|  | Max. thermal current (Ithe) |  | A | 6 |  |  |  |
|  | Max. total thermal current |  | A | 12 |  | 24 |  |
|  | Output fuse protection |  | A | 6 gG |  |  |  |
|  | Minimum current (volt-free contact) |  | mA | 10 (conforming to EN/IEC 60947-5-1, VDE 0660 part 200) |  |  |  |
|  | Minimum voltage (volt-free contact) |  | V | 17 |  | 5 |  |
| Electrical durability |  |  |  | See page 38610/2 |  |  |  |
| Response time on input opening |  |  | ms | <20 |  | 10 |  |
| Rated insulation voltage (Ui) |  |  | V | 300 (degree of pollution 2 conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |  |  |  |
| Rated impulse withstand voltage (Uimp) |  |  | kV | 4 (overvoltage category III, conforming to IEC/EN 60947-1, DIN VDE 0110 parts 1 \& 2) |  |  |  |
| LED display |  |  |  | 2 |  | 3 |  |
| Operating temperature |  |  | ${ }^{\circ} \mathrm{C}$ | $-25 \ldots+55$ |  | $-25 \ldots+55$ |  |
| Storage temperature |  |  | ${ }^{\circ} \mathrm{C}$ | $-25 \ldots+75$ |  | $-25 . . .+70$ |  |
| Degree of protection conforming to IEC 60529 | Terminals |  |  | IP 20 |  |  |  |
|  | Enclosure |  |  | IP 40 |  |  |  |
| Connection | Type | Terminals |  | Captive screw clamp terminals | Spring terminals | Captive screw clamp terminals | Spring terminals |
|  |  | Terminal block |  | Removable from module |  |  |  |
|  | 1-wire connection | Without cable end |  | Solid or flexible cable: $0.2 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |  |
|  |  | With cable end |  | Without bezel, flexible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |  |
|  |  |  |  | With bezel, flexible cable: <br> $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ | With bezel, flexible cable: <br> $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ | With bezel, flexible cable: <br> $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ | With bezel, flexible cable: <br> $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  | 2-wire connection | Without cable end |  | Solid or flexible cable: $0.2 \ldots . .1 \mathrm{~mm}^{2}$ | - | Solid or flexible cable: $0.2 \ldots 1 \mathrm{~mm}^{2}$ | - |
|  |  | With cable end |  | Without bezel, flexible cable: $0.25 \ldots 1 \mathrm{~mm}^{2}$ | - | Without bezel, flexible cable: $0.25 \ldots 1 \mathrm{~mm}^{2}$ | - |
|  |  |  |  | Double, with bezel, flexible cable: $0.5 . .1 .5 \mathrm{~mm}^{2}$ | Double, with bezel, flexible cable: $0.5 \ldots 1 \mathrm{~mm}^{2}$ | Double, with bezel, flexible cable: <br> $0.5 \ldots 1.5 \mathrm{~mm}^{2}$ | Double, with bezel, flexible cable: $0.5 \ldots 1 \mathrm{~mm}^{2}$ |

## Safety automation solutions

Preventa safety modules types XPS ECME, XPS ECPE
For extending the number of safety contacts


Safety modules for extending the number of safety contacts, for use with XPS base modules

| Number of Additional <br> safety <br> outputs <br> circuits | Supply | Connection | Reference | Weight <br> kg |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 4 | 2 | $\sim$ and $24 \vee=$ | Captive screw |  |
| clamp terminals |  |  |  |  |
| Terminal block |  |  |  |  |
| removable from module |  |  |  |  |$\quad$ XPS ECME5131P $\quad 0.270$

Spring terminals XPS ECME5131C 0.270
Terminal block
removable from module

Spring terminals $\quad$ XPS ECPE5131C $\quad 0.650$
Terminal block
removable from module
$115 . . .230$ V ~ Captive screw XPS ECPE3910P 0.650
clamp terminals
Terminal block
removable from module

Spring terminals XPS ECPE3910C 0.650
Terminal block
removable from module



S1: Start Button.
(1) Feedback loop
(2) See technical data for maximum fuse sizes

Functional diagram
Base module A1/A2, fuse Y03-Y04
Input S12
Input S22/S32
Output 13-14(NO)
Output 23-24 (NO)
Output 33-34 (NO)
Output 43-44 (NO)
Output 53-54 (NO)
Output 63-64(NO)
Output 73-74 (NO)
Output 83-84 (NO)
Feedback loop Y1-Y2
Signalling output 91-92 (NC)


Key 0 - ${ }^{1}$
$t A$ : response time (K1 and K2)
$t R$ : release time

Operating principle, characteristics

Safety automation solutions

## Preventa safety modules types XPS TSA,

 XPS TSWFor safety time delays

Operating principle
Safety modules XPS TSA and XPS TSW are used in applications requiring safety time delays:
■ modules XPS TSA in applications with interlocking on high inertia machines with
long rundown time (guards unlocked after safety time delay has elapsed),

- modules XPS TSW in applications with a safety switchover contact (shunting
contact in association with XPS VN modules for zero speed detection, solenoid valve monitoring, etc.).
The time delay of safety circuits can be set to 16 preset values, using 2 selectors located on the front face of the modules.

To aid diagnostics, the modules have LEDs which provide information on the monitoring circuit status and 2 solid-state outputs for signalling to the process PLC In addition, their removable terminal blocks optimise machine maintenance.


| References: | Connections: | Dimensions: |
| :--- | :--- | :--- |
| page 38785-EN/3 | page 38785-EN/3 | page 38730-EN/2 |

## Safety automation solutions

 connectionsPreventa safety modules types XPS TSA, XPS TSW
For safety time delays


XPS TSW・セ・•P

## Connections

XPS TSA
Delayed unlocking of a guard application


## XPS TSA <br> Wiring diagram


(1) Signal to be delayed.
(2) Volt-free relay outputs with on-delay.

ESC: External start conditions.
Functional diagram of module XPS TSA


LED details (XPS TSA, XPA TSW)


1 Supply voltage A1-A2 (fuse status).
Safety output closed.
3 Feedback loop Y1-Y2 status.
4 Time function active.

Safety automation solutions
Preventa safety modules type XPS TSW
For safety time delays

XPS TSW
Guard unlocking application using zero speed detection


Wiring diagram


## (1) Control signal.

(2) Volt-free relay outputs with pulse time delay

ESC: External start conditions.
LED details: see page 38785-EN/4.


# Safety automation solutions 

 characteristics
## Preventa safety modules types XPS DMB， XPS DME

For coded magnetic switch monitoring

Operating principle
Safety modules XPS DMB and XPS DME are speci cally designed for monitoring coded magnetic safety switches．They incorporate two safety outputs and two solid－state outputs for signalling to the process PLC．Conforming to Performance Level PL e／Category 4 conforming to EN／ISO 13849－1，modules XPS DMB can monitor two independent sensors and modules XPS DME can monitor up to six independent sensors．

To monitor a higher number of magnetic switches using these safety modules， the magnetic switches can be connected in series parallel，while meeting the requirements of Performance Level PL d／Category 3 conforming to standard EN／ISO 13849－1．

Safety modules XPS DM・ゃゃゃ・P incorporate removable terminal blocks，thus optimising machine maintenance．
To aid diagnostics，the modules have LEDs on the front face which provide information on the monitoring circuit status．

| Characteristics |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Module type |  |  |  | XPS DMB1132 | XPS DMB1132P | XPS DME1132 | XPS DME1132P |
| Maximum achievable safety level |  |  |  | PL e／Category 4 conforming to EN／ISO 13849－1，SILCL 3 conforming to EN／IEC 62061 |  |  |  |
| Reliability data | Mean Time To dangerous Failure（ $\mathrm{MTTF}_{\mathrm{d}}$ ） |  | Years | 83.1 |  | 82.4 |  |
|  | Diagnostic Coverage（DC） |  | \％ | ＞ 99 |  | ＞ 99 |  |
|  | Probability of dangerous Failure per Hour$\left(\mathrm{PFH}_{\mathrm{d}}\right)$ |  | 1／h | $3.92 \times 10^{-9}$ |  | $3.97 \times 10^{-9}$ |  |
| Conformity to standards |  |  |  | EN／IEC 60204－1，EN 1088／ISO 14119，EN／IEC 60947－1，EN／IEC 60947－5－1， EN／IEC 60947－5－3 |  |  |  |
| Product certifications |  |  |  | UL，CSA，TÜV |  |  |  |
| Supply（Ue） conforming to IEC 38 | Voltage |  | V | 24 －－－ |  |  |  |
|  | Voltage limits $24 \mathrm{~V}=-$ |  |  | －20．．．$+20 \%$ |  |  |  |
| Consumption |  |  | W | ＜2．5 |  | ＜3．5 |  |
| Module inputs fuse protection |  |  |  | Internal，electronic |  |  |  |
| Maximum wiring resistance RL between the module and the coded magnetic switches |  |  | $\Omega$ | 100 |  |  |  |
| Control unit voltage and current |  |  |  | $28 \mathrm{~V} / 8 \mathrm{~mA}$ |  |  |  |
| Synchronisation time between magnetic switch inputs |  |  | s | ＜0．5 |  |  |  |
| Safety outputs | Voltage reference |  |  | Volt－free |  |  |  |
|  | Number and type of safety circuits |  |  | 2 NO |  |  |  |
|  | Number and type of solid－state outputs |  |  | 2 |  |  |  |
|  | Breaking capacity in AC－15 |  | VA | C300：inrush 1800，maintained： 180 |  |  |  |
|  | Breaking capacity in DC－13 |  |  | $24 \mathrm{~V} / 1.5 \mathrm{~A}, \mathrm{~L} / \mathrm{R}=50 \mathrm{~ms}$ |  |  |  |
|  | Max．thermal current（Ithe） |  | A | 6 |  |  |  |
|  | Max．total thermal current |  | A | 12 |  |  |  |
|  | Output fuse protection |  | A | 4 gG or 6 fast acting |  |  |  |
|  | Minimum current |  | mA | 10 |  |  |  |
|  | Minimum voltage |  | V | 17 |  |  |  |
| Electrical durability |  |  |  | See page 38610－EN／2 |  |  |  |
| Response time on input opening |  |  | ms | ＜20 |  |  |  |
| Rated insulation voltage（Ui） |  |  | V | 300 （degree of pollution 2 conforming to IEC／EN 60947－5－1，DIN VDE 0110 parts 1 \＆2） |  |  |  |
| Rated impulse withstand voltage（Uimp） |  |  | kV | 4 （overvoltage category III，conforming to IEC／EN 60947－5－1，DIN VDE 0110 parts 1 \＆2） |  |  |  |
| LED display |  |  |  | 3 |  | 15 |  |
| Ambient air temperature | For operation |  | ${ }^{\circ} \mathrm{C}$ | －10．．． 55 |  |  |  |
|  | For storage |  | ${ }^{\circ} \mathrm{C}$ | －25．．．+85 |  |  |  |
| Degree of protection conforming to EN／IEC 60529 |  |  |  | Terminals：IP 20，enclosure：IP 40 |  |  |  |
| Connection | Type | Terminals |  | Captive screw clamp terminals |  |  |  |
|  |  | Terminal block |  | Integrated in module | Removable from module | Integrated in module | Removable from module |
|  | 1－wire connection | Without cable end |  | Solid or exible cable： $0.14 \ldots 2.5 \mathrm{~mm}^{2}$ | Solid or exible cable： $0.2 . . .2 .5 \mathrm{~mm}^{2}$ | Solid or exible cable： $0.14 \ldots 2.5 \mathrm{~mm}^{2}$ | Solid or exible cable： $0.14 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  |  | With cable end |  | Without bezel，exible cable： $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |  |  |  |
|  |  | With cable end |  | With bezel，exible cable： $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ | With bezel，exible cable： $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ | With bezel，exible cable： $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ | With bezel，exible cable： $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  | 2－wire connection | Without cable end |  | Solid or exible cable： $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ | Solid cable： $0.2 \ldots 1 \mathrm{~mm}^{2}$ ，exible cable： $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ | Solid or exible cable： $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ | Solid cable： $0.2 \ldots 1 \mathrm{~mm}^{2}$ ，exible cable： $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ |
|  |  | With cable end |  | Without bezel，exible cable： $0.25 . .1 \mathrm{~mm}^{2}$ |  |  |  |
|  |  | With cable end |  | With bezel，exible cable： $0.5 \ldots 1.5 \mathrm{~mm}^{2}$ |  |  |  |

Safety automation solutions
Preventa safety modules types XPS DMB, XPS DME
For coded magnetic switch monitoring


XPS DMB1132

| References |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Description | Type of terminal block connection | Number of safety circuits | Solid-state outputs for PLC | Supply | Reference | Weight |
|  |  |  |  | V |  | kg |
| Safety module for monitoring 2 coded | Integrated in module | 2 NO | 2 | 24 -- | XPS DMB1132 | 0.250 |


| Safety module for <br> monitoring 6 coded <br> magnetic switches | Integrated <br> in module | 2 NO | 2 | $24-\ldots$ | XPS DME1132 | 0.300 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |



| Safety module for <br> monitoring 2 coded <br> magnetic switches | Removable <br> from module | 2 NO | 2 | $24 \ldots$ | XPS DMB1132P | 0.250 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |

## Safety automation solutions

Preventa safety modules types XPS DMB,
XPS DME
For coded magnetic switch monitoring

## XPS DMB

Wiring to category 4 conforming to EN/ISO 13849-1. Example with NC + NO (NC staggered) contact. For example with 3-pole NC + NC + NO contact, see page 32942/4


ESC: External start conditions.
Wiring to category 3 conforming to EN/ISO 13849-1. Example with 3 switches with 2-pole NC + NO (NC staggered) contacts


Safety automation solutions
Preventa safety modules types XPS DMB, XPS DME
For coded magnetic switch monitoring


ESC: External start conditions.
Wiring to category 3 conforming to EN/ISO 13849-1. Example with 3 switches with 2-pole NC + NO (NC staggered) contacts


[^8]Safety automation solutions
Preventa safety modules types XPS DMB, XPS DME
For coded magnetic switch monitoring



Supply voltage A1-A2, internal electronic fuse status.
Fault signalling.
3 Safety outputs closed.

Functional diagrams
(continued)

Safety automation solutions
Preventa safety modules types XPS DMB, XPS DME
For coded magnetic switch monitoring

XPS DME
Functional diagram


Key


LED details


1 Supply voltage A1-A2, internal electronic fuse status.
2 Fault signalling.
3 Safety outputs closed.
4 Magnetic switch 1 activated.
5 Magnetic switch 1 deactivated.
6 Magnetic switch 2 activated.
7 Magnetic switch 2 deactivated.
8 Magnetic switch 3 activated.
9 Magnetic switch 3 deactivated.
10 Magnetic switch 4 activated.
11 Magnetic switch 4 deactivated.
12 Magnetic switch 5 activated.
13 Magnetic switch 5 deactivated.
14 Magnetic switch 6 activated.
15 Magnetic switch 6 deactivated.

## Operating principle

Preventa safety modules XPS VNE for zero speed detection are used to detect the stop condition of electric motors. Their most common applications include: providing the unlock signal for electrically interlocked sliding or removable machine guards, controlling rotation direction signals for reversing motors and engaging locking brakes after a motor has come to a standstill.

As electric motors run down, a remanent voltage is produced in the windings of the motor due to residual magnetism. This voltage is proportional to the speed of the motor and, therefore, decreases as the motor comes to a standstill.
This remanent voltage is measured in a redundant manner so as to detect the stop condition of the motor. The cabling between the motor windings and the inputs of the XPS VNE module is also monitored to prevent a cabling breakage or fault being seen as a stopped motor.
A transformer should not be used to connect the motor to terminals Z1, Z2 and Z3 since there is no monitoring of the connection with the motor winding via the resistance monitoring.

Modules XPS VNE are suitable for detecting the stop condition of all types of AC or DC motor driven machines which, when the motor runs down, produce a remanent voltage in the windings due to residual magnetism. These machines can be controlled by electronic devices, such as variable speed drives or DC injection brakes.
The input Iters for standard XPS VNE modules are designed for a frequency of up to 60 Hz .
For motors operating at a frequency higher than 60 Hz , which therefore produce a high frequency remanent voltage, special modules XPS VNE $\bullet \bullet \bullet \bullet H S$ should be used.

Modules XPS VNE have 2 potentiometers mounted on the front face of the module which allow independent adjustment of the switching threshold for each input circuit. This allows adjustment for different types of motors and application requirements.

To aid diagnostics, modules XPS VNE have 4 LEDs and 2 solid-state outputs to provide information on the status of the zero speed detection circuit.

| Characteristics |  |  |  |
| :---: | :---: | :---: | :---: |
| Module type |  |  | XPS VNE |
| Maximum achievable safety level |  |  | PL d/Category 3 conforming to EN/ISO 13849-1, SILCL 2 conforming to EN/IEC 62061 |
| Reliability data | Mean Time To dangerous Failure ( $\mathrm{MTTF}_{\mathrm{d}}$ ) | Years | 124.1 |
|  | Diagnostic Coverage (DC) | \% | $>99$ |
|  | Probability of dangerous Failure per Hour ( $\mathrm{PFH}_{\mathrm{d}}$ ) | 1/h | $9.26 \times 10^{-9}$ |
| Conformity to standards |  |  | EN/IEC 60204-1, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 |
| Product certifications |  |  | UL, CSA, TÜV |
| Supply | Voltage | V | $\begin{aligned} & 24 \sim \\ & 115 \sim \\ & 230 \sim \end{aligned}$ |
|  | Voltage limits |  | $\begin{aligned} & -15 \ldots+10 \%(24 \vee--) \\ & -15 \ldots+15 \%(115 \vee \sim) \\ & -15 \ldots+10 \%(230 \vee \sim) \end{aligned}$ |
|  | Frequency | Hz | $50 / 60$ (115 V, 230 V ) |
| Consumption |  | W | $\leqslant 3.5$ (24 V---) |
|  |  | VA | $\leqslant 7.5$ (115 V ~), $\leqslant 7$ (230 V ~) |
| Frequency of motor power supply |  | Hz | $\leqslant 60 \mathrm{~Hz}$ (XPS VN••42), > 60 Hz (XPS VN••42HS) |
| Inputs | Maximum voltage between terminals $\mathrm{Z1}-\mathrm{Z2}-\mathrm{Z3}$ | V | 500 mms |
|  | Detection threshold | V | 0.01-0.1 (adjustable) |

## Characteristics, references

## Safety automation solutions <br> Preventa safety modules type XPS VNE <br> For zero speed detection

| Characteristics (continued) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Module type |  |  |  | XPS VNE |
| Outputs | Voltage reference |  |  | Volt-free |
|  | Number and type of safety circuits |  |  | 1 NO (13-14), 1 NC (21-22) |
|  | Number and type of additional circuits |  |  | 2 solid-state |
|  | Breaking capacity in AC-15 |  |  | C300 (inrush: 1800 VA/maintained: 180 VA ) |
|  | Breaking capacity in DC-13 |  |  | $24 \mathrm{~V} / 1.5 \mathrm{~A}-\mathrm{L} / \mathrm{R}=50 \mathrm{~ms}$ (contact 13-14) <br> $24 \mathrm{~V} / 1.2 \mathrm{~A}-\mathrm{L} / \mathrm{R}=50 \mathrm{~ms}$ (contact 21-22) |
|  | Breaking capacity of solid-state outputs |  |  | $24 \mathrm{~V} / 20 \mathrm{~mA}, 48 \mathrm{~V} / 10 \mathrm{~mA}$ |
|  | Max. thermal current (Ithe) |  | A | 2.5 |
|  | Output fuse protection |  | A | 4 gG , conforming to IEC/EN 60947-5-1, DIN VDE 0660 part 200 |
|  | Minimum current (volt-free contact) |  | mA | 10 (1) |
|  | Minimum voltage (volt-free contact) |  | V | 17 (1) |
| Electrical durability |  |  |  | See page 38610-EN/2 |
| Rated insulation voltage (Ui) |  |  | V | 300 (degree of pollution 2 conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |
| Rated impulse withstand voltage (Uimp) |  |  | kV | 4 (overvoltage category III, conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 \& 2) |
| LED display |  |  |  | 4 |
| Operating temperature |  |  | ${ }^{\circ} \mathrm{C}$ | -10... +55 |
| Storage temperature |  |  | ${ }^{\circ} \mathrm{C}$ | -25... 85 |
| Degree of protection Conforming to EN/IEC 60529 |  | Terminals |  | IP 20 |
|  |  | Enclosure |  | IP 40 |
| Connection | Type | Terminals |  | Captive screw clamp |
|  |  | Terminal block |  | Removable from module |
|  | 1-wire connection | Without cable end |  | Solid or exible cable: $0.2 \ldots .2 .5 \mathrm{~mm}^{2}$ |
|  |  | With cable end |  | Without bezel, solid or exible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |
|  |  |  |  | With bezel, solid or exible cable: $0.25 . .2 .5 \mathrm{~mm}^{2}$ |
|  | 2-wire connection | Without cable end |  | Solid cable: $0.2 \ldots 1 \mathrm{~mm}^{2}$, exible cable: $0.2 \ldots 1.5 \mathrm{~mm}^{2}$ |
|  |  | With cable end |  | Without bezel, exible cable: $0.25 . .1 \mathrm{~mm}^{2}$ |
|  |  |  |  | With bezel, exible cable: $0.5 \ldots 1.5 \mathrm{~mm}^{2}$ |

(1) The module is also capable of switching low power loads ( $17 \mathrm{~V} / 10 \mathrm{~mA}$ ) provided that the contact has not been used for switching high power loads (possible contamination or wear of the gold layer on the contact tips).

| References |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Description | Number of safety circuits | Solid-state outputs for PLC | Supply | Frequency of motor power supply | Reference | Weight <br> kg |
|  | Safety modules for zero speed detection | 2 | 2 | $24 \mathrm{~V}=-$ | $\leqslant 60 \mathrm{~Hz}$ | XPS VNE1142P | 0.500 |
|  |  |  |  |  | $>60 \mathrm{~Hz}$ | XPS VNE1142HSP | 0.500 |
| Nat x-1-ME |  |  |  | 115 V | $\leqslant 60 \mathrm{~Hz}$ | XPS VNE3442P | 0.600 |
| 77 |  |  |  |  | $>60 \mathrm{~Hz}$ | XPS VNE3442HSP | 0.600 |
| XPS VNE••・セ |  |  |  | $230 \mathrm{~V} \sim$ | $\leqslant 60 \mathrm{~Hz}$ | XPS VNE3742P | 0.600 |
|  |  |  |  |  | $>60 \mathrm{~Hz}$ | XPS VNE3742HSP | 0.600 |

## XPS VNE

Wiring diagram

(1) Technical characteristics for establishing maximum rating of fuses, see page 38777-EN/2
(2) Disengagement in event of stop.
(3) Motor running.
$\mathrm{F} 1=2 \mathrm{~A}$
Functional diagram of module XPS VNE


LED details


[^9]
$F 1=2 A$


[^10]Module XPS VNE associated with a 3-phase motor + variable speed drive

$\mathrm{F} 1=2 \mathrm{~A}$
Module XPS VNE associated with a 3-phase motor with star-delta starting


## F1 $=2 \mathrm{~A}$

KM1: Fast rotation speed
KM2: Slow rotation speed
KM3: Star
The "Star" contactor (KM3) must be closed after the motor is de-energised, in order to allow detection of zero speed.

Safety automation solutions
Preventa safety modules type XPS VNE For zero speed detection

Module XPS VNE associated with a 3-phase motor with variable number of poles and star-delta starting

$\mathrm{F} 1=2 \mathrm{~A}$
KM1: Fast rotation speed
KM2: Slow rotation speed
KM3: Star
KM4: Delta
Module XPS VNE associated with a star-delta motor starter and guard switch type XCS E


Association of safety modules XPS VNE and XPS AK


Operating principle, characteristics

Safety automation system solutions
Preventa safety module type XPS EDA For lift control

Operating principle


When the cabin is parked at a landing, with the doors open, some lifts automatically correct their level (isolevelling) in relation to the landing in order to compensate for any differences generated by modi cation of the load in the cabin.
During this operation, European standard EN-81 recommends that the presence of the cabin be checked within a zone of $+/-0.2 \mathrm{~m}$ around the landing (door unlocking zone), by means of a safety circuit which will cause the cabin to stop if it moves out of the speci ed zone.

The use of the safety module XPS EDA, which checks the presence of the cabin in the speci ed zone at two points, meets this requirement.
The module incorporates two safety outputs and two solid-state outputs for signalling functions. Four LEDs on the front face of the module provide visual indication of the status of the safety circuit.
The position of the cabin in relation to the landing is detected by two limit switches in the lift shaft. It is also possible to use non-contact sensors (magnetic sensors with reed contact).
When the cabin reaches the preset position and when it is within the permissible tolerances in relation to the landing, the two safety circuits in safety module XPS EDA close and allow isolevelling of the cabin with the doors open. Any change in one of the input signals (cabin outside the speci ed zone) or detection of a fault (break in the wiring, short-circuit, etc.) causes immediate opening of the safety outputs in the XPS EDA module and subsequent stopping of the cabin.

Characteristics

| Module type |  |  | XPS EDA |
| :---: | :---: | :---: | :---: |
| Maximal level of safety reaches |  |  | PL e/Catégorie 4 according to EN/ISO 13849-1, SIL CL3 according to EN/IEC 62061 |
| Conformity to standards |  |  | EN 81-1, EN 81-2, EN/IEC 60947-5-1, EN 50082-2, EN 12015, EN 12016 |
| Product certifications |  |  | TÜV |
| Supply | Voltage | V | $\sim$ and $=-24(50 / 60 \mathrm{~Hz})$ |
|  | Voltage limits |  | -15... $+10 \%$ ( 24 V ), - 15...+15\% (-- 24 V ) |
|  | Frequency | Hz | 50/60 |
| Maximum consumption | $\sim 24 \mathrm{~V}$ | VA | $\leqslant 3.5$ |
|  | --24V | W | $\leqslant 2.5$ |
| Module inputs fuse protection |  |  | Internal, electronic |
| Control unit voltage between S11-S12, S21-S22 |  | V | 24 |
| Nominal contact current |  | mA | 10 |
| Maximum wiring resistance |  |  | Wiring resistance should not exceed $1 \mathrm{k} \Omega$ |
| Synchronisation time between inputs S1 and S2 |  |  | In nite |
| Outputs | Voltage reference |  | Volt-free |
|  | Number and type of safety circuits |  | 2 N/O (13-14, 23-24) |
|  | No. and type of additional circuits |  | 2 solid-state |
|  | Breaking capacity in AC-15 | VA | C300: inrush 1800, maintained 180 |
|  | Breaking capacity in DC-13 |  | $24 \mathrm{~V} / 2 \mathrm{~A}-\mathrm{L} / \mathrm{R}=50 \mathrm{~ms}$ |
|  | Breaking capacity of solid-state outputs |  | $24 \mathrm{~V} / 20 \mathrm{~mA}$ |
|  | Max. thermal current (Ithe) | A | 2.5 |
|  | Output fuse protection |  | 6 A fast acting, 4 A gG, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200 |
|  | Minimum current (volt-free contact) | mA | 10 |
|  | Minimum voltage (volt-free contact) | V | 17 |
|  | Max. total thermal current | A | 5 |
| Electrical durability |  |  | See page 38610/2 |
| Response time on input opening |  | ms | < 50 |
| Rated insulation voltage (Ui) |  | V | 300 (degree of pollution 2 conforming to IEC/EN 60947-5-1, EN/IEC 60664-1 |
| Rated impulse withstand voltage (Uimp.) |  | kV | 4 (overvoltage category III, conforming to IEC/EN 60947-5-1, EN/IEC 60664-1 |
| LED display |  |  | 4 |
| Operating temperature |  | ${ }^{\circ} \mathrm{C}$ | -20...+65 |
| Storage temperature |  | ${ }^{\circ} \mathrm{C}$ | -25... +85 |
| Degree of protection conforming to IEC 60529 |  |  | Terminals: IP 20 <br> Enclosure: IP 40 |
| Connection max. | Type | $\mathrm{mm}^{2}$ | Captive screw clamp terminals: without cable end $1 \times 2.5 \mathrm{~mm}^{2}$, with cable end $2 \times 1.5 \mathrm{~mm}^{2}$ |

[^11]page 38730/2

Preventa safety module type XPS EDA
For lift control


A Available: 4th Quarter 2011

## Connections

Module XPS EDA associated with a lift control system with limit switches


Module XPS EDA associated with a lift control system with contactless switches

(1) Maxi fuses size: 6A.
(2) Limit switch S1 (cabin position). (3) Limit switch S2 (cabin position).
(4) Release from lift control system.
(5) Output state: only for non safety relevant functions. (6) Automatic start.

S3: start button (non monitored).
Functional diagram of module XPS EDA


1 Supply voltage A1/A2. Fuse state.
2 First input circuit (terminals S11/S12).
3 Second input circuit (terminals S21/S22).
4 Safety outputs circuit (K1/ K2).

Safety automation system solutions
Preventa safety modules
AM1 DP200 rail mounting

Dimensions
 XPS VC•๑๑๑，XPS EDA



XPS ACゃ»॰॰P，XPS ABV $\bullet \bullet \bullet P, ~ X P S ~ A X E \bullet \bullet \bullet \bullet P, ~ X P S ~ A F \bullet \bullet \bullet P, ~$ XPS DMB॰ゃゃ॰P，XPS VCゃゃゃ॰P


 XPS ECME・ゃゃ॰C

$\xrightarrow{22,5}$


 XPS ECPEゃゃっ॰P


XPS BA



XPS ECPEゃゃゃ॰C




## Mounting

All safety modules: 35 mm ■ rail xing.

Safety automation solutions
Safety solutions on AS-Interface cabling system
Safety monitors and interfaces


AS-Interface "Safety at work"

Safety is incorporated into the AS-Interface cabling system by adding a monitor and a safety interface connected together with other standard AS-Interface components on the AS-Interface line


Safety applications integrated on the AS-Interface line Emergency stop, safety switches and light curtain monitoring
7.F

PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508

## EN 50295 ,

ENIIEC 60204-1
EN/IEC 61496-1,
EN 574/ISO 13851,
EN/IEC 60947-1,
EN/IEC 60947-5-1

UL, CSA, TÜV

| 2 NO | $2 \times 2$ NO |
| :--- | :--- |
| 1 solid-state output for <br> signalling to PLC | 2 solid-state outputs |
| 5 LEDs | 8 LEDs |
| $24 \mathrm{~V}=-$ |  |

## ASI SAFEMON1• <br> ASI SAFEMON2•

38171-EN/4


Product certifications


Pages


Safety interfaces on AS-Interface cabling system



PL e/Category 4 conforming to EN/ISO 13849-1,
SILCL 3 conforming to EN/IEC 62061
EN 50295,
EN/IEC 60204-1,
EN 1088/ISO 14119,
EN 574/ISO 13851,
EN/IEC 61496-1,
EN/IEC 60947-5-3
EN/IEC 60947-1,
EN/IEC 60947-5-1
UL, CSA, TÜV

| - |
| :--- |
| - |
| 2 LEDs |
| By AS-Interface line |

## ASI SSLC॰

ASI SSLLS

38172-EN/4


Interfaces premounted in Emergency stop mushroom head pushbutton stations XAL K

解 for Harmony ${ }^{\circledR} \varnothing 22$ mm Emergency stop mushroom head pushbuttons
$1 \times \mathrm{M} 12$ entry
Connector
O.B.F.F

Using adjustment terminal ASI TERV2

PL e/Category 4 conforming to EN/ISO 13849-1,
SILCL 3 conforming to EN/IEC 62061
EN 50295,
EN/ISO 13850,
EN/IEC 60204-1
EN/IEC 60947-1,
EN/IEC 60947-5-1

UL, CSA, TÜV

| - |
| :--- |
| - |
| - |
| By AS-Interface line |

ASI SEっ1C
ASI SSLE•

38172-EN/4

## Operating principle



AS-Interface, the recognised cabling system for sensors and actuators, has evolved. Standard process information and information relating to safety can now be transmitted over the same cable.
Capable of managing safety functions up to Performance Level PL e/Category 4 conforming to standard EN/ISO 13849-1 and SILCL 3 conforming to standard EN/IEC 61508, the AS-Interface "Safety at work" system meets the needs of the most common safety applications, such as:

- monitoring of Emergency stops with instantaneous opening contacts (stop category 0),
- monitoring of Emergency stops with time delay opening contacts (stop category 1),
- monitoring of switches with and without interlocking,
- monitoring of light curtains, etc.

Parameters for options relative to the selected safety function (for example, start button monitoring) may be set for all pre-de ned, certi ed functions. Safety is incorporated into the AS-Interface cabling system by adding a safety monitor and safety interfaces connected together with other standard AS-Interface components on the yellow cable.
Safety information is exchanged only between the safety monitor, the AS-Interface line master and the safety interfaces. This is transparent for the other standard AS-Interface components.
Based on this principle, AS-Interface cabling systems that are already installed can be updated with safety functions without having to replace the existing components (masters, I/O interfaces, power supplies, etc.). Safety circuits are diagnosed readily, and with no additional wiring, by the standard AS-Interface cabling system master communicating with the safety monitor(s) via the yellow cable.

The AS-Interface "Safety at work" system is con gured using software ASI SWIN2 running on Windows. A library of pre-de ned and certi ed safety functions is made available by the software and the user can graphically select the desired safety functions, even at the last minute, using the "Drag and drop" method in the con guration software. Knowledge of a programming language or speci ctools is not necessary to parameter the system. The con guration is loaded into the safety monitor(s) by means of a PC by carrying out a secure serial transmission and using the parameter setting connector on the front face of the monitor.

To meet the various safety requirements, the AS-Interface "Safety and work" monitor is available in two versions:

- monitors for basic monitoring of safety devices,
- monitors for enhanced monitoring of safety devices.

AS-Interface "Safety at work" monitors for basic and enhanced monitoring are available with:

- 1 safety output with 2 contacts, or
- 2 independent safety outputs with $2 \times 2$ contacts.

In addition to safety outputs with volt-free contacts, AS-Interface "Safety at work" safety monitors are equipped, depending on the model, with one or two solid-state signalling outputs and LEDs on the front face indicating the status of the system and of the monitoring circuits. To monitor more safety functions simultaneously or to stop several safety circuits at different locations, an increased number of safety monitors can be used in an AS-Interface cabling system.
The safety interfaces are connected directly on the yellow cable via an insulation displacement connector (IDC). Their addressing is carried out using self-addressing via the AS-Interface cabling system master or manually, using addressing terminal ASISTERV2.
The compactness of the safety interfaces enables their direct attachment to control devices such as Emergency stop buttons or switches. In addition to interfaces that can be attached to products, versions with 1 or 2 M 12 connectors are also available.

| Principle: <br> page 38171-EN/2 | Characteristics: <br> page 38171-EN/3 | References: <br> page 38171-EN/4 | Dimensions: <br> page 38171-EN/5 |
| :--- | :--- | :--- | :--- |

## Safety automation solutions

Safety solutions on AS-Interface cabling system
AS-Interface "Safety at work" monitors

| Monitoring functions |  |  |
| :---: | :---: | :---: |
|  | AS-Interface "Safety at work" monitors |  |
|  | For basic monitoring of safety devices ASI SAFEMON1, ASI SAFEMON2 | For enhanced monitoring of safety devices ASI SAFEMON1B, ASI SAFEMON2B |
| Monitoring of safety devices | - Emergency stops <br> - Safety switches <br> - Safety light curtains | $\begin{array}{ll}\text { - } & \text { Emergency stops } \\ \text { - } & \text { Safety switches } \\ \text { - Safety light curtains } \\ \text { - } & \text { Button for validation of linked devices } \\ \text { - } \text { Conditionally dependent devices } \\ \text { - } & \text { Devices with bouncing contacts }\end{array}$ |
| Logic functions | - "OR" (up to 2 devices) | ■ "OR" (up to 6 devices) ■ "AND" ■ "FLIP FLOP" ■ On-delay ■ Off-delay ■ "PULSE" on positive edge |
| External device monitoring (EDM) | - Feedback loop | - Feedback loop <br> - Feedback loop monitoring over the AS-Interface cabling system |
| Start devices | - Automatic start <br> - Start monitored by the AS-Interface cabling system slave <br> - Start monitored by connection to monitor <br> - Start monitored by the safety interface | - Automatic start <br> - Start monitored by the AS-Interface cabling system slave <br> - Start monitored by connection to monitor <br> - Start monitored by the safety interface |
| Output devices | - Stop category 1 <br> Stop category 0 | - Stop category 1 <br> Stop category 0 |

Characteristics

| AS-Interface "Safety at work" monitor type |  |  | ASI SAFEMON1, ASI SAFEMON1B ASI SAFEMON2, ASI SAFEMON2B |
| :---: | :---: | :---: | :---: |
| Maximum achievable safety level |  |  | PL e/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 61508 |
| Reliability data | Mean Time To dangerous Failure $\left(\right.$ MTTF $\left._{\mathrm{d}}\right)$ | Years | 451 |
|  | Diagnostic Coverage (DC) | \% | >99 |
|  | Probability of dangerous Failure per Hour $\left(\mathrm{PFH}_{d}\right)$ | 1/h | $9 \times 10^{-9}$ |
| Conformity to standards |  |  | EN 50295, <br> EN/IEC 60204-1, <br> EN/IEC 61496-1, <br> EN 574/ ISO 13851, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 |
| Product certifications |  |  | UL, CSA, TÜV |
| AS-Interface profile |  |  | 7.F |
| Consumption on AS-Interface line |  | mA | 44 |
| Type of protection (suitable only for use in electronic rooms/ electrical enclosures with a minimum IP 54 degree of protection) |  |  | IP 20 |
| Operating voltage Ub |  | V | $24-\mathrm{-} \pm 15 \%$ |
| Rated operating current |  | mA | 150: ASI SAFEMON1, ASI SAFEMON1B 200: ASI SAFEMON2, ASI SAFEMON2B |
| Response duration |  | ms | < 40 |
| Pick-up delay |  | s | <10 |
| Inputs | "Start" |  | Opto-electronic coupler input (active when High), input current approximately 10 mA at $24 \mathrm{~V}=-$ |
|  | "Protection control (EDM)" |  | Opto-electronic coupler input (active when High), input current approximately 10 mA at $24 \mathrm{~V}=-$ |
| Outputs | "Safety on" indication |  | PNP transistor output, 200 mA |
|  | Safety |  | Volt-free NO contacts, max. contact load |
| Fuse protection |  |  | External, with max. of 4AMT |
| Operating temperature |  | ${ }^{\circ} \mathrm{C}$ | -20...+60 |
| Storage temperature |  | ${ }^{\circ} \mathrm{C}$ | -30... 70 |
| Enclosure | Material |  | Polyamide PA66 |
|  | Mounting |  | Clip-on xing on -r rail conforming to EN 50022 |

[^12]

ASI SAFEMON•

| References |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| AS-Interface "Safety at work" monitors |  |  |  |  |  |
| Type | Number of safety circuits | Solid-state outputs for PLC | Supply | Reference | Weight kg |
| For basic monitoring of safety devices | 2 NO | 1 | 24 V -- | ASI SAFEMON1 | 0.350 |
|  | $2 \times 2 \mathrm{NO}$ | 2 | $24 \mathrm{~V}=-$ | ASI SAFEMON2 | 0.450 |
| For enhanced monitoring of safety devices | 2 NO | 1 | $24 \mathrm{~V}=-$ | ASI SAFEMON1B | 0.350 |
|  | $2 \times 2 \mathrm{NO}$ | 2 | 24 V -- | ASI SAFEMON2B | 0.450 |

## Configuration software

- Reference ASI SWIN2 is the full version of con guration software AS-Interface "Safety at work" version 2+ and must be installed if no previous version of this software has been installed.
- Reference SSVASISWINUP is an update for con guration software AS-Interface "Safety at work" and can be used if ASI SWIN2 has been installed using Safety Suite V1. An update from version 2.03 to version $2+$ for the con guration software AS-Interface "Safety at work" will then be performed.

| Description | For use with | Operating system | Language | Reference | Weight kg |
| :---: | :---: | :---: | :---: | :---: | :---: |
| AS-Interface "Safety at work" configuration software <br> CD-ROM + user manual | - Safety monitors <br> ASI SAFEMON1/2 for basic monitoring of safety devices <br> - Safety monitors ASI SAFEMON•B for enhanced monitoring of safety devices | Windows 95, <br> Windows 98, <br> Windows ME, <br> Windows $\mathrm{NT}^{\circledR}$, <br> Windows 2000, <br> Windows XP | FR, <br> EN, <br> DE, <br> IT, <br> ES, <br> PT | ASI SWIN2 <br> Software available on Safety Suite V2 software pack | 0.520 |
| ASI SWIN2 software update CD-ROM + user manual | - Safety monitors <br> ASI SAFEMON1/2 for basic monitoring of safety devices <br> $\square$ Safety monitors ASI SAFEMON•B for enhanced monitoring of safety devices | Windows 95, Windows 98, Windows ME, Windows $\mathrm{NT}^{\circledR}$, Windows 2000, Windows XP | FR, <br> EN, <br> DE, <br> IT, <br> ES, <br> PT | SSVASISWINUP <br> Software update available on Safety Suite V2 software pack | 0.520 |

Setting-up and diagnostic tools

| Description | Application | Reference | 0.500 |
| :--- | :--- | :--- | :--- |
| Adjustment terminal | Addressing and diagnostics of AS-Interface V2.1 interfaces <br>  <br> AS-Interface I/O test whilst powered-up <br> AS-Interface interface diagnostics | ASI TERV2 |  |
|  |  |  |  |


| AS-Interface | Identi cation of transmission errors on the AS-Interface line | ASI SA01 | 0.160 |
| :--- | :--- | :--- | :--- |



ASI SA01
line analyser

| Accessories <br> Description | Function | Reference | Weight <br> $\mathbf{k g}$ |
| :--- | :--- | :--- | ---: |
| Cables | Parametering, RS 232 | ASI SCPC | 0.100 |
|  |  | ASI SCM | 0.500 |

## Dimensions

ASI SAFEMON॰, ASI SAFEMON॰B


## LED details



## ASI SAFEMON1, ASI SAFEMON1B

1 AS-Interface line supply (green)
2 AS-Interface line fault (red)
3 Restart signal (yellow)
4 Safety outputs closed (green)
5 Safety outputs open (red) or output error ( ashing red)

## ASI SAFEMON2, ASI SAFEMON2B

## Output 1

1 AS-Interface line supply (green)
2 AS-Interface line fault (red)
3 Restart signal (yellow)
4 Safety outputs closed (green)
5 Safety outputs open (red) or output error ( ashing red)

## Output 2

6 AS-Interface line supply (green)
7 AS-Interface line fault (red)
8 Restart signal (yellow)
9 Safety outputs closed (green)
10 Safety outputs open (red) or output error ( ashing red)

Operating principle, presentation

Safety automation solutions
Safety solutions on AS-Interface cabling system
Safety interfaces

Operating principle

## Presentation

Interfaces for Harmony ${ }^{\circledR}$ Ø 22 mm Emergency stop

Interfaces for products with M12 connector

Interfaces for products with ISO entry

Interfaces premounted in Emergency stop mushroom head pushbutton stations XAL K, with M12 entry

Interfaces for mounting in enclosure for Harmony ${ }^{\text {® }}$ Ø 22 Emergency stop mushroom head pushbuttons

Safety is incorporated into the AS-Interface cabling system by adding a safety monitor and safety interfaces connected together with other standard AS-Interface components on the yellow cable.

Safety information is exchanged only between the safety monitor, the AS-Interface line master and the safety interfaces. This is transparent for the other standard AS-Interface components. Based on this principle, AS-Interface cabling systems that are already installed can be updated with safety functions without having to replace the existing components (master, I/O interfaces, power supplies, etc.).

Safety circuits are diagnosed readily, and with no additional wiring, by the standard AS-Interface cabling system master communicating with the safety monitor via the yellow cable.


Metal

$1 \times$ M12 entry


Plastic

$2 \times \mathrm{M} 12$ entries


ISO M16 or M20 entry

"Turn to release


Key release ( $n^{\circ} 455$ )


| Principle: <br> page 38172-EN/2 | Characteristics: <br> page 38172-EN/3 | References: <br> page 38172-EN/4 | Dimensions, connections: page <br> 38172-EN/5 |
| :--- | :--- | :--- | :--- |
| 2 |  | Schneider <br> Selectric | 38172-EN_Ver10.0 |

Safety automation solutions
Safety solutions on AS-Interface cabling system Safety interfaces

| Safety interface type |  |  | $\begin{array}{\|l} \hline \text { ASI } \\ \text { SSLB4 } \end{array}$ | $\begin{aligned} & \text { ASI } \\ & \text { SSLB5 } \end{aligned}$ | $\begin{aligned} & \text { ASI } \\ & \text { SSLC1 } \end{aligned}$ | $\begin{aligned} & \text { ASI } \\ & \text { SSLC2 } \end{aligned}$ | ASI SSLLS | ASI SEA1C | ASI SEK1C | $\begin{array}{\|l} \text { ASI } \\ \text { SSLE4 } \end{array}$ | $\begin{array}{\|l} \text { ASI } \\ \text { SSLE5 } \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Environment |  |  |  |  |  |  |  |  |  |  |  |
| Maximum achievable safety level |  |  | PLe/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 62061 |  |  |  |  |  |  |  |  |
| Reliability data | Mean Time To dangerous Failure $\left(\mathrm{MTTF}_{\mathrm{d}}\right)$ | Years | 103.4 |  | 103.6 |  |  | 103.9 |  |  |  |
|  | Diagnostic Coverage (DC) | \% | > 99 |  | > 99 |  |  | > 99 |  |  |  |
|  | Probability of dangerous Failure per Hour $\left(\mathrm{PFH}_{\mathrm{d}}\right)$ | 1/h | $1.82 \times 10^{-8}$ |  | $1.82 \times 10^{-8}$ |  |  | $1.82 \times 10^{-8}$ |  |  |  |
| Conformity to standards |  |  | EN 50295,EN/ISO 13850,EN/IEC 60204-1,EN/IEC 60947-1,EN/IEC 60947-5-1 |  | EN 50295, <br> EN/IEC 60204-1, <br> EN 1088/ISO 14119, <br> EN 574/ISO 13851, <br> EN/IEC 61496-1, <br> EN/IEC 60947-5-3, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 |  |  | EN 50295, <br> EN/ISO 13850, <br> EN/IEC 60204-1, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 |  |  |  |
| Product certifications |  |  | UL, CSA, TÜV |  |  |  |  | UL, CSA, TÜV |  |  |  |
| Degree of protection | Conforming to IEC 529 |  | IP 20 |  | IP 67 |  |  | IP 65 |  | IP 00 |  |
| AS-Interface profile |  |  | 0.B.F.F |  |  |  |  |  |  |  |  |
| Addressing |  |  | Using adjustment terminal ASI TERV2 |  |  |  |  |  |  |  |  |
| Ambient air temperature | For operation | ${ }^{\circ} \mathrm{C}$ | -10... 55 |  |  |  |  |  |  |  |  |
|  | For storage | ${ }^{\circ} \mathrm{C}$ | -25...+85 |  |  |  |  |  |  |  |  |
| Mechanical characteristics |  |  |  |  |  |  |  |  |  |  |  |
| Mechanical durability | In thousands of operating cycles |  | 0.3 |  | - |  | - | 0.3 |  | - |  |
| Shock resistance |  |  | 10 gn |  |  |  |  |  |  |  |  |
| Vibration resistance |  |  | 5 gn |  |  |  |  |  |  |  |  |

## Electrical characteristics

| Supply by AS-Interface line | Voltage | v | Via AS-Interface 24 --- |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Voltage limits |  | $-15 \ldots+15 \%$ |  |  |  |
| Consumption |  | W | 1.2 |  |  |  |
| Consumption on AS-Interface line |  | mA | 45 |  |  |  |
| Connection on AS-Interface line | IDC (Insulation Displacement Connector) |  | - - | - | - | - |
|  | Connector (type) |  | - (M12) | - | - (M12) | - |
|  |  | Note: The technical details of the system are described in the Schneider Electric AS-Interface guide, in the safety monitor hardware and software manuals and in the configuration software on "schneider-electric.com". |  |  |  |  |



| References |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Interfaces for Ø 22 Emergency stop |  |  |  |  |
| Type | Type of contact | Connection on AS-Interface line | Reference | Weight kg |
| Metal | NC + NC | IDC | ASI SSLB4 | 0.080 |
| Plastic | $N C+N C$ | IDC | ASI SSLB5 | 0.040 |
| Interfaces for products with connector |  |  |  |  |
| Type | Number of contacts | Connection on AS-Interface line | Reference | Weight kg |
| $1 \times \mathrm{M12}$ entry (1) | 2 | Connector | ASI SSLC1 | 0.040 |
| $2 \times \mathrm{M12}$ entries (1) (2) | 2 | Connector | ASI SSLC2 | 0.050 |
| Interfaces for products with ISO entry |  |  |  |  |
| Type | Number of contacts | Connection on AS-Interface line | Reference | Weight kg |
| 1 x ISO M16 entry (1) (3) | 2 | IDC | ASI SSLLS | 0.040 |

Interfaces premounted in Emergency stop mushroom head pushbutton stations XAL K

| Type | Number of <br> contacts | Connection on <br> AS-Interface line | Reference | Weight <br> $\mathbf{k g}$ |
| :--- | :--- | :--- | :--- | ---: |
| "Turn to release" | 2 | Connector | ASI SEA1C | 0.170 |
| Key release $\left(\mathbf{n}^{\circ} 455\right)(4)$ | 2 | Connector | ASI SEK1C | 0.190 |


| Interfaces for mounting in enclosure for Harmony ${ }^{\circledR} \varnothing 22$ Emergency stop mushroom head pushbuttons |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Type | Number of contacts | Connection on AS-Interface line | Reference | Weight kg |
| Metal | 2 | Connector | ASI SSLE4 | 0.060 |
| Plastic | 2 | Connector | ASI SSLE5 | 0.025 |
| Addressing accessories |  |  |  |  |
| Description | Application |  | Reference |  |
| Adaptor specifically for safety interfaces type ASI SSLBe, ASI SSLC•, ASISSLLS | Connection to ASI TERV2 | adjustment terminal | ASI SAD1 | 0.060 |


| Setting-up and diagnostic tools |  |  |  |
| :--- | :--- | :--- | :--- |
| Description | Application | Reference |  |
| Adjustment terminal | Addressing and diagnostics <br> of AS-Interface V2.1 interfaces | ASI TERV2 | 0.500 |
|  | AS-Interface I/O test whilst powered-up <br> AS-Interface interface diagnostics |  |  |
| AS-Interface <br> line analyser | Identi cation of transmission errors <br> on the AS-Interface line | ASI SA01 | 0.160 |


| Accessories <br> Type | Material | Unit <br> reference | Weight <br> $\mathbf{k g}$ |
| :--- | :--- | :--- | ---: |
| Adaptor for ISO M20 <br> (sold in lots of 5) | Metal | DE9 RI2016 | 0.040 |
| Ø 40 red mushroom head Emergency <br> stop buttons, turn to release (4) | Metal | ZB4 BS844 | 0.060 |
|  | Plastic | ZB5 AS844 | 0.050 |
| $\varnothing$ 40 red mushroom head Emergency <br> stop buttons, key release $\left(\mathbf{n}^{\circ} \mathbf{4 5 5}\right)(4)$ | Metal | ZB4 BS944 | 0.098 |

[^13]Dimensions, connections

Safety automation solutions
Safety solutions on AS-Interface cabling system Safety interfaces


ASI SSLLS




ASI SAD1


ASI SE•1C


## ASI SSLE4



ASI SSLE5


## Connections

ASI SSLC1

Selection guide
Safety detection solutions
Safety switches Preventa XCS


EN/IEC 60947-5-1, EN/ISO 13849-1, EN/IEC 62061, UL 508, CSA C22-2 n ${ }^{\circ} 14$
EN/IEC 60204-1, EN/ISO 14119
UL, CSA

| $30 \times 50 \times 16$ | $31 \times 34 \times 89$ |
| :--- | :--- |
| Centres: 20 | Centres: $20 / 22$ |

Plunger or rotary head
Head adjustable in $15^{\circ}$ steps throughout $360^{\circ}$
Linear (plunger) or rotary (lever) actuation.

| NC contacts with positive opening operation |
| :--- | :--- |
|  |
| $\begin{array}{ll}2 \text { NC + } 1 \text { NO break before make, slow break } & 2 \text { NC + } 1 \text { NO break before make, slow break or } \\ 2 \text { NC }+1 \text { NO and } 2 \text { NC }+2 \text { NO snap action } & \text { snap action }\end{array}$ |



| IP 66, IP 67 and IP 68 | IP 66 and IP 67 |
| :--- | :--- |
| $-25 \ldots+70^{\circ} \mathrm{C}$ | Tapped entry for Pg 13.5, ISO M20 cable gland <br> or tapped $1 / 2^{\prime \prime}$ NPT |
| - | - |
| L= 1, 2 or 5 m | XCS P |
| XCS M | $38118 / 2$ |
| 37630/2 |  |

## Preventa XCS lever or spindle operated switches

Protection of operators by stopping the machine when the operating lever (attached to hinged machine guard) is displaced by $5^{\circ}$.
All light industrial machines fitted with hinged or rotary protective covers with small opening radius.

## Compact format

Plastic with 1 or 2 cable entries

|  |  |  |  |
| :---: | :---: | :---: | :---: |
| Plastic, double insulated |  |  |  |
| 2 types of lever: straight or elbowed (flush with rear of switch) <br> 3 lever positions: to left, centred or to right |  | 2 types of spindle: length 30 mm or 80 mm |  |
| EN/IEC 60947-5-1, EN/ISO 13849-1, EN/IEC 62061, UL 508, CSA C22-2 n 14 , JIS C4520 |  |  |  |
| EN/IEC 60204-1, EN/ISO 14119 |  |  |  |
| UL, CSA, BG |  |  |  |
| $30 \times 87.5 \times 30$ | $52 \times 108.4 \times 30$ | $30 \times 96 \times 30$ | $52 \times 117 \times 30$ |
| Centres: 20/22 | Centres: 20/22 or 40.3 | Centres: 20/22 | Centres: 20/22 or 40.3 |
| Turret head: 4 positions Rotary actuation (lever) |  | Turret head: 4 positions Rotary actuation (spindle) |  |
| Slow break safety contacts with positive opening operation NC contacts open when lever or spindle displaced by more then $5^{\circ}$ |  |  |  |
| 1 NC + 1 NO break before make 2 NC <br> $1 \mathrm{NC}+2 \mathrm{NO}$ break before make <br> $2 \mathrm{NC}+1$ NO break before make | 1 NC + 2 NO break before make <br> $2 \mathrm{NC}+1$ NO break before make 3 NC | 1 NC + 1 NO break before make 2 NC <br> 1 NC + 2 NO break before make <br> $2 \mathrm{NC}+1 \mathrm{NO}$ break before make | 1 NC + 2 NO break before make $2 \mathrm{NC}+1 \mathrm{NO}$ break before make 3 NC |
| IP 67 |  |  |  |
| $-25 . . .+70^{\circ} \mathrm{C}$ |  |  |  |
| 1 tapped entry for Pg 11, ISO M16 cable gland or tapped 1/2" NPT | 2 tapped entries for Pg 11, ISO M16 cable gland or tapped 1/2" NPT | 1 tapped entry for Pg 11, ISO M16 cable gland or tapped $1 / 2$ " NPT | 2 tapped entries for Pg 11, ISO M16 cable gland or tapped $1 / 2$ " NPT |
| - | - | - | - |
| XCS PL | XCS TL | XCS PR | XCS TR |
| 32912/2 |  |  |  |

32912/2

Selection guide (continued)
Safety detection solutions
Safety switches Preventa XCS

## Preventa XCS key operated switches

Protection of operators by stopping the machine when the actuator
(attached to machine guard) is withdrawn from the head of the switch. All light industrial machines, with quick rundown time (1).

| Miniature format | Compact format |
| :--- | :--- |
| Plastic, pre-cabled | Plastic with 1 or 2 cable entries |


| Switch type |
| :--- |
| Applications |
| Design |


| Enclosure |
| :--- |
| Features |
| Conformity to standards |



EN/IEC 60947-5-1, EN/ISO 13849-1, EN/IEC 62061, UL 508, CSA C22-2 n 14 and JIS C4520
EN/IEC 60204-1, EN/ISO 14119

| cULus, BG | UL, CSA |  |
| :--- | :--- | :--- |
| $30 \times 87 \times 15$ | $30 \times 93.5 \times 30$ | $52 \times 114.5 \times 30$ |
| Centres: $20 / 22$ | Centres: $20 / 22$ | Centres: $20 / 22$ or 40.3 |
| Fixed head: 2 positions for <br> insertion of actuator. | Turret head: 8 positions for insertion of actuator. |  |

Safety contacts actuated by the actuator.

| ```1 NC + 1 NO break before make 2 NC \(2 \mathrm{NC}+1\) NO break before make 3 NC``` | 1 NC + 1 NO slow break contacts, break before make or make before break, or snap action <br> 2 NC slow break or snap action <br> 2 NC + 1 NO slow break contacts, break before make, or snap action <br> $1 \mathrm{NC}+2$ NO slow break contacts, break before make, | $1 \mathrm{NC}+2 \mathrm{NO}$ break before make <br> $2 \mathrm{NC}+1$ NO break before make $3 \text { NC }$ |
| :---: | :---: | :---: |

## IP 67

$$
-25 \ldots+70^{\circ} \mathrm{C}
$$

| - | Tapped entry for Pg 11, ISO M16 cable gland or tapped $1 / 2^{\prime \prime}$ <br> NPT |  |
| :--- | :--- | :--- |
| L = 2, 5 or 10 m | - | - |
| XCS MP | XCS PA | XCS TA |
| 32938/2 | $32935 / 2$ |  |
| $(1)$ Stopping time of machine less than time taken for operator to access hazardous zone |  |  |

(1) Stopping time of machine less than time taken for operator to access hazardous zone.


Metal
Without locking of actuator.


Manual locking and unlocking of actuator by pushbutton or key operated lock (can be mounted on left or right-hand side of switch head).

EN/IEC 60947-5-1, EN/ISO 13849-1, EN/IEC 62061, UL 508, CSA C22-2 nº14 and JIS C4520
EN/IEC 60204-1, EN/ISO 14119

UL, CSA

| $40 \times 113.5 \times 44$ | $52 \times 113.5 \times 44$ |
| :--- | :--- |
| $30 \times 60$ | $30 \times 60$ |
| Turret head: 8 positions for insertion of actuator. | Turret head: 8 positions for insertion of actuator. |
| Safety contacts actuated by the actuator. <br> Slow break and positive opening operation. | Safety contacts actuated by the actuator. <br> Slow break and positive opening operation. |
| 1 NC +2 NO break before make <br> 2 NC +1 NO break before make <br> 3 NC | 1 NC +2 NO break before make <br> 2 <br> $3 N C$ <br> 3 |

Selection guide (continued)

## Safety detection solutions Safety switches Preventa XCS



## Enclosure



## Degree of protection

Ambient air temperature For operation

| Connection | Terminals |
| :--- | :--- |
|  | Pre-cabled <br> Connector |

## Type reference

Pages

Preventa XCS key operated switches, locking and unlocking by solenoid
Protection of operators by stopping the machine when the actuator (attached to machine guard) is withdrawn from the head of the switch. All industrial machines, with slow rundown time (1)


EN/IEC 60947-5-1, EN/ISO 13849-1, EN/IEC 62061, UL 508 and CSAC22-2 n ${ }^{\circ} 14$

EN/IEC 60204-1, EN/ISO 12100
UL, CSA, TÜV (pending)
$51 \times 205 \times 43.5$
Centres: $30 \times 153.3$
Turret head: 8 positions for insertion of actuator.

Safety contacts actuated by the actuator. Slow break and positive opening operation.
$1 \mathrm{NC}+1 \mathrm{NO}$ break before make
2 NC
1 NC +2 NO break before make
$2 \mathrm{NC}+1 \mathrm{NO}$ break before make
3 NC + auxiliary contacts controlled by the solenoid,
$1 \mathrm{NC}+1 \mathrm{NO}$ break before make
2 NC
$1 \mathrm{NC}+2$ NO break before make
2 NC + 1 NO break before make
3 NC with positive opening operation.
IP 66/IP 67
$-25 \ldots+60^{\circ} \mathrm{C}$

Spring terminals, 3 cable entries.
Tapped entry for ISO M20 cable gland or tapped 1/2" NPT.
M23 (15 + 1 PE or 18 + 1 PE)

| XCS LE | XCS LF |
| :--- | :--- |
| $32939 / 2$ | $32939 / 2$ |

(1) Stopping time of machine greater than time taken for operator to access hazardous zone.

| Preventa XCS coded magnetic switches for detection without contact |  |  |  |
| :--- | :--- | :--- | :--- |
| Protection of operators by stopping the machine when the gate is opened <br> All light industrial machines fitted with access gates with imprecise guidance and/or subjected to frequent washing |  |  |  |
| Miniature rectangular format | Compact rectangular format | Cylindrical format | Coded magnetic systems with dedicated <br> transmitter |
| Plastic, pre-cabled or M8 <br> connector on flying lead | Plastic, pre-cabled or M12 <br> connector on flying lead | Plastic, pre-cabled or M12 <br> connector on flying lead | Plastic, pre-cabled or M12 connector |



## Safety detection solutions

Key operated switches

## Refer to standards <br> EN/ISO 12100 and EN/ISO 14119

Removable or movable protective guards for potentially dangerous machine functions must be used in conjunction with locking or interlocking devices.
Application requiring an interlocking device: high inertia (long rundown time) machines.
An interlocking device 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 potentially dangerous movement has stopped.

The safety interlock 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 standards EN/ISO 12100, IEC/ISO 13852, EN/ISO 14119 and EN/IEC 60204-1. They contribute to the protection of operators working on potentially dangerous machines by breaking the start control circuit of the machine when a protective guard is opened or removed, using positive opening operation contacts, thus stopping the dangerous movement of the machine
The removal/opening of the guard (after the dangerous movement has stopped) can either be:

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

The safety interlock switch if used in conjunction with a Preventa safety module enables designers to achieve PL=e, category 4 control systems with reference to EN/ISO 13849-1 and SIL CL3 with conforming to EN/IEC 62061. When used on their own or combined with another switch, they can achieve up to category 1, 2 or 3 control circuit. Safety related parts of control systems should be developed taking into account the results of an appropriate Risk Assessment

The start command for the machine can only be initiated following correct operation of the safety interlock switch.
On its release, the NC safety contacts are opened by positive action or, for coded magnetic switches, change state (must be monitored using a Preventa safety module).

