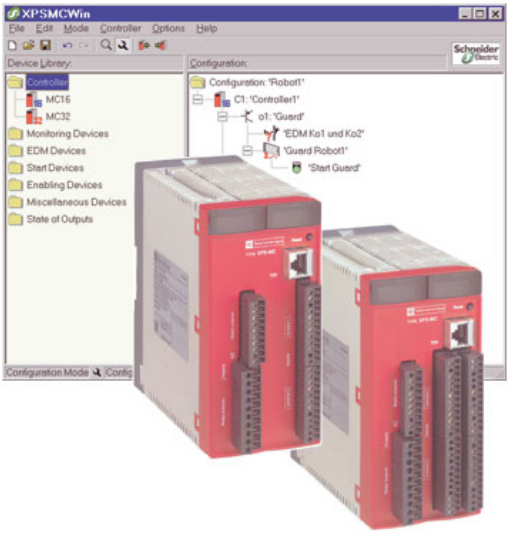
XPS-MCWIN

Configuration Software for XPS-MC16 and XPS-MC32, for MS-Windows



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1 General

1.1 About the XPS-MCWIN software

This program lets you start, set up and diagnose the XPS-MC safety controller from a PC.

The simple user interface lets you set up the XPS-MC for a multitude of applications for the protection of hazardous areas near mechanical machines.

The XPS-MCWIN software is used for the installation, documentation and fault diagnostics of your safety application.

This version of the XPS-MCWIN software was designed to be used with Microsoft® Windows 95/98/ ME/NT/2000/XP® operating systems.

1.2 Explanation of symbols

The explanation of the symbols used in this instruction manual is given below.

Attention!
This symbol is included in front of paragraphs which must be strictly complied with. If not complied with, injuries or equipment damage may result.

Notice !
This symbol marks passages containing important information.

HAZARD CATEGORIES AND SPECIAL SYMBOLS

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label on the product indicates that an electrical hazard exists which will result in personal injury or death if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result** in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result** in death, serious injury, or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result** in minor or moderate injury, or equipment damage.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result** in equipment damage.

PLEASE NOTE

NOTE:
Provides additional information to clarify or simplify a procedure.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out the use of this material.

2 System requirements and software installation

2.1 Hardware required

The following is required to set up / diagnose faults affecting the safety controller on a PC:

- an XPS-MC16 or XPS-MC32 safety controller,
- the TSXPCX1031 interface cable and the XPSMCCPC adaptor cable (not included) for connecting the safety controller to the PC,
- an IBM compatible PC with the following capabilities at least:
  - a Pentium® processor, or equivalent,
  - a CD-ROM drive (or a floppy disk drive) for the installation,
  - a mouse or an equivalent device,
  - a free RS232 serial port with a 9-pin subD connector,
  - at least 12 MB free hard disk space,
  - at least 8 MB RAM recommended.
- Display: 800 x 600, 256 colors (1024 x 768 recommended)

2.1.1 Connection between the PC and the XPS-MC safety controller

To set up and diagnose faults affecting the XPS-MC using the XPS-MCWIN software, connect a serial port of your PC to the TER connector of the XPS-MC safety controller by means of the TSXPCX1031 serial interface cable and the XPSMCCPC adaptor (not included).

⚠ WARNING

IMPROPER CONFIGURATION FROM PC

Exclusively use the TSXPCX1031 interface cable and XPSMCCPC adapter for connection to the XPS-MC when configuring from a PC.

Failure to follow this instruction can result in equipment damage or serious injury.

2.2 Software required

The XPS-MCWIN software requires the following system:

- Operating system: Microsoft® Windows 95/98/ME/NT/2000/XP®
- Adobe® Reader® 5 must be installed to read the PDF Files of the instructions sheets.

Note!
Under Windows-XP, transmission sometimes may not be fully completed.
Solution: quit and restart XPS-MCWIN.

2.3 Installation

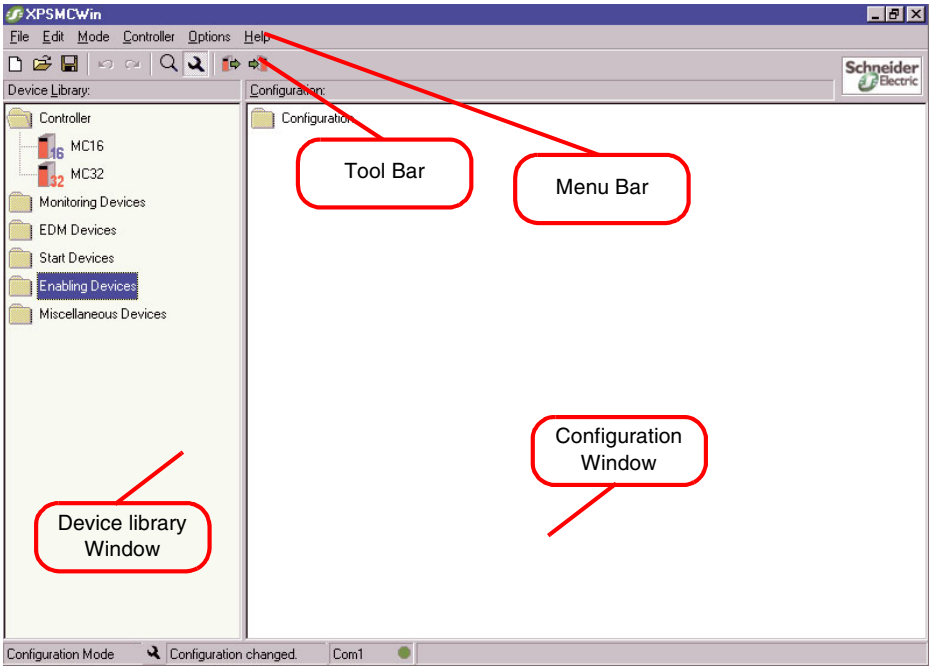
To install the XPS-MCWIN software, you need the installation CD-ROM included. If your PC does not have a CD-ROM drive, you can also copy the installation data on floppy disks and perform the installation in this way.

After inserting the CD into the drive, run the “setup.exe” file in the CD-ROM default directory, for example:
D:\setup.exe (if D: is the letter corresponding to your CD-ROM drive).

After the installation, the program is ready to be started for the first time.

3 Description of the XPS-MCWIN software user interface

When the XPS-MCWIN software is started, the user interface window opens:



3.1 Device Library

This window contains the two possible types of controllers (XPS-MC16 and XPS-MC32) and the library of all the functionalities available.

A device is copied from this library into the configuration window by pressing and holding down the left mouse button and simultaneously dragging the mouse.

3.2 Configuration Window

This is the working window in XPS-MCWIN. The configuration is defined and modified in this window.

3.2.1 Configuration of the properties of devices in the configuration window

All the devices of the configuration window are configured by following the same procedure.

If a device is moved in the configuration window, a window appears in which the parameters of this device are selected. On the subject of these parameters, reference should also be made to chapter 4 "Description of the components".

Note: If this window does not open automatically, this means that this device is not active in the "options editor" menu option. In this case, open the window by clicking with the right mouse button on the symbol and selecting the "Properties" option.

The following commands can also be called by clicking the right mouse button on the symbol in the configuration window:

Copy

Using this command, a device can be copied with the properties assigned to it and pasted elsewhere in the configuration tree.

Cut

Using this command, a device can be cut with the properties assigned to it and pasted elsewhere in the configuration tree.

Paste

This command pastes a copied or cut device into the selected location.

Delete

Deletes the selected object.

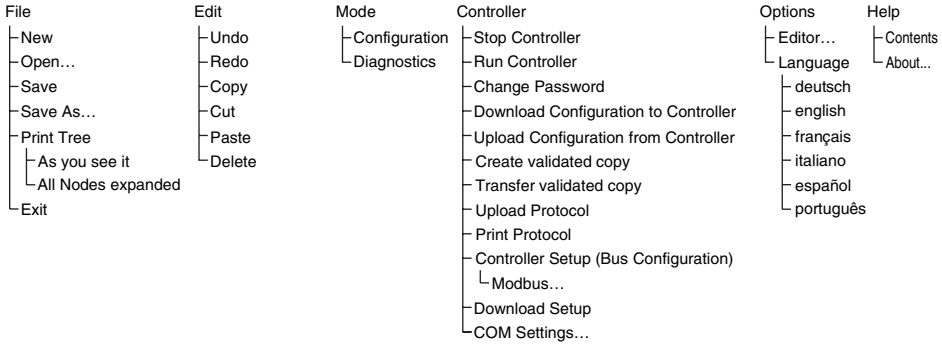
Tree

Minimises the configuration tree of this controller for better visibility. The tree is conserved and can be reopened at any time.

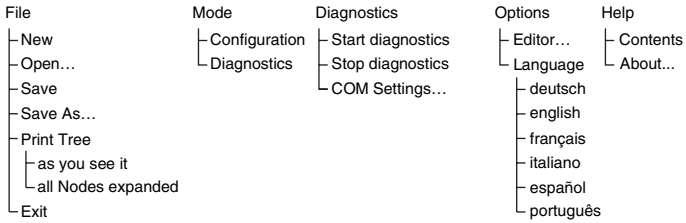
3.3 Menu bar

The menu bar contains all the commands of the XPS-MCWIN software as shown in the structure overview below.

3.3.1 Menu bar for mode: "Configuration"



3.3.2 Menu bar for mode: "Diagnostics"



Description of the menu commands

File

- New
  Creates a new configuration. When this command is called, a new window appears in which the name and the author of this configuration can be indicated. It can also be determined at this location whether the XPS-MC will be connected to a MODBUS system.
- Open
  Opens a Popup menu, with which a saved configuration is opened.

- Save
  Saves the current configuration under the current name.
- Save as…
  Saves the current configuration under a new name.
- Print tree
  - As you see it
    Print the configuration tree as you see it
  - All the nodes expanded
    Print the configuration tree with all the nodes expanded
- Exit
  Quits the XPS-MCWIN software.

Edit

- Undo
  Cancels the last action.
- Redo
  Restores a cancelled action.
- Copy
  Copies the selected item into the buffer memory.
- Cut
  Cuts the selected item and copies it into the buffer memory.
- Paste
  Pastes an item from the buffer memory into the selected location.
- Delete
  Deletes the selected item.

Mode

- Configuration
  The configuration mode is the software's working mode. All the commands can be executed in this mode. In the configuration mode, a configuration is created, modified, and sent to and reloaded from XPS-MC. When the program is started, this is the default mode of the software.
- Diagnostics
  The diagnostic mode is used exclusively for fault diagnosing the XPS-MC connected to the PC. The configuration can not be modified. In the fault diagnostic mode, the software working windows are grey in colour.
  In this mode, the connected XPS-MC safety controller continues to operate without being affected.

Controller

- Stop Controller
  This command shuts down the XPS-MC. Its safety outputs are de-activated in accordance with their stop category, (either immediately or with a delay). The password must be entered.
- Run Controller
  Switches the XPS-MC to the Run mode.
- Change Password
  Opens a window to change the password.
- Download Configuration to Controller
  Sends the current configuration to the selected controller. The controller cannot be in RUN mode. The password must be entered.
- Upload Configuration from Controller
  Loads into the PC and displays the current configuration of the connected XPS-MC. The XPS-MC can continue to operate at the same time.
- Create validated copy
  Creates a file as safety copy of a validated configuration.
- Transfer validated copy
  Transfers a validated configuration from a file into a controller.
- Upload the protocol
  Upload the protocol of the present configuration of the connected XPS-MC and represents it as a text file. The password must be entered.
- Print the protocol
  Prints the protocol generated in the configuration. This protocol is used as proof for the XPS-MC statutory configuration.
  For statutory use, the user checks, signs and keeps this protocol.
- Controller Setup (Bus Configuration)
  - Modbus…
    Opens a window for adjusting the settings required for the operation of all the XPS-MCs (up to 8) of this configuration with a MODBUS system. Operation with different MODBUS systems is also possible. By clicking on the “Download” button, the “send the settings to the controller” command is executed.
- Download Setup
  Sends the parameters set (for MODBUS) to the selected controller of this configuration. The XPS-MC must also be shut down. The password must be entered.
  This command only sends the bus parameters and not the configuration!
- COM Settings…
  Selects the COM port of the PC to which the XPS-MC is connected.

Options

- Editor…
  Setting possibilities to cause the “properties” dialogue window to be displayed automatically during item “Drag&Drop” and to save it automatically.
- Language
  - Selects the XPS-MCWIN software language.
  - A list of available languages is shown

Help

- Contents
  Overview of the online help
- About
  Information about the present version of the software

Diagnostics

- Start diagnostics
  The transmission of the diagnostics datas from the XPS-MC to the PC will be started.
- Stop diagnostics
  The transmission of the diagnostics datas from the XPS-MC to the PC will be stopped.
- COM Settings…
  Selection of the COM port of the PC, where the XPS-MC has to be connected.

After the change over in the mode diagnostics with menu command "Mode - Diagnostics", the menu bar will be modified like described in the chapter 3.3.2 "Menu bar for mode: "Diagnostics"".

3.4 Toolbar

The toolbar contains a number of often-used instructions in the form of icons.

4 Description of the components

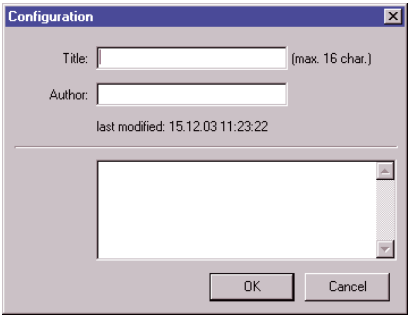
This listing contains all the functionalities of the XPS-MC. These functionalities are contained in the “Device Library” window in the configuration software.

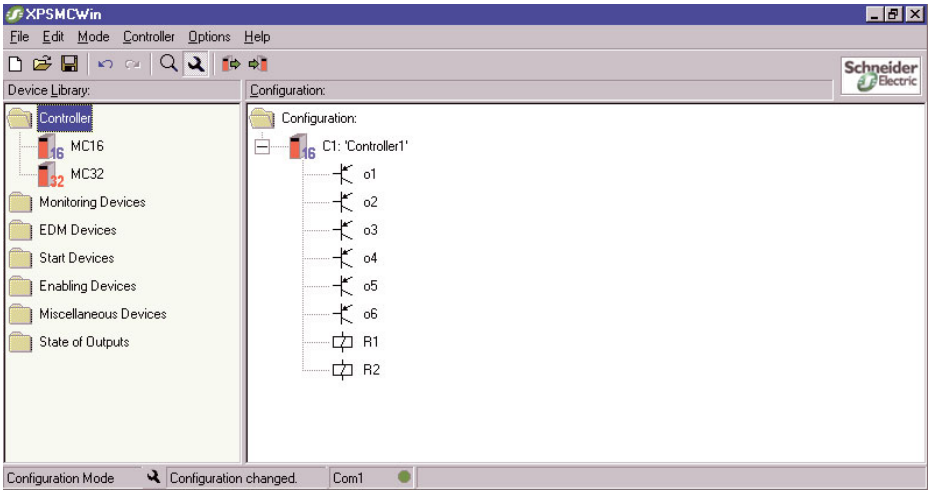
4.1 Controller

The folder “Controller” contains the two types of controllers available, the XPS-MC16 and XPS-MC32. To create a configuration, the type of controller used must first be selected by dragging the controller symbol into the configuration window. When the first controller of a configuration is selected, a window opens which may contain the name and author of this configuration. It may also be defined at this location whether the XPS-MC is to be connected to a MODBUS system.

Note: If this window does not open automatically, this function is then not active in the “options editor” menu option.

Note: You can also create a new configuration with the “File / New” command.

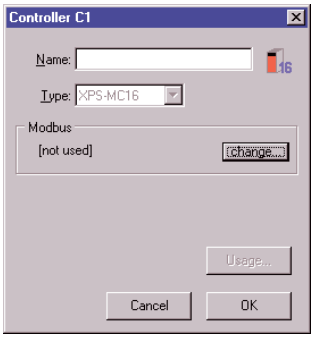




The 8 independent output functions of the controller are represented in a tree structure. Each output function can received one or more components from the “Device library” window as a validation condition.

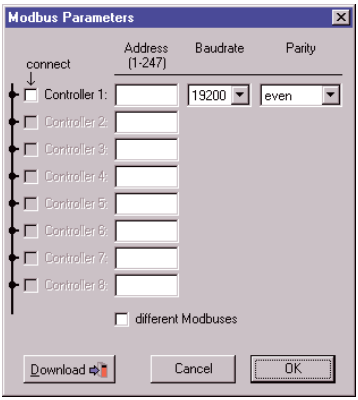
A window in which the name and, if applicable, the controller bus parameters are entered then opens (this window also opens when all the other controllers in this configuration are added).

Note: This window can also be accessed by clicking with the right mouse button on the controller symbol and then selecting the “Properties” option.



If you enter bus parameters, the following window opens:

Note: These windows can also be accessed by means of the MODBUS controller/controller settings



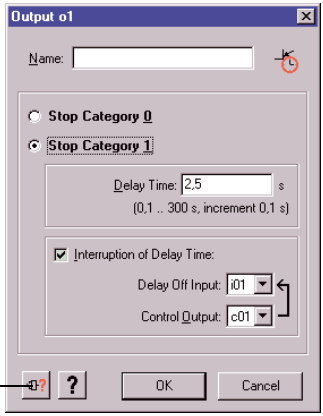
After having clicked the “Download” button, you will be asked to select the controller that your configuration corresponds to. The bus parameters for this controller will be transmitted.

Note: This corresponds to the “controller/send” the settings to the controller command.

After having closed the properties window of the controller, the controller will be represented with its output functions in a tree structure.

4.1.1 Setting the safety outputs

By clicking on the right mouse button or by double clicking the left mouse button on a safety output and by choosing the “Properties” menu, the following window opens to set the properties of the output:



Icon for Blockdiagram

In the “Name” field, a specific name can be assigned to the output.

A choice can be made between the stop category 0 (stop not delayed) and the stop category 1 (stop delayed).

For the stop category 1, the delay time is defined from 0.1 to 300 seconds in increments of 0.1s. An interrupt input can also be defined for an interruption of the delay. If the connection between the assigned control output and the safety input is opened, the safety output is immediately deactivated.

By clicking on the “Block diagram” icon, a window opens in which the block diagram of the concerned component is represented.

By clicking on the “Help” icon, the instruction sheet will be opened at the corresponding chapter of the component from which help is required.

These functions are available for all devices where the Block Diagram and Help icons appear.

4.1.2 Connecting a device to a safety output

To assign a device to the desired safety outputs, click on the device symbol and drag it onto the appropriate safety output in the configuration window, while continuously pressing the left mouse button. When the mouse button is released, the device is connected to the safety output, as represented in a tree structure.

The connection of several devices to a safety output is automatically a logical AND.

This procedure is the same for all the functionalities of the XPS-MC.

⚠ WARNING

LOSS OF SAFETY INPUT CROSS-CONNECTION DETECTION

Ensure that no more than one critical safety input is connected to each of the control outputs.

Failure to follow this instruction can result in equipment damage or serious injury.

4.1.3 Modifying the properties of a function and assigning control outputs and safety inputs

By dropping a component onto an output, the properties window of this component will be automatically opened. This function can be activated or deactivated in the menu Options - Editor.

Additional modifications of the properties can be done by clicking the right mouse button and choosing the properties menu, or by double clicking on the symbol of the component in the configuration window.

Note: If this window does not open automatically, this means that this function is not active in the "options editor" menu option. In this case, open the window by clicking with the right mouse button on the symbol and selecting the "Properties" menu option.

In this window, the adjustable parameters of this function can be modified. Lower down in this window, you must indicate the switching item of this function (for example, the emergency stop button, the limit switch, etc.), the control outputs and the safety inputs with which it is connected to the XPS-MC.

Attention!
If a control output c1...c8 has been used, a "" follows the name, for example "c2*", appears when this output is selected.*
The user must guarantee that no dangerous fault can occur when this control output is used more then once, as a dangerous short-circuit, for example, is no longer detected.

Note: If a safety input is occupied, it no longer appears in the list of safety inputs currently available. An incorrect double occupation is therefore eliminated.

Note: The already used control outputs can not be used in the properties window of the device "safety mats".

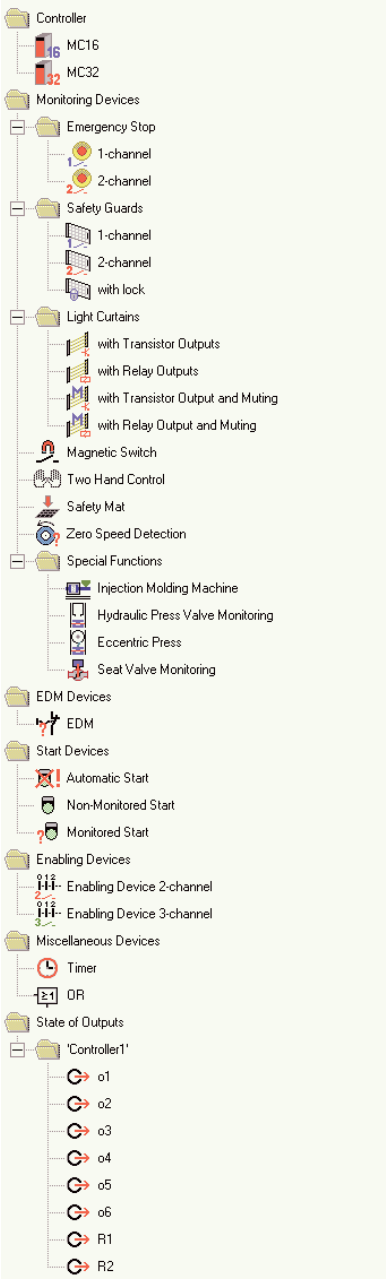
This procedure is the same for all the functionalities of the XPS-MC.

Finally, confirm the defined inputs with "OK" or cancel with "Cancel".

4.2 Monitoring devices

The “Monitoring Devices” folder contains all the control devices of the XPS-MC.

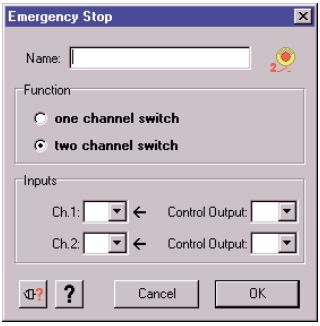
The figure below gives an overview of this:



4.2.1 Emergency stop

The “Emergency-Stop” folder contains the two device symbols for the one channel and two-channel emergency stop.

The parameter setting window provides the following setting possibilities:



In the “Name” field, a specific name can be assigned to this device.

In the “Function” field, you can choose between a one-channel or two-channel emergency stop. The device symbol in the configuration tree is adapted automatically.

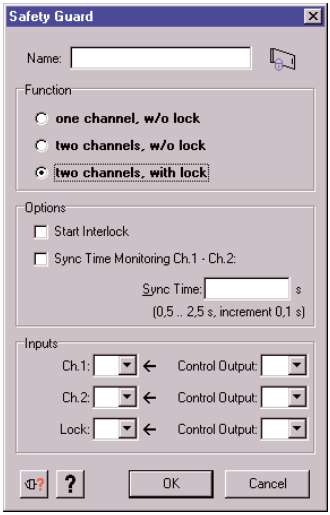
The control outputs and the safety inputs with which the emergency stop button is connected to the XPS-MC must be indicated in the “Inputs” field.

4.2.2 Safety guard

Notice!
One of the three starting devices: automatic starting, nonmonitored starting or monitored starting must be assigned to each protection door device. The corresponding safety output cannot be activated without this assignment.

The “Safety guard” folder contains three device symbols: protection door with one opening contact, protection door with two opening contacts and protection door with lock (three opening contacts).

The parameter setting window provides the following setting possibilities:



In the “Name” field, a specific name can be assigned to the device.

