EN



SM
Safety Modules

Instruction manual

Carlo Gavazzi Industri A/S Over Hadstenvej 40, 8370 Hadsten, Denmark

EN

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SM safety modules - Original instruction manual

Ownership

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Safety messages

The following symbols are used in this document to indicate warning concerning the user and/or the safety device:



Danger! a potentially risky situation which could lead to death or serious physical injury.



Warning: indicates actions that if not observed may lead to damage to the device.

Attention: only CARLO GAVAZZI technical service personnel are authorized to open the safety device.

General information



Information: This manual should be consulted for all situations related to installation and use. It must be kept in good condition and in a clean location accessible to all operators.

Service and warranty

In the event of malfunction or requests for information please contact the CARLO GAVAZZI branch or distributor in your country.

Maintenance and repairs

The device contains no parts that require maintenance.
In case of failure, do not open the device; the device must be sent to CARLO GAVAZZI branch or distributor.

1. Introduction

Description

The SM safety modules are compliant with international standards, designed to provide the most comprehensive protection for equipment and personnel. They enable safety functions, accepting different types of inputs.

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Validity of documentation

This documentation is valid only for SM safety modules and until new documentation is published.
This instruction manual describes the function, operation and installation of the product.
It is the user responsibility to decide if the safety module is correctly suited to the application

How to use the documentation

This user manual must be read and completely understood by personnel dealing with all the uses of the safety modules prior to carrying out any operation involving the module.
Please keep this document for future reference.
All the operations described in this manual must be carried out exclusively by specialized personnel, carefully following all the instructions given.

Use of the product

These safety modules are able to monitor multiple safety functions of industrial machinery, protecting operators from dangerous operations of the machine.
The SM modules provide a safety-related interruption of a safety circuit.
The safety modules are compliant with the requirements of EN ISO 13849-1 and EN 81-20 and EN 81-50 (only SMS31 and SMS20) and may be used in applications with:

		SMS31, SMS20	SMSA31	SM2H21	SME41
1	Emergency stop	•			
2	Emergency gate	•			
3	E-gate with antivalent function (1NC + 1NO)		•		
4	Limit switch	•			
5	Limit switch with antivalent function (1NC + 1NO)		•		
6	Non-contact switch	•			
7	Non-contact switch with antivalent function (1NC + 1NO)		•		
8	Lift levelling	•			
9	Two-hand control device			•	
10	Relay expansion unit				•

2. Safety

2.1. Functional safety

The EC machinery directive stipulates that machinery should not pose a danger (risk assessment in accordance with EN ISO 12100). Given that there is no such thing as zero risk in technology, the aim is to achieve an acceptably low level of risk. If safety is dependent on control systems, these must be designed so that the probability of functional faults is sufficiently low.
To meet this requirement, the user can apply the harmonized standards like EN ISO 13849-1.
Before using a SM module it is necessary to perform a safety assessment in accordance with the Machinery Directive.
Functional safety is guaranteed for the product as a single component. However, this does not guarantee the functional safety of the overall system. In order to achieve the required safety level for the overall system, the safety requirements for the plant/machine must be defined, and then how these requirements must be implemented.
SM modules are built to the following safety levels: PL e, Cat. 4, in accordance with the EN ISO 13849-1. However, the definitive PL of the application will depend on the number of safety components, their parameters and the connections that are made, as per the risk analysis.
An in-depth risk analysis must be performed to determine the appropriate safety level for each specific application, on the basis of all the applicable standards.
Installation of the SM module is the sole responsibility of the installer or the user.
The device must be installed in accordance with the specific risk analysis of the application and all the applicable standards.
Carlo Gavazzi is not responsible for these operations or for any risks in connection with them. Reference should be made to the manual and to the relative product and/or application standards to ensure correct use of any devices connected to the SM module within the specific application.
The ambient temperature where the system is installed must be compatible with the operating temperature parameters stated on the product label and in the specifications.
For all matters concerning safety, if necessary contact your country's official safety authority or trade association.

2.2 Lift Safety Standards

In 2020 The European Committee for Standardization released two new safety standards for the construction of lifts and for the testing of lift components. Both new standards applied to both passenger and goods lifts.
EN 81-20 defines the technical requirements for the construction of lifts.
EN 81-50 defines design rules, calculations and tests for lift components.
The SMS31 and SMS20 modules are compliant with these Standards (EN 81-20 and EN 81-50).

2.3 Links to more informations

Carlo Gavazzi Safety modules
EU Declaration of Conformity can be found here:

https://www.gavazziautomation.com/en-global/group/WC000002V13?cHash=75679d5fb9b9253e0c3a81a26666a614

Software SISTEMA

http://www.dguv.de/webcode/e34183

3. Installation and environmental conditions

	**Warning:** SM must be installed in a control cabinet with a protection grade of at least IP54, otherwise dampness or dust may lead to malfunction.
	**Warning:** Avoid installation during thunderstorms.
	**Danger!** If the safety module is tampered, it can no longer ensure the safety of the operator and the warranty is void.
	**Information:** Use the notch on the rear of the unit to attach it to a DIN rail. Ensure the unit is mounted securely on a DIN rail (35 mm) by using a fixing element (e.g. retaining bracket or an end angle).
	**Information:** Do not dispose of the packaging in the environment.
	**Information:** SM must only be used within an ambient temperature range of -25°C...+60°C (-13°F...+140°F); UL: +40°C (+104°F), away from any condensation or conducting fluids. To avoid possible interference, keep the connecting conductors separate from the power conductors.