The safety interlock switches incorporate slow break or snap action contacts with positive opening operation (except for coded magnetic switches where this is not possible). For mechanical safety interlock switches, on closing of the guard the actuator fitted to it enters the head of the switch, operates the multiple interlock device and closes the NC contacts. For coded magnetic switches, the presence of the magnet causes the contacts to change state.

All safety interlock switches are designed to accept a few millimetres of misalignment between the actuator and the switch in order to compensate for mechanical play, vibration, etc.

Both mechanically and magnetically actuated safety interlock switches are designed to be operated by specific actuators so that they cannot be defeated in a simple manner using common tools, rods, metal plates, simple magnets, etc. When loosening the fixing screws for re-orientation of the turret head on safety interlock switches, the head itself remains attached to the switch body and the contact states remain unchanged All safety interlock switches and safety limit switches are designed to avoid any adjusments in the head setting, removing the key actuator or to access the safety contacts without using 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 actuator or magnet, or any other foreign body,
- fixing the actuator or coded magnet to the guard by means that make it very difficult to remove (riveting or welding).


# Safety detection solutions <br> Key operated switches 

Metal key operated switches case

Metal safety
interlock switches
case, mushroom
head pushbutton for escape release on XCS LF

Plastic case guard switches with mechanical actuator

Without locking of actuator


Metal key operated switches case for use on machines with low 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 actuator and manual unlocking



Metal key operated switches case for use on heavy machines with low 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 actuator by solenoid


Metal safety interlock switches case for use on machines with high inertia or with a controlled opening of the protective guard.
The locking of the moving guard can either be on de-energisation or energisation of the solenoid
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".

With interlocking and locking of actuator by solenoid


Safety interlock switches type XCS LF are available with a mushroom head pushbutton mounted on the rear of the switch for unlocking the machine guard whilst being held in the locked position by the solenoid.
This manual unlocking using the mushroom head pushbutton for escape release is useful in the following cases

- whilst the machine or a group of machines is undergoing maintenance, enabling operation at reduced speed or whilst stopped with the guard(s) closed The safety of maintenance personnel is thus improved in the event of:
- a power failure,
- an interlocking circuit malfunction,
- personnel finding themselves in a dangerous situation.

Unlocking using the escape release mushroom head pushbutton takes priority over any other action. It therefore enables a person to leave the zone if the need arises.
The re-initialisation of this function is performed by turning (with or without key) the escape release mushroom head.

Without locking of actuator


Plastic safety interlock switches case for use on light machines with low 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 (XCS PA or XCS TA) is available as an accessory.

With interlocking and locking of actuator by solenoid


Plastic safety interlock switches case for use on machines with high inertia or with a controlled opening of the protective guard.
The locking of the moving guard can either be on de-energisation or energisation of the solenoid
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.

Safety detection solutions
Lever or spindle operated switches, safety limit switches and coded magnetic systems

## Rotary lever and spindle operated

 switches for hinged guardsCoded magnetic switches

## Safety limit switches

With head for rotary movement (lever or spindle)
Plastic case guard 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 $5^{\circ}$.

## With head for linear movement (plunger) or rotary movement (lever)



Metal or plastic case limit switches.
For use on machines with low inertia and also on machines with high inertia, when used in conjunction with actuator operated guard switches, for monitoring access doors and/or guards. 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".

## With an associated coded magnet

Plastic case guard switches for use on machines with low 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 or liquid spray.
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 the switch model.


With dedicated transmitter


These self-contained SIL 2/category 3, PL=d or SIL 3/ category 4, PL=e systems protect the operator by immediately stopping any dangerous movement, as soon as the distance between the transmitter and the receiver exceeds 10 mm .
Plastic case system for use on machines with low inertia. Specifically designed for industrial machines fitted with one or more doors, covers or guards with imprecise guiding.
They are ideally suited for machines subjected to frequent washing or liquid spray and that are not necessarily equipped with an enclosure or control cabinet.

## Safety detection solutions

Metal case key operated switches

Key actuators

## Turret head

## Safety contacts

## The key actuators are common to all metal and plastic safety interlock

 switches case types XCS LF and XCS LE

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

All metal safety interlock switches case are fitted with a square turret head which can be rotated through $360^{\circ}$ in $90^{\circ}$ steps


8 directions of actuation are possible for the actuator:

- 4 in the horizontal plane
- 4 from above the switch (4 alternative positions of the actuator slot, depending on the orientation of the head). When loosening the fixing screw for re-orientation of the operating head, the head itself remains attached to the body and the contact states remain unchanged.

Metal safety interlock switches case incorporate a 3-pole contact block with positive opening operation, which is actuated by insertion or withdrawal of the actuator attached to the guard.


An orange LED (optional for key operated switches type XCS A, XCS B and XCS C, standard for safety interlock switches type XCS LF and XCS LE) indicates the position of the machine guard:

LED illuminated: actuator not inserted in head of switch, NC contact(s) open, guard open.
Q
LED not illuminated: actuator inserted in head of switch, NC contact(s) closed, guard closed.
A green LED (incorporated on safety interlock switches type XCS LF and XCS LE) indicates the locking of the machine guard:

LED not illuminated: actuator not inserted in head of switch. The machine cannot be operated.
LED illuminated: actuator inserted in head of switch and actuator locked. The machine is either ready for starting, running or decelerating to a standstill.
Note: LED wiring must be done according to schematics indicated in the instruction sheet or in the catalogue pages.

## Safety detection solutions

Metal case key operated switches

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

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



Their use is not necessary for the normal operation of the guard switch.
For ease of access, the pushbutton or lock may be mounted on the right or the left of the key operated switch head.
For key operated switches type XCS C, when the machine guard is locked (key in position "LOCK"), the resistance to forcible withdrawal of the actuator fitted to the guard is $\mathbf{1 5 0} \mathbf{~ d a N}$. The key is removable from the locking device in the "LOCK" position.

Locking/unlocking by solenoid on XCS LF

Safety interlock switches type XCS LF incorporate a solenoid for locking/ unlocking of the machine guard


With the machine guard closed and locked, the resistance to forcible withdrawal of the actuator fitted to the guard is Fzh $\mathbf{2 3 0 0} \mathbf{N}$ according to the verification principle GS-ET19 (Fzh=Fmax/1.3). In addition to the 3-pole contacts, positively operated by the actuator fitted to the guard, safety interlock switches XCS LF incorporate $\mathrm{NC}+\mathbf{N O}$ or $\mathbf{2 N C}$ or $\mathbf{1 ~ N C}+\mathbf{2 N O}$ or $\mathbf{2 N C}+\mathbf{1 N O}$ or 3NC contact blocks mechanically linked to the solenoid.
The NC contact(s) are for use in the safety circuit of the machine and the NO contact for signalling the status of the solenoid.

Safety interlock switches type XCS LF are fitted with a key operated lock allowing the unlocking of the machine guard whilst being held in the lock position by the solenoid (for use by 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 level of protection is higher in preventing an accidental machine start. 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 solenoid always takes priority over manual unlocking using the key operated lock.
The lock fitted to standard safety interlock switches has key withdrawal from the "LOCK" and "UNLOCK" positions.

Example of operation for an XCS LF key operated switch with locking on de-energisation of solenoid

| Machine status | Stopped, de-energised | Stopped, energised | Stopped, ready to start | Running | Stopping sequence | Stopped, energised |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Guard position | Open | Open | Closed | Closed | Closed | Closed |
| Guard status | Free | Free | Free | Locked | Locked | Free |
| Solenoid status | "O" <br> (de-energised) | $\text { " } 1 \text { " }$ <br> (energised) | $\text { " } 1 \text { " }$ <br> (energised) | "O" <br> (de-energised) | "O" <br> (de-energised) | $\text { " } 1 \text { " }$ <br> (energised) |
| 2-pole contact state for XCS LF25••• |  |  |  |  |  |  |
| 2-pole contact state for <br> XCS LF27••• | $\begin{aligned} & \bar{\sim} L \bar{F} \\ & \approx \sim \\ & \sim \end{aligned}$ | $\begin{array}{l\|l} \bar{\sim} L & \bar{L} \\ \approx & \sim \end{array}$ |  |  |  |  |
| 3-pole contact state for XCS LF35••• |  |  |  |  |  |  |
| 3-pole contact state for XCS LF37••• | $\left.\begin{array}{l\|l\|l\|} \bar{N} L & \bar{m} L & \stackrel{m}{j} \\ \approx & \widetilde{m} & \dot{j} \end{array} \right\rvert\,$ |  |  |  |  |  |
| 3-pole contact state for XCS LF38••• | $\begin{aligned} & \mp \mid \bar{N} L \bar{m} L \\ & \approx \mid \sim(N \mid \end{aligned}$ | $\begin{aligned} & F \mid \bar{N} L \bar{m} L \\ & \sim / \sim\|c\| c \mid \end{aligned}$ | $\begin{array}{l\|l\|c\|} \bar{F} & \bar{N} \mid & \bar{m} \mid \\ \approx \mid & \approx & \widetilde{m} \end{array}$ |  |  |  |
| Functions | Machine at rest. | Machine cannot be operated. | Guard closed, actuator 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. <br> The guard can be opened. |

## Solenoid contact

states

| 2-pole contact state for <br> XCS LFe25••• |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 2-pole contact state for XCS LF•e27••• |  |  |  |  |  |  |
| 3-pole contact state for XCS LF••35••• |  |  |  |  |  |  |
| 3-pole contact state for <br> XCS LFe•37••• | $\begin{array}{c\|c\|c\|} \hline & \text { in } & 0 \\ \text { on } & \\ \text { y } & \text { in } & \text { d. } \end{array}$ |  |  |  |  |  |
| 3-pole contact state for <br> XCS LFee38•e॰ |  |  |  |  |  |  |
| Orange LED | $\otimes$ | 汹 = | $\otimes$ | $\otimes$ | $\otimes$ | $\otimes$ |
| Green LED | $\otimes$ | $\otimes$ | $\otimes$ | = 沙 | = | $\otimes$ |
| Safety circuit of the machine | Open | Open | Open | Closed | Closed | Open |

The key actuators are common to all plastic case key operated switches (except for XCS LE, see page 32920/5)


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

A pivoting actuator (both horizontally and vertically) is available when using guard switches in conjunction with hinged guards or guards with imprecise guiding.

Straight actuators are supplied with an adaptor shank for simple replacement of an XCK P key operated switch by an XCS PA switch, or an XCK T key operated switch by an XCS TA switch, without the need to drill additional fixing holes for the switch or the actuator.

Guard switches XCS PA, XCS TA and XCS LE are fitted with a square turret head which can be rotated through $360^{\circ}$ in $90^{\circ}$ steps. Guard switches XCS MP have a fixed head


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

When loosening the 2 fixing screws or the 4 fixing screws (XCSLE) 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).

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

XCS LE
$\stackrel{m}{\sim}\left|\begin{array}{c}\sim \\ \sim \\ \sim\end{array}\right|$



or XCS PA

or XCS PA, XCS TA


or XCS MP




In addition, safety interlock switches type XCS LE incorporate 1 NC or 2 NC contacts (with positive opening operation) actuated by the solenoid. The NC contact(s) are for use in the safety circuit of the machine. The withdrawal of the key actuator opens the NC safety contact(s), even in the event of the contact sticking or welding.
The two-pole 2 NC or three-pole 2 NC + $\mathbf{1} \mathbf{N O}$ or 3 NC (XCS TA/ XCS MP, XCS PA and XCS LE only) contact block enables up to $\mathrm{PL}=\mathrm{d}$, category 3 control circuit to be established conforming to EN/ISO 13849-1, by using both NC safety contacts in redundancy, or up to PL = b, category 1 control circuit by using one NC contact in the safety circuit and the NO other contact for signalling (for example: PLC, illuminated beacon, etc.).

# Safety detection solutions <br> Plastic case key operated switches 

Guard retaining device

The guard retaining device XCS 221 can be used with all plastic key operated switches case type
XCS PA and XCS TA that are used in conjunction with either the wide (XCS Z12) or pivoting (XCS Z13)
actuator


Locking/unlocking by solenoid on XCS LE

Unlocking by special tool for XCS LE

## Resilience

XCS LE / XCS LF

XCS LE against the partition: $\max =1.2 \mathrm{~J}$
XCS LE without partition: $\max =4.9 \mathrm{~J}$


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 level of protection is higher in preventing an accidental machine start. 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 solenoid always takes priority over manual unlocking using the special tool.
Safety interlock switches type XCS LE are supplied with a special tool 1 that enables unlocking of the machine guard whilst being held in the locked position by the solenoid (for use by authorised personnel only)


XCS LF against the partition: $\max =9.6 \mathrm{~J}$ XCS LE without partition: $\max =6.4 \mathrm{~J}$


Safety detection solutions
Plastic case key operated switches

Example of operation for an XCS LE key operated switch with locking on de-energisation of solenoid

| Machine status | Stopped, de-energised | Stopped, energised | Stopped, ready to start | Running | Stopping sequence | Stopped, energised |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Guard position | Open | Open | Closed | Closed | Closed | Closed |
| Guard status | Free | Free | Free | Locked | Locked | Free |
| Solenoid status | "O" <br> (de-energised) | "1" <br> (energised) | "1" <br> (energised) | "O" <br> (de-energised) | "O" <br> (de-energised) | "1" <br> (energised) |
| 2-pole contact state for <br> XCS LE25••• | $\begin{aligned} & \bar{\sim}\left[\begin{array}{c} ल \\ \sim- \\ \approx \\ \approx \end{array}\right] \end{aligned}$ |  |  |  |  | $\begin{array}{l\|r\|r\|} \bar{\sim} \mid & \frac{m}{1} \\ \approx & \underset{\sim}{\prime} \end{array}$ |
| 2-pole contact state for XCS LE27••• | $\begin{array}{l\|l} \bar{N} L \\ \sim \\ \sim & \sim \end{array}$ |  | $\begin{array}{c\|c\|} \bar{\sim} & =1 \\ & =1 \\ & \approx \end{array}$ |  | $\begin{array}{c\|c\|c} \bar{N} & \bar{F} \\ & & \\ & \approx \end{array}$ | $\begin{array}{l\|l\|l} \bar{N} \mid & \bar{F} \mid \\ & \cong \end{array}$ |
| 3-pole contact state for XCS LE35••• |  |  |  |  |  |  |
| 3-pole contact state for XCS LE37••• |  |  |  | $\begin{array}{c\|c\|c\|} \bar{N}\left\|\begin{array}{c\|c} \bar{m} & \stackrel{m}{\mid} \\ & \approx \\ \approx & ल \\ \hline \end{array}\right\| \end{array}$ |  | $\begin{array}{c\|c\|c\|} \bar{N}\left\|\begin{array}{c\|c} \bar{m} & \stackrel{m}{\mid} \\ & \approx \\ \approx & ल \\ \hline \end{array}\right\| \end{array}$ |
| 3-pole contact state for XCS LE38••• |  |  |  |  | $\begin{array}{l\|l\|l\|} F & \bar{N} \mid & \bar{m} \\ & \approx & \approx \\ \sim & \approx \end{array}$ | $\begin{array}{l\|l\|l\|l\|} \bar{F} & \bar{N} \mid & \bar{m} \\ & \approx & \approx & \widetilde{m} \end{array}$ |
| Functions | Machine at rest. | Machine cannot be operated. | Guard closed, actuator 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. <br> The guard can be opened. |

## Solenoid contact

| 2-pole contact state for XCS LE••25••• |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 2-pole contact state for XCS LE••27••• |  |  |  |  |  |  |
| 3-pole contact state for XCS LE••35••• |  |  |  |  |  |  |
| 3-pole contact state for XCS LEゃe37••• |  |  | $\begin{array}{c\|c\|c\|} \text { fy } & \text { in } & 0 \\ \text { O } \\ \text { y } & \text { in } & \text { d } \end{array}$ |  |  |  |
| 3-pole contact state for XCS LEゃe38••• |  |  |  |  |  |  |
| Orange LED | $\otimes$ | = | $\otimes$ | $\otimes$ | $\otimes$ | $\otimes$ |
| Green LED | $\otimes$ | $\otimes$ | $\otimes$ | = | = | $\otimes$ |
| Safety circuit of the machine | Open | Open | Open | Closed | Closed | Open |



## 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 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

Safety switches XCS PL and XCS PR incorporate a 2-pole
or 3-pole contact block, with positive opening operation. The
contact arrangements can be: NC + NO break before
make, $2 \mathrm{NC}, 1 \mathrm{NC}+2 \mathrm{NO}$ break before make or
$2 \mathrm{NC}+1 \mathrm{NO}$ break before make.
Safety switches XCS TL and XCS TR incorporate a 3-pole
contact block, with positive opening operation. The contact
arrangements can be:
$1 \mathrm{NC}+2$ NO break before make or $2 \mathrm{NC}+1 \mathrm{NO}$ break
before make. Opening of the NC safety contact(s) occurs
when the operating lever or spindle is displaced by an angle
equal to or greater than $5^{\circ}$.

These safety switches provide a solution for monitoring hinged protective guards with small opening radius 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 safety 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.


3 types of case

- PBT plastic body.
Compact rectangular, XCS DMC
Standard rectangular, XCS DMP
- Cylindrical $\varnothing 30$, XCS DMR
- Pre-cabled, length $2 \mathrm{~m}, 5 \mathrm{~m}$ or 10 m .
Connector on flying lead connection:
- M8: DMC
- M12: DMP, DMR


## Contacts

Coded magnetic switches are fitted with 2-pole
(XCS DMCIXCS DMRIXCS DMP) or 3-pole
(XCS DMP) Reed type contacts and are available with or without a "guard closed" LED indicator.
The NC and NO contacts change state as soon as the magnet is at a distance from the sensor of approximately 8 mm for types XCS DMP and XCS DMR and approximately 5 mm for type XCS DMC

## Connection

When used in safety circuits, the Reed technology contacts must always be used in conjunction with a Preventa safety module.

Coded magnetic systems with dedicated transmitter


## 1 type of case

- PBT plastic body.
- Self-contained range: SIL2/PL =d, category 3

XCS DM3 and SIL3/PL =e, category 4 XCS DM4.
■ Pre-cabled, length $2 \mathrm{~m}, 5 \mathrm{~m}$ or 10 m .

- Flying lead with M12 connector.


## Technology

Coded "Hall effect" detection.

## PNP safety outputs

Integrated self-monitoring using micro-processors.
Detection distance from 0 to 10 mm obtained on
approach of dedicated transmitter XCS DMT.

## Functions

- Dynamic EDM (External Device Monitoring) only for

XCS DM4.
■ Fault and short-circuit detection.

- Output diagnostics (non safety related) only for XCS DM4.
- LED indicator.
- Possible chaining of up to a maximum of 32 systems
for XCS DM3 only.


## Applications



These switches provide a solution for monitoring moveable machine guards fitted to machines with quick rundown times.
They are particularly suitable for guards without accurate guidance and for use in difficult environments (dust, liquids, etc.).
Installing self-contained coded magnetic systems provides an optimum solution (no control system required). They enable:

- monitoring of one or several guards (opening, closing) on small machines,
- savings in space and the elimination of enclosures and/or control cabinets.


## Safety limit switches XCS M

With head for linear movement（plunger）or rotary movement（lever）

－Narrow metal case XCS M．
－With protective plate，preventing both access to the fixing screws or adjustment of the head by non authorised personnel．
－Torx fixing screws．
－A removable cable entry to facilitate wiring．

## 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 19 mm steel roller lever．

## Connection

Pre－cabled switches，either $7 \times 0.5 \mathrm{~mm}^{2}$ or $9 \times 0.34 \mathrm{~mm}^{2}$ ．

## Safety limit switches XCS D and XCS P

With head for linear movement（plunger）or rotary movement（lever）


■ Compact metal case XCS D and plastic case XCS P．
－With protective plate，preventing both access to the
fixing screws or adjustment of the head by non authorised personnel．
－Torx fixing screws．
－A removable cable entry to facilitate wiring．

## Contacts

XCS P3・ゃゃ・ and XCS D3ゃゃゃゃ limit switches are fitted with 3－pole contacts．
4 versions of complete switches are available incorporating these contacts：
－metal end plunger，
－roller plunger，
－thermoplastic roller lever，
－diameter 19 mm steel roller lever．

## Applications

These switches provide a solution for monitoring covers，guards or grilles on machines with low inertia （quick rundown time），either in conjunction with key operated switches or not． 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 safety modules，achieve a PL＝e，category 4／SIL 3 system．


## Safety detection solutions

Limit switches
Miniature design, metal, type XCS M

## With head for linear movement (plunger). Fixing by the body

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With head for rotary movement (lever). Fixing by the body

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# Safety detection solutions 

Limit switches
Miniature design, metal, type XCS M

| Environment characteristics |  |  |
| :---: | :---: | :---: |
| Conformity to standards | Products | EN/IEC 60947-5-1, UL 508, CSA C22-2 n 14 |
|  | Machine assemblies | EN/IEC 60204-1, EN/ISO 14119 |
| Product certifications |  | UL, CSA |
| Maximum safety level (1) |  | PL=e, category 4 conforming to EN/ISO 13849-1 and SIL CL3 conforming to EN/IEC 62061 |
| Reliability data $\mathrm{B}_{10 \mathrm{~d}}$ |  | 50000000 (value given for a service life of 20 years, limited by mechanical or contact wear) |
| Protective treatment |  | Standard version: "TC" |
| Ambient air temperature |  | For operation: $-25 \ldots+70^{\circ} \mathrm{C}$ <br> For storage: $-40 \ldots+70^{\circ} \mathrm{C}$ |
| Vibration resistance |  | XCS M snap action: 5 gn. XCS M slow break: 25 gn ( $10 . . .500 \mathrm{~Hz}$ ) conforming to EN/IEC 60068-2-6 |
| Shock resistance |  | 25 gn (18 ms) conforming to EN/IEC 60068-2-27 |
| Electric shock protection |  | Class I conforming to IEC 6140 |
| Degree of protection |  | IP 66, IP 67 and IP 68 (1) conforming to EN/IEC 60529; IK 06 conforming to EN 50102 |
| Materials |  | Body: Zamak. Head: Zamak. Protective plate: steel, secured by 5-lobe torque safety screw. |
| Repeat accuracy |  | 0.05 mm on the tripping points, with 1 million operating cycles for head with end plunger |
| Contact block characteristics |  |  |
| Rated operational characteristics |  | ~ AC-15; B300 (Ue=240 V, le=1.5 A) <br> =- DC-13; R300 ( $\mathrm{Ue}=250 \mathrm{~V}$, le = 0.1 A), conforming to EN/IEC 60947-5-1 Appendix A |
| Rated insulation voltage |  | $\mathrm{Ui}=400 \mathrm{~V}$ degree of pollution 3 conforming to EN/IEC 60947-5-1 $\mathrm{Ui}=300 \mathrm{~V}$ conforming to UL 508, CSA C22-2 $\mathrm{n}^{\circ} 14$ |
| Rated impulse withstand voltage |  | U imp $=4 \mathrm{kV}$ conforming to EN/IEC 60947-1, EN/IEC 60664 |
| Positive operation (depending on model) |  | NC contacts with positive opening operation conforming to IEN/IEC 60947-5-1 Appendix K |
| Resistance across terminals |  | $\leq 25 \mathrm{~m} \Omega$ conforming to EN/IEC 60255-7 category 3 |
| Short-circuit protection |  | 6 A cartridge fuse type gG (gl) |
| Minimum actuation speed |  | Snap action contact: $0.01 \mathrm{~m} /$ minute, Break before make, slow break contact: $6 \mathrm{~m} /$ minute |

(1) Using an appropriate and correctly connected control system.

Electrical durability

(1) Protection against prolonged immersion: the test conditions are subject to agreement between the manufacturer and the user.

References, characteristics

## Safety detection solutions

Safety limit switches
Miniature design, metal, type XCS M
Pre-cabled

|  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Type of operator |  | Metal end plunger | Roller plunger | Thermoplastic roller lever | Steel roller lever |
| References |  |  |  |  |  |
|  | 3-pole 2 NC + 1 NO snap action contact | XCS M3910L1 <br> $\Theta$ | XCS M3902L1 | XCS M3915L1 | XCS M3916L1 |
|  | 3-pole $2 \mathrm{NC}+1$ NO break before make, slow break contact |  |  | XCS M3715L1 | XCS M3716L1 |
|  | 4-pole $2 \mathrm{NC}+2$ NO snap action contact | XCS M4110L1 | XCS M4102L1 | XCS M4115L1 <br> $\Theta$ | XCS M4116L1 <br> $\Theta$ |
| Weight (kg) |  | 0.165 | 0.170 | 0.205 | 0.210 |
| Contact operation |  | $\square$ closed |  | (A) = cam displacement <br> $(P)=$ positive opening point <br> $\Theta N C$ contact with opening positive operation |  |
| Complementary characteristics not shown under general characteristics (page 37630/3) |  |  |  |  |  |
| Switch actuation |  | On end | By $30^{\circ} \mathrm{cam}$ |  |  |
| Type of actuation |  | 亩 |  |  |  |
| Maximum actuation speed |  | $0.5 \mathrm{~m} / \mathrm{s}$ | $0.5 \mathrm{~m} / \mathrm{s}$ | $1.5 \mathrm{~m} / \mathrm{s}$ |  |
| Mechanical durability |  | 10 million operating cycles |  |  |  |
| Minimum force or torque | Tripping | 8.5 N |  | 0.5 N.m |  |
|  | Positive opening | 42.5 N | 35 N | 0.1 N.m |  |
| Cabling | 3 -pole contacts | PvR pre-cabled, $7 \times 0.5 \mathrm{~mm}^{2}$, length 1 m (1) |  |  |  |
|  | 4 -pole contacts | PvR pre-cabled, $9 \times 0.34 \mathrm{~mm}^{2}$, length $1 \mathrm{~m} \mathrm{(1)}$ |  |  |  |
|  |  | (1) For a $2 m$ long cable, replace L1 with L2. For a 5 m long cable, replace $L 1$ with $L 5$. |  |  |  |

Dimensions, connections

Safety detection solutions
Safety limit switches
Miniature design, metal, type XCS M Pre-cabled

Dimensions
XCSM ••10L1

(1) Protective plate fixed by 5-lobe torque safety screws.

XCSM ••15L1

(1) Protective plate fixed by 5-lobe torque safety screws.

## Connections

Wiring up to $\mathrm{PL}=\mathrm{b}$, category 1 conforming to EN/ISO 13849-1
Example with 3-pole $2 \mathrm{NC}+1 \mathrm{NO}$ contact and protection fuse to prevent shunting of the N/C contacts, either by cable damage or by tampering.

(1) Signalling contact

Example of guard monitoring using 2 switches and 1 safety module (PL=e, category 4 conforming to EN/ISO 13849-1)
Operation in positive and negative (combined) mode


## Presentation

## Safety detection solutions

Limit switches
Compact design, metal, type XCS D
Compact design, plastic, type XCS P
$\square$ With head for linear movement (plunger)
XCS D
XCS $P$
Conforming to standard EN 50047


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$\square$ With head for rotary movement (lever) XCS D

XCS P


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# Safety detection solutions 

## Limit switches

Compact design, metal, type XCS D
Compact design, plastic, type XCS P

Environment characteristics

| Conformity to standards | Products | EN/IEC 60947-5-1, UL 508, CSA C22-2 n 14 |
| :---: | :---: | :---: |
|  | Machine assemblies | EN/IEC 60204-1, EN/ISO 14119 |
| Product certifications |  | UL, CSA |
| Maximum safety level (1) |  | PL=e, category 4 conforming to EN/ISO 13849-1 and SIL 3 conforming to EN/IEC 61508 |
| Reliability data $\mathrm{B}_{10 \mathrm{~d}}$ |  | 50000000 (data value for a service life of 10 years can be limited by contact and mechanical wear) |
| Protective treatment | Standard version | "TC" |
| Ambient air temperature | For operation | $-25 \ldots+70^{\circ} \mathrm{C}$ |
|  | For storage | $-40 \ldots+70^{\circ} \mathrm{C}$ |
| Vibration resistance | Conforming to EN/IEC 60068-2-6 | $25 \mathrm{gn}(10 \ldots 500 \mathrm{~Hz})$ |
| Shock resistance | Conforming to EN/IEC 60068-2-27 | 50 gn ( 11 ms ) |
| Electric shock protection |  | Class I conforming to IEC 61140 for XCS D |
|  |  | Class II conforming to IEC 61140 for XCS P |
| Degree of protection | Conforming to EN/IEC 60529 | IP 66 and IP 67 |
|  | Conforming to EN 50102 | IK 06 for XCS D IK 04 for XCS $\mathbf{P}$ |
| Repeat accuracy |  | 0.1 mm on the tripping points, with 1 million operating cycles for head with end plunger |
| Cable entry | Depending on model | Tapped entry for 13.5 cable gland, tapped ISO M20 $\times 1.5$ or tapped 1/2" NPT |
| Materials |  | XCS D: zamak bodies and heads, XCS P: plastic bodies, zamak heads Plastic protective cover, secured by 5 -lobe torque safety screw |
| Contact block characteristics |  |  |
| Rated operational characteristics |  | ~AC-15; B300 ( $\mathrm{Ue}=240 \mathrm{~V}$, le $=1.5 \mathrm{~A}$ ); lthe $=6 \mathrm{~A}$ <br> =- DC-13; R300 (Ue = 250 V, le = 0.1 A), conforming to EN/IEC 60947-5-1 Appendix A |
| Rated insulation voltage |  | $\mathrm{Ui}=400 \mathrm{~V}$ degree of pollution 3 conforming to IEN/IEC 60947-1 $\mathrm{Ui}=300 \mathrm{~V}$ conforming to UL 508, CSA C22-2 $\mathrm{n}^{\circ} 14$ |
| Rated impulse withstand voltage |  | U imp $=4 \mathrm{kV}$ conforming to EN/IEC 60947-1, EN/IEC 60664 |
| Positive operation (depending on model) |  | NC contacts with positive opening operation conforming to IEN/IEC 60947-5-1 Appendix K |
| Resistance across terminals |  | $\leqslant 25 \mathrm{~m} \Omega$ conforming to EN/IEC 60255-7 category 3 |
| Short-circuit protection |  | 6 A cartridge fuse type gG (gl) |
| Connection (screw clamp terminals) |  | Clamping capacity, min: $1 \times 0.34 \mathrm{~mm}^{2}$, max: $1 \times 1 \mathrm{~mm}^{2}$ or $2 \times 0.75 \mathrm{~mm}^{2}$ |
| Minimum actuation speed (for head with end plunger) | Snap action | $0.01 \mathrm{~m} /$ minute |
|  | Slow break | $6 \mathrm{~m} / \mathrm{minute}$ |

(1) Using an appropriate and correctly connected control system.

Electrical durability
Conforming to EN/IEC 60947-5-1 Appendix C
Utilisation categories AC-15 and DC-13
Maximum operating rate: 3600 operating cycles/hour
Load factor: 0.5

- Load factor: 0.5

AC supply
$50 / 60 \mathrm{~Hz} ~$
תm inductive circuit


Slow break contacts


References, characteristics, dimensions

## Safety detection solutions

## Limit switches

Compact design, metal, type XCS D
Complete switches with 1 cable entry

| Type of head | \| Plunger |  | \| Rotary |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |
| Type of operator | Metal end plunger | Steel roller plunger | Thermoplastic roller lever | Steel roller lever |
| References of complete switches with 3-pole 2 NC + 1 NO snap action contact |  |  |  |  |
| With ISO M20 x 1.5 cable entry |  |  |  |  |
|  | XCS D3910P20 $\Theta$ | XCS D3902P20 | XCS D3918P20 | XCS D3919P20 |
| With Pg 13.5 cable entry |  |  |  |  |
|  | XCS D3910G13 | XCS D3902G13 | XCS D3918G13 | XCS D3919G13 |
| With 1/2" NPT cable entry |  |  |  |  |
|  | XCS D3910N12 | XCS D3902N12 $\Theta$ | XCS D3918N12 | XCS D3919N12 |
| Weight (kg) | 0.215 | 0.220 | 0.255 | 0.255 |
| Contact function diagrams |  |  |  |  |
|  |  |  |  |  |
| Contact operation | closed $(A)=$ cam displacement <br> open $(P)=$ positive opening point |  |  |  |
| Characteristics |  |  |  |  |
| Switch actuation Type of actuation | On end $\quad$ By $30^{\circ} \mathrm{cam}$ | By $30^{\circ} \mathrm{cam}$ |  |  |
|  |  |  |  |  |
| Maximum actuation speed | $0.5 \mathrm{~m} / \mathrm{s}$ |  | $1.5 \mathrm{~m} / \mathrm{s}$ |  |
| Mechanical durability (in millions of operating cycles) | 15 10 <br> 15 N 12 N |  |  |  |
| Minimum force or torque For tripping |  |  | 0.1 N.m |  |
| For positive opening | 45 N | 36 N | $0.25 \mathrm{~N} . \mathrm{m}$ |  |
| Cable entry | 1 entry tapped $\mathrm{M} 20 \times 1.5 \mathrm{~mm}$ for ISO cable gland, clamping capacity 7 to 13 mm1 entry tapped Pg 13.5 for cable gland, clamping capacity 9 to 12 mm1 entry tapped for $1 / 2^{\prime \prime}$ NPT (USAS B2-1) conduit |  |  |  |
| Dimensions |  |  |  |  |
| (1) Tapped entry for ISO M20 1.5 or Pg 13.5 cable gland or tapped 1/2" NPT. <br> (2) 2 elongated holes $\varnothing 4.3 \times 6.3 \mathrm{~mm}$ on 22 mm centres, 2 holes $\varnothing 4.3$ on 20 mm centres. <br> (3) $2 \times \varnothing 3$ holes for support studs, depth 4 mm . |  |  |  |  |

References, characteristics, dimensions (continued)

## Safety detection solutions

## Limit switches

Compact design, metal, type XCS D
Complete switches with 1 cable entry


References, characteristics, dimensions

## Safety detection solutions

## Limit switches

Compact design, plastic, type XCS P
Complete switches with 1 cable entry


References, characteristics, dimensions (continued)

## Safety detection solutions

## Limit switches

Compact design, plastic, type XCS P
Complete switches with 1 cable entry


## Presentation

## Safety detection solutions

Lever or spindle operated switches
Plastic, double insulated, turret head,
types XCS PL, XCS TL, XCS PR and XCS TR

With rotary operating head, with elbowed lever (flush with rear of switch) or straight lever, for hinged covers and guards


With rotary operating head, with spindle operator, for hinged covers and guards


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With rotary operating head, with elbowed lever (flush with rear of switch) or straight lever, for hinged covers and guards


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## With rotary operating head, with spindle operator, for hinged covers and guards



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## Characteristics

## Safety detection solutions

## Lever or spindle operated switches <br> Plastic, double insulated, turret head, types XCS PL, XCS TL, XCS PR and XCS TR

| Environment characteristics |  |  |
| :---: | :---: | :---: |
| Conformity to standards | Products | EN/IEC 60947-5-1, EN/IEC 60947-5-4, UL 508, CSA C22-2 ${ }^{\circ} 14$ |
|  | Machine assemblies | EN/IEC 60204-1, EN/ISO 14119 |
| Product certifications |  | UL, CSA, BG |
| Maximum safety level (1) |  | PL=e, category 4 conforming to EN/ISO 13849-1 and SIL CL3 conforming to EN/IEC 62061 |
| Reliability data $\mathrm{B}_{10 \mathrm{~d}}$ |  | 5000000 (value given for a service life of 20 years, limited by mechanical or contact wear) |
| Protective treatment |  | Standard version: "TC" and "TH" |
| Ambient air temperature | For operation | $-25 \ldots+70^{\circ} \mathrm{C}$ |
|  | For storage | $-40 . . .+70^{\circ} \mathrm{C}$ |
| Vibration resistance |  | $50 \mathrm{gn}(10 . . .500 \mathrm{~Hz})$ conforming to EN/IEC 60068-2-6 |
| Shock resistance |  | 50 gn (duration 11 ms ) conforming to EN/IEC 60068-2-27 |
| Electric shock protection |  | Class 2 conforming to EN/IEC 60536 |
| Degree of protection |  | IP 67 conforming to EN/IEC 60529 |
| Cable entry |  | XCS Pe: 1 entry tapped M16 $\times 1.5$ for ISO cable gland (clamping capacity 4.5 to 10 mm ) or for $\mathrm{n}^{\circ} 11$ (Pg 11) cable gland conforming to NF C 68-300 (DIN Pg 11) (clamping capacity 7 to 10 mm ) or tapped for $1 / 2^{\prime \prime}$ NPT (USAS B2-1) conduit. <br> XCS T•: 2 entries tapped M16 $\times 1.5$ for ISO cable gland (clamping capacity 4.5 to 10 mm ) or for $\mathrm{n}^{\circ} 11$ (Pg 11) cable gland conforming to NF C $68-300$ (DIN Pg 11) (clamping capacity 7 to 10 mm ) or for $1 / 2^{\prime \prime}$ NPT conduit using adaptor DE9 RA1012 in one of the $\mathrm{n}^{\circ} 11$ tapped entries and a blanking plug in the other. |
| Materials |  | Polyamide PA66 fibreglass impregnated case. Stainless steel lever and fixings |
| Contact block characteristics |  |  |
| Rated operational characteristics | 2 and 3 contact versions slow break | XCS PL, XCS TL, XCS PR and XCS TR: $\sim A C-15, A 300: ~ U e=240 \mathrm{~V}, \mathrm{le}=3 \mathrm{~A}$ or $\mathrm{Ue}=120 \mathrm{~V}$, $\mathrm{le}=6 \mathrm{~A}$ <br> All models: -. DC-13, Q300: $\mathrm{Ue}=250 \mathrm{~V}, \mathrm{le}=0.27 \mathrm{~A}$ or $\mathrm{Ue}=125 \mathrm{~V}, \mathrm{le}=0.55 \mathrm{~A}$ conforming to IEC/EN 60947-5-1 |
| Rated insulation voltage | 2 and 3 contact versions | XCS PL, XCS TL, XCS PR, XCS TR: <br> $\mathrm{Ui}=500 \mathrm{~V}$ conforming to IEC/EN 60947-1 <br> Ui $=300 \mathrm{~V}$ conforming to UL 508, CSA C22-2 $\mathrm{n}^{\circ} 14$ |
|  | 3 contact version | XCS PL, XCS PR: <br> Ui $=400$ V degree of pollution 3 conforming to EN/IEC 60947-1 Ui $=300 \mathrm{~V}$ conforming to UL 508, CSA C22-2 $\mathrm{n}^{\circ} 14$ |
| Rated impulse withstand voltage | 2 and 3 contact versions | XCS PL, XCS TL, XCS PR, XCS TR: Uimp = 6 kV conforming to EN/IEC 60947-5-1 |
|  | 3 contact version | XCS PL, XCS PR: Uimp = 4 kV conforming to EN/IEC 60947-5-4 |
| Positive operation |  | NC contacts with positive opening operation conforming to EN/IEC 60947-5-1, Section 3 |
| Resistance across terminals |  | $\leqslant 30 \mathrm{~m} \Omega$ conforming to EN/IEC 60947-5-4 |
| Short-circuit protection | 2 and 3 contact versions | XCS PL, XCS TL, XCS PR, XCS TR: 10 A cartridge fuse type gG (gl) |
|  | 3 contact version | XCS PL, XCS PR: 6 A cartridge fuse type gG (gl) |
| Connection | 2 contact version | XCS PL, XCS TL, XCS PR, XCS TR: <br> Clamping capacity, min: $1 \times 0.5 \mathrm{~mm}^{2}$, max: $2 \times 1.5 \mathrm{~mm}^{2}$ with or without cable end |
|  | 3 contact version | XCS PL, XCS PR: <br> Clamping capacity, min: $1 \times 0.34 \mathrm{~mm}^{2}$, max: $1 \times 1 \mathrm{~mm}^{2}$ or $2 \times 0.75 \mathrm{~mm}^{2}$ |
| Minimum actuation speed | 3 contact version | $0.01 \mathrm{~m} / \mathrm{second}$ |
| Complementary characteristics |  |  |
| Tripping angle |  | $5^{\circ}$ |
| Mechanical durability |  | 1 million operating cycles |
| Minimum torque |  | For tripping: $0.1 \mathrm{~N} . \mathrm{m}$, for positive opening: $0.25 \mathrm{~N} . \mathrm{m}$ (XCS PL and XCS PR). 0.45 N.m (XCS TL and XCS TR) |

(1) Using an appropriate and correctly connected control system.

## Electrical durability

Conforming to EN/IEC 60947-5-1 Appendix C. Utilisation categories AC-15 and DC-13. Load factor: 0.5
2 and 3 slow break contact versions


Maximum operating rate: 3600 operating cycles/hour.

## 3 slow break contact version (XCS PL/PR)



DC supply ...
Power broken in W for 1 million operating cycles

| Voltage | V | $\mathbf{2 4}$ | $\mathbf{4 8}$ | $\mathbf{1 2 0}$ |
| :--- | :--- | :--- | :--- | :--- |
| m | W | 13 | 9 | 7 |

References, characteristics

## Safety detection solutions

Lever or spindle operated switches
Plastic, double insulated, turret head ${ }_{(1)}$, types XCS PL, XCS TL, XCS PR and XCS TR 1 or 2 cable entries
Type

References of complete switches ( $\Theta$ NC contact with positive opening operation) with 1 cable entry tapped ISO M16 x 1.5

| 2-pole <br> 1 NC + 1 NO <br> break before make, slow break |  | XCS PL592 | XCS PL582 | XCS PL572 | XCS PL562 | XCS PL552 | XCS PR552 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { 2-pole } \\ & 2 \text { NC } \\ & \text { slow break } \end{aligned}$ | $\left.\begin{array}{l\|l\|} F & \bar{N} \\ \sim & - \\ \sim & \tilde{N} \end{array} \right\rvert\,$ | XCS PL792 | XCS PL782 | XCS PL772 | XCS PL762 | XCS PL752 | XCS PR752 |
| 3-pole <br> 1 NC + 2 NO <br> break before make, slow break |  | - | - | - | XCS PL862 | - | XCS PR852 |
| 3 -pole $2 \mathrm{NC}+1 \mathrm{NO}$ break before make, slow break |  | - | XCS PL982 | - | XCS PL962 | - | XCS PR952 |
| Weight (kg) |  | 0.095 | 0.095 | 0.095 | 0.095 | 0.095 | 0.105 |



References of complete switches ( $\Theta$ NC contact with positive opening operation) with 2 cable entries tapped ISO M16 $\times 1.5$

| 3-pole $1 \text { NC + } 2 \text { NO }$ <br> break before make, slow break |  | XCS TL592 | XCS TL582 | XCS TL572 | XCS TL562 | XCS TL552 | XCS TR552 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3-pole <br> $2 \mathrm{NC}+1$ NO <br> break before make, slow break |  | XCS TL792 | XCS TL782 | XCS TL772 | XCS TL762 | XCS TL752 | XCS TR752 |
| $\begin{aligned} & \text { 3-pole } \\ & \text { 3 NC } \\ & \text { slow break } \end{aligned}$ |  | XCS TL892 | XCS TL882 | XCS TL872 | XCS TL862 | XCS TL852 | XCS TR852 |
| Weight (kg) |  | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 | 0.155 |

To order a complete switch with 1 or 2 Pg 11 cable entries, replace the last number in the reference (2) by 1.
Example: XCS TL592 becomes XCS TL591.
References of complete switches with 1 or 2 cable entries for 1/2" NPT conduit
To order a complete type XCS PLゃゃ» or XCS PR $\bullet \bullet \bullet$ switch with 1 cable entry for 1/2" NPT conduit, replace the last number in the reference (2) by 3.
Example: XCS PL592 becomes XCS PL593
For a complete switch type XCS TL or XCS TR with 2 entries for 1/2" NPT conduit, use adaptor DE9 RA1012.

|  | Description | Sold in lots of 10 | Unit <br> reference |
| :--- | :--- | :--- | :--- |
|  | $1 / 2$ NPT conduit adaptor | 10 | DE9 RA1012 |

(1) Head adjustable in $90^{\circ}$ steps throughout $360^{\circ}$. Switches supplied with 2 additional self-locking screws for positive fixing of the head.
(2) For switches with 80 mm spindle: replace the $2^{n d}$ number in the reference (5) by 6. Example: XCS PR561. The weight increases by 0.032 kg . Other versions: please consult our Customer Care Centre.

Setting-up, dimensions, schemes

## Safety detection solutions

## Lever or spindle operated switches

Plastic, double insulated, turret head,
types XCS PL, XCS TL, XCS PR and XCS TR
1 or 2 cable entries

(2) 1 entr
$\varnothing$ : 2 elongated holes $\varnothing 4.3 \times 8.3$ on 22 centres,
2 holes $\varnothing 4.3$ on 20 centres

## XCS PR•••



[^14]Wiring up to PL=b, category 1 conforming to EN/ISO 13849-1
Example with cable short-circuit protection fuse


## Schemes

Wiring up to PL=d, category 3 conforming to EN/ISO 13849-1
Example with 3-pole $1 \mathrm{NC}+2$ NO contact with mixed redundancy of the contacts and the associated control relays

(1) 2 entries tapped ISO M16 1.5 or tapped for $n^{\circ} 11$ (Pg 11) cable gland
(2) 2 elongated holes $\varnothing 4.3 \times 8.3$ on 22 centres,

2 holes $\varnothing 4.3$ on 20 centres
(3) 2 elongated holes $\varnothing 5.3 \times 13.3$
$\mathrm{L}=30$ (XCS TR•5•) or 80 (XCS TR•6•)

Presentation, characteristics

## Safety detection solutions

Key operated switches
Metal, turret head, types XCS A, XCS and XCS C Plastic, double insulated, turret head, types XCS MP or XCS PA and XCS TA

## Metal, types XCS A, XCS B,

 XCS CKey operated switches with or without locking of the actuator


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Plastic, types XCS MP, XCS PA XCS TA

## Key operated switches with or without locking of the actuator



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## Environment characteristics

| Key operated switch type |  | XCS A, XCS B, XCS C (metal) | XCS MP, XCS PA, XCS TA (plastic) |
| :---: | :---: | :---: | :---: |
| Conformity to standards | Products | EN/IEC 60947-5-1, UL 508, CSA C22-2 n 14 |  |
|  | Machine assemblies | EN/IEC 60204-1, EN/ISO 14119 |  |
| Product certifications |  | UL, CSA | UL, CSA (cULus for XCS MP) |
| Maximum safety level (1) |  | PL=e, category 4 conforming to EN/ISO 13849-1 and SIL CL3 conforming to EN/IEC 62061 |  |
| Reliability data $\mathrm{B}_{10 \mathrm{~d}}$ |  | 5000000 (value given for a service life of 20 years, limited by mechanical or contact wear) |  |
| Protective treatment |  | Standard version: "TC" |  |
| Ambient air temperature | For operation | $-25 . . .+70^{\circ} \mathrm{C}$ |  |
|  | For storage | $-40 \ldots+70^{\circ} \mathrm{C}\left(-25 \ldots+80^{\circ} \mathrm{C}\right.$ for XCS MP) |  |
| Vibration resistance |  | $5 \mathrm{gn}(10 \ldots 500 \mathrm{~Hz})$ conforming to EN/IEC 60068-2-6 ( $6 \mathrm{gn} \mathrm{(10...55} \mathrm{Hz)} \mathrm{for} \mathrm{XCS} \mathrm{MP)}$ |  |
| Shock resistance |  | 10 gn (duration 11 ms ) conforming to EN/IEC 60068-2-27 (50 gn (duration 11 ms ) for XCS MP) |  |
| Electric shock protection |  | Class 1 conforming to EN/IEC 60536 Class 2 conforming to EN/IEC 60536 |  |
| Degree of protection |  | IP 67 conforming to EN/IEC 60529 and EN/IEC 60947-5-1 (2) |  |
| Cable entry |  | 1 entry tapped ISO M20 $\times 1.5$ (clamping capacity 7 to 13 mm ) or tapped for $\mathrm{n}^{\circ} 13$ (Pg 13.5) cable gland conforming to NFC 68 -300 (clamping capacity 9 to 12 mm ) or for 1/2" NPT (USAS B2-1) conduit | 1 entry (XCS PA) or 2 entries (XCS TA) tapped for ISO M16 $\times 1.5$ cable gland (clamping capacity 4.5 to 10 mm ) or for $\mathrm{n}^{\circ} 11$ (Pg 11) cable gland, or tapped $1 / 2^{\prime \prime}$ NPT, or for $1 / 2^{\prime \prime}$ NPT (USAS B2-1) conduit using metal adaptor DE9 RA1012) for XCS TA (other entry fitted with blanking plug). |
| Connecting cable |  | - | Pre-cabled, either $4 \times 0.5 \mathrm{~mm}^{2}$ or $6 \times 0.5 \mathrm{~mm}^{2}$ (XCS MP) |
| Materials |  | XCS A/B/C <br> Zamak case <br> Actuators (all types): steel XC60, surface treated | XCS MP/PA/TA <br> Polyamide PA66 fibreglass impregnated case |
|  |  |  |  |

(1) Using an appropriate and correctly connected control system.
(2) Live parts of these switches are protected against the penetration of dust and water. However, when installing take all necessary precautions to prevent the penetration of solid bodies, or liquids with a high dust content, into the actuator aperture. Not recommended for use in saline atmospheres.

## Safety detection solutions

Key operated switches
Metal, turret head, types XCS A, XCS and XCS C
Plastic, double insulated, turret head,
types XCS MP or XCS PA and XCS TA

Contact block characteristics

| Rated operational characteristics | 2 and 3 contact, slow break | XCS A, XCS B, XCS C, XCS TA, XCS PA: ~ AC-15, A300: Ue $=240 \mathrm{~V}$, le $=3 \mathrm{~A}$ or $\mathrm{Ue}=120 \mathrm{~V}, \mathrm{le}=6 \mathrm{~A}$ <br> XCS MP: ~AC-15, C300: $\mathrm{Ue}=240 \mathrm{~V}$, $\mathrm{le}=0.75 \mathrm{~A}$ or $\mathrm{Ue}=120 \mathrm{~V}$, le $=1.5 \mathrm{~A}$ All models: --- DC-13, Q300: $\mathrm{Ue}=250 \mathrm{~V}$, $\mathrm{le}=0.27 \mathrm{~A}$ or $\mathrm{Ue}=125 \mathrm{~V}$, $\mathrm{le}=0.55 \mathrm{~A}$ conforming to EN/IEC 60947-5-1 |
| :---: | :---: | :---: |
|  | 2 contact, snap action | XCS PA: ~AC-15, A300: Ue = 240 V , le $=3 \mathrm{~A}$; lthe $=10 \mathrm{~A}$ <br> $=-\mathrm{DC}-13, \mathrm{Q} 300: \mathrm{Ue}=250 \mathrm{~V}$, le $=0.27 \mathrm{~A}$ or $\mathrm{Ue}=125 \mathrm{~V}$, $\mathrm{le}=0.55 \mathrm{~A}$ conforming to $\mathrm{EN} / \mathrm{IEC}$ 60947-5-1 |
|  | 3 contact, snap action | XCS PA: ~AC-15, B300: Ue $=240 \mathrm{~V}$, le $=1.5 \mathrm{~A}$; Ithe $=6 \mathrm{~A}$ <br> =- DC-13, R300: Ue $=250 \mathrm{~V}$, le $=0.1 \mathrm{~A}$ or $\mathrm{Ue}=125 \mathrm{~V}$, le $=0.55 \mathrm{~A}$ conforming to $\mathrm{EN} / \mathrm{IEC} 60947-5-1$ |
| Conventional thermal current in enclosure |  | XCS A, XCS B, XCS C, XCS PA ( 2 \& 3 slow break contact and 2 snap action contact versions) XCS PA (3 snap action contact version): Ithe $=6 \mathrm{~A}$ <br> XCS MP: Ithe $=2.5 \mathrm{~A}$ |
| Rated insulation voltage | 2 and 3 contact | ```3 contact (XCS A, XCS B, XCS C, XCS TA), 2 contact (XCS PA), 2 and 3 contact (XCS MP): Ui=500 V conforming to EN/IEC 60947-1; Ui=300 V conforming to UL 508, CSAC22-2 n}\mp@subsup{}{}{\circ}1``` |
|  | 3 contact | XCS PA: <br> Ui $=400 \mathrm{~V}$ degree of pollution 3 conforming to EN/IEC 60947-1 <br> $\mathrm{Ui}=300 \mathrm{~V}$ conforming to UL 508, CSA C22-2 $\mathrm{n}^{\circ} 14$ |
| Rated impulse withstand voltage | 2 and 3 contact | 3 contact (XCS A, XCS B, XCS C, XCS TA), 2 contact (XCS PA), 2 and 3 contact (XCS MP): Uimp $=6$ kV conforming to EN/IEC 60947-5-1 |
|  | 3 contact | XCS PA: <br> Uimp $=4 \mathrm{kV}$ conforming to EN/IEC 60947-5-4 |
| Positive operation |  | NC contacts with positive opening operation conforming to EN/IEC 60947-5-1, Section 3 |
| Resistance across terminals |  | $\leqslant 30 \mathrm{~m} \Omega$ conforming to EN/IEC 60947-5-4 |
| Short-circuit protection | 2 and 3 contact | 3 contact (XCS A, XCS B, XCS C, XCS TA), 2 contact (XCS PA), 2 and 3 contact (XCS MP): 10 A cartridge fuse type gG (gI) |
|  | 3 contact | XCS PA: <br> 6 A cartridge fuse type gG (gl) |
| Connection $\quad \begin{aligned} & \text { Pre-cabled } \\ & \\ & \begin{array}{l}\text { Screw clam } \\ \text { terminals }\end{array}\end{aligned}$ |  | $4 \times 0.5 \mathrm{~mm}^{2}$ or $6 \times 0.5 \mathrm{~mm}^{2}$ (XCS MP). PVC |
|  | 2 contact, snap action | XCS PA, XCS TA: <br> Clamping capacity, min: $1 \times 0.34 \mathrm{~mm}^{2}, \max : 2 \times 1.5 \mathrm{~mm}^{2}$ |
|  | 2 and 3 contact | 3 contact (XCS A, XCS B, XCS C, XCS TA), 2 contact (XCS PA): Clamping capacity, $\mathrm{min}: 1 \times 0.5 \mathrm{~mm}^{2}$, max: $2 \times 1.5 \mathrm{~mm}^{2}$ with or without cable end |
|  | 3 contact | XCS PA: clamping capacity, min: $1 \times 0.34 \mathrm{~mm}^{2}$, max: $1 \times 1 \mathrm{~mm}^{2}$ or $2 \times 0.75 \mathrm{~mm}^{2}$ |
| Electrical durability |  |  |
| Conforming to EN/IEC 60947-5-1 Appendix C. <br> Utilisation categories AC-15 and DC-13. <br> Maximum operating rate: 3600 operating cycles/hour. <br> Load factor: 0.5 |  | Only applicable to XCS MP: Conforming to EN/IEC 60947-5-1 Appendix C. <br> Utilisation categories AC-15 and DC-13. <br> Maximum operating rate: 900 operating cycles/hour. |

## AC supply

$50 / 60 \mathrm{~Hz} \sim$
m inductive circuit

Power broken in W for
5 million operating cycles.

## AC supply

$50 / 60 \mathrm{~Hz} \sim$ sm inductive circuit

DC supply ---
Power broken in W for
5 million operating cycles.

and 2 slow break contact version


| Voltage | V | $\mathbf{2 4}$ | $\mathbf{4 8}$ | $\mathbf{1 2 0}$ |
| :--- | :--- | :--- | :--- | :--- |
| m | W | 13 | 9 | 7 |

ed to the values shown with reverse polarity.
3 slow break contact version XCS PA


References, characteristics

## Safety detection solutions

Key operated switches
Plastic, fixed head, type XCS MP
Pre-cabled, length $2 \mathrm{~m}, 5 \mathrm{~m}$ or 10 m
Type of switch $\mid$ Without locking of actuator


References of switches without actuator $(\Theta$ NC contact with positive opening operation) (1)(3)

| 2-pole 1 NC + 1 NO <br> break before make, slow break (2) |  | XCS MP59L• |
| :---: | :---: | :---: |
| 2-pole 2 NC slow break (2) |  | XCS MP79L• |
| 3-pole 2 NC + 1 NO break before make, slow break (2) |  | XCS MP70L• <br> $\Theta$ |
| 3-pole 3 NC slow break (2) |  | XCS MP80L• |
| Weight (kg) |  | 0.110 |

Complementary characteristics not shown under general characteristics (page 32921/2)

| Actuation speed | Maximum: $1.5 \mathrm{~m} / \mathrm{s}$, minimum: $0.05 \mathrm{~m} / \mathrm{s}$ |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Resistance to forcible withdrawal of actuator | 8 N |  |  |  |  |
| Mechanical durability | >1 million operating cycles |  |  |  |  |
| Pre-cabled connection | $4 \times 0.5 \mathrm{~mm}^{2}$ or $6 \times 0.5 \mathrm{~mm}^{2}$ |  |  |  |  |
| Maximum operating rate | For maximum durability: 1200 operating cycles per hour |  |  |  |  |
| Minimum force for extraction of actuator | $\geqslant 8 \mathrm{~N}$ |  |  |  |  |
| References of actuators |  |  |  |  |  |
| Description | Straight actuator | Right-angled actuator | Pivoting actuator For right-hand door | For left-hand doo |  |
|  |  |  |  |  |  |
| For guard switches XCS MP | XCS $\mathbf{Z 8 1}$ | XCS Z84 | XCS Z83 | XCS $\mathbf{Z 8 5}$ |  |
| Weight (kg) | 0.015 | 0.025 | 0.085 | 0.085 |  |
| Separate components |  |  |  |  |  |
| Description | Unit reference |  |  |  | Weight kg |
| Blanking plugs for operating head slot (Sold in lots of 10) | XCS 229 |  |  |  | 0.005 |

(1) Blanking plug for operating head slot included with switch.
(2) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(3) Basic reference, to be completed: replace the dot by 2 for a 2 m long cable, by 5 for a 5 m long cable or by 10 for a 10 m long cable. Example: XCS MP59L• becomes XCS MP59L10 for a switch with a 10 m long cable.

| Dimensions: <br> page 32938/3 | Setting-up: <br> page 32938/4 | Schemes: <br> page 32938/5 |  |
| :--- | :--- | :--- | :--- |
| 2 |  | Schneider <br> EVlectric | 32938-EN_Ver5.0 |

Safety detection solutions
Key operated switches
Plastic, fixed head, type XCS MP
Pre-cabled, length $2 \mathrm{~m}, 5 \mathrm{~m}$ or 10 m

## Dimensions

XCS MP XCS Z81

(1) $\varnothing 7.6$, length 2,5 or 10 m .


XCS Z84


XCS Z83

(1) 2 elongated holes $\varnothing 4.2 \times 6$.

XCS Z85

(1) 2 elongated holes $\varnothing 4.2 \times 6$.

Safety detection solutions
Key operated switches
Plastic, fixed head, type XCS MP
Pre-cabled, length $2 \mathrm{~m}, 5 \mathrm{~m}$ or 10 m

Operating radius required for actuator XCS Z81


XCS Z83


XCS Z84


XCS Z85


Functional diagrams
XCS MP80•

closed
Contact operation

open

Schemes Note: These schemes are given as examples only, the designer must refer to the relevant safety standards for guidance.
Wiring up to PL=b, category 1 conforming to EN/SO 13849-1
Example with 3-pole $2 \mathrm{NC}+1 \mathrm{NO}$ contact and protection fuse to prevent shunting of the NC contact, either by cable damage or by tampering.

(1) Signalling contact

Wiring to PL=e, category 4 conforming to EN/ISO 13849-1 and SIL CL3 conforming to EN/IEC 62061. Wiring method used in conjunction with Preventa safety module.
(The guard switch should be used in conjunction with a safety limit switch to give electrical/mechanical redundancy).
Method for machines with quick rundown time (low inertia)
Locking or interlocking device based on the principle of redundancy and self-monitoring.
The safety modules ensure these functions.


[^15]
# Safety detection solutions 

Key operated switches
Plastic, turret head (1), types XCS PA and XCS TA
1 or 2 cable entries


References of switches without actuator $(\Theta$ NC contact with positive opening operation) with 1 or 2 cable entries tapped ISO M16 $\times 1.5$

| 2-pole $1 \mathrm{NC}+1 \mathrm{NO}$ (2) break before make, slow break |  | XCS PA592 | $\Theta$ | - |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 2-pole 1 NC + 1 NO (2) snap action |  | XCS PA192 | $\Theta$ |  |  |
| $\text { 2-pole } 1 \mathrm{NO}+1 \mathrm{NC} \text { (2) }$ <br> make before break, slow break |  | XCS PA692 | $\Theta$ | - |  |
| 2-pole 2 NC (2) slow break |  | XCS PA792 | $\Theta$ | - |  |
| 2-pole 2 NC (2) snap action |  | XCS PA292 | $\Theta$ |  |  |
| 3-pole $1 \mathrm{NC}+2 \mathrm{NO}$ (2) break before make, slow break |  | XCS PA892 | $\Theta$ | XCS TA592 | $\Theta$ |
| 3-pole 1 NC + 2 NO (2) snap action |  | XCS PA392 | $\Theta$ | - |  |
| 3-pole $2 \mathrm{NC}+1$ NO (2) break before make, slow break |  | XCS PA992 | $\Theta$ | XCS TA792 | $\Theta$ |
| 3-pole $2 \mathrm{NC}+1$ NO (2) snap action |  | XCS PA492 | $\Theta$ | - |  |
| 3-pole 3 NC (2) slow break |  | - |  | XCS TA892 | $\Theta$ |
| Weight (kg) |  | 0.110 |  | 0.160 |  |

References of switches without actuator $(\Theta$ NC contact with positive opening operation) with 1 or 2 cable entries tapped Pg 11 or 1/2" NPT
To order a switch with 1 or 2 cable entries for $n^{\circ} 11$ ( Pg 11 ) cable gland (clamping capacity 7 to 10 mm ), replace the last number ( 2 ) by 1 in the selected reference. Example: XCS PA592 becomes XCS PA591.
To order a switch with 1 or 2 cable entries for $1 / 2^{\prime \prime}$ NPT conduit (one $n^{\circ} 11$ tapped entry fitted with metal adaptor DE9 RA1012), replace the last number (2) by 3 in the selected reference. Example: XCA TA592 becomes XCS TA593
Complementary characteristics not shown under general characteristics (page 32921/2)

| Actuation speed | Maximum: $0.5 \mathrm{~m} / \mathrm{s}$, minimum: $0.01 \mathrm{~m} / \mathrm{s}$ |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Resistance to forcible withdrawal of actuator | XCS PA, XCS TA: 10 N ( 50 N using actuators XCS Z12 or XCS Z13 together with guard retaining device XCS Z21) |  |  |  |
| Mechanical durability | XCS PA, XCS TA: > 1 million operating cycles |  |  |  |
| Maximum operating rate | For maximum durability: 600 operating cycles per hour |  |  |  |
| Minimum force for positive opening | $\geqslant 15 \mathrm{~N}$ |  |  |  |
| Cable entry | XCS PA: 1 entry tapped M16 $\times 1.5$ for ISO cable gland. <br> XCS TA: 2 entries tapped M16 x 1.5 for ISO cable gland. |  |  |  |
| Materials | Body and head: polyamide PA66, fibreglass impregnated |  |  |  |
| References of accessories |  |  |  |  |
|  | Description | For use with | Unit reference | Weight kg |
|  | Blanking plugs for operating head slot (Sold in lots of 10) | XCS PA, XCS TA | XCS Z28 | 0.050 |
|  | Padlocking device to prevent insertion of actuator, for up to 3 padlocks (padlocks not included) | XCS PA, XCS TA | XCS Z91 | 0.053 |
| XCS Z91 XCS Z200 | Actuator centring device (3) (Fixing screws included) | XCS PA, XCS TA | XCS Z200 | 0.022 |

(1) Head adjustable in $90^{\circ}$ steps throughout $360^{\circ}$. Blanking plug for operating head slot included with switch. (3) Do not use with XCS $Z 91$.
(2) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.