In the “Function” field, a choice can be made between a protection barrier with one limit switch, two limit switches or two limit switches with lock. The device symbol is adapted to the choice made.

Protection door with one channel, without lock

In the “Options” field, you can define whether a startup test is to be carried out. During the startup test, the protection door must be opened once before the machine is started and then closed again, to guarantee that the connected contact ch.1 also operates.

In the “Input” field, the control output and the safety input to which ch.1 is connected must be indicated.

Protection door with two channels, without lock

In the “Options” field, you can define whether a startup test is to be carried out. During the startup test, the protection door must be opened once before the machine is started and then closed again, to guarantee that the connected contacts ch.1 and ch.2 also operate. A synchronisation time, during which contacts ch.1 and ch.2 must close, can also be entered. If this time is exceeded, the assigned safety outputs are not activated. This time can be defined from 0.5s to 2.5s, in increments of 0.1s.

The control outputs and the safety inputs used must be indicated in the “Inputs” field.

Protection door with two channels, with lock

In the “Options” field, you can define whether a startup test is to be carried out. During the startup test, the protection door must be opened once before the machine is started and then closed again, to guarantee that the connected contacts ch.1, ch.2 and lock also operate. A synchronisation time, during which contacts ch.1 and ch.2 must close, can also be entered. If this time is exceeded, the assigned safety outputs are not activated. This time can be defined from 0.5s to 2.5s, in increments of 0.1s.

The control outputs and the safety inputs used must be indicated in the “Inputs” field.

The "Light curtain" folder contains four device symbols:
Light curtain (ESPE = Contact-free protection device) with transistor outputs or relay outputs, with and without muting.

4.2.3 Safety light curtain (ESPE) of the Category 4 without muting

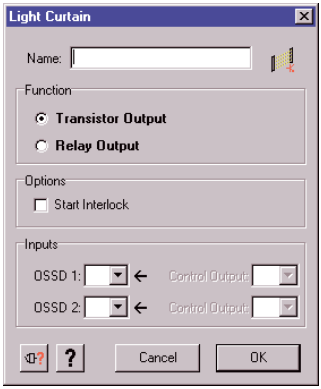
Notice!
One of the three starting devices: automatic starting, nonmonitored starting or monitored starting must be assigned to each light curtain device. The corresponding safety output cannot be activated without this assignment.

For the light curtain with transistor outputs, the light curtain checks its safety outputs itself (OSSD = Output Safety Switching Device) by a short interruption. The light curtain safety outputs must be connected to different XPS-MC safety inputs.

This output test is not, however, possible for the relay output and is thus performed by the XPS-MC. To guarantee complete short-circuit monitoring, the light curtain safety outputs must be connected to different XPS-MC safety inputs and control outputs.

For the light curtain safety outputs, a synchronisation time of 0.5s is accepted. If the time difference between the tripping of the two safety outputs (OSSD) is greater, the safety outputs affected are not activated.

The parameter setting window provides the following setting possibilities:



In the "Name" field, a specific name can be assigned to the device.

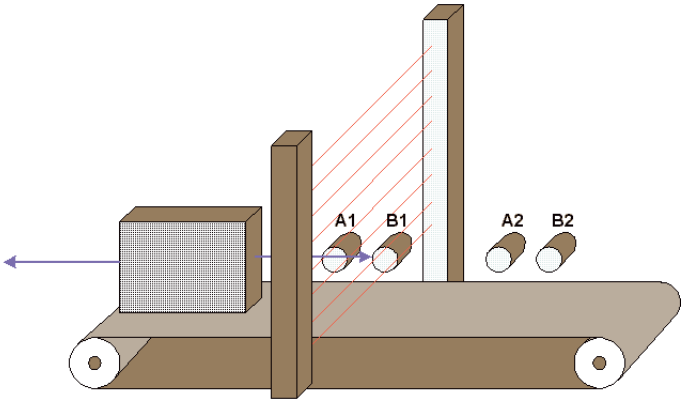
In the "Function" field, a choice can be made between the light curtain with a transistor or relay output. The device symbol is adapted to the choice made.

In the "Options" field, you can define whether a startup test is to be carried out. During the startup test, the light curtain protection field must be interrupted once and validated again, before activating the XPS-MC safety outputs.

In the "Inputs" field, the control outputs (by relay outputs alone) and the safety inputs to which the light curtain safety outputs (OSSD) are connected, are activated.

4.2.4 Light curtain (ESPE) of the Category 4 with Muting

The “Light curtain” folder contains the light curtains with muting device symbols. The muting function can be used to bypass the protection field of a light curtain (ESPE) to, for example, bring a part to be worked into and/or leave the hazardous area.



The muting function is controlled by four additional sensors belonging to two groups (A and B), and can only be activated when the safety outputs have already been activated (the protection field is then free). If not, the activation of the muting function produces an error message and the safety outputs remain deactivated. Muting operates according to a suitable order of the muting sensors in both directions of transport, and thus inside and outside the hazardous area again.

Figure 7.18 "Muting for light curtains type 4" shows a muting example with its functional diagrams.

The muting sensors of groups A and B must be activated during a variable synchronisation time tsyn (0.5 to 3s or to infinity), in order to trigger the muting function. A muting time tM can also be adjusted from 0.5 to 10 minutes or to infinity. During this time, the conveyed goods can pass through the activated protection field, without the XPS-MC safety outputs switching off the machine. If this time is exceeded, an error message appears and the safety outputs are deactivated.

The override button is used to bypass the protection field manually. This is necessary, for example, when the muting function is activated and when conveyed goods have entered and become stuck in the light curtain protection field (ESPE). Through this option, the goods can be withdrawn from the machine, in spite of the light curtain (ESPE). To prevent inappropriate use, the override function can only be activated for up to 10 minutes.

⚠ WARNING
IMPROPER ACCESS TO PROTECTED AREA
Ensure opening sizes are as small as possible and comply with EN60294.
Ensure photo-sensors are clean and free from obstructions.
Failure to follow this instruction can result in death or serious injury.

⚠ WARNING

DETECTOR INTERFERENCE HAZARD WITH THRU-BEAM SENSORS

Reciprocal mount transmitters and receivers.

Mount adjacent receivers at distance greater than minimum separation distance.

Failure to follow this instruction can result in death or serious injury.

To create the muting signal, sensors with relais output, or mechanical limit switches are suitable for making sure that a distinction is made between individuals and goods. At the same time, all easy defeating must be prevented (stickers or photoelectric sensors for example).

On entering the hazardous area, light signal is recommended to announce the muting status for muting operation; this signal must be connected between terminal H1 and the XPS-MC supply voltage (terminal A1). If a fault occurs at the level of this light signal (short-circuit, interruption), the muting function is immediately de-activated and an error message appears. The safety outputs are then deactivated.

Sources of white light with an illumination surface of 1 cm^2 and a brightness of at least 200 lm/m^2 are used as a light signal. The intensity value of this light source must vary from 20mA to 350mA.

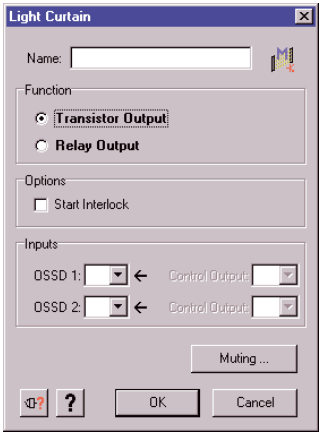
The light signal always comes on when the muting signals are generated correctly and announces the bypassing of the light curtain protection function (ESPE).

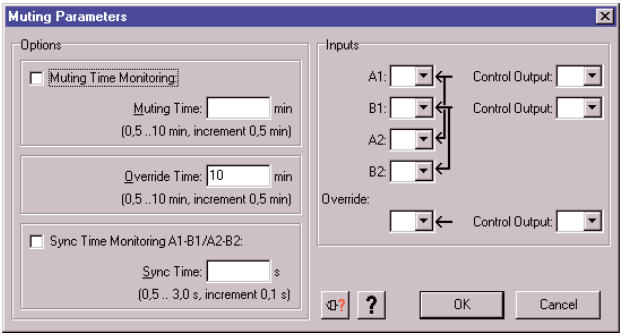
- A new cycle is only initiated with the starting control when no muting signal is required and when the protection field is free.
- During the time a muting signal is produced correctly, no one must be allowed to enter the hazardous area.
- A guide less means of transport must create the muting signal before it enters the protection field, and may only leave this field when it no longer interrupts the light curtains beams of the protection field.

The muting function meets the requirements of category 4 according to EN 954-1. To ensure the correct monitoring of the muting lamp, a minimum duration of 500 ms for muting is necessary.

Photoelectric muting sensors must operate in dark switching mode, in order to produce the output signal when a light ray is interrupted.

The parameter setting window provides the following setting possibilities:





In the “Name” field, a specific name can be assigned to this device.

In the “Function” field, a choice can be made between the light curtain with a transistor or relay output. The device symbol is adapted to the choice made.

Three time values can be set in the “Options” field:

1. The optional muting time indicates the maximum time the muting function is allowed to operate. Exceeding this time with the muting function still activated causes an error message.
2. The relieve time indicates the maximum time during which the relieve time function can be activated. The default value set is 10 minutes.
3. The optional synchronisation time is the time during which the muting sensors of groups A and B must be activated before muting is started. If this time is exceeded, the muting function is not activated.

The control outputs and the safety inputs to which the ESPE is connected, must be indicated in the “Inputs” field. The two groups A and B of muting sensors must be necessarily connected to different control outputs.

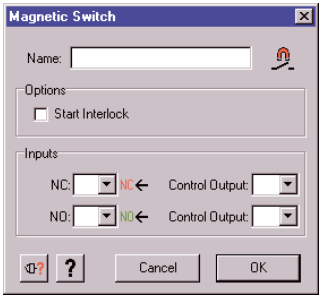
4.2.5 Magnetic switch

Notice!
One of the three starting devices: automatic starting, nonmonitored starting or monitored starting must be assigned to each magnetic switch device. The corresponding safety output cannot be activated without this assignment.

The “Monitoring Devices” folder contains the “Magnetic Switch Control” device symbol.

The magnetic switch consists of an opening contact and a closing contact, which must be actuated within the synchronisation time space of 0.5s, otherwise the safety outputs affected are not activated.

The parameter setting window provides the following setting possibilities:



In the “Name” field, a specific name can be assigned to this device.

In the “Options” field, you can define whether a startup test is to be carried out. During the startup test, the magnetic switch must be actuated once before the machine is started and then de-activated again, to guarantee that the connected contacts also operate.

The control outputs and the safety inputs used must be indicated in the “Inputs” field.

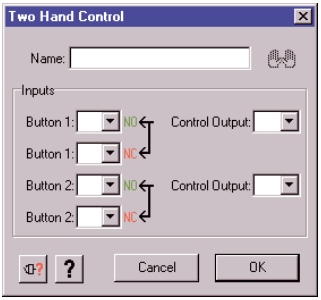
4.2.6 Two-hand control

The “Monitoring Devices” folder contains the “Two Hand Control” device symbol.

The control panel of the two-hand control consists of two buttons each having an opening contact and a closing contact. These buttons must be actuated within the synchronisation time space of 0.5s, to obtain switching of the safety outputs. If this time is exceeded, the assigned safety outputs are not activated.

To ensure complete short-circuit monitoring, the two buttons must be connected to different control outputs. If a button produces an unexpected signal, such as a short-circuit for example, the safety outputs affected are deactivated or are not activated and an error message appears.

The parameter setting window provides the following setting possibilities:



In the “Name” field, a specific name can be assigned to this device.

The control outputs and the safety inputs to which the two-hand control buttons are connected, must be indicated in the “Inputs” field.

4.2.7 Safety mat

Notice!
One of the three starting devices: automatic starting, nonmonitored starting or monitored starting must be assigned to each switching mat function. The corresponding safety output cannot be activated without this assignment.

The “Monitoring Devices” folder contains the “Safety Mat” function symbol.

The switching mat consists of two pairs of metal leads that are short-circuited when the mat is walked on. The XPS-MC safety outputs are then immediately deactivated. To be able to detect this shortcircuit, the four connection leads must be connected to different safety inputs and control outputs.

Types: see Technical Specifications, Hardware Presentation

Attention!
The control outputs used for this device cannot be used for any other device!

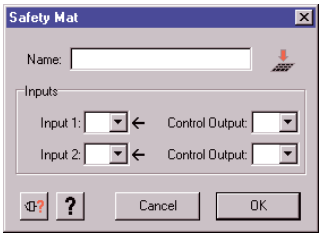
⚠ WARNING

LOSS OF SAFETY INPUT CROSS-CONNECTION DETECTION

In Safety Mat applications, ensure that all four connection leads are connected to different safety inputs and control outputs.

Failure to follow this instruction can result in equipment damage or serious injury.

The parameter setting window provides the following setting possibilities:



In the “Name” field, a specific name can be assigned to this device.

The control outputs and the safety inputs to which the safety switching mat is connected, must be indicated in the “Inputs” field.

4.2.8 Zero speed detection

The “Monitoring Devices” folder contains the “Zero Speed Detection” device symbol.

This device detects the zero speed of a motor or a shaft. To enter the motor rotational speed, an encoder wheel and two PNP sensors are required as indicated in figure 7.13.1 "Functional diagram". These sensors can only be connected to XPS-MC safety inputs i1 and i2. If these inputs are already taken, a warning appears automatically.

The following points should be complied with for this device:

- The entry must always be organized such that, at any time, if possible always only one sensor is always activated (= HIGH-Signal).
- If both sensors are in the LOW state, a cable break is indicated and the corresponding outputs are deactivated.
- If both sensors are in the HIGH state during the motor operation, a short-circuit occurs after t=1/f seconds. After a zero speed detection, both sensors may be in the HIGH state.
- If the two safety inputs i1 and i2 receive a synchronous signal, an error message appears after t=1/ f seconds and the corresponding outputs are deactivated.
- If only one sensor produces a dynamic signal after a zero speed, an error message appears after 30s and the corresponding outputs are deactivated.
- After power on of the XPS-MC, both sensors may give a HIGH state, without that an error message appears.
- If, after the XPS-MC has started, both sensors are in the LOW state, an error message appears.

If the motor rotates, both sensors deliver HIGH-LOW sequences the frequency of which depends on the rotational speed of the encoder wheel according to the following formula:

$$f[Hz] = \frac{n[U/min]}{60} \cdot z \qquad \text{or} \qquad n[U/min] = \frac{f[Hz] \cdot 60}{z}$$

where f = pulse frequency of the sensors in Hertz
n = Rotational speed of the encoder wheel in revolutions per minute
z = Encoder wheel number of cogs

⚠ WARNING

IMPROPER OPERATION
Do not use the XPS-MC in applications where the pulse frequency requirement for detection of cogs on a rotary machine exceeds 450 Hz.
Failure to follow this instruction can result in equipment damage or serious injury.

Example 1: Machine with 3000 rpm and an encoder wheel with 26 cogs:

$$f_{max} = \frac{3000}{60} \cdot 26 = 1300Hz$$ NOT AUTHORIZED !!!

Example 2: The same machine (3000 rpm) and an encoder wheel with 8 cogs:

$$f_{max} = \frac{3000}{60} \cdot 8 = 400Hz$$ O.K.

The frequency limit, below which the zero speed is detected and the safety outputs activated, can be adjusted by the user within a range of 0.05 to 20 Hz.

Example: A 8-cog encoder wheel is located above a shaft. A zero speed is detected when the speed is less than 10rpm.

$$f_{Switching\ frequency} = \frac{10\ U/min}{60} \cdot 8 = 1,33Hz$$

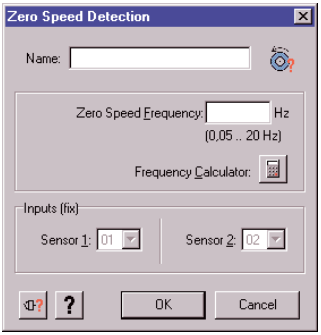
A switching frequency of 1.33Hz must be indicated to detect a zero speed.

Notice!
A frequency calculator is included in the properties determination menu. Enter the number of cogs and the zero speed limit in rpm, and the frequency limit to be set is calculated automatically.

The switching from “motor operation” to “zero speed” (= activation of safety outputs) only occurs when:

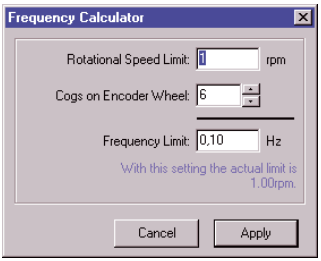
1. one safety input contains a HIGH signal and
2. the other input contains a LOW signal and
3. the frequency on the two inputs is lower than the value entered.

The parameter setting window provides the following setting possibilities:



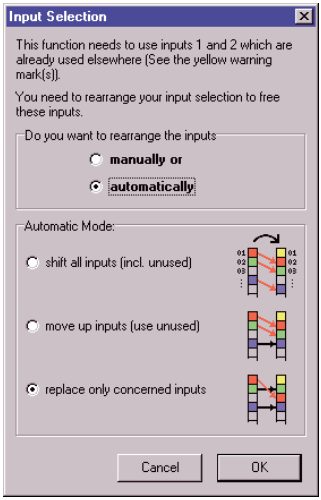
In the “Name” field, a specific name can be assigned to this device.

The frequency limit, below which the zero speed must be detected and the safety outputs activated, must be indicated in the next field, as indicated above. The following dialogue field opens when you click on the “Frequency Calculator” button:



The desired rotational speed limit (in rpm) to detect a zero speed and the number of cogs must be entered in this field. The frequency limit to be set is calculated automatically; it can be adjusted using the “Apply” button in the “Properties” menu.

Safety inputs i1 and i2 are already automatically indicated in the “Inputs” field. This device cannot operate with other inputs. If inputs i1 and/or i2 are already used, the following window appears to resolve the conflict:



Manual sorting:
As a user, you assign other safety inputs manually to the function using i1 and/or i2. When OK is clicked, the properties window of all concerned devices will be opened

Automatic sorting:
The software automatically assigns other safety inputs to the function using i1 and/or i2 according to one of three options:

1. shift all inputs
   All the safety inputs are shifted as a block. Inputs that are not used and are available may also be shifted.
   For example, i1 becomes i3, i2 becomes i4 and i4 becomes i6.
2. move up inputs
   All the safety inputs are shifted as a block. Inputs that are not used and are available may also be shifted, and “spaces” thus filled.
   For example, i1 becomes i3, i2 becomes i4 and i4 becomes i5.
3. replace only concerned inputs
   Only the inputs that are used (i1 and/or i2) are shifted to the next free safety inputs.
   This is the standard option.

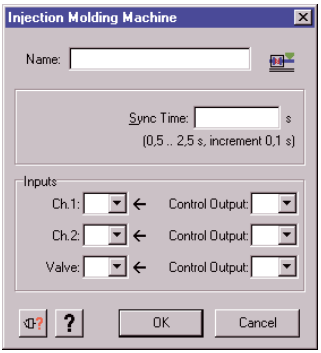
4.2.9 Injection molding machine

Notice!
One of the three starting devices: automatic starting, nonmonitored starting or monitored starting must be assigned to each injection molding machine device. The corresponding safety output cannot be activated without this assignment.

The “Special Functions” folder contains the “Injection Molding Machine” device symbol for monitoring an injection molding machine with a protection door, as indicated in figure 7.8.2 "Wiring diagram".

The three limit switches Ch.1, Ch.2 and Valve must then be connected to various control outputs and safety inputs, to ensure complete short-circuit monitoring. The injection molding machine is activated according to the switching states of limit switches Ch.1, Ch.2 and Valve, in accordance with the function diagram in figure 7.8.1. A startup test is, in this case, mandatory, i.e. the protection door must be opened once and then closed again, to make starting possible.

The parameter setting window provides the following setting possibilities:



In the “Name” field, a specific name can be assigned to this device.

A synchronisation time, during which contacts Ch.1 and Ch.2 must close, must be entered in the following field. If this time is exceeded, the assigned safety outputs are not activated. This time can be adjusted from 0.5s to 2.5s in increments of 0.1s.

The safety inputs and control outputs used must be indicated in the “Inputs” field.

4.2.10 Hydraulic press valve monitoring

The “Special Functions” folder contains the “Hydraulic Press” device symbol for controlling a hydraulic press valve, as indicated in figure 7.14.2 "Wiring diagram".

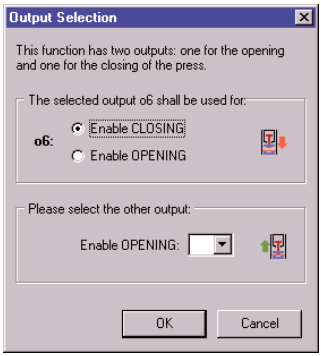
Using this device, a hydraulic press with safety valves with three position switches or with PNP sensors Valve C to Valve C+O can be connected to the XPS-MC, as shown in the figure 7.14.2 . The press control delivers the press opening and closing signals. Each time the leading edge of the two press control signals, “open the press” and “close the press” goes positive, a configurable internal time window is generated, during which the XPS-MC waits for a response from the appropriate valve position switch (Valve C and Valve C+O for press closing, Valve O for press opening). If this time window is exceeded, the corresponding safety outputs are deactivated.

If signals Valve C to Valve C+O appear in an order other than the one shown in figure 7.14.1 "Functional diagram", the affected safety outputs of this function are then deactivated and an error message appears.

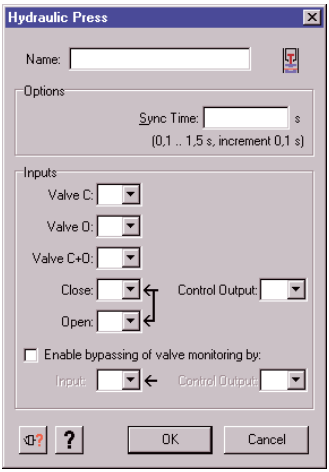
This function thus delivers the “closing authorisation” signal to a safety output, if the “close press” signal is active and if Valve C and Valve C+O are closed correctly in the time window.

The “opening authorisation” signal will also be activated on a safety output, if the “open press” signal is active and if Valve O is closed correctly in the time window.

When this device is selected, it is first necessary to assign the “opening authorisation” function to a safety output and the “closing authorisation” function to another safety output. This takes place in the window which appears automatically:



The parameter setting window provides the following setting possibilities:



In the “Name” field, a specific name can be assigned to this device.

A synchronisation time, during which the respective contacts Valve C / Valve C+O and Valve O / Valve C+O must close, can be entered in the “Options” field. If this time is exceeded, the corresponding safety outputs are deactivated. This synchronisation time can be adjusted from 0.1s to 1.5s in increments of 0.1s.

The safety inputs and the control output used must be indicated in the “Inputs” field. Switches Valve C to Valve C+O must be connected directly to the +24V supply voltage. The two contacts for “open press” and “close press” can operate with the same control output.

Optional, an input to bypass the monitoring of the valves can be chosen.

If the bypass is utilised, Valve C, Valve O and Valve C+O will not be monitored and have no influence on the position of the press. The safety outputs are dependant only on the situation of the “open” and “close” contacts.