4. Wiring

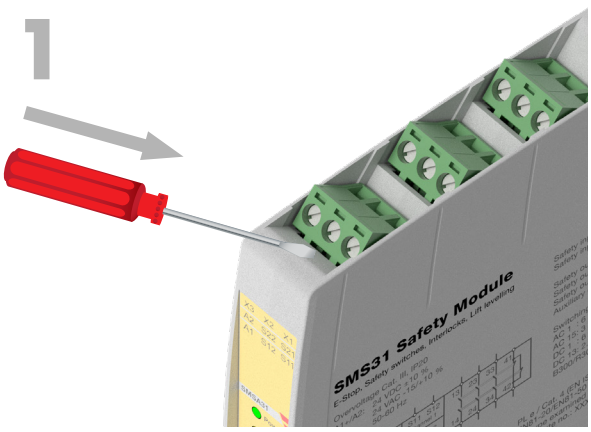
4.1 Power supply

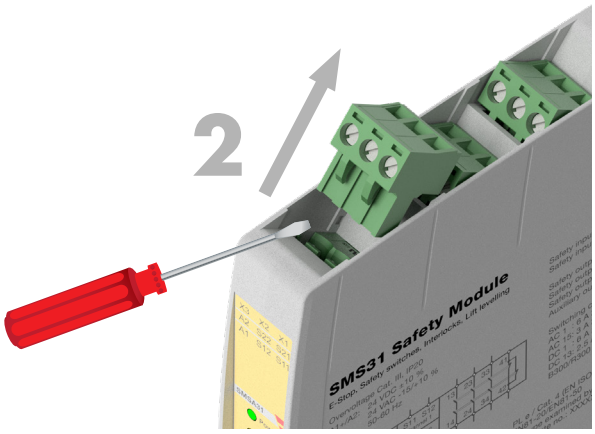
24Vdc ± 10%; 24Vac -15%/+10%, 50÷60 Hz, Class 2, overvoltage category III.

4.2 Wiring

	1	**Warning:** Max. terminal tightening torque: 0.5Nm (for all connections)
	2	**Warning:** Switch power supply OFF before wiring the device
	3	To prevent contact welding, a fuse should be connected on the output contacts. Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads. Ensure the wiring and EMC requirements of IEC 60204-1 are met.
	4	**Information:** It is good practice to separate the power supply of the control unit from that of other electrical devices (e.g. frequency drives, electric motors, inverters) or other sources of disturbance.
	5	**Information:** Use conductors with section: 0,2 - 2,5 mm² (24 - 14 AWG)
	6	Do not exceed the electrical ratings.

The safety modules are equipped with pluggable terminal blocks for easy wiring and devices exchange.





Procedure:

- Switch power supply OFF before wiring the device
- Insert the screwdriver in the recess of the terminal block and lift it to remove it. Do not remove the terminals blocks by pulling the cables!
- Once the wiring of the terminal block is completed, insert the terminal block into the respective position

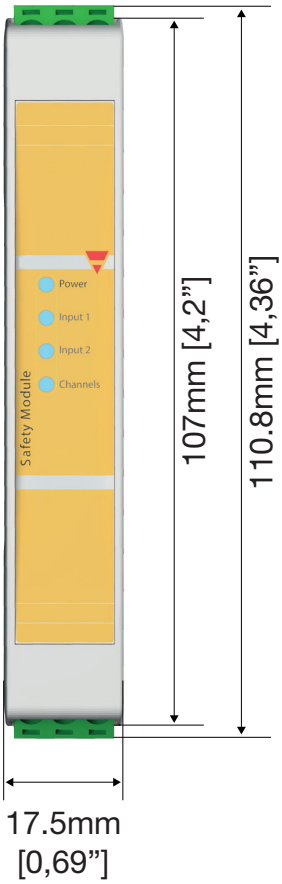
The plug-in terminal blocks are coded, so to prevent inserting the terminal blocks in the wrong position.

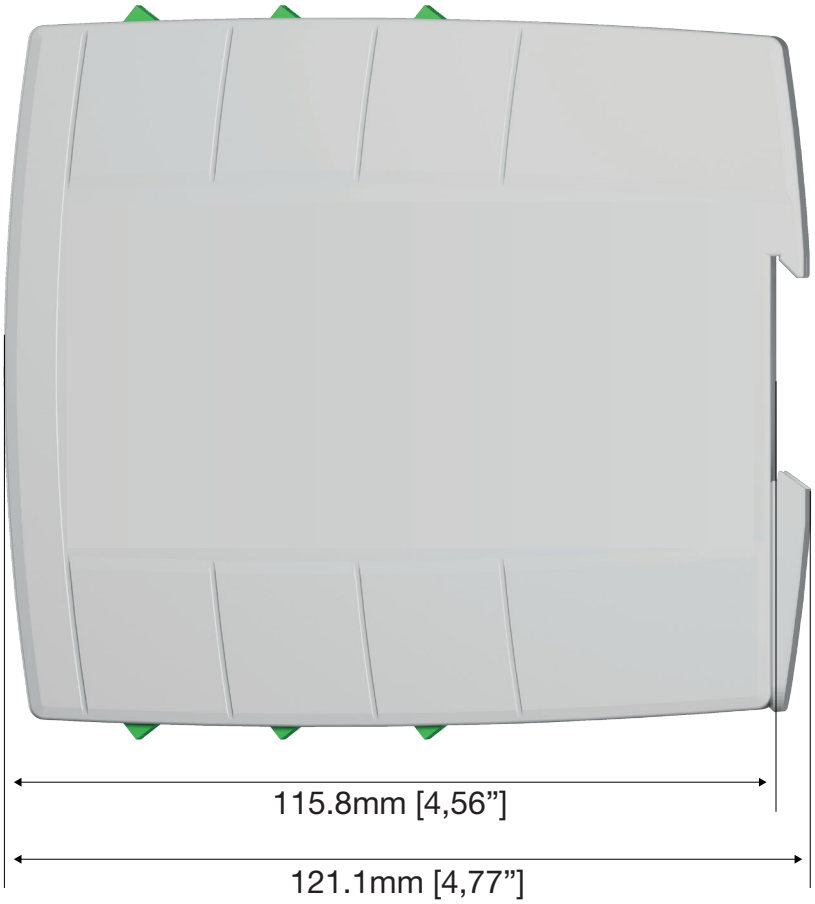
5. Devices

SM modules are compliant with international standards, designed to provide the most comprehensive protection for equipment and personnel. They enable safety functions, accepting different types of inputs.
SM safety modules and expansion unit provide for safety instantaneous relay outputs.