Other versions: please consult our Customer Care Centre.

References (continued), dimensions

## Safety detection solutions

Key operated switches
Plastic, turret head, types XCS PA and XCS TA
1 or 2 cable entries

References of actuators and guard retaining device

|  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Description | Straight actuator | Actuator with wide fixing (1) |  | Pivoting actuator | Right-angled actuator | Guard retaining device (2) |
| For key operated switches XCS PA, TA | XCS Z11 | XCS Z12 | XCS $\mathrm{Z15}$ | XCS Z13 | XCS Z14 | XCS Z21 |
| Weight (kg) | 0.015 | 0.015 | 0.012 | 0.085 | 0.025 | 0.080 |

(1) 2 actuator lengths, $X C S$ Z12: $L=40 \mathrm{~mm}, X C S ~ Z 15: L=29 \mathrm{~mm}$.
(2) Only for use with key operated switches XCS PA and XCS TA (without actuator centring device XCS Z200) used in conjunction with actuators XCS Z12, XCS Z13 or XCS Z15.


Safety detection solutions
Key operated switches
Plastic, turret head, types XCS PA and XCS TA
1 or 2 cable entries

$\varnothing$ : 2 elongated holes $\varnothing 4.7 \times 10$
$\bar{\varnothing}: 1$ elongated hole $\varnothing 4.7 \times 10$

$\mathrm{R}=$ minimum radius

## Safety detection solutions

## Key operated switches

Plastic, turret head, types XCS PA and XCS TA
1 or 2 cable entries


Contact operation

- ClosedOpen

Unstable

## Setting-up

Functional diagrams

## XCS TA8••



Contact operation

- Closed
$\square$ Open
- Unstable

Schemes Note: These schemes are given as examples only, the designer must refer to the relevant safety standards for guidance. Wiring to PL=b, category 1 conforming to EN/ISO 13849-1
Example with 3-pole $1 \mathrm{NC}+2 \mathrm{NO}$ contact and protection fuse to prevent shunting of the NC contact, either by cable damage or by tampering.


## Wiring to PL=d, category 3 conforming to

## EN/ISO 13849-1

Example with 2-pole $1 \mathrm{NC}+1 \mathrm{NO}$ contact with mixed redundancy of the contacts and the associated control relays. To activate K1, it is necessary to remove and re-insert the actuator when the supply is switched on.

(1) Signalling contact.

Wiring to PL=e, category 4 conforming to EN/ISO 13849-1 and SIL CL3 conforming to EN/IEC 62061
Wiring method used in conjunction with safety module
(The key operated switch should be used in conjunction with a safety limit switch to give electrical/mechanical redundancy)

## Method for machines with quick rundown time (low inertia)

Locking or interlocking device based on the principle of redundancy and self-monitoring The safety modules ensure these functions.


Safety detection solutions<br>Key operated switches<br>Metal, turret head (1), types XCS A, XCS B and XCS C 1 cable entry

| Type of switch | Without locking of actuator |  |  | With locking of actuator, manual unlocking (2) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
| LED indication on opening of NC contacts | Without | 1 orange LED 24/48 V ~ | 1 orange <br> LED <br> 110/ <br> 240 V ~ | Without | 1 orange LED $24 /$ $48 \mathrm{~V} \sim$ | $\begin{array}{\|l\|} \hline 1 \text { orange } \\ \text { LED } \\ 110 / \\ 240 \mathrm{~V} \sim \end{array}$ | Without | $\begin{array}{\|l} \hline 1 \text { orange } \\ \text { LED } \\ 24 / 48 \mathrm{~V} \sim \end{array}$ | $\begin{array}{\|l} \hline 1 \text { orange } \\ \text { LED } \\ 110 / \\ 240 \mathrm{~V} \sim \end{array}$ |
| References of switches without actuator ( $\Theta$ NC contact with positive opening operation) with 1 cable entry tapped ISO M20 x 1.5 |  |  |  |  |  |  |  |  |  |
| 3-pole <br> 1 NC + 2 NO <br> break before make, slow break (3) | XCS A502 | XCS A512 | XCS A522 | XCS B502 | XCS B512 | \| XCS B522 | XCS C502 | XCS C512 | XCS C522 |
|  | XCS A702 | XCS A712 | XCS A722 | XCS B702 | XCS B712 | XCS B722 | XCS C702 | XCS C712 | XCS C722 |
|  | XCS A802 | - | - | XCS B802 | - | - | XCS C802 | - | - |
| Weight (kg) | 0.440 | 0.440 | 0.440 | 0.475 | 0.475 | 0.475 | 0.480 | 0.480 | 0.480 |
| References of switches without actuator ( $\Theta$ NC contact with positive opening operation) with 1 cable entry tapped Pg 13.5 |  |  |  |  |  |  |  |  |  |

To order a switch with a Pg 13.5 cable entry, replace the last number (2) by 1 in the selected reference.
Example: XCS A502 becomes XCS A501.

## References of switches without actuator ( $\Theta$ NC contact with positive opening operation) with 1 cable entry tapped 1/2" NPT

To order a switch with a 1/2" NPT cable entry, replace the last number (2) by $\mathbf{3}$ in the selected reference.
Example: XCS A502 becomes XCS A503.

## Complementary characteristics not shown under general characteristics (page 32921/3)

| Actuation speed | Maximum: $0.5 \mathrm{~m} / \mathrm{s}$, minimum: $0.01 \mathrm{~m} / \mathrm{s}$ |
| :--- | :--- |
| Resistance to forcible withdrawal <br> of actuator | XCS B and XCS C: 1500 N |
| Mechanical durability | XCS A: $>1$ million operating cycles <br> XCS B and XCS C: 0.6 million operating cycles |
| Maximum operating rate | For maximum durability: 600 operating cycles per hour |
| Minimum force for extraction of actuator | $\geqslant 20 \mathrm{~N}$ |
| Cable entry | XCS A, XCS B, XCS C: 1 cable entry <br> Entry tapped ISO M20 1.5, clamping capacity 7 to 13 mm |
| Materials | Body: Zamak. Head: Zamak. Safety screws: 5 -lobe torque. Protective plate: steel. |
| References of actuators |  |


(1) Head adjustable in $90^{\circ}$ steps throughout $360^{\circ}$. Blanking plug for operating head slot included with switch.
(2) Unlocking by pushbutton for XCS B $\bullet \bullet \bullet$ and by key operated lock for XCS C $\bullet \bullet \bullet$ (2 keys included with switch).
(3) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.

Other versions: please consult our Customer Care Centre.

| Dimensions: | Schemes: |
| :--- | :--- |
| page 32923/3 | page 32923/5 |

Safety detection solutions
dimensions

Key operated switches
Metal，turret head，types XCS A，XCS B and XCS C 1 cable entry


## Dimensions

Key operated switches

（1） 1 tapped entry for cable gland
$\varnothing$ ： 2 elongated holes $\varnothing 5.3 \times 7.3$

## Safety detection solutions

Key operated switches
Metal, turret head, types XCS A, XCS B and XCS C 1 cable entry


Fixing axis \% related to actuator.
Operating radius required for actuator
XCS Z01


XCS Z02


XCS Z03

$R=$ minimum radius

Metal, turret head, types XCS A, XCS B and XCS C 1 cable entry


Schemes Note: These schemes are given as examples only, the designer must refer to the relevant safety standards for guidance.

Wiring up to PL=b, category 1 conforming to EN/SO 13849-1
Example with 3-pole $1 \mathrm{NC}+2$ NO contact and protection fuse to prevent shunting of the NC contact, either by cable damage or by tampering.

(1) Signalling contact

Wiring up to PL=d, category 3 conforming to EN/ISO 13849-1

Example with 3-pole $1 \mathrm{NC}+2$ NO contact with mixed redundancy of the contacts and the associated control relays. To activate K1, it is necessary to remove and re-insert the actuator when the supply is switched on.


H1: "actuator not inserted" indicator

Wiring to PL=e, category 4 conforming to EN/ISO 13849-1 and SIL CL3 conforming to EN/IEC 62061. Wiring method used in conjunction with Preventa safety module. (The key operated switch should be used in conjunction with a safety limit switch to give electrical/mechanical redundancy).
Method for machines with quick rundown time (low inertia)
Locking device based on the principle of redundancy and self-monitoring.
The safety modules ensure these functions.


Locking of actuator and operation in positive mode associated with a safety module.

| References: | Dimensions: |
| :--- | :--- |
| page 32923/2 | page 32923/3 |

## Safety detection solutions

## Safety interlock switches

by actuator, with solenoid, turret head
Metal, type XCS LF
Plastic, type XCS LE

## Metal, type XCS LF

## Safety interlock switches operating by actuator



## Safety interlock switches operating by actuator



Pages 32939/8 and 32939/9

| Environment characteristics |  |  |  |
| :---: | :---: | :---: | :---: |
| Guard switch type |  | XCS LF (metal) | XCS LE (plastic) |
| Conformity to standards | Products | EN/IEC 60947-5-1, EN/ISO 13849-1, EN/IEC 62061, UL 508, CSA C22-2 n 14 |  |
|  | Machine assemblies | EN/IEC 60204-1, EN/ISO 14119, EN/ISO 12100 |  |
| Product certifications |  | UL (1), CSA, TÜV (pending) |  |
| Maximum safety level (2) |  | PL=e, category 4 conforming to EN/ISO 13849-1 and SIL CL3 conforming to EN/IEC 62061 |  |
| Reliability data $\mathrm{B}_{10 \mathrm{~d}}$ |  | 5500000 (value given for a service life of 20 years, limited by mechanical or contact wear) |  |
| Protective treatment |  | Standard version: "TC" |  |
| Ambient air temperature | For operation | $-25 \ldots+60^{\circ} \mathrm{C}$ |  |
|  | For storage | $-40 \ldots+70^{\circ} \mathrm{C}$ |  |
| Vibration resistance |  | $5 \mathrm{gn}(10 \ldots 500 \mathrm{~Hz})$ conforming to EN/IEC 60068-2-6 |  |
| Shock resistance |  | 10 gn (duration 11 ms ) conforming to EN/IEC 60068-2-27 |  |
| Electric shock protection |  | Class I conforming to EN/IEC 60536 | Class II conforming to EN/IEC 60536 |
| Degree of protection |  | IP 66 and IP 67 (IP 66 for XCS LF $\bullet \bullet \bullet \bullet 4 \bullet \bullet$ and for XCS LF $\bullet \bullet \bullet \bullet 6 \bullet \bullet$ ) conforming to EN/IEC 60529 and EN/IEC 60947-5-1 (3) |  |
| Connection |  | 3 cable entries tapped M20 $\times 1.5$ for ISO cable gland. Clamping capacity 7 to 13 mm or entries tapped for $1 / 2^{\prime \prime}$ NPT (USAS B2-1) conduit or 1 M23 connector output, $15+1$ PE or $18+1$ PE 24 V -- versions. |  |
| Material |  |  |  |
|  |  |  |  |

(1) The safety function on this device has not been tested by the UL.
(2) Using an appropriate and correctly connected control system.
(3) Live parts of these switches are protected against the penetration of dust and water However, when installing take all necessary precautions to prevent the penetration of solid bodies, or liquids with a high dust content, into the actuator aperture. Not recommended for use in saline atmospheres.

## Safety detection solutions

## Safety interlock switches

by actuator, with solenoid, turret head
Metal, type XCS LF
Plastic, type XCS LE

Contact block characteristics


## Switching capacity

conforming to EN/IEC 60947-5-1
Appendix C
Utilization categories AC-15 and DC-13

```
Switching capacity 1:
C300 240 V 0.75A
R300 250V 0.1A
Switching capacity 2:
C300 120 V 1.5A
R300 125V 0.22A
```



References, characteristics

## Safety detection solutions

Safety interlock switches
by actuator, with solenoid, turret head (1)
With 3 cable entries
Metal, type XCS LF
Type of switch $\quad$ Locking on de-energization and unlocking on energization of solenoid (2)

| LED indication | Orange LED: "guard open" indication Green LED:"guard closed and locked" indication |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Power supply for the solenoid and the LEDs | $24 \mathrm{~V}=-$ or $\sim(50 / 60 \mathrm{~Hz}$ on $\sim)$ |  |  |  |  |
| Type of contact on solenoid | $1 \mathrm{NC}+1 \mathrm{NO}$ break before make | 2 NC simultaneous $\left\lvert\, \begin{array}{c\|c} \bar{n} & \underset{y}{f} \\ & \underset{y}{c} \end{array}\right.$ | $1 \mathrm{NC}+2 \mathrm{NO}$ break before make <br>  <br>  | $2 \mathrm{NC}+1 \mathrm{NO}$ break before make | 3 NC simultaneous |

References of switches without actuator $(\Theta$ NC contact with positive opening operation) with 3 cable entries tapped ISO M20 x 1.5

| 2-pole contact <br> $1 \mathrm{NC}+1$ NO <br> break before make, slow break (3) |  | XCS LF2525312 | - | - | - | - |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { 2-pole contact } \\ & 2 \text { NC } \\ & \text { simultaneous, slow break (3) } \end{aligned}$ |  | XCS LF2725312 | XCS LF2727312 $\Theta$ | - | - | - |
| 3-pole contact <br> 1 NC + 2 NO <br> break before make, slow break (3) |  | - | - | XCS LF3535312 | - | - |
| 3-pole contact <br> 2 NC + 1 NO <br> break before make, slow break (3) |  | - | - | - | XCS LF3737312 | - |
| 3-pole contact <br> 3 NC <br> simultaneous, slow break (3) |  | - | - | - | - | XCS LF3838312 |
| Weight (kg) |  | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 |

Solenoid and LED characteristics

| Load factor | $100 \%$ |
| :--- | :--- |
| Rated operational voltage (4) | $24 \mathrm{~V}=$ or $\sim$ or $120 \mathrm{~V} \sim$ or $230 \mathrm{~V} \sim$ |
| Voltage limits | $-15 \%,+10 \%$ of the rated operational voltage (including ripple on $-=-)$ |
| Consumption | Conforming to <br> EN/IEC $60947-1$ |
| References of complete switches with solenoid supply voltage of 120 V or 230 V |  |

To order a switch with a solenoid voltage of $110 / 120 \mathrm{~V} \sim$, replace the $6^{\text {th }}$ number in the selected reference with 3.
Example: XCS LF3535312 becomes XCS LF3535332.
To order a switch with a solenoid voltage of $220 / 240 \vee \sim$, replace the $6^{\text {th }}$ number in the selected reference with 4.
Example: XCS LF3535312 becomes XCS LF3535342.

## References of switches with locking on energization and unlocking on de-energization

To order a guard switch with locking on energization and unlocking on de-energization of the solenoid, replace the $5^{\text {th }}$ number in the selected reference with 5 . Example: XCS LF3535312 becomes XCS LF3535512

## References of complete switches with 3 cable entries tapped for $1 / 2^{\prime \prime}$ NPT conduit

To order a switch with $31 / 2$ " NPT cable entries, replace the last number in the reference with 3.
Example: XCS LF3535312 becomes XCS LF3535313.

## References of actuators and separate parts

See page 32939/10.
(1) Head adjustable in $90^{\circ}$ steps throughout $360^{\circ}$. Blanking plug for operating head slot included with switch.
(2) A key operated lock (2 keys included with switch) enables forced opening of the interlocking mechanism, by authorized personnel, allowing withdrawal of the actuator and subsequent opening of the NC safety contacts.
(3) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(4) Common power supply for the solenoid and the LEDs.

Other versions: consult your Customer Care Centre.

| Presentation: <br> page 32939/2 | Characteristics: <br> page 32939/3 | Dimensions: <br> page 32939/13 | Schemes: <br> page 32939/16 |
| :--- | :--- | :--- | :--- |
| 4 |  | Schneider |  |
| Sectric | 32939-EN_Ver2.0.indd |  |  |

References, characteristics

## Safety detection solutions

## Safety interlock switches

by actuator, with solenoid, turret head (1)
Connector output
Metal, type XCS LF

| Type of switch | Locking on de-energization and unlocking on energization of solenoid (2) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |
| LED indication | Orange LED: "guard open" indication Green LED: "guard closed and locked" signalling |  |  |  |  |
| Power supply for the solenoid and the LEDs | $24 \mathrm{~V}=-$ or $\sim(50 / 60 \mathrm{~Hz}$ on $\sim$ ) |  |  |  |  |
| Type of contact on solenoid | 1 NC + 1 NO break before make |  | $1 \mathrm{NC}+2 \mathrm{NO}$ <br> break before make | $2 \mathrm{NC}+1 \mathrm{NO}$ break before make | 3 NC simultaneous |
| References of switches without actuator $\Theta \mathrm{NC}$ contact with positive opening operation), 16-pin (4 contacts) or 19-pin (6 contacts) M23 connector output |  |  |  |  |  |
| 2-pole contact <br> 1 NC + 1 NO <br> break before make, slow break (3) | XCS LF252531M2 | - | - | - | - |
| 2-pole contact <br> 2 NC <br> simultaneous, slow break (3) | XCS LF272531M2 | XCS LF272731M2 | - | - | - |
| 3-pole contact 1 NC + 2 NO <br> break before make, slow break (3) | - | - | XCS LF353531M3 | - | - |
| 3-pole contact $2 \mathrm{NC}+1 \mathrm{NO}$ <br> break before make, slow break (3) | - | - | - | XCS LF373731M3 | - |
| 3-pole contact 3 NC <br> simultaneous, slow break (3) | - | - | - | - | XCS LF383831M3 <br> $\Theta$ |
| Weight (kg) | 1.100 | 1.100 | 1.100 | 1.100 | 1.100 |
| Solenoid and LED characteristics |  |  |  |  |  |
| Load factor | 100\% |  |  |  |  |
| Rated operational voltage (4) | $24 \mathrm{~V}=$ or $\sim$ |  |  |  |  |
| Voltage limits Conforming to <br>  EN/IEC 60947-1 | $-15 \%,+10 \%$ of the rated operational voltage (including ripple on ---) |  |  |  |  |
| Consumption | $<5.4 \mathrm{~W}$ at $20^{\circ} \mathrm{C}$ and max. voltage |  |  |  |  |

To order a guard switch with locking on energization and unlocking on de-energization of the solenoid, replace the $5^{\text {th }}$ number in the selected reference with 5 . Example: XCS LF272731M2 or XCS LF353531M3 becomes XCS LF272751M2 or XCS LF353551M3.

## References of actuators and separate parts

See page 32939/10.
(1) Head adjustable in $90^{\circ}$ steps throughout $360^{\circ}$. Blanking plug for operating head slot included with switch.
(2) A key operated lock (two keys included with switch) enables forced opening of the interlocking mechanism, by authorized personnel, allowing withdrawal of the actuator and subsequent opening of the NC safety contacts.
(3) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(4) Common power supply for the solenoid and the LEDs.

Note : Due to existing cable connections and to ensure your personal safety, safety screws have been used in front of the product to prevent unauthorized access.
Other versions: consult your Customer Care Centre.

A : Available $4^{\text {th }}$ quarter 2011.

References, characteristics (continued)

## Safety detection solutions

Safety interlock switches
by actuator, with solenoid, turret head (1)
With 3 cable entries
Metal, type XCS LF

| Type of switch | Locking on de-energization and unlocking on energization of solenoid (2) or <br> in emergency by mushroom head pushbutton (3) |
| :--- | :--- |



| LED indication | Orange LED: "guard open" indication <br> Green LED: "guard closed and locked" indication |  |
| :--- | :--- | :--- |
| Power supply for the solenoid and the LEDs | $24 \mathrm{~V}=-$ or $\sim(50 / 60 \mathrm{~Hz}$ on $\sim)$ |  |
| Type of contact on solenoid | $1 \mathrm{NC}+2 \mathrm{NO}$ break before make | 2 |

References of switches without actuator $(\Theta$ NC contact with positive opening operation) with trigger action mushroom head pushbutton, diameter 40 mm , "turn to release" reset, with 3 entries tapped ISO M20 x 1.5

| 3-pole contact <br> $1 \mathrm{NC}+2 \mathrm{NO}$ <br> break before make, slow break (4) | XCS LF3535412 | - |
| :---: | :---: | :---: |
| 3-pole contact <br> 2 NC + 1 NO <br> break before make, slow break (4) | - | XCS LF3737412 |
| Weight (kg) | 1.220 | 1.220 |
| Solenoid and LED characteristics |  |  |
| Load factor | 100\% |  |
| Rated operational voltage (5) | $24 \mathrm{~V}=$-- or $\sim$ or $120 \mathrm{~V} \sim$ or $230 \mathrm{~V} \sim$ |  |
| Conforming to EN/IEC 60947-1 | $-15 \%,+10 \%$ of the rated operational voltage (including ripple on ---) |  |
| Consumption | $<5.4 \mathrm{~W}$ at $20^{\circ} \mathrm{C}$ a |  |

## References of switches with trigger action mushroom head pushbutton, diameter 40 mm , key no. 455 reset

To order a switch with trigger action mushroom head pushbutton, key no. 455 release, diameter 40 mm at the rear of the product, replace the $5^{\text {th }}$ number in the selected reference with 6 .
Example: XCS LF3535412 becomes XCS LF3535612.

## References of complete switches with solenoid supply voltage of $\mathbf{1 2 0} \mathrm{V}$ or 230 V

To order a switch with a solenoid voltage of $110 / 120 \mathrm{~V} \sim$, replace the $6^{\text {th }}$ number in the selected reference with 3 .
To order a switch with a solenoid voltage of $220 / 240 \mathrm{~V} \sim$, replace the $6^{\text {th }}$ number in the selected reference with 4.

## References of complete switches with 3 cable entries tapped for $1 / 2$ " NPT conduit

To order a switch with 3 1/2" NPT cable entries, replace the last number in the reference with 3.
Example: XCS LF3737412 becomes XCS LF3737413.

## References of actuators and separate parts

See page 32939/10.
(1) Head adjustable in $90^{\circ}$ steps throughout $360^{\circ}$. Blanking plug for operating head slot included with switch.
(2) A key operated lock (2 keys included with switch) enables forced opening of the interlocking mechanism, by authorized personnel, allowing withdrawal of the actuator and subsequent opening of the NC safety contacts.
(3) Trigger action, diameter 40 mm , "turn to release" or "key no. 455" reset type.
(4) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(5) Common power supply for the solenoid and the LEDs.

Other versions: consult your Customer Care Centre.
© : Available $4^{\text {th }}$ quarter 2011.

| Presentation: <br> page 32939/2 | Characteristics: <br> page 32939/3 | Dimensions: <br> page 32939/13 | Schemes: <br> page 32939/16 |
| :--- | :--- | :--- | :--- |
| 6 |  | Schneider |  |
| Selectric | 32939-EN_Ver2.0.indd |  |  |

# Safety detection solutions 

Safety interlock switches
by actuator，with solenoid，turret head（1）
Connector output
Metal，type XCS LF

| Type of switch | Locking on de－energization and unlocking on energization of solenoid（2）or <br> in emergency by mushroom head pushbutton（3） |
| :--- | :--- |



| LED indication | Orange LED：＂guard open＂indication Green LED：＂guard closed and locked＂indication |  |
| :---: | :---: | :---: |
| Power supply for the solenoid and the LEDs | $24 \mathrm{~V}=-\mathrm{or} \sim(50 / 60 \mathrm{~Hz}$ on $\sim$ ） |  |
| Type of contact on solenoid | $1 \mathrm{NC}+2$ NO break before make | $2 \mathrm{NC}+1$ NO break before make |
| References of switches without actuator $(\Theta$ NC contact with positive opening operation） with trigger action mushroom head pushbutton，diameter 40 mm ，＂turn to release＂reset，19－pin M23 connector output（6 contacts） |  |  |


| 3－pole contact <br> 1 NC＋ 2 NO <br> break before make，slow break（4） | XCS LF353541M3 | － |
| :---: | :---: | :---: |
| 3－pole contact <br> $2 \mathrm{NC}+1 \mathrm{NO}$ <br> break before make，slow break（4） | － | XCS LF353541M3 |
| Weight（kg） | 1.220 | 1.220 |
| Solenoid and LED characteristics |  |  |
| Load factor | 100\％ |  |
| Rated operational voltage（5） | 24 V －－or $\sim$ |  |
| Conforming to EN／IEC 60947－1 | $-15 \%,+10 \%$ of the rated operational voltage（including ripple on $=-$ ） |  |
| Consumption | $<5.4 \mathrm{~W}$ at $20^{\circ} \mathrm{C}$ and max．voltage |  |

## References of switches with trigger action mushroom head pushbutton，diameter 40 mm ，key no． 455 <br> reset

To order a switch with trigger action mushroom head pushbutton，unlocked by key no． 455 ，diameter 40 mm at the rear of the product，replace the $5^{\text {th }}$ number in the selected reference with 6
Example：XCS LF353541M3 becomes XCS LF353561M3

## References of actuators and separate parts

See page 32939／10．
（1）Head adjustable in $90^{\circ}$ steps throughout $360^{\circ}$ ．Blanking plug for operating head slot included with switch．
（2）A key－operated lock（two keys included with switch）enables forced opening of the interlocking mechanism，by authorized personnel，allowing withdrawal of the actuator and subsequent opening of the NC safety contacts．
（3）Trigger action，diameter 40 mm ，＂turn to release＂or＂key no．455＂reset type．
（4）Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch
（5）Common power supply for the solenoid and the LEDs．
Note ：Due to existing cable connections and to ensure your personal safety，safety screws have been used in front of the product to prevent unauthorized access．
Other versions：consult your Customer Care Centre．

A ：Available $4^{\text {th }}$ quarter 2011.

References, characteristics

## Safety detection solutions

Safety interlock switches
by actuator, with solenoid, turret head (1)
With 3 cable entries, double insulated Plastic, type XCS LE

| Type of switch |
| :--- |
| LED indication |
| Power supply for the solenoid and the LEDs |
| Type of contact on solenoid |
|  |

References of switches without actuator $\Theta$ NC contact with positive opening operation) with 3 cable entries tapped ISO M20 1.5
2-pole contact
1 NC + $\mathbf{1 ~ N O}$
break before make, slow break (3)

| XCS LE2525312 | - | - | - | - |
| :---: | :---: | :---: | :---: | :---: |
| - | XCS LE2727312 | - | - | - |
| - | - | XCS LE3535312 | - | - |
| - | - | - | XCS LE3737312 | - |
| - | - | - | - | XCS LE3838312 |
| 0.530 | 0.530 | 0.530 | 0.530 | 0.530 |

## Solenoid and LED characteristics

| Load factor | $100 \%$ |
| :--- | :--- |
| Rated operational voltage (4) | $24 \mathrm{~V}=$ or $\sim$ or $120 \mathrm{~V} \sim$ or $230 \mathrm{~V} \sim$ |
| Voltage limits | Conforming to <br> EN/IEC $60947-1$ |
| Consumption | $-15 \%,+10 \%$ of the rated operational voltage (including ripple on $-=$ ) |

## References of complete switches with solenoid supply voltage of 120 V or 230 V

To order a switch with a solenoid voltage of $110 / 120 \mathrm{~V} \sim$, replace the $6^{\text {th }}$ number in the selected reference with 3.
Example: XCS LE2525312 becomes XCS LE2525332.
To order a switch with a solenoid voltage of $220 / 240 \mathrm{~V} \sim$, replace the $6^{\text {th }}$ number in the selected reference with 4.
Example: XCS LE2525312 becomes XCS LE2525342.

## References of switches with locking on energization and unlocking on de-energization

To order a guard switch with locking on energization and unlocking on de-energization of the solenoid, replace the $5^{\text {th }}$ number in the selected reference with 5
Example: XCS LE2525312 becomes XCS LE2525512

## References of complete switches with three cable entries tapped for $1 / 2$ " NPT conduit

To order a switch with $1 / 2^{\prime \prime}$ NPT cable entries, replace the last number in the reference with 3.
Example: XCS LE2727312 becomes XCS LE2727313.

## References of actuators and separate parts

See page 32939/10.
(1) Head adjustable in $90^{\circ}$ steps throughout $360^{\circ}$. Blanking plug for operating head slot included with switch.
(2) A special tool included with the guard switch enables forced opening of the interlocking mechanism, by authorized personnel, allowing withdrawal of the actuator and subsequent opening of the NC safety contacts.
(3) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(4) Common power supply for the solenoid and the LEDs.

Other versions: consult your Customer Care Centre.

| Presentation: <br> page 32939/2 | Characteristics: <br> page 32939/3 | Dimensions: <br> page 32939/13 | Schemes: <br> page 32939/16 |
| :--- | :--- | :--- | :--- |
| 8 |  | Schneider |  |
| Selectric | 32939-EN_Ver2.0.indd |  |  |

References, characteristics

## Safety detection solutions

## Safety interlock switches

by actuator, with solenoid, turret head (1)
Connector output, double insulated
Plastic, type XCS LE
Type of switch

| LED indication | Orange LED: "guard open" indication Green LED: "guard closed and locked" indication |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Power supply for the solenoid and the LEDs | $24 \mathrm{~V}=$ - or $\sim(50 / 60 \mathrm{~Hz}$ on $\sim$ ) |  |  |  |  |
| Type of contact on solenoid | 1 NO + 1 NC break before make | 2 NC simultaneous | $1 \mathrm{NC}+2 \mathrm{NO}$ break before make | $2 \mathrm{NC}+1 \mathrm{NO}$ break before make | 3 NC simultaneous |
|  |  | $\cdots$ |  |  |  |

References of switches without actuator $(\Theta$ NC contact with positive opening operation),
16-pin ( 4 contacts) or 19-pin ( 6 contacts) M23 connector output

| 2-pole contact $1 \mathrm{NC}+1 \mathrm{NO}$ <br> break before make, slow break (3) | XCS LE252531M2 | - | - | - | - |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 2-pole contact 2 NC <br> simultaneous, slow break (3) | - | XCS LE272731M2 | - | - | - |
| 3-pole contact <br> 1 NC + 2 NO <br> break before make, slow break (3) | - | - | XCS LE353531M3 | - | - |
| 3-pole contact <br> $2 \mathrm{NC}+1$ NO <br> break before make, slow break (3) | - | - | - | XCS LE373731M3 | - |
| 3-pole contact 3 NC <br> simultaneous, slow break (3) | - | - | - | - | XCS LE383831M3 |
| Weight (kg) | 0.530 | 0.530 | 0.530 | 0.530 | 0.530 |
| Solenoid and LED characteristics |  |  |  |  |  |
| Load factor | 100\% |  |  |  |  |
| Rated operational voltage (4) | 24 V -- or $\sim$ |  |  |  |  |
| Voltage limits Conforming to <br>  EN/IEC 60947-1 | $-15 \%,+10 \%$ of the rated operational voltage (including ripple on - --) |  |  |  |  |
| Consumption | $<5.4 \mathrm{~W}$ at $20^{\circ} \mathrm{C}$ and max. voltage |  |  |  |  |

## References of switches with locking on energization and unlocking on de-energization

To order a guard switch with locking on energization and unlocking on de-energization of the solenoid, replace the $5^{\text {th }}$ number in the selected reference with 5 . Example: XCS LE252531M2 becomes XCS LE252551M2 and XCS LE353531M3 becomes XCS LE353551M3

## References of actuators and separate parts

See page 32939/10.
(1) Head adjustable in $90^{\circ}$ steps throughout $360^{\circ}$. Blanking plug for operating head slot included with switch
(2) A special tool included with the guard switch enables forced opening of the interlocking mechanism, by authorized personnel, allowing withdrawal of the actuator and subsequent opening of the NC safety contacts.
(3) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(4) Common power supply for the solenoid and the LEDs.

Note : Due to existing cable connections and to ensure your personal safety, safety screws have been used in front of the product to prevent unauthorized access.
Other versions: consult your Customer Care Centre.

A : Available $4^{\text {th }}$ quarter 2011.

Safety detection solutions
Safety interlock switches
by actuator, with solenoid, turret head
Metal, type XCS LF and plastic, type XCS LE
Accessories


XCS 201


XCS Z02


XCS Z03


XCS Z90

| Actuator references |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | Used for | Unit reference | Weight kg |
| Straight actuator | XCS LF, <br> XCS LE | XCS 201 | 0.020 |


| Actuator with wide fixing | XCS LF, <br> XCS LE | XCS Z02 | 0.020 |
| :--- | :--- | :--- | :--- |
|  |  |  |  |


| Pivoting actuator | XCS LF, <br> XCS LE | XCS Z03 | 0.095 |
| :--- | :--- | :--- | :--- |
|  |  |  |  |


| Latch for sliding doors | XCS LF, | XCS Z05 | 0.600 |
| :--- | :--- | :--- | :--- |
|  | XCS LE |  |  |


| Separate parts |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | Used for | Unit reference | Weight kg |
| Blanking plugs for operating head slot (Sold in lots of 10) | XCS LF, <br> XCS LE | XCS $\mathbf{Z 3 0}$ | 0.050 |
| Keys for interlock "forced opening" device (Sold in lots of 10) | XCS LF | XCS Z25 | 0.100 |
| Padlocking device to prevent insertion of actuator, for up to 3 padlocks (padlocks not included) | $\begin{aligned} & \text { XCS LF, } \\ & \text { XCS LE } \end{aligned}$ | XCS $\mathbf{Z 9 0}$ | 0.055 |
| Tool for forced opening of interlocking device (Sold in lots of 10) | XCS LE | XCS $\mathbf{Z 1 0 0}$ | 0.050 |
| Cover safety kit consisting of: <br> $4 \times 5$-lobe torque screws <br> 1 magnetic screwdriver bit | XCS LF | XCS 2210 | 0.020 |
|  | XCS LE | XCS 2211 | 0.020 |

References (continued), characteristics, dimensions, connections

## Safety detection solutions

Safety interlock switches
by actuator, with solenoid, turret head
Metal, type XCS LF and plastic, type XCS LE
Cabling accessories

| M23 connectors |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Characteristics |  |  |  |  |  |  |
| Type of connection | Screw threaded (metal clamping ring) |  |  |  |  |  |
| Degree of protection | IP 65 (with clamping ring correctly tightened) |  |  |  |  |  |
| Ambient air temperature | $-25 . . .+110^{\circ} \mathrm{C}$ |  |  |  |  |  |
| Connection | To solder terminals. <br> Maximum conductor c.s.a.: $1 \mathrm{~mm}^{2}$ Cable gland: no. 13 metal (Pg 13.5) Clamping capacity: 9 to 12 mm |  |  |  |  |  |
| LED signalling | - |  |  |  |  |  |
| Nominal voltage | $60 \mathrm{~V} \sim, 75 \mathrm{~V}=-$ |  |  |  |  |  |
| Nominal current | 7.5 A |  |  |  |  |  |
| Insulation resistance | $>10^{12} \Omega$ |  |  |  |  |  |
| Contact resistance | $\leq 5 \mathrm{~m} \Omega$ |  |  |  |  |  |
| References |  |  |  |  |  |  |
|  | Type of connector | Number of contacts | Cable connection | Type | Reference | Weight kg |
| prom | Female, M23 | $16$ | To solder terminals | Straight | XZ CC23FDM160S | 0.080 |
| ( 000 |  |  |  | Elbowed | XZ CC23FCM160S | 0.150 |
| - |  | 19 | To solder terminals | Straight | XZ CC23FDM190S | 0.080 |
|  |  |  |  | Elbowed | XZ CC23FCM190S | 0.150 |

## Dimensions

XZ CC23FDM160S and XZ CC23FDM190S Xz CC23FCM160S and XZ CC23FCM190s

(1) No. 13 metal cable gland

Connections
Xz CC23F•M160S
Xz CC23F•M190S


References (continued), characteristics, dimensions, connections

Safety detection solutions
Safety interlock switches
by actuator, with solenoid, turret head
Metal, type XCS LF and plastic, type XCS LE
Cabling accessories

## Connector adaptors <br> Characteristics

| Type of connection |  | Screw threaded |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Degree of protection |  | IP 67 |  |  |  |  |  |
| Ambient air temperature |  | $-25 \ldots+80^{\circ} \mathrm{C}$ |  |  |  |  |  |
| Connection |  | Via 100 mm long wires |  |  |  |  |  |
|  | Conductor c.s.a. | XZC E03M2316M: $16 \times 0.28 \mathrm{~mm}^{2}$ XZC E03M2319M: $19 \times 0.28 \mathrm{~mm}^{2}$ |  |  |  |  |  |
| LED signalling |  | - |  |  |  |  |  |
| Max. voltage |  | $36 \mathrm{~V} \sim$ |  |  |  |  |  |
| Nominal current |  | 4 A |  |  |  |  |  |
| Insulation resistance |  | $>10^{9} \Omega$ |  |  |  |  |  |
| Contact resistance |  | $\leq 5 \mathrm{~m} \Omega$ |  |  |  |  |  |
| References |  |  |  |  |  |  |  |
|  |  | Adaptor type | Number of contacts | Size of tapped hole | Number of wires | Reference | Weight kg |
|  |  | M23, male | 5 | $\mathrm{M} 20 \times 1.5$ | 16 | XZC E03M2316M | 0.100 |
|  |  | Metal body |  |  | 19 | XZC E03M2319M | 0.100 |

Dimensions
xz CE20M2310M

(1) M20 $\times 1.5$

Connections
XZ CE 20M2316M
XZ CE20M2319M


Safety detection solutions
Safety interlock switches
by actuator, with solenoid, turret head
Metal, type XCS LF
Plastic, type XCS LE

$\varnothing$ : 2 elongated holes $\varnothing 7 \times 5.2$


Plastic safety interlock switches XCS LE•••••••


Safety detection solutions
Safety interlock switches
by actuator, with solenoid, turret head
Metal, type XCS LF
Plastic, type XCS LE


## Actuation radius

## XCS Z01



XCS Z02


XCS Z03

$\mathrm{R}=$ minimum radius

## Safety detection solutions

Safety interlock switches
by actuator, with solenoid, turret head
Metal, type XCS LF
Plastic, type XCS LE


## Connections

Wiring to PL=e, category 4 conforming to EN/ISO 13849-1 and SIL CL3 conforming to EN/IEC 62061. Wiring method used in conjunction with Preventa safety module (the safety interlock switch should be used in conjunction with a safety limit switch to achieve electrical/mechanical redundancy).
Method for machines with long rundown time (high inertia)


Interlocking device for actuator fitted on guard and zero speed detection.

Safety detection solutions
Safety interlock switches
by actuator, with solenoid, turret head
Metal, type XCS LF
Plastic, type XCS LE

Wiring up to PL=b, category 1 conforming to EN/ISO 13849-1
Wiring example with protection fuse to prevent shunting of the NC contact, either by cable damage or by tampering
1 NC +1 NO locking on de-energization
and 1 NC + 1 NO auxiliary contacts
XCS LFILE25253••


E1-E2: Solenoid supply
13-14: Safety contact, available for redundancy
13-X2/E2: LED (orange): actuator withdrawn
41-X1/E2: LED (green): actuator inserted and locked
22-41 : Safety pre-wiring obligatory
S1: Manual release button
X : Unlocking signal

## Wiring up to PL=d, category 3 conforming to EN/ISO 13849-1

Wiring example with redundancy for the guard switch contacts, without monitoring or redundancy in the power circuit.

2 NC +1 NO locking on de-energization
and 2 NC + 1 NO auxiliary contacts
XCS LFILE37373•e


E1-E2: Solenoid supply
21-22 and 31-32: Safety contacts, available for redundancy
13-X2/E2: LED (orange): actuator withdrawn
51-X1/E2: LED (green): actuator inserted and locked
22-41 and 32-51: Safety pre-wiring obligatory
S1: Manual release button
X : Zero speed or unlocking signal

## Safety detection solutions

## Safety interlock switches

by actuator, with solenoid, turret head
Metal, type XCS LF
Plastic, type XCS LE

Connection by M23 connectors
16-pin M23 connectors

XCS LF/LE2525••


XCS LF/LE2725••


XCS LF/LE2727••


19-pin M23 connectors XCS LFILE3535••


XCS LF/LE3737••


XCS LF/LE 3837 ••
XCS LF/LE3838••


## Presentation

## Safety detection solutions

Coded magnetic switches
Plastic


Page 32942/2

## Rectangular, standard: $88 \times 25 \times 13$

Pre-cabled connection
Connector on flying lead connection


Page 32942/2

Cylindrical, diameter: 30, length: 38.5
Pre-cabled connection
Connector on flying lead connection


Environment

| Conformity to standards | Products |  | EN/IEC 60947-5-1, UL 508, CSA C22-2 n 14 |
| :---: | :---: | :---: | :---: |
|  | Machine assemblies |  | EN/IEC 60204-1, EN/ISO 14119 |
| Product certifications |  |  | UL, CSA, BG |
| Maximum safety level (1) |  |  | PL=e, category 4 conforming to EN/ISO 13849-1 and SIL 3 conforming to EN/IEC 61508 |
| Reliability data $\mathrm{B}_{10 \mathrm{~d}}$ |  |  | 50000000 (value given for a service life of 20 years, limited by mechanical or contact wear) |
| Protective treatment |  |  | Standard version: "TH" |
| Ambient air temperature | For operation | ${ }^{\circ} \mathrm{C}$ | $-25 \ldots+85$ |
|  | For storage | ${ }^{\circ} \mathrm{C}$ | -40...+ 85 |
| Vibration resistance |  |  | $10 \mathrm{gn}(10 . .150 \mathrm{~Hz})$ conforming to EN/IEC 60068-2-6 |
| Shock resistance |  |  | 30 gn (11 ms) conforming to EN/IEC 60068-2-7 |
| Sensitivity to magnetic fields |  | mT | $\geq 0.3$ |
| Electric shock protection |  |  | Class II conforming to EN/IEC 60536 |
| Degree of protection | $\begin{aligned} & \text { Conforming to } \\ & \text { IEC } 60529 \end{aligned}$ |  | IP 66 and IP 67 for coded magnetic switches with pre-cabled connection IP 67 for coded magnetic switches with connector on flying lead connection |
| Materials |  |  | Thermoplastic case (PBT) PVC cable (ROHS) |

## Contact block characteristics

| Rated operational characteristics |  |  | Ue: 24 V ---, le: 100 mA max. |
| :---: | :---: | :---: | :---: |
| Rated insulation voltage (Ui) |  |  | Ui: 100 V =-- |
| Rated impulse withstand voltage (U imp) |  | kV | 2.5 conforming to EN/IEC 60947-5-1 |
| Resistance across terminals | Contact with LED | $\Omega$ | 57 |
|  | Contact without LED | $\Omega$ | 10 |
| Protection (not using safety module) |  |  | External cartridge fuse: $500 \mathrm{~mA} \mathrm{gG} \mathrm{(gl)}$ |
| Connection XCS DMC | 2 contact model |  | Pre-cabled, $4 \times 0.25 \mathrm{~mm}^{2}$, length: 2,5 or 10 m depending on model or M8 connector on 0.15 m flying lead |
| XCS DMP | 2 contact model |  | Pre-cabled, $4 \times 0.25 \mathrm{~mm}^{2}$, length: 2,5 or 10 m depending on model or M12 connector on 0.15 m flying lead |
|  | 3 contact model |  | Pre-cabled, $6 \times 0.25 \mathrm{~mm}^{2}$, length: 2,5 or 10 m depending on model or M12 connector on 0.15 m flying lead |
| XCS DMR | 2 contact model |  | Pre-cabled, $4 \times 0.25 \mathrm{~mm}^{2}$, length: 2,5 or 10 m depending on model or M12 connector on 0.15 m flying lead |
| Contact material |  |  | Rhodium |
| Electrical durability |  |  | 1.2 million operating cycles |
| Maximum switching voltage |  | V | 100 -- |
| Switching capacity | Contact with LED | mA | 5... 100 |
|  | Contact without LED | mA | 0.1... 100 |
| Insulation resistance |  | M $\Omega$ | 1000 |
| Maximum breaking capacity | Contact with LED | VA | 3 |
|  | Contact without LED | VA | 10 |
| Maximum switching frequency |  | Hz | 150 |

[^16]
## Safety detection solutions

Coded magnetic switches
Plastic, pre-cabled

Type

| Rectangular | Standard | Cylindrical |
| :--- | :--- | :--- |
| Compact | $88 \times 25 \times 13$ | Diameter 30 |
| $51 \times 16 \times 7$ | Length 38.5 |  |



References of switches (1) $\triangle$ must be used in conjunction with safety modules XPS (see page 32942/8) Contact states shown are with the magnet positioned in front of the switch

| 2-pole 1 NC + 1 NO <br> (staggered) |  | XCS DMC5902 | XCS DMP5902 | XCS DMR5902 |
| :---: | :---: | :---: | :---: | :---: |
| 2-pole 2 NC (2) <br> (staggered) |  | XCS DMC7902 | XCS DMP7902 | XCS DMR7902 |
| 3-pole 1 NC + 2 NO <br> (1 NO staggered) |  | - | XCS DMP5002 | - |
| 3-pole $2 \mathrm{NC}+1$ NO (2) <br> (1 NC staggered) |  | - | XCS DMP7002 | - |
| 2-pole 1 NC + 1 NO <br> (staggered) |  | XCS DMC5912 | XCS DMP5912 | XCS DMR5912 |
| 2-pole 2 NC (2) (staggered) |  | XCS DMC7912 | - | XCS DMR7912 |
| 3-pole 1 NC + 2 NO <br> (1 NO staggered) |  | - | XCS DMP5012 | - |
| 3-pole $2 \mathrm{NC}+1$ NO (2) <br> (1 NC staggered) |  | - | XCS DMP7012 | - |
| Weight (kg) |  | 0.101 | 0.180 | 0.146 |

(1) Magnetic switch + coded magnet (XCS ZC••••).

Switch pre-cabled with 2 m long cable. For other cable lengths, replace the last number of the reference (2) by 5 for a 5 m long cable or by 10 for a 10 m long cable.
Example: rectangular, compact switch with 1 NC +1 NO contacts and 10 m cable becomes XCS DMC59010.
(2) Only to be wired in conjunction with an XPS AF module (see page 32942/9).

Complementary characteristics not shown under general characteristics (page 32941/3)

| Operating zone | Sao: 5 mm <br> Sar: 15 mm | Sao: 8 mm <br> Sar: 20 mm | Sao: 8 mm <br> Sar: 20 mm |
| :--- | :--- | :--- | :--- |
| Approach directions | 3 directions | 3 directions | 1 direction |

## Accessories (page 32942/4)

## Safety detection solutions

## Coded magnetic switches

Plastic, connector on flying lead

Type \begin{tabular}{lll}

\hline Rectangular \& | Standard |
| :--- |
| Compact |
| $51 \times 16 \times 7$ | \& | Cylindrical |
| :--- |
| Diameter 30 |
| Length 38.5 | <br>

$88 \times 25 \times 13$
\end{tabular}

References of switches (1) $\triangle$ must be used in conjunction with safety modules XPS (see page 32942/8) Contact states shown are with the magnet positioned in front of the switch

| 2-pole $1 \mathrm{NC}+1$ NO (staggered) |  | XCS DMC590L01M8 | XCS DMP590L01M12 | XCS DMR590L01M12 |
| :---: | :---: | :---: | :---: | :---: |
| 2-pole 2 NC (2) (staggered) |  | XCS DMC790L01M8 | XCS DMP790L01M12 | XCS DMR790L01M12 |
| 3-pole 1 NC + 2 NO <br> (1 NO staggered) |  | - | XCS DMP500L01M12 | - |
| 3-pole $2 \mathrm{NC}+1 \mathrm{NO}$ (2) <br> (1 NC staggered) |  | - | XCS DMP700L01M12 | - |
| 2-pole 1 NC + 1 NO <br> (staggered) |  | XCS DMC591L01M8 | XCS DMP591L01M12 | XCS DMR591L01M12 |
| 2-pole 2 NC (2) (staggered) |  | XCS DMC791L01M8 | XCS DMP791L01M12 | XCS DMR791L01M12 |
| 3-pole $1 \mathrm{NC}+2 \mathrm{NO}$ <br> (NO staggered) |  | - | XCS DMP501L01M12 | - |
| 3-pole $2 \mathrm{NC}+1 \mathrm{NO}$ (2) <br> (NC staggered) |  | - | XCS DMP701L01M12 | - |
| Weight (kg) |  | 0.101 | 0.180 | 0.146 |

(1) Magnetic switch + coded magnet (XCS ZC••••).
(2) Only to be wired in conjunction with an XPS AF module (see page 32942/9).

Complementary characteristics not shown under general characteristics (page 32941/3)

| Operating zone | Sao: 5 mm <br> Sar: 15 mm | Sao: 8 mm <br> Sar: 20 mm | Sao: 8 mm <br> Sar: 20 mm |
| :--- | :--- | :--- | :--- |
| Approach directions | 3 directions | 3 directions | 1 direction |

## Accessories (page 32942/4)

References， characteristics

## Safety detection solutions

Coded magnetic switches
Accessories

| Accessories |  |  |  |
| :---: | :---: | :---: | :---: |
| Accessories for coded magnetic switches | XCS DMC•••2 <br> XCS DMCeeッL | XCS DMP•eゃ2 XCS DMP•・ッL | XCS DMR•••2 XCS DMReeoL |
| Fixing clamp | － |  | XSZ B130 |
| Weight（kg） | － |  | 0.080 |
| Additional coded magnet | XCS ZC1 | XCS ZP1 | XCS ZR1 |
| Weight（kg） | 0.009 | 0.050 | 0.018 |
| Non－magnetic shims | XCS ZCC（lot of 2） | XCS ZCP（lot of 2） | XCS ZCR |
| Weight（kg） | 0.008 | 0.012 | 0.002 |

Pre－wired female connectors for connector version switches
Pre－wired connector characteristics

| Pre－wired connector type |  | XZ CP0941Le，XZ CP1041L• | XZ CP29P11L• | XZ CP1141Le，XZ CP1241L• |
| :---: | :---: | :---: | :---: | :---: |
| Type of connection |  | Screw threaded （metal clamping ring） | Screw threaded （metal clamping ring） | Screw threaded （metal clamping ring） |
| Number of contacts |  | 4 | 8 | 4 |
| Degree of protection |  | IP 67 （with clamping ring correctly tightened） |  |  |
| Ambient air temperature | Static | $-35 \ldots+90^{\circ} \mathrm{C}$ | $-35 \ldots+90^{\circ} \mathrm{C}$ | $-35 \ldots+90^{\circ} \mathrm{C}$ |
|  | Dynamic | $-5 \ldots+90^{\circ} \mathrm{C}$ | $-5 . . .+90^{\circ} \mathrm{C}$ | $-5 \ldots+90^{\circ} \mathrm{C}$ |
| Cabling |  | $\varnothing 5.2 \mathrm{~mm}$ cable， wire c．s．a．： $4 \times 0.34 \mathrm{~mm}^{2}$ | $\varnothing 5.2 \mathrm{~mm}$ cable， wire c．s．a．： $8 \times 0.25 \mathrm{~mm}^{2}$ | $\varnothing 5.2 \mathrm{~mm}$ cable， wire c．s．a．： $4 \times 0.34 \mathrm{~mm}^{2}$ |
| LED signalling |  | － | － | － |
| Nominal voltage |  | $60 \mathrm{~V} \sim, 75 \mathrm{~V}=-$ | $30 \vee \sim, 36 \vee=$ | $250 \mathrm{~V} \sim, 300 \mathrm{~V}=-$ |
| Nominal current |  | 4A | 2 A | 4A |
| Insulation resistance |  | $>10^{9} \Omega$ | $>10^{\circ} \Omega$ | $>10^{9} \Omega$ |
| Contact resistance |  | $\leqslant 5 \mathrm{~m} \Omega$ | $\leqslant 5 \mathrm{~m} \Omega$ | $\leqslant 5 \mathrm{~m} \Omega$ |

References of pre－wired connectors


XZ CP0941L


XZ CP29P11L•

xZ CP1141L•


XZ CP1041L•


XZ CP1241L•

| Type of connector | Number of pins | For use with | Type | Cable length m | Reference | Weight kg |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Female，M8 | 4 | XCS DMC•eャL | Straight | 2 | XZ CP0941L2 | 0.080 |
|  |  |  |  | 5 | XZ CP0941L5 | 0.180 |
|  |  |  |  | 10 | XZ CP0941L10 | 0.360 |
|  |  |  | Elbowed |  | XZ CP1041L2 | 0.080 |
|  |  |  |  | 5 | XZ CP1041L5 | 0.180 |
|  |  |  |  | 10 | XZ CP1041L10 | 0.360 |
| Female，M12 | 8 | XCS DMP•・セL | Straight | 2 | XZ CP29P11L2 | 0.100 |
|  |  |  |  | 5 | XZ CP29P11L5 | 0.290 |
|  |  |  |  | 10 | XZ CP29P11L10 | 0.470 |
| Female，M12 | 4 | XCS DMR•••L／ <br> XCS DMP•••L | Straight | 2 | XZ CP1141L2 | 0.090 |
|  |  |  |  | 5 | XZ CP1141L5 | 0.190 |
|  |  |  |  | 10 | XZ CP1141L10 | 0.370 |
|  |  |  | Elbowed |  | XZ CP1241L2 | 0.090 |
|  |  |  |  | 5 | XZ CP1241L5 | 0.190 |
|  |  |  |  | 10 | XZ CP1241L10 | 0.370 |

[^17]| Function diagrams with magnet present（pre－cabled version） |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| XCS DMC59＊＊ |  |  | XCS DMC79ャ＊ |  |  | XCS DMP50＊ |  |  | XCS DMP70＊ |  |  |
|  |  | Colour <br> （NC）：BN／BU <br> （NO）：BK／WH | $\begin{array}{c\|c} 0 & 5 \\ \|S \mathrm{SaO}\| \\ \hline \mathrm{F} & \\ \hline \end{array}$ |  | Colour <br> （NC）：BN／BU <br> （NC）：BK／WH |  |  | Colour <br> （NC）：BN／BU <br> （NO）：BK／WH <br> （NO）：GY／PK | $\begin{array}{c\|c} 08 \\ \left\lvert\, \begin{array}{c} 0 \\ \|S a O\| \\ \mathrm{F} \\ \mathrm{~F} \\ \mathrm{O} \\ \hline \end{array}\right. & \\ \hline \end{array}$ |  | Colour <br> （NC）：BN／BU <br> （NC）：BK／WH <br> （NO）：GY／PK |
| XCS | DMR59 | －／XCSDMP59•＊ | XCS DMR79＊e／CS DMP79＊＊ |  |  |  |  |  |  |  |  |
| ${ }_{\substack{\text {｜}}}^{\text {SaO }}$ |  | Colour <br> （NC）：BN／BU <br> （NO）：BK／WH | $\begin{array}{cc} 0 & 8 \\ \|S a o\| \\ \text { F } & \\ \hline & \\ \hline \end{array}$ |  | Colour <br> （NC）：BN／BU <br> （NC）：BK／WH |  |  |  |  |  |  |


| XCS DMC59ャ＊ |  |  | XCS DMC79ャ๑ |  |  | XCS DMP50e＊ |  |  | XCS DMP70•๑ |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Pin <br> （NC）：1／3 <br> （NO）： $4 / 2$ |  |  | Pin <br> （NC）： $1 / 3$ <br> （NC）： $4 / 2$ |  |  | Pin <br> （NC）：1／3 <br> （NO）：4／2 <br> （NO：6／7 |  |  | Pin <br> （NC）： $1 / 3$ <br> （NC）： $4 / 2$ <br> （NO）：6／7 |
| XCS DMR59＊＠／XCSDMP59ャ＊ |  |  | XCS DMR79•®／CS DMP79＊＊ |  |  |  |  |  |  |  |  |
| $\begin{aligned} & 0 \\ & { }^{0} \mathrm{SaO} \mid \\ & \mathrm{F} \\ & \hline \end{aligned}$ |  | Pin <br> （NC）： $1 / 3$ <br> （NO）： $4 / 2$ | $\begin{array}{cr\|r} 0 & 8 \\ & \|S a O\| \\ \hline & \\ \hline & & \\ \hline \end{array}$ |  | Pin <br> （NC）： $1 / 3$ <br> （NC）：4／2 |  |  |  |  |  |  |


| Contact closed | Sao：assured operating distance． <br> Sar：assured tripping distance． <br> Conforming to EN／IEC 60947－5－3 |
| :--- | :--- | :--- |
| $\square$ Contact open |  |
| Contact unstable |  |
| $\square$ |  |

Safety detection solutions
Coded magnetic switches
Plastic

Coded magnetic switches

## xCS DMC

Pre-cabled connection

## Connector on flying lead connection


(1) Counterbored: $\varnothing 6 \times 3.5 \mathrm{~mm}$.

XCS DMP
Pre-cabled connection


XCS DMR
Pre-cabled connection


(1) Counterbored: $\varnothing 6 \times 3.5 \mathrm{~mm}$.
(2) M8 4-pin connector.

Connector on flying lead connection

(1) M12 4 or 6-pin connector.

## Connector on flying lead connection


(1) M12 4-pin connector.

Coded magnet for XCS DMC XCS ZC1

(1) Counterbored: $\varnothing 6 \times 3.5 \mathrm{~mm}$.

Coded magnet for XCS DMP
XCS ZP1


Coded magnet for XCS DMR XCS ZR1

(1) $2 \times \varnothing 4.3$, countersunk: $\varnothing 7.5$ at $45^{\circ}$.

Dimensions (continued), schemes, mounting

Safety detection solutions
Coded magnetic switches
Plastic
Accessories
Fixing clamp
XSZ B130
(1) 2 elongated holes $\varnothing 4 \times 8$

Pre-wired connectors


Schemes

M8 pre-wired connector
XZ CP0941L•


M12 pre-wired connector XZ CP1141Le, XZ CP1241L•


## XZ CP29P11L•




| XCS | a | b | c | d | e |
| :--- | :--- | :--- | :--- | :--- | :--- |
| DMC | 40 | 13 min. | - | $81 \times 55$ | - |
| DMP | 100 | 10 min. | - | $118 \times 55$ | - |
| DMR | 40 | 12 min. | $>10$ | $\varnothing 45$ | 20 |
|  |  | - | $>10$ | $\varnothing 45$ | 13 |
|  |  | 12 min. | $<10$ | - | 20 |
|  |  | - | $<10$ | - | 17 |


| Non-magnetic shims |  |
| :--- | :---: |
| $\mathbf{A}$ | XCS ZCC |
| $\mathbf{B}$ | XCS ZCP |
| $\mathbf{C}$ | XCS ZCR |

Schemes， connections

## Safety detection solutions

Coded magnetic switches
Plastic，pre－cabled

XCS DMP5eee with XPS DMB
Wiring to PL＝e，category 4 conforming to EN／ISO 13849－1 and SIL 3 conforming to EN／IEC 61508．Example with 3－pole 1 NC +2 NO（1 NO staggered）contact．


ESC：External start conditions．
XCS DMC5・ゃゃ，XCS DMP5・ゃゃ，XCS DMR5・ゃゃ with XPS DME
Wiring to PL＝e，category 4 conforming to EN／ISO 13849－1 and SIL 3 conforming to EN／IEC 61508．Example with 2－pole 1 NC＋ 1 NO（staggered）contact．


ESC：External start conditions．

References：
page 32942／2

Schemes, connections (continued)

Safety detection solutions

## Coded magnetic switches

Plastic, pre-cabled

Connection of up to 3 magnetic switches, with an LED on one input, with XPS DM• (1)
Wiring up to PL=d, category 3 conforming to EN/ISO 13849-1 and SIL 2 conforming to EN/IEC 61508

Example with 2-pole $1 \mathrm{NC}+1 \mathrm{NO}$ contact


Example with 3-pole $1 \mathrm{NC}+2 \mathrm{NO}$ contact

(1) Input: S11, S12, S13 or S21, S22, S23.

XCS DM•7•・ゃ with XPS AF
Wiring up to PL=e, category 4 conforming to EN/ISO 13849-1 and SIL 3 conforming to EN/IEC 61508. Example with 2-pole 2 NC contact


[^18](2) Without start button monitoring.

ESC: External start conditions.

Schemes， connections

Safety detection solutions
Coded magnetic switches
Plastic，connector on flying lead

XCS DMP5eee with XPS DMB
Wiring to PL＝e，category 4 conforming to EN／ISO 13849－1 and SIL 3 conforming to EN／IEC 61508．Example with 3－pole 1 NC +2 NO（1 NO staggered）contact．


ESC：External start conditions．
XCS DMC5・ゃゃ，XCS DMP5・ゃゃ，XCS DMR5・ゃゃ with XPS DME
Wiring to PL＝e，category 4 conforming to EN／ISO 13849－1 and SIL 3 conforming to EN／IEC 61508．Example with 2－pole 1 NC＋ 1 NO（staggered）contact．


ESC：External start conditions．

References：
page $32942 / 2$
page 32942／2

Schemes, connections (continued)

Safety detection solutions
Coded magnetic switches
Plastic, connector on flying lead

Connection of up to 3 magnetic switches, with an LED on one input, with XPS DM• (1)
Wiring to PL=d, category 3 conforming to EN/ISO 13849-1 and SIL 2 conforming to EN/IEC 61508
Example with 2-pole $1 \mathrm{NC}+1 \mathrm{NO}$ contact


Example with 3-pole $1 \mathrm{NC}+2 \mathrm{NO}$ contact

(1) Input: S11, S12, S13 or S21, S22, S23.