4.2.11 Safety stopping control of an eccentric press with over-travel monitoring and optional valve monitoring

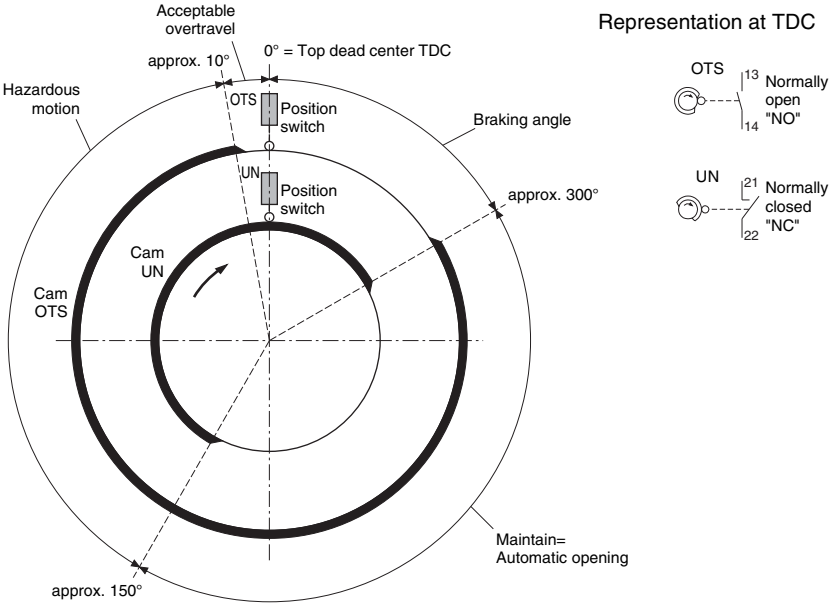
The "Special Functions" folder contains the "Eccentric Press" device symbol to control the safety stopping of an eccentric press at top dead centre (OT) with over-travel monitoring and optional valvemonitoring. The valve-monitoring shown in figure 7.15.4 "Wiring diagram" is optional.

The press must be operated with a two-hand control device. The XPS-MC safety outputs are activated as long as the start signal is active at the beginning of a cycle and the position switches OTS, UN, PSV1 and PSV2 deliver the correct signals throughout the cycle. To guarantee perfect short-circuit detection, the position switches must be connected to different safety inputs and control outputs.

The function detailed operation differs according to the selected operating method.

Position switches OTS and UN detect the press movement and in particular, safety stopping at the top dead centre OT.

The control cams are shown with the following functional diagram:

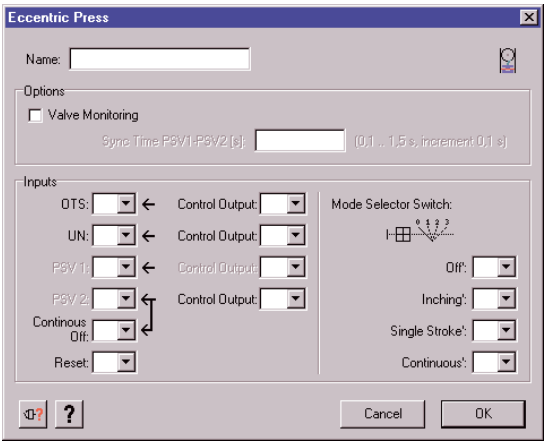


Position switches PSV1 and PSV2 monitor the status of the press safety valve. An adjustable synchronisation time of 0.1s to 1.5s is observed between the two contacts. If this time is exceeded, an error message appears and the corresponding safety outputs are deactivated until the Reset input is activated.

To delete an overtravel error or an error at the UN or OTS position switches, the reset input has to be actuated. The errors on the press safety valves, the UN or OTS position switches and overtravel will not be cleared by switching off the controller.

If one of the safety inputs delivers an incorrect signal, an error message appears and the corresponding safety outputs are deactivated.

The parameter setting window provides the following setting possibilities:



In the "Name" field, a specific name can be assigned to this device.

In the "Options" field, the valve monitoring can be activated and the synchronisation time for the switch ON and OFF of the press safety valves PSV1 and PSV2 can be adjusted.

The safety inputs and the control output used must be indicated in the "Inputs" field, see the figure 7.15.4 "Wiring diagram" Reset-Switch and Mode Selector Switch must be connected directly to the +24V supply voltage.

Mode "Off"
The press is deactivated and all safety outputs connected to the press are turned off.

Mode "Inching"
Position switches OTS and UN as well as the switches of the valves PSV1 and PSV2 will not be monitored, and have no influence on the movement of the press. The safety outputs are dependant only on the situation of the Two Hand control.
An extra start switch is to be used in series with the safety output for the mode "Inching" with a safety guard or a light curtain.

Mode "Single stroke"
With each releasing of the start device, for instance Two Hand control, one stroke of the press is implemented. The safety stopping at the top dead centre is realised by means of the limit switches OTS and UN. The automatic upstroke is controlled by the closing of the limit switch UN. In addition, with selected valve monitoring, the synchronous time of the two halves of the press safety valve (PSV) are monitored with the switches PSV1 and PSV2 when switching on and off.

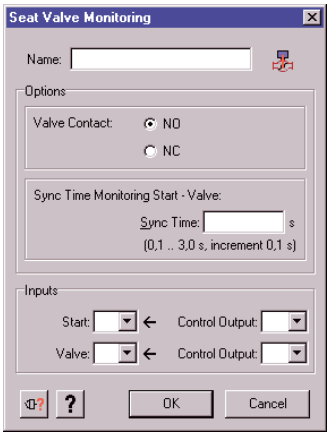
Mode "Continuous"
The functions of monitoring correspond in theory to those of the mode "Single stroke", however the press does not stop after one cycle, but continues to operate until the switch "continuous off" is actuated. The monitoring of the valve and the monitoring of over-travel will only be accomplished one time in the continuous cycle.

The mode « continuous » needs the use of sure tools, or additional protection measures have to be taken.

4.2.12 Seat Valve Monitoring

The "Special Functions" folder contains the "Seat Valve Monitoring" device symbol for monitoring of a seat valve as shown in figure 7.16.2 "Wiring diagram".

The device senses the start signal for operating the valve with the first input and the answer signal of the concerned valve contact with the second input. In the properties window, the function of the valve contact can be selected as either NO or NC and the synchronisation time between the start signal and the valve answer can be adjusted from 0.1s to 3.0s in increments of 0.1s.



After the start signal is given and the valve contact is open, the output of the device is immediately activated and remains activated until the synchronisation time is exceeded. The output only remains activated if the valve contact closed during the synchronisation time. After this, the valve contact may open and close without disrupting the output as long as the start signal is maintained. If the start command disappears, the output will always be deactivated.

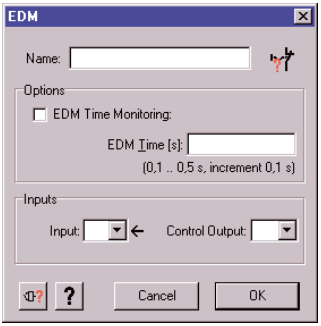
4.2.13 EDM Devices (EDM = External Device Monitoring)

The “EDM Devices” folder contains the “EDM Device” device symbol for monitoring a return circuit. This device is used to monitor external devices such as downstream switches or relays.

If, for example, external switches K1 / K2 are activated, the EDM input to which opening contacts K1 and K2 are assigned must then be opened, by the end of the adjustable synchronisation time at the latest. If this is not the case, an error message appears and the safety outputs concerning K1 and K2 are deactivated.

Immediately before activating the safety outputs, make sure that the EDM input is closed. If this is not the case, an error message appears and the safety outputs are deactivated.

The parameter setting window provides the following setting possibilities:



In the "Name" field, a specific name can be assigned to this device.

A synchronisation time, during which the return circuit must open, can be entered in the “Options” field. If this time is exceeded, the corresponding safety outputs are deactivated. This time can be adjusted from 0.1s to 0.5s in increments of 0.1s.

If this synchronisation time is not activated, only check whether the EDM input is closed immediately before activating the safety outputs.

The safety inputs and the control output used must be indicated in the “Inputs” field.

4.3 Start device

The “Start Devices” folder contains the device symbols for automatic starting, nonmonitored starting and monitored starting. The functional diagram for these devices is shown, as an example, in figure 7.6.1 "Functional diagram".

4.3.1 Automatic start

The safety outputs are activated as soon as all the starting conditions are fulfilled. A start button is not necessary.

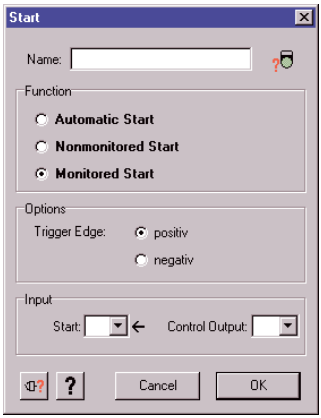
4.3.2 Nonmonitored start

The safety outputs are activated as soon as all the starting conditions are fulfilled and starting is initiated by the start button being pressed. The start button may also be bypassed and nonmonitored starting then operates in the same way as automatic starting.

4.3.3 Monitored start

In this case, the safety outputs are only activated when all the starting conditions are fulfilled and starting is initiated when the start button is pressed (automatic starting on a positive-going edge) or when the start button is pressed and released (automatic starting on a negative-going edge). It is possible to define whether starting should take place on the positive-going edge or negative-going edge of the starting signal. Unlike nonmonitored starting, the safety output cannot be activated when the start button is actuated by an XPS-MC Power-Up or when the start button is bypassed. Bypassing the start button causes an error message.

The parameter setting window provides the following setting possibilities:



In the “Name” field, a specific name can be assigned to this device.

You can then select one of the starting devices again in the “Function” field. The device symbol in the configuration tree is adapted automatically.

During monitored starting, a selection can be made in the “Options” field between starting on the positive-going edge (= starting when the start button is pressed) or starting on the negative-going edge (= starting when the start button is released).

The safety input and the control output used must be indicated in the “Input” field.

4.4 Two-channel or three-channel enable switch

The “Enabling Devices” folder contains the device symbols for the enable switch. This device can be used alone on a safety output, or with a safety guard.

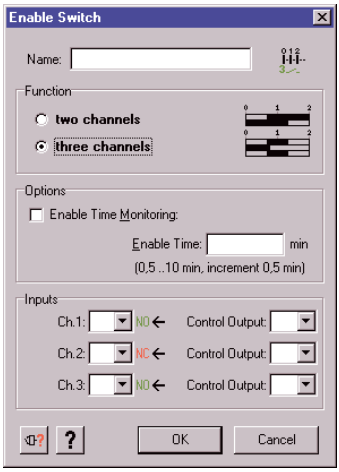
Note: To do it, the enable switch function symbol must be dragged onto the symbol of the safety guard.
For the changeover between the safety guard and the enable switch, an external position switch must be used.

With an enable switch, a safety guard can be bypassed and a hazardous movement can consequently be started, even with a protection door open, during the fitting out of a machine for example. The enable switch does not activate the dangerous movement but gives a validation for the dangerous movement to be actuated.

This function works with a two or three channel enable switch with the switching diagram which appears in figure 7.20.2 "Wiring diagram" or figure 7.19.2 "Wiring diagram". Category 4 is only achieved when using the 3 position enable switch. For the types of enable switches that can be used, see the Technical data chapter of the Hardware instruction manual.

To produce the confirmation signal, the enable switch must first be set to position 0 and then to position 1. The authorisation is thus activated, as are the XPS-MC safety outputs. If the enable switch reaches position 2, the safety outputs are again deactivated. When the enable switch is set back to position 0, no further enabling is authorized, even if the switch is returned to position 1.

The parameter setting window provides the following setting possibilities:



In the “Name” field, a specific name can be assigned to this device.

In the “Options” field, a max. enable time can be given. If the enable switch is active longer than the enable time, the corresponding safety outputs will be deactivated and a fault message will be given. The time is adjustable from 0.5 to 10 minutes.

You can select one of the enable switches in the “Function” field. The device symbol in the configuration tree is adapted automatically. The switching diagram needed for the contact switch is also schematically illustrated here.

The safety inputs and control outputs used must be indicated in the “Inputs” field. To ensure reliable short-circuit detection, all the contacts must be set into service on different control outputs.

4.5 Miscellaneous devices

The “Miscellaneous devices” folder contains all the logic devices.

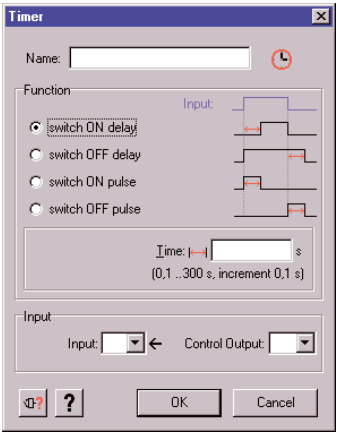
4.5.1 Timing device

The “Timing Devices” folder contains the Timer device symbol. figure 7.17.1 indicates the corresponding functional diagrams.

This device enables the safety output(s) as the timer function of a control signal. Four possibilities are provided:

1. Switch on delay. The safety output is activated when the control signal delayed by an adjustable time is activated. It lasts for as long as the control signal is active.
2. Switch off delay. The safety output is stopped when the control signal delayed by an adjustable time is stopped. The safety output is activated at the same time as the control signal is activated.
3. Switch on pulse. The safety output is activated at the same time as the control signal is activated, but only lasts for an adjustable time.
4. Switch off pulse. The safety output is activated at the same time as the control signal is stopped, but only lasts for an adjustable time.

The parameter setting window provides the following setting possibilities:



In the “Name” field, a specific name can be assigned to this device.

You can select one of the four operating modes in the “Function” field. The function is presented by an explanatory schematic diagram.

The safety input and the control output used for the control signal must be indicated in the “Input” field.

4.5.2 OR device

The “Miscellaneous devices” folder contains the symbol of the OR device for a logical OR connection between devices.

With this device, the validation of an output is the result of an OR connection between several devices.

The OR component has no properties window.

The OR component can not be used with several E-Stop devices.

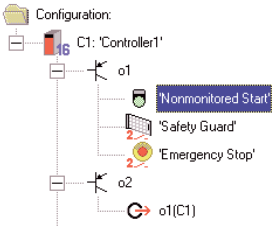
4.6 Applying output states to other safety outputs

The “Output states” folder contains the symbol of the safety outputs for each controller.

By moving the output “X” symbol on the output “Y” in the configuration window, the safety output “Y” will have the same behaviour as the safety output “X”. Other components can be assigned to the output “Y”.

The same result will be achieved by moving the output “X” symbol with the left mouse button onto the output “Y”.

Example:



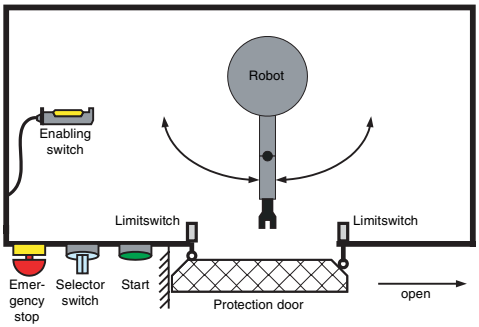
In this example, safety output o1 is associated with nonmonitored starting, safety guard and two channel emergency stop. Safety output o2 represents the 2nd channel of this safety function and will behave exactly like o1.

No adjustment is provided for in this function. Modifications can only be performed in the original safety function (in this case, safety output o1); they are then taken into account automatically in the corresponding safety output.

5 Creating a configuration

Notice!
The configuration can be created with the PC offline, i.e. without being connected with an XPS-MC, and later sent to the XPS-MC.

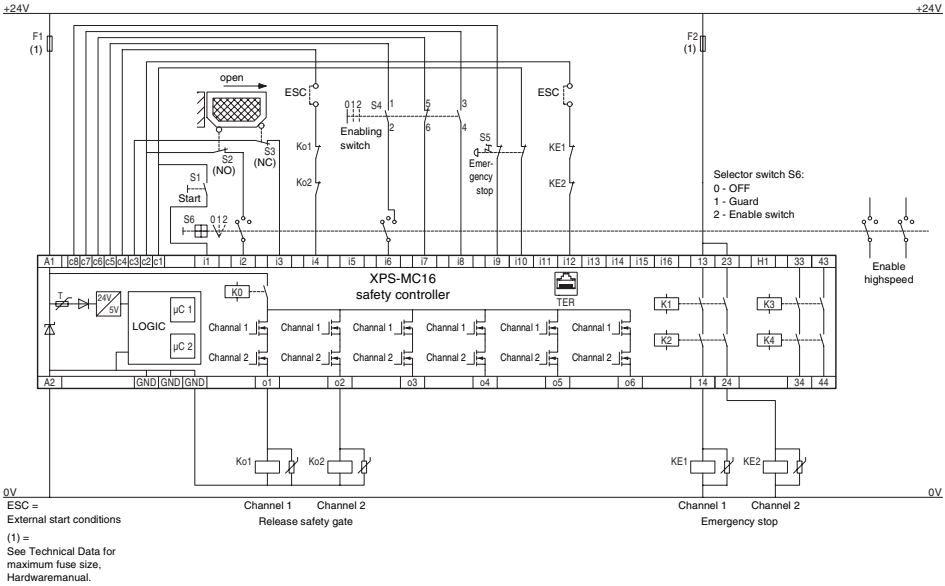
By way of example, the creation of a configuration is explained by means of the following application:



The hazardous zone of a robot arm is in this case made safe by a protection door with two limitswitches. For adjustment and maintenance purposes, the robot can also be controlled when the protection door is open by means of an enable device. This will be done with an external selector switch. The machine is made safe by a two-channel emergency stop.

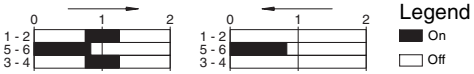
The XPS-MC safety controller must be connected to an existing MODBUS system.

The corresponding wiring diagram could be as follows:



XPS-MC32 with 32 inputs i1…i32, otherwise identical

Enable switch contact:



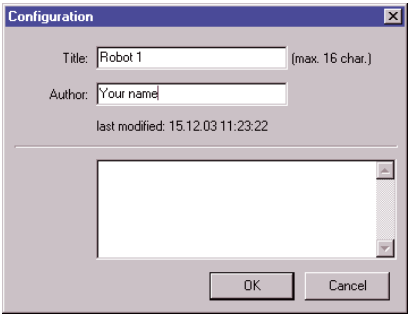
A complete overview of all the functions and their configurations is given in chapter 7 "Connection drawing / application examples".

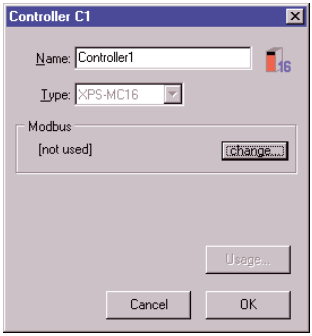
5.1 Application scheme configuration

5.1.1 Creating a new configuration / selecting a controller type

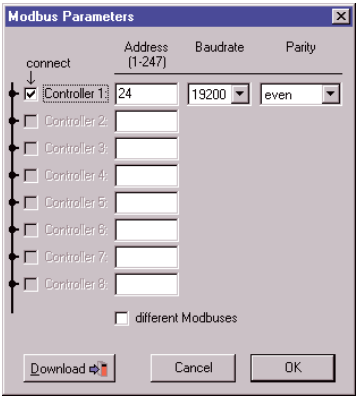
Start the XPS-MCWIN configuration software. The program user interface appears: Drag the symbol of the desired controller (in this case XPS-MC 16) from the " Device Library " window into the still empty configuration window. Release the left mouse button and a new configuration is automatically created. Fill in the window which has opened.

Note: If the window does not open automatically, you are prompted to activate automatic opening in the "Options editor" menu option.



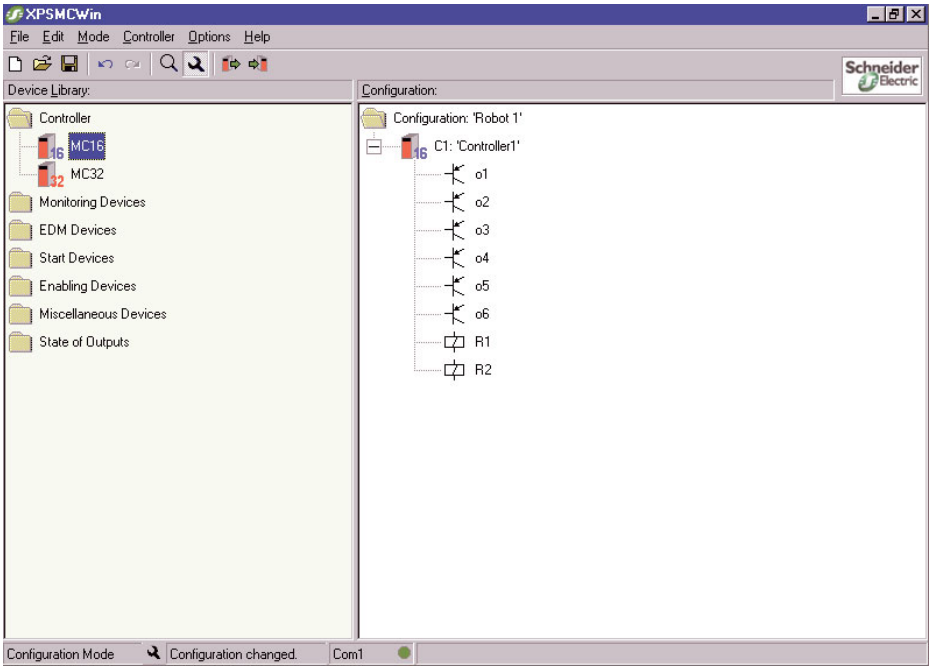


To provide for adjustments for the future MODBUS operation, click on the "change" button and fill in the window which appears, for example:



As the PC is not yet connected to controller 1, the MODBUS settings cannot yet be sent at this level to controller 1. Then click on "OK".

Your screen should now look like the one in the next figure.



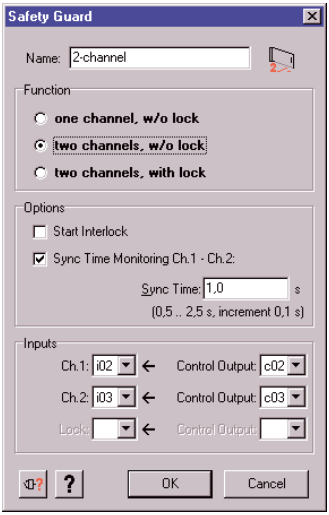
5.1.2 Assigning the switch position

For safety reasons, a position switch is necessary, which determines if the machine will be started with the safety guard OR with the enable switch (see the block diagram in the chapter 5).

To configure this OR connection, the symbol of the OR device has to be moved to the o1 output.

5.1.3 Assigning the protective guard function

In the “Safety guard ” folder (which is located in the “ Monitoring Device ” folder), select the 2-channel protection door symbol, and drag it onto the symbol of the OR component. A window opens, in which you have to define the function properties, for example:

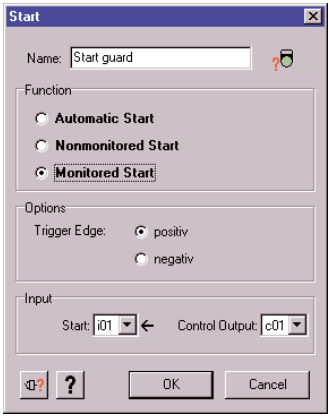


Confirm with “OK”. The protection door device is then assigned with the OR component to safety output o1.

Note: If several safety outputs operate in exactly the same way, only define one safety output and copy its state onto the other safety outputs.

5.1.4 Assigning the starting function

In this example, the protection door function must be started on the spot using a monitored start button. Hence drag the monitored starting symbol from the “Start Devices” folder onto the protection door symbol in the configuration window and fill in the window.



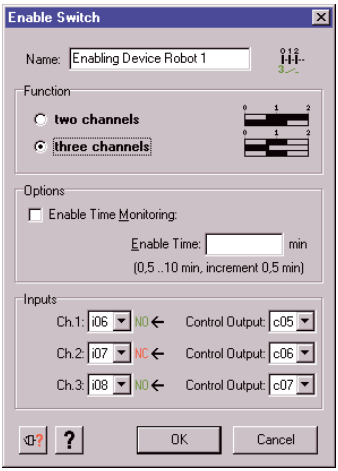
Note: One of the three starting functions must necessarily be assigned to each protection door. The corresponding safety output cannot be activated without this assignment.