	SMS20	SMS31	SMSA31	SM2H21	SME41
					
NO safety outputs	2	3	3	2	4
Aux NC output	-	1	1	1	-
NC feedback output	-	-	-	-	1
Input type	2 NO	2 NO	1NO + 1NC	2-hand control 2NO	2 NO or 2 OSSD

5.1 Dimensions





6. SMS20

The SMS20 module monitors emergency stops, limit switches, magnetic switches according to 2006/42/CE Machinery Directives.
The SMS20 is also used for floor levelling and relevelling of lift cabin, according to the 2014/33/EU Lift Directive, in lift applications.

6.1 Terminal layout

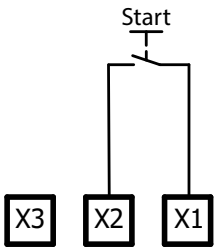


X1-X2: manual start / automatic start
X1-X3: monitored manual start
S11-S12: channel 1 NO input
S21-S22: channel 2 NO input
A1: power supply 24 Vdc (+)/Vac(~)
A2: power supply 24 Vdc (-)/Vac(~)

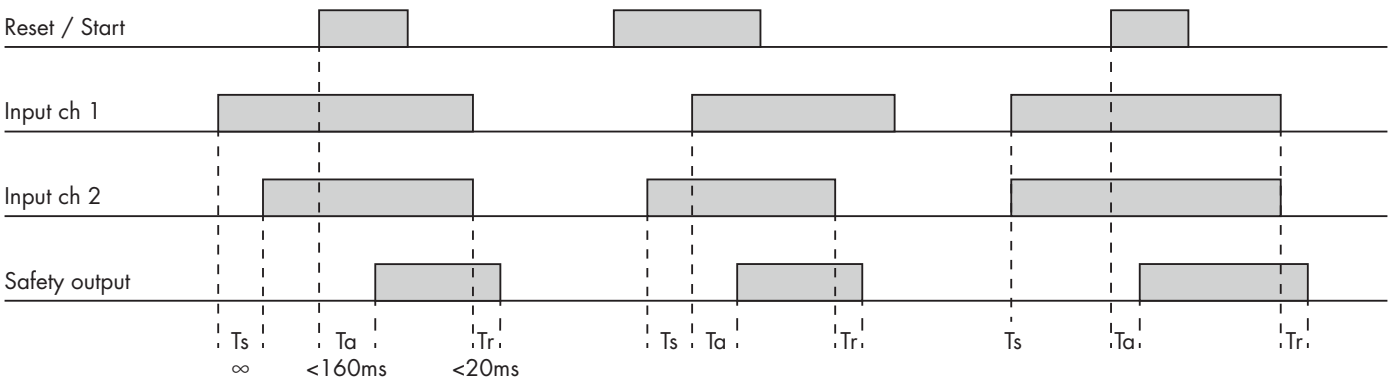
13-14: NO safety output
23-24: NO safety output

6.2 Operating modes

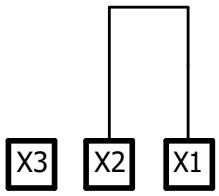
6.2.1 Manual start



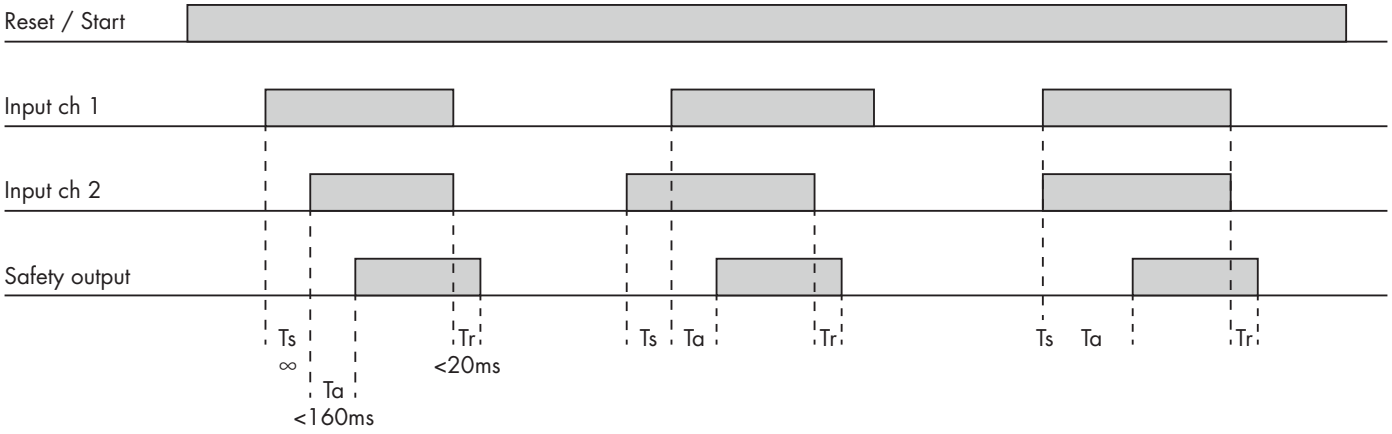
A	The start button is connected between X1 and X2. The safety inputs S12 and S22 are operated: • contact closed between S11 and S12 • contact closed between S21 and S22 The start button is pressed and the safety outputs switch ON
B	The opening of at least one safety input contact forces immediately the safety outputs to the open state
C	A new operating cycle is possible only after releasing both input contacts and then operating them again