XCS DM•7•・ゃ with XPS AF
Wiring to PL=e, category 4 conforming to EN/ISO 13849-1 and SIL 3 conforming to EN/IEC 61508. Example with 2-pole 2 NC contact


[^19](2) Without start button monitoring

ESC: External start conditions.

## Safety detection solutions

Coded magnetic systems

Coded magnetic system
Pre-cabled connection

SIL 2/PL=d, category 3 and SIL 3/PL=e, category 4

## XCS DM3791・ゃ/XCS DM4801••



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## SIL 2/PL=d, category 3 and SIL 3/PL=e, category 4 XCS DM3791M12/XCS DM4801M12



## Safety detection solutions <br> Coded magnetic systems

| Coded magnetic system type |  |  | SIL 2/PL= d, category 3 XCS DM3 | SIL 3/PL=e, category 4 XCS DM4 |
| :---: | :---: | :---: | :---: | :---: |
| Environment |  |  |  |  |
| Conformity to standards |  |  | EN/IEC 60947-5-1; EN/IEC 60947-5-2; EN/IEC 60947-5-3 EN/ISO 14119 |  |
| Product certifications |  |  | C $¢, ~$ UL, CSA, TÜV |  |
| Maximum safety level (1) |  |  | SIL 2 conforming to EN/IEC 61508,PL=d, category 3 conforming to EN/ISO 13849-1 | SIL 3 conforming to EN/IEC 61508, PL=e, category 4 conforming to EN/ISO 13849-1 |
| Reliability data |  |  | $\begin{aligned} & \mathrm{MTTF}_{\mathrm{d}}=182 \text { years } \\ & \mathrm{PFH}=3.94 \mathrm{E}^{-9 / P F D}=1.15 \mathrm{E}^{-5} \\ & \mathrm{SFF}=92.5 \% / \mathrm{HFT}=1 \end{aligned}$ |  |
| Ambient air temperature | For operation | ${ }^{\circ} \mathrm{C}$ | $-25 . . .+70^{\circ} \mathrm{C}$ |  |
|  | For storage | ${ }^{\circ} \mathrm{C}$ | $-40 \ldots+85^{\circ} \mathrm{C}$ |  |
| Vibration resistance | Conforming to EN/IEC 60068-2-6 |  | $10 \mathrm{gn}(10 \ldots 500 \mathrm{~Hz})$ |  |
| Shock resistance | Conforming to EN/IEC 60068-2-7 |  | $30 \mathrm{gn}, 11 \mathrm{~ms}$ |  |
| Sensitivity to magnetic fields |  | mT | $\leqslant 0.5$ |  |
| Electric shock protection | Conforming to EN/IEC 61140 |  | Class III |  |
| Degree of protection | Conforming to EN/IEC 60529 |  | Pre-cabled version: IP 66, IP 67 Connector version: IP 67 |  |
|  | Conforming to DIN 40050 |  | Pre-cabled version: IP 69K |  |
| Materials |  |  | Thermoplastic case (PBT); PVC cable |  |
| Characteristics |  |  |  |  |
| Rated operational characteristics |  |  | Ub: $24 \mathrm{~V}=-\mathrm{+}$ + 10\% - 20\% |  |
| Rated insulation voltage (Ui) |  |  | Ui: $36 \mathrm{~V}=-$ |  |
| Rated impulse withstand voltage (U imp) | Conforming to EN/IEC 60947-5-1 | kV | 2.5 |  |
| Integrated output protection |  |  | Overload and short-circuit protection |  |
| Connection | Conforming to EN/IEC 60947-5-2-A3 and EN/IEC 61076 |  | Pre-cabled, $6 \times 0.25 \mathrm{~mm}^{2}$, length: 2,5 or 10 m depending on model or M12 connector (A coding) | Pre-cabled, $8 \times 0.25 \mathrm{~mm}^{2}$, length: 2,5 or 10 m depending on model or M12 connector (A coding) |
| Cable diameter |  | mm | $6.1+/-0.3$ |  |
| Cable resistance |  | $\mathrm{m} \Omega / \mathrm{m}$ | 90 |  |
| Safety outputs OSSD (Output Signal Switching Devices) |  |  | 2 PNP type (NO) solid-state outputs, 1.5 A (2 A up to $60^{\circ} \mathrm{C}$ ) 24 V --. (short-circuit protected) |  |
| Alarm output |  |  | - | 1 solid-state output, $0.5 \mathrm{~A}, 24 \mathrm{~V}=-$, PNP |
| Signalling |  |  | LED (green/red/orange) |  |
| Maximum switching frequency |  | Hz | 3 |  |
| Activation delay |  | ms | 100 |  |
| Discordance time |  | s | 2 |  |
| HFT (Hardware Fault Tolerance) |  |  | 1 |  |
|  |  |  | Test interval: 12 months |  |
| Tightening torque |  | Nm | 1.8 max. |  |
| Chaining in series |  |  | 32 maximum with 2 m long cable | - |
| Functions |  |  |  |  |
| Functions |  |  | - LED status signalling | - Auto/Manual start via "Start"input <br> - Monitoring of external switching devices <br> (EDM: External Device Monitoring) <br> - Display of operating modes (LED) <br> - Monitoring of the function (open or closed) as well as the response time of the power components. |

(1) Using an appropriate and correctly connected control system.

References, characteristics

Safety detection solutions
Coded magnetic systems
Plastic, solid-state PNP type output


| References |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Description | Type of connection | SIL 2/PL=d, category 3 | SIL 3/PL=e, category 4 | Weight kg |
| Coded magnetic system with dedicated transmitter (1) | Pre-cabled $\mathrm{L}=2 \mathrm{~m}$ | XCS DM379102 | XCS DM480102 | 0.320 |
|  | Pre-cabled, $\mathrm{L}=5 \mathrm{~m}$ | XCS DM379105 | XCS DM480105 | 0.480 |
|  | Pre-cabled, $\mathrm{L}=10 \mathrm{~m}$ | XCS DM379110 | XCS DM480110 | 0.745 |

(1) Self-contained system not requiring the use of a safety module or non-magnetic shim.

## Detection characteristics

| Assured operating distance | Sao: 10 mm |
| :--- | :--- |
| Assured tripping distance | Sar: 20 mm |
| Approach directions | 9 |
| Approach speed | $0.01 \mathrm{~m} / \mathrm{s} \mathrm{min}$. |

## Output status (pre-cabled connection)

Output states shown are with the dedicated transmitter positioned in front of the receiver


Output closed
$\square$ Output open Transitional state

## XCS DM4801••



Sao: Assured operating distance
Sar: Assured tripping distance
Conforming to EN/IEC 60947-5-3

## Approach directions



References, characteristics (continued)

## Safety detection solutions

Coded magnetic systems
Plastic, solid-state PNP type output
Type

| References |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Description | Type of connection | SIL 2/PL=d, category 3 | SIL 3/PL=e, category 4 | Weight kg |
| Magnetic system with dedicated transmitter (1) | M12 connector | XCS DM3791M12 | XCS DM4801M12 | 0.215 |

(1) Self-contained system not requiring the use of a safety module or non-magnetic shim.

Detection characteristics

| Assured operating distance | Sao: 10 mm |
| :--- | :--- |
| Assured tripping distance | Sar: 20 mm |
| Approach directions | 9 |
| Approach speed | $0.01 \mathrm{~m} / \mathrm{s} \mathrm{min}$. |
| Output Status (M12 connector connection) |  |

Output states shown are with the dedicated transmitter positioned in front of the receiver

## XCS DM3791M12



Output closed
Output open
Transitional state

XCS DM4801M12

"OFF" = Error
Sao: Assured operating distance
Sar: Assured tripping distance
Conforming to EN/IEC 60947-5-3

References, characteristics (continued)

## Safety detection solutions

Coded magnetic systems
Accessories

| Accessories |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Description | For use with | Reference | Weight kg |
|  | Replacement dedicated transmitter | XCS DM3/4•••02/05/10 <br> XCS DM3/4•••M12 | XCS DMT | 0.100 |
|  | Arc suppressor (pair) | XCS DM3/4•••02/05/10 <br> XCS DM3/4•••M12 | XUS LZ500 | 0.020 |

Pre-wired female connectors for connector version coded magnetic systems
Pre-wired connector characteristics

| Pre-wired connector type <br> Type of connection |  |  |
| :--- | :--- | :--- |
| XZ CP29P12L• |  |  |
| Screw threaded (metal clamping ring) |  |  |

References of pre-wired connectors


| Type of connector | Number of pins | For use with | Type | Cable length m | Reference | Weight kg |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Female, M12 (A coding) | 8 | XCS DM3/4•••02 <br> XCS DM3/4•••05 | Straight | 2 | XZ CP29P12L2 | 0.100 |
|  |  | XCS DM3/4•••10 |  | 5 | XZ CP29P12L5 | 0.290 |
|  |  |  |  | 10 | XZ CP29P12L10 | 0.470 |

## Coded magnetic systems

Pre-cabled connection

XCS DM3/4•••02/05/10


M12 connector (A coding) connection
XCS DM3/4•eゃM12


## Accessory

Replacement dedicated transmitter
XCS DMT


## Pre-wired connectors

XZ CP29P12L。


## Connection

M12 pre-wired female connector
XZ CP29P12L•


Mounting XCS DM3/DM4


Schemes
Category 3 (this scheme can achieve SIL 2/PL=d, category 3)


M12 connector (A coding) connection
XCS DM3791M12

SIL 3/PL=e, category 4
Pre-cabled connection
XCS DM4801••


M12 connector (A coding) connection
XCS DM4801M12


Chaining coded magnetic systems (2)

XCS DM3791••


Wiring to SIL 3/PL=e, category 4 with Preventa module
Example: XCS DM3••••• + XPS AFL5130

(1) The K1 and K2 coils must be protected with arc suppressors.
(2) Maximum chaining: 32 maximum with 2 m long cable.
(3) 2 A max.
(4) Mechanically linked contacts.

## Selection guide

Safety detection solutions
Preventa safety mats
Type XY2 TP

Applications

Function

Packaging, conveying, material handling, warehousing, stocking, etc.

Zone protection: by stopping dangerous machine movements following detection of intrusion into the hazardous zone.

Maximum achievable safety level

## Conformity to product standards

Product certifications

| Degree of protection |
| :--- |
| Dimensions $(\mathrm{mm})$ |

Response time
Connection

| Sensitivity |
| :--- |
| Maximum supply voltage |
| Type reference |

Pages

PL=d/Category 3 conforming to EN/ISO 13849-1,
SIL 2 conforming to EN/IEC 61508
EN/IEC 60947-5-1, EN 1760-1/ISO 13856-1, UL 508, CSA C22-2 n 14

BG, with safety modules XPS AK and safety controllers XPS MP/MC cULus

## IP 67

$500 \times 500$
$500 \times 750$
$\leqslant 40 \mathrm{~ms}$ with XPS AK, $\leqslant 30 \mathrm{~ms}$ with XPS MP/MC

## $2 \times 2$-core ying leads tted with $\varnothing 8$ connector ( 1 male, 1 female)

 diameter 8
## Single mat: > 20 kg

Group of mats: > 35 kg
-. 30 V

## XY2 TP1

XY2 TP2

38161/5

$\mathrm{PL}=\mathrm{d} /$ Category 3 conforming to EN/ISO 13849-1, SIL 2 conforming to EN/IEC 61508

EN/IEC 60947-5-1, EN 1760-1/ISO 13856-1, UL 508, CSA C22-2 n ${ }^{\circ} 14$

BG, with safety modules XPS AK and safety controllers XPS MP/MC
cULus

IP 67
$750 \times 750$
$750 \times 1250$
$\leqslant 40 \mathrm{~ms}$ with XPS AK, $\leqslant 30 \mathrm{~ms}$ with XPS MP/MC
$2 \times 2$-core ying leads tted with $\varnothing 8$ connector (1 male, 1 female) diameter 8

Single mat: > 20 kg
Group of mats: > 35 kg
$=30 \mathrm{~V}$

XY2 TP3
XY2 TP4

## 38161/5

# Safety detection solutions 

## Preventa safety mats

Type XY2 TP


## Presentation <br> Zone protection

The equipment comprises safety mats, installed in front of or around potentially dangerous machines and/or robots. They provide a protection zone by detecting the presence of operators on these installations.
The safety mats therefore form protection zones that are mainly designed to ensure the safety of personnel.
They thus supplement safety devices in allowing access required for machine loading/unloading.
The safety mats are used either in conjunction with safety modules or combined with other zone protection systems. They are suitable for use in polluted environments (dust, oil, etc.).
"Protect Area Design" configuration software (1) enables design and setting-up of installations.

## Applications

Safety mats are mainly used in: $\square$ assembly and packaging lines, $\square$ conveying and handling lines, $\square$ warehousing and stocking systems.

## Description

## - A safety mat comprises:

- a sensing zone 1 ,
- a border comprising aluminium rails 2 ,
- and rail corners which secure the assembly 3.
- Safety mats can be mounted in order to define the safety zone.
$\square$ Mats are electrically interconnectable, without loss of sensitivity.


## Operating principle

Safety modules type XPS AK and safety controllers XPS MP/MC used in conjunction with safety mats XY2 TP establish a safety-related part of the control system that can reach safety level PL=d (category 3), in accordance with the standard EN/ISO 13849-1 and SIL 2 in accordance with the standard EN/IEC 61508.

- The hazardous zone 1 is defined by the dangerous movement of the machine.
- The safety zone 2, defined in accordance with standard EN 999/ISO 13855, comprises one or several juxtaposed safety mats 3 ( 10 maximum for XPS AK and 30 maximum for XPS MP/MC).

■ Safety mats are used for detecting persons stepping onto the mat or falling objects in accordance with standard EN 1760-1/ISO 13856:

- weight $>20 \mathrm{~kg}$ for a single mat,
- weight $>35 \mathrm{~kg}$ for a group of mats.
- Any detection of movement on the safety mat immediately instigates the stopping of the dangerous movement of the machine to be made safe. The resetting of the machine can be performed manually or automatically, depending on the wiring configuration of the safety module within the process.
- The safety mats can also be used for detection applications not related to safety.


## Directives and standards

■ The safety mats conform to the following standards:

- PrEN/ISO 12100,
- EN/IEC 61508,
- EN/IEC 60947-5-1,
- EN/ISO 13849-1,
- EN 1760-1/ISO 13856-1,
- EN/IEC 60204-1,
- UL 508,
- CSA C22-2 n 14.

■ Used in conjunction with safety modules XPS AK and safety controllers
XPS MP/MC, the safety mats are cULus and BG certified and approved.
(1) See pages 38161/8 and 38161/9.

$S=$ minimum distance between the hazardous zone and the detection limit.
the detection limit.

## Installation precautions <br> Standard EN 999/ISO 13855 defines: <br> $\square$ the minimum distance between the hazardous zone and the detection limit of the device furthest away from the hazardous zone, see calculation below, <br> $\square$ the body approach speed. <br> Standard EN 1760-1/ISO 13856 states the following requirements: <br> ■ surface layout drawing, <br> - surface preparation, <br> - handling and connection, <br> - starting and testing.

## Safety rules

Detect failures liable to compromise safety and stopping of the machine
The design of the machine and its control system must be the same level of safety as the safety mat system in order to ensure the immediate stopping of the machines dangerous movement as soon as the hazardous zone is accessed.
It must not be possible to access the protected zone without tripping the protection system. Therefore, safety mats must be installed in such a way that they cannot be avoided.
The machine can only be restarted if no danger exists and no personnel are present in the hazardous zone.

## Calculation of the minimum safety distance according to the application

Standard EN 999/ISO 13855 states the following calculation of distance:

- Safety mat installed on a flat surface:
$\mathrm{S}=(1600 \mathrm{~mm} / \mathrm{s} \times(\mathrm{t} 1+\mathrm{t} 2))+1200 \mathrm{~mm}$.
- Safety mat installed on a step:
$\mathrm{S}=(1600 \mathrm{~mm} \times(\mathrm{t} 1+\mathrm{t} 2))+(1200 \mathrm{~mm}-0.4 \mathrm{H})$.
$\mathrm{S}=$ minimum distance in mm , in a horizontal plane, between the hazardous zone and the detection limit of the device furthest away from the hazardous zone.
$\mathrm{T}=$ overall response time $=\mathrm{t} 1+\mathrm{t} 2$.
t 1 = maximum time in seconds between activation of the detection function (safety mat) and the changeover of the output signal switching devices to the inhibited state (e.g. safety module type XPS AK).
t2 $=$ response time of machine in seconds. Time required to stop the dangerous movement of the machine.
$\mathrm{H}=$ distance above reference plane (e.g. height of step in mm ).
Note: In all cases $\mathrm{S}>750 \mathrm{~mm}$.

Example of an application processed using "Protect Area Design" software (1)
■ Unintentional access to the hazardous zone of a machine must be detected by a safety device.

- The estimated risk combined with a very dusty environment indicates that a floor mounted sensing device (safety mat) would be appropriate.
- The stopping time of the machine is 300 ms and the response time of the sensing device is $\leq 40 \mathrm{~ms}$.

Calculation formula: $S=(1600 \mathrm{~mm} / \mathrm{s} \times \mathrm{T})+(1200 \mathrm{~mm}-0.4 \times \mathrm{H})=(1600 \times 0.34)+$ $(1200-0)=1744 \mathrm{~mm}$.
(1) See pages 38161/8 and 38161/9

## Safety detection solutions

## Preventa safety mats

Type XY2 TP


[^20]
## Safety detection solutions

Preventa safety mats
Type XY2 TP

|  |  | Reference |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |

Characteristics, references, connections

## Safety detection solutions

## Preventa safety mats

Jumper cables Ø 8 mm-M8 and M8-M8

(1) The maximum number of jumper cables that can go through a rail is 4 .

## Connections



BU: (-) blue BN: (+) brown

Dimensions, connections

Safety detection solutions

## Preventa safety mats

Type XY2 TP


## Connections

Wiring example to level PL=d (category 3), SIL 2 with an XPS AK module


# Safety detection solutions <br> Protect Area Design <br> Software configurator for safety installations incorporating safety mats 

## Presentation <br> Preparation and standards

Before using the configurator, it is necessary to perform the following 2 procedures: risk assessment and risk reduction in accordance with PrEN/ISO 12100 in order to select the required safety level for the control system.

## The Protect Area Design software

Protect Area Design software is a configurator that enables selection of the zone protection device (safety mats) required for safety applications.
This software enables the user, via a graphic interface, to create, test or modify a safe working environment within the vicinity of a potentially dangerous machine. Having established the predefined fields (selection the control system safety level, dimensions of the machine, etc.), the Protect Area Design software calculates the safety distance in relation to the reaction time of the machine and the approach direction for gaining access to the hazardous zone. It then displays the optimum safety protection solution and creates the list of products (references, quantities and accessories to be used).
Protect Area Design software is user-friendly and compatible with Windows 98, NT, 2000 and XP.

## Main functions of the software

The software enables creation of an application using the procedures stated (see next page) or selection from applications previously established The procedure is manual or assisted.

| Protect Area Design software |  | Language | Weight <br> kg |
| :--- | :--- | :--- | :--- |
| Description | Compatibility |  | - |
| Protect Area Design V2 <br> software configurator, <br> downloadable from <br> www.schneider-electric.com | Windows $98 / \mathrm{NT} / 2000$ and | French/English |  |

# Safety detection solutions <br> ProtectArea Design <br> Software configurator for safety installations incorporating safety mats 



## Configuration of safety mats

The Protect Area Design software enables determination of the shape to be covered and optimisation of the use of mats using the following proposed solutions:
"Coverage of the zone to be protected" or "Optimised coverage of the zone to be protected".
■ For configuration in "Assisted procedure" mode the software enables access to the following menus:
$\square$ description of the installation: description of the machine, reaction time,
$\square$ description of the structure and access to the hazardous zone,
$\square$ selection of configuration according to the zone to cover,
$\square$ calculation.
■ For configuration in "Manual procedure" mode the software enables access to the following menus:

- replacement of an existing installation,
$\square$ selection of surface to cover and measurements.


Control system safety level and its sensitivity


Configuration according to the zone to cover

## On-screen results

After the safety distance calculation, the software displays the following results:
■ component selection (description of products),

- graphical representation of the configuration,
- list of selected components (references and quantities).


Description of the installation

List of products



Graphical representation of the sensing mat configuration

Selection guide
Safety detection solutions
Safety light curtains

|  | Applications |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Pres |  | orking/ machine | Textile |
| Protection | Finger protection ( 14 mm ) or hand protection ( 30 mm ) |  |  |  |
| Type of recommended light curtains | Type 4 |  |  |  |
|  |  |  |  |  |
| Characteristics | Finger protection | Hand protection | Finger protection | Hand protection |
| Distance | $\begin{aligned} & 0.3 \ldots 3 \mathrm{~m} \\ & \text { or } 0.3 \mathrm{~m} \ldots .7 \mathrm{~m} \end{aligned}$ | $\begin{aligned} & 0.3 \ldots 8 \mathrm{~m} \\ & \text { or } 0.3 \ldots 20 \mathrm{~m} \end{aligned}$ | $\begin{aligned} & 0.3 \ldots 3 \mathrm{~m} \\ & \text { or } 0.3 \mathrm{~m} \ldots .7 \mathrm{~m} \end{aligned}$ | $\begin{aligned} & 0.3 \ldots 8 \mathrm{~m} \\ & \text { or } 0.3 \ldots 20 \mathrm{~m} \end{aligned}$ |
| Height protected | 280... 1360 mm | $320 . . .2120 \mathrm{~mm}$ | 280... 2560 mm (with segments) | 320... 5120 mm (with segments) |
| Detection capacity | 14 mm | 30 mm | 14 mm | 30 mm |
| Type of outputs | 2 safety PNP <br> 1 auxiliary PNP or NPN |  |  |  |
| Integrated functions |  |  |  |  |
| Blanking | - |  | - |  |
| Floating blanking | - |  | - |  |
| External device monitoring | - |  | $\bullet$ |  |
| Test input | - |  | - |  |
| Cascadable segments | - |  | Up to 256 beams - up to 4 segments |  |
| Muting | Via external module type XPS LCM1150 |  | Integrated when using connection box <br> XPS LCM1 or via external module type <br> XPS LCM1150 |  |
| Automatic/manual start | - |  | - |  |
| Type references | XUS LBeoece** |  |  XPS LCM1 |  |
| Pages | 30314/2 and 30315/2 |  |  |  |

Applications


| $0.8 \ldots 20 \mathrm{~m}$ or $0.8 \ldots . .70 \mathrm{~m}$ depending on con guration <br> $0.8 \ldots 8 \mathrm{~m}$ for light curtains with passive receiver |
| :--- |
| $750 \ldots 1800 \mathrm{~mm}$ ( 1 to 6 light beams) |
| 1 to 6 light beams |
| 2 safety PNP <br> 1 auxiliary PNP or NPN |

$0.3 \ldots 15 \mathrm{~m}$

30 mm

2 safety PNP

Via external module type XPS LCM1150
-
XUS LNG5Cゃe००, XUS LNG5D•eゃ०

30312/3
0... 8 m
$750 \ldots 1200 \mathrm{~mm}$ (1 to 4 light beams)

1 to 4 light beams

2 safety PNP
4 auxiliary PNP
1 muting signalling


30303/4 and 30303/5

# Safety detection solutions <br> Safety light curtains 

## Presentation

## Directives and standards

## Protection of personnel

Safety light curtains are electro-sensitive protection equipment (ESPE) designed for the protection of persons operating or working in the vicinity of machinery, by stopping the dangerous movement of parts as soon as one of the light beams is broken.
In particular, they provide protection to ensure the safety of personnel operating dangerous machinery (annex IV of 98/37/EC) but they are equally suitable for use with many other types of machines. They make it possible to protect personnel whilst allowing free access to machines.

The absence of a door or guard reduces the time required for loading, inspection or adjustment operations as well as making access easier.

## Conformity to standards

## These light curtains conform to:

■ European Machinery Safety Directive 98/37/EC and European Work Equipment
Directive 89/655/EEC,

- Low Voltage Directives 73/23/EEC and 93/68/EEC and also, the Electromagnetic

Compatibility Directive 89/336/EEC,
■ Standard EN/IEC 61496-1, EN/IEC 61496-2 and IEC 61508 (only XUS LB,
XUS LDM and XUS LDS) (electro-sensitive protection equipment: ESPE),

- Standard EN 60825 (emission power),
- Standard EN 999/ISO 13855 (installation positioning).

These light curtains are UL, CSA and TÜV certi ed.
Main applications

- Application sectors for type 2 products:
- assembly and packaging lines,
- conveying and handling lines,
- warehousing and storage systems,
- waste disposal skips.
- Types of machine requiring the use of type 4 products:
- presses (all types), shears and trimmers,
- hoisting equipment,
- saws (all types),
- machine tools llathes, milling machines, machining centres),
- woodworking machines (planing machines, lathes, spindle moulding machines,
side and face milling cutters),
- textile machinery (carding machines, weaving looms, steam rooms),
- assembly machines,
- assembly robots.


## Safety rules

## Detection of failures <br> Detection of failures liable to compromise safety and stopping of the machine

The design of the machine and its control system must be to the same level of safety as that of the safety light curtain in order to ensure the immediate stopping of the machines dangerous movement as soon as the hazardous zone, protected by the light curtain, is entered.

It must not be possible to enter the protected zone without breaking the protective light beams. The safety light curtain must therefore be installed in such a manner that the light beams cannot be avoided.
The machine can only be restarted if no danger exists and no personnel are present in the hazardous zone. The risk that persons might be inside the protected zone but out of the protective light beams must be addressed

## Safety detection solutions <br> Safety light curtains

Installation rules


These are defined in standard EN 999/ISO 13855. In particular:

- the safety distance between the light curtain and the hazardous zone,
- the body approach speed,
- multiple single-beam devices,
- multi-beam light curtains.

Calculation of minimum safety distance $S$ between the light curtain and the hazardous zone
$\mathbf{S}=\mathrm{K}(\mathbf{t} \mathbf{1}+\mathbf{t} \mathbf{2})+\mathbf{C}$ (general formula)
$\mathbf{S}=$ minimum distance in mm
$\mathbf{K}=$ body approach speed (or of part of the body) in $\mathrm{mm} / \mathrm{s}$
t1 $=$ response time of protection device in s
t2 = stopping time of machine (dangerous movements) in s
$\mathbf{C}=$ additional distance in mm
■ For single-beam light curtains:
$\mathrm{K}=1600 \mathrm{~mm} / \mathrm{s}$
$\mathrm{C}=1200 \mathrm{~mm}$ for a single beam
C $=\mathbf{8 5 0} \mathbf{~ m m}$ for several beams
The heights protected are as follows:

| Number of beams | Heights protected (mm) |
| :--- | :--- |
| 4 | $300,600,900,1200$ |
| 3 | $300,700,1100$ |
| 2 | 400,900 |
| 1 | 750 |

For multi-beam light curtains:
$\mathrm{K}=2000 \mathrm{~mm} / \mathrm{s}$
$C=\mathbf{8 ( d - 1 4 )}$ where $\mathbf{d}=$ detection capacity of the light curtain

## Special rules for presses

The use of safety light curtains and mechanical protectors on metal working presses is governed by speci c standards and rules.
The standards specify that only safety light curtains or mechanical protectors must be used as safety devices so that, if a person enters the protective eld whilst the dangerous movement is in progress, the machine stops as quickly as possible. "Quick stopping" means stopping of the ram before the operator can reach the hazardous zone, taking into account their speed of movement.

The continuous self-monitoring function of safety light curtains is essential for metal working press applications. If a fault occurs in the safety device, the potentially dangerous machine must be stopped automatically.

Once the protected zone is clear, the movement which was started and then interrupted by entry into the zone must not resume its normal travel, even after a Reset button has been pressed. Resetting must restart the movement from the beginning of the cycle. The safety light curtain must only allow starting of a dangerous movement if its correct operation has been proved (by pushing a test rod into the hazardous zone, or by means of an automatic device) and if a Reset button (start interlock) has been reactivated.

The safety distance $S$ is calculated in a special way for:

- mechanical presses: refer to EN 692,
- hydraulic presses, pneumatic folding machines, shears, bending and shaping machines: refer to prEN 693.


# Safety detection solutions <br> Safety light curtains 



Without additional safety device: insuf cient degree of protection

Prevention of access from beneath the light curtain


Without additional safety device: insuf cient degree of protection


With additional safety device: light beam(s) broken, the machine stops

## Prevention of access from rear of light curtain




Addition of solid protection to the light curtain when using channel Addition of
selection

## Additional safety devices

Safety light curtains can only be used on machines on which the movement of working components can be stopped at any time during a hazardous phase.

These light curtains provide a stop signal, not a control instruction. This stop signal must be stored.

Clearing of the light curtain must not result in restarting of moving parts.
Subsequent restarting must only be possible by means of deliberate operation of the appropriate control device, after having checked that there is no longer any danger.

Electrical interfacing between the light curtain and the machine circuits must correspond to the machine standard specifications.

Where safety light curtains do not provide an adequate degree of protection due to their location, additional suitable safety devices or additional light curtains must be used in order to prevent operators from entering the protective light curtain and reaching the hazardous zone (EN 294/ISO 13852, EN 811/ISO 13853), or from remaining in the area between the hazardous zone and the safety light curtain (EN 999/ISO 13855).

The position and size of these additional safety devices must be such that it is impossible for operators to reach the hazardous zone in any way whatsoever (over the top, from beneath, from behind or from the side) without breaking the beams of the light curtain.

These additional safety devices must be:

- either xed
(if possible, screwed or welded to the machine),
- or moving
(with continuous monitoring of their position if they have to open).
It must be impossible for operators to disconnect or cut-out the switching circuits for these additional safety devices.


## Protection for Blanking, Floating blanking or Monitored blanking functions

 The Blanking (inhibition of light beams), Floating blanking ( oating inhibition of light beams) or Monitored blanking (xed and oating inhibition/disinhibition of light beams) functions create non protected areas in the detection eld. These non protected areas are required for some applications. If an obstruction does not completely II these unprotected areas, one of two actions must be implemented: - an increase of safety distance to take into account a larger opening in the light curtain,- the area not lled by an obstruction must be guarded by a solid protection method (mechanical barrier: metal plate or unfolded structure).


## Safety detection solutions <br> Safety light curtains

Installation precautions


## Reflective surface

The devices must be installed such that the transmitter and associated receiver are mounted facing each other and correctly aligned for both height and angle.

The aperture angle of the optics and transmitter/receiver alignment tolerance are $\pm 2.5^{\circ}$.

Re ective surfaces located alongside the optical axis could result in stray re ections interfering with the beams which are the furthest away from the axis and, in consequence, prevent detection of an object entering the hazardous zone. The direct beam could then be joined by a stray re ected beam and this latter beam would not be broken when the object is in the axis.

For this reason, prEN 50100-1 and 2 and EN/IEC 61496-1 specify a minimum distance $\mathbf{D}$ whereby:

- for $0<L<3 \mathrm{~m}, \mathrm{D}=131 \mathrm{~mm}$,
- for $\mathbf{L}>3 \mathrm{~m}, \mathrm{D}=(\mathbf{0 . 0 3 5} \mathbf{x} \mathbf{L})+5$ (with a minimum limit value of 131 mm ).
$\mathbf{D}=$ minimum distance between the light curtain and re ective surface in mm
$\mathbf{L}=$ sensing distance of the light curtain in mm


## Mutual interference

Certain installation con gurations may require the installation of 2 (or more) safety light curtains side by side.

In cases where the products used do not have a light beam coding system it is recommended that their installation is as indicated below.


## Environments subject to interference

Industrial applications sometimes place products in extreme operating conditions, mainly due to:

■ Electromagnetic interference generated by the proximity of variable speed drives, welding machines or walkie-talkies.
The products in the XUS L range are designed to be immune to such interference. They conform to:

- level 3 according to EN/IEC 61496-1,
- resistance to interference caused by variable speed drives.

■ Light interference (conformity to standard EN/IEC 61496-2).

## Safety detection solutions <br> Safety light curtains

## Definitions



Detection capacity (d)
This is the smallest diameter (object) that a type 4 safety light curtain is capable of detecting with absolute certainty.
$d=P+e$
P: distance between the axis of 2 adjacent beams
e: diameter of the beams

| XUS L range | $\mathbf{P ( m m})$ | $\mathbf{e}(\mathbf{m m})$ | $\mathbf{d}(\mathbf{m m})$ |
| :--- | :--- | :--- | :--- |
| XUS L• | 10 | 3.3 | 14 |
| Finger protection |  |  |  |

## Protected height (Hp)

According to prEN 50100-2, this is the zone (or height) within which an object of equal diameter to the detection capacity $\mathbf{d}$ is detected with absolute certainty.


## Response time

European standard EN 999/ISO 13855 fully incorporates the various aspects of "response time" in the formula for calculating the minimum safety distance (see page 38131-EN/3):
$S=K(t 1+t 2)+C$
with, in particular:

- t1: response time of the protection device (in s). This is the time indicated for the XPS CE and XUS L ranges. It is the total time between detection by the device and switching of the output component.
- t2: stopping time of the machine and, in particular, of its dangerous movements (in s). This information is supplied by the machine manufacturer. It is the time between the stop instruction and the actual stop of the dangerous mechanical components.


# Safety detection solutions <br> Safety light curtains 

## Functions

## Protection mode

AUTO/MAN (automatic/manual): this is what standard EN/IEC 61496 calls start (or restart) interlock of the safety light curtain: - in AUTO mode: on power-up or after the beams have been cleared, the light curtain resets itself automatically (closing of the OSSD output safety circuits),

- in MANUAL mode: on power-up or after the beams have been cleared, the light curtain keeps its output safety circuits in the "open" position. Pressing (and releasing) the reset button will cause actual resetting of the light curtain (and closing of its OSSD output safety circuits).

Note: in all cases, a general start instruction for the machine will trigger its actual start-up.

## Monitoring of external switching devices

Also called EDM (External Device Monitoring) by standard EN/IEC 61496, this consists of monitoring the function (open or closed), together with the time taken to reach that condition, of the machines power switching components.

## Auxiliary output

This is a low power solid-state output for signalling, when con gurable (XUS LP/XUS LB/XUS LDM), to the automation system. This output closes when the light curtain switches to run mode.

## Alarm

This is a low power solid-state output for signalling to the automation system. This output closes when the light curtain switches to alarm mode.

## Signalling

LED display of operating modes and alarm.

## Alignment aid

Display by visible infrared LED of each beam broken.

## Muting (inhibition)

When activated, the "muting" function inhibits the detection function of the light curtain.
Activation (or deactivation) is achieved by means of standard sensors (photo-electric or other). When activated, a signal is sent to the automation system. This function is used to allow objects to access the hazardous zone during the process.
Signalling informs the operator or operators that they are not protected.

## Reduction of resolution

This function enables the resolution of the light curtain to be reduced by inhibiting 1 or 2 adjacent light beams, anywhere within the protected height. This function is mainly used for ignoring metal plate guide rails and metal plates of varying thickness on folding or cutting presses.

## Blanking

This function makes it possible to inhibit detection by a selected group of light beams in the light curtain (and not all the beams as with muting). This function (adapted to the size of the objects) allows the presence of objects during process operations. Caution when using: the detection capacity changes. This imposes a greater safety distance. In addition, the use of additional protection each side of the object present must be included, in order to prevent any intrusion into the free areas.

## Floating blanking

This function makes it possible to inhibit one or two light beams (adjacent or otherwise), anywhere in the light curtain. This con guration is used, for example, for metal plate feeding applications on folding presses or shears.

## Monitored blanking

This function makes it possible to inhibit a group of light beams when a predetermined object enters the light curtain and disinhibit the same group of light beams after completing its movement and exiting the light curtain, without switching it to the stop mode and halting the dangerous movement of the machine.

## Blanking plus floating blanking and Monitored blanking plus floating blanking

The Blanking ( xed inhibition of light beams) and Floating blanking (moving inhibition of one or two light beams) functions can be combined as can the Monitored blanking and Floating blanking functions. Caution, these applications require complementary safety measures.

## Multi-Segments

The "multi-segments" enable the protection of zones using a single connection. Only the rst segment (XUS LDM...), also called the "master", has to be connected to the enclosure or control cabinet. This rst segment, which can either be for nger or hand detection, can support up to 3 other segments, also called intermediate segments or "slaves", which are connected by jumper cables to the M12 connectors located on its top surface. The intermediate segments can be of different detection capacities and heights protected than that of the "Master". They are fully dependent on the functions con gured in the rst segment. Caution: the multi-segment system developed can not exceed 256 light beams in total and each intermediate segment must not exceed 128 light beams nor have a jumper cable longer than 10 m between them.

## Adjustment of response time (only available on light curtains XUS LD)

This function enables the user to reduce the scanning frequency of the safety light curtain in order to improve its immunity to interference associated to the environment. When low frequency is activated, an additional 9 ms to 40 ms ( 16 light beams to 256 light beams) is added to the normal response time. This function can be used in dif cult environmental conditions where electrical interference, smoke/fumes, dust or other particles can disrupt the operation of the safety light curtain.

WARNING: The activation of this function requires recalculation of the safety distance to compensate for the added response time. The safety distance must be increased. Ignoring this essential requirement could lead to serious injury, death or damage to material.

# Safety detection solutions Preventa 

Safety light curtains, type 4
Light curtains basic XUS LB and
advanced XUS LDM with solid-state output

| Light curtain type |  |  | XUS LBQ6A •••• XUS LDMQ6A••••• ( 14 mm ) | XUS LBR5A•••• ( 30 mm ) | XUS LDMY5A••••• ( 30 mm ) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Environment characteristics |  |  |  |  |  |
| Conformity to standards |  |  | ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, EN/IEC 61496-1 and EN/IEC 61496-2 and IEC 61508-1, 2 (Type 4 ESPE) |  |  |
| Certifications |  |  | C $¢$, TUV, UL, CSA |  |  |
| European directives |  |  | Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC <br> ROHS directive 2002/95/EC |  |  |
| Maximum safety level (1) Reliability data |  |  | PL = e/category 4 conforming to EN/ISO 13849-1 SIL 3 conforming to EN/IEC 61508 |  |  |
|  |  |  | $\mathrm{PFH}_{\mathrm{d}}=4.9 \mathrm{E}^{-8} 1 / \mathrm{h}$ conforming to EN/IEC 61508 |  |  |
| Ambient air temperature | Operating | ${ }^{\circ} \mathrm{C}$ | -10... 55 |  |  |
|  | For storage | ${ }^{\circ} \mathrm{C}$ | -25... 75 |  |  |
| Relative humidity |  |  | 95\% maximum, without condensation |  |  |
| Degree of protection |  |  | IP 65 |  |  |
| Shock and vibration resistance | Conforming to IEC 61496-1 |  | Shock resistance: 10 gn , impulse 16 ms Vibration resistance: $10 \ldots 55 \mathrm{~Hz}$, amplitude: $0.35 \pm 0.05 \mathrm{~mm}$ |  |  |
| Materials |  |  | Casing: aluminium with electrostatically applied red (RAL 3000) polyester paint nish; end caps: 20\% breglass impregnated polycarbonate. |  |  |
| Fixings |  |  | End brackets (included) |  |  |

## Optical characteristics

| Minimum detection capacity | mm |
| :--- | :--- |
| Nominal sensing distance (Sn) | m |
| Height protected | mm |
| Effective aperture angle (EAA) |  |
| Light source |  |
| Immunity to ambient light |  |

## Electrical characteristics


(1) Using an appropriate and correctly connected control system.
(2) PDM: Programming and Diagnostic Module, available as option, see page 30314/8.
(3) Pre-wired connectors to be ordered separately, see page 30314/8.

| General: | References: | Dimensions: | Connections: |
| :--- | :--- | :--- | :--- |
| pages 38131/2 to 38131/7 | pages 30314/4 to 30314/9 | pages 30314/10 and 30314/11 | page 30314/12 |

## Characteristics (continued)

## Safety detection solutions Preventa <br> Safety light curtains, type 4 <br> Light curtains basic XUS LB and <br> advanced XUS LDM with solid-state output

| Light curtain type |  | XUS LB•••••๑ | XUS LDM••・セ๑ |
| :---: | :---: | :---: | :---: |
| Functions |  |  |  |
| Functions | Accessible by cabling alone (1) | - Automatic start <br> Auxiliary output (PNP, status signalling) <br> Test (MTS: Monitoring Test Signal) <br> Alignment aid by display of each light b <br> LED display of operating modes and fa | am broken ults |
|  | Accessible via programming and diagnostic module | - Auto/Manual <br> - Monitoring of external switching devices (EDM: External Device Monitoring) <br> - Light beam coding (A or B) <br> $\square$ Sensing distance (short, long) <br> - Programming and downloading of con guration settings, via programming and diagnostic module (PDM) <br> - Display of operating modes and faults by LED and/or PDM (2) |  <br> Auto/Manual, manual 1st cycle Monitoring of external switching devices (EDM: External Device Monitoring) Blanking (ECS/B) Monitored Blanking Floating Blanking (FB) Reduction of resolution Response time (normal, slow) Light beam coding (A or B) Sensing distance (short, long) <br> - Auxiliary output (alarm or status signalling, PNP or NPN) <br> - Start button (N/O or N/C, 0 V or 24 V ) <br> - Muting (see page 30315/2) <br> - Cascadable versions with up to 4 segments total (256 light beams max., modular nger/hand) using segments XUS LDS <br> - Programming and downloading of con guration settings, via programming and diagnostic module (PDM) - Display of operating modes and faults by LED and/or PDM (2) |
| Monitoring of external switching devices (EDM = External Device Monitoring) |  | Monitoring of the function (open or closed) as well as the response time of the power components. |  |
| "Test" function |  | Instigates the stop instruction of the light curtain by opening the contact (simulated intrusion) |  |
| "Muting" function |  | - With external module XPS LCM1150 | - Integrated when using connection box XPS LCM1 for connecting sensors and "muting" indicator light - or with module XPS LCM1150 |

(1) Not requiring use of PDM.
(2) PDM: Programming and Diagnostic Module, available as option, see page 30314/8.

| General: <br> pages 38131/2 to 38131/7 | References: <br> pages 30314/4 to 30314/9 | Dimensions: <br> pages 30314/10 and 30314/11 | Connections: <br> page 30314/12 |
| :--- | :--- | :--- | :--- |
| 30314-EN_Ver2.2.indd |  | Schneider |  |
| Electric |  |  |  |

# Safety detection solutions Preventa 

Safety light curtains, type 4
Basic light curtains XUS LB with solid-state output


XUS LBQ6A・セ・•


XUS LBR5A••••

夫 Products available in stock

Transmitter-receiver pairs for finger protection (1)
Detection capacity 14 mm . Sensing distance 0.3 to 7 m (or 3 m with PDM).
■ 2 PNP safety outputs

| Height <br> protected | Response <br> time | Number of <br> light beams | Auxiliary <br> output | Reference <br> (2) | Weight |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathbf{m m}$ | $\mathbf{m s}$ |  |  | kg |  |
| 280 | 23 | 24 | PNP | XUS LBQ6A0280 $\star$ | 1.790 |
| 320 | 23 | 32 | PNP | XUS LBQ6A0320 | 1.970 |
| 360 | 23 | 36 | PNP | XUS LBQ6A0360 $\star$ | 2.150 |
| 440 | 23 | 44 | PNP | XUS LBQ6A0440 $\star$ | 2.500 |
| 520 | 23 | 52 | PNP | XUS LBQ6A0520 $\star$ | 2.870 |
| 600 | 23 | 60 | PNP | XUS LBQ6A0600 $\star$ | 3.220 |
| 720 | 32 | 72 | PNP | XUS LBQ6A0720 $\star$ | 3.760 |
| 760 | 32 | 76 | PNP | XUS LBQ6A0760 | 3.940 |
| 880 | 32 | 88 | PNP | XUS LBQ6A0880 $\star$ | 4.470 |
| 920 | 32 | 92 | PNP | XUS LBQ6A0920 | 4.650 |
| 960 | 32 | 96 | PNP | XUS LBQ6A0960 | 4.830 |
| 1040 | 32 | 104 | PNP | XUS LBQ6A1040 | 5.190 |
| 1120 | 32 | 112 | PNP | XUS LBQ6A1120 | 5.540 |
| 1200 | 32 | 120 | PNP | XUS LBQ6A1200 | 5.900 |
| 1360 | 41 | 136 | PNP | XUS LBQ6A1360 | 6.180 |

Transmitter-receiver pairs for hand protection (1)
Detection capacity 30 mm . Sensing distance 0.3 to 8 m (or 20 m with PDM).

- 2 PNP safety outputs

| Height <br> protected | Response <br> time | Number of <br> light beams | Auxiliary <br> output | Reference <br> (2) | Weight |
| :--- | :--- | :--- | :--- | :--- | ---: |
| $\mathbf{m m}$ | $\mathbf{m s}$ |  |  |  | kg |
| 320 | 23 | 16 | PNP | XUS LBR5A0320 | 1.970 |
| 360 | 23 | 22 | PNP | XUS LBR5A0360 $\star$ | 2.150 |
| 440 | 23 | 26 | PNP | XUS LBR5A0440 | 2.500 |
| 520 | 23 | 30 | PNP | XUS LBR5A0520 $\star$ | 2.870 |
| 600 | 23 | 34 | PNP | XUS LBR5A0600 | 3.220 |
| 680 | 23 | 38 | PNP | XUS LBR5AA0760 $\star$ | 3.580 |
| 760 | 23 | 44 | PNP | XUS LBR5A0880 $\star$ | 4.940 |
| 880 | 23 | 46 | PNP | XUS LBR5A0920 | 4.650 |
| 920 | 23 | 52 | PNP | XUS LBR5A1040 $\star$ | 5.190 |
| 1040 | 23 | 60 | PNP | XUS LBR5A1200 $\star$ | 5.900 |
| 1200 | 23 | 68 | PNP | XUS LBR5A1360 | 6.620 |
| 1360 | 23 | 70 | PNP | XUS LBR5A1400 $\star$ | 6.800 |
| 1400 | 23 | 76 | PNP | XUS LBR5A1520 | 7.330 |
| 1520 | 32 | 78 | PNP | XUS LBR5A1560 $\star$ | 7.500 |
| 1560 | 32 | 82 | PNP | XUS LBR5A1640 | 7.870 |
| 1640 | 32 | 86 | PNP | XUS LBR5A1720 | 8.230 |
| 1720 | 32 | 88 | PNP | XUS LBR5A1800 | 8.590 |
| 1800 | 32 | 96 | PNP | XUS LBR5A1920 | 9.120 |
| 1920 | 32 | 106 | PNP | XUS LBR5A2120 | 10.020 |

(1) Supplied with a test rod, 2 sets of 2 brackets with fixings, user guide with certificate of conformity on CD-ROM and 1 arc suppressor set.
Programming and Diagnostic Module (if required) and pre-wired connectors to be ordered separately, see page 30314/8.
(2) To order a receiver only, add the letter $\boldsymbol{R}$ to the end of the reference for the corresponding transmitter-receiver pair.
Example: reference XUS LBR5A0320 becomes XUS LBR5A0320R for the receiver only. To order a transmitter only, add the letter $\boldsymbol{T}$ to the end of the reference for the corresponding transmitter-receiver pair.
Example: reference XUS LBR5A0320 becomes XUS LBR5A0320T for the transmitter only.

| General: <br> pages 38131/2 to 38131/7 | Characteristics: <br> pages 30314/2 and 30314/3 | Dimensions: <br> pages 30314/10 and 30314/11 | Connections: <br> page 30314/12 |
| :--- | :--- | :--- | :--- |

# Safety detection solutions Preventa 

Safety light curtains，type 4<br>Advanced light curtains XUS LDM with solid－state output



XUS LDMQゃゃゃ・


XUS LDMYゃゃゃ・
＊Products available in stock

| Transmitter－receiver pairs for finger protection（1） |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Detection capacity 14 mm ．Sensing distance 0.3 to 7 m （or 3 m with PDM）． |  |  |  |  |  |  |
| － 2 PNP safety outputs |  |  |  |  |  |  |
| Height protected | Response time |  | Number of light beams | Auxiliary output | Reference(2) | Weight |
|  | Normal | Slow |  |  |  |  |
| mm | ms | ms |  |  |  | kg |
| 280 | 23 | 38 | 24 | PNP／NPN | XUS LDMQ6A0280 ${ }^{\text {® }}$ | 1.790 |
| 320 | 23 | 38 | 32 | PNP／NPN | XUS LDMQ6A0320 ${ }^{\text {® }}$ | 1.970 |
| 360 | 23 | 38 | 36 | PNP／NPN | XUS LDMQ6A0360 | 2.150 |
| 440 | 23 | 38 | 44 | PNP／NPN | XUS LDMQ6A0440＊ | 2.500 |
| 520 | 23 | 38 | 52 | PNP／NPN | XUS LDMQ6A0520 ${ }^{\text {® }}$ | 2.900 |
| 600 | 23 | 38 | 60 | PNP／NPN | XUS LDMQ6A0600 | 3.220 |
| 720 | 32 | 53 | 72 | PNP／NPN | XUS LDMQ6A0720＊ | 3.760 |
| 760 | 32 | 53 | 76 | PNP／NPN | XUS LDMQ6A0760 | 3.940 |
| 880 | 32 | 53 | 88 | PNP／NPN | XUS LDMQ6A0880 ${ }^{\text {® }}$ | 4.470 |
| 920 | 32 | 53 | 92 | PNP／NPN | XUS LDMQ6A0920 | 4.650 |
| 960 | 32 | 53 | 96 | PNP／NPN | XUS LDMQ6A0960 | 4.830 |
| 1040 | 32 | 53 | 104 | PNP／NPN | XUS LDMQ6A1040 | 5.190 |
| 1120 | 32 | 53 | 112 | PNP／NPN | XUS LDMQ6A1120 | 5.540 |
| 1200 | 32 | 53 | 120 | PNP／NPN | XUS LDMQ6A1200 | 5.900 |
| 1360 | 41 | 68 | 136 | PNP／NPN | XUS LDMQ6A1360 | 6.620 |

Transmitter－receiver pairs for hand protection（1） Detection capacity 30 mm ．Sensing distance 0.3 to 20 m （or 8 m with PDM）．
－ 2 PNP safety outputs

| Height protected | Response time |  | Number of light beams | Auxiliary output | Reference(2) | Weight |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Normal | Slow |  |  |  |  |
| mm | ms |  |  |  |  | kg |
| 320 | 23 | 38 | 16 | PNP／NPN | XUS LDMY5A0320 | 1.970 |
| 360 | 23 | 38 | 18 | PNP／NPN | XUS LDMY5A0360＊ | 2.150 |
| 440 | 23 | 38 | 22 | PNP／NPN | XUS LDMY5A0440 | 2.500 |
| 520 | 23 | 38 | 26 | PNP／NPN | XUS LDMY5A0520＊ | 2.870 |
| 600 | 23 | 38 | 30 | PNP／NPN | XUS LDMY5A0600 | 3.220 |
| 680 | 23 | 38 | 34 | PNP／NPN | XUS LDMY5A0680＊ | 3.580 |
| 760 | 23 | 38 | 38 | PNP／NPN | XUS LDMY5A0760 | 3.940 |
| 880 | 23 | 38 | 44 | PNP／NPN | XUS LDMY5A0880＊ | 4.470 |
| 920 | 23 | 38 | 46 | PNP／NPN | XUS LDMY5A0920 | 4.650 |
| 1040 | 23 | 38 | 52 | PNP／NPN | XUS LDMY5A1040＊ | 5.190 |
| 1200 | 23 | 38 | 60 | PNP／NPN | XUS LDMY5A1200 | 5.900 |
| 1360 | 23 | 38 | 68 | PNP／NPN | XUS LDMY5A1360 | 6.620 |
| 1400 | 23 | 38 | 70 | PNP／NPN | XUS LDMY5A1400＊ | 6.800 |
| 1520 | 32 | 53 | 76 | PNP／NPN | XUS LDMY5A1520 | 7.330 |
| 1560 | 32 | 53 | 78 | PNP／NPN | XUS LDMY5A1560 | 7.500 |
| 1640 | 32 | 53 | 82 | PNP／NPN | XUS LDMY5A1640 | 7.870 |
| 1720 | 32 | 53 | 86 | PNP／NPN | XUS LDMY5A1720 | 8.230 |
| 1800 | 32 | 53 | 88 | PNP／NPN | XUS LDMY5A1800 | 8.590 |
| 1920 | 32 | 53 | 96 | PNP／NPN | XUS LDMY5A1920 | 9.120 |
| 2120 | 32 | 53 | 106 | PNP／NPN | XUS LDMY5A2120 | 10.020 |

（1）Supplied with a test rod， 2 sets of 2 brackets with fixings，user guide with certificate of conformity on CD－ROM and 1 arc suppressor set．
Programming and Diagnostic Module（if required）and pre－wired connectors to be ordered separately，see page 30314／8．
（2）To order a receiver only，add the letter $\boldsymbol{R}$ to the end of the reference for the corresponding transmitter－receiver pair
Example：reference XUS LDMY5A0320 becomes XUS LDMY5A0320R for the receiver only．
To order a transmitter only，add the letter $\boldsymbol{T}$ to the end of the reference for the corresponding transmitter－receiver pair．
Example：reference XUS LDMY5A0320 becomes XUS LDMY5A0320T for the transmitter only．

Combining type 4 safety light curtains with external module for muting function．
See pages 30311／2 to 30311／9．

| General： <br> pages 38131／2 to 38131／7 | Characteristics： <br> pages 30314／2 and 30314／3 | Dimensions： <br> pages 30314／10 and 30314／11 | Connections： <br> page 30314／12 |
| :--- | :--- | :--- | :--- |
| 30314－EN＿Ver2．2．indd |  | Schneider |  |
| Electric |  |  |  |

# Safety detection solutions Preventa 

Safety light curtains, type 4
Segments XUS LDS
for advanced light curtains XUS LDM

$X U S L D M+X U S L D S$

Universal XUS LDM light curtains, cascadable versions
Cascadable versions with up to 4 segments total ( 256 light beams max., modular nger/hand) using segments XUS LDS

## Configuration of segments XUS LDS



| Response time |
| :--- |
| $\mathbf{m s}$ |
| 23 |
| 32 |
| 41 |
| 50 |
| 59 |


| Three segments |  |
| :---: | :---: |
| Number of light beams | Response time |
|  | ms |
| 0 to 59 | 23 |
| 60 to 114 | 32 |
| 115 to 168 | 41 |
| 169 to 223 | 50 |
| 224 to 256 | 59 |


| Four segments <br> Number of light beams | Response time <br> ms <br> $\frac{0 \text { to } 53}{} 54$ to 108 <br> 109 to 162 |
| :--- | :--- |
| $\frac{23}{32}$ |  |
| 163 to 217 | $\frac{41}{50}$ |

# Safety detection solutions Preventa 

## Safety light curtains, type 4 <br> Segments XUS LDS <br> for advanced light curtains XUS LDM



XUS LDSQ6A••••


XUS LDSY5A••••

* Products available in stock

| Transmitter-receiver pairs for finger protection (1) |  |  |  |
| :---: | :---: | :---: | :---: |
| Detection capacity 14 mm . Sensing distance depending on XUS LDM light curtain used |  |  |  |
| ■ Segments for cascadable Universal light curtains (2) |  |  |  |
| Height protected | Number of light beams | Reference (3) | Weight |
| mm |  |  | kg |
| 280 | 24 | XUS LDSQ6A0280 | 1.790 |
| 320 | 32 | XUS LDSQ6A0320 | 1.970 |
| 360 | 36 | XUS LDSQ6A0360 | 2.150 |
| 440 | 44 | XUS LDSQ6A0440 | 2.500 |
| 520 | 52 | XUS LDSQ6A0520 | 2.870 |
| 600 | 60 | XUS LDSQ6A0600 | 3.220 |
| 720 | 72 | XUS LDSQ6A0720 | 3.760 |
| 760 | 76 | XUS LDSQ6A0760 | 3.940 |
| 880 | 88 | XUS LDSQ6A0880 | 4.470 |
| 920 | 92 | XUS LDSQ6A0920 | 4.650 |
| 960 | 96 | XUS LDSQ6A0960 | 4.830 |
| 1040 | 104 | XUS LDSQ6A1040 | 5.190 |
| 1120 | 112 | XUS LDSQ6A1120 | 5.540 |
| 1200 | 120 | XUS LDSQ6A1200 | 5.900 |

Transmitter-receiver pairs for hand protection (1)
Detection capacity $\mathbf{3 0} \mathbf{~ m m}$. Sensing distance depending on XUS LDM light curtain used
■ Segments for cascadable Universal light curtains (2)

| Height protected | Number of light beams | Reference (3) | Weight |
| :---: | :---: | :---: | :---: |
| mm |  |  | kg |
| 320 | 16 | XUS LDSY5A0320 | 1.970 |
| 360 | 18 | XUS LDSY5A0360 * | 2.150 |
| 440 | 22 | XUS LDSY5A0440 | 2.500 |
| 520 | 26 | XUS LDSY5A0520 | 2.870 |
| 600 | 30 | XUS LDSY5A0600 | 3.220 |
| 680 | 34 | XUS LDSY5A0680 * | 3.580 |
| 760 | 38 | XUS LDSY5A0760 | 3.940 |
| 880 | 44 | XUS LDSY5A0880 | 4.470 |
| 920 | 46 | XUS LDSY5A0920 | 4.650 |
| 1040 | 52 | XUS LDSY5A1040 * | 5.190 |
| 1200 | 60 | XUS LDSY5A1200 | 5.900 |
| 1360 | 68 | XUS LDSY5A1360 | 6.620 |
| 1400 | 70 | XUS LDSY5A1400 | 6.800 |
| 1520 | 76 | XUS LDSY5A1520 | 7.330 |
| 1560 | 78 | XUS LDSY5A1560 | 7.500 |
| 1640 | 82 | XUS LDSY5A1640 | 7.870 |
| 1720 | 86 | XUS LDSY5A1720 | 8.230 |
| 1800 | 88 | XUS LDSY5A1800 | 8.590 |
| 1920 | 96 | XUS LDSY5A1920 | 9.120 |
| 2120 | 106 | XUS LDSY5A2120 | 10.020 |

(1) Supplied with 2 sets of 2 brackets and fixings.