Confirm with “OK”.

5.1.5 Assigning the enabling device

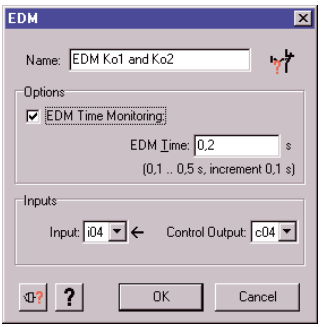
According to this example application, the safety guard can be bypassed by the 3 channel enabling device. This gives the possibility for the Robot to run with the safety guard open when the 3 channel enabling device is used (when selector switch is in appropriate position).

Drag the 3-channel enabling device symbol from the “Enabling Devices” folder onto the “OR Device” symbol in the configuration window, fill in the window and confirm with “OK”:



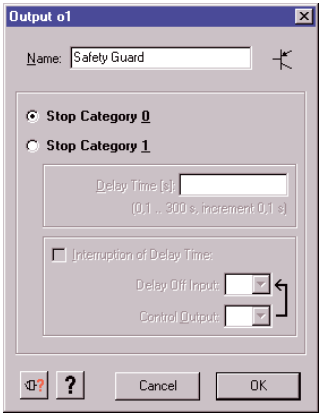
5.1.6 EDM adjustment

The opening contacts of switches Ko1 and Ko2 must be defined with a synchronisation time of 0.2s, i.e. within 0.2s after the activation of safety outputs o1 and o2, and the return circuit must be open. Drag the return circuit function symbol from the “EDM Devices” folder onto symbol o1 in the configuration window, fill in the window in accordance with the application and confirm:



5.1.7 Assign a name and a stop category to a safety output

To assign a name and a stop category to safety output o1, click the right mouse button on its function symbol in the configuration window and select the “Properties” menu option. Indicate a name and the stop category, and confirm.



Note: Any safety output not modified has a default stop category of 0.

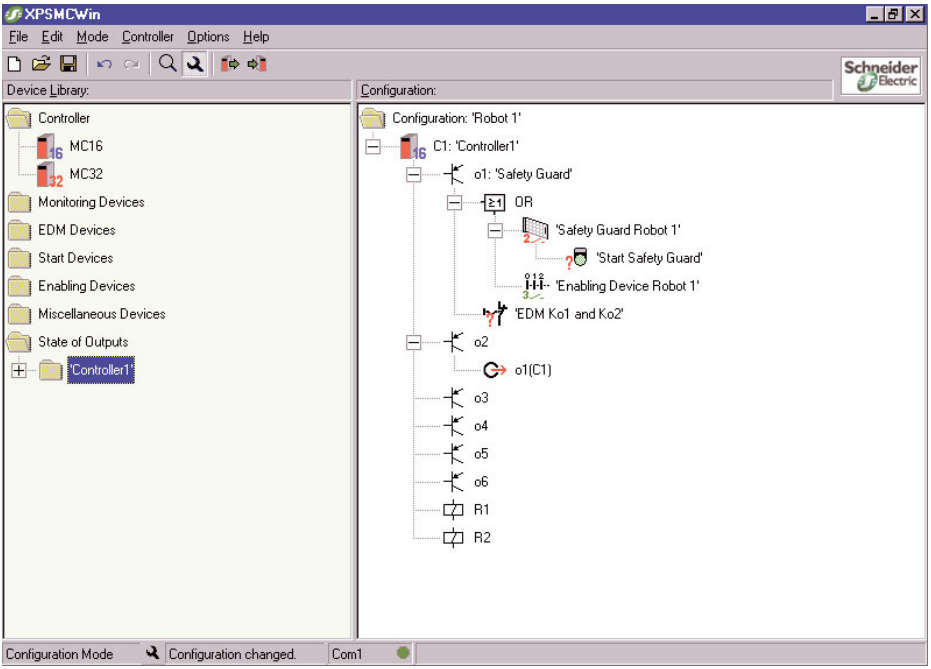
This completes the configuration of safety output o1.

5.1.8 Copying the state of one safety output onto another safety output

In our example, o2 represents the 2nd channel of a safety control system, and must consequently behave exactly like o1. For this purpose, just copy the state of o1 from the folder of the corresponding controller (in this case controller 1, the folder of which is located in “Output States”) and paste it on the function symbol o2 in the configuration folder.

The global protection door function is then configured for safety outputs o1 and o2.

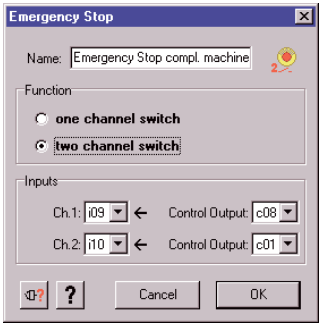
Your screen should look like the one below:



5.2 Configuring the emergency stop function

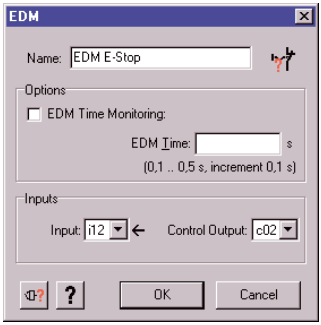
Depending on the application, the machine's global control system must be able to be stopped by means of emergency stop button S1 which activates volt-free outputs 13 / 14 and 23 / 24 of relay group R1. Their switches KE1 and KE2 are assigned to ensure that when the machine is started, KE1 and KE2 are stopped in a statutory fashion.

Drag the one-channel emergency stop symbol from the "Emergency Stop" folder (which is located in the "Monitoring Devices" folder) onto the output symbol of R1 in the configuration window, fill in the window and confirm with "OK":



Now the E-Stop device is assigned to the safety relays group R1. To also assign it to the solid state output o1, click with the right mouse button on the E-Stop device in the configuration window and choose "copy" from the selection. The E-Stop device will then be copied with all its properties. Click with right mouse button on the symbol of the output o1 and choose « Paste » from the selection. The E-Stop device will now also act on the output o1, and as the output state o1 is linked with o2, it will also act on o2.

To adjust the return circuit, drag the return circuit function symbol from the "EDM Devices" folder onto the symbol for R1 in the configuration window, fill in the window in accordance with the application and then confirm:



This ensures that the installation can only be started when KE1 and KE2 are closed and the external start conditions (ESC) are fulfilled.

Attention!
If a control output c1...c8 has been used, a "" follows the name, for example "c2*", appears when this output is selected.*
The user must guarantee that no dangerous fault can occur when this control output is used more then once, as a dangerous short-circuit, for example, is no longer detected.

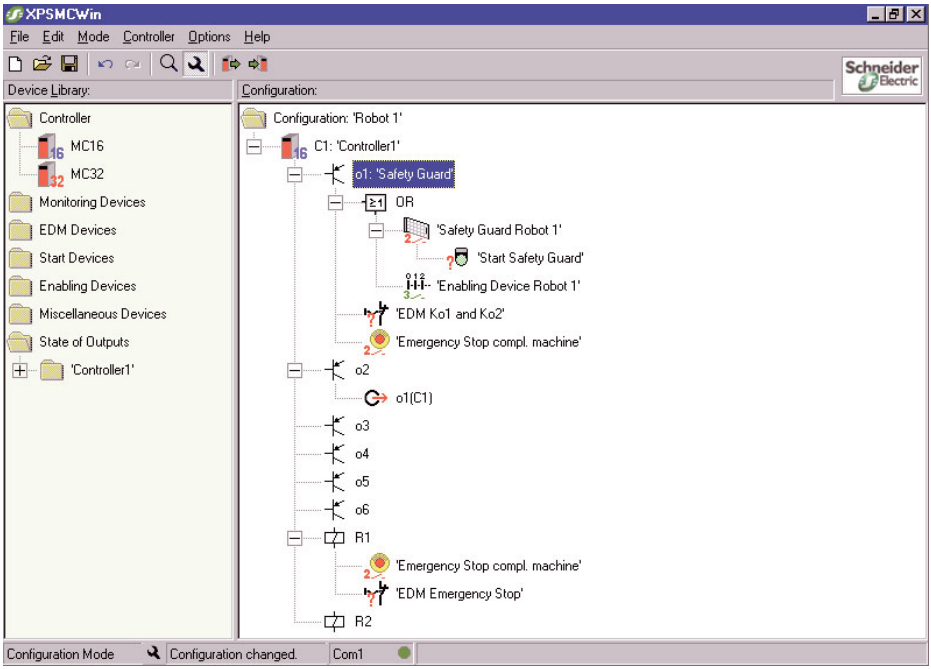
⚠ WARNING

LOSS OF SAFETY INPUT CROSS-CONNECTION DETECTION

Ensure that no more than one critical safety input is connected to each of the control outputs.

Failure to follow this instruction can result in equipment damage or serious injury.

Your screen should now look like the one below:



The creation of the example configuration is completed, and can now be saved and then sent to the XPS-MC.

5.2.1 The Master E-Stop device

A E-Stop device acts as a Master E-Stop on all the other devices of the output. The other devices will be deactivated when the Master E-Stop is pressed. When this occurs, the start of this output is not possible until the start conditions of all the other devices are met.

This is also available for all the copies of the E-Stop devices.

Attention!
An output state does not transfer a master E-Stop command on other devices. Only the status itself is transferred.

5.3 Save the configuration

The configuration can be saved by opening the “File/Save” menu option (or by clicking on the floppy disk symbol button) under the current name or by opening the “File/Save As...” option and assigning a new path/name.

5.4 Requesting the password, changing the password

Each XPS-MC command involving quitting the RUN mode (setting up the XPS-MC for example) must be confirmed with a password. If such a command is performed, a dialogue window opens in which the password must be entered.
The default password is “safety”; as a safety measure, it must be changed to an individual password. The password must contain between 4 and 12 symbols. Any combination of letters and numbers may be used.
The password can be modified with command “Controller - change password”.

Notice!
The password is case sensitive. “Security” and “security” are thus two different passwords.

5.5 Sending a configuration from the PC to the XPS-MC and performing a check

To send a completed configuration from the PC to the safety controller, follow this procedure:

Note: The settings indicated are also sent to the bus system and retrieved by the XPS-MC with the configuration data.

Setting the initial configuration / Modifying a current configuration

1. Apply the 24V DC supply voltage to terminals A1-A2 of the XPS-MC. An automatic check lasting about 2 seconds takes place during which all the LEDs are lit.
2. At the end of the automatic test, all the LEDs except the “Power” LED go off. If the XPS-MC is not yet configured, the yellow “CNF” LED flashes.
3. Connect your PC to the XPS-MC safety controller.
4. Start the XPS-MCWIN software. To set the configuration, the software must be in the configuration mode (default setting).

5. Load and create the configuration to be sent with the XPS-MCWIN software.
6. Begin by saving the configuration again by means of the command “Controller - Download Configuration to Controller” or by clicking on the button . The configuration is sent with comments. If the controller is in RUN mode, the password must be entered.
7. The data transmission begins, and the “CNF” and “COM” LEDs are lit to announce that the configuration data are now being sent.
8. After the download of the configuration to the XPSMC controller, the configuration protocol will be automatically uploaded by the XPS-MCWIN software and displayed in a separate window.
9. In order for the configuration to become effective, it must be validated.

   To do this, click on the "Validate" button, in the new window , give your name and fix the options for the copie of the validated configuration. Then, in the new window give the password of the controller.

   The configuration will be again downloaded and the protocol will then be displayed with the date, the hour, your name and the validation counter stored in the controller (VDC), as well as the running time (OPC) of this configuration, which is saved in the controller.

   This protocol serves as proof of the configuration, and must be carefully analysed, printed, signed and kept.
10. The controller can then be put into RUN mode.

5.6 Loading a configuration

The configuration of a controller can be uploaded at any time, even with the controller not in STOP mode.

1. Connect your PC to the XPS-MC safety controller.
2. Choose the command from the “Controller - Upload Configuration from Controller” menu or click on the button in the toolbar. The configuration is loaded from the XPS-MC and then represented in the usual tree structure.

5.7 Creation of a validated configuration copy

As a condition to create a copy of a validated configuration, the "Enable copying of validated configuration from controller" option must be selected during the validation of the configuration. Under this condition the user is able to make a copy of the validated configuration from the XPS-MC into a binary file at any time. In addition, the "Create a copy of the validated configuration now" option can be selected in order to immediately create such a copy during the validation.

Included with the configuration itself, the following data of the original controller is taken:

1. Validation counter (VDC)
2. Password
3. Validation data (name, date)

4. Device parameters (Modbus parameters, controller number)

This file can be used as a safety copy to transfer the validated configuration to another controller without the need of a new validation.

Saving a validated configuration to a file

To save a validated configuration to a file, follow this procedure:

1. Connect the PC to the controller containing the validated configuration which is free for copy.
2. Choose the command « Controller - Create validated copy ».
   The configuration will be read out of the controller.
3. Enter the save location and file name in the window which appears.
   The copy will be saved as this file.

5.8 Transfer of a validated configuration copy

When a file with a copy of a validated configuration has been made (see chapter 5.7 "Creation of a validated configuration copy") for a certain controller, it is easy to transfer the configuration into another controller, especially for replacement of a XPS-MC unit for service or for installation of controllers in identical machines.

Transferring a validated configuration to a controller

To transfer a validated configuration from a file into a controller, follow this procedure:

1. Connect the PC to the controller in which the validated configuration is to be transferred.
2. Set the controller with the command « Controller - Stop Controller » in the Stop Modus.
   (If the password is unknown, the controller must be started with the pressed reset button. Afterwards the Controller behave as with the first start-up and the old configuration can no more be started).
3. Choose the command « Controller - Transfer validated copy ».
4. Indicate in the appearing window the memory place and the name of the file as the copy of the configuration.
   The validated configuration is picked out from the file and transferred into the connected Controller.

The new controller now has the validated configuration, including the validation counter (VDC), the password, the validation data (name, date) and the device parameters (Modbus parameters, controller number).
It can be used like the original controller from which the copy was made from, except that the running time (OPC) of the configuration is set to zero.

In order to put the controller in the RUN mode after the download, the supply voltage must be stopped and restored.

5.9 Upload protocol

1. The controller has to be put in STOP mode with the menu « Controller - Stop Controller » and entering the password.
2. Choose the menu « Controller - Upload protocol ». The protocol will be displayed in a separate window and can be printed.

Notice!
This print is just a work tool.
The only proof of the correctness of the configuration is the validated and signed protocol. (see chapter 5.5 "Sending a configuration from the PC to the XPS-MC and performing a check")

5.10 Modifying the bus configuration

To modify the bus configuration of an XPS-MC, follow this procedure:

1. If not already done, connect your PC to the XPS-MC safety controller as per the description in chapter 5.5 concerning the equipment.
2. Stop the controller with the command “Controller - Stop Controller”. The safety outputs are then deactivated.
3. Load the configuration data corresponding to this controller, or load the saved configuration of the XPS-MC on the PC see chapter 5.5 "Sending a configuration from the PC to the XPS-MC and performing a check".
4. Choose MODBUS from the “Controller - Controller setup” menu.
5. In the window which appears, indicate the bus system values for all the controllers of this configuration. A controller with the same configuration can also be set into service for different MODBUS systems.
6. Click on the button Download . The configuration is sent with comments.
7. Use the XPS-MC in the RUN mode with the command “Controller - Run Controller”.

6 XPS-MC safety controller diagnostics

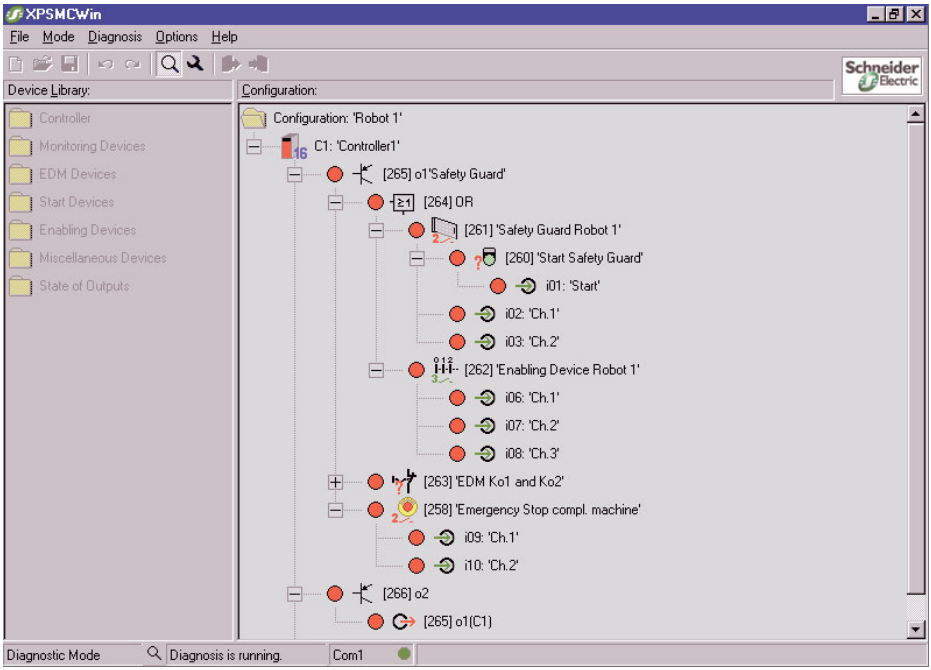
Various states of an XPS-MC can be loaded from a PC for fault diagnostics and error finding purposes.

Notice!
During the fault diagnostics, the XPS-MC continues to operate without being influenced, to allow the progress of a complete machine cycle to be monitored.

The fault diagnostic mode is activated as follows:

1. Connect your PC to the XPS-MC safety controller in operation.
2. Start the XPS-MCWIN software.
3. Open a configuration from a file or upload the configuration from the controller. During the opening of a saved configuration from a file, the configuration must correspond to the one already in the controller. The controller configuration must have been validated.
4.) Choose the diagnostic mode. To do this, choose the menu “Mode - Diagnostic” or click on the icon for the diagnostic mode. The window will become grey, to show that no modifications can be made.

In the “Configuration” window, a coloured circle is placed next to each function symbol of the configuration tree. The colour indicates the current status of the corresponding function.



A red point means:
the safety output concerned is deactivated, or this device has not been validated (for example, protection door open, emergency stop not initiated, etc.), or the concerned input is opened.

A red point with a yellow flash means:
An error exists for this device (input/output). The error message will then be shown by clicking on the device.

A green point means:
the safety output concerned is activated, or this device has been validated (for example, protection door closed, emergency stop initiated, etc.), or the concerned input is closed.

A green point with a hourglass means:
This output has a category 1 stop.
The commutation conditions are no longer fulfilled, but the time delay is not yet finished.

A yellow point means:
this component or this outputs are enabled (i.e. the starting conditions are fulfilled), but not yet started.

A grey point means:
the safety output concerned is not used, or the PC has not yet received the fault diagnostics data from the XPS-MC (all the points are then greyed).

The state of the inputs of the different devices will be shown in the same way by clicking on the symbol of the device.

A special menu will appear by clicking the right mouse button within the diagnostic window.

When “Overview” is selected from the menu, a new window appears displaying the diagnostics of all the inputs and outputs of the controller.

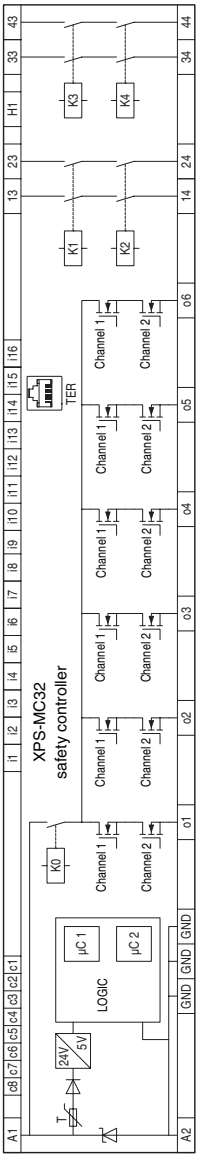
The “Stop diagnostic” in the menu selection stops the diagnostics. The diagnostic window is then frozen.

The “Run diagnostic” in the menu selection begins the diagnostics.

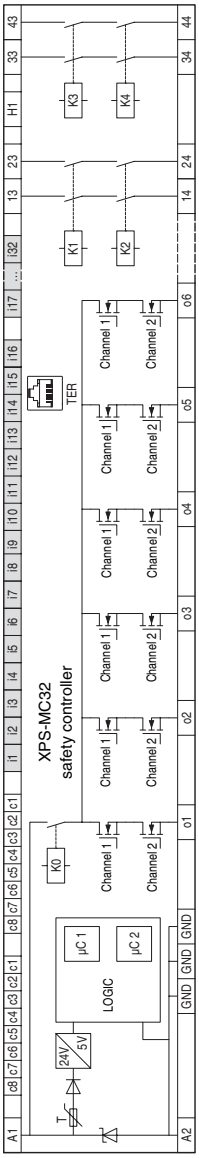
7 Connection drawing / application examples

7.1 Electrical diagram for the XPS-MC16 / XPS-MC32

XPS-MC16



XPS-MC32 – with 32 inputs i1…i32, otherwise identical



Description of terminals:

A1/A2:	24V supply ⎓
GND:	ground connection (= A2 potential) for loads on o1…o6
c1…c8:	control outputs
i1…i16 (or i1…i32):	safety inputs
H1:	muting lamp connection
o1…o6:	semi-conductor safety outputs
13/14,23/24,33/34,43/44:	voltage-free relay safety outputs
TER:	8 pin RJ45 connector for connecting a PC for configuration setting or fault diagnostics (Bus system with the Modbus protocol) and for the connecting of other Modbus modules (API, terminals, etc.)

⚠ DANGER

HAZARDOUS VOLTAGE

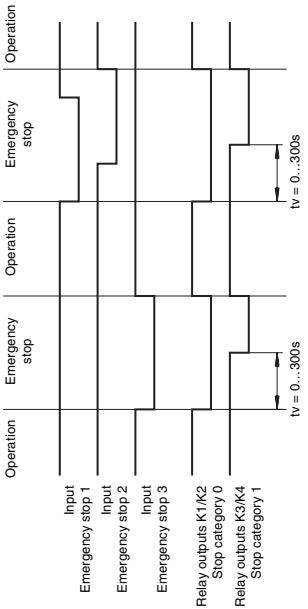
Disconnect all power before servicing equipment.

Electric shock will result in death or serious injury.