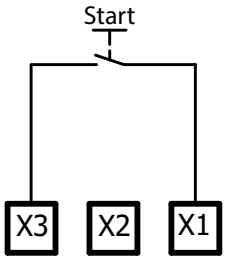
6.2.2 Automatic start



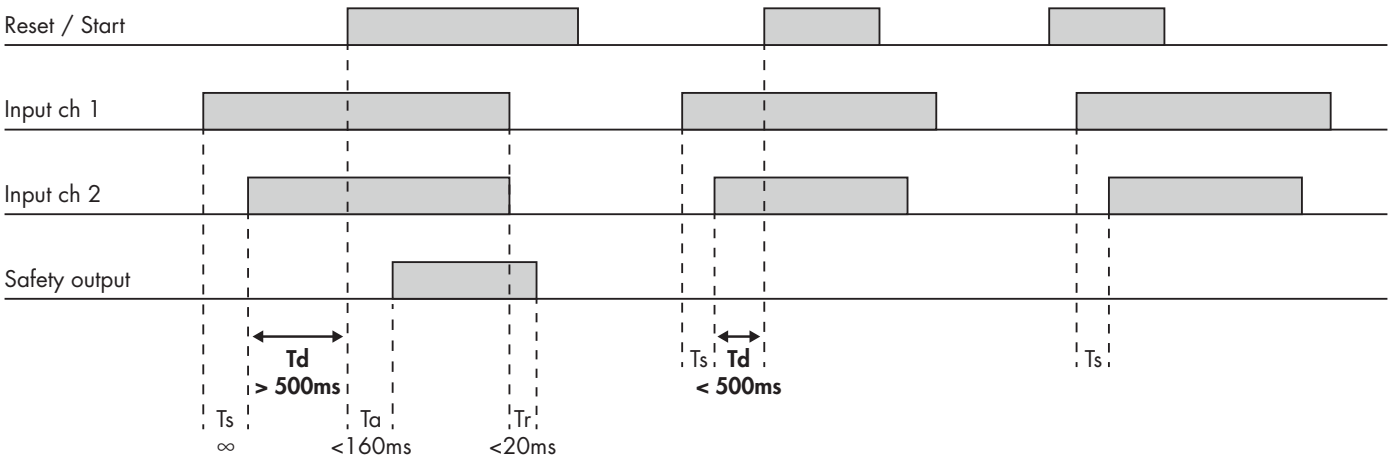
A	Connection between X1 and X2. The safety inputs S12 and S22 are operated: • contact closed between S11 and S12 • contact closed between S21 and S22 The safety outputs switch ON
B	The opening of at least one safety input contact forces immediately the safety outputs to the open state
C	A new operating cycle is possible only after releasing both input contacts and then operating them again



6.2.3 Monitored manual start



A	The start button is connected between X1 and X3. The safety inputs S12 and S22 are operated: • contact closed between S11 and S12 • contact closed between S21 and S22 The start button can be pressed at least 500ms after the safety inputs are operated, to enable the safety outputs to the active state
B	The opening of at least one safety input contact forces immediately the safety outputs to the open state
C	A new operating cycle is possible only after releasing both input contacts and then operating them again





Information:
- The start/restart command must be installed outside the danger area in a position where the concerned danger and entire working area are clearly visible.
- It must not be possible to reach the start/restart command from the inside of the danger area.



Attention:
Use in manual start mode is mandatory where the safety device controls an access protecting a danger zone. This is to prevent a situation in which, once a person has passed through the opening, they could remain in the danger zone without being detected. Failure to comply with this rule may result in serious risks to people exposed.

6.3 Technical data

6.3.1 Timing specification

Activation time Ta	< 160ms
Release time Tr	Double channel mode: < 20ms Single channel mode: < 160ms
UCM Release time Tr	Double channel mode: < 20ms
Simultaneity Ts	Infinite
Monitored manual start delay Td	< 500ms
Min. start activation time	100ms
Recovery time DC supply @ nom conditions	< 500ms
Recovery time AC supply @ nom conditions	< 1500ms
Min. operate time with manual start	< 160ms
Min. operate time with automatic start	~ 1500ms

6.3.2 Safety specification

Safety outputs	13-14 and 23-24
Safe state of outputs	Open
Safety inputs	S11-S12 and S21-S22
Safe state of inputs	Open
Safety function	1. The release of either one or both safety inputs will release the safety outputs. 2. The re-activation of the safety outputs is only possible after the release of both safety inputs.

6.3.3 Safety parameters

ISO 13849-1 Safety Category	Cat. 4
ISO 13849-1 Performance Level	PL e
EN 81-20	Certified
EN 81-50	Certified
$MTTF_D$ [a]	420,8
PFH_D [1/h]	1,85 E-10
DCavg	99%
ß	5,00 E-02
$ß_D$	2,00 E-02
Mission time	20 years



Warning:
EN 81-20 defines the technical requirements for lift construction.
EN 81-50 provides the framework for design and testing of lift components

6.3.4 Electrical data

Supply voltage	24 Vdc ±10%, 2 W, Class 2 24 Vac -15/+10% 50…60 Hz, 4.5 VA, Class 2
	Overvoltage category III
	Short circuit protection internal PTC
Rated insulation	4 kV coil to contacts 4 kV contact to contact

6.3.5 Inputs

Number of safety channels	2
Safety inputs (contact inputs)	S11-S12 and S21-S22
Loop resistance	Max. 1 kΩ
Input current	Typical 5 mA

6.3.6 Outputs

Number of NO safety outputs		2
Type		Voltage free contact output, relays with forcibly guided contacts
Max current rating - single output:	**EN 60947-5-1**	@ 60°C (140°F) operating temperature: AC 1: 250V / 6A / 2000 VA - AC 15: 230V / 3A DC 1: 24V / 6A - DC 13: 24V / 2.5A / 0.1 Hz
	UL 508	Pilot duty: B300 / R300
Max. total current Σ I_{th}^2:	**EN 60947-5-1**	Spacing between modules ≥100mm: 72A² @40°C (104°F) ambient temperature Modules mounted stacked: 26A² @25°C (77°F) ambient temperature Please refer to the derating curves in chapter 12
	UL 508	Pilot duty: B300 / R300
Mechanical life		> 10^7 operations
Electrical life AC1 (360 s/h)		~ 10^5 operations