Jumper cables to be ordered separately, see page 30314/8.
(2) The segments are to be connected to the M12 4-pin connector on top of the XUS LDM light curtains.
(3) To order a receiver only, add the letter $\boldsymbol{R}$ to the end of the reference for the corresponding transmitter-receiver pair.
Example: reference XUS LDSY5A0320 becomes XUS LDSY5A0320R for the receiver only. To order a transmitter only, add the letter $\boldsymbol{T}$ to the end of the reference for the corresponding transmitter-receiver pair.
Example: reference XUS LDSY5A0320 becomes XUS LDSY5A0320T for the transmitter only.
$\left.\begin{array}{lll}\hline \begin{array}{l}\text { General: } \\ \text { pages 38131/2 to 38131/7 }\end{array} & \begin{array}{l}\text { Characteristics: } \\ \text { pages 30314/2 and 30314/3 }\end{array} & \begin{array}{l}\text { Dimensions: } \\ \text { pages 30314/10 and 30314/11 }\end{array}\end{array} \begin{array}{l}\text { Connections: } \\ \text { page 30314/12 }\end{array}\right]$

References (continued)


XUS LPDM


XSZ BCT••
XSZ BCR••

* Products available in stock


## Safety detection solutions Preventa

Safety light curtains, type 4
Light curtains basic XUS LB and advanced XUS LDM/LDS with solid-state output


Characteristics， references

## Safety detection solutions Preventa

Safety light curtains，type 4
Protection tubes for light curtains with solid－state output
XUS LB／XUS LDM and segments XUS LDS

| IP 67 protection tubes for light curtains XUS LB／XUS LDM | XUS LZD7•••• |
| :--- | :--- |
| and segments XUS LDS |  |
| Environment characteristics |  |


| Air temperature | For operation | ${ }^{\circ} \mathrm{C}$ | 0．．．+40 |
| :---: | :---: | :---: | :---: |
|  | For storage | ${ }^{\circ} \mathrm{C}$ | －25．．．+70 |
| Degree of protection |  |  | IP 67 conforming to IEC 60529 |
| Material |  |  | Acrylic |
| Sensing distance（Sn）reduction coefficient |  |  | 0.90 |

## Environmental chemicals

| Chemical resistance | Aliphatic hydrocarbons | Resistant |
| :---: | :---: | :---: |
|  | Alkalis |  |
|  | Aqueous solutions |  |
|  | Detergents and cleaners |  |
|  | Inorganic diluted acids |  |
|  | Chlorinated or aromatic hydrocarbons | Limited resistance |
|  | Esters |  |
|  | Ketones |  |
| Environmental resistance | Adverse weather，sunlight（UV） | Resistant |
|  | Humidity |  |
|  | Immersion in water |  |

References of IP 67 protection tubes


XUS LZD7•••

| Description | For use with | Height mm | Reference | Weight kg |
| :---: | :---: | :---: | :---: | :---: |
| IP 67 protection tubes for XUS LB／LDM transmitter－ receiver pair and segments XUS LDS $\bullet \bullet \bullet$ （ 0.90 Sn ）（1） （Sold in lots of 2） | XUS L••6A0280 | 284.4 | XUS LZD70280 | 2.650 |
|  | XUS L•・セA0320 | 324.8 | XUS LZD70320 | 2.810 |
|  | XUS L••๑A0360 | 364.5 | XUS LZD70360 | 2.960 |
|  | XUS L••๑A0440 | 443.9 | XUS LZD70440 | 3.270 |
|  | XUS Le・セA0520 | 523.4 | XUS LZD70520 | 3.580 |
|  | XUS LeセeA0600 | 604.1 | XUS LZD70600 | 3.890 |
|  | XUS L•05A0680 | 683.6 | XUS LZD70680 | 4.190 |
|  | XUS L・セ6A0720 | 724 | XUS LZD70720 | 4.350 |
|  | XUS Leセ๑A0760 | 763 | XUS LZD70760 | 4.500 |
|  | XUS L••๑A0880 | 882.8 | XUS LZD70880 | 4.960 |
|  | XUS L•・セA0920 | 922.5 | XUS LZD70920 | 5.120 |
|  | XUS L••6A0960 | 963.6 | XUS LZD70960 | 5.270 |
|  | XUS L••๑A1040 | 1042.9 | XUS LZD71040 | 5.580 |
|  | XUS L••6A1120 | 1122.3 | XUS LZD71120 | 5.890 |
|  | XUS L••๑A1200 | 1203.8 | XUS LZD71200 | 6.200 |
|  | XUS L•・ャA1360 | 1362 | XUS LZD71360 | 6.810 |
|  | XUS L・セ5A1400 | 1401.7 | XUS LZD71400 | 6.970 |
|  | XUS L••5A1520 | 1521.5 | XUS LZD71520 | 7.430 |
|  | XUS L・セ5A1560 | 1563.3 | XUS LZD71560 | 7.580 |
|  | XUS L•05A1640 | 1641.3 | XUS LZD71640 | 7.890 |
|  | XUS L•05A1720 | 1720.8 | XUS LZD71720 | 8.200 |
|  | XUS L・セ5A1800 | 1802.9 | XUS LZD71800 | 8.510 |
|  | XUS L・セ5A1920 | 1922.8 | XUS LZD71920 | 8.970 |
|  | XUS L••5A2120 | 2120.7 | XUS LZD72120 | 9.740 |

[^21]
## Safety detection solutions

 PreventaSafety light curtains, type 4
Light curtains basic XUS LB and advanced XUS LDM with solid-state output

## Light curtains

XUS LB


| xus | b | b1 | H | Height protected |
| :---: | :---: | :---: | :---: | :---: |
| LBe••0280 | 284.4 | 420.4 | 381.7 | 280 |
| LB-0.0320 | 324.8 | 460.8 | 422.1 | 320 |
| LB•••0360 | 364.5 | 500.5 | 461.8 | 360 |
| LBe•00440 | 443.9 | 579.9 | 541.2 | 440 |
| LB•••0520 | 523.4 | 659.4 | 620.7 | 520 |
| LB••00600 | 604.1 | 740.1 | 701.4 | 600 |
| LB•••0680 | 683.6 | 819.6 | 780.9 | 680 |
| LB-0.0720 | 724 | 860 | 821.3 | 720 |
| LB•••0760 | 763 | 899 | 860.3 | 760 |
| LB•••0880 | 882.8 | 1018.8 | 980.1 | 880 |
| LB•••0920 | 922.5 | 1058.5 | 1019.8 | 920 |
| LB•••0960 | 963.6 | 1099.6 | 1060.9 | 960 |
| LB-••1040 | 1042.9 | 1178.9 | 1140.2 | 1040 |
| LB•••1120 | 1122.3 | 1258.3 | 1219.6 | 1120 |
| LB•••1200 | 1203.8 | 1339.8 | 1301.1 | 1200 |
| LB-••1360 | 1362 | 1498 | 1459.3 | 1360 |
| LB-*•1400 | 1401.7 | 1537.7 | 1499 | 1400 |
| LB•••1520 | 1521.5 | 1657.5 | 1618.8 | 1520 |
| LB•••1560 | 1563.3 | 1699.3 | 1660.6 | 1560 |
| LB•••1640 | 1641.3 | 1777.3 | 1738.6 | 1640 |
| LB-0.1720 | 1720.8 | 1856.8 | 1818.1 | 1720 |
| LB-001800 | 1802.9 | 1938.9 | 1900.2 | 1800 |
| LB-*•1920 | 1922.8 | 2058.8 | 2020.1 | 1920 |
| LB•••2120 | 2120.7 | 2256.7 | 2217.3 | 2120 |

## XUS LDM



| xus | b | b1 | H | Height protected |
| :---: | :---: | :---: | :---: | :---: |
| LDM•e0280 | 284.4 | 420.4 | 381.7 | 280 |
| LDM••0320 | 324.8 | 460.8 | 422.1 | 320 |
| LDM••0360 | 364.5 | 500.5 | 461.8 | 360 |
| LDM••0440 | 443.9 | 579.9 | 541.2 | 440 |
| LDM••0520 | 523.4 | 659.4 | 620.7 | 520 |
| LDM••0600 | 604.1 | 740.1 | 701.4 | 600 |
| LDM••0680 | 683.6 | 819.6 | 780.9 | 680 |
| LDM••0720 | 724 | 860 | 821.3 | 720 |
| LDM••0760 | 763 | 899 | 860.3 | 760 |
| LDM••0880 | 882.8 | 1018.8 | 980.1 | 880 |
| LDM••0920 | 922.5 | 1058.5 | 1019.8 | 920 |
| LDM••0960 | 963.6 | 1099.6 | 1060.9 | 960 |
| LDM••1040 | 1042.9 | 1178.9 | 1140.2 | 1040 |
| LDM••1120 | 1122.3 | 1258.3 | 1219.6 | 1120 |
| LDM*•1200 | 1203.8 | 1339.8 | 1301.1 | 1200 |
| LDM••1360 | 1362 | 1498 | 1459.3 | 1360 |
| LDMe•1400 | 1401.7 | 1537.7 | 1499 | 1400 |
| LDM••1520 | 1521.5 | 1657.5 | 1618.8 | 1520 |
| LDM••1560 | 1563.3 | 1699.3 | 1660.6 | 1560 |
| LDM••1640 | 1641.3 | 1777.3 | 1738.6 | 1640 |
| LDMe•1720 | 1720.8 | 1856.8 | 1818.1 | 1720 |
| LDM••1800 | 1802.9 | 1938.9 | 1900.2 | 1800 |
| LDM••1920 | 1922.8 | 2058.8 | 2020.1 | 1920 |
| LDMee2120 | 2120.7 | 2256.7 | 2217.3 | 2120 |

(1) 2 elongated holes $18.5 \times 6.8 \mathrm{~mm}$.
(2) 4 elongated holes $23.2 \times 6.8 \mathrm{~mm}$.
(3) M12 male connector on 0.27 m flying lead.

| General: <br> pages 38131/2 to 38131/7 | Characteristics: <br> pages 30314/2 and 30314/3 | References: <br> pages 30314/4 and 30314/5 | Connections: <br> page 30314/12 |
| :--- | :--- | :--- | :--- |

# Safety detection solutions Preventa 

Safety light curtains, type 4
Segments XUS LDS for advanced XUS LDM light curtains.
Protection tube

Cascadable segments
XUS LDS


| xus | b | b1 | b2 | H | H1 | Height protected |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| LDS•••0280 | 284.4 | 420.4 | 401.5 | 381.7 | 363.1 | 280 |
| LDS•••0320 | 324.8 | 460.8 | 442.3 | 422.1 | 403.5 | 320 |
| LDSe•e0360 | 364.5 | 500.5 | 482 | 461.8 | 443.2 | 360 |
| LDSe•e0440 | 443.9 | 579.9 | 561.4 | 541.2 | 522.6 | 440 |
| LDSe•e0520 | 523.4 | 659.4 | 640.9 | 620.7 | 602.1 | 520 |
| LDS•••0600 | 604.1 | 740.1 | 721.6 | 701.4 | 682.8 | 600 |
| LDSe••0680 | 683.6 | 819.6 | 801.1 | 780.9 | 762.3 | 680 |
| LDSe•e0720 | 724 | 860 | 841.5 | 821.3 | 802.7 | 720 |
| LDS•••0760 | 763 | 899 | 880.5 | 860.3 | 841.7 | 760 |
| LDSe•e0880 | 882.8 | 1018.8 | 1000.3 | 980.1 | 961.5 | 880 |
| LDSe•e0920 | 922.5 | 1058.5 | 1040 | 1019.8 | 1001.2 | 920 |
| LDSe••0960 | 963.6 | 1099.6 | 1081.1 | 1060.9 | 1042.3 | 960 |
| LDS*••1040 | 1042.9 | 1178.9 | 1160.4 | 1140.2 | 1121.6 | 1040 |
| LDS•••1120 | 1122.3 | 1258.3 | 1239.8 | 1219.6 | 1201 | 1120 |
| LDSe•e1200 | 1203.8 | 1339.8 | 1321.3 | 1301.1 | 1282.5 | 1200 |
| LDSe•e1360 | 1362 | 1498 | 1479.5 | 1459.3 | 1440.7 | 1360 |
| LDS•••1400 | 1401.7 | 1537.7 | 1519.2 | 1499 | 1480.4 | 1400 |
| LDSe•e1520 | 1521.5 | 1657.5 | 1639 | 1618.8 | 1600.2 | 1520 |
| LDS*e•1560 | 1563.3 | 1699.3 | 1680.8 | 1660.6 | 1679.2 | 1560 |
| LDS•••1640 | 1641.3 | 1777.3 | 1758.8 | 1738.6 | 1720 | 1640 |
| LDSe•e1720 | 1720.8 | 1856.8 | 1838.3 | 1818.1 | 1799.5 | 1720 |
| LDS*••1800 | 1802.9 | 1938.9 | 1920.4 | 1900.2 | 1881.6 | 1800 |
| LDSe••1920 | 1922.8 | 2058.8 | 2040.3 | 2020.1 | 2001.5 | 1920 |
| LDS•••2120 | 2120.7 | 2256.7 | 2237.5 | 2217.3 | 2198.7 | 2120 |

(1) Flexible 0.11 m long cable.

Protection tube for light curtains XUS LBIXUS LDM and segments XUS LDS XUS LZD7••••

| General: <br> pages 38131/2 to 38131/7 | Characteristics: <br> pages 30314/2 and30314/3 | References: <br> pages 30314/6 and 30314/9 | Connections: <br> page 30314/12 |
| :--- | :--- | :--- | :--- |
| 30314-EN_Ver2.2.indd |  | Schneider |  |
| Sěectric |  |  |  |

## Safety detection solutions Preventa

Safety light curtains, type 4 Light curtains basic XUS LB and advanced XUS LDM with solid-state output

## Direct connection with XUS LB/LDM•••


(1) For testing prior to installation, the user can select MPCE/EDM OFF (default factory setting). In this case, the MPCE/EDM line must be connected to the 0 V line of the system.
(2) The auxiliary output connects to a PLC (optional).
(3) If remote start is not used, connect the start line to the 0 V line.
(4) The K1 and K2 coils must be protected using the arc suppressors included in the mounting kit.
(5) The power supply must conform to ENIIEC 61496 and EN/IEC 60204-1 standards.

Note: Relays K1 and K2 must have mechanically linked contacts.

## Connection via a Preventa XPS AFL module


(1) The auxiliary output connects to a PLC (optional).
(2) The light curtain must be configured with MPCE/EDM OFF and with automatic start.
(3) The power supply must conform to EN/IEC 61496 and EN/IEC 60204-1 standards.

Note: Relays K1 and K2 must have mechanically linked contacts.

# Safety detection solutions 

 PreventaSafety light curtains, type 4
Light curtains basic XUS LB and
advanced XUS LDM with solid-state output


Programming and diagnostic module
Description and connection to light curtains XUS LB/LDM
XUS LPDM


1 Screen
2 Navigation button for displaying menus and selecting functions

## Substitution table

Light curtains with closest functionalities

## Safety detection solutions <br> \section*{Preventa}

## Safety light curtains, type 4

Light curtains basic XUS LB and
advanced XUS LDM with solid-state output

| Basic light curtains |  |
| :---: | :---: |
| Detection capacity 14 mm |  |
| Old light curtain | New light curtain |
| XUS LTQ6A0260, XUS LTQ6B0260 | XUS LBQ6A0280 |
| XUS LTQ6A0350, XUS LTQ6B0350 | XUS LBQ6A0320, XUS LBQ6A0360 |
| XUS LTQ6A0435, XUS LTQ6B0435 | XUS LBQ6A0440 |
| XUS LTQ6A0520, XUS LTQ6B0520 | XUS LBQ6A0520 |
| XUS LTQ6A0610, XUS LTQ6B0610 | XUS LBQ6A0600 |
| XUS LTQ6A0700, XUS LTQ6B0700 | XUS LBQ6A0720 |
| XUS LTQ6A0785, XUS LTQ6B0785 | XUS LBQ6A0760 |
| XUS LTQ6A0870, XUS LTQ6B0870 | XUS LBQ6A0880, XUS LBQ6A0920 |
| XUS LTQ6A0955, XUS LTQ6B0955 | XUS LBQ6A0960 |
| XUS LTQ6A1045, XUS LTQ6B1045 | XUS LBQ6A1040 |
| XUS LTQ6A1130, XUS LTQ6B1130 | XUS LBQ6A1120 |
| XUS LTQ6A1215, XUS LTQ6B1215 | XUS LBQ6A1200 |
| XUS LTQ6A1305, XUS LTQ6B1390, <br> XUS LTQ6A1390, XUS LTQ6B1390 | XUS LBQ6A1360 |
| Detection capacity 30 mm |  |
| Old light curtain | New light curtain |
| XUS LTR5A0350, XUS LTR5B0350 | XUS LBR5A0320, XUS LBR5A0360, XUS LBR5A0440 |
| XUS LTR5A0520, XUS LTR5B0520 | XUS LBR5A0520, XUS LBR5A0600 |
| XUS LTR5A0700, XUS LTR5B0700 | XUS LBR5A0680, XUS LBR5A0760 |
| XUS LTR5A0870, XUS LTR5A0870, | XUS LBR5A0880, XUS LBR5A0920 |
| XUS LTR5A1045, XUS LTR5B1045 | XUS LBR5A1040 |
| XUS LTR5A1215, XUS LTR5B1215 | XUS LBR5A1200, XUS LBR5A1360 |
| XUS LTR5A1390, XUS LTR5B1390 | XUS LBR5A1400, XUS LBR5A1520 |
| XUS LTR5A1570, XUS LTR5B1570 | XUS LBR5A1560, XUS LBR5A1640 |
| XUS LTR5A1745, XUS LTR5B1745 | XUS LBR5A1720, XUS LBR5A1800 |
| XUS LTR5A1920, XUS LTR5B1920 | XUS LBR5A1920 |
| XUS LTR5A2095, XUS LTR5B2095 | XUS LBR5A2120 |

Note: Caution, the characteristics of the ranges (optics, connections, dimensions, fixings, functions, etc.) are not exactly the same.
Please refer to the detailed characteristics of the XUS LB••••••• and XUS LD••••••• ranges and associated accessories when replacing a light curtain from the XUS LTゃゃ००००० range

## Substitution table <br> Light curtains with closest functionalities <br> Safety detection solutions <br> Preventa <br> Safety light curtains, type 4 <br> Light curtains basic XUS LB and <br> Advanced XUS LDM with solid-state output

| Advanced light curtains |  |
| :--- | :--- |
| Detection capacity 30 mm <br> Old light curtain <br> XUS LTY5A0350, XUS LTY5B0350 | New light curtain <br> XUS LDMY5A0320, XUS LDMY5A0360, <br> XUS LDMY5A0440 |
| XUS LTY5A0520, XUS LTY5B0520 | XUS LDMY5A0520, XUS LDMY5A0600 |
| XUS LTY5A0700, XUS LTY5B0700 | XUS LDMY5A0680, XUS LDMY5A0760 |
| XUS LTY5A0870, XUS LTY5B0870 | XUS LDMY5A0880, XUS LDMY5A0920 |
| XUS LTY5A1045, XUS LTY5B1045 | XUS LDMY5A1040 |
| XUS LTY5A1215, XUS LTY5B1215 | XUS LDMY5A1200, XUS LDMY5A1360 |
| $X U S ~ L T Y 5 A 1390, ~ X U S ~ L T Y 5 B 1390 ~$ | XUS LDMY5A1400, XUS LDMY5A1520 |
| $X U S ~ L T Y 5 A 1570, ~ X U S ~ L T Y 5 B 1570 ~$ | XUS LDMY5A1560, XUS LDMY5A1640 |
| $X U S ~ L T Y 5 A 1745, ~ X U S ~ L T Y 5 B 1745 ~$ | XUS LDMY5A1920 |
| $X U S ~ L T Y 5 A 1920, ~ X U S ~ L T Y 5 B 1920 ~$ |  |
| $X U S ~ L T Y 5 A 2095, ~ X U S ~ L T Y 5 B 2095 ~$ |  |

Note: Caution, the characteristics of the ranges (optics, connections, dimensions, fixings, functions, etc.) are not exactly the same.
Please refer to the detailed characteristics of the XUS LB••••••• and XUS LD••••••• ranges and associated accessories when replacing a light curtain from the XUS LT••••••• range


ESPE: electro-sensitive protection equipment (light curtain). A, B, D, C: "muting" sensors. $m$ : trolley length and $d M=$ distance between $A, B$ and $D, C$.

## Operating principle

Universal XUS LDM light curtains have an integrated "muting" function that is configurable using the programming and diagnostic module XUS LPDM. This function enables the automatic passage of parts for machining or loaded pallets, without interrupting the transportation movement within the zone protected by the electro-sensitive protection equipment (ESPE) system. In addition to the safety light curtain, a connection box XPS LCM1, which is connected directly to the top of the light curtain receiver, enables the cabling of 2 to 4 "muting" sensors as well as an indicator light. In the event of a sequence error the "muting" indicator light flashes (1 second interval) and turning the Start key switch off and back on restarts the system.

When the system is switched on by the start command and the light curtain protection not interrupted, the main circuit is closed by the safety outputs of the XUS LDM light curtain (solid-state safety outputs). In addition to the safety outputs, the light curtain incorporates signalling LEDs and an auxiliary output (alarm or status signalling) for sending system status information to the PLC. Four LEDs on the light curtain and one on the front face of connection box XPS LCM1 provide information on the safety circuit status.

An interruption of the protection field monitored by the electro-sensitive protection equipment causes instantaneous opening of the safety outputs; the process PLC receives a stop command and the LED display mounted on the front face indicates the change of state of the safety circuits. The "open" state is maintained until the light beams are unobstructed and, if included in the light curtain configuration, the Start key switch operated.

The "muting" function cannot be activated by supplying the "muting" sensors unless the safety outputs have been closed beforehand. To trigger the "muting" function, the "muting" devices must be activated within the configurable time interval ( 50 milliseconds to 5 seconds in increments of 50 milliseconds). During the activated "muting" phase, materials can be transported through the protection field without deactivating the safety outputs. In the event of intrusion into the hazardous zone, a person cannot activate the "muting" sensors in the same way and the system stops. Whilst the "muting" function is activated, a "muting" status indicator light is controlled by the connection box XPS LCM1. A fault at indicator light level (short-circuit, open circuit) is immediately recognised and deactivates the "muting" function. The indicator light only illuminates when a "muting" signal is generated and indicates the inhibition of the protection function.

## Conditions to be observed for the "Muting" function

- The "muting" sensors must either be
- thru-beam: XUK OARCTL2 (sensing distance 30 m ) + XUK OARCTL2T
- polarised reflex: XUK OARCTL2 (sensing distance 5 m ) + reflector XUZ C50 or mechanical limit switches with contacts.
- $\mathrm{dM} \leq \mathrm{m}$ to obtain continuous validation of the "muting" function.
- Avoid the intrusion of persons during the "muting" phase. This phase is indicated by the indicator light connected to the "muting" indicator output of connection box XPS LCM1.
- A materials trolley must provide the "muting" signal before entering the protection field and cease it once it has cleared all the sensors of the protection field on exiting.

| Characteristics |  |  |  |
| :---: | :---: | :---: | :---: |
| Connection box type |  |  | XPS LCM1 |
| Certifications |  |  | C€, TÜV, CSA, UL |
| Product designed for max. use in safety related parts of control systems | $\begin{aligned} & \text { Conforming to } \\ & \text { EN 954-1/ISO 13849-1 } \end{aligned}$ |  | Category 4 |
| Ambient air temperature | For operation | ${ }^{\circ} \mathrm{C}$ | 0...+55 |
|  | For storage | ${ }^{\circ} \mathrm{C}$ | -25... 75 |
| Degree of protection conforming to IEC 60529 | Terminals |  | IP 20 |
|  | Enclosure |  | IP 20 |
| Power supply by light curtain XUS LDM | Voltage | V | --2 $24(-20 \ldots+20 \%)$ |
|  | Maximum current | mA | 30 |
| Maximum consumption |  | W | 0.7 |
| Rated insulation voltage (Ui) |  | V | 500 |
| Rated impulse withstand voltage (Uimp) |  | kV | 1.1 |
| Shock resistance | Conforming to IEC 60068-2-6 | gn | 6 (10... 55 Hz ) |
| Vibration resistance | Conforming to IEC 60068-2-29 | gn | 10 (16 ms) |
| Number of light curtains that can be connected |  |  | 1 transmitter-receiver pair |
| Inputs for "muting" sensors - number of inputs to be monitored |  |  | 2 to 4 per "muting" function |
| - supply voltage of sensors |  | V | --24 |
| - output current of each sensor |  | mA | <20 |
| Type of "muting" sensors |  |  | Thru-beam, polarised reflex or sensors with volt-free contacts |
| Synchronisation time of "muting" sensors |  | ms | 50 to 500 (configurable in light curtain XUS LDM in increments of 50 ms ) |
| Maximum "muting" time |  | min | 2 or unlimited |
| Safety outputs |  |  |  |
| - number and type |  |  | 2 PNP (terminals 1 and 2) |
| - breaking capacity of outputs |  | mA | $30 \mathrm{~V} / 100$ |
| "Muting" indicator light output |  |  | 1 NPN |
| "Muting" indicator light power |  | W | 1 to 7 max. |
| "Muting" indicator light type |  |  | LED or filament bulb |
| Signalling |  |  | 1 LED |
| Connection | Type |  | Captive screw clamp terminals, non removable |
| 1-wire connection | Without cable end |  | Solid or flexible cable: $0.14 . .0 .2 .5 \mathrm{~mm}^{2}$ |
|  | With cable end |  | Without bezel, flexible cable: $0.25 . .2 .5 \mathrm{~mm}^{2}$ |
|  | With cable end |  | With bezel, flexible cable: $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ |
| 2-wire connection | Without cable end |  | Without bezel, flexible cable: $0.25 . .1 \mathrm{~mm}^{2}$ |
|  | Without cable end |  | Double, with bezel, flexible cable: 0.5 ..1.5 $\mathrm{mm}^{2}$ |



## Description <br> XPS LCM1

To aid diagnostics, the connection box has 1 LED on the front face 1.

| References |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Connection box |  |  |  |  |  |
| Description | Type of terminal block connection | "Muting" indicator light output | Supply | Reference | Weight $\mathrm{kg}$ |
| Connection box for "muting" function | Non removable | 1 NPN | -. 24 V | XPS LCM1 | 0.190 |


| Connection cables |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | Length m | Reference | Weight kg |
| Pre-wired connectors for connection | 10 | XSZ DCRM10 | 0.690 |
| between the XPS LCM1 module and the | 15 | XSZ DCRM15 | 1.030 |
| XUS LD receiver | 30 | XSZ DCRM30 | 1.930 |

## Dimensions

## XPS LCM1

Mounting on 35 mm rail


Connection of light curtains XUS LDM with connection box XPS LCM1
Example: configuration with light curtains XUS LDM

(1) For testing prior to installation, the user can select MPCE/EDM OFF (default factory setting). In this case, the MPCE/EDM line must be connected to the $0 \vee$ line of the system.
(2) The auxiliary output connects to a PLC (optional).
(3) If remote start is not used, connect the start line to the $O V$ line.
(4) The K1 and K2 coils must be protected using the arc suppressors included in the mounting kit.
(5) The power supply must conform to EN/IEC 61496 and EN/IEC 60204-1 standards.

| Presentation: | Characteristics: | References: | Dimensions: |
| :--- | :--- | :--- | :--- |
| page 30315/2 | page 30315/3 | page 30315/4 | page 30315/4 |

Functional diagram of light curtain XUS LDM with connection box XPS LCM1
"Start/restart interlock" mode with 2 sensors

(1) Press Start button.

## Override function



Key $0=\square 1$

Functional diagrams (continued)

Safety detection solutions
Connection box Preventa XPS LCM1 For "muting" function on light curtains type XUS LDM

Functional diagram of light curtain XUS LDM with connection box XPS LCM1
"Start/restart interlock" mode with 4 sensors

(1) Press Start button.

## Override function



Key $0 \square 1$

# Safety detection solutions <br> Preventa <br> Safety light curtains, type 4 <br> Compact light curtains XUS LP with solid-state output 

| Light curtain type |  |  | XUS LP••*๑ |
| :---: | :---: | :---: | :---: |
| Environmental characteristics |  |  |  |
| Conformity to standards |  |  | ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, EN/IEC 61496-1-2 for type 4 ESPE |
| Certifications |  |  | C $\epsilon$, TUV, UL, CSA |
| European directives |  |  | Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC |
| Maximum safety level (1) |  |  | PL = e/category 4 conforming to EN/ISO 13849-1 SIL 3 conforming to EN/IEC 61508 |
| Reliability data |  |  | $\mathrm{PFH}_{\mathrm{d}}=2.7 \mathrm{E}^{-9} 1 / \mathrm{h}$ conforming to EN/IEC 61508 |
| Ambient air temperature | Operating | ${ }^{\circ} \mathrm{C}$ | 0... +55 |
|  | For storage | ${ }^{\circ} \mathrm{C}$ | -25... 75 |
| Relative humidity |  |  | 95\% maximum, without condensation |
| Degree of protection |  |  | IP 65 and IP 67 |
| Shock and vibrationresistance |  |  | Shock resistance: 10 gn , impulse 16 ms , Vibration resistance: $10 \ldots 55 \mathrm{~Hz}$, amplitude: $0.35 \pm 0.05 \mathrm{~mm}$ |
| Materials |  |  | Casing: aluminium with electrostatically applied red (RAL 3000) polyester paint nish; end caps: 20\% breglass impregnated polycarbonate. Front face: acrylic. |
| Fixings |  |  | End brackets (included) |
| Optical characteristics |  |  |  |
| Minimum detection capacity |  | mm | 300, 400, 500, 600 and single beam (Body protection) |
| Nominal sensing distance (Sn) |  | m | 0.8 to 20 or 0.8 to 70 depending on con guration and 0.8 to 8 m for light curtains with passive receiver |
| Height protected |  |  | Depending on number of light beams, see table on page 38131-EN/3 |
| Effective aperture angle (EAA) |  |  | $2.5^{\circ}$ at 3 m |
| Light source |  |  | GaAIAs LED, 850 nm |
| Immunity to ambient light |  |  | Conforming to EN/IEC 61496-2 |
| Electrical characteristics |  |  |  |
| Response time |  | ms | $<16 \ldots<24$ depending on light beam coding selected |
| Power supply | Transmitter | mA | --- $24 \mathrm{~V} \pm 20 \% 2$ A conforming to EN/IEC 61496 and EN/IEC 60204-1 |
|  |  |  | 100 (SELV: Safety Extra Low Voltage) |
|  | Receiver | A | 1.6 (with maximum load) |
| Maximum current consumption (no-load) | Transmitter | mA | 100 |
|  | Receiver | mA | 300 |
| Immunity to interference |  |  | Conforming to EN/IEC 61496-1 |
| Safety outputs OSSD (Output Signal Switching Devices) |  |  | 2 solid-state PNP (N/O) outputs $\leq 650 \mathrm{~mA},-\mathrm{-z} 24 \mathrm{~V}$ (Short-circuit protected) |
| Auxiliary output |  |  | 1 solid-state output $100 \mathrm{~mA},-\mathrm{-} 24 \mathrm{~V}$, PNP |
| Monitoring activation of output switching devices (MPCE/EDM) |  |  | $50 \mathrm{~mA},-\mathrm{-} 24 \mathrm{~V}$ |
| Signalling | Transmitter |  | 1 LED (power supply) |
|  | Receiver |  | 3 LEDs (stop, run, interlock) and a 2-digit display for diagnostics |
| Connections (2) | Transmitter |  | M12, 5-pin, male connector or terminal block |
|  | Receiver |  | M12, 8-pin, male connector or terminal block |
| Conductor c.s.a. | Transmitter-receiver pre-wired connector | $\mathrm{mm}^{2}$ | 0.35 . Tinned wires. |
| Cable resistance | Transmitter-receiver | $\Omega$ | 0.055 per metre for $0.35 \mathrm{~mm}^{2}$ c.s.a. cable |
| Cable lengths |  | m | Pre-wired connectors with cable lengths of $5,10,15$ and 30 m are available separately. The maximum cable length is 120 m , depending on the load current and power supply. |
| Functions |  |  |  |
| Functions |  |  | Start: <br> - Auto/Manual, manual $1^{\text {st }}$ cycle, <br> - Monitoring of external switching devices (EDM: External Devices Monitoring), <br> - Test (MTS: Monitoring Test Signal) for XUS LPZ only, <br> - Alignment aid by display of each light beam broken, <br> - Display of operating modes and alarm by LEDs and 2-digit display. <br> Selection of Auto/Manual, relay monitoring, alarm or auxiliary output functions, light beam coding and selection of sensing distance using con guration switches. |
| Monitoring of external switching devices (EDM = External Devices Monitoring) |  |  | Monitoring of the function (open or closed) as well as the response time of the power components. <br> Parameterable using con guration switches. |
| "Test" function |  |  | Instigates the stop instruction of the light curtain by opening the contact (simulated intrusion) |
| "Muting" function (inhibition) |  |  | Possible with external module XPS LCM1150 |

(1) Using an appropriate and correctly connected control system.
(2) Pre-wired female connectors to be ordered separately, see page 30313-EN/5.

| General: | References: | Dimensions: | Connections: |
| :--- | :--- | :--- | :--- |
| pages 38131-EN/2 to 38131- | pages 30313-EN/3 and 30313- | pages 30313-EN/6 and 30313- | pages 30313-EN/8 and 30313- |

## Safety detection solutions Preventa

## Safety light curtains, type 4

Compact light curtains XUS LP with solid-state output, with connector

# Safety detection solutions 

 PreventaSafety light curtains, type 4
Compact light curtains XUS LP with solid-state output, with terminal block


| Transmitter-receiver pairs for body protection (1) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Detection capacity $300,400,500,600 \mathrm{~mm}$ and single beam. Sensing distance 0.8 to 20 m and 0.8 to 70 m (depending on configuration) |  |  |  |  |  |  |  |
| ■ 2 PNP safety outputs |  |  |  |  |  |  |  |
| Detection capacity | Response time Light beam coding |  |  | Number of light beams | Auxiliary output | Reference(2) | Weight |
|  | A | B | C |  |  |  |  |
| mm | ms | ms | ms |  |  |  | kg |
| - | $<24$ | <20 | <16 | 1 | PNP | XUS LPZ1AB | 4.500 |
| 500 | <24 | <20 | <16 | 2 | PNP | XUS LPZ2A0500B | 6.300 |
| 600 | <24 | <20 | <16 | 2 | PNP | XUS LPZ2A0600B | 6.700 |
| 400 | <24 | <20 | <16 | 3 | PNP | XUS LPZ3A0400B | 7.200 |
| 500 | <24 | <20 | <16 | 3 | PNP | XUS LPZ3A0500B | 8.600 |
| 300 | <24 | <20 | <16 | 4 | PNP | XUS LPZ4A0300B | 8.200 |
| 300 | <24 | <20 | <16 | 5 | PNP | XUS LPZ5A0300B | 9.500 |
| 300 | <24 | $<20$ | <16 | 6 | PNP | XUS LPZ6A0300B | 10.400 |

(1) Supplied with 2 sets of 2 brackets with fixings and a user guide with certificate of conformity.
(2) To order a receiver only, add the letter $\boldsymbol{R}$ to the end of the reference for the corresponding transmitter-receiver pair.
Example: reference XUS LPZ2A0600B becomes XUS LPZ2A0600BR for the receiver only. To order a transmitter only, add the letter $\boldsymbol{T}$ to the end of the reference for the corresponding transmitter-receiver pair.
Example: reference XUS LPZ2A0600B becomes XUS LPZ2A0600BT for the transmitter only.

Other versions Combining type 4 safety light curtains with external module for muting function.
See pages 30311/2 à 30311/9.

| General: <br> pages 38131-EN/2 to 38131- | Characteristics: <br> page 30313-EN/2 | Dimensions: <br> pages 30313-EN/6 and 30313- | Connections: <br> pages 30313-EN/8 and 30313- |  |
| :--- | :--- | :--- | :--- | :--- |
| 4 |  | Schneider |  | 30313-EN_Ver6.1.indd |
| Electric |  |  |  |  |

## Safety detection solutions

## Preventa

Safety light curtains, type 4
Accessories for compact light curtains XUS LP


## Separate components

Power supplies, $90^{\circ}$ mirror adaptors, protective covers, anti-vibration kit, fixing bases
See pages 30308-EN/2 to 30308-EN/9.

| Accessories |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Description | Usage | Length <br> m | Reference | Weight kg |
| Fixing kit (2 brackets) | For light curtains XUS LP | - | XUS LZ219 | 0.450 |
| Pre-wired female connectors | Transmitter type | 5 | XSZ PCT05 | 0.350 |
|  |  | 10 | XSZ PCT10 | 0.700 |
|  |  | 15 | XSZ PCT15 | 1.020 |
|  |  | 30 | XSZ PCT30 | 2.020 |
|  | Receiver type | 5 | XSZ PCR05 | 0.350 |
|  |  | 10 | XSZ PCR10 | 0.700 |
|  |  | 15 | XSZ PCR15 | 1.020 |
|  |  | 30 | XSZ PCR30 | 2.020 |
| Sliding nuts for side fixing (4 nuts) | - | - | XUS LZ320 | 0.450 |
| User guide on CD-ROM | All types of light curtain | - | XUS LZ450 | 0.020 |
| Arc suppressor (pair) | All types of light curtain | - | XUS LZ500 | 0.020 |

Safety detection solutions Preventa
Safety light curtains, type 4
Compact light curtains XUS LP with solid-state output

Light curtains
XUS LPZ•••


| XUS | b | b1 | G |
| :--- | :--- | :--- | :--- |
| LPZ1A• | 231,6 | - | 220.7 |
| LPZ2A0500• | 731,6 | 500 | 720.7 |
| LPZ2A0600• | 831,6 | 600 | 820.7 |
| LPZ3A0400• | 1031,6 | 400 | 1020.7 |
| LPZ3A0500• | 1231,6 | 500 | 1220.7 |
| LPZ4A0300• | 1141,1 | 300 | 1120.7 |
| LPZ5A0300• | 1431,6 | 300 | 1411.2 |
| LPZ6A0300• | 1731,6 | 300 | 1711.2 |

## Safety detection solutions

## Preventa

Safety light curtains, type 4
Compact light curtains XUS LP with solid-state output

## Light curtains

## XUS LPB・ゃ



| XUS | b | b1 | G |
| :--- | :--- | :--- | :--- |
| LPB2A500M | 781.1 | 500 | 760.7 |
| LPB2A600M | 881.1 | 600 | 860.7 |

## Safety detection solutions Preventa

Safety light curtains, type 4
Compact light curtains XUS LP with solid-state output

Direct connection with XUS LP•••

(1) For testing prior to installation, the user can select MPCE/EDM OFF (default factory setting). In this case, the MPCE/EDM line must be connected to the 0 V line of the system.
(2) The auxiliary output connects to a PLC (optional).
(3) If remote start is not used, connect the start line to the $0 V$ line.
(4) The power supply must conform to ENIIEC 61496 and EN/IEC 60204-1 standards.

## Connection via a Preventa XPS AFL module


(1) The auxiliary output connects to a PLC (optional).
(2) The light curtain must be configured with MPCE/EDM OFF and with automatic start.
(3) The power supply must conform to EN/IEC 61496 and EN/IEC 60204-1 standards.

| General: <br> pages 38131-EN/2 to 38131- | Characteristics: <br> page 30313-EN/2 | References: <br> pages 30313-EN/3 and 30313- | Dimensions: <br> pages 30313-EN/6 and 30313- |
| :--- | :--- | :--- | :--- |
| 8 | Schneider |  |  |
| SElectric |  |  |  |

## Safety detection solutions Preventa

Safety light curtains, type 4
Compact light curtains XUS LP with solid-state output


Receiver
Pre-wired connector of receiver (XUS LPZ) and pre-wired Receiver status indicator connector of transmitter-receiver (XUS LPB)


1 Interlock or Alarm yellow LED
2 Machine stop
Configuration indicator XUS LPZ and XUS LPB

red LED


3 Machine run green LED
4 2-digit display

Connection to terminal block


# Safety detection solutions Preventa <br> Safety light curtains, type 2 <br> Slim, compact light curtains XUS LN with solid-state output 

| Light curtain type |  |  | XUS LNG•••७ (30 mm) |
| :---: | :---: | :---: | :---: |
| Environmental characteristics |  |  |  |
| Conformity to standards |  |  | IEC 61496-1 and IEC 61496-2 (Type 2 ESPE) |
| Certifications |  |  | C $\in$, TUV, UL, CSA |
| European directives |  |  | Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC |
| Maximum safety level (1) |  |  | PL = c/category 2 conforming to EN/ISO 13849-1 SIL 2 conforming to EN/IEC 61508 |
| Reliability data |  |  | $\mathrm{PFH}_{\mathrm{d}}=2.29 \mathrm{E}^{-7} 1 / \mathrm{h}$ conforming to EN/IEC 61508 |
| Ambient air temperature | Operating | ${ }^{\circ} \mathrm{C}$ | 0... +55 |
|  | For storage | ${ }^{\circ} \mathrm{C}$ | -25... 75 |
| Relative humidity |  |  | 95\% maximum, without condensation |
| Degree of protection |  |  | IP 65 |
| Shock and vibration resistance | Conforming to IEC 61496-1 |  | Shock resistance: 10 gn , impulse 16 ms , Vibration resistance: $10 \ldots 55 \mathrm{~Hz}$, amplitude: $0.35 \pm 0.05 \mathrm{~mm}$ |
| Materials |  |  | Casing: aluminium with electrostatically applied red (RAL 3000) polyester paint nish; end caps: 30\% breglass impregnated nylon; front face: acrylic. |
| Fixings |  |  | End brackets (included) |
| Optical characteristics |  |  |  |
| Minimum detection capacity |  | mm | 30 (Hand) |
| Nominal sensing distance (Sn) |  | m | 0.3... 15 |
| Height protected |  | mm | 150... 1500 |
| Effective aperture angle (EAA) |  |  | $5^{\circ}$ at 3 m conforming to IEC 61496-1 and IEC 61496-2 (Type 2 ESPE) |
| Light source |  |  | GaAIAs LED, 880 nm |
| Immunity to ambient light |  |  | Conforming to IEC/EN 61496-2 |
| Electrical characteristics |  |  |  |
| Response time |  | ms | 14... 24 |
| Power supply | Transmitter | mA | $=24 \mathrm{~V} \pm 20 \% 2$ A conforming to IEC 61496 and IEC 60204-1 (-10\% using the EDM function) |
|  |  |  | 50 (SELV: Safety Extra Low Voltage) |
|  | Receiver | A | 1.09 (with maximum load) |
| Maximum current consumption (no-load) | Transmitter | mA | 50 |
|  | Receiver | mA | 90 |
| Immunity to interference |  |  | Conforming to EN 61496-1 and EN 61496-2 |
| Safety outputs OSSD (Output Signal Switching Devices) |  |  | 2 solid-state PNP (N/O) outputs $\leq 500 \mathrm{~mA},-$-. 24 V (Short-circuit protection) |
| Signalling | Transmitter |  | 2 LEDs (power supply and diagnostic) |
|  | Receiver |  | 4 LEDs (stop, run, top alignment and bottom alignment) |
| Connections (2) | Transmitter |  | M12, 4-pin, male connector |
|  | Receiver |  | M12, 5-pin, male connector |
| Pre-wired connectors c.s.a. | Transmitter-receiver | $\mathrm{mm}^{2}$ | 0.25 . Tinned wires. |
| Cable resistance | Transmitter-receiver | $\Omega$ | 0.093 per metre for $0.25 \mathrm{~mm}^{2}$ c.s.a. cable |
| Cable lengths |  | m | Pre-wired connectors with cable lengths of 3,10 and 30 m are available separately. The maximum cable length is 50 m , depending on the load current and power supply. |
| Functions |  |  |  |
| Functions |  |  | - Start: <br> - Automatic: model XUSLNG5C <br> - Manual: model XUSLNG5D <br> - Alignment aid using 2 LEDs <br> - LED display of operating modes <br> - Monitoring of external switching devices EDM/MPCE |
| "Muting" function (inhibition) |  |  | Possible with external module XPS LCM1150 |

(1) Using an appropriate and correctly connected control system.
(2) Pre-wired female connectors to be ordered separately, see page 30312-EN/3.

| References: <br> page 30312-EN/3 | Dimensions: <br> page 30312-EN/4 | Connections: <br> pages 30312-EN/4 and 30312- |
| :--- | :--- | :--- |
| 2 |  | Schneider <br> Slectric |

# Safety detection solutions Preventa 

## Safety light curtains, type 2

Slim, compact light curtains XUS LN with solid-state output


Transmitter-receiver system for hand protection (1)
Detection capacity $\mathbf{3 0} \mathbf{~ m m}$. Sensing distance 0.3 to 15 m .

- 2 PNP safety outputs - Automatic start

| Height <br> protected | Response <br> time | Number of <br> light beams | Alarm <br> output | Reference <br> (2) | Weight |
| :--- | :--- | :--- | :--- | :--- | ---: |
| $\mathbf{m m}$ | $\mathbf{m s}$ |  |  |  | $\mathbf{k g}$ |
| $\mathbf{1 5 0}$ | 14 | 7 | PNP | XUS LNG5C0150 | 2.700 |
| 300 | 15 | 14 | PNP | XUS LNG5C0300 | 2.900 |
| 450 | 16 | 21 | PNP | XUS LNG5C0450 | 3.200 |
| 600 | 17 | 28 | PNP | XUS LNG5C0600 | 3.400 |
| 750 | 18 | 35 | PNP | XUS LNG5C0750 | 3.600 |
| 900 | 19 | 42 | PNP | XUS LNG5C0900 | 3.900 |
| 1050 | 20 | 49 | PNP | XUS LNG5C1050 | 4.100 |
| 1200 | 21 | 56 | PNP | XUS LNG5C1200 | 4.300 |
| 1350 | 22 | 63 | PNP | XUS LNG5C1350 | 4.500 |
| 1500 | 23 | 70 | PNP | XUS LNG5C1500 | 4.800 |

■ 2 PNP safety outputs - Manual star

| Height <br> protected | Response <br> time | Number of <br> light beams | Alarm <br> output | Reference <br> (2) | Weight |
| :--- | :--- | :--- | :--- | :--- | ---: |
| $\mathbf{m m}$ | $\mathbf{m s}$ | 7 | PNP | XUS LNG5D0150 | 2.700 |
| 150 | 14 | 14 | PNP | XUS LNG5D0300 | 2.900 |
| 300 | 15 | 21 | PNP | XUS LNG5D0450 | 3.200 |
| 450 | 16 | 28 | PNP | XUS LNG5D0600 | 3.400 |
| 600 | 17 | 35 | PNP | XUS LNG5D0750 | 3.600 |
| 750 | 18 | 42 | PNP | XUS LNG5D0900 | 3.900 |
| 900 | 19 | 49 | PNP | XUS LNG5D1050 | 4.100 |
| 1050 | 20 | 56 | PNP | XUS LNG5D1200 | 4.300 |
| 1200 | 21 | 63 | PNP | XUS LNG5D1350 | 4.500 |
| 1350 | 22 | 70 | PNP | XUS LNG5D1500 | 4.800 |
| 1500 | 23 | 13 |  |  |  |

(1) Supplied with a test rod, 2 sets of 2 brackets with fixings and a user guide with certificate of conformity and 1 arc suppressor set.
Pre-wired female connectors to be ordered separately, see below.
(2) To order a transmitter only, replace the letter C or D by E and add the letter $\boldsymbol{T}$ to the end of the reference for the corresponding transmitter-receiver pair.
Example: reference XUS LNG5C0150 becomes XUS LNG5E0150T for the transmitter only. To order a receiver only, add the letter $\boldsymbol{R}$ to the end of the reference for the corresponding transmitter-receiver pair.
Example: reference XUS LNG5C0150 becomes XUS LNG5C0150R for the receiver only.

Other versions
Combining type 2 safety light curtains with external module for muting function and monitoring 2 to 4 light curtains. See pages $2 / 220$ to $2 / 225$.

| Accessories | For use with | Length <br> $\mathbf{m}$ | Reference | Weight <br> $\mathbf{k g}$ |
| :--- | :--- | :--- | :--- | :--- | ---: |
| Description |  |  |  |  |

## Separate components

Power supplies, $90^{\circ}$ mirror adaptors, anti-vibration kit and fixing bases
See pages 30308-EN/2, 30308-EN/4 and 30308-EN/5


| References: <br> page 30312-EN/3 | Dimensions: <br> page 30312-EN/4 | Connections: <br> pages 30312-EN/4 and 30312- |
| :--- | :--- | :--- |
| $30312-$ EN_Ver5.1.indd | Schneider <br> SElectric | 3 |

Safety detection solutions Preventa
Safety light curtains，type 2
Slim，compact light curtains XUS LN with solid－state output

Dimensions
Slim，compact light curtains

## XUS LN•••



| XUS | b | b1 | H | Height protected |
| :---: | :---: | :---: | :---: | :---: |
| LNeゃe0150 | 147 | 272 | 245.6 | 150 |
| LNee＊0300 | 294 | 419 | 392.6 | 300 |
| LNe•e0450 | 441 | 566 | 539.5 | 450 |
| LNe•e0600 | 588 | 713 | 686.6 | 600 |
| LNe•e0750 | 735 | 860 | 833.6 | 750 |
| LNeャッ0900 | 882 | 1007 | 980.6 | 900 |
| LNe•1050 | 1029 | 1154 | 1127.6 | 1050 |
| LNe＊e1200 | 1176 | 1301 | 1274.6 | 1200 |
| LNe＊e1350 | 1323 | 1448 | 1421.6 | 1350 |
| LNeゃ1500 | 1470 | 1595 | 1568.6 | 1500 |

（1） 1 elongated hole $\varnothing 6.75 \times 16.75 \mathrm{~mm}$ ．
（2）M12 male connector．


# Safety detection solutions Preventa 

Safety light curtains, type 2
Slim, compact light curtains XUS LN with solid-state output

Connections (continued)
Direct connection with XUS LNG5D•e॰

Power supply
ABL 8RPS (3)

(1) The K1 and K2 coils must be protected using the arc suppressors included in the mounting kit.
(2) For the EDM function, contactors LC1D $\bullet B D$ and control relays $C A D \bullet \bullet B D, C A 4 K N \bullet \bullet B W 3$ and $C A 3 K N \bullet \bullet B D$ are recommended (for more information on contactors and control relays, please refer to our "Motor starter solutions" catalogue).
(3) The power supply must conform to EN/IEC 61496 and ENIIEC 60204-1 standards.

Note: Never connect the 0 V dc to earth ground.
Connection of light curtain XUS LN5Cee» via a Preventa XPS AFL module

(1) The power supply must conform to EN/IEC 61496 and EN/IEC 60204-1 standards.

Note: Never connect the $0 V$ dc to earth ground.

| Characteristics: <br> page 30312-EN/2 | References: <br> page 30312-EN/3 | Dimensions: <br> page 30312-EN/4 |
| :--- | :--- | :--- |
| 30312-EN_Ver5.1.indd | Schneider |  |
| Selectric |  |  |

# Safety detection solutions Preventa 

Accessories for safety light curtains types 2 and 4

|  | $90^{\circ}$ mirror adaptor for light curtains |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Glass mirror (0.88 Sn) (1) |  |  |  |  |  |  |
|  | Description | For use with light curtains |  |  | Height (2) mm | Reference | Weight kg |
|  |  | XUS LB/LDM | XUS LP | XUS LN |  |  |  |
|  | $90^{\circ}$ mirror adaptor | - | XUS LPZ1A• | - | 140 | XUS ZM0102 | 1.040 |
|  | with rotatable xings | - | - | - | 191 | XUS ZM0152 | 1.300 |
|  |  | XUS LB/LDM0280 | - | XUS LN•••0150 | 343 | XUS ZM0305 | 1.900 |
|  |  | XUS LB/LDM0320 XUS LB/LDM0360 | - | XUS LN•••0300 | 495 | XUS ZM0457 | 2.500 |
|  |  | XUS LB/LDM0440 | - | XUS LN•••0450 | 546 | XUS ZM0508 | 2.800 |
|  |  | XUS LB/LDM0520 | XUS LP•2A500• | - | 648 | XUS ZM0610 | 3.200 |
|  |  | XUSLB/LDM0600/0680 | XUS LP•2A0600• | XUS LN•••0600 | 749 | XUS ZM0711 | 3.700 |
|  |  | XUS LB/LDM0720 | - | - | 800 | XUS ZM0762 | 3.800 |
|  |  | XUS LB/LDM0760 | - | XUS LN•••0750 | 851 | XUS ZM0813 | 4.000 |
|  |  | XUS LB/LDM0880 | XUS LPZ3A0400• | - | 953 | XUS ZM0914 | 4.500 |
|  |  | XUSLB/LDM0920/0960 |  | XUS LN••00900 | 1054 | XUS ZM1016 | 5.000 |
|  |  | XUS LB/LDM1040 | XUS LPZ3A0500• | - | 1105 | XUS ZM1067 | 5.200 |
|  |  | XUS LB/LDM1120 | XUS LPZ4A0300• | XUS LN•••1050 | 1257 | XUS ZM1219 | 5.900 |
| XUS ZMIZA•••• |  | XUS LB/LDM1200 | XUS LPZ5A0300• | XUS LN•••1200 | 1359 | XUS ZM1321 | 6.300 |
|  |  | XUS LB/LDM1360 | - | XUS LN•••1350 | 1410 | XUS ZM1372 | 6.500 |
|  |  | XUS LB/LDM1400 | - | - | 1461 | XUS ZM1422 | 6.700 |
|  |  | XUS LB/LDM1520 | - | XUS LN•••1500 | 1562 | XUS ZM1524 | 7.200 |
|  |  | XUS LB/LDM1560 | XUS LPZ6A0300• | - | 1664 | XUS ZM1626 | 7.600 |
|  |  | XUSLB/LDM1640/1720 | - | - | 1867 | XUS ZM1830 | 8.500 |
|  |  | XUS LB/LDM1800 | - | - | 1867 | XUS ZM1830 | 8.500 |
|  |  | XUS LB/LDM1920/2120 | - | - | 2172 | XUS ZM2134 | 9.800 |
|  | Stainless steel mirror (0.82 Sn) (1) |  |  |  |  |  |  |
|  | Description | For use with light curtains |  |  | Height (2) | Reference | Weight |
|  |  | XUS LB/LDM | XUS LP | XUS LN | mm |  | kg |
|  | $90^{\circ}$ mirror adaptor with rotatable xings | - | XUS LPZ1A• | - | 140 | XUS ZA0102 | 1.090 |
|  |  | - | - | - | 191 | XUS ZA0152 | 1.300 |
|  |  | XUS LB/LDM0280 | - | XUS LN•••0150 | 343 | XUS ZA0305 | 2.000 |
|  |  | XUS LB/LDM0320 XUS LB/LDM0360 | - | XUS LN•••0300 | 495 | XUS ZA0457 | 2.700 |
|  |  | XUS LB/LDM0440 | - | XUS LN•••0450 | 546 | XUS ZA0508 | 3.000 |
|  |  | XUS LB/LDM0520 | XUS LP•2A500• | - | 648 | XUS ZA0610 | 3.500 |
|  |  | XUSLB/LDM0600/0680 | XUS LP•2A0600• | XUS LN•••0600 | 749 | XUS ZA0711 | 3.900 |
|  |  | XUSLB/LDM0720 | - | - | 800 | XUS ZA0762 | 4.200 |
|  |  | XUS LB/LDM0760 | - | XUS LN•••0750 | 851 | XUS ZA0813 | 4.400 |
|  |  | XUS LB/LDM0880 | XUS LPZ3A0400• | - | 953 | XUS ZA0914 | 4.500 |
|  |  | XUSLB/LDM0920/0960 |  | XUS LN•••0900 | 1054 | XUS ZA1016 | 5.400 |
|  |  | XUS LB/LDM1040 | XUS LPZ3A0500• | - | 1105 | XUS ZA1067 | 5.600 |
|  |  | XUS LB/LDM1120 | XUS LPZ4A0300• | XUS LN•••1050 | 1257 | XUS ZA1219 | 6.400 |
|  |  | XUSLB/DM1200 | XUS LPZ5A0300• | XUS LN•••1200 | 1359 | XUS ZA1321 | 6.800 |
|  |  | XUS LB/LDM1360 | - | XUS LN•••1350 | 1410 | XUS ZA1372 | 7.000 |
|  |  | XUS LB/LDM1400 | - | - | 1461 | XUS ZA1422 | 7.300 |
|  |  | XUS LB/LDM1520 | - | XUS LN•••1500 | 1562 | XUS ZA1524 | 7.800 |
|  |  | XUS LB/LDM1560 | XUS LPZ6A0300• | - | 1664 | XUS ZA1626 | 8.300 |
|  |  | XUSLB/LDM1640/1720 | - | - | 1867 | XUS ZA1830 | 9.200 |
|  |  | XUS LB/LDM1800 | - | - | 1867 | XUS ZA1830 | 9.200 |
|  |  | XUS LB/LDM1920/2120 | - | - | 2172 | XUS ZA2134 | 10.600 |
|  | Accessories |  |  |  |  |  |  |
|  | Description |  | Usage |  |  | Reference | Weight |
|  | Laser alignment tool |  | All types of light curta |  |  | XUS LAT1 | 0.340 |



ABL 8RPS24050

| Power supplies for light curtains XUS L® (3) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Input voltage | Secondary |  |  | Reset | Conforming to standard EN 61000-3-2 | Reference | Weight kg |
|  | Output voltage | Nominal power | Nominal current |  |  |  |  |
| Single phase (N-L1) or 2-phase (L1-L2) connection |  |  |  |  |  |  |  |
| ~ 100... $120 \mathrm{~V}-200 . . .500 \mathrm{~V}$ | -- | 72 W | 3 A | Auto/manu | Yes | ABL 8RPS24030 | 0.300 |
| -15\%,+10\% | 24...28,8 V | 120 W | 5 A | Auto/manu | Yes | ABL 8RPS24050 | 0.700 |
| $50 / 60 \mathrm{~Hz}$ |  | 240 W | 10 A | Auto/manu | Yes | ABL 8RPS24100 | 1.000 |

(1) Sensing distance reduction coefficient to be taken into account for each $90^{\circ}$ mirror adaptor used.
(2) Usable reflective height.
(3) For full information, please refer to www.schneider-electric.com.

## Safety detection solutions Preventa

Accessories for safety light curtains types 2 and 4


[^22]
# Safety detection solutions Preventa 

## Accessories for safety light curtains types


(1) Low frequency, high amplitude applications, such as punching presses where a powerful shock can exist.
(2) High frequency, Iow amplitude applications, such as offset printing machines where constant vibration can exist.
(3) Head: transmitter, receiver or mirror.


Dimensions:
page 30308/7

## Safety detection solutions Preventa <br> Accessories for safety light curtains types 2 and 4



[^23]Safety detection solutions Preventa
Accessories for safety light curtains types 2 and 4
$90^{\circ}$ mirror adaptors + fixing clamps

## XUS ZM•••๐IXUS ZA••••

Fixing clamps (quantity 2)


| XUS |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
| Glass | Stainless <br> steel | $\mathbf{b}$ | H |
| ZM0102 | ZA102 | 140 | 182 |
| ZM0152 | ZA152 | 191 | 233 |
| ZM0305 | ZA0305 | 343 | 386 |
| ZM0457 | ZA0457 | 495 | 538 |
| ZM0508 | ZA0508 | 546 | 589 |
| ZM0610 | ZA0610 | 648 | 690 |
| ZM0711 | ZA0711 | 749 | 792 |
| ZM0762 | ZA0762 | 800 | 843 |
| ZM0813 | ZA0813 | 851 | 894 |
| ZM0914 | ZA0914 | 953 | 995 |
| ZM1016 | ZA1016 | 1054 | 1097 |
| ZM1067 | ZA1067 | 1105 | 1148 |
| ZM1219 | ZA1219 | 1257 | 1300 |
| ZM1321 | ZA1321 | 1359 | 1402 |
| ZM1372 | ZA1372 | 1410 | 1452 |
| ZM1422 | ZA1422 | 1461 | 1503 |
| ZM1524 | ZA1524 | 1562 | 1605 |
| ZM1626 | ZA1626 | 1664 | 1706 |
| ZM1830 | ZA1830 | 1867 | 1910 |
| ZM2134 | ZA2134 | 2172 | 2214 |



Protective covers
XUS ZWeee


| LZWB0280 | 310 |
| :--- | :--- |
| LZWB0320 | 350 |
| LZWB0360 | 390 |
| LZWB0440 | 470 |
| LZWB0520 | 550 |
| LZWB0600 | 630 |
| LZWB0680 | 710 |
| LZWB0720 | 750 |
| LZWB0760 | 790 |
| LZWB0880 | 910 |
| LZWB0920 | 950 |
| LZWB0960 | 990 |
| LZWB1040 | 1070 |
| LZWB1120 | 1150 |
| LZWB1200 | 1230 |
| LZWB1360 | 1390 |
| LZWB1400 | 1430 |
| LZWB1520 | 1550 |
| LZWB1560 | 1590 |
| LZWB1640 | 1670 |
| LZWB1720 | 1750 |
| LZWB1800 | 1830 |
| LZWB1920 | 1950 |
| LZWB2120 | 2150 |



## References:

pages 30308/2 and 30308/3

Safety detection solutions Preventa
Accessories for safety light curtains types 2 and 4

Anti-vibration kits (1)
XSZ SMK
XSZ SMK1
XSZ SMK2

(1) The anti-vibration kit comprises 8 shock absorbers, 16 washers and 16 nuts.

Fixing brackets for anti-vibration kits
XUS LZ227 pour XUS LN


Safety detection solutions
Preventa
Accessories for safety light curtains types 2 and 4

Fixing base XUS ZCeゃe•


## Floor fixing kit (quantity 4) for fixing base XUS ZC••७७

## xus zcB

Echelle 2,5


1 Bolt,
21 lock nut,
33 washers,
4 Rubber insulator,
5 Spacer (tube),
62 standard nuts,
7 Rawplug.

Dimensions (continued), schemes

Safety detection solutions Preventa
Accessories for safety light curtains types 2 and 4

## Dimensions

ABL 8RPS24.0.


| ABL 8 | a | b |
| :--- | :--- | :--- |
| RPS24030 | 120 | 44 |
| RPS24050 | 120 | 56 |
| RPS24100 | 140 | 85 |

Internal schemes

## ABL 8RPS24030



ABL 8RPS24050


ABL 8RPS24100


# Safety detection solutions <br> Preventa safety modules and single-beam <br> photo-electric sensors <br> With a test input associated with a built-in "muting" function 

## Operating principle

XPS CM safety modules used in conjunction with XU2 S single-beam photo-electric sensors (periodically tested), establish a category 2 light curtain conforming to IEC/EN 61496 parts 1 and 2.
The connection of 1 to 4 pairs of XU2 S photo-electric sensors makes it possible to create a protected zone up to 1200 mm high conforming to EN 999/ISO 13855 and 8 m long.

The built-in "muting" function allows the automatic passage of parts to be machined, or loaded pallets, without interrupting the transportation movement.
When the system is switched on by the start command (in series with the main circuit feedback loop) and the light protection is not interrupted, the main circuit is closed by the two safety relays of the XPS CM module.

An interruption of the protection field causes the safety outputs to open instantaneously, and the process PLC receives a stop command. The LED on the XPS CM front panel changes from green to red. The "open" state is maintained until the module is restarted using the start button.

The "muting" function allows the light curtain protection to be inhibited. This can be used to authorise the passage a materials trolley through the light curtain without tripping the main circuit. The "muting" function cannot be activated by supplying the inhibition sensors unless the safety outputs have been switched on beforehand.

To trigger the "muting" function, the inhibition devices must be activated within the 3 second time interval. This synchronisation time for the two inhibition inputs can be deactivated by connecting two configuration terminals. The "muting" cycle has a maximum duration of 60 seconds. During this period, materials can be transported through the protection field without deactivating the safety outputs. The 60 second limit value of the "muting" cycle may be made infinite by connecting two configuration terminals.

During the "muting" process, a light indicating the "muting" status is controlled by the XPS CM module. An fault at indicator light level (short-circuit, open circuit) will be immediately recognised and deactivate the "muting" function. The indicator light comes on when a "muting" signal is generated and indicates the inhibition of the protection function.


D1, D2, D3, D4: monitoring photo-electric sensors. MA1, MB1, MA2, MB2: "muting" photo-electric sensors. $\mathrm{m}=$ trolley length (including material) $\mathrm{dM}=$ distance between MA1, MB1 and MA2, MB2 .