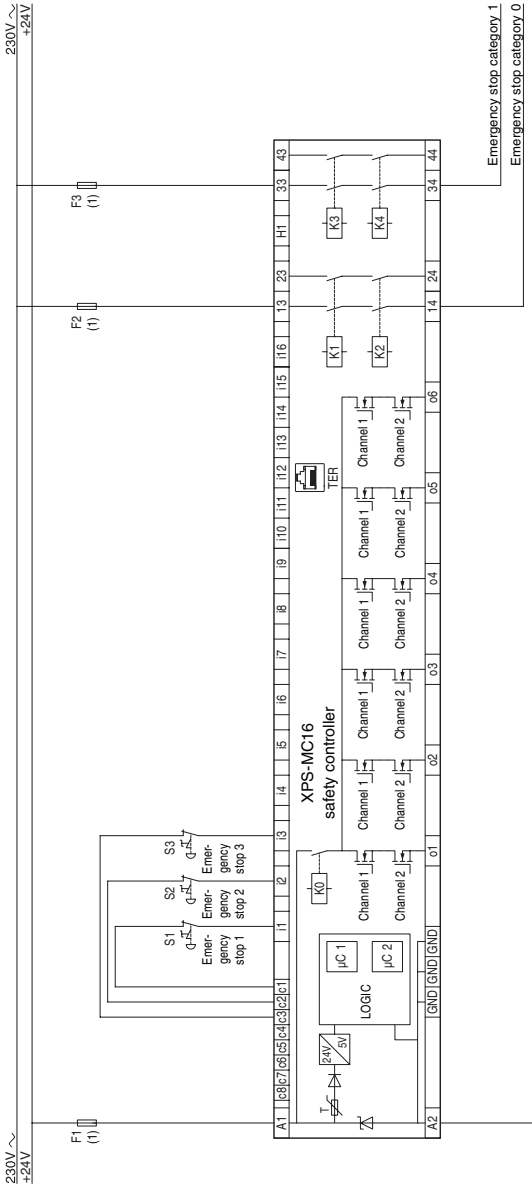
ENGLISH

7.2 One-channel emergency stop, with automatic start

7.2.1 Functional diagram



7.2.2 Wiring diagram



XPS-MC32 with 32 inputs i1...i32, otherwise identical

⚠ DANGER

HAZARDOUS VOLTAGE

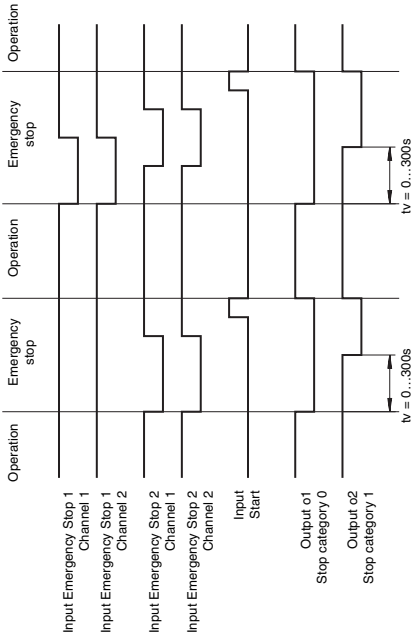
Disconnect all power before servicing equipment.

Electric shock will result in death or serious injury.

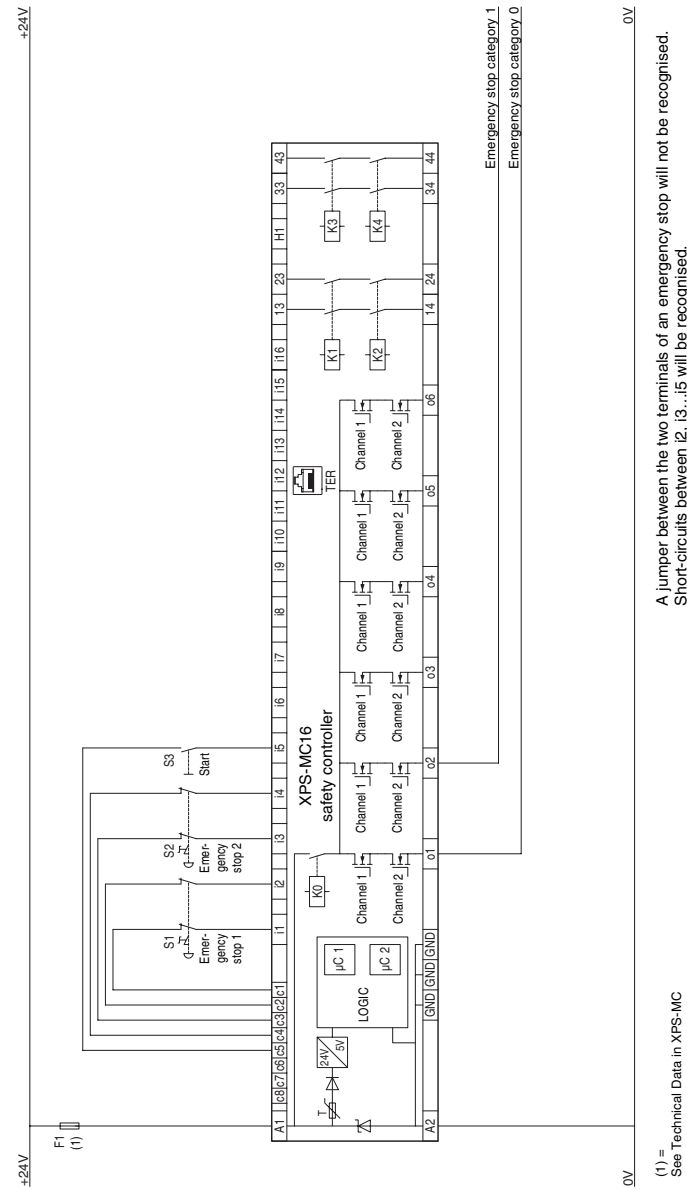
ENGLISH

7.3 Two-channel emergency stop, with start button

7.3.1 Functional diagram



7.3.2 Wiring diagram

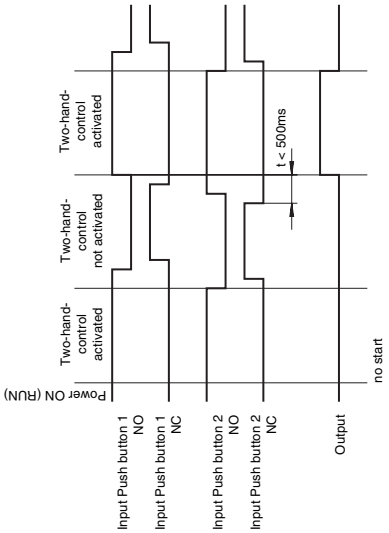


XPS-MC32 with 32 inputs i1...i32, otherwise identical

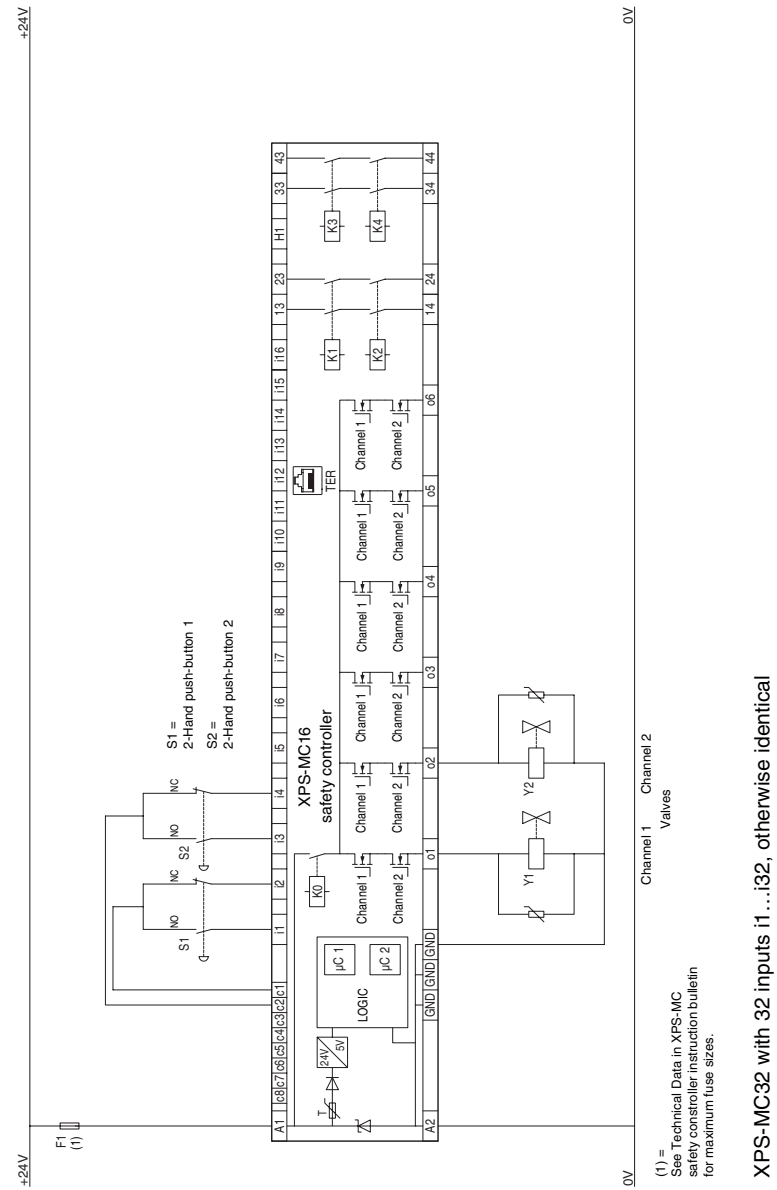
ENGLISH

7.4 Two-hand control

7.4.1 Functional diagram



7.4.2 Wiring diagram

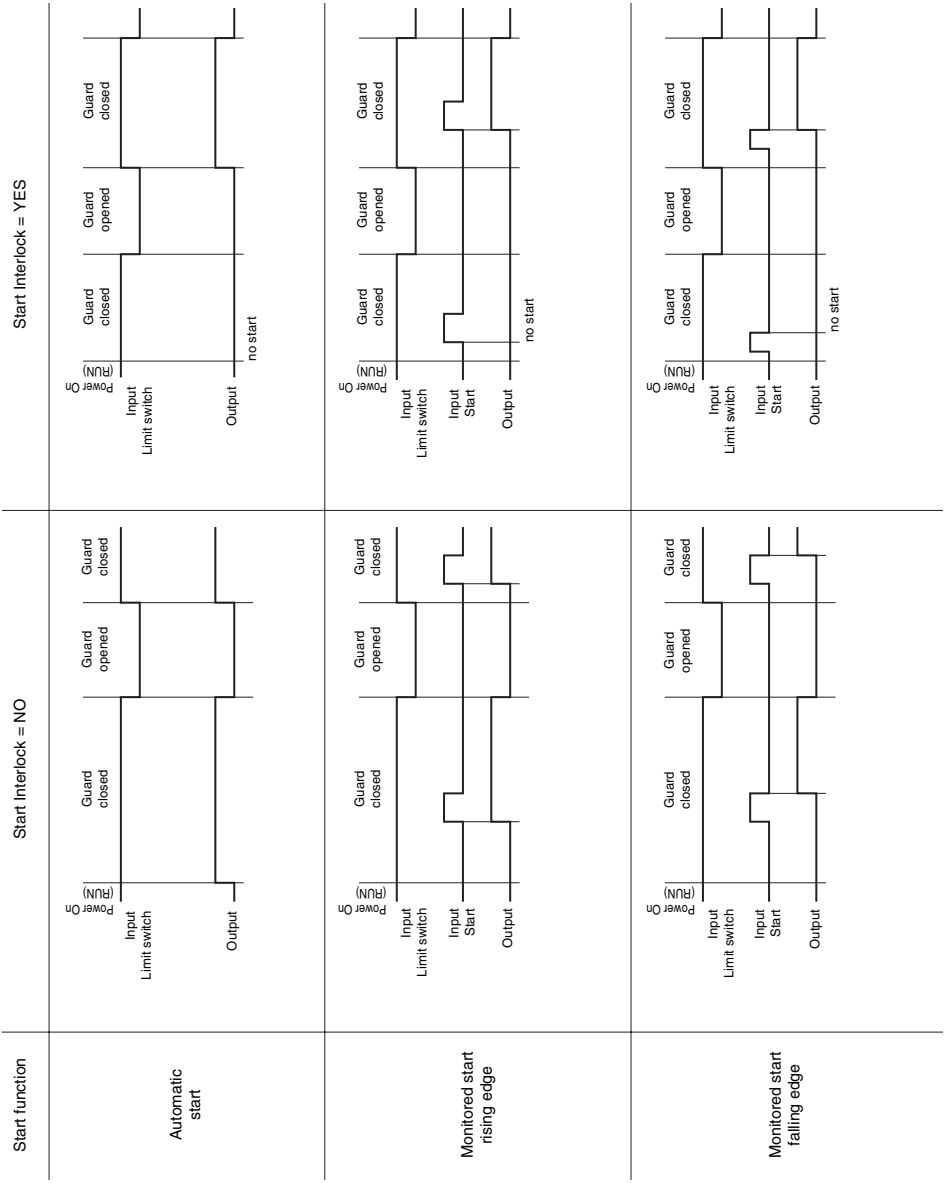


XPS-MC32 with 32 inputs i1…i32, otherwise identical

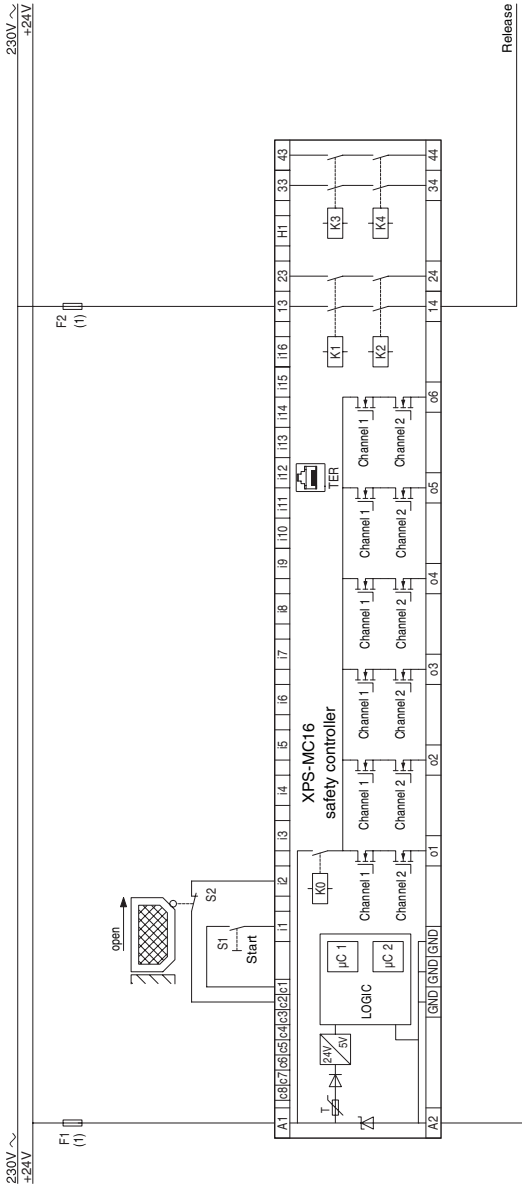
ENGLISH

7.5 Safety guard with one channel

7.5.1 Functional diagram



7.5.2 Wiring diagram



XPS-MC32 with 32 inputs i1…i32, otherwise identical

⚠ DANGER

HAZARDOUS VOLTAGE

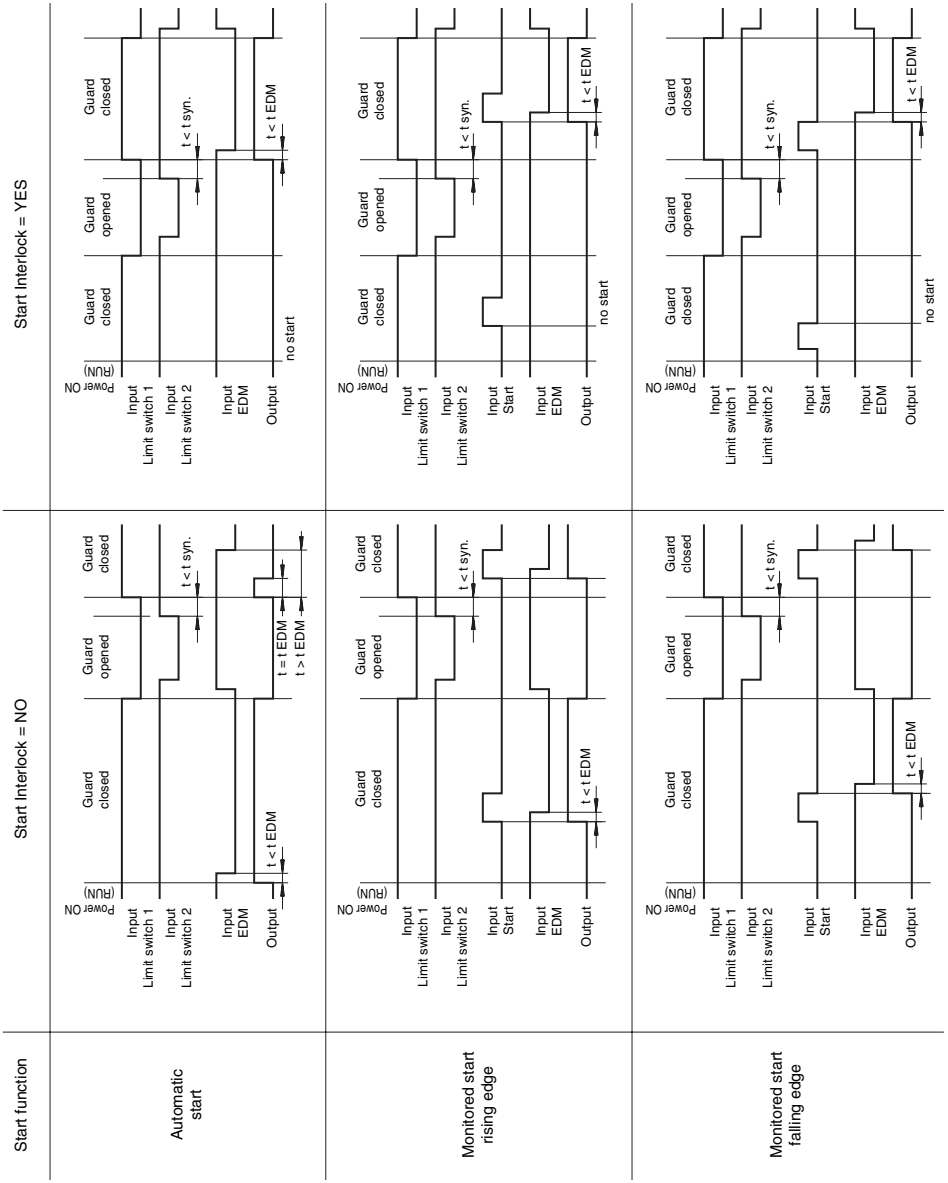
Disconnect all power before servicing equipment.

Electric shock will result in death or serious injury.

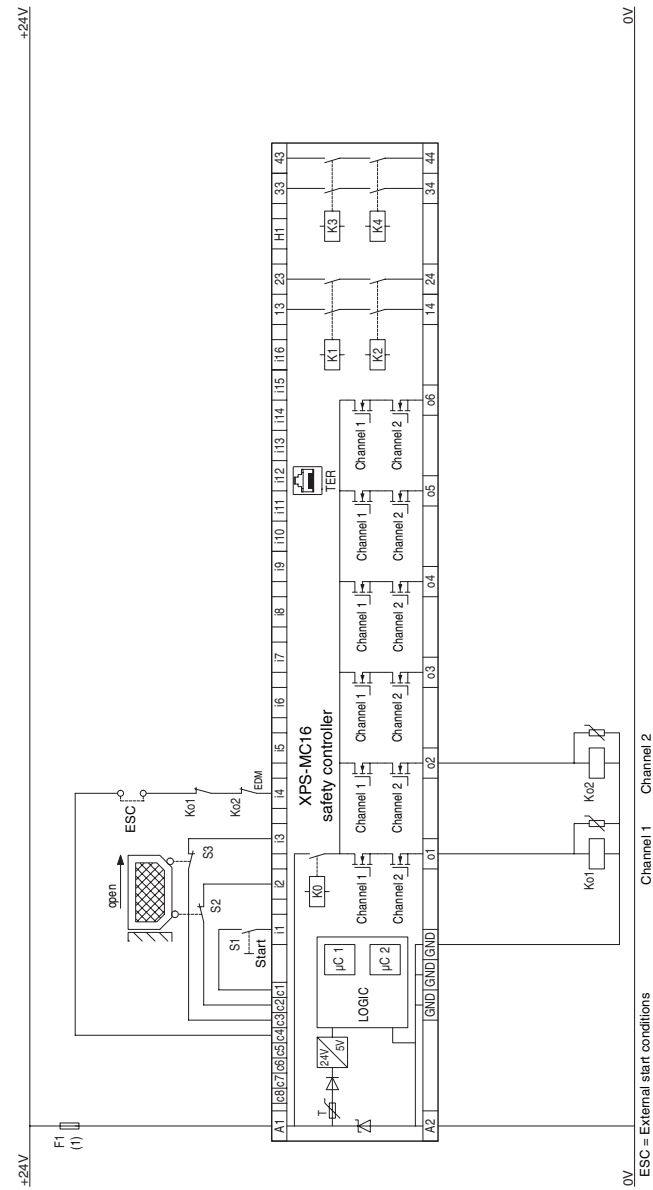
ENGLISH

7.6 Safety guard with two channels

7.6.1 Functional diagram



7.6.2 Wiring diagram



ESC = External start conditions

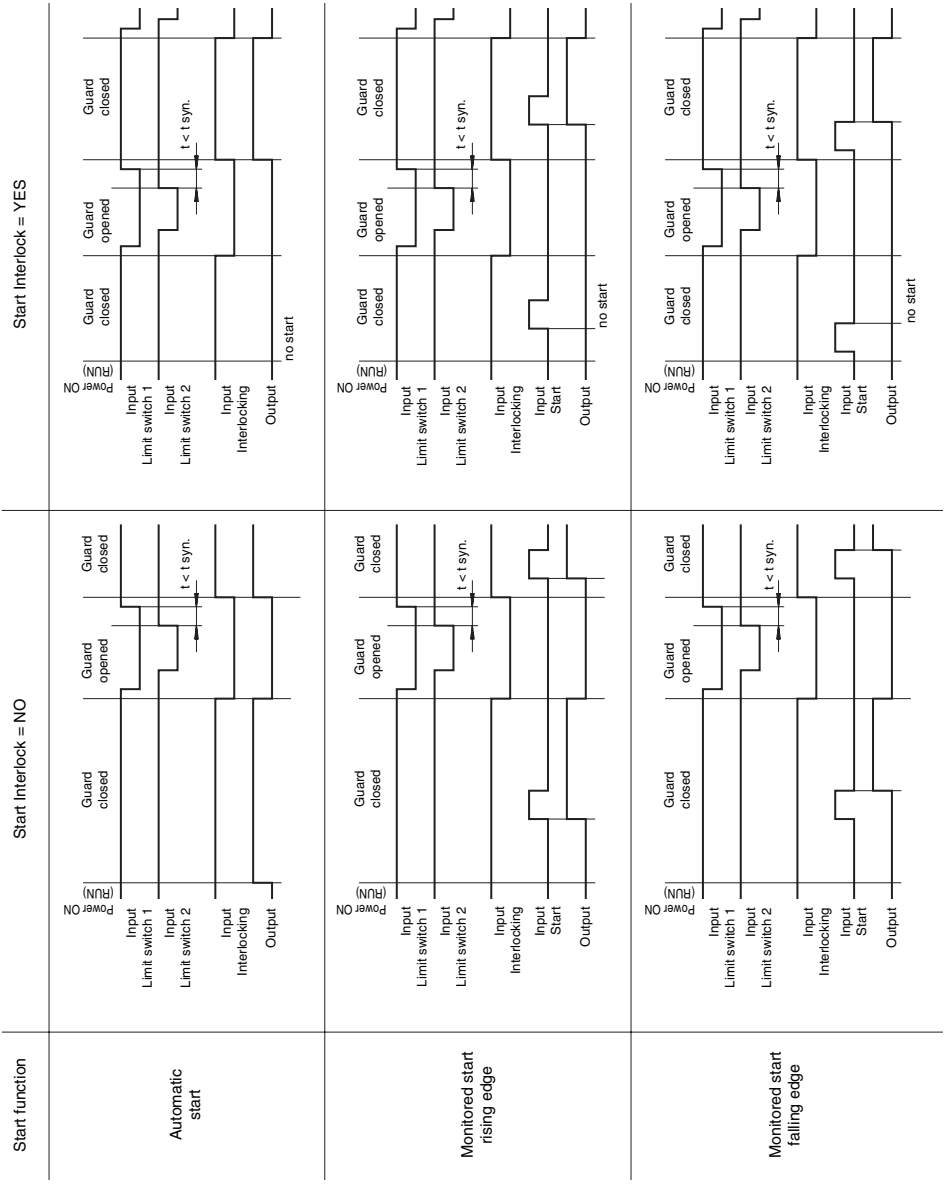
(1) = See Technical Data in XPS-MC safety controller instruction bulletin for maximum fuse sizes.