6.3.7 Compatibility and conformity

Low Voltage Directive 2014/35/EU	
EN 60947-5-1	Low-voltage switchgear and controlgear - Control circuit devices and switching elements - Electromechanical control circuit devices
EMC Directive 2014/30/EU	
EN 60947-5-1	Low-voltage switchgear and controlgear - Control circuit devices and switching elements - Electromechanical control circuit devices
Machinery Directive 2006/42/EC	EC type examined by TÜV Rheinland - Cert. no. 01/205/6003.00/25
EN ISO 13849-1	Safety of machinery - safety related parts of control systems - General principles for design
EN 60204-1	Safety of machinery - Electrical equipment of machines - General requirements E-stop category 0
EN 61326-3-1	Electrical equipment for measurement, control and laboratory use. EMC requirements. Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) - General industrial applications
Lift Directive 2014/33/EU	EU type examined by TÜV Rheinland - Cert. no. 01/208/4A/6149.00/25
EN 81-20	Safety rules for the construction and installation of lifts. Part 20: passenger and goods passenger lifts
EN 81-50	Safety rules for the construction and installation of lifts. Part 50: design rules, calculations, examinations and tests of lift components
EN 12015	Electromagnetic compatibility. Product family standard for lifts, escalators and passenger. Emission
EN 12016	Electromagnetic compatibility. Product family standard for lifts, escalators and passenger. Immunity
Approvals	CE RoHS COMPLIANT c UL us LISTED

6.3.8 Environmental

Protection grade	IP40 on frontal part of the housing, IP20 on the terminals. The device has to be installed in a cabinet with protection degree of IP54.
Pollution degree	2
Operating Temperature	-25°C...+60°C (-13°F...140°F), UL: +40°C (104°F); (tested @ temp 65°C (149 °F) as per lift norm)
Storage Temperature	-30°C...+70°C (-22°F...158°F)
Ambient humidity range	R.H. ≤95% non condensing

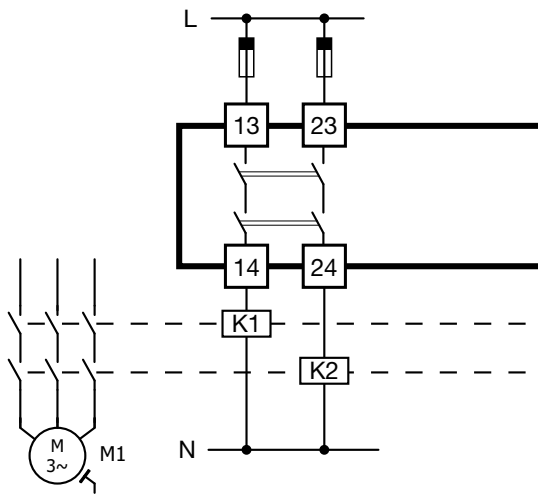


Information:
You must comply with the safety-related parameters in order to ensure the required safety level for your plant/machine. All the units which use a safety function must be considered when calculating the overall safety level.

6.4 Function description

Not only must the output be safe, but also the complete wiring and surroundings. In order to reach cat. 4 of functional safety, two outputs must be wired as a pair, so that a defect of one output cannot cause a total loss of safety, as the other one of the pair is still able to switch off the dangerous parts of the plant (or machine). So wiring similar to the following has to be done:

6.4.1 Outputs function

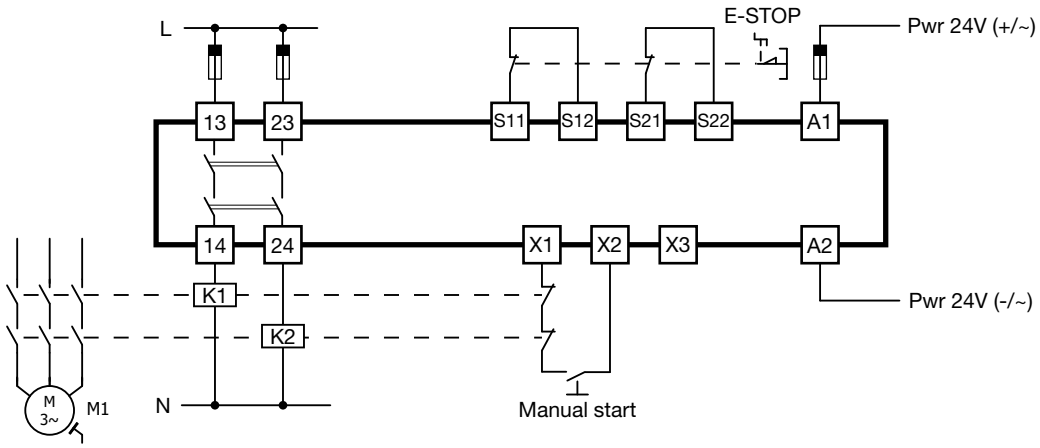


A	The NO safety outputs switch on (contact closes) when the safety inputs are active and the start/reset is pressed.
B	In case of intervention of the safety inputs, the NO safety outputs are switched off
C	If the power supply fails, the NO safety outputs are switched off

6.5 Application

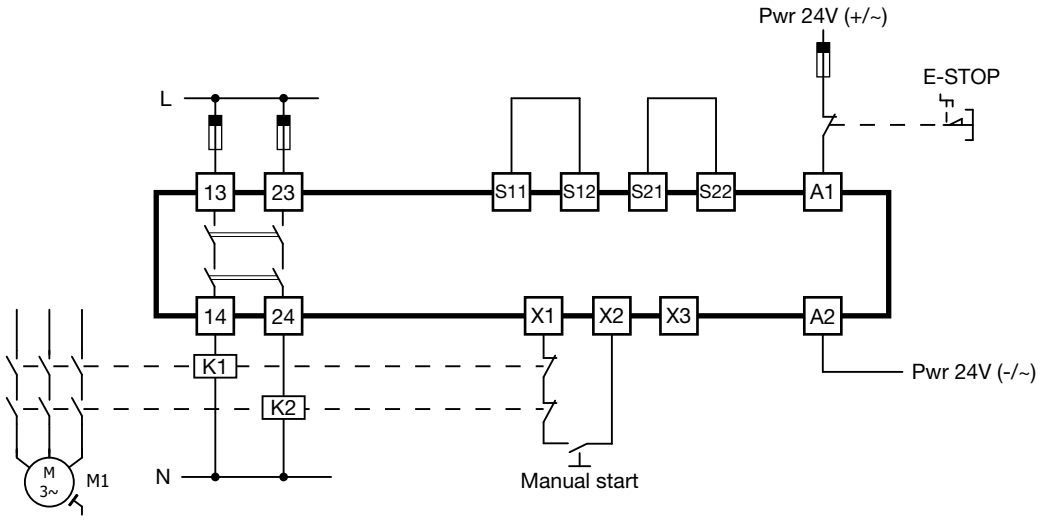
6.5.1 E-stop, safety limit switch and safety interlocks (double channel mode)