## Conditions to be observed for the "muting" function

■ The "muting" sensors must either be thru-beam type XU2 M18PP340, polarised reflex type XU9 M18PP340 or mechanical limit switches with contacts.
■ $\mathrm{dM} \leq \mathrm{m}$ to obtain continuous validation of the "muting" function.
■ Avoid the intrusion of persons during the "muting" phase. This phase is indicated by the indicator light connected to the "muting" indicator output of the XPS CM module. - A materials trolley must provide the "muting" signal before entering the protection field and cease it once it has cleared all the sensors of the protection field on exiting.

| Characteristics: <br> page $30303 / 3$ | References: <br> pages $30303 / 4$ and $30303 / 5$ | Functional diagrams, connections: <br> pages $30303 / 6$ to $30303 / 9$ |
| :--- | :--- | :--- |
| 2 |  | Schneider <br> Selectric |

## Safety detection solutions

## Preventa safety modules and single-beam photo-electric sensors <br> With a test input associated with a built-in "muting" function

| Characteristics of safety modules |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Module type |  |  | XPS CM1144 | XPS CM1144P |
| Maximum achievab |  |  | PL c/Category 2 conforming to EN/ISO 13849-1, SILCL 1 conforming to EN/ IEC 62061 |  |
| Reliability data | Mean Time To dangerous Failure ( $\mathrm{MTTF}_{\mathrm{d}}$ ) | Years | 16.6 |  |
|  | Diagnostic Coverage (DC) | \% | 95.5 |  |
|  | Probability of dangerous Failure per Hour $\left(\mathrm{PFH}_{\mathrm{d}}\right)$ | 1/h | $3.12 \times 10^{-7}$ |  |
| Conformity to standards |  |  | EN/IEC 61496-1, EN/IEC 61496-2, EN/IEC 60204-1, EN/IEC 60947-1, EN/IEC 60947-5-1 |  |
| Product certifications |  |  | UL, CSA, IFA |  |
| Ambient air temperature |  | ${ }^{\circ} \mathrm{C}$ | For operation: $-10 \ldots+55$, for storage: $-25 \ldots+85$ |  |
| Degree of protection conforming to IEC 60529 |  |  | Terminals: IP 20 <br> Enclosure: IP 40 |  |
| Supply Voltage |  | v | 24 -.., voltage limits: - $20 \ldots+20 \%$ |  |
| Maximum consumption |  | w | <15, with thru-beam photo-electric sensors and "muting" signalling |  |
| Module fuse protection |  |  | Internal, electronic |  |
| Rated insulation voltage (Ui) |  | v | 300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2) |  |
| Rated impulse withstand voltage (Uimp) |  | kV | 4 (overvoltage category III, conforming to IEN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2) |  |
| Inputs for sensors <br> - number of inputs to be monitored |  |  | 4 (terminals Z1, Z2, Z3, Z4) |  |
| - input voltage |  | v | 24 -.. |  |
| - supply voltage of sensors |  | v | 24 - (terminal U+/U-) |  |
| - supply current of sensors |  | mA | <200 |  |
| Inputs for "muting" function | Number of "muting" inputs |  | 2 (terminals MA, MB) |  |
|  | Input voltage | v | 24 --. (terminal U+/U-) |  |
|  | Maximum current | mA | <200 |  |
|  | Synchronisation time | s | 3 (+/-20 \%) for activation of the MA/MB "muting" signal |  |
|  | Maximum "muting" time | s | 60 (-10...+30\%) |  |
| Single-beam thru-beam photo-electric sensors authorised for monitoring inputs $\mathrm{Z1}-\mathrm{Z} 2-\mathrm{Z3}-\mathrm{Z4}$ <br> - sensors authorised for the protection field (4 max.) <br> - "muting" sensors |  |  | XU2 S18PP340•・セ (infrared) |  |
|  |  |  | XU2 M18PP340 $\bullet \bullet$ or XU9 M18PP340 $\bullet \bullet \bullet$ photo-electric sensors or XC limit switches |  |
| Sensor supply resistivity |  | $\Omega$ | 10 max. |  |
| Safety outputs <br> - number and type <br> - breaking capacity of solid-state outputs <br> - breaking capacity in AC-15 <br> - breaking capacity in DC-13 <br> - maximum thermal current (Ithe) <br> - sum of maximum thermal current <br> - minimum current (volt-free contact) <br> - minimum voltage (volt-free contact) <br> - short-circuit protection |  |  | 2 NO (terminals 13-14, 23-24), volt-free |  |
|  |  |  | $4 \mathrm{NO} 24 \mathrm{~V} / 20 \mathrm{~mA},(\mathrm{Y} 33-\mathrm{Y} 34, \mathrm{Y} 33-\mathrm{Y} 44, \mathrm{Y} 33-\mathrm{Y} 54, \mathrm{Y} 33-\mathrm{Y} 64)$ |  |
|  |  | VA | C300: inrush 1800, maintained 180 |  |
|  |  |  | $24 \mathrm{~V} / 1.5 \mathrm{~A}, \mathrm{~L} / \mathrm{R}=50 \mathrm{~ms}$ |  |
|  |  | A | 5.6 |  |
|  |  | A | 11 |  |
|  |  | mA | 10 |  |
|  |  | v | 17 |  |
|  |  | A | 4 gG or 6 fast acting cartridge fuse, conforming to EN/IEC 60947-5-1 and DIN VDE 0660 part 200 |  |
| "Muting" signalling sensors for incandescent lamp |  |  | Number: 1 (terminal H1), maximum power: $6.5 \mathrm{~W} / 24 \mathrm{~V}=$ minimum power: $4 \mathrm{~W} / 24 \mathrm{~V}$ =- |  |
| Response time on input change of state |  | ms | <25 |  |
| Electrical durability |  |  | See our catalogue Safety functions and solutions using Preventa |  |
| Display |  |  | 4 LEDs |  |
| Connection | Type |  | Captive screw clamp terminals | Captive screw clamp terminals, removable terminal block |
| - 1-wire connection | Without cable end |  | Solid or flexible cable: $0.14 \ldots . .2 .5 \mathrm{~mm}^{2}$ | Solid or flexible cable: $0.2 . . .2 .5 \mathrm{~mm}^{2}$ |
|  | With cable end |  | Without bezel, flexible cable: $0.25 \ldots 2.5$ $\mathrm{mm}^{2}$ | Without bezel, flexible cable: $0.25 \ldots 2.5$ $\mathrm{mm}^{2}$ |
|  | With cable end |  | With bezel, flexible cable: $0.25 \ldots 1.5 \mathrm{~mm}^{2}$ | With bezel, flexible cable: $0.25 \ldots 2.5 \mathrm{~mm}^{2}$ |
| - 2-wire connection | Without cable end |  | Solid or flexible cable: $0.14 \ldots 0.75 \mathrm{~mm}^{2}$ | Solid cable: $0.2 \ldots 1 \mathrm{~mm}^{2}$, flexible cable: $0.2 . .1 .5 \mathrm{~mm}^{2}$ |
|  | With cable end |  | Without bezel, flexible cable: $0.25 \ldots 1 \mathrm{~mm}^{2}$ | Without bezel, flexible cable: $0.25 \ldots 1 \mathrm{~mm}^{2}$ |
|  | With cable end |  | Double, with bezel, flexible cable: $0.5 \ldots 1.5$ $\mathrm{mm}^{2}$ | Double, with bezel, flexible cable: $0.5 \ldots 1.5$ $\mathrm{mm}^{2}$ |

(1) Using an appropriate and correctly connected control system, associated with the safety module XPS CM1144•

Characteristics (continued), references

Safety detection solutions
Preventa safety modules and single-beam photo-electric sensors
With a test input associated with a built-in "muting" function

| Characteristics of photo-electric sensors |  |  |  |
| :---: | :---: | :---: | :---: |
| Conformity to standards |  |  | IEC 61496-1 and IEC 61496-2 (Type 2 ESPE) |
| Maximum safety level (1) |  |  | PL = c/category 2 conforming to EN/ISO 13849-1 |
| Reliability data | Probability of dangerous <br> Failure per Hour $\left(\mathrm{PFH}_{\mathrm{d}}\right)$ | 1/h | $\mathrm{PFH}_{\mathrm{d}}=4.6 \mathrm{E}^{-7}$ conforming to EN/IEC 61508 <br> $\mathrm{PFH}_{\mathrm{d}}=5.5 \mathrm{E}^{-7}$ conforming to EN/IEC 61508, with "muting" function |
| Ambient air temperature | For operation | ${ }^{\circ} \mathrm{C}$ | $-25 \ldots+55$ (infrared transmission sensors) |
|  | For storage | ${ }^{\circ} \mathrm{C}$ | -40... +70 |
| Vibration resistance |  |  | 7 gn ( $\mathrm{f}=10 \ldots 55 \mathrm{~Hz}$ ), conforming to EN/IEC 60068-2-6 |
| Shock resistance |  |  | 30 gn , 3 axes: 3 times, conforming to EN/IEC 60068-2-27 |
| Degree of protection |  |  | IP 67 conforming to IEC/EN 60529 |
| Connection | Pre-cabled |  | PVC cable, diameter 5 mm , length 5 m , wire c.s.a: $4 \times 0.34 \mathrm{~mm}^{2}\left(3 \times 0.34 \mathrm{~mm}^{2}\right.$ for thru-beam transmitter) |
|  | Connector |  | M12, 4-pin male connector (suitable 4-pin female connectors, including pre-wired versions) |
| Materials |  |  | Case: nickel plated brass (infrared transmission sensors). Lenses: PMMA |
| Nominal sensing distance |  | m | 8 (infrared transmission sensors) |
| Rated supply voltage |  | v | $12 . .24$--. (with protection against reverse polarity) |
| Voltage limits |  | V | $10 . .30$-. (including ripple) |
| Switching capacity (sealed) |  | mA | $\leq 100$ (with overload and short-circuit protection) |
| Voltage drop, closed state |  | V | $\leq 1.5$ |
| Current consumption, no-load |  | mA | $\leq 35$ |
| Maximum switching frequency |  | Hz | 500 |
| Delays |  | ms | $\begin{aligned} & \text { Response: } \leq 1 \\ & \text { Recovery: } \leq 1 \\ & \hline \end{aligned}$ |

(1) Using an appropriate and correctly connected control system, associated with the safety module XPS CM1144•

## Safety modules



XPS CM1144•

| Description | Type of <br> terminal <br> block <br> connection | Number Additional Supply <br> of safety <br> circuits | Reference | Weight |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  | $24 \mathrm{~V}=$ | XPS CM1144 | 0.350 |  |  |
| Safety modules | Integrated | 2 | 4 |  |  |  |
| for monitoring <br> single-beam <br> photo-electric <br> sensors, with a <br> built-in "muting" <br> function |  |  |  |  |  |  |


| Removable <br> from module | $24 \mathrm{~V}=-$ |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |


| Operating principle: | Characteristics: | Functional diagrams, connections: |
| :--- | :--- | :--- |
| page $30303 / 2$ | page $30303 / 3$ | pages $30303 / 6$ to $30303 / 9$ |

Safety detection solutions<br>Preventa safety modules and single-beam photo-electric sensors<br>With a test input associated with a built-in "muting" function




| $90^{\circ}$ to | Pre-cabled, | XU2 S18PP340WL5 | 0.485 |
| :--- | :--- | :--- | :--- |
| case axis | $L=5 \mathrm{~m}$ |  |  |



XU2 S18•P340WL5


XU2 S18KP340L5T


XU2 S18PP340DR


XU2 S18PP340WL5R

| PNP thru-beam, Infrared <br> receiver only <br> (for | Along case <br> axis | Pre-cabled, <br> $\mathrm{L}=5 \mathrm{~m}$ | XU2 S18PP340L5R | 0.250 |
| :--- | :--- | :--- | :--- | :--- |
| XPS CM1144•) |  |  |  |  |

$\overline{\text { M12 connector }}$ XU2 S18PP340WDR $\quad 0.080$
Other versions Pre-cable sensors with other cable lengths.

Safety detection solutions
Preventa safety modules and single-beam photo-electric sensors
With a test input associated with a built-in "muting" function

## Functional diagrams

Functional diagram of module XPS CM



Key to LEDs


1 Supply voltage A1-A2, internal electronic fuse status
2 Signalling for restarting
3 Safety output closed
4 Safety output open

Operation, curves, dimensions, connections

## Safety detection solutions

## Preventa safety modules and single-beam photo-electric sensors <br> With a test input associated with a built-in "muting" function



Dimensions
XU2 S18PP340L5, XU2 S18PP340L5L

(1) LED
(2) Potentiometer

XU2 S18PP340WL5


Connector version
Transmitter


## Cable connections

| (-) | BU | (Blue) |
| :--- | :--- | :--- |
| (+) | BN | (Brown) |
| (OUT) | BK | (Black) (receiver) |
| (Prog.) | OG | (Orange) (receiver) |
| (Test) | VI | (Violet) (transmitter) |

## XU2 S18PP340D



Fixing nut tightening torque: 24 N.m
Connector tightening torque: $2 \mathrm{~N} . \mathrm{m}$
XU2 S18PP340WD


Fixing nut tightening torque: 24 N.m
Connector tightening torque: $2 \mathrm{~N} . \mathrm{m}$

Receiver
Light switching (no object present). PNP output


Receiver
Light switching (no object present). PNP output


Connector schemes
Sensor connector pin view
Transmitter Receiver


Receiver
Dark switching (no object present). PNP output


Beam break test (for transmitter only)
Beam made Beam broken


Safety detection solutions
Preventa safety modules and single-beam photo-electric sensors
With a test input associated with a built-in "muting" function

## Connections

Connection of module XPS CM with 4 pairs of XU2 S single-beam sensors
(Connection of 1 to 4 pairs of XU2 S single-beam sensors to XPS CM, see page 30303-EN/9)


Main control part
of motor
XU2 S sensors can be programmed for light switching or dark switching (for example: dark switching with sensors 1 and 3 and light switching with sensors 2 and 4 ). ESC: external start conditions.
Y1-Y2: feedback loop.
STM: For stopping time measurement.
(1) Protection field sensors.
(2) Muting sensors.

Safety detection solutions
Preventa safety modules and single-beam photo-electric sensors
With a test input associated with a built-in "muting" function

Connections (continued)
Connection of module XPS CM with 1 pair of XU2 S sensors (dark switching)


Connection of module XPS CM with 3 pairs of XU2 S singlebeam sensors
(2 for dark switching, 1 for light switching)


Connection of module XPS CM with 2 pairs of XU2 S sensors (dark switching)


Connection of module XPS CM with 4 pairs of XU2 S singlebeam sensors
(2 for dark switching, 2 for light switching)


# Safety automation solutions <br> Safety monitoring module Preventa XPS LCM <br> for the "muting" function of type 2 and type 4 safety light curtains 

## Operating principle

XPS LCM safety modules are used with type 4 light curtains conforming to EN/ IEC 61496-1 to provide a system inhibiting the light curtain protection, i.e. "muting". This function enables the automatic passage of parts for machining or loaded pallets, without interrupting the transportation movement within the zone protected by the electro-sensitive protection equipment (ESPE) system. In addition to the electro-sensitive protection and XPS LCM safety modules, the system comprises 4 to 8 inhibition sensors, 2 indicator lights and a key switch to reset the system to the initial state in the event of a sequence error.

When the system is switched on by the start command and the light curtain protection not interrupted, the main circuit is closed by the safety outputs of the XPS LCM modules (solid-state safety outputs). In addition to safety outputs, the modules incorporate signalling outputs for sending system status information to the PLC. Either 5 or 14 LEDs and a 2-digit display, mounted on the front face of the module, provide information on the safety circuit status.

An interruption of the protection eld monitored by the electro-sensitive protection equipment causes instantaneous opening of the safety outputs; the process PLC receives a stop command and the LED display mounted on the front face indicates the change of state of the safety circuits. The "open" state is maintained until the module is restarted using the Start button.

The "muting" function cannot be activated by supplying the inhibition sensors unless the safety outputs have been switched on beforehand. To trigger the "muting" function, the inhibition devices must be activated within the 3 second time interval. During the activated "muting" phase, materials can be transported through the protection eld without deactivating the safety outputs. In the event of intrusion into the hazardous zone, a person cannot activate the inhibition sensors in the same way and the system stops.
Whilst the "muting" function is activated, a "muting" status indicator light is controlled by the XPS LCM module. A fault at indicator light level (short-circuit, open circuit) is immediately recognised and deactivates the "muting" function. The indicator light only illuminates when a "muting" signal is generated and indicates the inhibition of the protection function.


ESPE: electro-sensitive protection equipment (light curtain).
$A, B, D, C$ : "muting" sensors.
$m$ : trolley length and $d M=$ distance between $A, B$ and $D, C$.

## Conditions to be observed for the "muting" function

■ The "muting" sensors must either be thru-beam type XUB 0BPSNL2 + XUB 0BKSNL2T, polarised re ex type XUB OBPSNL2 + XUC Z50 or mechanical limit switches with contacts.
■ $\mathrm{dM} \leq \mathrm{m}$ to obtain continuous validation of the "muting" function.

- Avoid the intrusion of persons during the "muting" phase. This phase is indicated
by the indicator light connected to the "muting" indicator output of the XPS LCM module.
■ A materials trolley must provide the "muting" signal before entering the protection eld and cease it once it has cleared all the sensors of the protection eld on exiting.

| Characteristics: <br> page 30311-EN/3 | References: <br> page 30311-EN/4 | Dimensions: <br> pages 30311-EN/5 |
| :--- | :--- | :--- |
| 2 |  | Schemes: <br> pages 30311-EN/6 to 30311-EN/9 <br> SElectric |

## Safety automation solutions

## Safety monitoring module

Preventa XPS LCM
for the "muting" function of type 2 and type 4 safety light curtains

| Characteristics |  |  |  |
| :---: | :---: | :---: | :---: |
| Module type |  |  | XPS LCM1150 |
| Maximum achievable safety level (1) |  |  | PL e/Category 4 conforming to EN/ISO 13849-1, SILCL 3 conforming to EN/IEC 62061 |
| Conformity to standards |  |  | EN/IEC 61496-1, <br> EN/IEC 61496-2, <br> EN/IEC 60204-1, <br> EN/IEC 60947-1, <br> EN/IEC 60947-5-1 |
| Product certifications |  |  | UL, CSA, TÜV |
| Ambient air temperature | For operation | ${ }^{\circ} \mathrm{C}$ | 0... 55 |
|  | For storage | ${ }^{\circ} \mathrm{C}$ | -25... 75 |
| Degree of protection conforming to IEC 60529 | Terminals |  | IP 20 |
|  | Enclosure |  | IP 20 |
| Power supply | Voltage | v | 24 -- |
|  | Voltage limits |  | -10...+ 10\% |
| Maximum consumption |  | W | < 150 |
| Rated insulation voltage (Ui) |  | V | 300 (degree of pollution 2 conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 and 2) |
| Rated impulse withstand voltage (Uimp) |  | kV | 4 (overvoltage category III, conforming to IEC/EN 60947-5-1, DIN VDE 0110 parts 1 and 2) |
| Number of light curtains monitored |  |  | 1 or 2 transmitter-receiver pairs |
| Inputs for "muting" sensors <br> - number of inputs to be monitored <br> - supply voltage of sensors <br> - output current of each sensor |  |  | 2 to 4 per "muting" function |
|  |  | V | 24 |
|  |  | mA | <20 |
| Type of "muting" sensors |  |  | Thru-beam, polarised re ex or sensors with volt-free contacts |
| Synchronisation time of "muting" sensors |  | s | 3 or unlimited |
| Maximum "muting" time |  | min | 2 or unlimited |
| Safety outputs <br> - number and type <br> - max. thermal current (Ithe) |  |  | 2 PNP (terminals 1 and 2), 0.625 A at 24 V |
|  | 1 output | A | - |
|  | 2 outputs | A | $2 \times 0.108$ |
|  | 3 outputs | A | - |
|  | 3 contacts | A | - |
| Auxiliary outputs <br> - breaking capacity of solid-state PNP outputs <br> - breaking capacity of solid-state NPN outputs |  |  | 1 PNP (terminal 5) + 1 NPN (terminal 6) |
|  |  | mA | 24 V/500 |
|  |  | mA | $24 \mathrm{~V} / 100$ |
| "Muting" indicator light power |  | W | 1 to 7 max. |
| Response time on input change of state |  | ms | 1 |
| Signalling |  |  | 14 LEDs plus 2-digit display |
| Connection | Type |  | Captive screw clamp terminals, removable terminal block |
| 1-wire connection | Without cable end |  | Solid cable: $4 \mathrm{~mm}^{2}$ |
|  | Without cable end |  | Flexible cable: $0.14 \ldots 1.5 \mathrm{~mm}^{2}$ |
|  | With cable end |  | Without bezel, exible cable: $0.14 \ldots 1.5 \mathrm{~mm}^{2}$ |
| 2-wire connection | Without cable end |  | Solid cable: 0.14...1.5 mm ${ }^{2}$ |
|  | Without cable end |  | Flexible cable: $0.14 . .0 .7 .5 \mathrm{~mm}^{2}$ |

[^24]Description, references

## Safety automation solutions

Safety monitoring module
Preventa XPS LCM
for the "muting" function of type 2 and type 4 safety light curtains


## Description <br> \section*{XPS LCM1150}

To aid diagnostics, the safety monitoring module has 14 LEDs and a 2-digit display on the front face which provide information on the monitoring circuit status.


| Spare parts <br> Description | Power | Reference | Weight |
| :--- | :--- | :--- | ---: |
| "Muting" indicator light kit | W | 5 |  |
| Replacement bulbs for | 1 to 7 | XSZ CM01 | 0.012 |
| "muting" indicator light kit <br> comprising one lot of 10 <br> replacement bulbs and |  |  |  |
| 1 removal/insertion tool |  |  |  |
| XBF X13 |  |  |  |

Safety automation solutions
Safety monitoring module
Preventa XPS LCM
for the "muting" function of type 2 and type 4 safety light curtains

## Dimensions

XPS LCM1150
Mounting on 35 mm rail

Rear view

"Muting" indicator light kit XSZ CM01

(1) Faston connector 4.7.

(1) Arc suppressor.
(2) Muting activation/deactivation key switch.
(3) The power supply must conform to EN/IEC 61496 and EN/IEC 60204-1 standards.

| Presentation: | Characteristics: | References: |
| :--- | :--- | :--- |
| page 30311-EN/2 | page 30311-EN/3 | page 30311-EN/4 |

for the "muting" function of type 2 and type 4 safety light curtains

Connection via the safety monitoring module XPS LCM1150
Example: configuration with 2 light curtains XUS LP and XUS LN

(1) Arc suppressor.
(2) Muting activation/deactivation key switch.
(3) When module XPS LCM1150 is used with a type 2 light curtain (example: XUS LN), the entire protection system is downgraded to category 2.
(4) The power supply must conform to EN/IEC 61496 and EN/IEC 60204-1 standards.

## Safety automation solutions

Safety monitoring module
Preventa XPS LCM
for the "muting" function of type 2 and type 4 safety light curtains

Functional diagram of safety monitoring module XPS LCM1150
"Start/restart interlock" mode with 2 sensors


Key $0=1$
(1) Press Start button.

| Presentation: | Characteristics: | References: |
| :--- | :--- | :--- |
| page 30311-EN/2 | page 30311-EN/3 | page 30311-EN/4 |

Functional diagrams (continued)

## Safety automation solutions

## Safety monitoring module

Preventa XPS LCM
for the "muting" function of type 2 and type 4 safety light curtains

Functional diagram of safety monitoring module XPS LCM1150
"Start/restart interlock" mode with 4 sensors

(1) Press Start button.

Dialogue components

Trip wire switches for:

- conveyor systems,
- materials handling,
machine tools,
- electrical testing stations
Foot switches for:
- bending machines, dosing machines,
assembly stations, packaging machines,
cutting presses, stamping presses,
- machine tools (numerical control, lathes,
milling machines, grinders, machining centres),
- guillotines, cutters, folders, saws,
- forging machines, rolling machines, cold
metal forming machines


Positive operation conforming to EN/IEC 60947-5-1
Appendix K
Rated insulation voltage

Rated impulse withstand voltage conforming to EN/IEC 60947-1

## Type references

## Pages



Length of protected zone: 15 to 100 metres. Can be tripped by the operator at any point in the work zone

XY2 CH, XY2 CE:
EN/IEC 60947-5-1,
EN/ISO 13850:2006, UL 508 and
CSAC22-2 n 14
(when speci ed H7)
XY2 CB: EN/IEC 60947-5-1,
EN/ISO 13850:2006,
CSA C22-2 $\mathrm{n}^{\circ} 14$
(when speci ed H2)
Special version, "TH"
$-25 \ldots+70^{\circ} \mathrm{C}$

Class 1

XY2 CH, XY2 CE: IP 65
XY2 CB: enclosure IP 22,
contact housing IP 65


Metal, with or withou protective cover. Single or double pedal
Without protective
cover:
EN/IEC 60947-5-1,
CSA C22-2 $\mathrm{n}^{\circ} 14$
With protective cover NF E 09-031


Plastic, with or without protective cover. Single pedal

XPE B, G:
EN/IEC 60947-5-1 UL 508, CSA C22-2 n 14 XPE A, Y:
EN/IEC 60947-5-1


Plastic enclosure


EN/IEC 60947-1,
EN/IEC 60947-5-1,
EN/IEC 60204-1,
cUL us 508,
CSA C22-2 n ${ }^{\circ} 14$

Standard version, "TC"
$-10 \ldots+60^{\circ} \mathrm{C}$
$-25 \ldots+70^{\circ} \mathrm{C}$ XPE A, G. $-25 \ldots+70^{\circ} \mathrm{C}$ XPE A, Y: $-25 \ldots+55^{\circ} \mathrm{C}$

Class II

IP 66,
IP 669 (with protective cover)

XPE B, G:IP 66
XPE Y:IP 55
XPE A : IP 43

N/C contacts with positive opening operation $\Theta$

XY2 CH, XY2 CE: Ui $=400 \mathrm{~V}$ degree of pollution 3 conforming to EN/IEC 60947-1,
Ui $=300 \mathrm{~V}$ conforming to UL 508,
CSAC22-2 $n^{\circ} 14$
XY2 CB: $U i=500 \mathrm{~V}$ degree of
pollution 3 conforming to
EN/IEC 60947-1,
$\mathrm{Ui}=600 \mathrm{~V}$ conforming to
CSA C22-2 $\mathrm{n}^{\circ} 14$
$\mathrm{Ui}=500 \mathrm{~V}$, degree of pollution 3 conforming to EN/IEC 60947-1, group C conforming to NF C 20-040 and VDE 0110 $\mathrm{Ui}=300 \mathrm{~V}$ conforming to UL 508, CSAC22-2 n ${ }^{\circ} 14$

XY2 CH, XY2 CE: Uimp $=4 \mathrm{kV}$
Uimp $=6 \mathrm{kV}$
Uimp $=2.5 \mathrm{kV}$
Uimp $=6 \mathrm{kV}$
XY2 CB: Uimp $=6 \mathrm{kV}$

XY2 C
XPE M, XPE R XPE A, XPE B, XPE G, XPE Y

| Beacons and indicator <br> banks | Rotating mirror beacons <br> for long distance <br> signalling applications | Sirens <br> for long distance <br> signalling <br> applications |
| :--- | :--- | :--- |
|  |  |  |
|  |  |  |


| Control stations for: |
| :--- |
| - assembly and |
| packaging machines, |
| - paper, cardboard and |
| woodworking machines, |
| - food/beverage |
| processing, chemical and |
| automobile industries, |
| mechanical presses |

ontrol stations for: paper, cardboard and working machines processing, chemical and mechanical presses


|  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Metal bezel and xing collar | Plastic bezel and xing collar | Plastic enclosure | Direct xing or on support tube | Light source included: <br> - halogen bulb 70 W or <br> - incandescent bulb 25 W | Power <br> - 106 db, single tone <br> - 106 db, 2 tone |
| EN/IEC 60947-1, <br> EN/IEC 60947-5-1, <br> EN/IEC 60947-5-4, <br> EN/IEC 60947-5-5, <br> EN/ISO 13850:2006 and EN/IEC 60204-1 (trigger action and mechanical latching <br> mushroom head pushbuttons), <br> JIS C 4520, <br> CSA C22-2 $\mathrm{n}^{\circ} 14$, <br> UL 508 |  |  | ```EN/IEC 60947-5-1, UL 508, CSA C22-2 n 14``` | EN/IEC 60947-1, <br> EN/IEC 60947-5-1, <br> UL 508, <br> CSA C22-2-14 | EN/IEC 60947-1, EN/IEC 60947-5-1 |
| Standard version, "TH" |  |  | Standard version, "TC" |  |  |
| $-25 \ldots+70^{\circ} \mathrm{C}$ |  |  | See page 35081-EN/2 | $-20 \ldots+50^{\circ} \mathrm{C}$ | $-40 \ldots+50^{\circ} \mathrm{C}$ |
| $-40 \ldots+70^{\circ} \mathrm{C}$ |  |  |  |  |  |
| Classe I | Classe II |  | Class I: mounted on support tube Class II: mounted directly | Class I | $\begin{aligned} & \text { Class II: } \sim 120 / 230 \mathrm{~V} \\ & \text { Class III: } \approx 24 \mathrm{~V} \end{aligned}$ |
| IP 66, IP 69K (head tted with Nema type 4X and 12, 13 | bellows ZBZ •8) |  | IP 65 (mounted on xing base XVB Z0•) IP 66 (mounted directly on base unit) | IP 65 | IP 40 |
| N/C contacts with positive op | ing operation $\Theta$ |  | - |  |  |

Standard single and double blocks with screw clamp terminals:
$\mathrm{Ui}=600 \mathrm{~V}$, degree of pollution 3
Blocks for plug-in connector or Faston connectors:
$\mathrm{Ui}=250 \mathrm{~V}$, degree of pollution 3
Standard blocks for printed circuit board connection:
$\mathrm{Ui}=250 \mathrm{~V}$, degree of pollution 3
conforming to EN/IEC 60947-1


Light source included: Power - halogen bulb 70 W or - 106 db , single tone

EN/IEC 60947-1, EN/IEC 60947-1,
EN/IEC 60947-5-1,
UL 508,
CSA C22-2-14
$20 \ldots+50^{\circ} \mathrm{C}$

Class II: ~120/230 V
Class III: $\sim 24$

## IP 40

Ui $=250$ V conforming to EN/IEC 60947-1

| XB4 B | XB5 A | XAL K | XVB L, XVB C | XVR | XVS |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 36063-EN_Ver3.0/2 | $36163-E N \_V e r 3.0 / 2$ | $36032-E N \_V e r 14.0 / 6$ and <br> $36032-E N \_V e r 14.0 / 12 ~$ | 35081-EN_Ver14.0/4 | 35087-EN_Ver10.1/3 | 35088-EN_Ver8.1/3 |

Control and signalling units for safety applications

## Emergency stop trip wire switches, type XY2 C



## Emergency stop trip wire switches

Emergency stop trip wire switches are designed to:

- avert hazards (dangerous phenomena) at the earliest possible moment, or to reduce risks which could cause injury to persons or damage either to machines or work in progress,
- be tripped by a single human action when a normal Emergency stop function is not available,
- trip in the event of the trip wire breaking.

Emergency stop trip wire switches are essential in premises and on machines that are potentially dangerous when in operation. The operator must be able to trigger the stop instruction at any point within their working area.
Application examples: woodworking machines, shears, conveyor systems, transfer machines, printing machines, textile machines, rolling mills, test laboratories, paint shops, surface treatment works.


Installation
Typical installation


1 Fixing support
2 First cable support
3 Turnbuckle

4 Pulley supports and pulleys
5 End spring
6 Cable grips

7 Switch adjustment
8 Emergency stop

## Notes regarding installation

■ All XY2 CH/CE/CB trip wire switches can be tted with a pilot light to indicate their tripped condition.

- Cable tension adjustment can be performed using:
$\square$ a turnbuckle (to be ordered separately, see page 38145/7),
$\square$ a tensioner (integrated in certain XY2 CH models, see page 38145/5).
■ This adjustment is simpli ed by:
ㅁ a cable tension indicator that is available on all models XY2 CH,
$\square$ the availability of versions with a "cable tension indicator" window by stating its reference on the order form (see page 38145/5). Example: reference XY2 CE1A250 becomes XY2 CE1D250.
- The use of an end spring is strongly advised for conveyor system applications to ensure operation of the Emergency stop in the event of the cable being pulled towards the switch.
■ It is essential that pulleys be used with trip wires that deviate from a straight run, i.e. angled to form a protected zone.
■ Important: switches XY2 CB must not be used if the installation requires that the trip wire be angled.
Switches XY2 CH and XY2 CE can be used if the installation requires that the trip wire be angled. In this case, the total sum of the angles through which the trip wire bends must not exceed $180^{\circ}$ (For further information on instructions to be adhered to, please refer to the installation manual).


# Control and signalling units for safety applications 

## Emergency stop trip wire switches, type XY2 C

## Main features



Resetting: stop condition (awaiting reset/restart)


1 The switches incorporate positive opening operation contacts, the tripping of the switch being made with positive action.
2 The switch latches in the tripped position (N/C safety contact(s) open). The function of the N/O contact is purely for signalling.
3 The switches incorporate a reset button, which re-closes the safety contact(s). Restarting of the machine must only be achieved by manual operation of a control device within the machine start circuit, remote to the trip wire switch.

Trip wire expansion
and contraction: d

Tripping force: F1
Tripping deflection: f

Temperature variations likely to be encountered in the protected zone will obviously cause the trip wire to expand or contract.
To enable instant veri cation that the trip wire is at its correct tension (and for making any necessary adjustments), trip wire switches XY2 CH and XY2 CE incorporate a trip wire tension indicator.


The tripping force F1 is the force necessary on the trip wire to cause the switch to trip.
The tripping de ection f is the distance that the trip wire has to be de ected from its taut position to the point at which the switch trips.


Adjustment values (with end spring)

For Emergency stop trip wire switches type XY2 CE: the adjustment values depend on the positions of the cam located inside the switch. Adjustment is made by rotating the cam after the switch has been installed. Each notched position of the cam is referenced by the letters A to F, and the selected letter is visible through a viewing port.
Temperature range: $<25^{\circ} \mathrm{C}$.

| Type | Position of cam | Max. length of cable | End spring | Average tripping deflection values $f$ and tripping forces F for a distance of 5 m between cable supports and cable used |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Force F1 (daN) |  |  |  | Deflection $\mathrm{f}(\mathrm{mm})$ for: |  |  |  |
|  |  |  |  | Standard |  | Light |  | Standard force |  | Light force |  |
|  |  |  |  | $\begin{array}{\|l\|} \hline \text { Cable } \\ \varnothing 3.2 \mathrm{~mm} \\ \hline \end{array}$ | $\begin{aligned} & \text { Cable } \\ & \varnothing 5 \mathrm{~mm} \\ & \hline \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { Cable } \\ \varnothing 3.2 \mathrm{~mm} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline \text { Cable } \\ \varnothing 5 \mathrm{~mm} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline \text { Cable } \\ \varnothing 3.2 \mathrm{~mm} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline \text { Cable } \\ \varnothing 5 \mathrm{~mm} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline \text { Cable } \\ \varnothing 3.2 \mathrm{~mm} \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline \text { Cable } \\ \varnothing 5 \mathrm{~mm} \\ \hline \end{array}$ |
| XY2 CH | - | 15 m | XY2 CZ703 | 2.4 | 3 | - | - | 190 | 230 | - | - |
| XY2 CE | A | 50 m | XY2 CZ702 | 7 | 7 | 4 | 4.4 | 270 | 260 | 240 | 250 |
|  | B |  |  | 8.6 | 8.4 | 4.4 | 4.8 | 300 | 280 | 250 | 270 |
|  | C |  |  | 10.1 | 9.6 | 4.8 | 5.1 | 320 | 300 | 270 | 270 |
|  | D |  |  | 11 | 10.2 | 4.6 | 5.3 | 330 | 320 | 280 | 280 |
|  | E |  |  | 12.5 | 12.3 | 5.8 | 6 | 360 | 340 | 310 | 290 |
|  | F |  |  | 14.4 | 13.3 | 6.4 | 6.6 | 390 | 360 | 330 | 320 |
| XY2 CB | - | 100 m | XY2 CZ702 | 4.5 | - | - | - | 325 | - | - | - |

## Standards

Trip wire switches $\mathrm{XY} 2 \mathrm{CH}, \mathrm{XY} 2 \mathrm{CE}$ and XY 2 CB meet all the requirements of the harmonised European standard EN/ISO 13850, relating to Emergency stop devices.
All the trip wire switches are $C \in$ marked and supplied with an EC declaration of conformity.

# Control and signalling units for safety applications 

## Emergency stop trip wire switches, type XY2 C


(1) Only products $X Y 2 \mathrm{CH}$ without pilot light are CCC and UL-CSA approved.
(2) Using an appropriate and correctly connected control system.

## Control and signalling units for safety applications

## Emergency stop trip wire switches, type XY2 C



XY2 CE1A250

(1) See separate components, page 38145/6.
(2) $\varnothing 30$ spring return key operated pushbutton. Locking and key withdrawal in the rest (unactuated) position.
(3) For ISO M20 threaded cable entry version, add H29 to the end of the reference selected. Example: XY2 CH13250 becomes XY2 CH13250H29
(4) Only available on Emergency stop enclosures type $X Y 2 \mathrm{CH} 1325 \bullet$ and $X Y 2 \mathrm{CH} 1327 \bullet$ for standard, H29 and TK versions.
(5) Available with window for viewing cable tension indicator, for adjustment whilst the cover is closed (see versions XY2 CE $\bullet \bullet \bullet \bullet$ and XY2 CE•Eゃ・• on the order form, page 38145/6)
(6) ATEX version available (products for explosive atmospheres): To order, add EX to the end of the reference. Example: XY2 CE1A250 becomes XY2 CE1A250EX.
(7) Key switch, 2 position spring return. Locking and key withdrawal in the rest (unactuated) position.

Control and signalling units for safety applications

## Emergency stop trip wire switches, type XY2 C


(1) See separate components, page 38145/7. End spring XY2 CZ702 included.
(2) For 1/2" NPT threaded cable entry version, add the suffix H2 to the reference selected. Example: XY2 CB10 becomes XY2 CB1OH2.
(3) Bulb DL1 CB006 included.

| General: <br> page 38148/2 | Characteristics: <br> page 38145/2 | Dimensions: <br> page 38145/9 |  |
| :--- | :--- | :--- | :--- |
| 4 |  | Schneider | 38145-EN_Ver17.1 |

## Order form <br> (specimen suitable for photocopying) <br> Control and signalling units for safety applications

Emergency stop trip wire switches, type XY2 C

Complete units, pre-assembled

| Customer |  |  | Schneider Electric Industries SA |  |
| :--- | :--- | :--- | :--- | :--- |
| Company | Order $\mathrm{N}^{\circ}$ | Delivery date | Sales of ce - Subsidiary Co. | Order $\mathrm{N}^{\circ}$ |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

How to use this form:

- indicate the number of Emergency stop switches required,
- complete the basic reference.

(1) Opening of a circuit + mechanical latching in the open position.
(2) Other key numbers: 458A, 520E, 1242A, 1243E, 1344A, 1422A, 1431E, 2123E and 2132E.
(3) Emergency stop trip wire switches can only be fitted with slow break contact blocks.
(4) Only for versions without pilot light. For versions with pilot light, order an H4 version.
(5) Protective treatment TK is only possible for switches with silicone bellows (XY2 CH12•••TK, XY2 CH14•••H29TK...).

Order form
(specimen suitable for photocopying)

Control and signalling units for safety applications

## Emergency stop trip wire switches, type XY2 C

Complete units, pre-assembled

| Customer |  |  | Schneider Electric Industries SA |  |
| :--- | :--- | :--- | :--- | :--- |
| Company | Order $\mathrm{N}^{\circ}$ | Delivery date | Sales of ce - Subsidiary Co. | Order $\mathrm{N}^{\circ}$ |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

## How to use this form:

- indicate the number of Emergency stop switches required,
- complete the basic reference.

| Reference |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Number of identical Emergency stops |  |  |  |  |  |  |  |  |
| Model |  |  |  |  |  |  |  |  |
| Emergency stop (latching) | Anchor point on RH side, standard force | 1 |  |  |  |  |  |  |
|  | Anchor point on LH side, standard force | 2 |  |  |  |  |  |  |
|  | Anchor point on RH side, light force | 5 |  |  |  |  |  |  |
|  | Anchor point on LH side, light force | 6 |  |  |  |  |  |  |
|  | Anchor point on RH side, standard force (1) | F |  |  |  |  |  |  |
|  | Anchor point on LH side, standard force (1) | G |  |  |  |  |  |  |
|  | Anchor point on RH side, light force (1) | J |  |  |  |  |  |  |
|  | Anchor point on LH side, light force (1) | K |  |  |  |  |  |  |
| Degree of protection and "cable tension indicator" window |  |  |  |  |  |  |  |  |
| IP 65 (standard bellows) without "cable tension indicator" window |  |  | A |  |  |  |  |  |
| IP 65 (silicone bellows) without "cable tension indicator" window |  |  | C |  |  |  |  |  |
| IP 65 (standard bellows) with "cable tension indicator" window |  |  | D |  |  |  |  |  |
| IP 65 (silicone bellows) with "cable tension indicator" window |  |  | E |  |  |  |  |  |
| Type of reset |  |  |  |  |  |  |  |  |
| Emergency stop (2) Reset by spring return pushbutton | Flush |  |  | 1 |  |  |  |  |
|  | Booted |  |  | 2 |  |  |  |  |
|  | Mushroom head, Ø 30 |  |  | 3 |  |  |  |  |
| Emergency stop (2) Key ${ }^{\circ} 421$ |  |  |  | 4 |  |  |  |  |
| Reset by key switch Key n 455 |  |  |  | 5 |  |  |  |  |
| Key 458 A or 520E |  |  |  | 9 |  |  |  |  |
| Contact blocks for Emergency stop function (3) |  |  |  |  |  |  |  |  |
| Slow break | $1 \mathrm{NC}+\mathrm{NO}$ |  |  |  | 5 |  |  |  |
|  | $1 \mathrm{NC}+\mathrm{NC}$ |  |  |  | 7 |  |  |  |
|  | $2 \mathrm{NC}+\mathrm{NO}$ (compulsory with pilot light) (4) |  |  |  | 9 |  |  |  |
| Pilot light |  |  |  |  |  |  |  |  |
| Without pilot light |  |  |  |  |  | 0 |  |  |
| With 24 to 130 V direct supply LED pilot light (provide for 2 contact blocks) |  |  |  |  |  | 6 |  |  |
| With 230 to 240 V direct supply LED pilot light (provide for 2 contact blocks) |  |  |  |  |  | 7 |  |  |
| 1/2" NPT tapped cable entries (the LED pilot light will be red) |  |  |  |  |  |  | H7 |  |
| Increased protective treatment against corrosion |  |  |  |  |  |  |  | TK (5) |

(1) With cable tensioner.
(2) Opening of NC contact + mechanical latching in the open position.
(3) Emergency stop trip wire switches can only be fitted with slow break contact blocks.
(4) The use of a pilot light means selecting a switch fitted with 2 NC + NO contacts: XY2 CE $\bullet \bullet 9$


| General: page 38148/2 | Characteristics: page 38145/2 | Dimensions: page 38145/9 |  |
| :---: | :---: | :---: | :---: |
| 6 |  | chneider <br> Electric | 38145-EN_Ver17.1 |

Control and signalling units for safety applications

## Emergency stop trip wire switches, type XY2 C

|  |
| :--- | :--- | :--- | :--- | :--- |

Control and signalling units for safety applications

## Emergency stop trip wire switches, type XY2 C



| General: <br> page 38148/2 | Characteristics: <br> page 38145/2 | Dimensions: <br> page 38145/9 |
| :--- | :--- | :--- |
| 8 |  | Schneider <br> Selectric |

Control and signalling units for safety applications
Emergency stop trip wire switches，
type XY2 C

（1）Maximum extension．
（2）Tapped entries for $n^{\circ} 13$（Pg 13．5）cable gland．For ISO M2O the reference becomes XY2 CH・ゃゃゃゃH29
（3） $121 \mathrm{~mm}: 24 \mathrm{~V}$ and 48 V versions． $131 \mathrm{~mm}: 130 \mathrm{~V}$ and 230 V versions．
XY2 CE
XY2 CE1A $\bullet \bullet$（anchor point on RH side）
XY2 CEeゃゃ with cable tensioner＋XY2 CZ804（bracket）

（1） 3 plain holes for $n^{\circ} 13$（Pg 13．5）or ISO M20 cable gland．
（2）Maximum extension．
$\varnothing: 4$ elongated holes $\varnothing 6$ mm．
XY2 CB
Without pilot light
With pilot light

（1） 2 access points for operating cable．
（2）+125 for opening cover
（3） 1 tapped entry for $n^{\circ} 13$（Pg 13．5）cable gland．For ISO M20 use adaptor DE9 RP13520．


# Control and signalling units for safety applications 

Foot switches, Harmony type XPE


The foot switches can incorporate one or two N/C + N/O contact blocks.
Positive opening operation on release of pedal: the hold down or return to the rest position of the pedal (machine stop) is positive acting

Positive opening operation

A switch meets this requirement when all its N/C contacts can be switched to the open position with certainty, i.e. there are no exible links between the moving contacts and the actuator to which the operating force is applied.

All pedal operated foot switches incorporate a snap action N/C + N/O contact block with positive opening operation, and conform fully to standard IEC 60947-5-1 Section 3.

Snap action contact (quick break)

[^25]
# Control and signalling units for safety applications 

## Foot switches, Harmony type XPE

Start instructions
Foot switches XPE with protective cover are ideally suited for issuing a safety "Start" instruction for potentially dangerous machines.


Normal stop
instructions

All foot switches of the XPE range can be used for issuing a normal stop instruction to a machine.


Never use the protective cover nor the trigger mechanism for this type of application. Access to the stop control must be as unrestricted as possible and without any constraints.

For machine stop instructions, use the N/C contact(s).

# Control and signalling units for safety applications 

Foot switches, Harmony type XPE

| Pedal latching | Foot switches with pedal latching device are particularly suited for the control of "hold to run" machines <br> and also, for adjustment operations. |
| :--- | :--- |
| device when | and |


#### Abstract

and also, for adjustment operations.




Pressing the pedal issues the machine start instruction and, when the pedal reaches its stop, it latches in the operated position.

Removing the foot from the pedal will not stop the "machine" cycle (hold to run), the pedal remains latched.

For issuing a normal stop instruction, the foot is replaced on the pedal and the toe plate operated: this returns the pedal to the rest position.

## Switches with <br> 2 step contact operation

Foot switches featuring 2 step contact operation are ideal for applications involving 2-speed machines. Examples:
$\square$ First speed: low (used for setting-up, adjustment or tool maintenance).
■ Second speed: fast (normal machine operating speed).



The second step, at maximum pedal travel ( 12 mm ) and required foot pressure ( 9 daN), actuates a second N/C + N/O contact block.

## Applications

Many types of machines are fitted with foot switches

```
- Bending machine
\square Dosing machine
■ Assembly station
- Packaging machines
- Cutting presses, stamping presses
■ Machine tools (numerical control, lathes, milling machines, grinders, machining
centres)
■ Guillotines, cutters, folders, saws
■ Forging machines, rolling machines, cold metal forming machines
```

Characteristics:
pages 38146-EN_Ver14.1/2 and

# Control and signalling units for safety applications 

## Foot switches, Harmony type XPE

## Foot switches <br> used in conjunction with two-hand control stations

Foot switches XPE can be mounted directly on the baseplate (without drilling additional fixing holes) of the pedestal XY2 SB90 for two-hand control stations XY2 SB7•.


The baseplate of the two-hand control station pedestal XY2 SB90 is pre-drilled with xing holes to suit the mounting of either:

■ One XPE foot switch, with or without protective cover.
■ Two XPE R foot switches, each with its own protective cover or tted with a common (double) cover.


The protective cover is very strong and is sufficiently dimensioned to accommodate all types of footwear (large size, safety boots, etc.).


The foot switch is designed such that the operating pedal is close to the ground and at a comfortable angle.

Various accessories improve the working comfort for machine operators and help to avoid discomfort in the base of the spine due to unbalanced positioning of the pelvis:

- Heel rest (metal XPE).
- Hand grip for mounting on protective cover.


# Control and signalling units for safety applications 

## Metal foot switches, Universal, Harmony types XPE M/R



Connection
Screw clamp terminals
Maximum clamping capacity: $1 \times 2.5 \mathrm{~mm}^{2}$ or $2 \times 1.5 \mathrm{~mm}^{2}$ with or without cable end
(1) Using an appropriate and correctly connected control system.

| General: | References: | Dimensions: |
| :--- | :--- | :--- |
| page 38149-EN_Ver8.0/2 | page 38146-EN/3 | page 38146-EN/5 |

# Control and signalling units for safety applications 

Metal foot switches, Universal, Harmony types XPE M/R


Single and double pedal foot switches with protective cover

| Description | Pedal | Contact operation |  | Colour | Reference | Weight |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Metal <br> With trigger mechanism requiring positive action to allow pedal operation | Single | 1 step | $1 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M510 | 2.570 |
|  | Double | 1 step | $2 \times 1 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M5100D | 6.070 |
|  | Single | 1 step | $1 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Orange | XPE R510 | 2.570 |
|  | Double | 1 step | $2 \times 1 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Orange | XPE R5100D | 6.070 |


|  |  |  | Blue | XPE M511 | 2.590 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Double | 1 step | $2 \times 2$ N/C + N/O | Blue | XPE M5110D | 6.090 |


| Single | 1 step | 2 N/C + N/O | Orange | XPE R511 | 2.590 |
| :--- | :--- | :--- | :--- | :--- | :--- |


| Double | 1 step | $2 \times 2$ N/C + N/O | Orange | XPE R5110D | 6.090 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Single | 2 step | 2 N/C + N/O | Blue | XPE M711 | 2.590 |


|  |  |  | Orange | XPE R711 | 2.590 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Single | 1 step with analogue | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M529 | 2.600 |


|  |  | output |  | Orange | XPE R529 | 2.600 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Metal | Single | 1 step | $1 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M310 | 2.400 |
| mechanism | Double | 1 step | $2 \times 1$ N/C + N/O | Blue | XPE M3100D | 5.900 |
|  | Single | 1 step | $1 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Orange | XPE R310 | 2.400 |
|  | Double | 1 step | $2 \times 1$ N/C + N/O | Orange | XPE R3100D | 5.900 |
|  | Single | 1 step | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M311 | 2.420 |
|  | Double | 1 step | $2 \times 2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M3110D | 5.920 |
|  | Single | 1 step | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Orange | XPE R311 | 2.420 |
|  | Double | 1 step | $2 \times 2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Orange | XPE R3110D | 5.920 |
|  | Single | 1 step latching | 1 N/C + N/O | Blue | XPE M410 | 2.400 |
|  |  |  |  | Orange | XPE R410 | 2.420 |
|  | Single | 2 step | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M611 | 2.420 |
|  |  |  |  | Orange | XPE R611 | 2.420 |
|  | Single | 1 step with | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M329 | 2.420 |


| Double | 2 step <br> +1 step | $2 \times 1 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ <br> $+1 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M6210D | 5.900 |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |

## Control and signalling units for safety applications

## Metal foot switches, Universal, Harmony types XPE M/R



XPE R810


XPE M110


XPE Z902

XE2S P4151•

| Foot switches without protective cover |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Description | Contact operation |  | Colour | Reference | Weight kg |
| Metal <br> With trigger mechanism requiring positive action to allow pedal operation | 1 step | $1 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M810 | 1.200 |
|  |  |  | Orange | XPE R810 | 1.200 |
|  |  | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M811 | 1.220 |
|  |  |  | Orange | XPE R811 | 1.220 |
|  | 2 step | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M911 | 1.220 |
|  |  |  | Orange | XPE R911 | 1.220 |
|  | Analogue output | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M929 | 1.220 |
|  |  |  | Orange | XPE R929 | 1.220 |
| Metal Without trigger mechanism | 1 step | 1 N/C + N/O | Blue | XPE M110 (1) | 1.200 |
|  |  |  | Orange | XPE R110 (1) | 1.200 |
|  |  | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M111 (1) | 1.220 |
|  |  |  | Orange | XPE R111 (1) | 1.220 |
|  | 2 step | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE M211 (1) | 1.220 |
|  |  |  | Orange | XPE R211 (1) | 1.220 |
|  | Analogue output | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Orange | XPE R229 | 1.220 |


| Accessories |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | For use with | Unit reference | Weight kg |
| Single protective cover | XPE M | XPE Z901 | 1.200 |
|  | XPE R | XPE 2911 | 1.200 |
| Double protective cover | XPE M | XPE Z921 | 1.200 |
|  | XPE R | XPE $\mathbf{Z 9 3 1}$ | 1.200 |
| Hand grip for protective cover | XPE Z901 or XPE Z911 | XPE $\mathbf{Z 9 1 3}$ | 0.450 |
| Heel rest | XPE M | XPE Z902 | 0.240 |
|  | XPE R | XPE $\mathbf{Z 9 1 2}$ | 0.240 |
| Trigger mechanism | XPE M or XPE R | XPE Z903 | 0.170 |
| Latching device (replacement for foot switches with this feature) | XPE M or XPE R | XPE Z904 | 0.170 |
| Cable clamp | XPE M or XPE R | XPE Z905 | 0.010 |
| Contact blocks Snap action | $\begin{aligned} & 1 \text { step switches: } 1^{\text {st }} \text { or } 2^{\text {nd }} \mathrm{N} / \mathrm{C}+\mathrm{N} / \mathrm{O} \\ & 2 \text { step switches: } 1^{\text {st }} \mathrm{N} / \mathrm{C}+\mathrm{N} / \mathrm{O} \end{aligned}$ | XE2S P4151 | 0.020 |
|  | 2 step switches: $2^{\text {nd }} \mathrm{N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | XE2S P4151B | 0.020 |
| ISO M20 adaptor (Sold in lots of 5) | XPE M or XPE R | DE9 RA1620 | 0.050 |

(1) To order an ATEX D version of the product (protection against dust), add EX to the end of the reference. Example: XPE M110EX.

| General: <br> page 38149-EN_Ver8.0/4 | Characteristics: <br> page 38146-EN/2 | Dimensions: <br> page 38146-EN/5 |  |
| :--- | :--- | :--- | :--- |
| 4 |  | Schneider |  |
| 3 |  | Electric |  |

Control and signalling units for safety applications Metal foot switches, Universal, Harmony types XPE M/R

XPE M, XPE R without protective cover


XPE M, XPE R with protective cover


XPE Z913

b
160
295

|  | a | b |
| :--- | :--- | :--- |
| Single pedal | 152 | 160 |
| Double pedal | 155 | 295 |

(1) 2 tapped entries for $n^{\circ} 16$ (Pg 16) cable gland. For ISO M20, use adaptor DE9 RA1620 (2) $1 \varnothing 6$ plain hole.

# Control and signalling units for safety applications 

## Plastic foot switches, Harmony types XPEA/B/G/Y



## Connection

Screw clamp terminals
Maximum clamping capacity: $1 \times 2.5 \mathrm{~mm}^{2}$ or $2 \times 1.5 \mathrm{~mm}^{2}$ with or without cable end
(1) Using an appropriate and correctly connected control system

# Control and signalling units for safety applications 

## Plastic foot switches, <br> Harmony types XPEA/B/G/Y



XPE G810


XPE •110


XPE A110


XE2S P4151


Foot switches without protective cover

| Description | Contact operation |  | Housing | Reference | Weight |
| :---: | :---: | :---: | :---: | :---: | :---: |
| With trigger mechanism requiring positive action to allow pedal operation | 1 step | $1 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Grey | XPE G810 | 0.580 |
|  | 2 step | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Grey | XPE G911 | 0.580 |
| Without trigger mechanism | 1 step | 1 N/C + N/O | Yellow | XPE Y110 (1) | 0.570 |
|  |  |  | Blue | XPE B110 | 0.570 |
|  |  |  | Grey | XPE G110 | 0.570 |
|  |  |  | Black | XPE A110 | 0.275 |
|  |  | $2 \mathrm{~N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ | Blue | XPE B111 | 0.570 |
|  |  |  | Grey | XPE G111 | 0.570 |
|  |  |  | Black | XPE A111 | 0.295 |
|  | 2 step | 2 N/C + N/O | Yellow | XPE Y211 (1) | 0.570 |
|  |  |  | Blue | XPE B211 | 0.570 |
|  |  |  | Grey | XPE G211 | 0.570 |


| Accessories for foot switches, with or without protective cover |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Description | For use with | Sold in lots of | Unit reference | Weight kg |
| M20 x 1.5 | Cable Ø 5... 10 mm | 5 | DE9RA200612 | 0.014 |
|  | Cable Ø 7... 13 mm | 5 | DE9RA201014 | 0.01 |
| Contact blocks, snap action | 1 or 2 step switches | 1 | XE2S P4151 | 0.02 |

(1) IP 55, not UL, CSA approved.

| General: | Characteristics: | Dimensions: |
| :--- | :--- | :--- |
| page 38149/2 | page 38159/2 | page 38159/4 |

# Control and signalling units for safety applications 

## Plastic foot switches,

Harmony types XPE B/G/Y

## XPE B, XPE G, XPE Y <br> With protective cover


(1) $\varnothing 16 \times 4$ counterbored hole.
(2) 4 cover fixing screws: stainless steel. Tightening torque: 1 N.m.

## Without protective cover


(1) 2 plain holes for ISO M20 or n ${ }^{\circ} 13$ (Pg 13.5) cable gland. (2) 4 cover fixing screws: stainless steel. Tightening torque: 1 N.m (3) Return spring: stainless steel.

(1) 1 plain hole for ISO M20 or $n^{\circ} 13$ (Pg 13.5) cable gland. (2) 1 plain hole for ISO M20 or $n^{\circ} 9$ (Pg 11) cable gland.

Operating principle, characteristics

## Safety dialogue solutions <br> Enabling switches <br> For safety circuits

Operating principle

| Environment |  |  |  |
| :---: | :---: | :---: | :---: |
| Conforming to standards | Products |  | IEC/EN 60947-1, IEC/EN 60947-5-1, cUL us 508 and CSA C22-2 ${ }^{\circ} 14$ |
|  | Machine assemblies |  | IEC/EN 60204-1 |
| Maximum safety level (1) |  |  | PLe, category 4 conforming to EN/ISO 13849-1 and SIL 3 conforming to EN/IEC 61508 |
| Reliability data B10d |  |  | $5,000,000$ (data value for a service life of 10 years: can be limited by contact and mechanical wear) |
| Protective treatment |  |  | Standard version: "TC" |
| Ambient air temperature | Operation | ${ }^{\circ} \mathrm{C}$ | $-10 \ldots+60$ |
|  | Storage | ${ }^{\circ} \mathrm{C}$ | -40... +70 |
| Vibration resistance |  |  | $6 \mathrm{gn}(5 \ldots 55 \mathrm{~Hz})$ conforming to IEC 60068-2-6 |
| Shock resistance |  |  | 10 gn (11 ms) conforming to IEC 60068-2-27 |
| Electric shock protection |  |  | Class II conforming to IEC/EN 61140 |
| Degree of protection |  |  | IP 66 conforming to IEC 60529, IP 65 with a pushbutton, IK 06 conforming to EN 50102 |
| Mechanical durability |  | Op. cycle | 1 million |
| Enclosure |  |  | Double insulated enclosure made of PA66 |
| Cable diameter |  | mm | 7... 13 |
| Contact block characteristics |  |  |  |
| Rated operational characteristics |  |  | ~AC-15: C300 or Ue $=250 \mathrm{~V}$, le $=1.5 \mathrm{~A}$ or $\mathrm{Ue}=125 \mathrm{~V}$, $\mathrm{le}=0.75 \mathrm{~A}$ -.- DC-13 : R300 or $\mathrm{Ue}=250 \mathrm{~V}$, $\mathrm{le}=0.1 \mathrm{~A}$ or $\mathrm{Ue}=125 \mathrm{~V}$, $\mathrm{le}=0.22 \mathrm{~A}$ conforming to IEC 60947-5-1 Appendix A |
| Thermal current (Ithe) |  | A | 5 |
| Rated insulation voltage (Ui) |  | V | 250, degree of pollution III (II inside) conforming to IEC 60947-1 <br> 125, contact 7-8 |
| Rated impulse withstand voltage (Uimp) |  | kV | 2.5 conforming to EN 60947-1 |
| Positive operation |  |  | 2 3-position contacts with positive opening operation conforming to IEC 60947-5-1 appendix K |
| Contact operation |  |  | Slow break |
| Resistance across terminals |  | $\mathrm{m} \Omega$ | $\leq 50$ |
| Actuation force |  |  | $\begin{aligned} & \hline \text { 1..2: } 12 \mathrm{~N} \\ & \text { 2...3: } 50 \mathrm{~N} \\ & \hline \end{aligned}$ |
| Terminal referencing |  |  | Numbered conforming to CENELEC EN 50013 |
| Short-circuit protection |  |  | 4 A cartridge fuse type gG (gl) |
| Connection |  | mm ${ }^{2}$ | Terminal block, $1 \times 0.34 \ldots 1 \times 1.5$ |

(1) Using an appropriate and correctly connected control system.

References, dimensions, connections

Safety dialogue solutions

## Enabling switches

For safety circuits


XY2 AU•


XY2 AZ1


XY2 AZ2


XY2 AZ3


Separate components and spare parts

| Description | Reference | Weight <br> $\mathbf{k g}$ |
| :--- | :--- | ---: |
| Grip support | XY2 AZ1 | 0.215 |

Cover kit for key actuator XCS Z01 or XCS Z11 XY2 AZ2
0.015 only applicable to XY2 AU1

Cover

XY2 AU2


XY2 AZ1


Connection example

With XPS VC safety module


ESC : external start conditions

State of XY2 AU• contacts


Only 8 applicable to XY2 AU2

# Safety dialogue solutions <br> Two-hand ergonomic control stations <br> With Harmony XB4 B control units 



## Presentation

The design of the control station incorporates features to signi cantly reduce occupational illnesses associated with repetitive movements of the hands, particularly "carpal tunnel syndrome".

The health and comfort of the machine operator is assured by:
■ the numerous alternative hand positions for operating the 2 pushbutton actuators, see diagrams to left,

- a hand rail,

■ simple and fast adjustments of control station position.

This two-hand control station protects machine operators against both industrial accidents and illnesses related to their occupation.

It conforms to the following European safety standards:
■ EN 574/ISO 13851 (two-hand control)
EN 999 (approach speeds of parts of the human body and positioning of safety devices).

The control station can be mounted:
■ directly on the machine housing,
■ on a pedestal, enabling 3 directional adjustment:
$\square$ height,

- rake,
- skew.

The use of a two-hand control station in conjunction with a safety module type XPS BCE or XPS BF provides type IIIC two-hand control conforming to EN 574/ISO 13851 and PL e / Category 4 according to EN/ISO 13859-1.

The range comprises
■ two-hand control stations with or without pre-wired terminal blocks,

■ kits (control station + pedestal), with or without pre-wired terminal blocks

The products are supplied with an installation manual, which is also available as a separate item

## Description

The control station 1 has ve cut-outs ( $\varnothing 22 \mathrm{~mm}$ ) 2 as standard. Five additional cutouts are possible 3.

Its pedestal 5 enables the following quick and simple adjustments:
■ Control station rake $\left( \pm 30^{\circ}\right)$ using handle 4 .
■ Control station skew $\left( \pm 180^{\circ}\right)$ using handle 6 .
■ Control station height ( 835 to 1170 mm ) using handle 6 .
The baseplate 8 can be tted with safety foot switches XPE R 9, together with their protective covers 7 . See page $38146-E N / 3$.


## Safety dialogue solutions <br> Two-hand ergonomic control stations With Harmony XB4 B control units


(1) Using an appropriate and correctly connected control system.