XPS-MC32 with 32 inputs i1…i32, otherwise identical

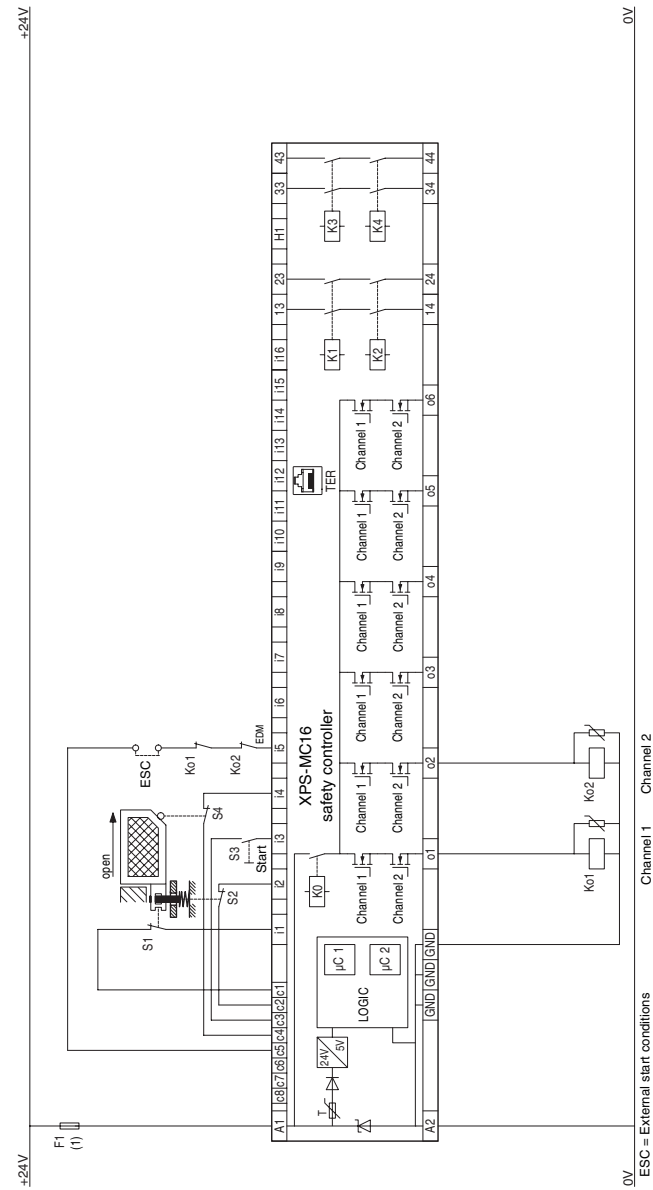
ENGLISH

7.7 Safety guard with 2 channels and lock

7.7.1 Functional diagram



7.7.2 Wiring diagram

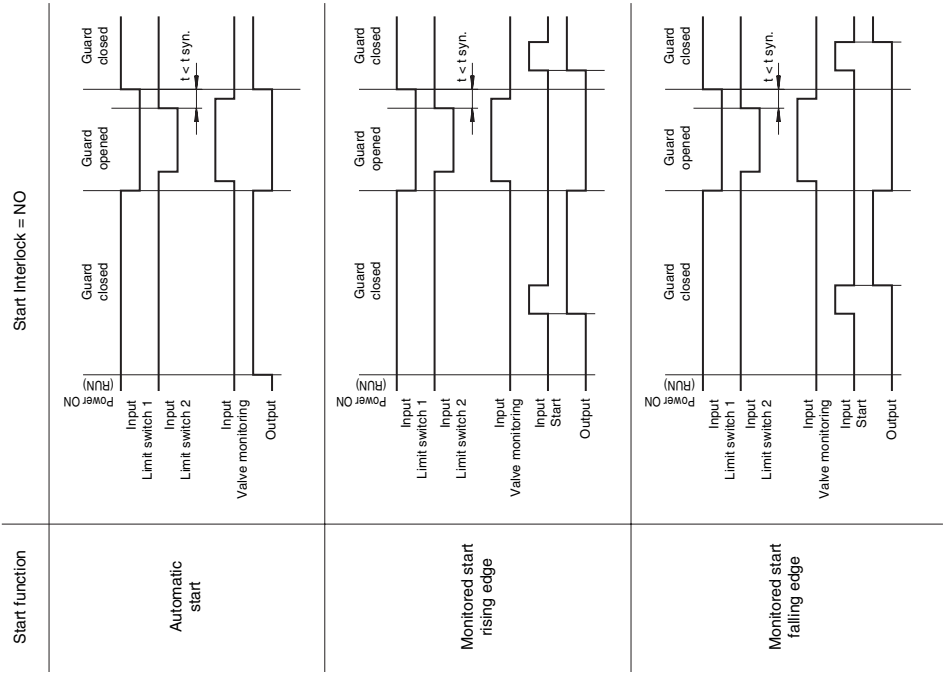


XPS-MC32 with 32 inputs i1…i32, otherwise identical

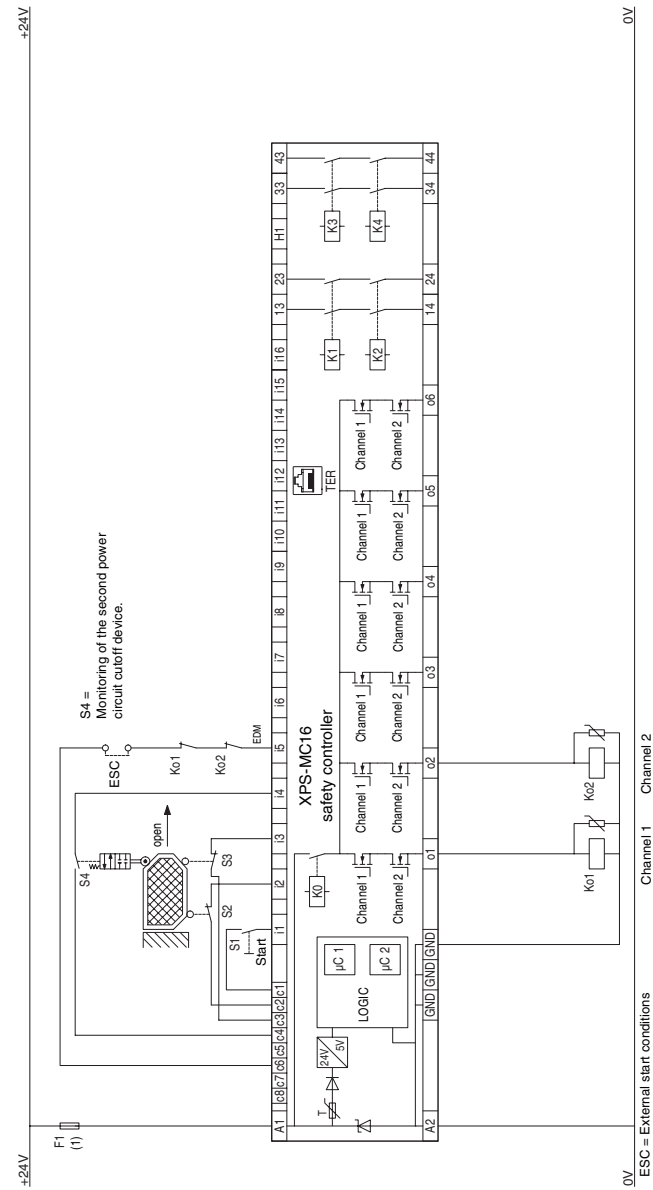
ENGLISH

7.8 Injection molding machines

7.8.1 Functional diagram

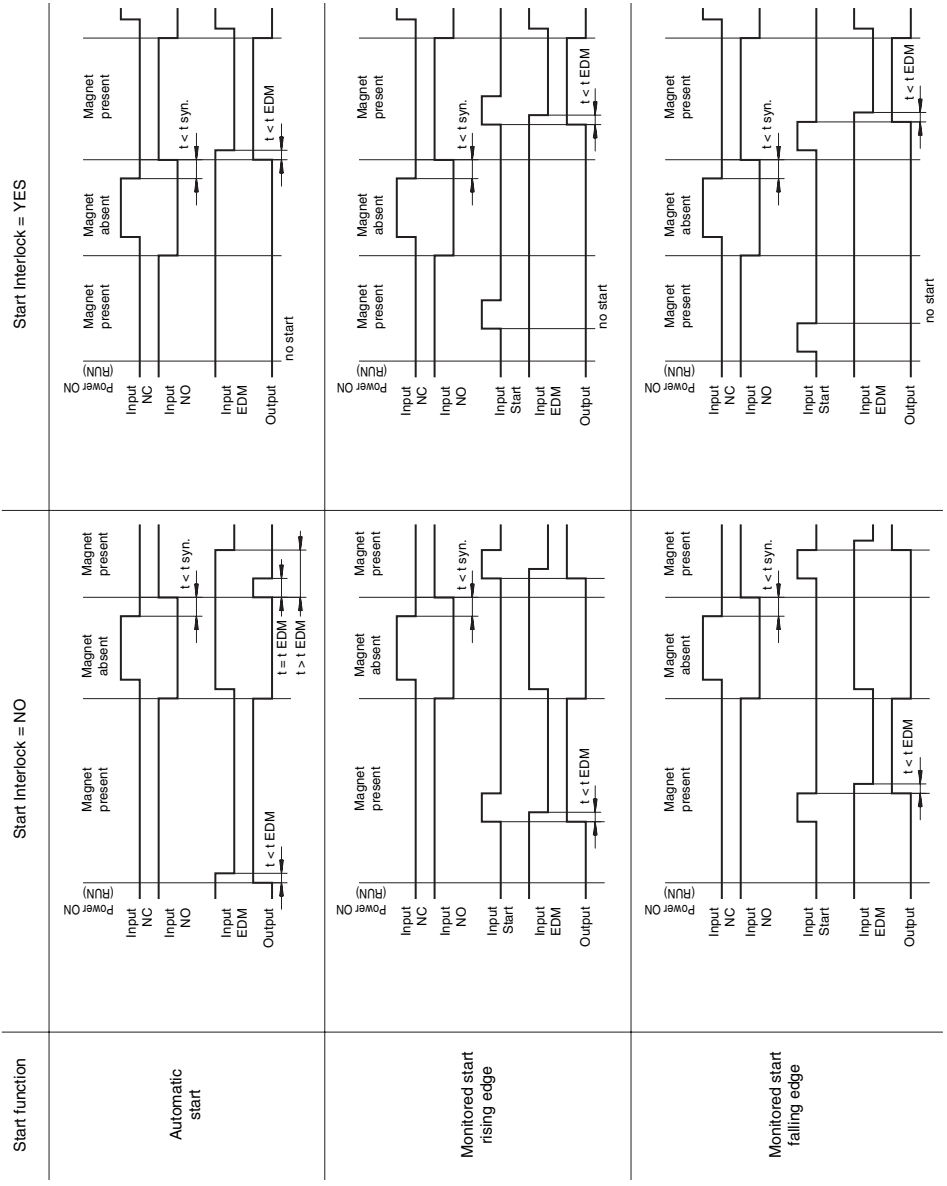


7.8.2 Wiring diagram

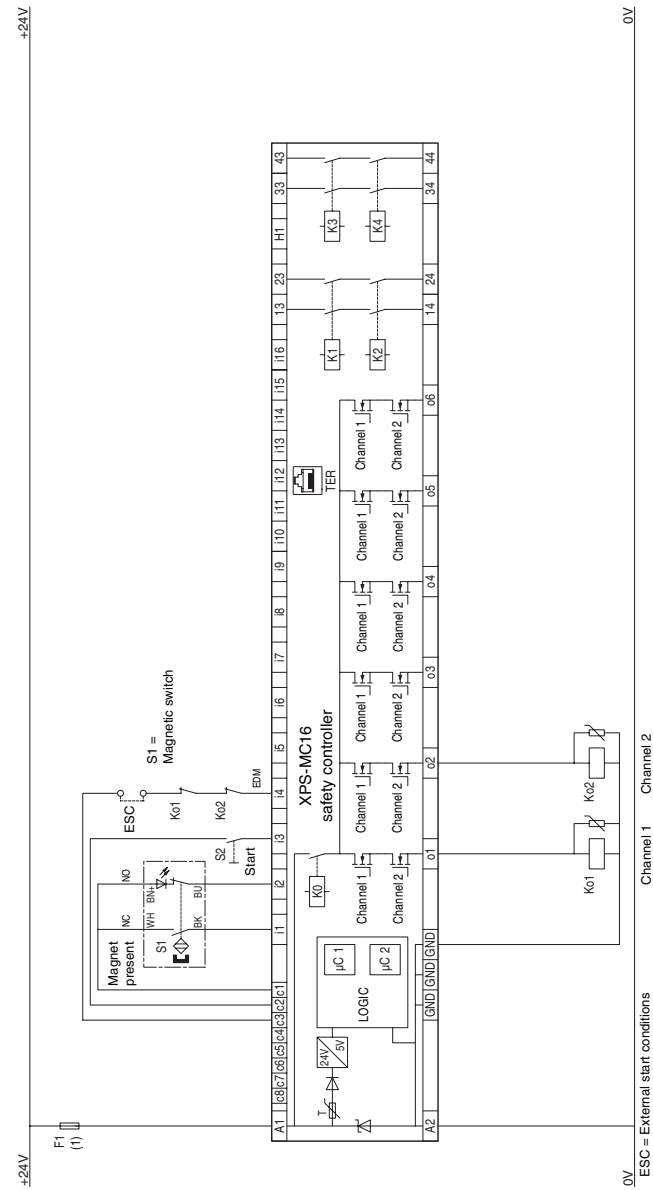


7.9 Magnetic switch monitoring

7.9.1 Functional diagram



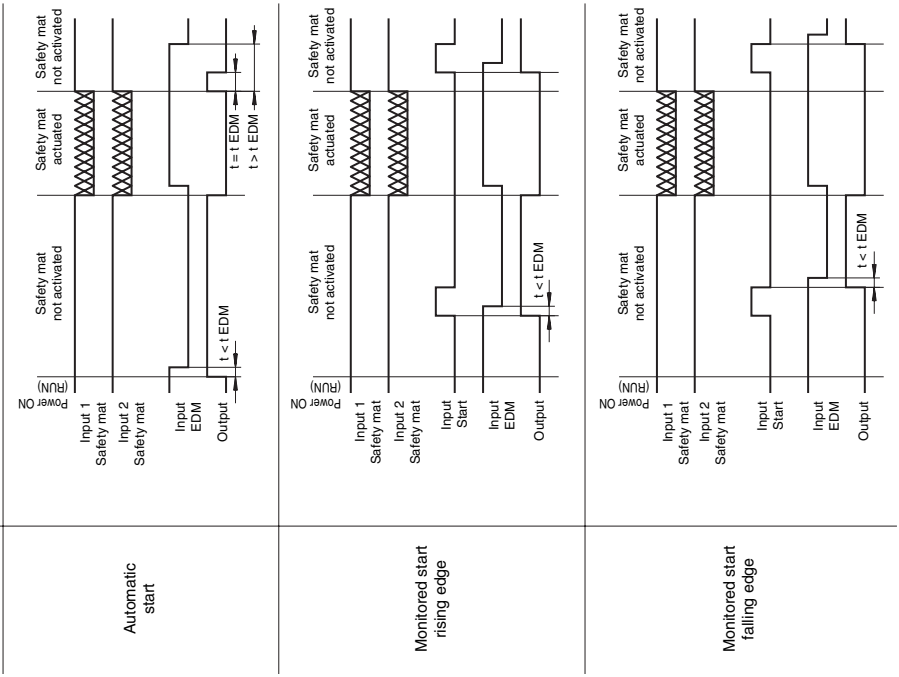
7.9.2 Wiring diagram



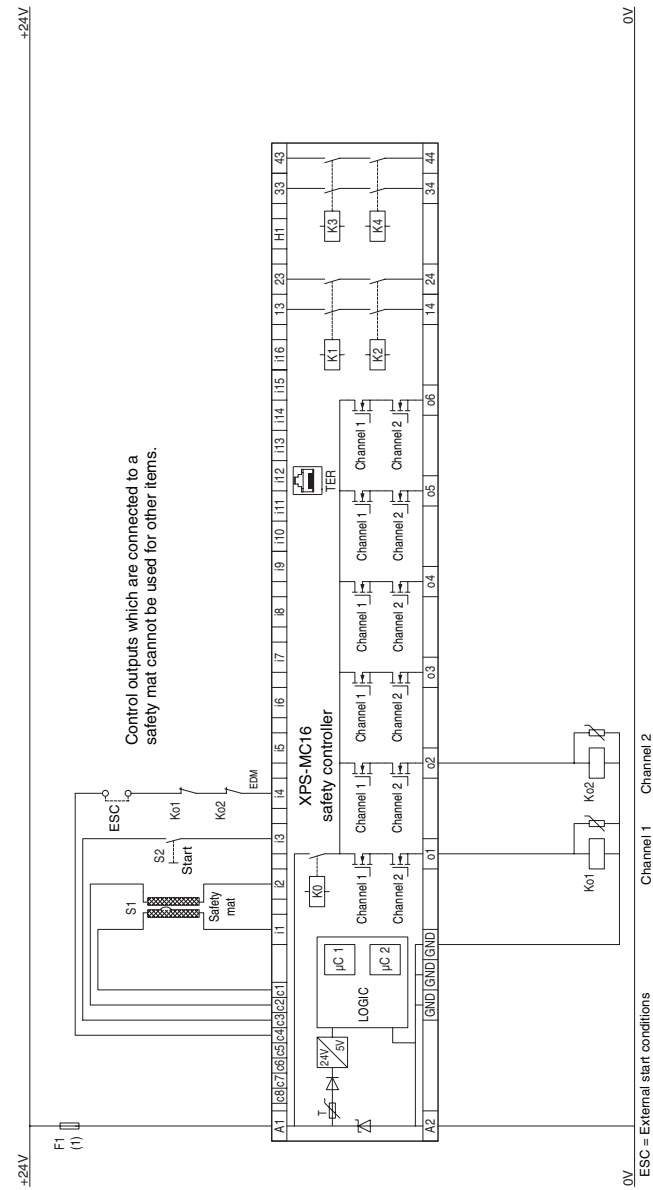
XPS-MC32 with 32 inputs i1…i32, otherwise identical