A	A cross circuit between the two channels will be recognized
B	In case of a fault the safety outputs will switch OFF
C	Suitable up to cat. 4, PLe (EN ISO 13849-1) Demand rate: once per month



6.5.2 E-stop, safety limit switch and safety interlocks (single channel mode)

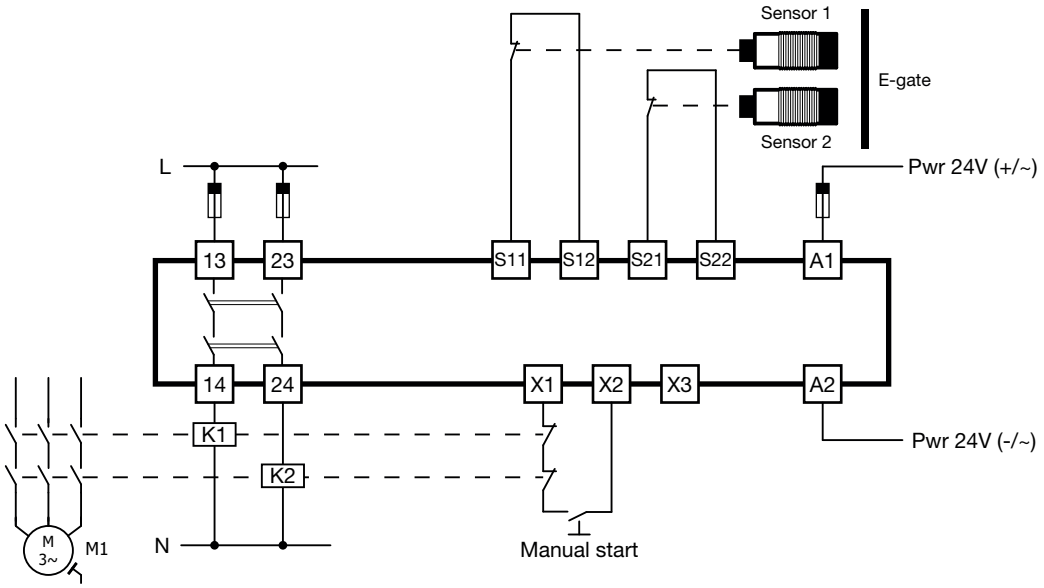
A	In case of a fault the safety outputs will switch OFF
B	Suitable up to cat. 1, PLc (EN ISO 13849-1)



Information:
- The release time in single channel mode is < 160 ms
- Automatic start not allowed in single channel mode

6.5.3 E-gate and safety non-contact switches

A	A cross circuit between the two channels will be recognized
B	In case of a fault the safety outputs will switch OFF
C	Suitable up to cat. 4, PLe (EN ISO 13849-1) Demand rate: once per month

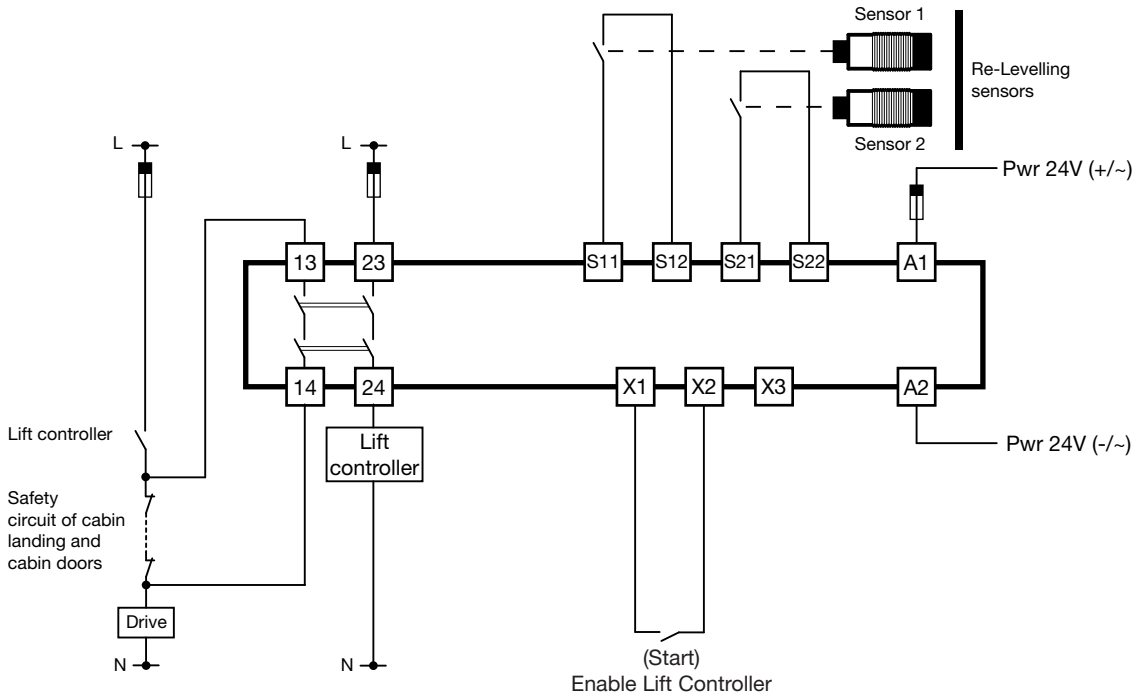


6.5.4 Lift levelling application

The SMS20 is designed to be employed in lift plants for floor levelling and relevelling of the cabin, according to the requirements of EN 81-20 and EN 81-50 Standards, and according to the 2014/33/EU Lift Directive.