XY2 SB7•


XY2 SB7•4

| Two-hand control stations - painted |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Description | Mushroom head |  | Reference | Weight kg |
|  | Function and colour | Contacts |  |  |
| 2 control pushbuttons with N/C + N/O break before make contacts and | Emergency stop Red | $\mathrm{N} / \mathrm{C}+\mathrm{N} / \mathrm{C}$ slow break | XY2 SB71 | 4.000 |
| 1 mushroom head pushbutton | Lock out (Schaltsperre) Yellow | $\mathrm{N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ <br> break before make | XY2 SB75 | 4.000 |


| 2 control | Emergency stop | N/C + N/C | XY2 SB72 | 4.000 |
| :---: | :---: | :---: | :---: | :---: |
| pushbuttons with | Red | slow break |  |  |
| N/C + N/O break before make contacts and |  |  |  |  |
| 1 mushroom head | Lock out | N/C + N/O | XY2 SB76 | 4.000 |
| pushbutton, with | (Schaltsperre) | break before make |  |  |
| pre-wired terminal | Yellow |  |  |  |

Kits (control station + pedestal)

| Description | Mushroom head |  | Reference | Weight kg |
| :---: | :---: | :---: | :---: | :---: |
|  | Function and colour | Contacts |  |  |
| 2 control pushbuttons and | Emergency stop Red | $\mathrm{N} / \mathrm{C}+\mathrm{N} / \mathrm{C}$ <br> slow break | XY2 SB714 | 17.000 |
| 1 mushroom head |  |  |  |  |
| Emergency stop pushbutton |  |  |  |  |
| + pedestal XY2 SB90 |  |  |  |  |


| $\mathbf{2}$ control | Emergency stop | N/C + N/C | XY2 SB724 | 17.000 |
| :--- | :--- | :--- | :--- | :--- |
| pushbuttons and | Red | slow break |  |  |
| $\mathbf{1}$ mushroom head |  |  |  |  |
| Emergency stop <br> pushbutton, with <br> pre-wired terminal |  |  |  |  |
| block |  |  |  |  |
| + pedestal XY2 SB90 |  |  |  |  |


| Documentation | Reference | Weight <br> kg |  |
| :--- | :--- | :--- | ---: |
| Description | For use with |  | 0.200 |
| Installation manual | All control stations XY2 SB7•e | XCO M2514 | $\mathbf{0 . 2}$ |

Safety dialogue solutions
Two-hand ergonomic control stations With Harmony XB4 B control units


XY2 SB99


| Separate components and spare parts |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Various accessories |  |  |  |  |
| Description | For use with | Colour | Unit reference | Weight kg |
| Metal pedestal adjustable height | XY2 SB•๑ | Orange | XY2 SB90 | 13.000 |
| Collar for guard rail (welded xing) | XY2 SB90 | Orange | XY2 SB98 | 0.800 |
| Control station top without control devices | - | Orange | XY2 SB511 | 2.500 |
| Control station base | - | Orange | XY2 SB531 | 1.200 |
| Double protective metal cover | Metal pedestal XY2SB90 and foot switches type XPE R | Orange | XY2 SB96 | 4.370 |
| Replacement handle (sold in lots of 5) | Metal pedestal XY2SB90 | Black | XY2 SB93 | 0.155 |
| Replacement seals | - | - | XY2 SB99 | 0.300 |
| Adaptor (sold in lots of 5) | ISO M25 | - | DE9 RA2125 | 0.010 |
| Fixing nut (sold in lots of 5) | Adaptor | - | DE9 EC21 | 0.005 |
| Control units (1) |  |  |  |  |
| Description | Component part | Colour | Reference | Weight kg |
| Pushbutton actuator | $\varnothing 60 \mathrm{~mm}$ mushroom head | Black | ZB4 BR216 | 0.095 |
|  | $\mathrm{N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ body/contact assembly | - | ZB4 BZ105 | 0.055 |
| Emergency stop pushbutton | $\varnothing 40 \mathrm{~mm}$ mushroom head | Red | ZB4 BS844 | 0.060 |
|  | $\mathrm{N} / \mathrm{C}+\mathrm{N} / \mathrm{C}$ body/contact assembly | - | ZB4 BZ104 | 0.055 |
| Lock out pushbutton | $\varnothing 40$ mm mushroom head | Yellow, marked "Schalts | ZB4 BS845S | 0.060 |
|  | $\mathrm{N} / \mathrm{C}+\mathrm{N} / \mathrm{O}$ body/contact assembly | - | ZB4 BZ105 | 0.055 |

[^26]Dimensions

## Control station

 XY2 SB7•

## Pedestal XY2 SB90



Double protective cover
XY2 SB96

(1) Adjustable height of pedestal 720 to 1060 mm .

# Safety dialogue solutions 

Harmony ${ }^{\circledR}$ XB4, metal<br>Emergency stop mushroom head pushbuttons<br>$\varnothing 22$ trigger action<br>Chromium plated metal bezel

| Environment |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Maximum safety level (1) |  |  | PLe, category 4 conforming to EN/ISO 13849-1 and SIL 3 conforming to EN/IEC 61508 |  |  |
| Reliability data B10d |  |  | $\begin{aligned} & \text { 1,500,000 } \\ & \text { (data value can be limited by contact and mechanical wear) } \end{aligned}$ |  |  |
| Protective treatment | Standard version |  | "TH" |  |  |
| Ambient air temperature around the device | For storage | ${ }^{\circ} \mathrm{C}$ | -40... 70 |  |  |
|  | For operation | ${ }^{\circ} \mathrm{C}$ | $-25 \ldots+70$ unless otherwise stated |  |  |
| Electric shock protection | Conforming to IEC/EN 61140 |  | Class I |  |  |
| Degree of protection | Conforming to IEC 60529 |  | IP 66 unless otherwise stated |  |  |
|  | Conforming to NEMA |  | NEMA 4X and 13, unless otherwise stated |  |  |
| Mechanical shock protection | Conforming to EN 50102 |  | IK 03 |  |  |
| Conformity to standards |  |  | IEC/EN 60947-1, IEC/EN 60947-5-1, IEC/EN 60947-5-4, IEC/EN 60947-5-5, EN/ISO 13850:2006 and IEC/EN 60204-1(trigger action and mechanical latching) JIS C 4520 UL 508, CSA C22-2 n ${ }^{\circ} 14$ |  |  |
| Product certifications | UL Listed, CSA |  | Standard contact with screw clamp terminals: A600; Q600 |  |  |
|  | BV, RINA, LROS, DNV, GL |  | Standard contact with screw clamp terminals |  |  |
| Terminal referencing |  |  | Conforming to EN 50005 and EN 50013 |  |  |
| Contact function and complete unit characteristics |  |  |  |  |  |
| Mechanical characteristics |  |  |  |  |  |
| Contact operation | N/C or N/O |  | Slow break |  |  |
| Positive operation | Conforming to <br> IEC/EN 60947-5-1 Appendix K |  | All functions incorporating a N/C contact are positive opening operation |  |  |
| Operating force |  | N | Emergency stop with N/C + N/O: <br> - Push-Pull: trigger action: 50 <br> - Turn to release (with and without key unlocking): trigger action: 44 |  |  |
|  |  | N | Additional contact (extra to change state) <br> - N/C contact: 2 <br> - N/O contact: 2.3 |  |  |
| Mechanical durability (in millions of operating cycles) | Emergency stop pushbutton |  | 0.3 |  |  |
|  | Standard block only |  | 5 |  |  |
| Vibration resistance | Conforming to IEC 60068-2-6 |  | Frequency: $2 . .500 \mathrm{~Hz}: 5 \mathrm{gn}$ |  |  |
| Shock resistance | Conforming to IEC 60068-2-27 |  | Half sine wave acceleration 11 ms : 10 gn |  |  |
| Electrical characteristics |  |  |  |  |  |
| Cabling capacity | Conforming to IEC 60947-1 | mm ${ }^{2}$ | Screw clamp terminals; cross head screws (Pozidriv type) Min.: $1 \times 0.22$ without cable end ( $1 \times 0.34$ for linking) Max.: $2 \times 1.5$ with cable end |  |  |
| Contact material | Silver alloy (Ag/Ni) |  | Standard block with screw clamp terminals |  |  |
| Short-circuit protection | Conforming to IEC/EN 60947-5-1 | A | Standard block with screw clamp terminals: 10 ( gG cartridge fuse conforming to IEC 60269-1) |  |  |
| Rated insulation voltage | Conforming to IEC/EN 60947-1 | V | Standard block with screw clamp terminals: Ui=600, degree of pollution 3 |  |  |
| Rated impulse withstand voltage | Conforming to IEC/EN 60947-1 | kV | Standard block with screw clamp terminals: Uimp = 6 |  |  |
| Rated operational characteristics Conforming to IEC/EN 60947-5-1 | a.c. supply: utilisation category AC-15 |  | Standard block with screw clamp terminals: <br> $\mathrm{A} 600: \mathrm{Ue}=600 \mathrm{~V}$ and $\mathrm{le}=1.2 \mathrm{~A}$ or $\mathrm{Ue}=240 \mathrm{~V}$ and $\mathrm{le}=3 \mathrm{~A}$ or $\mathrm{Ue}=120 \mathrm{~V}$ and $\mathrm{le}=6 \mathrm{~A}$ |  |  |
|  | d.c. supply: utilisation category DC-13 |  | Standard block with screw clamp terminals: <br> Q600: $\mathrm{Ue}=600 \mathrm{~V}$ and $\mathrm{le}=0.1 \mathrm{~A}$ or $\mathrm{Ue}=250 \mathrm{~V}$ and $\mathrm{le}=0.27 \mathrm{~A}$ or $\mathrm{Ue}=125 \mathrm{~V}$ and $\mathrm{le}=0.55 \mathrm{~A}$ |  |  |
| Electrical durability <br> Conforming to <br> IEC/EN 60947-5-1 Appendix C <br> Operating rate: 3600 operating cycles/hour <br> Load factor: 0.5 | a.c. supply for 1 million operating cycles utilisation category AC-15 | V |  |  |  |
|  |  |  | Standard block with screw clamp terminals: <br> 24 |  |  |
|  |  | A | 4 | 3 | 2 |
|  | d.c. supply for 1 million operating cycles utilisation category DC-13 | V | Standard block with screw clamp terminals: |  |  |
|  |  |  | 24 | 110 |  |
|  |  | A | 0.5 | 0.2 |  |
| Electrical reliability | Failure rate (according to IEC/EN 60947-5-4) |  | Standard block in clean environment: <br> At 17 V and $5 \mathrm{~mA}, \lambda<10^{-8}$ <br> At 5 V and $1 \mathrm{~mA}, \lambda<10^{-6}$ |  |  |

(1) Using an appropriate and correctly connected control system.

## Safety dialogue solutions

Harmony ${ }^{\circledR}$ XB4, metal
Emergency stop mushroom head pushbuttons
$\varnothing 22$ trigger action
Chromium plated metal bezel


XB4 BT845


ZBY 2130


| Legend holder, $30 \times 40 \mathrm{~mm}$ |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | White marking on red background | Reference | Weight kg |
| With $8 \times 27 \mathrm{~mm}$ legend | EMERGENCY STOP | ZBY 2330 | 0.002 |
|  | ARRET D'URGENCE | ZBY 2130 | 0.002 |
|  | NOT-AUS | ZBY 2230 | 0.002 |

Circular legends

| Diameter | Marking, <br> on yellow background | Reference | Weight |
| :--- | :--- | :--- | ---: |
| $\mathbf{m m}$ | EMERGENCY STOP | ZBY 9330 | $\mathbf{~ k g}$ |
|  | ARRET D'URGENCE | ZBY 9130 | 0.004 |
|  | NOT-AUS | ZBY 9230 | 0.004 |
| $\mathbf{9 0}$ | EMERGENCY STOP | ZBY 8330 | 0.008 |
|  | ARRET D'URGENCE | ZBY 8130 | 0.008 |
|  | NOT-AUS | ZBY 8230 | 0.008 |
|  |  |  |  |

## Safety dialogue solutions

Harmony ${ }^{\circledR}$ XB4, metal
Emergency stop mushroom head pushbuttons
$\varnothing 22$ trigger action
Chromium plated metal bezel

## References



ZB4 BZ102


ZB4 BT84



| Trigger action <br> Turn to release <br> (2) | 30 | Red | ZB4 BS834 | 0.068 |
| :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |


| 10 | Trigger action <br> Key release $\left(n^{\circ} 455\right)$ <br> (2) | 30 | Red | ZB4 BS934 | 0.094 |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  |  | 40 | Red | ZB4 BS944 | (1) |

(1) Other key numbers:
Key $n^{\circ} 421 E$ : add the suffix 12 to the reference.
Key $n^{\circ}$ 458A: add the suffix 10 to the reference.
Key $n^{\circ} 520 \mathrm{E}$ : add the suffix 14 to the reference.
Key $n^{\circ}$ 3131A: add the suffix 20 to the reference.
Example: the reference for a $\varnothing 40$ red mushroom head for a trigger action latching pushbutton with release by key $n^{\circ}$ 421E becomes: ZB4 BS94412
(2) Maximum number of contact blocks fitted to associated body: 4.

Safety dialogue solutions
Harmony ${ }^{\circledR}$ XB4, metal
Emergency stop mushroom head pushbuttons
$\varnothing 22$ trigger action
Chromium plated metal bezel

Emergency stop mushroom head pushbuttons (complete units)

## XB4 BT845



XB4 BS8445


XB4 BS9445


Common face view

e: support panel thickness 1 to 6 mm .
Heads for latching mushroom head pushbuttons
Push-pull
ZB4 BT84


Turn to release
ZB4 BS834



Bodies for pushbuttons, screw clamp terminal connections ZB4 BZ10•, BZ141



Panel cut-out and mounting centres


# Safety dialogue solutions 

Harmony ${ }^{\circledR}$ XB5, plastic
Emergency stop mushroom head pushbuttons
$\varnothing 22$ trigger action
Plastic bezel

| Environment |  |  |  |
| :---: | :---: | :---: | :---: |
| Maximum safety level (1) |  |  | PLe, category 4 conforming to EN/ISO 13849-1 and SIL 3 conforming to EN/IEC 61508 |
| Reliability data B10d |  |  | 1,500,000 (data value can be limited by contact and mechanical wear) |
| Protective treatment | Standard version |  | "TH" |
| Ambient air temperature around the device | For storage | ${ }^{\circ} \mathrm{C}$ | -40... 70 |
|  | For operation | ${ }^{\circ} \mathrm{C}$ | $-25 \ldots+70$ unless otherwise stated |
| Electric shock protection | Conforming to IEC/EN 61140 |  | Class II |
| Degree of protection | Conforming to IEC 60529 |  | IP 66 |
|  | Conforming to NEMA |  | NEMA 4X and 13, unless otherwise stated |
| Mechanical shock protection | Conforming to EN 50102 |  | IK 03 |
| Conformity to standards |  |  | IEC/EN 60947-1, IEC/EN 60947-5-1, IEC/EN 60947-5-4, IEC/EN 60947-5-5, EN/ISO 13850:2006 and IEC/EN 60204-1(trigger action and mechanical latching) JIS C 4520 UL 508, CSA C22-2 $\mathrm{n}^{\circ} 14$ |
| Product certifications | UL Listed, CSA |  | Standard contact with screw clamp terminals: A600; Q600 |
|  | BV, RINA, LROS, DNV, GL |  | Standard contact with screw clamp terminals |
| Terminal referencing |  |  | Conforming to EN 50005 and EN 50013 |

## Contact function and complete unit characteristics

Mechanical characteristics

(1) Using an appropriate and correctly connected control system.

## Safety dialogue solutions

Harmony ${ }^{\circledR}$ XB5, plastic
Emergency stop mushroom head pushbuttons
$\varnothing 22$ trigger action
Plastic bezel


XB5 AS8445



|  | Trigger action Turn to release $\varnothing 40$ | 1 | 1 | XB5 AS8445 <br> (ZB5 AZ105 <br> ZB5 AS844) | 0.072 |
| :---: | :---: | :---: | :---: | :---: | :---: |


| Legend holder, $30 \times 40 \mathrm{~mm}$ |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | White marking on red background | Reference | Weight kg |
| With $8 \times 27 \mathrm{~mm}$ legend | EMERGENCY STOP | ZBY 2330 | 0.002 |
|  | ARRET D'URGENCE | ZBY 2130 | 0.002 |
|  | NOT-AUS | ZBY 2230 | 0.002 |

Circular legends

| Diameter | Marking, <br> on yellow background | Reference | Weight |
| :--- | :--- | :--- | ---: |
| $\mathbf{m m}$ | EMERGENCY STOP | ZBY 9330 | $\mathbf{0 . 0 0 4}$ |
|  | ARRET D'URGENCE | ZBY 9130 | 0.004 |
|  | NOT-AUS | ZBY 9230 | 0.004 |
| $\mathbf{9 0}$ | EMERGENCY STOP | ZBY 8330 | 0.008 |
|  | ARRET D'URGENCE | ZBY 8130 | 0.008 |
|  | NOT-AUS | ZBY 8230 | 0.008 |

## Safety dialogue solutions

Harmony ${ }^{\circledR}$ XB5, plastic
Emergency stop mushroom head pushbuttons
Ø 22 trigger action
Plastic bezel


ZB5 AT84



|  | Trigger action <br> Turn to release <br> (2) | 30 | Red | ZB5 AS834 |
| :--- | :--- | :--- | :--- | :--- |


| Trigger action <br> Key release $\left(n^{\circ} 455\right)$ <br> (2) | 30 | Red | ZB5 AS934 | 0.068 |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
|  |  | 40 | Red | ZB5 AS944 | (1) |


Trigger action
Key release ( $n^{\circ} 4 A 185$ )
(2)
(1) Other key numbers:

Key $n^{\circ} 421 \mathrm{E}$ : add the suffix 12 to the reference.
Key $n^{\circ} 458 \mathrm{~A}$ : add the suffix 10 to the reference.
Key $n^{\circ} 520 \mathrm{E}$ : add the suffix 14 to the reference.
Key $n^{\circ}$ 3131A: add the suffix 20 to the reference.
Example: the reference for a $\varnothing 40$ red mushroom head for a trigger action latching pushbutton with release by key $n^{\circ} 421 E$ becomes: ZB5 AS94412.
(2) Maximum number of contact blocks fitted to associated body: 4.

## Safety dialogue solutions

## Harmony ${ }^{\circledR}$ XB5, plastic

Emergency stop mushroom head pushbuttons
$\varnothing 22$ trigger action
Plastic bezel

e: support panel thickness 1 to 6 mm .
Heads for latching mushroom head pushbuttons
Push-Pull
ZB5 AT84


Turn to re
ZB5 AS834


## Key release

ZB5 AS934


ZB5 AS944, AS964


| ZB5 | $\varnothing$ |
| :--- | :--- |
| AS944 | 40 |
| AS964 | 60 |

ZB5 AS944D


Bodies for pushbuttons, screw clamp terminal connections
ZB5 AZ10•, AZ141


Panel cut-out and mounting centres


Environment

| Maximum safety level (1) |  |  | PL e, category 4 conforming to EN/ISO 13849-1 and SIL 3 conforming to EN/IEC 61508 |
| :---: | :---: | :---: | :---: |
| Reliability data B10d |  |  | 1,500,000 (data value can be limited by contact and mechanical wear) |
| Protective treatment | Standard version |  | "TH" |
| Ambient air temperature around the device | For storage | ${ }^{\circ} \mathrm{C}$ | -40... 70 |
|  | For operation | ${ }^{\circ} \mathrm{C}$ | $-25 \ldots+70$ unless otherwise stated |
| Electric shock protection | Conforming to IEC/EN 61140 |  | Class II |
| Degree of protection | Conforming to IEC 60529 |  | IP 66 |
|  | Conforming to NEMA |  | NEMA 4X and 13 |
| Mechanical shock protection | Conforming to EN 50102 |  | IK 03 |
| Conformity to standards |  |  | IEC/EN 60947-1, IEC/EN 60947-5-1, IEC/EN 60947-5-4, IEC/EN 60947-5-5, EN/ISO 13850:2006 and IEC/EN 60204-1(trigger action and mechanical latching) JIS C 4520 UL 508, CSA C22-2 n ${ }^{\circ} 14$ |
| Product certifications | UL Listed, CSA |  | Standard contact with screw clamp terminals: A600; Q600 |
| Terminal referencing |  |  | Conforming to EN 50005 and EN 50013 |
| Material and colours |  |  | Polycarbonate, yellow RAL 1012 lid and light grey RAL 7035 base |
| Cable entries |  |  | Knock-out entries for $\mathrm{n}^{\circ} 13$ (CM12, Pg 13.5) cable gland and tapped ISO 20 |

## Contact function characteristics

## Mechanical characteristics


(1) Using an appropriate and correctly connected control system.

## Safety dialogue solutions

XAL control stations for $\varnothing 22$ trigger action
Emergency stop mushroom head pushbuttons
Complete stations (screw clamp terminal connections)


| Emergency stop function <br> (yellow lid "RAL 1012", light grey base "RAL 7035") |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
| Description | Type |  |  |  |



| 1 mushroom head | Trigger action | - | 2 | XAL K188F | 0.188 |
| :--- | :--- | :--- | :--- | :--- | :--- |

pushbutton Ø 40 mm ,
red
Key release ( $\mathrm{n}^{\circ} 455$ )

| 1 | 1 | XAL K188E | 0.188 |
| :--- | :--- | :--- | :--- |

Safety dialogue solutions
XAL control stations for $\varnothing 22$ trigger action Emergency stop mushroom head pushbuttons Separate components for user assembly


ZB5 AS844


ZBY 2130

| Empty enclosures |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | Number of cut-outs | Reference | Weight kg |
| For normal environments (with stainless steel lid xing screws) |  |  |  |
| Yellow lid "RAL 1012" <br> Light grey base "RAL 7035" | 1 | XAL K01 | 0.136 |
| For normal environments, CSA + UL certifications (1) (with stainless steel lid xing screws) |  |  |  |
| Yellow lid "RAL 1012" <br> Light grey base "RAL 7035" | 1 | XAL K01H7 | 0.136 |


| Description | Type | Sold in lots of | Unit reference | Weight kg |
| :---: | :---: | :---: | :---: | :---: |


| Standard contact blocks <br> (2) | N/O contact | 5 | ZEN L1111 | 0.015 |
| :--- | :--- | :--- | :--- | :--- |
|  | N/C contact | 5 | ZEN L1121 | 0.015 |



|  | Key release$\left(n^{\circ}\right.$ 455) ( $\mathrm{n}^{\circ} 455$ ) | 30 | Red | ZB5 AS934 |  | 0.068 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 40 | Red | ZB5 AS944 | (3) | 0.071 |
|  |  | 60 | Red | ZB5 AS964 |  | 0.092 |


|  | Key release <br> $\left(n^{\circ}\right.$ 4A185 | 40 | Red | ZB5 AS944D | 0.071 |
| :--- | :--- | :--- | :--- | :--- | :--- |


| Legend holder | White marking on red <br> background | Reference | Weight <br> kg |
| :--- | :--- | :--- | ---: |
| Description | EMERGENCY STOP | ZBY 2130 | 0.002 |
| Legend holder <br> $30 \times 40 \mathrm{~mm}$ <br> with <br> $\mathbf{8 \times 2 7} \mathbf{~ m m ~ l e g e n d ~}$ | ARRET D'URGENCE | ZBY 2113 | 0.002 |
|  | NOT-AUS | ZBY 2230 | 0.002 |

(1) Volt-free commoning/earth terminal included.
(2) A maximum of 3 electrical blocks can be fitted per associated head.
(3) Other key numbers:

Key $n^{\circ}$ 421E: add the suffix 12 to the reference.
Key $n^{\circ}$ 458A: add the suffix 10 to the reference.
Key $n^{\circ} 520 \mathrm{E}$ : add the suffix 14 to the reference.
Key $n^{\circ}$ 3131A: add the suffix 20 to the reference.
Example: the reference for a $\varnothing 40$ red mushroom head for a trigger action latching pushbutton with release by key $n^{\circ} 421$ E becomes: ZB5 AS94412.

Single-way control stations XAL K

(1) Knock-out entry for $n^{\circ} 13$ cable gland.
(2) 2 knock-outs for cable entry.
(3) 91 mm for latching mushrom

113 mm latching mushroom head pushbuttons.
(4) 113 mm for latching mushroom head pushbuttons with key release.

Selection guide

# Safety control and protection solutions 

Mini-VARIO and VARIO switch disconnectors

> Mini-Vario and Vario rotary switch disconnectors from 12 to 175 A are suitable for on-load making and breaking of resistive or mixed resistive and inductive circuits where frequent operation is required. They can also be used for direct switching of motors in utilisation categories AC-3 and DC-3 specific to motors.
> Vario switch disconnectors are suitable for isolator applications with fully visible breaking (since the handle cannot indicate the "open" position unless all the contacts are actually open and separated by the appropriate isolating distance) and it is possible to padlock the handles in the open position.


## Standard applications

| Bare switches |  | Enclosed switches |  |
| :---: | :---: | :---: | :---: |
| Pre-assembled | For customer assembly | Pre-assembled | For customer assembly |
| 12 and 20 A |  | 10... 32 A | 10 and 16 A |
| 8.1 and 11 A |  | 8.1...29 A | 8.1..11 A |
| 3 | 3... 5 | 3 | 3... 5 |
| - | 1 or 2 | - | 1 or 2 |

## Yes

| On door | At back of <br> enclosure | On door or at <br> back of enclosure | - |
| :--- | :--- | :--- | :--- |


| Direct | Offset with <br> door interlock <br> mechanism | Direct or offset <br> with door <br> interlock <br> mechanism | Direct |
| :--- | :--- | :--- | :--- |


| VCDN 12 <br> VCDN 20 | VCCDN 12 <br> VCCDN 20 | VN 12 <br> VN 20 | VCFN 12GE <br> to <br> VCFN 40GE | VN 12, <br> VN 20 + <br> VCFX GE1 |
| :--- | :--- | :--- | :--- | :--- |
| 23050-EN/2 | 23050-EN/3 | $23053-E N / 2$ | $23053-E N / 3$ to <br> $23054-E N / 3$ |  |

Mini-Vario and Vario rotary switch disconnectors from 12 to 175 A are suitable for on-load making and breaking of resistive or mixed resistive and inductive circuits where frequent operation is required.
They can also be used for direct switching of motors in utilisation categories AC-3 and DC-3 specific to motors.
Vario switch disconnectors are suitable for isolator applications with fully visible breaking (since the handle cannot indicate the "open" position unless all the contacts are actually open and separated by the appropriate isolating distance) and it is possible to padlock the handles in the open position.


High performance applications

| Bare switches |  |  |  | Enclosed switches |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Pre-assembled |  |  | For customer assembly | Pre-assembled | For customer assembly |
| 12...175 A |  |  |  | 10...140 A | 10...63A |
| 8.1... 83 A |  |  |  |  | 8.1... 41 A |
| 3 |  |  | 3... 6 (up to 80 A ) 3 (for 125 and 175 A ratings) | 3 | 3... 6 |
| - |  |  | 1 or 2 | - | 2 |
| Yes |  |  |  |  |  |
| On door | At back of enclosure | In enclosure or modular distribution boards | On door, at back of enclosure, in enclosure or modular distribution boards | - |  |
| Direct | Indirect with door interlock mechanism | Direct | Direct or indirect with door interlock mechanism | Direct |  |


| $\text { VC॰ } 02$ <br> to VCo 6 | VCCo 02 <br> to VCCo 6 | VVE 0 to VVE 4 | $\begin{array}{\|l} \hline \text { V02 } \\ \text { to } \\ \text { V6 } \end{array}$ | $\begin{aligned} & \text { VCF 02GE } \\ & \text { to } \\ & \text { VCF 6GE } \end{aligned}$ | $\begin{aligned} & \text { V02 to V4 } \\ & \text { + VCFX GE1 } \\ & \text { to } \\ & \text { VCFX GDXE } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 23051-EN/2 |  |  | $\begin{aligned} & \text { 23051-EN/3 to 23052- } \\ & \text { EN/5 } \end{aligned}$ | 23053-EN/2 | 23053-EN/3 |

Safety control and protection solutions
Mini-VARIO and VARIO switch disconnectors

## Characteristics



| $\begin{aligned} & \text { V2 } \\ & \text { vZ } 2 \end{aligned}$ | $\left\lvert\, \begin{aligned} & \text { VVD } 2 \\ & \text { VVE } 2 \end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { V3 } \\ & \text { VZ } 3 \end{aligned}\right.$ | $\begin{aligned} & \text { VVD } 3 \\ & \text { VVE } 3 \end{aligned}$ | $\left\lvert\, \begin{aligned} & \text { v4 } \\ & \text { VZ } 4 \end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { VVD } 4 \\ & \text { VVE } 4 \end{aligned}\right.$ | v5 | v6 | $\left\lvert\, \begin{aligned} & \text { VZ7 } \\ & \text { VZ2 } \end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { VZN } 05 \\ & \text { VZN } 06 \end{aligned}\right.$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| IEC 60947-3 |  |  |  |  |  |  |  | IEC 60947-5 |  |  |
| UL, CSA, GL |  |  |  |  |  |  |  |  |  |  |
| "TC" |  |  |  |  |  |  |  |  |  |  |
| IP 20 conforming to IEC 60529 |  |  |  |  |  |  |  |  |  |  |
| -20... 50 |  |  |  |  |  |  |  |  |  |  |
| 960 conforming to IEC 60695-2-1 |  |  |  |  |  |  |  |  |  |  |
| 30 |  |  |  |  |  |  |  | - |  |  |
| 1 |  |  |  |  |  |  |  | - |  |  |
| $\begin{aligned} & \text { V2 } \\ & \text { VZ } 2 \end{aligned}$ | $\left\lvert\, \begin{aligned} & \text { VVD } 2 \\ & \text { VVE } 2 \end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { v3 } \\ & \text { vz } 3 \end{aligned}\right.$ | $\begin{array}{\|l\|} \text { VVD } 3 \\ \text { VVE } \end{array}$ | $\left\lvert\, \begin{aligned} & \text { v4 } \\ & \text { vz } 4 \end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { VVD } 4 \\ & \text { VVE } 4 \end{aligned}\right.$ | v5 | v6 | $\left\lvert\, \begin{aligned} & \text { VZ7 } \\ & \text { VZ2 } \end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { VZN } 05 \\ & \text { VZN } 06 \end{aligned}\right.$ |  |
| 690 |  |  |  |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  | 6 |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | 12 | 6 |  |
| 32 |  | 50 |  | 63 |  | 100 | 140 | 10 | 4 |  |
| 40 |  | 63 |  | 80 |  | 125 | 160 | Ie/AC-15 |  |  |
| 25.877.5 |  |  |  | 61.2/18.5 |  | 71.9/22 | 96.6/30 | 6 A |  |  |
| 24.877.5 |  | 48.2/15 |  | 58.5/18.5 |  | 68/22 | 92.7/30 | 6A |  |  |
| 29/15 |  | 41.5/22 |  | 57/30 |  | 68.5/37 | 83/45 | 4A |  |  |
| 28/15 |  | 40/22 |  | 55/30 |  | 66/37 | 80/45 | 4A |  |  |
| 28.5/18.5 |  | 44/30 |  | 54/37 |  | 64.5/45 | 79/55 | 2A |  |  |
| 17.5/15 |  | 25/22 |  | 33/30 |  | 42/37 | 49/45 | 1A |  |  |
| 5.5 |  | 11 |  | 15 |  | 22 | 30 | - |  |  |
| 11 |  | 18.5 |  | 22 |  | 30 | 37 | - |  |  |
| 15 |  | 22 |  | 30 |  | 37 | 45 | - |  |  |
| 11 |  | 18.5 |  |  |  | 30 | 37 | - |  |  |
| 30 |  |  |  |  |  |  |  | - |  |  |
| 400 |  | 630 |  | 800 |  |  | 1750 | - |  |  |
| 320 |  | 500 |  | 640 |  | 1000 | 1400 | - |  |  |
| 480 |  | 756 |  | 960 |  | 1500 | 2100 | - |  |  |
| 1 |  | 2.1 |  |  |  | 2.8 |  | - |  |  |
| 10 |  |  |  |  |  |  |  | 1 |  |  |
| 50 |  | 63 |  | 80 |  | 125 | 200 | 16 | 1.6 |  |
| 23011-EN_Ver7.0 |  |  |  | Schneider |  |  |  |  |  | 3 |

Safety control and protection solutions
Mini-VARIO and VARIO switch disconnectors

| Characteristics |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Switch type (bare type) |  |  |  | VN 12 VZN 12 | $\begin{array}{\|l} \text { V02 } \\ \text { VZ } 02 \end{array}$ | VN 20 VZN 20 | $\begin{aligned} & \text { v01 } \\ & \text { VZ } 01 \end{aligned}$ | $\left\lvert\, \begin{array}{l\|l} \text { vo } \\ \text { VZ } 0 \end{array}\right.$ | VVD 0 VVE 0 | $\left\lvert\, \begin{aligned} & \text { V1 } \\ & \text { VZ } 1 \end{aligned}\right.$ | VVD 1 VVE 1 |
| Rated operational current DC-1 (L/R = 1ms) | 24 V | 1 contact | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 2 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 3 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  | 48 V | 1 contact | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 2 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 3 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  | 60 V | 1 contact | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 2 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 3 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  | 110 V | 1 contact | A | 1.5 |  | 2 |  | 9 |  | 10 |  |
|  |  | 2 contacts | A | 8 |  | 10 |  | 12 |  | 16 |  |
|  |  | 3 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  | 220 V | 1 contact | A | 1.5 |  | 2 |  | 2.5 |  | 3 |  |
|  |  | 2 contacts | A | 7 |  | 8 |  | 10 |  | 12 |  |
|  |  | 3 contacts | A | 10 |  | 14 |  | 16 |  | 20 |  |
|  | 250 V | 1 contact | A | 0.6 |  | 0.7 |  | 0.8 |  | 1 |  |
|  |  | 2 contacts | A | 3 |  | 4 |  | 6 |  | 8 |  |
|  |  | 3 contacts | A | 8 |  | 10 |  | 12 |  | 16 |  |
| Rated operational current DC-2 to DC-5 (L/R = 1ms) | 24 V | 1 contact | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 2 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 3 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  | 48 V | 1 contact | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 2 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 3 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  | 60 V | 1 contact | A | 10 |  | 14 |  | 16 |  | 20 |  |
|  |  | 2 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  |  | 3 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  | 110 V | 1 contact | A | 1.5 |  | 2 |  | 2.5 |  | 3 |  |
|  |  | 2 contacts | A | 3 |  | 4 |  | 5 |  | 6 |  |
|  |  | 3 contacts | A | 12 |  | 20 |  | 25 |  | 32 |  |
|  | 220 V | 1 contact | A | 0.4 |  | 0.5 |  | 0.5 |  | 0.8 |  |
|  |  | 2 contacts | A | 1.4 |  | 1.5 |  | 1.5 |  | 2 |  |
|  |  | 3 contacts | A | 1 |  | 2 |  | 3 |  | 4 |  |
|  | 250 V | 1 contact | A | 0.3 |  | 0.4 |  | 0.5 |  | 0.8 |  |
|  |  | 2 contacts | A | 0.4 |  | 0.6 |  | 0.8 |  | 1 |  |
|  |  | 3 contacts | A | 1.2 |  | 2.4 |  | 1.6 |  | 2 |  |
| Other characteristics |  |  |  |  |  |  |  |  |  |  |  |
| Switch type (bare type) |  |  |  | VN 12 VZN 12 | $\begin{array}{\|l} \text { v02 } \\ \text { VZ } 02 \end{array}$ | VN 20 VZN 20 | $\begin{aligned} & \text { v01 } \\ & \text { VZ } 01 \end{aligned}$ | $\left\lvert\, \begin{aligned} & \text { vo } \\ & \text { VZ } 0 \end{aligned}\right.$ | VVD 0 VVE 0 | $\left\lvert\, \begin{aligned} & \text { V1 } \\ & \text { VZ } 1 \end{aligned}\right.$ | VVD 1 VVE 1 |
| Mechanical durability (millions of operating cycles) |  |  |  | 0.05 | 0.1 | 0.05 | 0.1 |  |  |  |  |
| Electrical durability in cat. AC-21 (millions of operating cycles) |  |  |  | 0.05 | 0.1 | 0.05 | 0.1 |  |  |  |  |
| Electrical durability in cat. DC-1 to 5 (operating cycles) |  |  |  | 30000 |  |  |  |  |  |  |  |
| Suitable for isolation |  |  |  | Yes |  |  |  |  |  |  |  |
| Cabling | Flexible cable + cable end |  | mm ${ }^{2}$ | 4 | 6 | 4 | 6 |  |  |  |  |
|  | Solid cable |  | mm ${ }^{2}$ | 4 | 10 | 4 | 10 |  |  |  |  |
| Tightening torque |  |  | N.m | 0.7 | 2.1 | 0.7 | 2.1 |  |  |  |  |


| $\begin{aligned} & \text { V2 } \\ & \text { VZ } 2 \end{aligned}$ | $\left\lvert\, \begin{aligned} & \text { VVD } 2 \\ & \text { VVE } 2 \end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { v3 } \\ & \text { vz } 3 \end{aligned}\right.$ | VVD 3 VVE 3 | $\begin{array}{\|l\|} \hline \text { V4 } \\ \text { VZ } 4 \end{array}$ | $\left\lvert\, \begin{aligned} & \text { VVD } 4 \\ & \text { VVE } 4 \end{aligned}\right.$ | v5 | v6 | $\begin{array}{\|l\|l\|} \text { VZ7 } \\ \text { VZ2 } \end{array}$ | $\begin{aligned} & \text { VZN } 05 \\ & \text { VZN } 06 \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 40 |  | 63 |  | 80 |  | 125 | 175 | 8 (le/DC-11) |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | 8 (Il/DC-11) |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 35 |  | 40 |  | 50 |  | 60 | 70 | 4 (Ie/DC-11) |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 12 |  | 20 |  | 25 |  | 30 | 12 | 2 (Ie/DC-11) |  |
| 20 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 4 |  | 6 |  | 8 |  | 12 | 15 | 1 (Ie/DC-11) |  |
| 14 |  | 25 |  | 30 |  | 40 | 50 | - |  |
| 25 |  | 30 |  | 40 |  | 80 | 100 | - |  |
| 2 |  | 4 |  | 5 |  | 3 | 10 | 0.8 (le/DC-11) |  |
| 12 |  | 20 |  | 25 |  | 30 | 40 | - |  |
| 20 |  | 30 |  | 40 |  | 50 | 61 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 25 |  | 40 |  | 50 |  | 60 | 70 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 40 |  | 63 |  | 80 |  | 125 | 175 | - |  |
| 5 |  | 6 |  | 8 |  | 10 | 12 | - |  |
| 8 |  | 10 |  | 20 |  | 22 | 24 | - |  |
| 40 |  | 50 |  | 63 |  | 70 | 80 | - |  |
| 1 |  | 1.5 |  | 2 |  | 2.2 | 2.4 | - |  |
| 3 |  | 4 |  | 6 |  | 7 | 8 | - |  |
| 7 |  | 10 |  | 15 |  | 16 | 13 | - |  |
| 1 |  | 1.2 |  | 1.5 |  | 1.6 | 1.8 | - |  |
| 2 |  | 3 |  | 6 |  | 7 | 8 | - |  |
| 6 |  | 8 |  | 10 |  | 12 | 14 | - |  |
| $\begin{aligned} & \text { V2 } \\ & \text { VZ } 2 \end{aligned}$ | $\begin{array}{\|l\|} \left\lvert\, \begin{array}{l} \text { VVD } \\ \text { VVE } \end{array}\right. \end{array}$ | $\left\lvert\, \begin{aligned} & \text { v3 } \\ & \text { VZ } 3 \end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { VVD } 3 \\ & \text { VVE } 3 \end{aligned}\right.$ | $\left\lvert\, \begin{aligned} & \text { v4 } \\ & \text { VZ } 4 \end{aligned}\right.$ | $\begin{array}{\|l\|} \left\lvert\, \begin{array}{l} \text { VVD } \\ \text { VVE } \end{array}\right. \end{array}$ | V5 | V6 | $\left\lvert\, \begin{aligned} & \text { VZ7 } \\ & \text { VZ2 } \end{aligned}\right.$ | VZN 05 VZN 06 |
| 0.1 |  | 0.03 N |  |  |  |  |  | 0.1 | 0.05 |
| 0.1 |  | 0.03 |  |  |  |  |  | 0.1 (AC-15) | 0.05 |
| 30000 |  |  |  |  |  |  |  | 30000 (DC-11) |  |
| Yes |  |  |  |  |  |  |  | - |  |
| 6 |  | 16 |  |  |  | 70 |  | 2x 0.75...1.5 |  |
| 10 |  | 25 |  |  |  | 95 |  | $2 \times 1 \ldots 2.5$ |  |
| 2.1 |  | 4 |  |  |  | 22.6 |  | 0.7 |  |

## References

## Safety control and protection solutions

## Mini-VARIO switch disconnectors for standard applications <br> Complete units



VCDN 20


VCCDN 20

■ 3-pole rotary switch disconnectors, 12 to 20 A
■ Padlockable operating handle (padlocks not supplied).

- Degree of protection IP 65

■ Marking on operator ـلـ

| Main and Emergency stop switch disconnectors |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| For door mountingOperator |  |  | Ith | Reference | Weight |
| Handle | Front plate | Fixing |  |  |  |
|  | mm | mm | A |  | kg |
| Red, padlockable with up to 3 padlocks ( $\varnothing 4$ to $\varnothing 8$ ) | Yellow $60 \times 60$ | Ø 22.5 | 12 | VCDN 12 | 0.177 |
|  |  |  | 20 | VCDN 20 | 0.177 |


| For mounting at back of an enclosure (1) Operator |  |  | Ith | Reference | Weight |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Handle | Front plate | Fixing |  |  |  |
|  | mm | mm | A |  | kg |
| Red, padlockable with up to 3 padlocks$\text { ( } \varnothing 4 \text { to } \varnothing 8 \text { ) }$ | $\begin{aligned} & \text { Yellow } \\ & 60 \times 60 \end{aligned}$ | $\varnothing 22.5$ | 12 | VCCDN 12 | 0.334 |
|  |  |  | 20 | VCCDN 20 | 0.334 |

(1) Switches supplied with a shaft extension VZN 17 and a door interlock plate KZ 32.

# Safety control and protection solutions <br> Mini-VARIO switch disconnectors for standard applications <br> For customer assembly 


$\left.\begin{array}{|lllr|}\hline \text { Switch bodies } & & & \text { Reference }\end{array} \begin{array}{r}\text { Weight } \\ \text { Description } \\ \\ \text { Dating }\end{array}\right)$

| Add-on modules | Rating <br> Description | 12 | Reference |
| :--- | :--- | :--- | ---: | | Weight |
| ---: |
| Main pole modules |

Maximum number of add-on modules that can be fitted on a switch body


# Safety control and protection solutions 

## VARIO switch disconnectors <br> for high performance applications <br> Complete units



- 3-pole rotary switch disconnectors, 12 to 175 A

■ Marking on operator ــ
■ Padlockable operating handle (padlocks not supplied).
Degree of protection IP 65.

| Main and Emergency stop switch disconnectors |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| For door mounting |  |  |  |  |  |
| Handle | Front plate mm | Fixing | Rating A | Reference | Weight kg |
| Red, padlockable with up to 3 padlocks (Ø 4 to Ø 8) | $\begin{aligned} & \text { Yellow } \\ & 60 \times 60 \end{aligned}$ | $\varnothing 22.5$ | 12 | VCD 02 | 0.215 |
|  |  |  | 20 | VCD 01 | 0.215 |
|  |  |  | 25 | VCD 0 | 0.215 |
|  |  |  | 32 | VCD 1 | 0.215 |
|  |  |  | 40 | VCD 2 | 0.215 |
|  |  | 4 screws | 12 | VCF 02 | 0.250 |
|  |  |  | 20 | VCF 01 | 0.250 |
|  |  |  | 25 | VCF 0 | 0.250 |
|  |  |  | 32 | VCF 1 | 0.250 |
|  |  |  | 40 | VCF 2 | 0.250 |
|  |  |  | 63 | VCF 3 | 0.560 |
|  |  |  | 80 | VCF 4 | 0.560 |
| Red, long, padlockable | Yellow | 4 screws | 125 | VCF 5 | 1.200 |
|  | $90 \times 90$ |  | 175 | VCF 6 | 1.200 | with up to

3 padlocks
(Ø 4 to Ø 8)

| For mounting at back of an enclosure (1) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Handle | Front plate mm | Fixing | Rating A | Reference | Weight kg |
| Red, padlockable with up to 3 padlocks (Ø 4 to Ø 8) | Yellow$60 \times 60$ | $\emptyset 22.5$ | 12 | VCCD 02 | 0.392 |
|  |  |  | 20 | VCCD 01 | 0.392 |
|  |  |  | 25 | VCCD 0 | 0.392 |
|  |  |  | 32 | VCCD 1 | 0.392 |
|  |  |  | 40 | VCCD 2 | 0.392 |
|  |  | 4 screws | 12 | VCCF 02 | 0.527 |
|  |  |  | 20 | VCCF 01 | 0.527 |
|  |  |  | 25 | VCCF 0 | 0.527 |
|  |  |  | 32 | VCCF 1 | 0.527 |
|  |  |  | 40 | VCCF 2 | 0.527 |
|  |  |  | 63 | VCCF 3 | 0.440 |
|  |  |  | 80 | VCCF 4 | 0.680 |
| Red, long, | Yellow | 4 screws | 125 | VCCF 5 | 1.320 |
| padlockable with up to 3 padlocks <br> (Ø 4 to Ø 8) | $90 \times 90$ |  | 175 | VCCF 6 | 1.320 |


| For mounting in an enclosure or for modular distribution boards |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Handle | Front plate mm | Fixing | Rating <br> A | Reference | Weight kg |
| Red, padlockable with 1 padlock (Ø 4 to Ø 6) | Yellow$45 \times 45$ |  | 25 | VVE 0 | 0.250 |
|  |  |  | 32 | VVE 1 | 0.250 |
|  |  |  | 40 | VVE 2 | 0.250 |
|  |  |  | 63 | VVE 3 | 0.530 |
|  |  |  | 80 | VVE 4 | 0.530 |

[^27]| Characteristics: | Dimensions: |
| :--- | :--- |
| page 23011-EN/2 | page 23003-EN/2 |

# Safety control and protection solutions 

## VARIO switch disconnectors for high performance applications Complete units



| Switch bodies |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | Rating A | Reference | Weight kg |
| 3-pole switch disconnectors(1) | 12 | V02 | 0.200 |
|  | 20 | V01 | 0.200 |
|  | 25 | Vo | 0.200 |
|  | 32 | V1 | 0.200 |
|  | 40 | V2 | 0.200 |
|  | 63 | V3 | 0.500 |
|  | 80 | V4 | 0.500 |
|  | 125 | V5 | 0.900 |
|  | 175 | V6 | 0.900 |
| Add-on modules |  |  |  |
| Description | Rating A | Reference | Weight kg |
| Main pole modules | 12 | VZ 02 | 0.050 |
|  | 20 | VZ 01 | 0.050 |
|  | 25 | VZ 0 | 0.050 |
|  | 32 | VZ 1 | 0.050 |
|  | 40 | VZ 2 | 0.050 |
|  | 63 | VZ 3 | 0.100 |
|  | 80 | VZ 4 | 0.100 |
| Neutral pole modules with early make and late break contacts (1) | 12 to 40 | VZ 11 | 0.050 |
|  | 63 to 80 | VZ 12 | 0.100 |
|  | 125 and 175 | VZ 13 | 0.250 |
| Earthing modules | 12 to 40 | VZ 14 | 0.050 |
|  | 63 and 80 | VZ 15 | 0.100 |
|  | 125 and 175 | VZ 16 | 0.250 |
| Auxiliary contact block modules |  |  |  |
| Auxiliary contact block modules with 2 auxil. contacts | N/O + N/C (2) | VZ 7 | 0.050 |
|  | N/O+N/O | VZ 20 | 0.050 |

Maximum no. of add-on modules that can be fitted on a switch body
1 add-on module on each side of the switch body

| VZ 7 or VZ 20 | + | V0• | $+$ | VZ 7 or VZ 20 | VZ 7 | + |  | + | VZ 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| or |  |  |  | or | or |  | V5 |  | or |
| VZ 11 or VZ 12 | + | vo | + | VZ 11 or VZ 12 | VZ 20 | + |  | + | VZ 20 |
| or |  |  |  | or | or |  | or |  | or |
| VZ 14 or VZ 15 | + | to | + | VZ 14 or VZ 15 | VZ 13 | + |  | + | VZ 13 |
| or |  |  |  | or | or |  | V6 |  | or |
| VZ O^/VZ 0 to VZ 4 | + | V4 | + | $\begin{gathered} \text { VZ O@/VZ } 0 \text { to } \\ \text { VZ } 4 \end{gathered}$ | VZ 16 | + |  | + | VZ 16 |


| VZ 0• | + | VZ 0• | $+$ | V0• | + | VZ 0• | + | VZ 7 | or | VZ 20 | or | VZ 11 | or | VZ 14 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| VZ 0 | + | VZ 0 | + | vo | + | VZ 0 | + | VZ 7 | or | VZ 20 | or | VZ 11 | or | VZ 14 |
| VZ 1 | + | VZ 1 | + | V1 | + | VZ 1 | + | VZ 7 | or | VZ 20 | or | VZ 11 | or | VZ 14 |
| VZ 2 | + | VZ 2 | + | V2 | + | VZ 2 | + | VZ 7 | or | VZ 20 | or | VZ 11 | or | VZ 14 |
| VZ 3 | + | VZ 3 | + | V3 |  | VZ 3 | + | VZ 7 | or | VZ 20 | or | VZ 12 | or | VZ 15 |
| VZ 4 | + | VZ 4 | + | V4 |  | VZ 4 |  | VZ 7 | or | VZ 20 | or | VZ 12 | or | VZ 15 |

Note : The add-on modules mounted next to the switch body are main poles. Maximum of 3 main pole modules per switch body.
(1) Protection shrouds are available if required: see page 23052-EN/4.
(2) Late make N/O, early break N/C contacts

| Characteristics: <br> page 23011-EN/2 | Dimensions: <br> page 23003-EN/2 | Schemes: <br> page 23003-EN/3 |
| :--- | :--- | :--- |
| $23051-E N \_V e r 5.1 . i n d d$ | Schneider <br> SNectric | 3 |

Safety control and protection solutions
Mini-VARIO and VARIO switch disconnectors


# Safety control and protection solutions <br> Mini-VARIO and VARIO switch disconnectors Operators, handles and front plates (for customer assembly) 

- Padlockable operating handle (padlocks not supplied).
- Degree of protection IP 65.

■ Marking on operator لـ.

Handles and front plates for main and Emergency stop switch disconnectors

| For switch body | Operator |  |  | Reference | Weight |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Handle | Front plate |  |  |  |
|  |  | Dimensions | Fixing |  |  |
|  |  | mm |  |  | kg |
| $\begin{aligned} & \text { VN 12, VN } 20 \\ & \text { V02...V2 } \end{aligned}$ | Red, padlockable with up to | Yellow $45 \times 45$ | $\varnothing 22.5$ | KCC 1YZ | 0.050 |
|  | 1 padlock <br> ( $\varnothing 4$ to Ø 6) |  | 4 screws | KCE 1YZ | 0.040 |
|  | Red, padlockable with up to | $\begin{aligned} & \hline \text { Yellow } \\ & 60 \times 60 \end{aligned}$ | Ø 22.5 | KCD 1PZ | 0.082 |
|  | 3 padlocks ( $\varnothing 4$ to $\varnothing 8$ ) |  | 4 screws | KCF 1PZ | 0.075 |
| V3 and V4 | Red, padlockable with up to 3 padlocks ( $\varnothing 4$ to $\varnothing 8$ ) | Yellow $60 \times 60$ | 4 screws | KCF 2PZ | 0.070 |
| V5 and V6 | Red, long, padlockable with up to 3 padlocks ( $\varnothing 4$ to $\varnothing 8$ ) | Yellow $90 \times 90$ | 4 screws | KCF 3PZ (1) | 0.160 |

(1) For door mounting of 63 and 80 A switch disconnectors, adapter plate KZ 106 must be ordered separately (see page 23052-EN/4).

Safety control and protection solutions
Mini-VARIO and VARIO switch disconnectors Accessories


| Characteristics: <br> page 23011-EN/2 | Dimensions: <br> pages 23004-EN/2 to 23003-EN/3 | Schemes: <br> pages 23004-EN/3 and 23003-EN/3 |
| :--- | :--- | :--- |
| 4 | Schneider | 23052-EN_Ver5.1.indd |

# Safety control and protection solutions <br> Mini-VARIO and VARIO switch disconnectors <br> Accessories 



KZ 67


| Accessories for operators |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Description | For use on | Front plate dimensions | Sold in lots of | Unit reference | Weight |
|  |  | mm |  |  | kg |
| Legend holder with silver coloured blank legend plate | Front plate | $45 \times 45$ | 5 | KZ 13 | 0,060 |
|  |  | $60 \times 60$ | 5 | KZ 15 | 0,065 |
|  |  | $90 \times 90$ | 5 | KZ 103 | 0,070 |
| Legend holders without legend plate | Front plate | $45 \times 45$ | 20 | KZ 14 | 0,060 |
|  |  | $60 \times 60$ | 10 | KZ 16 | 0,065 |
|  |  | $90 \times 90$ | 5 | KZ 101 | 0,070 |
| Silver coloured blank legend plates for engraving by customer | KZ 14 | - | 20 | KZ 76 | 0,020 |
|  | KZ 16 | - | 10 | KZ 77 | 0,010 |
|  | KZ 101 | - | 5 | KZ 100 | 0,005 |
| Seals | VN 12, VN 20 | $45 \times 45$ | 5 | KZ 65 | 0,037 |
|  | V02...V2 | $60 \times 60$ | 5 | KZ 66 | 0,033 |
|  | V3 and V4 | $60 \times 60$ | 5 | KZ 62 | 0,033 |
|  | V3...V6 | $90 \times 90$ | 5 | KZ 67 | 0,064 |
| Tightening tool | For operators with Ø 22.5 xing | - | 5 | Z01 | 0,050 |

# Safety control and protection solutions 

## VARIO enclosed switch disconnectors <br> (pre-assembled)

Enclosed switch disconnectors for high performance applications


VCF OGE


VCF $3 G E$


| Operator |  | Ithe | Power AC <br> 23 <br> at 400 V | Incorporated switch body | Possible attachments <br> (2) | Reference | Weight |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Handle | Front plate Dimensions |  |  |  |  |  |  |
|  | mm | A | kW |  |  |  | kg |
| Red, padlockable with 1 padlock | $\begin{aligned} & \text { Yellow } \\ & 60 \times 60 \end{aligned}$ | 10 | 4 | VN 12 | 2 | VCFN 12GE <br> (2) | 0.422 |
| ( $\varnothing 8$ shank) |  | 16 | 5.5 | VN 20 | 2 | VCFN 20GE (2) | 0.422 |
| or up to 3 padiocks ( $\varnothing 6$ shank) |  | $\underline{20}$ | 7.5 | V0 | 0 | VCFN 25GE | 0.512 |
|  |  | 25 | 11 | V1 | 0 | VCFN 32GE | 0.512 |
|  |  | 32 | 15 | V2 | 0 | VCFN 40GE | 0.512 |

(1) Switch disconnector characteristics, see pages 23011-EN/2 to 23011-EN/4.
(2) For enclosures VCF and VCFN, see page 23054-EN/2

- 3-pole rotary switch disconnectors from 10 to 140 A
- Padlockable operating handle (padlock not included).

■ IP 65 degree of protection enclosures, sealable and lockable.
■ Cover lockable in position "I" (ON) up to 63 A rating.

| 3-pole main and Emergency stop switch disconnectors (1) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Operator |  | Ithe | Power AC-23 at 400 V | Incorporated switch body | Possible attachments(2) | Reference | Weight |
| Handle | Front plate Dimensions |  |  |  |  |  |  |
|  | mm | A | kW |  |  |  | kg |
| Red, padlockable with up to 3 padlocks ( $\varnothing 4$ to $\varnothing 8$ shank) | Yellow | 10 | 4 | V02 | 2 | VCF 02GE | 0.500 |
|  | $60 \times 60$ | 16 | 5.5 | V01 | 2 | VCF 01GE | 0.500 |
|  |  | 20 | 7.5 | V0 | 2 | VCF 0GE | 0.500 |
|  |  | 25 | 11 | V1 | 2 | VCF 1GE | 0.500 |
|  |  | 32 | 15 | V2 | 2 | VCF 2GE | 0.500 |
|  |  | 50 | 22 | V3 | 3 | VCF 3GE | 0.930 |
|  |  | 63 | 30 | V4 | 3 | VCF 4GE | 0.930 |
| Red, long padlockable | Yellow | 100 | 37 | V5 | 1 | VCF 5GE | 2.190 |
| with up to 3 padlocks | $90 \times 90$ | 140 | 45 | V6 | 1 | VCF 6GE | 2.190 |

( $\varnothing 4$ to $\varnothing 8$ shanks)

## Enclosed switch disconnectors for standard applications

■ 3-pole rotary switch disconnectors from 10 to 32 A
■ Degree of protection IP 55.

3-pole main and Emergency stop switch disconnectors (1)
g on operator O

VCFN 12GE

# Safety control and protection solutions 

## VARIO enclosed switch disconnectors (assembled by the user)



VCFX GE2

vo

| Empty enclosures |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| IP 65 enclosure with red padlockable handle operator and yellow front plate (for mounting a main or Emergency stop switch disconnector) |  |  |  |  |
| For switch body type | Ithe | Possible attachments (1) | Reference | Weight |
|  | A |  |  | kg |
| VN 12, VN 20 v02...V2 | 10... 32 | 2 | VCFX GE1 | 0.340 |
| V02...V2 | 10... 32 | 4 | VCFX GE4 | 0.660 |
| V3 and V4 | 50... 63 | 3 | VCFX GE2 | 0.660 |
|  |  | 4 | VCFX GDXE | 0.660 |


| Switch bodies for standard applications (2) |  |  |  |
| :--- | :--- | :--- | ---: |
| Rescription | Rating | Reference | Weight |
| 3-pole <br> switch disconnectors | 10 | VN 12 | $\mathbf{k g}$ |
|  |  |  |  |


| Switch bodies for high performance applications (2) |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | Rating | Reference | Weight |
|  | A |  | kg |
| 3-pole switch disconnectors | 10 | V02 | 0.200 |
|  | 16 | V01 | 0.200 |
|  | 20 | Vo | 0.200 |
|  | 25 | V1 | 0.200 |


| 32 | V2 | 0.200 |
| :--- | :---: | :---: |
| 50 | V3 | 0.200 |
| 63 | V4 | 0.200 |

(1) See page 23054-EN/2.
(2) Switch disconnector characteristics, see pages 23011-EN/2 to 23011-EN/2.