7.10 Monitoring of safety mats and sensitive edges

7.10.1 Functional diagram



7.10.2 Wiring diagram

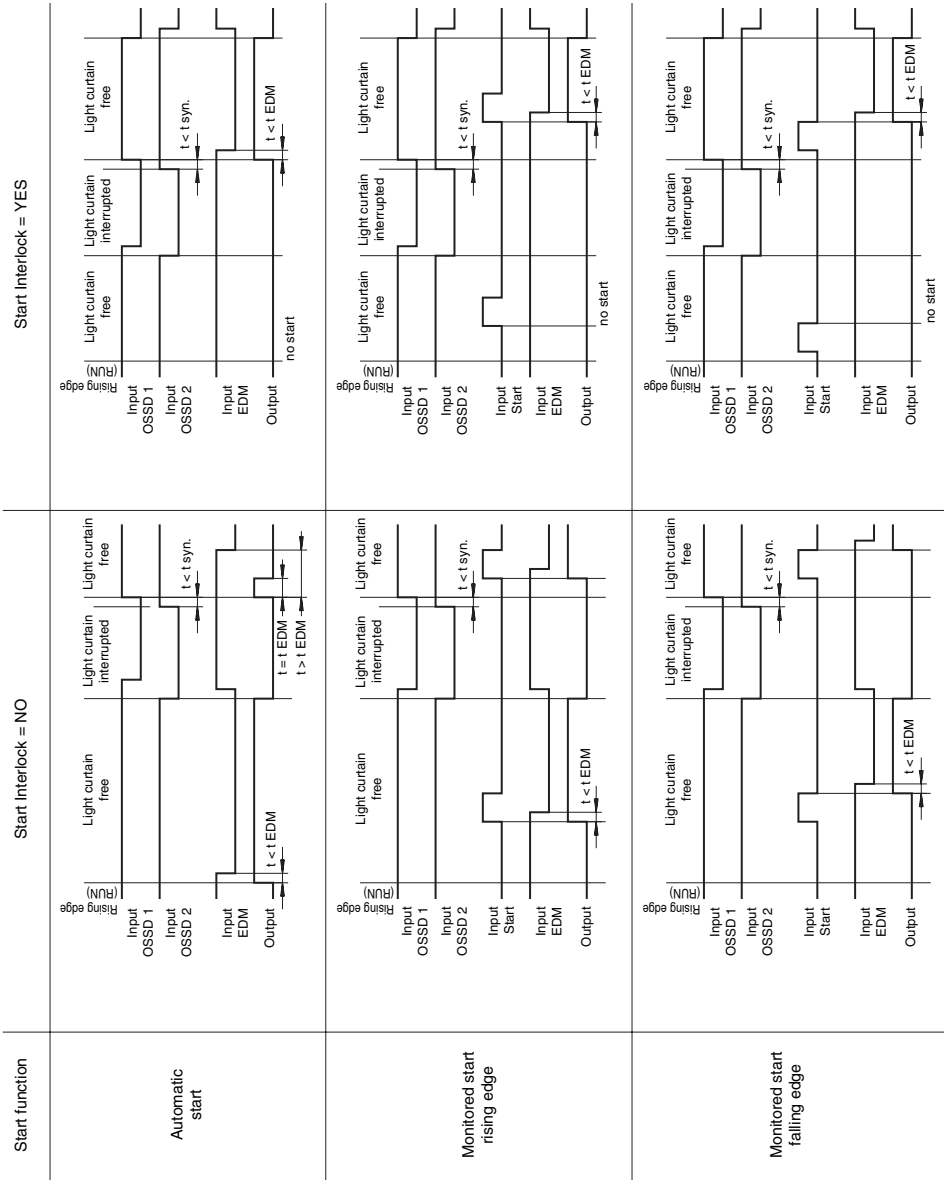


XPS-MC32 with 32 inputs i1…i32, otherwise identical

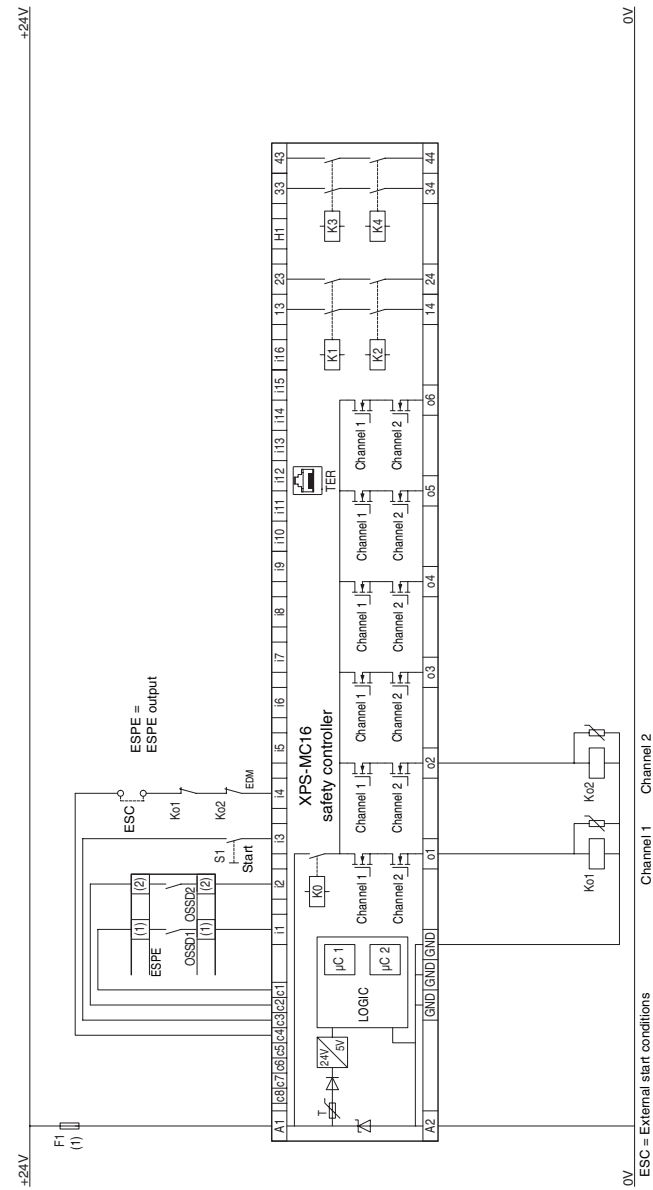
ENGLISH

7.11 Light curtains with relay outputs

7.11.1 Functional diagram



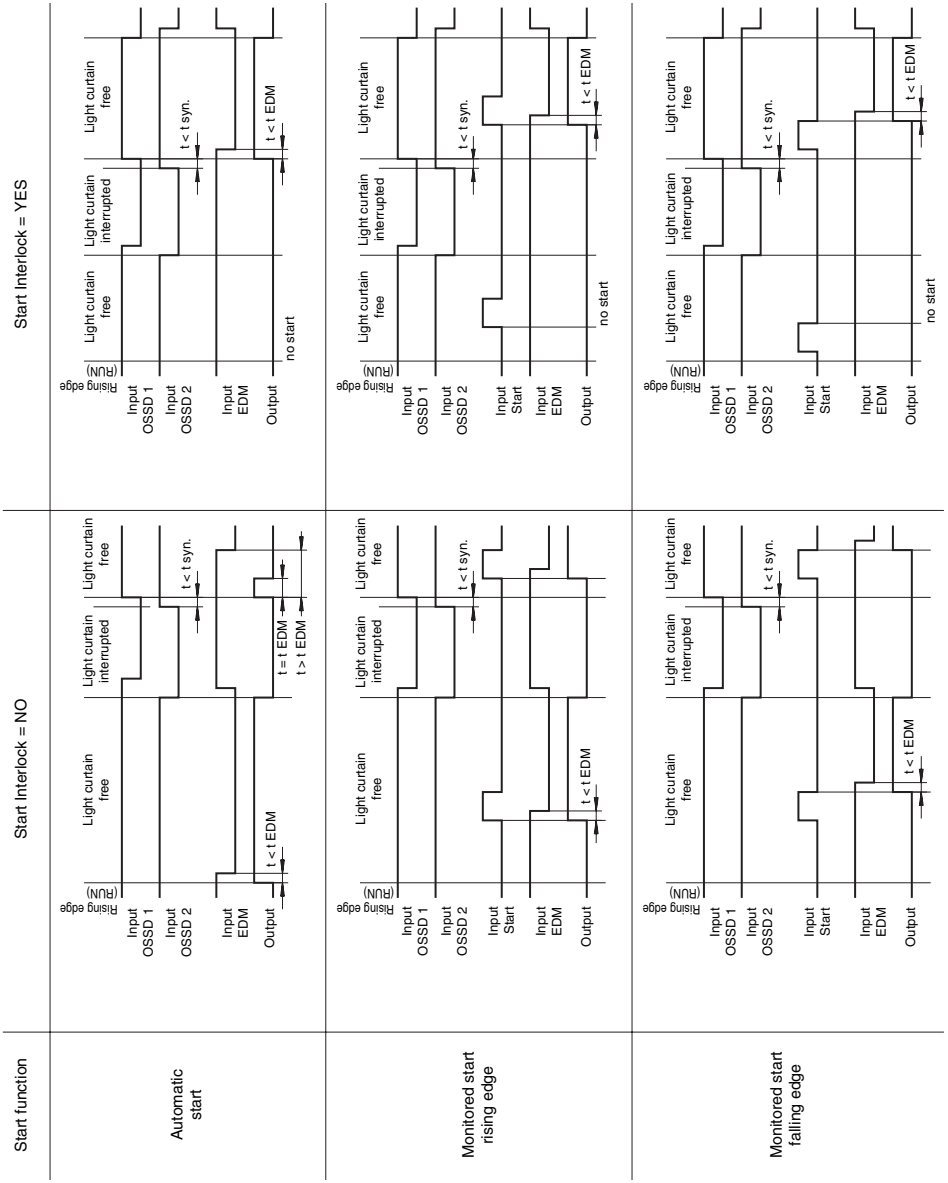
7.11.2 Wiring diagram



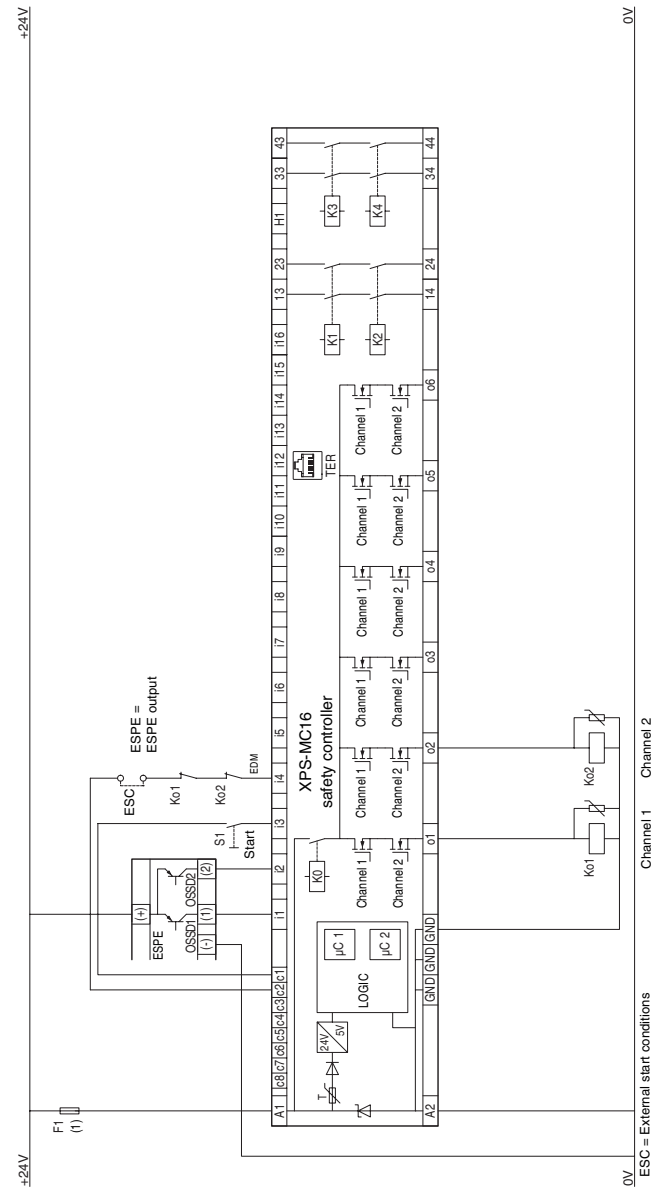
XPS-MC32 with 32 inputs i1…i32, otherwise identical

7.12 Light curtains with solid-state outputs

7.12.1 Functional diagram



7.12.2 Wiring diagram



XPS-MC32 with 32 inputs i1…i32, otherwise identical

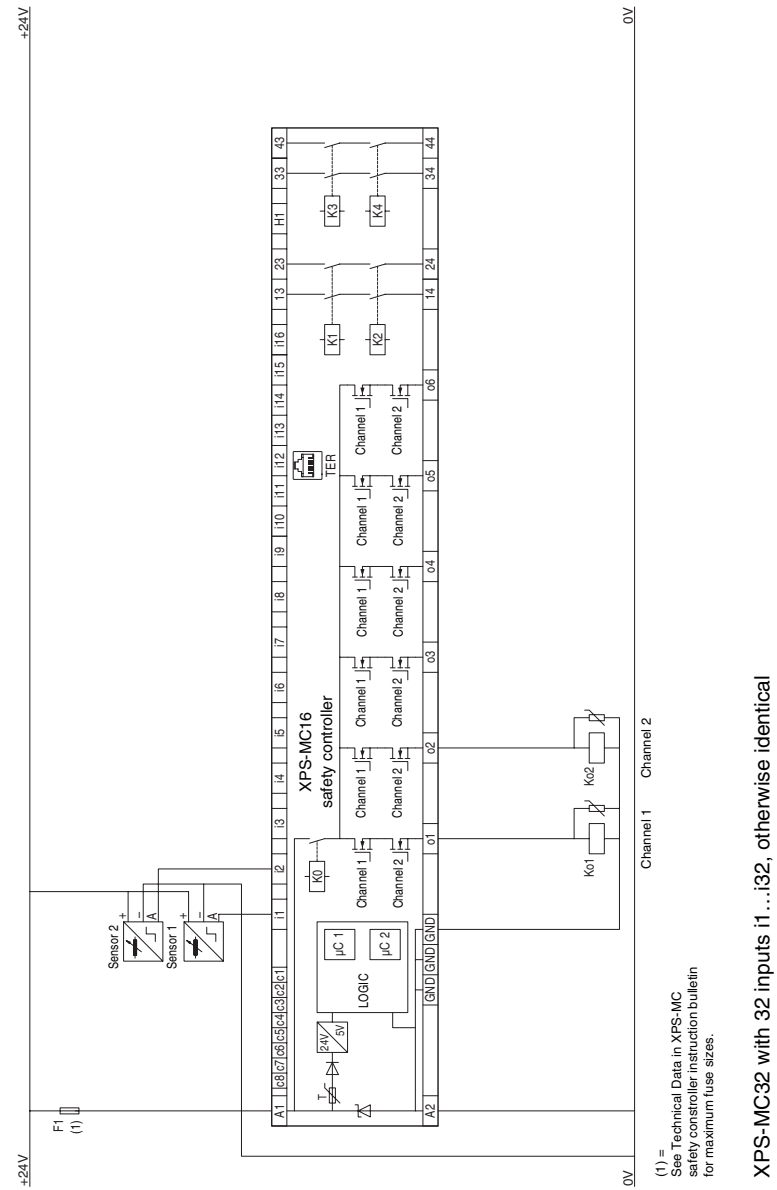
7.13 Zero speed detection

7.13.1 Functional diagram

Sensor control:

Notice !
It is vital to use inputs i1 and i2 for zero speed detection.
The two sensors must be arranged so that only one sensor s activated at each one time.
If the inputs are in the low state, the zero speed signal will disappear after t=1/f seconds and an opencircuit will be indicated.
If the 2 inputs are in the high state, the zero speed signal will disappear after t=1/f seconds and a shortcircuit will be indicated.
If the 2 inputs are in the high or low state after starting, no enabling will take place.

7.13.2 Wiring diagram

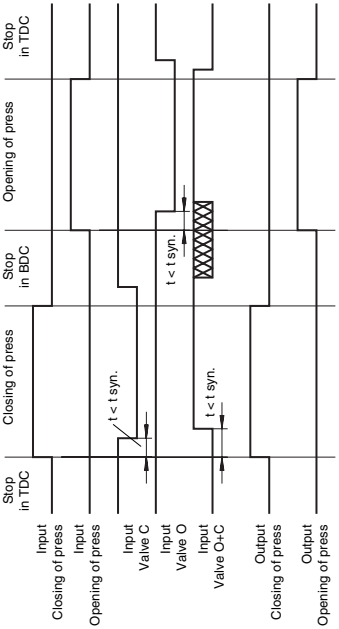


XPS-MC32 with 32 inputs i1…i32, otherwise identical

ENGLISH

7.14 Valve control on a three-valve hydraulic press

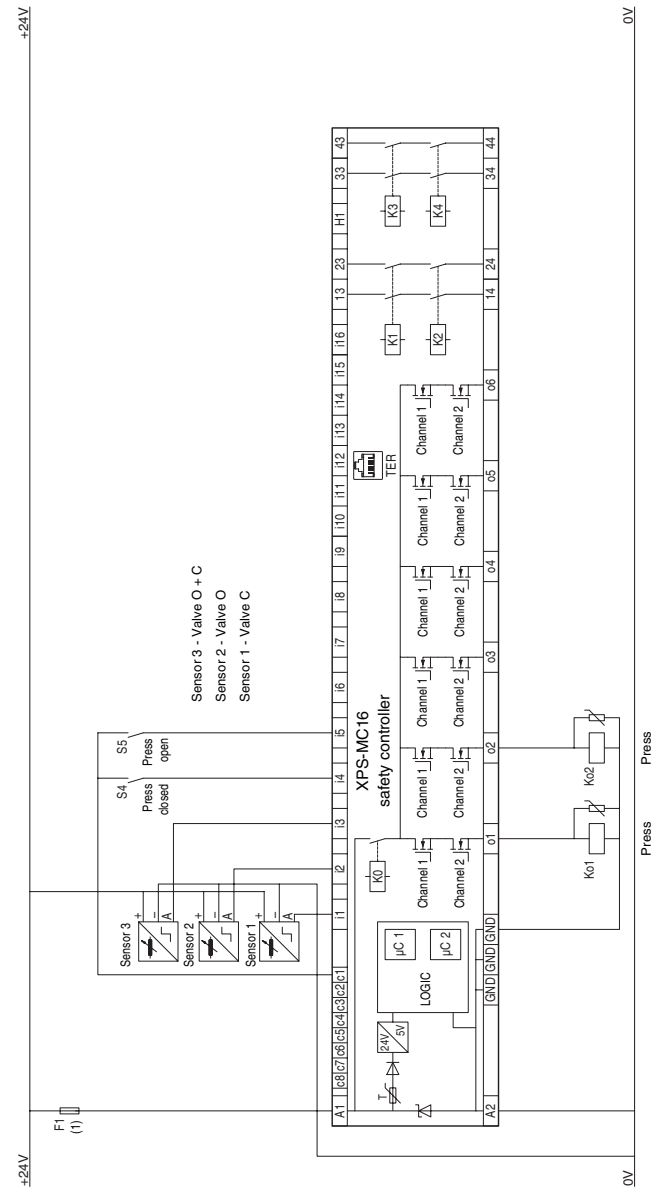
7.14.1 Functional diagram



Sensor signals at valve level:

Valve	Sensor	Stop (opened)	Pressing (Closing)	Stop (closed)	Retraction (Opening)
Valve C	1				
Valve O	2				
Valve O + C	3				

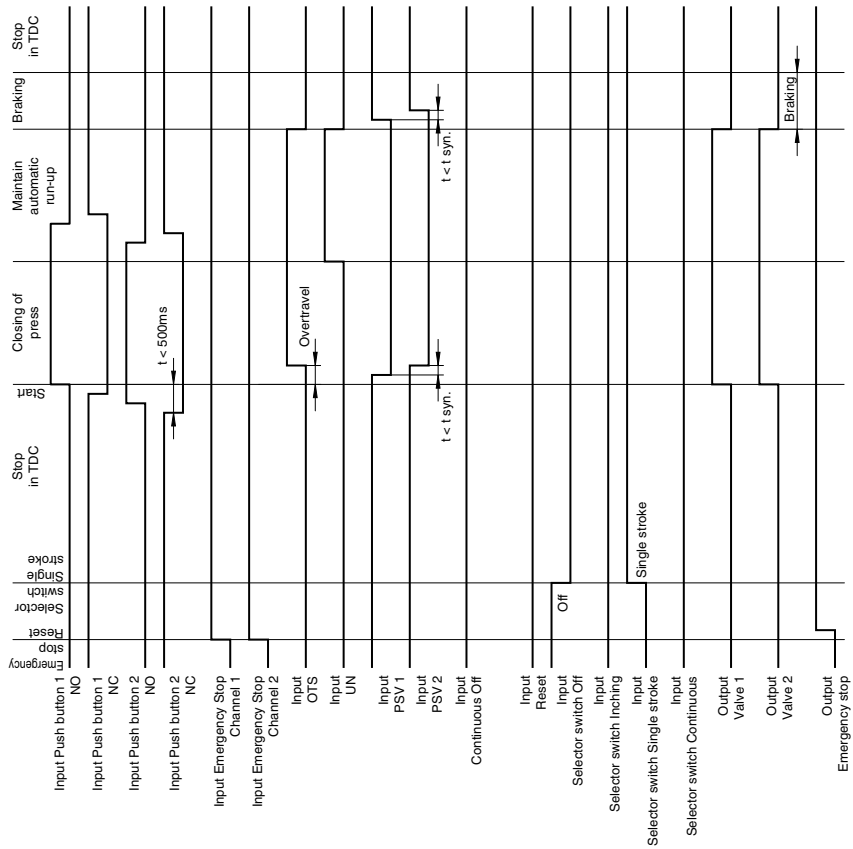
7.14.2 Wiring diagram



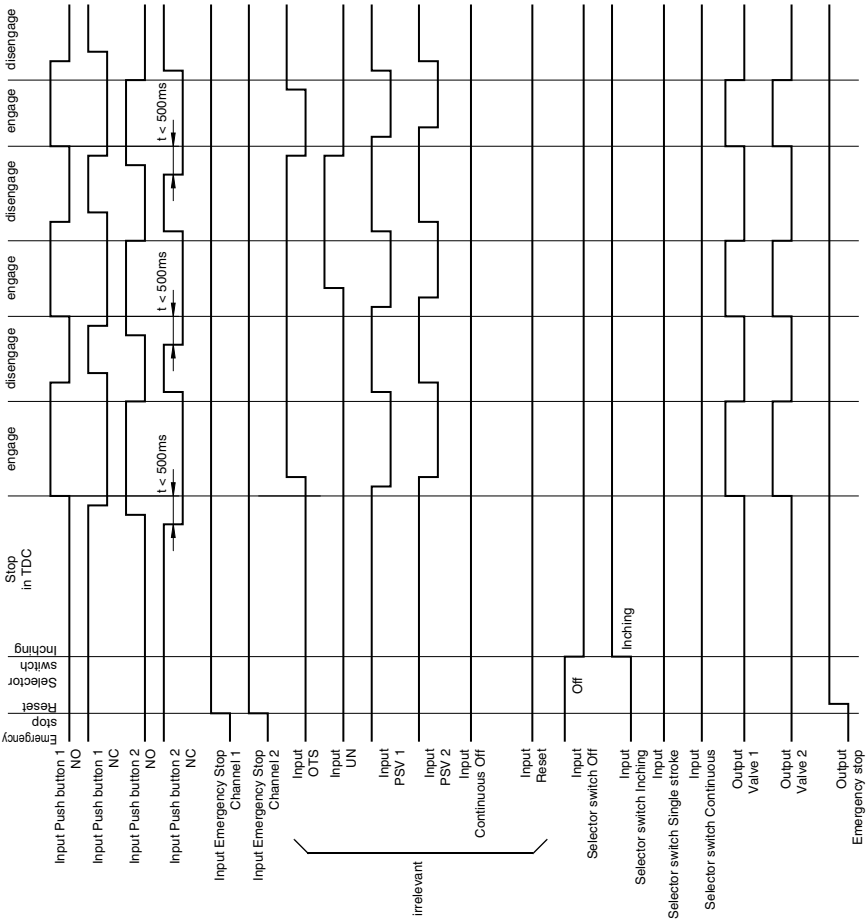
XPS-MC32 with 32 inputs i1…i32, otherwise identical

7.15 Eccentric press with valve control

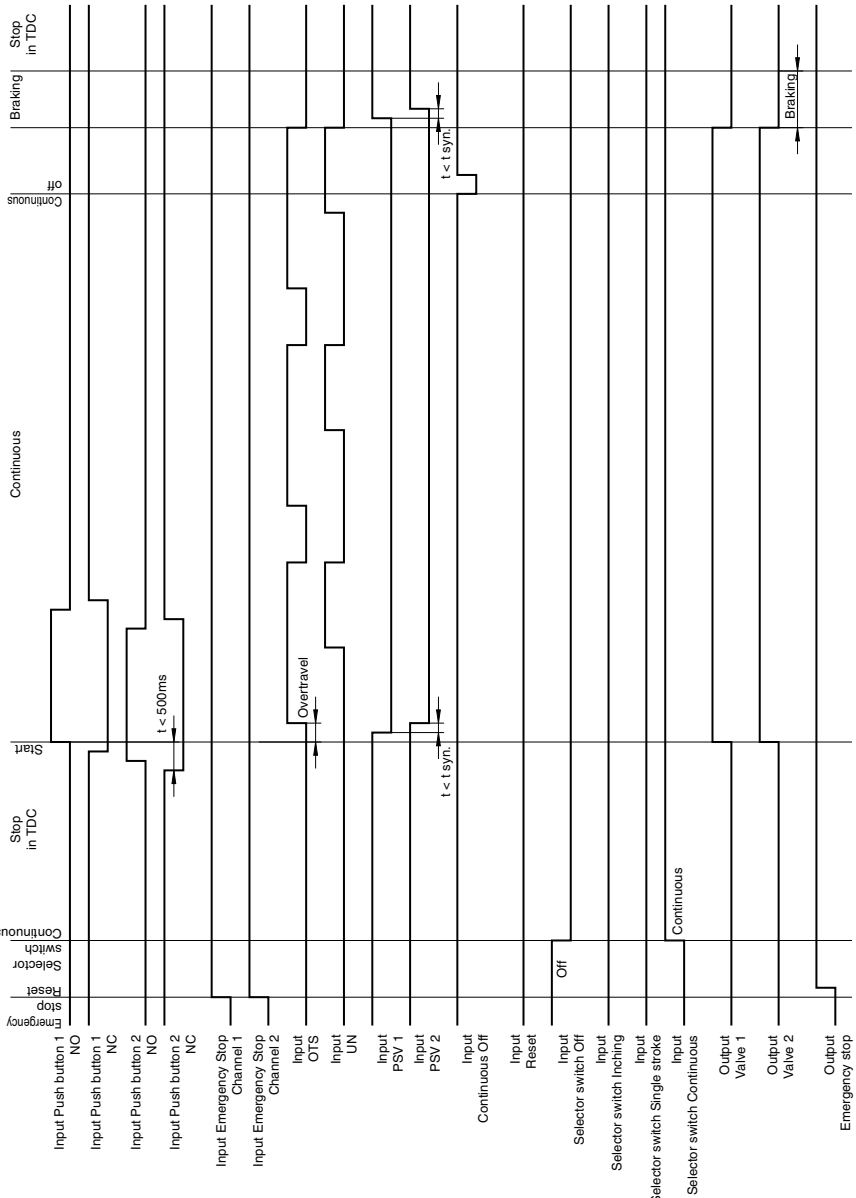
7.15.1 Functional diagram – Mode Single stroke



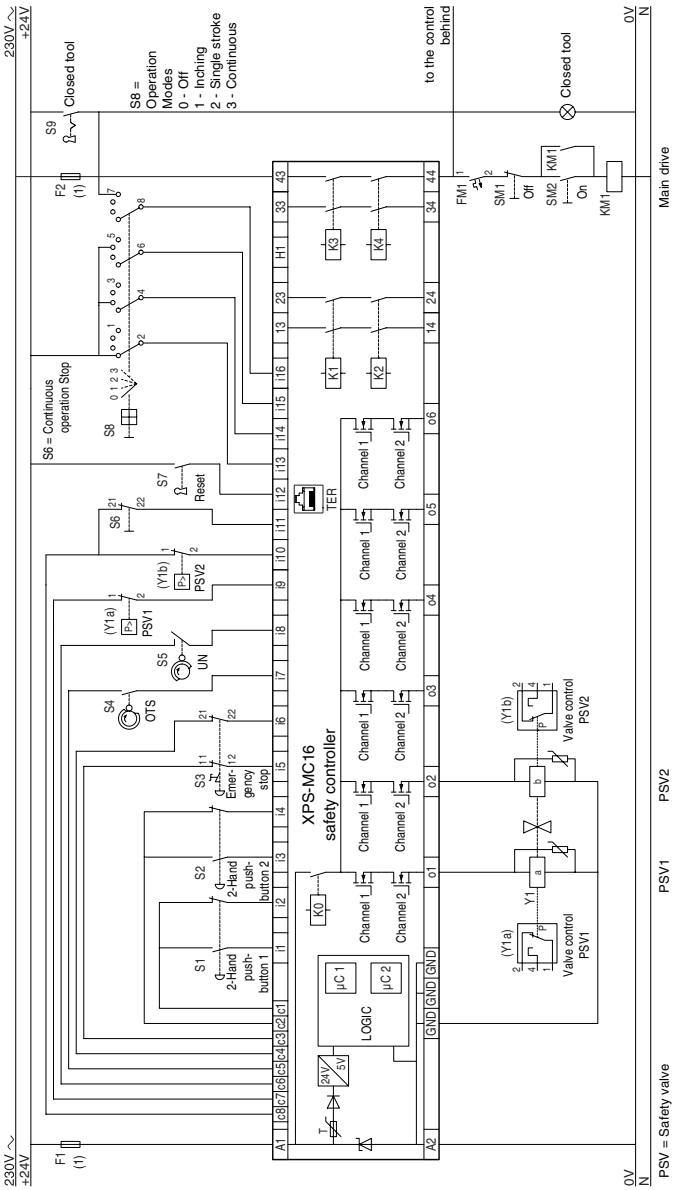
7.15.2 Functional diagram – Mode Inching



7.15.3 Functional diagram – Mode Continuous



7.15.4 Wiring diagram



XPS-MC32 with 32 inputs i1…i32, otherwise identical

⚠ DANGER

HAZARDOUS VOLTAGE

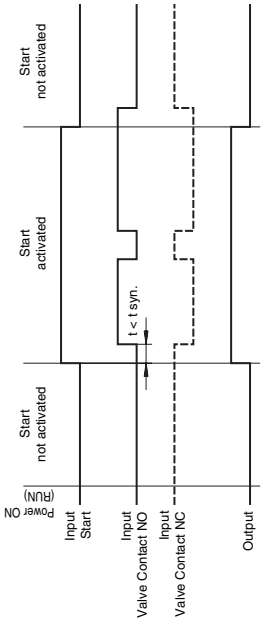
Disconnect all power before servicing equipment.