Lift levelling with magnetic sensors

A	For the levelling and re-levelling functionality the Lift controller must be able to detect when the cabin is within the unlocking zone. This monitoring functionality is enabled from the lift controller by activating the "start/reset" input of the safety module. The safety module monitors the two re-levelling sensors and when the cabin is in the unlocking zone, it enables the safety outputs. One safety output must be connected to bypass the circuit that monitors the cabin landing and cabin doors, when the lift cabin is inside the unlocking zone; Otherwise, a cabin movement with open doors will not be possible. The other safety output is connected to the Lift controller to enable the re-levelling functionality, controlled by the Lift controller. The re-levelling functionality is limited to the unlocking zone, so as soon as the re-levelling sensors detect that the cabin is outside the unlocking zone, the safety outputs, at the safety module, are disabled which also disables the re-levelling functionality.
B	The inputs S12, S22 are connected to the re-levelling zone sensors



Information:
Lift car levelling safety module, designed according to Lift Directive 2014/33/EU and to safety circuit requirements of EN 81-20, EN 81-50 Standards.

Information:
EN 81-20: Safety rules for the construction and installation of lifts. Part 20: passenger and goods/passenger lifts.
EN 81-50: Safety rules for the construction and installation of lifts. Part 50: design rules, calculations, examinations and tests of lift components.

Lift levelling with photosensors

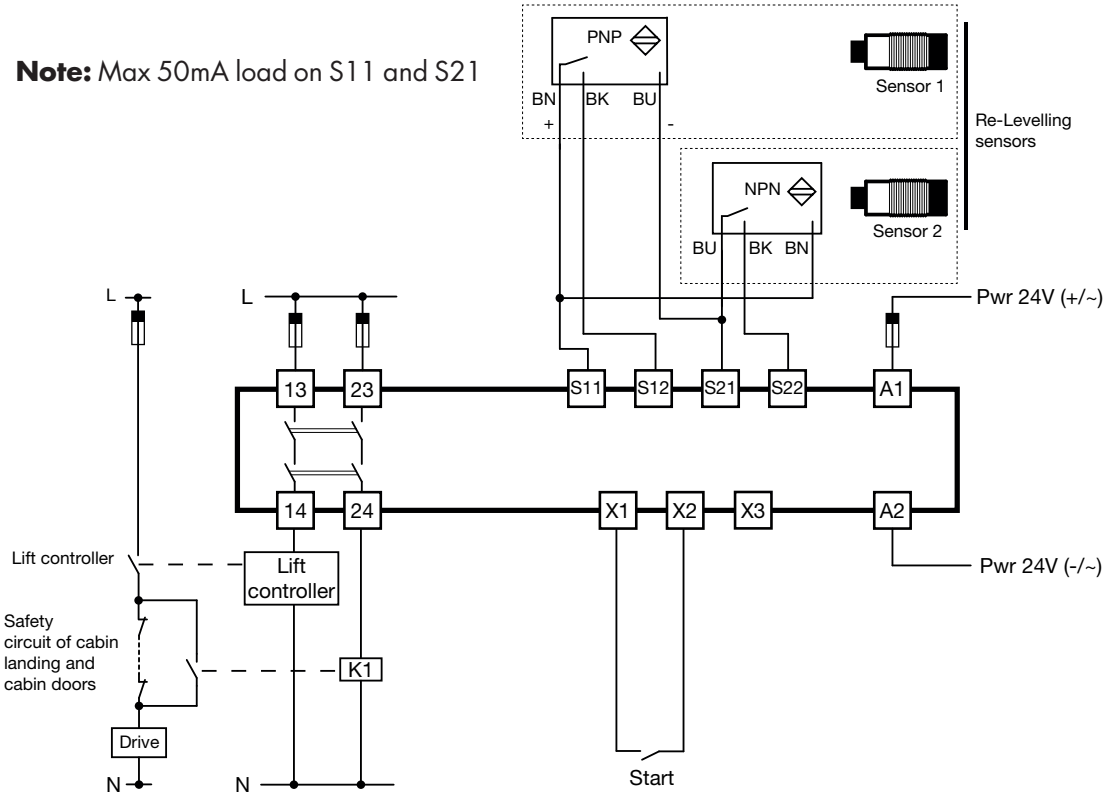
A

For the levelling and re-levelling functionality the Lift controller must be able to detect when the cabin is within the unlocking zone. This monitoring functionality is enabled from the lift controller by activating the "start/reset" input of the safety module. The safety module monitors the two re-levelling sensors and when the cabin is in the unlocking zone, it enables the safety outputs.
One safety output must be connected to bypass the circuit that monitors the cabin landing and cabin doors, when the lift cabin is inside the unlocking zone; Otherwise, a cabin movement with open doors will not be possible. The other safety output is connected to the Lift controller to enable the re-levelling functionality, controlled by the Lift controller.
The re-levelling functionality is limited to the unlocking zone, so as soon as the re-levelling sensors detect that the cabin is outside the unlocking zone, the safety outputs, at the safety module, are disabled which also disables the re-levelling functionality.

B

The inputs S12, S22 are connected to the re-levelling zone sensors

Note: Max 50mA load on S11 and S21



Information:
Lift car levelling safety module, designed according to Lift Directive 2014/33/EU and to safety circuit requirements of EN 81-20, EN 81-50 Standards.

Information:
EN 81-20: Safety rules for the construction and installation of lifts. Part 20: passenger and goods/passenger lifts.
EN 81-50: Safety rules for the construction and installation of lifts. Part 50: design rules, calculations, examinations and tests of lift components.