# Safety control and protection 

 solutionsVARIO enclosed switch disconnectors
Add-on modules


| Add-on modules for enclosure VCF |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | Rating | Reference | Weight |
|  | A |  | kg |
| Main pole modules (mounted in enclosure) | 10 | VZ 02 | 0.050 |
|  | 16 | VZ 01 | 0.050 |
|  | 20 | VZ 0 | 0.050 |
|  | 25 | VZ 1 | 0.050 |
|  | 32 | VZ 2 | 0.050 |
|  | 50 | VZ 3 | 0.100 |
|  | 63 | VZ 4 | 0.100 |
| Neutral pole modules with early make and late break contacts | 10 to 32 | VZ 11 | 0.050 |
|  | 50 and 63 | VZ 12 | 0.100 |
|  | 100 and 140 | VZ 13 | 0.250 |
| Earthing modules | 10 to 32 | VZ 14 | 0.050 |
|  | 50 and 63 | VZ 15 | 0.100 |
|  | 100 and 140 | VZ 16 | 0.250 |
| Auxiliary contact block modules with 2 auxiliary contacts | $\mathrm{N} / \mathrm{O}+\mathrm{N} / \mathrm{C}$ (1) | VZ 7 | 0.050 |
|  | $\mathrm{N} / \mathrm{O}+\mathrm{N} / \mathrm{O}$ | VZ 20 | 0.050 |

Maximum number of add-on modules that can be fitted on a
switch body
1 add-on module on each side of the switch body

| VZ 7 or VZ 20 | V0• | + | VZ 7 or VZ 20 |
| :---: | :---: | :---: | :---: |
| or |  |  | or |
| VZ 11 or VZ 12 | vo | + | VZ 11 or VZ 12 |
| or |  |  | or |
| VZ 14 or VZ 15 | to | $+$ | VZ 14 or VZ 15 |
| or |  |  | or |
| VZ 0•/VZ 0 to VZ 4 | V4 |  | VZ Oe/VZ 0 to VZ |

2 add-on modules on each side of the switch body


Note : The add-on modules mounted next to the switch body are main pole modules. Maximum of 3 main pole modules per switch body.
(1) Late make N/O, early break N/C contacts

## Safety control and protection solutions <br> Mini-VARIO enclosed switch disconnectors Add-on modules



[^28]Dimensions, mounting

Safety control and protection solutions
Mini-VARIO switch disconnectors, 12 and 20 A
Dimensions

| Switch disconnectors |
| :--- |
| Switch bodies VN 12, VN 20 |

Add-on modules VZN 12, VZN 20

## Mounting <br> Switch disconnector mounted on enclosure door <br> VN 12, VN 20 <br> Single hole fixing



VN 12, VN 20
4 screw fixing
$45 \times 45$ front plate
$60 \times 60$ front plate



Mounting (continued), schemes

## Safety control and protection solutions <br> Mini-VARIO switch disconnectors, 12 and 20 A

Mounting (continued)
Switch disconnector mounted at back of enclosure with shaft extension VZN 17 or VZN 30 (clip-on mounting on Чrail) VN 12, VN 20
Single hole fixing
4 screw fixing


|  | Shaft extension | Distance (e) <br> enclosure back/door |
| :--- | :--- | :--- |
| $\mathbf{m m}$ |  |  |
| VN 12, VN 20 | VZN 17 | $300 \ldots 330$ |
|  | VZN 30 | $400 \ldots 430$ |


| Schemes |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Switch body VN 12, VN 20 | Main pole module VZN 12, VZN 20 | Neutral pole module VZN 11 | Auxiliary contact blocks |  |
|  |  |  | VZN 05 | VZN 06 |
|  | $\frac{1}{8}$ |  | $\stackrel{m}{ \pm}$ | $\begin{aligned} & \bar{N} \\ & N \end{aligned}$ |

Dimensions, mounting

Safety control and protection solutions
VARIO switch disconnectors, 12 to 175 A

Dimensions
Switch disconnectors
Switch bodies V0e, V0 to V2


Add-on modules VZ 02 to VZ 4 and VZ 11 to VZ 16


|  | a | b | c |
| :--- | :--- | :--- | :--- |
| VZ 02 and VZ 01, | 16 | 74 | 35 |
| VZ 0 to VZ 2, VZ 11, VZ 14 |  |  |  |
| $\mathbf{V Z ~ 3 , ~ V Z ~ 4 , ~ V Z ~ 1 2 , ~ V Z ~ 1 5 ~}$ | 20 | 83 | 46 |
| VZ 13, VZ 16 | 30 | 125 | 63 |

## Mounting

Switch disconnector mounted on enclosure door

## Single hole fixing

V0@, V0 to V4



|  | a | b | c | G | H | Ø |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathbf{V 3}, \mathbf{V 4}$ | 60 | 83 | 65 | 48 | 48 | 5.5 |
| $\mathbf{V 5}$, V6 | 90 | 125 | 90 | 68 | 68 | 5.5 |
| Add-on modules $\mathbf{V Z} \mathbf{7}, \mathbf{V Z} \mathbf{~ 2 0}$ |  |  |  |  |  |  |



## 4 screw fixing

Voe, V0 to V4


V5 and V6. 4 screw fixing

$$
90 \times 90 \text { front plate }
$$



Mounting (continued), schemes

Safety control and protection
solutions
VARIO switch disconnectors, 12 to 175 A


|  | Shaft extension | Distance (e) <br> enc.back/door | $\varnothing$ | $G$ |
| :--- | :--- | :--- | :--- | :--- |
| V02 and V01 | VZ 17 | $300 \ldots 330$ | $2 \times 4.2$ | 15 |
| V0 to V2 | VZ 30 | $400 \ldots 430$ | $2 \times 4.2$ | 15 |
| V3 and V4 | VZ 18 | $300 \ldots 320$ | $2 \times 5$ | 20 |
|  | VZ 31 | $400 \ldots 420$ | $2 \times 5$ | 20 |


|  | Shaft <br> extension | Distance (e) enc. <br> back/door |
| :--- | :--- | :--- |
| V5 and V6 | VZ 18 | $300 \ldots 350$ |

Switch disconnectors for modular distribution boards

VV• 0 to VV• 2

$\stackrel{45}{ }$

VV• 3 to VV• 4


Schemes
Switch body V02 and V01 V0 to V6





Safety control and protection solutions
VARIO enclosed switch disconnectors

Dimensions
VCFN 12GE to VCFN 40GE


Cable glands: $2 \times 16$ P top and bottom
VCF 02GE to 4GE, VCFX GE1 to GE4


|  | a | b | c | c1 | H |
| :--- | :--- | :--- | :--- | :--- | :--- |
| VCF 02GE to VCF 2GE, VCFX GE1 (1) | 90 | 146 | 85 | 131 | 130 |
| VCF 3GE and VCF 4GE (2) | 150 | 170 | 106 | 152 | 164 |
| VCFX GE2 and VCFX GE4 (2) | 150 | 170 | 106 | 152 | 164 |

(1) Cable glands: $2 \times 16 \mathrm{P}$ top and bottom
(2) Cable glands: $2 \times 16 / 21 / 29 P$ top and bottom

## VCF 5GE and 6GE



## Safety control and protection solutions

VARIO enclosed switch disconnectors (assembled by the user)

Dimensions (continued)
Empty enclosures
VCFX GDXE


## Schemes

Switch disconnectors
Enclosed switch disconnectors
Main pole module
Neutral pole or switch bodies
module


Auxiliary contact blocks

| VZ 7 | VZ 20 | VZN 05 | VZN |
| :---: | :---: | :---: | :---: |
| 끼 | $\stackrel{\sim}{\sim} \mid$ | $\stackrel{m}{\sim}$ | $\stackrel{\square}{\sim}$ |
| $\pm \underset{\sim}{\top}$ |  | $\pm$ | N |


$\stackrel{m}{7}$
$\bar{N}$
$N$${ }_{4}$

Selection guide
TeSys contactors
From 6 to 16 A

## Applications

Rated operational current | le $\max A C-3(U e \leqslant 440 \mathrm{~V})$ |  |
| :--- | :--- |
|  |  |
|  |  |

| Rated operational voltage |  |
| :---: | :---: |
| Number of poles |  |
| Rated operational power in category AC-3 | 220/240 V |
|  | $380 / 400 \mathrm{~V}$ |
|  | $415 / 440 \mathrm{~V}$ |
|  | 500 V |
|  | 660/690 V |
|  | 1000 V |


| Add-on auxiliary <br> contact blocks | Front |
| :--- | :--- |
|  | Side |
|  | Front time delay |
| Associated manual-auto dust and damp protected <br> thermal overload relays | Class 10 A |

## Suppressor modules



| Reversing contactor with <br> mechanical interlock <br> type references | $\sim$ |
| :--- | :--- |
|  | $=-$ |
|  |  |


| Pages | Contactors |
| :--- | :--- |
| Reversing contactors |  |

## Simple automation systems



| 6 A |
| :--- |
| 12 A |

## 690 V

| 2 or 3 |
| :--- |
| 1.1 kW |
| 2.2 kW |
| 2.2 kW |
| - |
| - |
| - |


| Up to 2 N/C or N/O |
| :--- |
| - |
| - |
| - |

$-$

## Varistor or diode

| LC1 SK |
| :--- |
| LP1 SK |



22101/2 and 22101/3
$-\quad$


3

| 1.5 kW |
| :--- |
| 2.2 kW |
| $2.2 / 3 \mathrm{~kW}$ |
| 3 kW |
| 3 kW |
| - |

Up to $4 \mathrm{~N} / \mathrm{C}$ or $\mathrm{N} / \mathrm{O}$

| - |
| :--- |
| 1 N/C |
| - |

$0.11 \ldots 16$ A
$-$

Varistor, diode + Zener diode or RC circuit

| LC1 or LC7 K06 |
| :--- |
| LP1 K06 |


| LC2 or LC8 K06 |
| :--- |
| LP2 K06 |

## 24402/2 to $24403 / 3$

24404/2 to 24405/3

|  |  |  |
| :---: | :---: | :---: |
| 9 A | 12A | 16 A |
| 20 A | - | - |
|  |  |  |
|  |  |  |
| 3 or 4 |  |  |
|  |  |  |
| 2.2 kW | 3 kW | 3 kW |
| 4 kW | 5.5 kW | 7.5 kW |
| 4 kW | 5.5 kW | 7.5 kW |
| 4 kW | 4 kW | 5.5 kW |
| 4 kW | 4 kW | 4 kW |
| - | - | - |

16A
$-$

| LC1 or LC7 K09 |
| :--- |
| LP1 K09 |


| LC1 or LC7 K12 |
| :--- |
| LP1 K12 |


| LC1 K16 |
| :--- | :--- |
| - |

LC2 or LC8 K09
LP2 K09

LC2 or LC8 K12
LP2 K12

| LC2 K16 |
| :--- |
| - |

TeSys contactors
TeSys D low consumption contactors

Selection guide

Applications

Rated operational current | le $\max A C-3(U e \leqslant 440 \mathrm{~V})$ |  |
| :--- | :--- |
|  | le $A C-1\left(\theta \leqslant 60^{\circ} \mathrm{C}\right)$ |

| Rated operational voltage |  |
| :--- | :--- |
| Number of poles |  |
| Rated operational <br> power in AC-3 | $320 / 240 \mathrm{~V}$ |
|  | $\overline{415 / 440 / 400 \mathrm{~V}}$ |


| Coil consumption |
| :--- |
| Operating ranges |


| Operating time <br> at $20^{\circ} \mathrm{C}$ and at Uc | Closing |
| :--- | :--- |
|  | Opening |

Auxiliary contact block modules

| Interference suppression |  |
| :--- | :--- |
| Contactor type | 3 -pole <br> Reversing contactor type <br> Pages <br> 3-pole |
|  | Contactors |




| 690 V |  |  |
| :--- | :--- | :--- |
| 3 or 4 | 3 or 4 | 3 or 4 |
| 2.2 kW | $\frac{3 \mathrm{~kW}}{5.5 \mathrm{~kW}}$ | 5.5 kW <br> 4 kW <br> 4 kW <br> 5.5 kW <br> 5.5 kW |

$$
\begin{aligned}
& \text { 2.4 W (100 mA - } 24 \mathrm{~V}) \\
& \hline 0.7 \ldots 1.25 \mathrm{Uc}
\end{aligned}
$$

70 ms

1 N/C and 1 N/O instantaneous contacts incorporated in the contactors, with add-on blocks common to the whole range, comprising up to $2 \mathrm{~N} / \mathrm{C}$ or 2 N/O instantaneous standard contacts

Built-in suppression as standard, by bi-directional peak limiting diode


## 24501/2 to 24502/5 <br> 24503/2 to 24510/3

(1) With low consumption kit LA4 DBL (see page 24511/7).
(2) With 2 low consumption kits LA4 DBL (see page 24511/7).

$\frac{25 A}{25 / 40 A}$


| 690 V |  |  |
| :--- | :--- | :--- |
| 3 or 4 | 3 | 3 |
| 5.5 kW | 7.5 kW |  |
| 11 kW | 15 kW | 9 kW |
| 11 kW | 18 kW | 18.5 kW |
| 15 kW | 18.5 kW | 18.5 kW |
| 15 kW | 18.5 kW | 18.5 kW |

2.4 W (100 mA - 24 V )
0.7...1.25 Uc

70 ms

25 ms


3

3

| 11 kW |
| :--- |
| 18.5 kW |
| 22 kW |
| 22 kW |
| 30 kW |

0.6 W (25 mA - 24 V ) for relay LA4 DFB + the power consumed by the contactor coil


1 N/C and 1 N/O instantaneous contacts incorporated in the contactors, with add-on blocks common to the whole range, comprising up to 2 N/C or 2 N/O instantaneous standard contacts

Built-in suppression as standard, by bi-directional peak limiting diode

| LC1 D25 | LC1 D32 | LC1 D38 | LC1 D40A (1) | LC1 D50A (1) | LC1 D65A (1) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| LC1 DT40/D258 |  |  | - | - | - |
| LC2 D25 | LC2 D32 | LC2 D38 | LC2 D40A (2) | LC2 D50A (2) | LC2 D65A (2) |
| LC2 DT40 |  |  |  |  |  |

## 24501/2 to 24502/5

24503/2 to 24510/3

Tripping threshold on short-circuit

| Standard motor power ratings in AC-3, 415 V |
| :--- |
| Operational current at 415 V |


| Breaking capacity at 415 V (Icu) to IEC 60947-2 |
| :--- |
| Door interlock mechanism |
| Circuit-breaker type |

Up to 30 kW

## 37 kW

| Up to 15 kW | Up to 30 kW | 37 kW |
| :--- | :--- | :--- |
| $0.1 \ldots 32 \mathrm{~A}$ | $9 \ldots . .65 \mathrm{~A}$ | $56 \ldots 80 \mathrm{~A}$ |
| $10 \ldots 100 \mathrm{kA}$ | $35 \ldots 100 \mathrm{kA}$ | $50 \ldots 100 \mathrm{kA}$ |
| Without | With | With |
| GV2 ME | GV2 P | GV3 P |
| 24508/2 and 24508/3 | $24508 / 4$ | $24508 / 4$ |



20 In

## Up to 11 kW

$0.25 \ldots 23 \mathrm{~A}$
15... 100 kA

With

## GV2 RT

24508/6 and 24508/7


Power range for $50 \ldots 60 \mathrm{~Hz}(\mathrm{~kW})$ line supply
$\ldots . .60 \mathrm{~Hz}(\mathrm{~kW})$ line supply
Single-phase $100 \ldots 120 \mathrm{~V}(\mathrm{~kW})$
Single-phase $200 \ldots 240 \mathrm{~kW})$
Three-phase $200 \ldots 230 \mathrm{~V}(\mathrm{~kW})$
Three-phase $200 \ldots 240 \mathrm{~V}(\mathrm{~kW})$
Three-phase $380 \ldots 480 \mathrm{~V})$
Three-phase $380 \ldots 500 \mathrm{~V}(\mathrm{~kW})$
Three-phase $500 \ldots 600 \mathrm{~V}(\mathrm{~kW})$
Three-phase $525 \ldots 600 \mathrm{~V})$
Three-phase $500 \ldots 690 \mathrm{~V}(\mathrm{~kW})$

Degree of protection

## Type of cooling

| Drive system | Output frequency |
| :--- | :--- |
| $\qquad$Type of control <br> Asynchronous <br> motor <br>  <br>  <br> Transient overtorque |  |


| Functions (number) |  |
| :--- | :--- |
| Safety functions | Integrated <br>  <br> Available as an option |
| Number of preset speeds <br> Number $/ / O$ | Analog inputs |
|  | Logic inputs |
|  | Analog outputs |
|  | Logic outputs |


| Communication | Integrated  <br> Available as an option  <br>  Bluetooth link |
| :--- | :--- |


| Options |  |
| :--- | :--- |
|  |  |
| Dialogue tools |  |
| Configuration | Setup software <br> Configuration tools <br> Standards and certifications |

Standards and certifications

## References

Catalogues

| Variable speed drives without sensor <br> (velocity control) | Variable speed drive |
| :--- | :--- |
| For material handling (conveyors), transfer <br> machines, packaging machines, hoisting, <br> special machines (textile, transfer), wood- <br> working or metal processing machines, etc. | For hoisting, material handling, packaging, <br> textile machines, wood-working machines, <br> process machines |
|  |  |
|  |  |
|  |  |
|  |  |

## ATV 32

"Altivar 32 variable speed drives"

ATV 71
"Altivar 71 variable speed drives"

## Selection guide

## Related products <br> Motion control <br> Lexium 32

## Printing, material handling, conveying, etc.), transfer machines, packaging, textiles, etc. <br> Clamping, cutting, cutting to length, flying shear, rotary knife, Pick \& Place, winding, marking, etc.

Lexium 32 servo drives with sensor feedback (position control)

0.15... 7
0.15...0.8
0.3...1.6
0.4... 7

Nominal speed:
■ BMH servo motors: continuous stall torque range between $1.2 \ldots 84 \mathrm{Nm}$ for nominal
speeds between 1200 and 5000 rpm

- BSH servo motors: continuous stall torque range between $0.5 \ldots 33.4 \mathrm{Nm}$ for nominal speeds between 2500 and 6000 rpm

| - |  |
| :--- | :--- |
| Synchronous motor with sensor feedback for BMH and BSH servo motors |  |
| SinCos Hiperface ${ }^{\text {sensor }}$ |  |
| - | Resolver encoder <br> Analog encoder (motor and <br> machine) <br> Digital encoder (machine only) |


| Peak current, up to 4 times the drive direct current for 1 second |  |  |
| :---: | :---: | :---: |
| - |  |  |
| 1: STO (Safe Torque Off) |  |  |
| 4 : SLS (Safe Limited Speed), SS1 (Safe Stop 1), SS2 (Safe Stop 2), SOS (Safe Operating Stop) |  |  |
| 2 | - | - |
| 6 | 1 capture input | 6 (2 of which can be used as a capture input) |
| - | - | - |
| 5 | - | 3 |
| - | - | - |
| Modbus | Modbus, CANopen, CANmotion | Modbus |
| - | - | CANopen, CANmotion, DeviceNet, EtherNet/IP, PROFIBUS DP V1, EtherCat |
| Available as an option | Available as an option | Available as an option |
| SoMove setup software Multi-Loader configuration tool IP 54 remote graphic display terminal Filters, braking resistors, line chokes |  |  |
|  |  |  |
| IEC 61800-5-1, IEC 61800-3 (environments 1 and 2, categories C2 and C3) IEC 61000-4-2/4-3/4-4/4-5, ISO/EN13849-1 (PL e), IEC 61508 SIL 3 level |  |  |
| C $\in$, UL, CSA |  |  |
| LXM 32C | LXM 32A | LXM 32M |
| Please consult our website www.schneider-electric.com |  |  |



Safety and process reliability

## Introduction

Safety has become a key issue for businesses.
Social developments in association with technological progress have had a profound impact on legislation and on regulations for the use of building electrical automation equipment.

## Social issues

The safety-conscious nature of our western societies has led the legislature to increase the number of requirements and establish stricter rules, while the high cost of accidents has prompted companies to make efforts in the same direction.

## Technological issues

■ Increasing levels of automation have led to new restrictions. In some case it is difficult, if not dangerous, to stop a machine suddenly and it is necessary to perform a safe shut down sequence before allowing personnel to enter into a production cell.

■ The increasingly widespread use of electronics and software has required a different approach to the solutions adopted; empirical rules are no longer enough. Selection includes a reliability calculation to determine the behaviour of the system.

In this context, the specification and design phase are crucial. Studies show that more than $2 / 3$ rds of incidents are due to bad design and inadequate specifications. At this stage it is therefore necessary to estimate potential risks and select the most appropriate solutions to reduce their consequences. Standards are available to assist and guide the designer.
Manufacturers of components and solutions help their customers by offering complete, ready-to-use functions which, when combined in accordance with the regulations, satisfy the customer's needs and meet legislative requirements.

In this chapter, we will present a simplified process. To make a choice, the customer will then be able to refer to the safety functions chapter and to the safety products chapters.

## European legislation

European legislation requires that preventive action be taken to preserve and protect the quality of the environment and human health. To achieve these objectives, European Directives have been prepared which must be applied by plant operators and by manufacturers of equipment and machines. It also assigns responsibility for possible accidents.

■ Notwithstanding the constraints, machine safety has the following positive repercussions:

- prevention of industrial accidents,
- protection of workers and personnel by means of suitable safety measures that
take into account the machine's application and the local environment.
■ This makes it possible to reduce direct and indirect related costs:
- by reducing physical harm,
- by reducing insurance premiums,
- by reducing production losses and possible delay penalties,
- by limiting damages and costs for maintenance.

■ Safe operation involves two principles: safety and reliability of the process: - safety is the ability of a device to keep the risk incurred by persons within acceptable limits,

- reliability of operation is the ability of a system or device to perform its function at any moment in time and for a specified duration.

■ Safety must be taken into account right from the beginning of the design stage and kept in place throughout all stages of a machine's life cycle: transport, installation, commissioning, maintenance, dismantling.

## Industrial accidents

An industrial accident occurs through work or in the workplace and causes minor to serious injury to a person using a machine, feeding it or carrying out special work on it (fitter, operator, maintenance personnel, etc.).

## Causes of accidents in the workplace

## Consequences

## Conclusion

## Types of potential hazard

- Human-related factors (designers, users):
- poor grasp of machine design,
- over-familiarity with danger through habit and failure to take dangerous situations seriously,
- underestimation of hazards, causing people to ignore safe working procedure,
- loss of concentration on tasks to be performed (e.g. fatigue),
- failure to comply with procedures,
- stressful working conditions (noise, work rates, etc.),
- uncertainty of employment which can lead to inadequate training,
- inadequate or bad maintenance, generating unsuspected hazards.
- Machine-related factors:
- inadequate guards,
- inherent machine hazards (e.g. reciprocal motion of a machine, unexpected starting or stopping),
- machines not suited to the application or environment (e.g. sound alarms deadened by the noise of surrounding machinery).
- Plant-related factors:
- movement of personnel from machine to machine (automated production line), - machinery from different manufacturers and using different technologies,
- flow of materials or products between machines.
- Risk of varying degrees of physical injury to the user,
- stoppage of the machine involved,
- stoppage of similar machine installations for inspection, for example by health and safety inspectors,
- if necessary, modifications to make machinery safe,
- change of personnel and training new personnel for the job,
- damage to the company brand image.

Damages for physical injuries are equivalent to about 20 thousand million euro paid out each year in the European Union. Decisive action is required to reduce the number of accidents in the workplace. The first essentials are adequate company policies and efficient organisation. Reducing the number of industrial accidents and injuries depends on the safety of machines and equipment

The potential hazards of a machine can be classified into three main groups, as illustrated below:
 electrocution, burns


Catching, dangerous substances


Electrical hazards Electric shock, entanglement, drawing in, trapping

Physical and chemical hazards
Discharge of Burns
shearing, fractures,

Burns

## European legislation and the standards

The main purpose of the Machinery Directive 2006/42/EC is to compel manufacturers to guarantee a minimum safety level for machinery and equipment sold within the European Union. This version has been replacing the 98/37/EC version since January 2010.

To allow free circulation of machinery within the European Union, the C $\in$ marking must be applied to the machine and an EC declaration of conformity is issued to the purchaser. This directive came into effect in January 1995 and has been enforced since January 1997 for all machines.

The user has obligations defined by the Use of Work Equipment directive 89/655/EEC which can in most cases be met by using machinery compliant with relevant standards.
These standards are complex. After a brief presentation of the structure of the standards system, we will provide the reader with a practical guide to the typical standards to be applied according to the selected control system design.

## Standards

The harmonised European safety standards establish technical specifications which comply with the minimum safety requirements defined in the related directives. Compliance with all applicable harmonised European standards can be assumed to ensure compliance with the related directives. The main purpose is to guarantee a minimum safety level for machinery and equipment sold within the EU market and allow the free circulation of machinery within the European Union.


## The 3 groups of European standards

## ■ Type A standards

Basic safety standards which specify the basic concepts, design principles and general aspects valid for all types of machine: e.g. PrEN/ISO 12100.

■ Type B standards
Standards relating to specific aspects of safety or to a particular device that can be used on a wide range of machines.
$\square$ Type B1 standards
Standards relating to specific safety aspects of machines: e.g. EN/IEC 60204-1 Electrical equipment of machines.
$\square$ Type B2 standards
Standards relating to specific products such as two-hand control stations (EN 574), guard switches (EN 1088/ISO 14119), emergency stops (EN/ISO 13850), etc.

■ Type@standards
Standards relating to various families or groups of machines (e.g.: hydraulic presses EN 693, robots, ...) and giving detailed applicable requirements.

## Safety of personnel and equipment <br> European legislation and the standards (continued)

| European legislation and the standards (continued) |  |  |
| :---: | :---: | :---: |
| A selection of standards |  |  |
| Standards | Type | Subject |
| PrEN/ISO 12100 | A | Machinery safety - General principles for design, risk assessment and risk reduction |
| EN 574 | B | Two-hand control devices - Functional aspects and design principles |
| EN/ISO 13850 | B | Emergency stop - Principles for design |
| EN/IEC 62061 | B | Functional safety of safety-related electrical, electronic and electronic programmable control systems |
| $\begin{aligned} & \text { EN/ISO 13849-1 } \\ & \text { (EN 954-1) } \end{aligned}$ | B | Machinery safety - Safety-related parts of control systems - Part 1 general principles for design |
| EN 349 | B | Minimum gaps to avoid crushing parts of the human body |
| EN 294 | B | Safety distances to prevent hazardous zones being reached by upper limbs |
| EN 811 | B | Safety distances to prevent hazardous zones being reached by lower limbs |
| EN/IEC 60204-1 | B | Machinery safety - Electrical equipment of machines <br> - Part 1: general requirements |
| EN 999/ISO 13855 | B | Positioning of protective equipment in respect of approach speeds of body parts |
| EN 1088/ISO 14119 | B | Interlocking devices associated with guards - Principles for design and selection |
| EN/IEC 61496-1 | B | Electro-sensitive protective equipment |
| EN/IEC 60947-5-1 | B | Electromechanical control circuit devices |
| EN 842 | B | Visual danger signals - General requirements, design and testing |
| EN 1037 | B | Prevention of unexpected start-up |
| EN 953 | B | General requirements for the design and construction of fixed and movable guards |
| EN 201 | C | Machinery for plastics and rubber - Injection moulding machines - Safety requirements |
| EN 692 | C | Mechanical presses - Safety requirements |
| EN 693 | C | Hydraulic presses - Safety requirements |
| EN 289 | C | Machinery for plastics and rubber - Presses - Safety requirements |
| EN 422 | C | Blow moulding machines for producing hollow parts - Design and construction requirements |
| EN/ISO 10218-1 | C | Manipulating industrial robots - Safety requirements |
| EN 415-4 | C | Safety of packaging machines - Part 4: palletisers and depalletisers |
| EN 619 | C | Safety and EMC requirements for equipment for mechanical handling of unit loads |
| EN 620 | C | Safety and EMC requirements for fixed belt conveyors for bulk material |
| EN 746-3 | C | Industrial thermo processing equipment - Part 3: safety requirements for the generation and use of atmosphere gases |

# Safety of personnel and equipment Standards to be applied 

## European Machinery Directive 2006/42/EC



| EN/ISO 13849-1 | EN/IEC 62061 |
| :---: | :---: |
| Machinery safety <br> Safety-related parts of <br> control systems | Machinery safety |
| Functional safety of <br> safety-related electrical, <br> electronic and <br> programmable electronic <br> control systems |  |



Certification and C $\epsilon$ marking in accordance with the Machinery Directive

## Standards to be applied <br> The process

## European Machinery Directive 2006/42/EC

Compliance with the following standards ensure compliance with the Machinery Directive (this new version of the Machinery Directive 2006/42/EC has been replacing 98/37/EC since January 2010).

PrEN/ISO 12100 :2009: General principles for design, risk assessment and risk reduction.
See page 38816-EN/7.
The purpose of this standard is to provide designers with an overall framework and guidance to enable them to produce machines that are safe for their intended use.

Standards to be apply according to the design selected for the safety-related machine control system.
See page 38816-EN/10.

## Remarks:

The use of one of these 2 standards gives presumption of conformity to the new 2006/42/EC directive.

[^29]See page 38816-EN/21.


Achieved by design measures, safety-related systems and by external risk reduction devices

Reduction of risk to an acceptable level


Selection of the protection system (PrEN/ISO 12100 :2009)

## Standards to be applied (continued)

## Risk and safety

Safety is the absence of risks which could cause injury to or damage the health of persons. Functional safety is a part of safety that depends on the correct operation of safety functions.

According to the requirements of standard PrEN/ISO 12100 :2009, the machine designer's job is to reduce all risks to a value lower than the acceptable risk. For more details concerning the sources of accidents and risk prevention, the reader is referred on page 38816-EN/3.

This standard recognises two sources of hazardous phenomena:

- moving transmission parts,
- moving parts contributing to the work.

It gives guidelines for the selection and installation of devices which can be used to protect persons and identifies those measures that are implemented by the machine designer and those dependent on its user.

The measures taken by the machine designer may be:

- inherent in the design,
- selection of guards and additional measures, including control systems,
- information for the user.

The measures taken by the user may be (non-exhaustive list):

- organisation, procedures, etc.,
- personal protective equipment,
- training.


Definition of risk

## Assessment of machinery related risk European legislation <br> ■ Machines are sources of potential risk and the Machinery Directive requires a risk assessment to ensure that any potential risk is reduced to less than the acceptable risk.

Standard PrEN/ISO 12100 :2009 defines risk as follows: risk is the severity multiplied by the possibility of occurrence. It defines an iterative process for achieving machine safety, which states that the risks for each potential hazard can be determined in four stages. This method provides the basis for the requisite risk reduction.



#### Abstract

Risk assessment Risk assessment consists of a series of logic steps which make it possible to systematically analyse and evaluate machinery-related risks.

Risk assessment is followed, whenever necessary, by a reduction of the risk. This definition taken from standard PrEN/ISO 12100 :2009 is based on an iterative process represented in the diagram opposite.


## Determination of machine limits

Risk assessment starts by determining the limits of the machine at all stages of its life cycle:

- transport, assembly, installation,
- commissioning,
- use,
- de-commissioning, dismantling.

The use limitations must then be specified:

- operating modes,
- level of training required,
- space limits (amplitude, movement...),
- time limits (life cycle, frequency of maintenance...).


## Identification of the potential hazard

If a potential hazard exists, a hazardous phenomenon will cause harm if measures are not taken. All the tasks associated with the machine's life cycle must be identified, such as:

- assembly, transport and installation,
- adjustment, testing,
- learning, programming,
- tool changing,
- feeding, removal of product from the machine,
- starting, stopping,
- emergency stops, restarting after an unexpected stop,
- maintenance, cleaning, etc.


Elements of the risk


## $\lambda_{\mathrm{DU}} \lambda_{\mathrm{DD}} \quad \lambda_{\mathrm{SU}} \lambda_{\mathrm{SD}}$

$\lambda$ rate of control system failures
$\lambda_{D}$ rate of dangerous failures
$\lambda_{\text {DU }}$ rate of undetected dangerous failures
$\lambda_{\text {DD }}$ rate of detected dangerous failures
$\lambda_{\mathrm{s}}$ rate of safe failures
$\lambda_{\text {su }}$ rate of undetected safe failures
$\lambda_{\text {SD }}$ rate of detected safe failures
Breakdown of the probability of failures

## Assessment of machinery related risk (continued) <br> Risk assessment (continued) <br> Risk estimation

The risk is a function of the severity of the harm and the probability that this harm will occur.

■ The severity of the harm takes into account:

- the severity of injuries (slight, serious, death),
- the extent of the harm (number of persons).

■ The probability of the harm occurring takes into account:

- exposure to the hazard (nature of access, time spent in the hazardous zone, number of persons exposed, frequency of access...),
- the occurrence of a hazardous event (accident history, comparison of risks, ...),
- the possibility of avoiding or limiting the harm (experience, awareness of the risk, ...).

Risk evaluation
On the basis of the risk assessment, the designer has to define the safety related control system. To achieve that, the designer will chose one of the two standards appropriate to the application:

- either standard EN/ISO 13849-1, which defines performance levels (PL),
- or standard EN/IEC 62061, which defines safety integrity leveIS (SIL).


## Risk reduction

The process of risk reduction for dangerous events starts by:

- intrinsic prevention (inherently safe design),
- definition of the appropriate protective means (guards, carters, fix fences, ...),
- personal training.

If the selected preventive measure depends on a safety related control system, the designer has to perform an iterative process for the design of the safety relative control system.

- The first stage is to define the necessary safety-related control functions: - either through the choice of components,
- or by adapting the control system architecture. Redundancy (double circuit components), for example, significantly increases the reliability of the solution.

■ Once the limits of available technologies have been reached, it will not be possible to further reduce the rate of dangerous failures. To achieve the required level of safety, it will be necessary to use a diagnostic system that allows dangerous failures to be detected.

# Safety of personnel and equipment Standard to be applied according to the design selected for the safety-related machine control system 

## Standard to be applied according to the design selected for the safety-related machine control system <br> Safety standards to be applied according to type of architecture selected

Based on the generic definition of the risk, the standards classify necessary safety levels in different discrete levels corresponding for each one to a probability of dangerous failure per hour:

- PL (Performance Level) for standard EN/ISO 13849-1
- SIL (Safety Integrity Level) for standard EN/IEC 62061.

The table below gives the relationship between the performance level (PL) and the Safety Integrity Level (SIL).

| PL | ISL | Probability of dangerous failures per hour $\mathbf{1} \mathbf{h}$ |
| :--- | :--- | :--- |
| a | No correspondance | $\geqslant 10^{-5} \ldots<10^{-4}$ |
| b | 1 | $\geqslant 3 \times 10^{-6} \ldots<10^{-5}$ |
| c | 1 | $\geqslant 10^{-6} \ldots<3 \times 10^{-6}$ |
| d | 2 | $\geqslant 10^{-7} \ldots<10^{-6}$ |
| e | 3 | $\geqslant 10^{-8} \ldots<10^{-7}$ |

In order to be able to select the applicable standard, a common table in both standards gives indications which are summarised in the table below:

|  | EN/ISO 13849-1 | EN/IEC 62061 |
| :--- | :--- | :--- |
| Technology used | max. PL | max. SIL |
| Non electric only, for example hydraulic | e | Not covered |
| Including some electromechanical, for example <br> relays and/or non complex electronics | e (1) | 3 |
| Including complex electronics, <br> for example programmable | d | 3 |

(1) For designated architectures only.

For building specific complex sub-systems or for higher level requirements including software, standard EN/IEC 61508 relating to systems must be used.

# Safety of personnel and equipment Standard to be applied according to the design selected for the safety-related machine control system (continued) 

## Standard to be applied according to the design selected for the control system (continued)

Designing a safety-related control system taking into account the requirements of safety standards may seem rather complex. We will guide the reader through this process by presenting:
$\square$ the basis and development of the standards,

- the safety standards to be applied according to the type of architecture selected,
- machine equipment and wiring.


## Basis and development of the standards

In a complex system, such as a refinery, it is no longer sufficient to consider only the sub-systems to ensure protection; failure of a sub-system could be catastrophic for persons and the environment.
The approach is therefore more global. Taking into account the whole safety life cycle, standard EN/IEC 61508 deals with safety-related control systems, and includes safety rules, technical specifications, management and training of personnel.

The use of more complex saftey-related control systems based on electronics and software highlights the weaknesses of standard EN 954-1:

- the reliability of components is not taken into account,
- insufficient requirements for programmable products,
- combining components with a category certification is not enough to "guarantee" the required level of risk reduction.

Based on experience gained with systems, the standards body has, in line with standard EN/IEC 61508, developed standard EN/IEC 62061 which applies the principles of functional safety to the design of safety-related control systems for machinery.
This standard offers two important advantages:

- it incorporates the new electronic and electronic programmable technologies to provide the safety functions,
- it is consistent with the basic standard EN/IEC 61508 and is therefore being specified more and more for machines by users.

At the same time, standard EN/ISO 13849-1, effective since 2006, has completely been replacing the standard EN 954-1 since January 2010, which brings several improvements and, above all, is consistent with safety standards in general.

## Standard EN/ISO 13849-1 <br> Machinery safety - Safety-related parts of control systems

Standard EN/ISO 13849-1 is a development of standard EN 954-1. For clarity, only a simplified analysis of this new version will be presented here.

## Field of application of the standard

This standard gives safety requirements and advice relating to principles for the design and integration of safety-related parts of control systems (SRP/CS), including software design. For these parts, it specifies the characteristics, including the performance level, needed to achieve these safety functions. It applies to the SRP/ CS of all types of machine, regardless of the technology and type of energy used (electric, hydraulic, pneumatic, mechanical, etc.).

## Process

Risk assessment as defined in standard PrEN/ISO 12100 :2009 (see page 38816EN/6.) leads to decisions on risk reduction measures. If these measures depend on a control system, then PrEN/ISO 12100 :2009 can apply. It defines a 6-stage design process.
1 - Selection of the essential safety functions that SRP/CS must perform. For each safety function, specify the required characteristics.
2 - Determine the required performance level (PLr).
3 - Design and technical creation of safety functions: identify the parts that perform the safety function.
4 - Evaluate the performance level PL for each safety-related part.
5 - Check that the performance level PL achieved is greater than or equal to the required level (PLr).
6 - Check that all requirements are satisfied.

We will now illustrate these stages, taking as an example a safety function that stops operation of a machine motor when a safety guard is opened. The machine is potentially dangerous, there is a risk of the operator's arm being amputated if there is no guard.

Stage 1-Selection of safety functions
The diagram opposite shows a safety function which consists of several parts:

- the input actuated by opening of the guard (SRP/CSa),
- the control logic, limited in this example to opening or closing of a contactor coil
(SRP/CSb),
- the power output that controls the motor (SRP/CSc),
- the connections ( $\mid a b, l b c$ ).

Stage 2 - Estimation of required performance level (PLr)
For our safety function, this is estimated using the risk graph.
The parameters to be considered are:
$\square$ S severity of the injury

- S1 slight injury, normally reversible,
- S2 Serious, normally irreversible, including death.
$\square F$ frequency and/or duration of exposure to the hazardous phenomenon.
- F1 rare to fairly frequent and/or short duration of exposure,
- F2 frequent to permanent and/or long duration of exposure.
$\square \mathbf{P}$ possibility of avoiding the hazardous phenomena or limiting the harm.
- P1 possible under certain circumstances,
- P2 virtually impossible.

The result of the estimation (in blue on the drawing on the next page) gives a required performance level PLr $=\mathrm{e}$.

# Safety of personnel and equipment Standard EN/ISO 13849-1 <br> Machinery safety - Safety-related parts of control systems (SRP/CS) (continued) 



| Key: |  |
| :--- | :--- |
| im | Interconnecting means |
| c | Cross monitoring |
| I, I1, I2 | Input device, e.g. sensor |
| L, L1, L2 | Logic |
| m | Monitoring |
| O, O1, O2 | Output device, e.g. main contactor |
| TE | Test equipment |
| OTE | Output of TE |

## Standard EN/ISO 13849-1 <br> Machinery safety - Safety-related parts of control systems (continued) <br> Process (continued)

## Stage 3

Design and creation of the safety functions
At this point, we need to describe the PL calculation method.
The PL is defined in terms of the probability of a dangerous failure per hour:

| PL | Probability of a dangerous failure per hour |
| :--- | :--- |
| a | $\geqslant 10^{-5} \ldots<10^{-4}$ |
| b | $\geqslant 3 \times 10^{-6} \ldots<10^{-5}$ |
| c | $\geqslant 10^{-6} \ldots<3 \times 10^{-6}$ |
| d | $\geqslant 10^{-7} \ldots<10^{-6}$ |
| e | $\geqslant 10^{-8} \ldots<10^{-7}$ |

For a SRP/CS (or a combination of SRP/CS) designed according to the requirements of the article 6, PL could be estimated with the figure shown on the next page, after estimation of several factors such as :

- hardware and software system structure (categories),
- mechanism of failures, diagnostic coverage (DC),
- components reliability, Mean Time To dangerous Failure (MTTF ${ }_{\mathrm{d}}$ ),
- Common Cause Failure (CCF).
- Categories (Cat.) and designated architectures

The table below summarises system behaviour in the event of a failure and the principles used to achieve the safety, for the 5 categories defined:


■ MTTF $_{d}$ (Mean Time To dangerous Failure)
The value of the MTTF ${ }_{d}$ of each channel is given in 3 levels (see table below) and shall be taken into account for each channel (e.g. single channel, each channel of a redundant system) individually.

| Reliability levels of components |  |
| :--- | :--- |
| Index | Range |
| Low | 3 years $\leqslant \mathrm{MTTF}_{d}<10$ years |
| Medium | 10 years $\leqslant \mathrm{MTTF}_{d}<30$ years |
| High | 30 years $\leqslant \mathrm{MTTF}_{d}<100$ years |

A MTTF ${ }_{d}$ of less than 3 years should never be found, because this would mean that after one year in operation, $30 \%$ of all those components in use would have failed to a dangerous state. The maximum value is limited to 100 years because devices dealing with a significant risk should not depend on the reliability of a single component. Additional measures such as redundancy and tests are required.

Safety of personnel and equipment
Standard EN/ISO $13849-1$
Machinery safety - Safety-related parts of
control systems (SRP/CS) (continued)

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (continued)
Process continued)

## Stage 3- (continued)

- Diagnostic coverage: this term is expressed as a percentage and quantifies the ability to diagnose a dangerous failure.
For example, in the event of welding of a N/C contact in a relay, the state of the N/O contact could incorrectly indicate the opening of the circuit, unless the relay has mechanically linked N/O and N/C contacts, when the fault can be detected. The standard recognises four levels:

| Diagnostic coverage |  |
| :--- | :--- |
| Denotation | Range |
| Nil | DC $<60 \%$ |
| Low | $60 \% \leqslant$ DC $<90 \%$ |
| Medium | $90 \% \leqslant$ DC $<99 \%$ |
| High | $99 \% \leqslant$ DC |

- Relationship between Categories, DC and MTTF ${ }_{d}$ of each channel and the PL

- In our example, to reach the PL=e, the solution will therefore have to correspond to category 4 with redundant circuit; the function scheme is shown opposite with two channels in parallel,
$\square$ a high diagnostic capability,
$\square$ a high MTTF $_{\mathrm{d}}$.
For our application, we could suggest a redundant relay scheme but it is nowadays easier to use safety function blocks.
The solution is illustrated below.


The process suggested by the standard is iterative and a few estimations are therefore necessary in order to obtain the expected result. In view of the required performance level, we have chosen a solution with redundant circuit.

# Safety of personnel and equipment <br> Standard EN/ISO 13849-1 <br> Machinery safety - Safety-related parts of control systems (SRP/CS) (continued) 

## Standard EN/ISO 13849-1 <br> Machinery safety - Safety-related parts of control systems (continued) <br> Process (continued)

Stage 4 - Evaluate the performance level PL for each safety-related part Based on the information in the supplier's catalogue and Annex E of the standard, we obtain the following values:

| Example | $\mathbf{B}_{10}$ (number of operations) / \% <br> dangerous failure | MTTF $_{\mathbf{d}}$ | DC |
| :--- | :--- | :--- | :--- |
| SRP/CS $:$ Safety limit switches | $10.000 .000 / 20 \%$ dangerous failure | 7102 | $99 \%$ |
| SRP/CS $_{b}$ : XPS AK safety module | - | 154.5 | $99,99 \%$ |
| SRP/CS $_{c}$ : LCK contactor | $1.000 .000 / 73 \%$ dangerous failure | 194 | $99 \%$ |

For electromechanical products,
the MTTF is calculated on the basis of the total number of operations that the product can perform, using $\mathbf{B}_{10 \mathrm{~d}}$ values:
In our case, the machine operates for 220 days per year, 8 hours per day with a cycle of 90 s .
$N=220 \times 8 \times(3600 / 90)=70400$ operations/year
$\mathrm{MTTF}_{\mathrm{d}}=\mathrm{B}_{10 \mathrm{~d}} /(0.1 \times \mathrm{N})$ and $\mathrm{B}_{10 \mathrm{~d}}=\mathrm{B}_{10} / \%$ dangerous failure.
For the safety switches,
the MTTF $_{d}=(1 / 0.20 \times 10000000) /(0.1) \times 70400=7102$ years
For the contactors
the MTTF $_{d}=(1 / 0.73 \times 1000000) /(0.1) \times 70400=194$ years
The $M T T{ }_{d}$ dor each channel will then be calculated using the formula:
$\frac{1}{\text { MTFF }_{\mathrm{d}}}=\frac{1}{\text { MTTF }_{\mathrm{da}}}+\frac{1}{\text { MTTF }_{\mathrm{db}}}+\frac{1}{\text { MTTF }_{\mathrm{dc}}}$
i.e. 85 years for each channel.

A similar formula is used to calculate the diagnostic capability


The result of the calculation in our example gives a value of $99 \%$

Stage 5-Checking that required performance level is achieved The result of the above calculations is summarised below:
$\square$ a redundant architecture: category 4,
$\square$ a mean time to failure > 30 years: high MTTF
$\square$ a diagnostic capability of 99\%: high DC.
Looking at this table, we confirm that PL level $\mathbf{e}$ is achieved:


Stage 6 - Validation of the required performance level
The design of SRP/CS must be validated and must show that the combination of SRP/CS performing each safety function satisfies all the applicable requirements of EN/ISO 13849.

# Safety of personnel and equipment Standard EN/IEC 62061 <br> Machinery safety - Safety-Related Electrical Control systems (SRECS) 

## Standard EN/IEC 62061 <br> Machinery safety - Safety-Related Electrical Control systems (SRECS)

Functional Safety of safety-related electrical, electronic and electronic programmable control systems

## Field of application of the standard

Safety-related electrical control systems in machines (SRECS) are playing an increasing role in ensuring the overall safety of machines and are more and more frequently using complex electronic technology.

This standard is specific to the machine sector within the framework of EN/IEC 61508. It gives rules for the integration of sub-systems designed in accordance with EN/ISO 13849. It does not specify the operating requirements of non-electrical control components in machines (for example: hydraulic, pneumatic).

## Functional approach to safety

As with EN/ISO 13849-1, the process starts with analysis of the risks (PrEN/ISO 12100 :2009) in order to be able to determine the safety requirements.
A particular feature of this standard is that it prompts the user to make a functional analysis of the architecture, then split it into sub-functions and analyse their interactions before deciding on a hardware solution for them (the SRECS).

■ A functional safety plan must be drawn up and documented for each design project. It must include:

- a specification of the safety requirements for the safety functions (SRCF) that is in two parts:
- a description of the functions and interfaces, operating modes, function priorities, frequency of operation, etc.
- specification of the safety integrity requirements for each function, expressed in terms of SIL (Safety Integrity Level).
The table below gives the target maximum failure values for each level.

| SIL | Probability of a dangerous failure per hour (PFHd) |
| :--- | :--- |
| 3 | $\geqslant 10^{-8} \ldots<10^{-7}$ |
| 2 | $\geqslant 10^{-7} \ldots<10^{-6}$ |
| 1 | $\geqslant 10^{-6} \ldots<10^{-5}$ |

$\square$ The structured and documented design process for electrical control systems (SRECS),
$\square$ the procedures and resources for recording and maintaining appropriate information,
$\square$ the process for management and modification of the configuration, taking into account organisation and authorised personnel,
$\square$ the verification and validation plan.

- Functional safety

The decisive advantage of this approach is that of being able to offer a failure calculation method that incorporates all the parameters that can affect the reliability of electrical systems, whatever the technology used.
The method consists of assigning a SIL to each function, taking into account the following parameters:

- the probability of a dangerous failure of the components (PFHd),
- the type of architecture; with or without redundancy, with or without diagnostic device making it possible to avoid some of the dangerous failures,
- common cause failures (power cuts, overvoltage, loss of communication network, etc.) (CCF),
- the probability of a dangerous transmission error where digital communication is used,
- electromagnetic interference (EMC)


# Safety of personnel and equipment Standard EN/IEC 62061 <br> Machinery safety - Safety-Related Electrical Control systems (SRECS) (continued) 



Risk assessment parameters

## SRECS



Stage 1: Basic structure of the electrical control system

## Standard EN/IEC 62061 <br> Machinery safety - Safety-Related Electrical Control systems (SRECS) (continued) <br> Process

Designing a system is split into 5 stages after having drawn up the functional safety plan:
1 - based on the safety requirements specification (SRS), assign a safety level (SIL) and identify the basic structure of the electrical control system (SRECS), describe each related function (SRCF),
2 - break down each function into a function block structure (FB),
3 - list the safety requirements for each function block and assign the function blocks to the sub-systems within the architecture,
4 - select the components for each sub-system,
5 - design the diagnostic function and check that the specified safety level (SIL) is achieved.
We will retain the previous example which consists of stopping the operation of a motor when the safety guard is opened. In the event of an incident, there is a risk of an harm being amputated or fracture of a limb.

■ Stage 1 - Assign a safety integrity level (SIL) and identify the structure of the SRECS
Based on the risk assessment performed in accordance with standard PrEN/ISO 12100 :2009, estimation of the required SIL is performed for each hazardous phenomenon and is broken down into parameters, see illustration opposite.

## $\square$ Severity Se

The severity of injuries or damage to health can be estimated by taking into account reversible injuries, irreversible injuries and death.
The classification is shown in the table below.

| Consequence | Severity Se |
| :--- | :--- |
| Irreversible: death, loss of an eye or an arm | 4 |
| Irreversible: shattered limb, loss of a finger | 3 |
| Reversible: requires the attention of a medical practitioner | 2 |
| Reversible: requires first aid | 1 |

$\square$ Probability of the harm occurring
Each of the three parameters Fr, Pr, Av must be estimated separately using the most unfavourable case. It is strongly recommended that a task analysis model be used in order to ensure that estimation of the probability of the harm occurring is correctly taken into account.

- Frequency and duration of exposure Fr

The level of exposure is linked to the need to access the hazardous zone (normal operation, maintenance, ...) and the type of access (manual feeding, adjustment, ...). It must then be possible to estimate the average frequency of exposure and its duration.
The classification is shown in the table below:

| Frequency of dangerous exposure | Fr |
| :--- | :--- |
| $\leqslant 1$ hour | 5 |
| $>1$ hour... $\leqslant 1$ day | 5 |
| $>1$ day... $\leqslant 2$ weeks | 4 |
| 2 weeks... $\leqslant 1$ year | 3 |
| $>1$ year | 2 |

- Probability of occurrence of a hazardous event Pr.

Two basic concepts must be taken into account:

- the predictability of the dangerous components in the various parts of the machine in its various operating modes (normal, maintenance, troubleshooting), paying particular attention to unexpected restarting,
- behaviour of the persons interacting with the machine, such as stress, fatigue, inexperience, etc.

| Probability of occurrence of a dangerous event | Pr |
| :--- | :--- |
| Very high | 5 |
| Probable | 4 |
| Possible | 3 |
| Almost impossible | 2 |
| Negligible | 1 |

Safety of personnel and equipment
Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical
Control systems (SRECS) (continued)

SRECS


Stage 2: Break down into function blocks


| Standard EN/IEC 62061 |
| :--- |
| Machinery safety - Safety-Related Electrical Control systems |
| (SRECS) (continued) |
| Process (continued) |
| $\square$ Stage 1 -(continued) |
| - Probability of avoiding or limiting the harm Av. |
| This parameter is linked to the design of the machine. It takes into account the |
| suddenness of the occurrence of the hazardous event, the nature of the dangerous |
| component (cutting, temperature, electrical) and the possibility for a person to |
| identify a hazardous phenomenon. |


| Probability of avoiding or limiting the harm | Av |
| :--- | :--- |
| Impossible | 5 |
| Almost impossible | 3 |
| Probable | 1 |

- Assignment of the SIL

Estimation is made with the help of the table below.
In our example, the degree of severity is 3 because there is a risk of a finger being amputated; this value is shown in the first column of the table.
All the other parameters must be added together in order to select one of the classes
(vertical columns in the table below), which gives us:
$\mathrm{Fr}=5$ accessed several times a day
$\operatorname{Pr}=4$ hazardous event probable
Av $=3$ probability of avoiding almost impossible
Therefore a class $\mathrm{CI}=5+4+3=12$
A level of SIL 2 must be achieved by the safety-related electrical control system(s)
(SRECS) on the machine.
Estimation of the SIL

|  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Se | Class CI |  |  |  |  |
|  | $3-4$ | $5-7$ | $8-10$ | $11-13$ | $14-15$ |
| 4 | SIL 2 | SIL 2 | SIL 2 | SIL 3 | V |
| 3 | - | SIL 3 |  |  |  |
| 2 | - | - | - | SHL | SIL 2 |
| 1 | - | - | SIL 3 |  |  |

$\square$ Basic structure of the SRECS
Without going into detail about the hardware components to be used, the system is broken down into sub-systems. In our case, we find the 3 sub-systems that will perform the input, processing and output functions. The figure opposite illustrates this stage, using the terminology given in the standard.

Stage 2 - Break down each function into a function block structure (FB) A function block (FB) is the result of a detailed break down of a safety-related function.
The function block structure gives an initial concept of the SRECS architecture. The safety requirements of each block are deduced from the specification of the safety requirements of the system's function.

■ Stage 3 - List the safety requirements for each function block and assign the function blocks to the sub-systems within the architecture

Each function block is assigned to a sub-system in the SRECS architecture. A failure of any sub-system will lead to the failure of the safety-related control function. More than one function block may be assigned to each sub-system. Each sub-system may include sub-system elements and, if necessary, diagnostic functions in order to ensure that anomalies can be detected and the appropriate action taken. These diagnostic functions ( D ) are considered as separate functions; they may be performed within the sub-system, by another internal or external sub-system.

# Safety of personnel and equipment Standard EN/IEC 62061 <br> Machinery safety - Safety-Related Electrical Control systems (SRECS) (continued) 



Stage 4: Component selection


Types of sub-system architecture

## Standard EN/IEC 62061 <br> Machinery safety - Safety-Related Electrical Control systems (SRECS) (continued)

## Process (continued)

■ Stage 4 - Select the components for each sub-system
The products shown in the illustration opposite are selected. If the sensors and contactors are the same as in the previous example, a safety module XPS AK will be chosen. In this example, we take a cycle of 450 s which means the duty cycle $\mathbf{C}$ is 8 operations per hour.

As the safety integrity level required for the entire system is SIL 2, each of the components must achieve this level.
The manufacturer's catalogue gives the following values:
Safety limit switches 1 and 2: $B_{10}=10000000$ operations, the proportion of dangerous failures is $20 \%$, lifetime is 10 years.

- Safety module: $\mathrm{PFH}_{\mathrm{d}}=7.38910^{-9}$
- Contactors 1 and 2: $\mathrm{B}_{10}=1000000$ operations, the proportion of dangerous failures $=73 \%$, lifetime is 20 years.

■ Stage 5 - Design the diagnostic function
The SIL of the sub-system depends not only on the components, but also on the architecture selected. For our example, we will choose architectures B and D of the standard.
In our architecture, the safety module performs diagnostics not only on itself, but also on the safety limit switches.

We have three sub-systems for which the safety levels must be determined $\square$ SS1: two redundant safety limit switches in a sub-system with a type D architecture
$\square$ SS2: a SIL 3 safety module (obtained on the basis of the PFH provided by the manufacturer),
$\square$ SS3: two redundant contactors built in accordance with a type B architecture
The calculation method is quite complex, so we will only give the final result. This method takes into account the following parameters

- $\mathbf{B}_{10}$ : number of operations at which $10 \%$ of the population fail
- C: Duty cycle (number of operations per hour)
- $\lambda_{D}$ : rate of dangerous failures ( $\lambda_{D}=\lambda \times$ portion of dangerous failures in $\%$ )
- $\beta$ : common cause failure coefficient, which is $10 \%$ here and $10 \%$ is the worst case: see Annex F.
- T1: Proof Test Interval or life time whichever is smaller, as provided by the supplier - T2: diagnostic test interval
- DC: Diagnostic coverage rate $=\lambda_{D D} / \lambda_{D}$, ratio between the rate of detected failures and the rate of dangerous failures.

We obtain:
$\begin{aligned} & \text { - for SS1 PFH } \\ & \text { d }=1.6 \mathrm{E}^{-9} \\ & \text { - for SS3 PFH } \\ & \mathrm{d}=1.06 \mathrm{E}^{-7}\end{aligned}$
The total probability of dangerous failures per hour is:
$-\mathrm{PFH}_{\text {DSRECS }}=\mathrm{PFH}_{\mathrm{DSS} 1}+\mathrm{PFH}_{\mathrm{DSS} 2}+\mathrm{PFH}_{\mathrm{DSS} 3}$
$-\mathrm{PFH}_{\text {DSRECS }}=1.610^{-9}+7,3810^{-9}+1.06 \mathrm{E}^{-7}=1.15 \mathrm{E}^{-7}$
Which corresponds to the expected result (table below) of a SIL = 2
Comment: A level of SIL 3 could have been achieved by using mirror contacts to create a feedback loop on the contactors, i.e. a sub-system architecture type D.

| Checking the required SIL |  |
| :--- | :--- |
| SIL | Probability of dangerous failures per hour (PFHd) |
| 3 | $\geqslant 10^{-8} \ldots<10^{-7}$ |
| 2 | $\geqslant 10^{-7} \ldots<10^{-6}$ |
| 1 | $\geqslant 10^{-6} \ldots<10^{-5}$ |

## Certification and $\subset \in$ marking

There are 6 stages in the process for certification and affixing of the $\subset \in$ marking on machines:
1 - apply all the relevant directives,
2 - conform to the essential health and safety requirements,
3 - draw up the technical documentation,
4 - if applicable proceed with the conformity examination,
5 - draw up the Declaration of Conformity,
6 - affix the C $\in$ marking.

## The Machinery Directive

The Machinery Directive is an example of the "New approach" for the harmonisation of products in terms of technical specifications and standards. It is based on:

- essential health and safety requirements which must be complied with before the machine is put on the market,
- a voluntary harmonisation process of standards undertaken by the European Standards Committee (CEN) and the European committee for electro-technical standardisation (CENELEC).
- conformity of evaluation procedures adapted to the types of risk and associated with machine types,
- the C $\in$ marking, affixed by the manufacturer to indicate that the machine conforms to the applicable directives; machines bearing this marking can circulate freely within the European Union.

The directive has considerably simplified the multiple national legislations which were in force and has therefore removed many barriers which made trading difficult in the European Union. This has also made it possible to reduce the social cost of accidents. The directives do not apply to pre-existing machines within the EU unless they are substantially modified.
A list of the machines requiring special attestation procedures can be found in the Machinery Directive Annex 4.

## The essential requirements

Annexe I of the Machinery Directive groups together the essential health and safety requirements, for putting machines and safety components on the market and into service in Europe.
It follows that:

- if all the requirements of the directive are complied with, no member state of the European Union can oppose circulation of this product.
- if the requirements of the directive are not complied with, putting the product on the market may be prohibited or withdrawal of the product from the market may be required.

In the European Union, this concerns not only manufacturers or their distributors, but also importers and resellers who import these machines or put them into service. Second-hand machines within the EU are not covered, but used machines that have been modified or refurbished can be considered to be new machines.

## The harmonised standards

The simplest way to demonstrate conformity with the directives is to conform to the European Harmonised Standards. When, for a product listed in Annex 4 of the Machinery Directive, there is no harmonised standard, or the existing standards are not relevant to cover the essential health and safety requirements, or if the manufacturer considers that these standards are not applicable to their product, they can apply for approval by an outside Notified Body.

These bodies are approved by the Member States after having shown that they have the recognised expertise to give such an opinion (TÜV, BGIA, INRS, BSI Product Services, etc.).

Although the Notified Body has a certain number of responsibilities under the Directive, it is always the manufacturer or their representative who remain responsible for conformity of the product

## Certification and $(\in$ marking (continued) Declaration of conformity

In accordance with Article 1 of the Machinery Directive, the manufacturer or their authorised representative established in the European Union must draw up a European Declaration of Conformity for each machine (or safety component). This is in order to certify that the machine or safety component conforms to the Directive.
Before putting a product on the market, the manufacturer or their representative must be able to prepare a technical file.

## © $€$ marking

Finally, the C $\epsilon$ mark must be affixed to the machine by the manufacturer or their authorised representative in the European Union. This marking has been obligatory since 1st January 1995 and can only be affixed if the machine conforms to all the applicable directives, such as:

- the Machinery Directive 2006/42/ECC,
- the Electromagnetic Compatibility (EMC) directive 2004/108/EC,
- the Low Voltage Directive 2006/95/EC.

There are other directives such as the protection of persons, lifts, medical equipment, etc., which may also be applicable.

The C $€$ marking is the machine's passport in the European Union, which allows it to be marketed in all countries within the Union without taking into account regulations in each individual country.
© $€$ marking procedure



[^0]:    Functional diagram of a two-hand control station

[^1]:    (1) Due to short-circuit detection of the XPS AC safety module..
    (2) Due to the feedback loop of the mechanically-linked auxiliary contacts built-into the LC1D contactor.

[^2]:    1-2-3 Function 1 con guration code.
    $4 \quad$ K1/K2 status (function 1, NO safety outputs closed).
    5-6-7 Function 2 con guration code.
    K3/K4 status (function 2, NO safety outputs closed).
    Supply voltage A1-A2
    Fault.
    Function 1 con guration.
    Function 2 con guration.
    Con guration buttons.

[^3]:    (1) Prevention of start-up necessary: to check the sensors connected, open and reclose the guard.

[^4]:    (1) 8 independent safety outputs $=6$ solid-state safety outputs $+2 \times 2$ relay outputs (4 relay outputs with guided contacts).
    (2) 8 control outputs are available but they are not safety outputs.

[^5]:    (1) To be ordered separately.

[^6]:    1 Supply voltage A1-A2, internal electronic fuse status.
    2 S12 (A) input status.
    3 S22 (B) input status.
    4 Stop category 1 outputs closed.

[^7]:    (1) With start button monitoring
    (2) Without start button monitoring

[^8]:    Input: S11, S12, S13 or S21, S22, S23 or S31, S32, S33 or S41, S42, S43 or S51, S52, S53 or S61, S62, S63.
    Input not used: terminals S•1-S•3 (S21-S23, S31-S33, S41-S43, S51-S53, S61-S63) linked.

[^9]:    1 Supply voltage A1-A2.
    Stop detected by channel 1.
    Stop detected by channel 2.
    4 Motor stop condition detected by both channels within time window.

[^10]:    $F 1=2 A$

[^11]:    Dimensions:

[^12]:    Note: The impedance of a safety monitor must be taken into account when selecting the number of interfaces on the AS-Interface cabling system, even if it is used in "watchdog" mode.
    The technical details of the system are described in the Schneider Electric AS-Interface guide, in the safety monitor hardware and software manuals and in the configuration software on "schneider-electric.com".

[^13]:    (1) To be used with yellow AS-Interface "standard" version cable XZ CB•••••.

    The yellow AS-I "TPE" version cable XZ CB $\bullet \bullet \bullet \bullet \mathrm{H}$ cannot be used with the safety interfaces ASI SSLC• and ASI SSLLS.
    (2) Only use pre-wired connectors XZ CP1541Le.
    (3) For ISO M20 product, see adaptor.
    (4) For other "mushroom head" buttons, please refer to our "Control and signalling components" catalogue.

[^14]:    (1) 1 entry tapped for $n^{\circ} 11$ cable gland
    (2) 1 entry tapped for 1/2" NPT conduit
    $\varnothing$ : 2 elongated holes $\varnothing 4.3 \times 8.3$ on 22 centres
    2 holes $\varnothing 4.3$ on 20 centres
    L = 30 (XCS PR•5•) or 80 (XCS PR•6•)

[^15]:    Locking of actuator and operation in positive mode associated with a safety module.

[^16]:    (1) Using an appropriate and correctly connected control system

[^17]:    Dimensions：
    page 32942／7

[^18]:    (1) With start button monitoring.

[^19]:    (1) With start button monitoring.

[^20]:    (1) The resistance of the covering to the products listed is valid for an ambient temperature of $23^{\circ} \mathrm{C}$, provided there is no surface deterioration.

[^21]:    （1）Sensing distance reduction coefficient to be taken into account for each pair of IP 67 protection tubes used．

[^22]:    Dimensions:
    page 30308/6

[^23]:    XUS ZCe***

[^24]:    (1) Using an appropriate and correctly connected control system

[^25]:    The displacement speed of the moving contacts is not related to the speed at which the contact actuator is operated. This feature gives consistent electrical performance, even when the contact actuator device is operated at low speeds.

[^26]:    (1) Other XB4 B control and signalling units are suitable for use on the control stations. Please refer to our "Human Machine Interface catalogue".

[^27]:    (1) Switches supplied with a shaft extension VZN 17 and a door interlock plate KZ 32 or KZ 74 (see page 23052-EN/4).

[^28]:    Schemes:
    page 23055-EN/3

[^29]:    EN/IEC 60204-1: Electrical equipment of machines
    Standard EN/IEC 60204-1 completes the safety standards by giving setting-up rules for each component of a machine's electrical functions.
    It specifies, amongst other things:

    - the type of connection terminals and disconnection and breaking devices,
    - the type of electric shock protection,
    - the type of control circuits,
    - the type of conductors and wiring rules,
    - the type of motor protection.