Electric shock will result in death or serious injury.

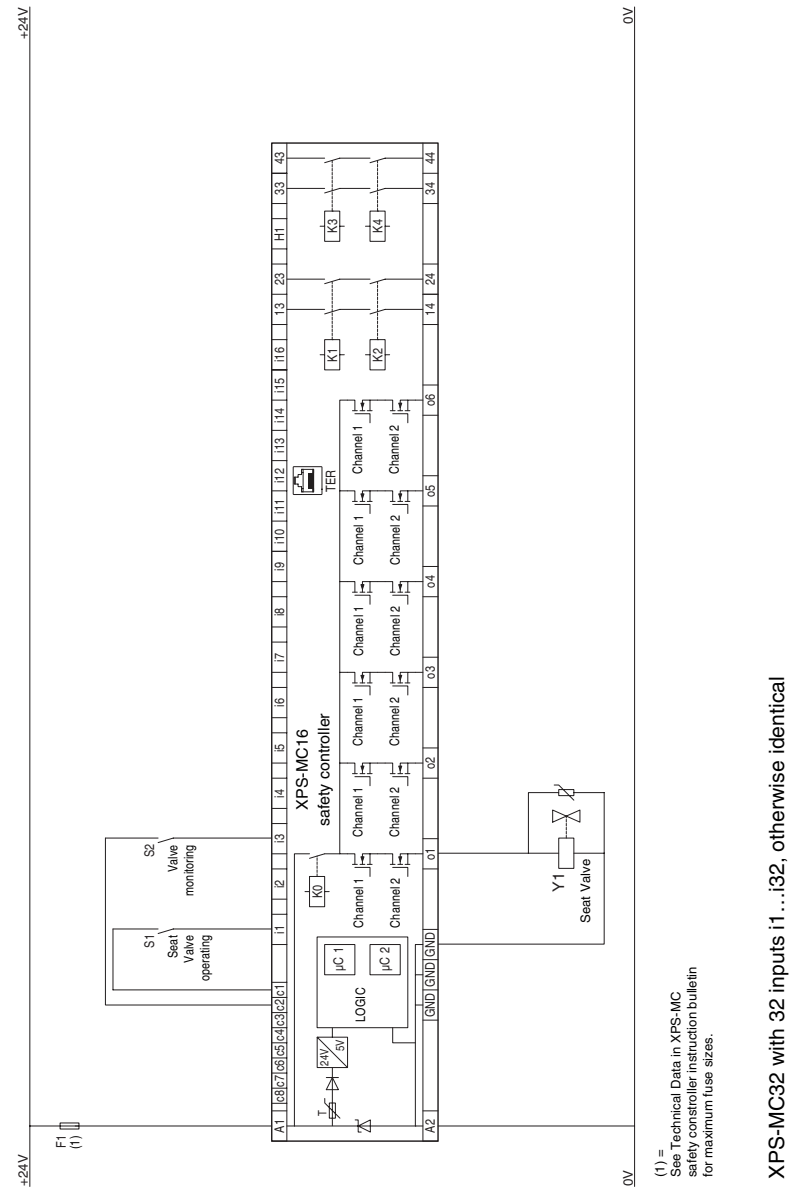
ENGLISH

7.16 Seat Valve Monitoring

7.16.1 Functional diagram



7.16.2 Wiring diagram



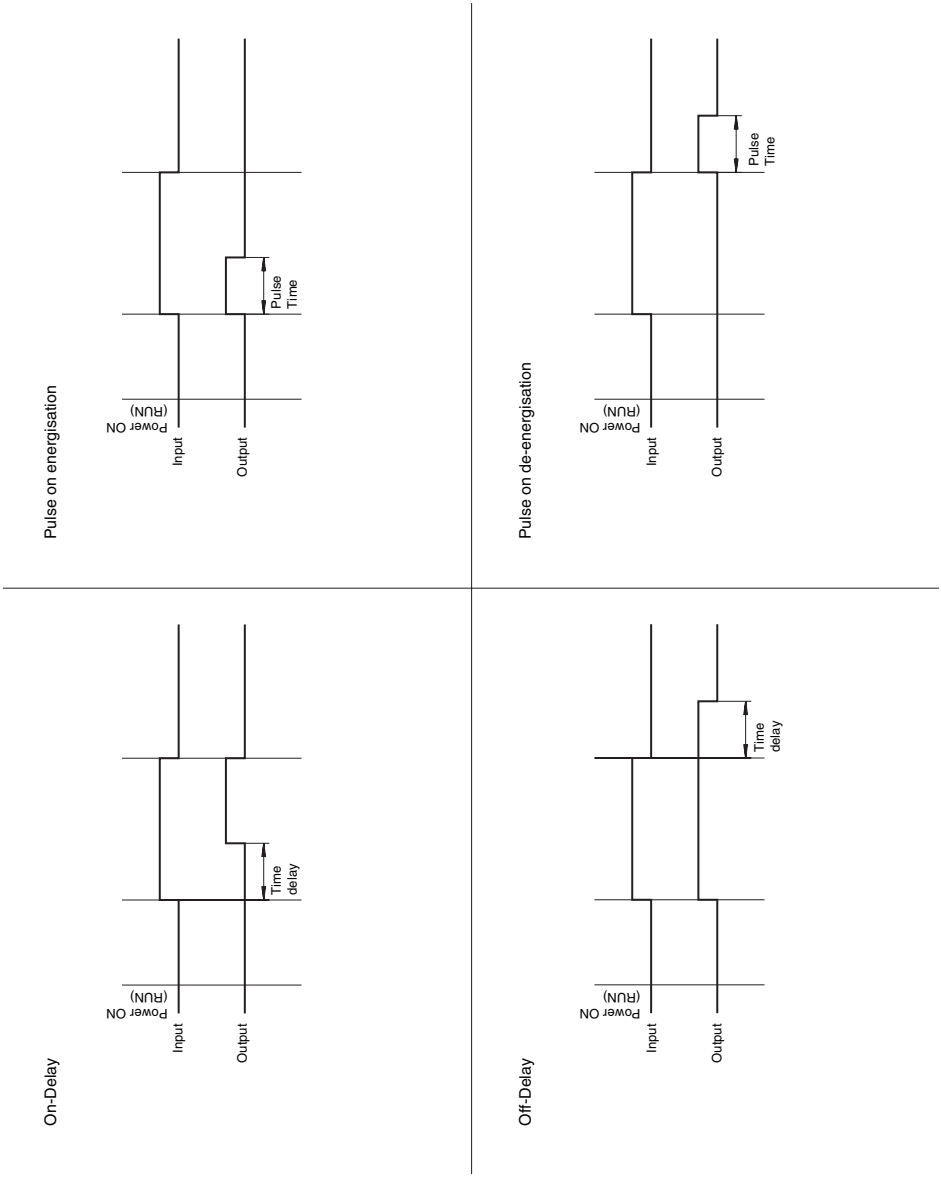
(1) =
See Technical Data in XPS-MC
safety controller instruction bulletin
for maximum fuse sizes.

XPS-MC32 with 32 inputs i1...i32, otherwise identical

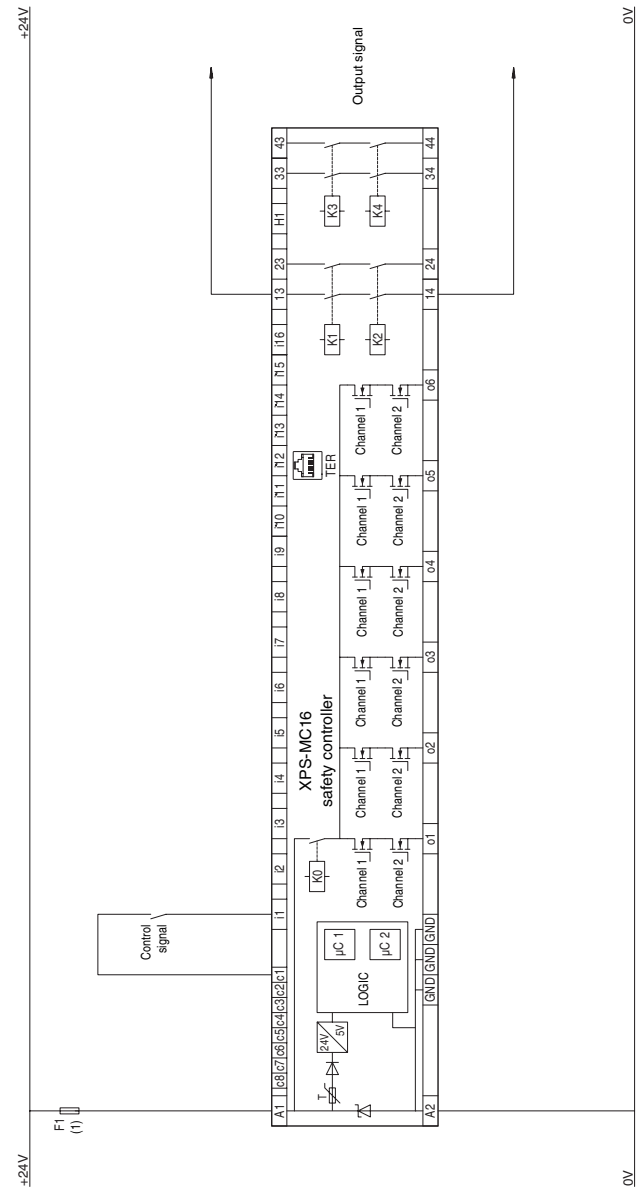
ENGLISH

7.17 Time-delay relay

7.17.1 Functional diagram



7.17.2 Wiring diagram



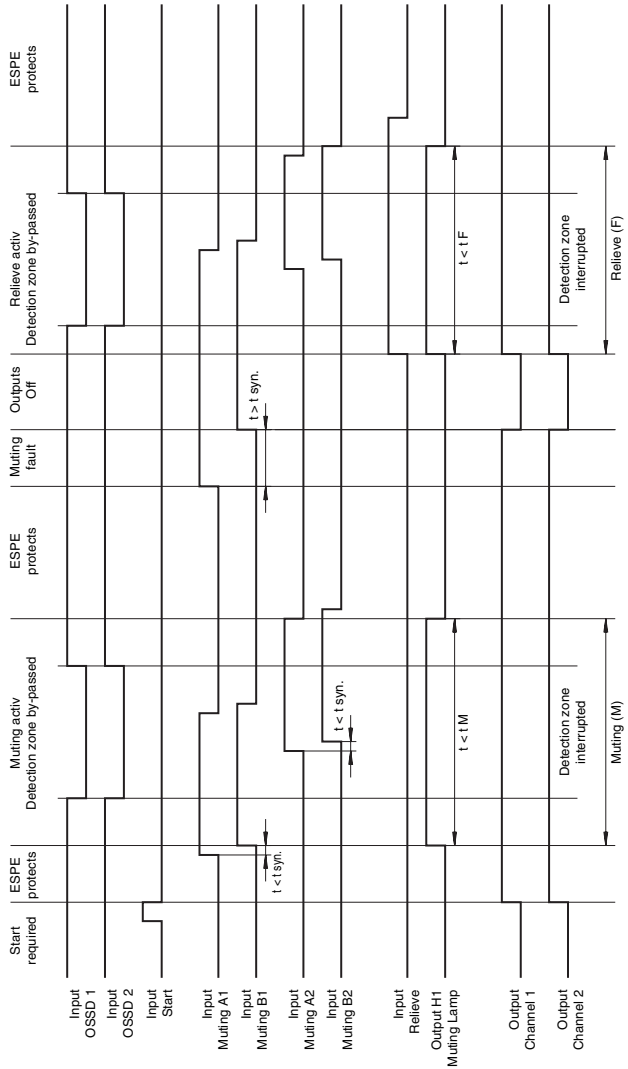
(1) = See Technical Data in XPS-MC safety controller instruction bulletin for maximum fuse sizes.

XPS-MC32 with 32 inputs i1…i32, otherwise identical

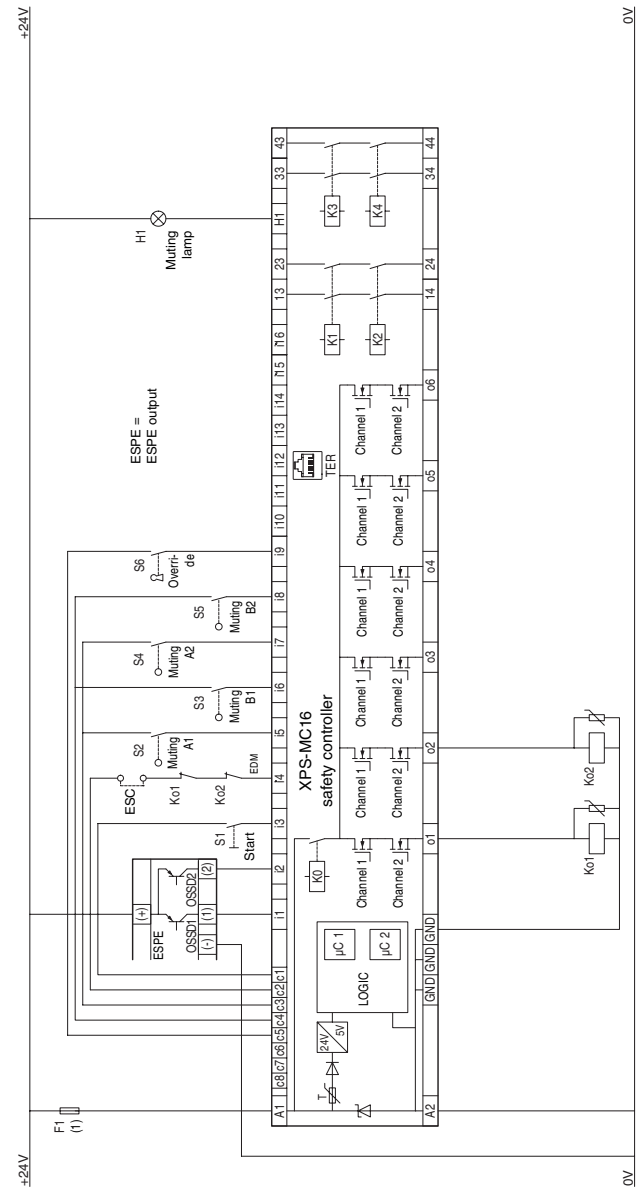
ENGLISH

7.18 Muting for light curtains type 4

7.18.1 Functional diagram



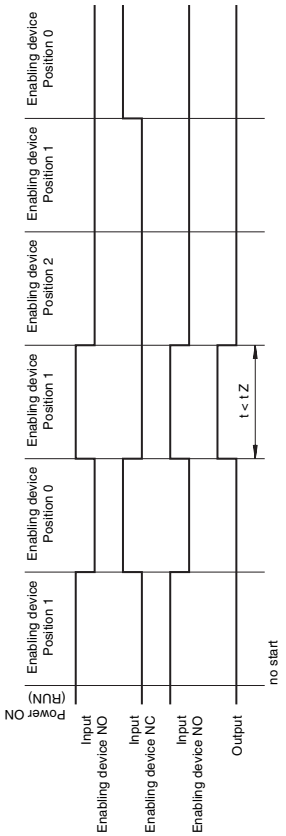
7.18.2 Wiring diagram



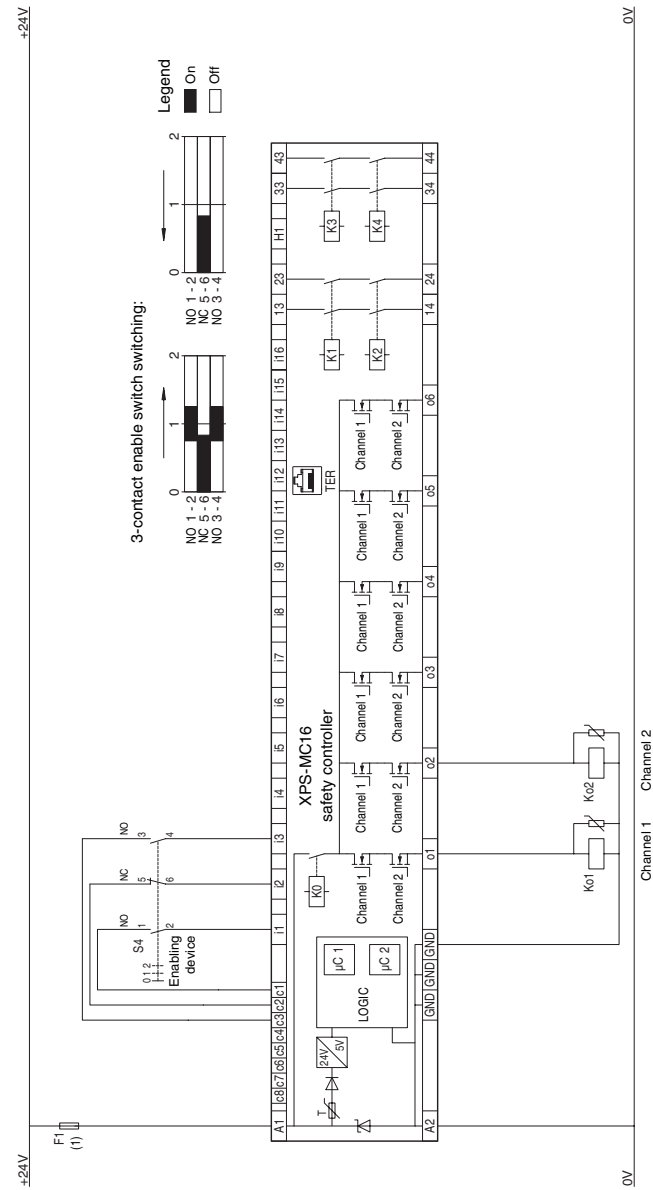
XPS-MC32 with 32 inputs i1…i32, otherwise identical

7.19 3-contact enabling device

7.19.1 Functional diagram



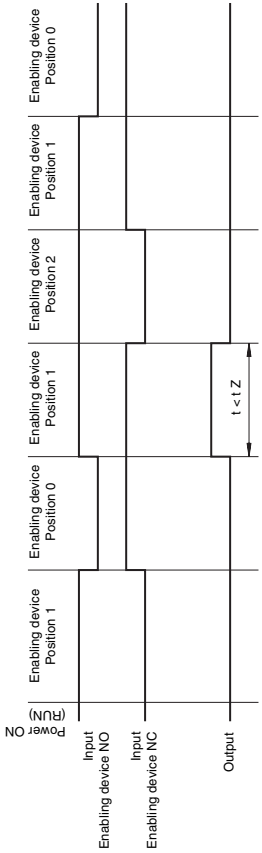
7.19.2 Wiring diagram



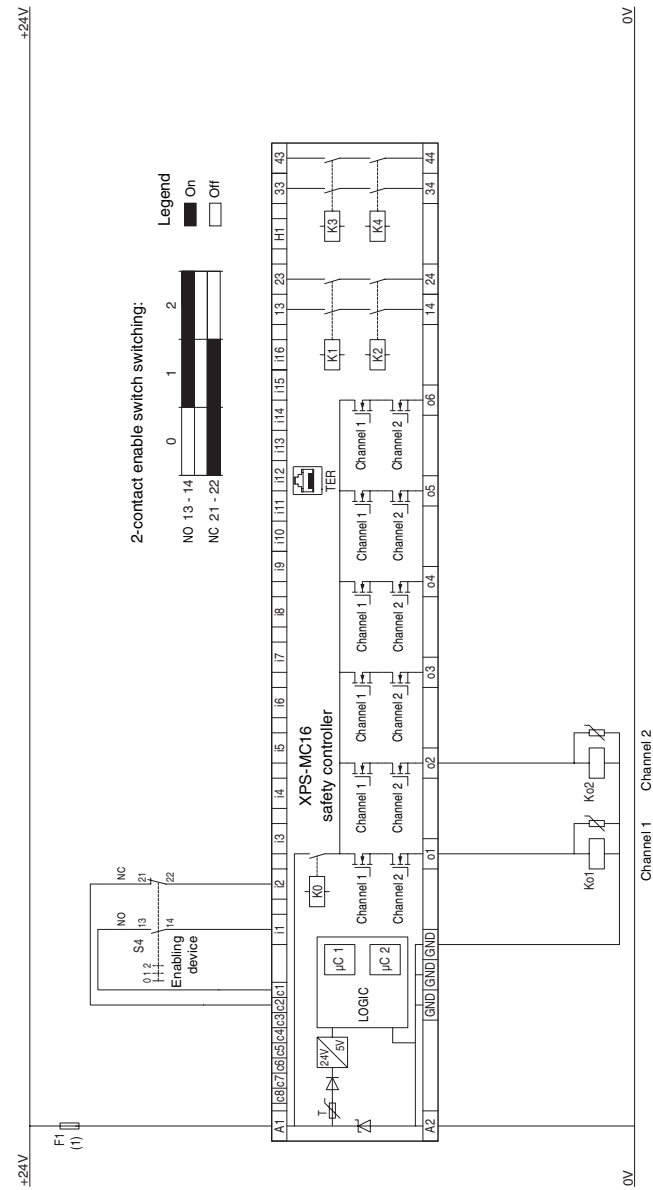
XPS-MC32 with 32 inputs i1…i32, otherwise identical

7.20 2-contact enable switch

7.20.1 Functional diagram



7.20.2 Wiring diagram



XPS-MC32 with 32 inputs i1…i32, otherwise identical

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