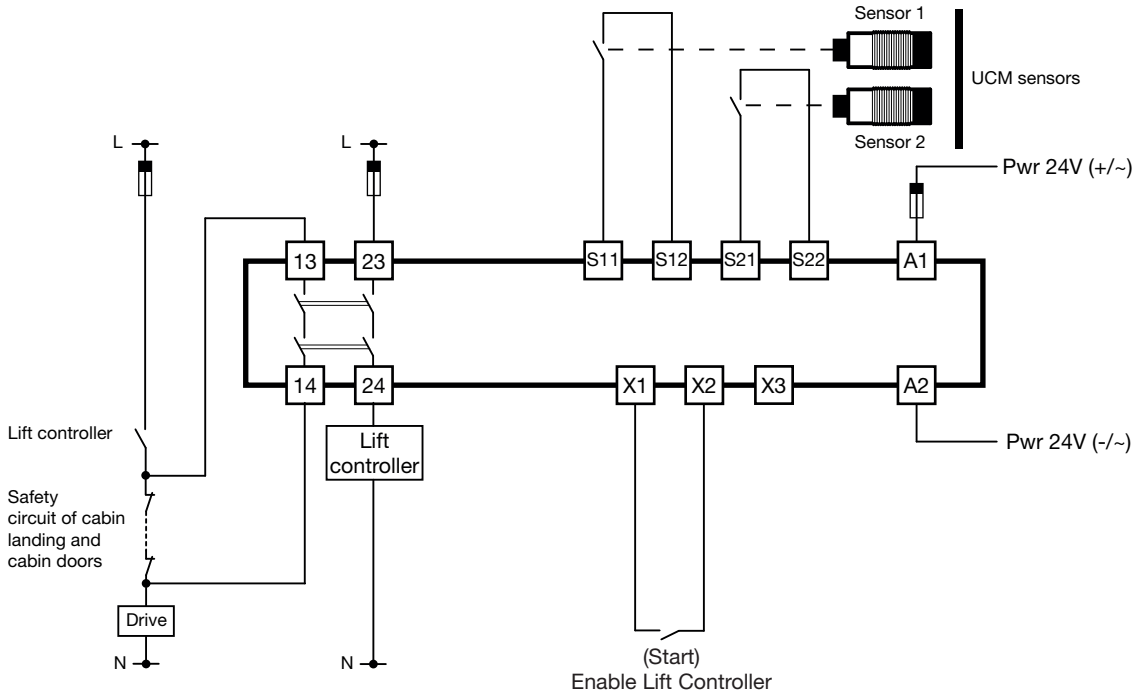
6.5.5 Unintended car movement (UCM) application

The SMS20 is designed to be employed in lift plants for protection against unintended car movements, according to the requirements of EN 81-20 and EN 81-50 Standards, and according to the 2014/33/EU Lift Directive.

Unintended car movement detection with magnetic sensors

A For the Unintended Car Movement (UCM) functionality the Lift controller must be able to detect when the cabin is within the unlocking zone. This monitoring functionality is enabled from the lift controller by activating the "start/reset" input of the safety module. The safety module monitors the two UCM sensors and when the cabin is in the unlocking zone, it enables the safety outputs.
In this situation the lift controller can open the landing door and the car door. Unintended movement of the car is detected by at least one of the two UCM sensors, latest when the car moves out of the unlocking zone with open doors. In this situation the safety module disables the safety outputs, which will stop the car immediately.

B The inputs S12, S22 are connected to the UCM sensors.





Information:
Unintended car movement safety module, designed according to Lift Directive 2014/33/EU and to safety circuit requirements of EN 81-20, EN 81-50 Standards.



Information:
EN 81-20: Safety rules for the construction and installation of lifts. Part 20: passenger and goods/passenger lifts.
EN 81-50: Safety rules for the construction and installation of lifts. Part 50: design rules, calculations, examinations and tests of lift components.

7. SMS31

The SMS31 module monitors emergency stops, limit switches, magnetic switches according to 2006/42/CE Machinery Directives.
The SMS31 is also used for floor levelling and relevelling of lift cabin, according to the 2014/33/EU Lift Directive, in lift applications.

7.1 Terminal layout

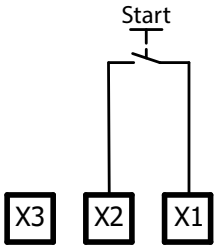


X1-X2: manual start / automatic start
X1-X3: monitored manual start
S11-S12: channel 1 NO input
S21-S22: channel 2 NO input
A1: power supply 24 Vdc (+)/Vac(~)
A2: power supply 24 Vdc (-)/Vac(~)

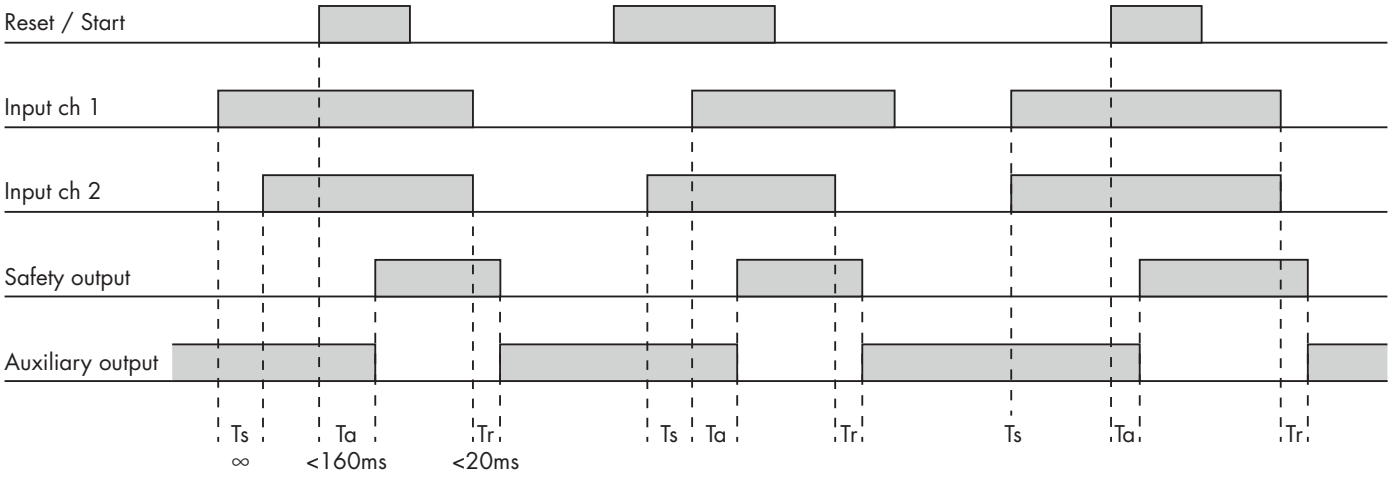
13-14: NO safety output
23-24: NO safety output
33-34: NO safety output
41-42: NC auxiliary output

7.2 Operating modes

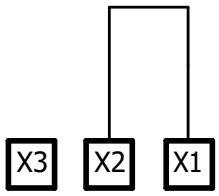
7.2.1 Manual start



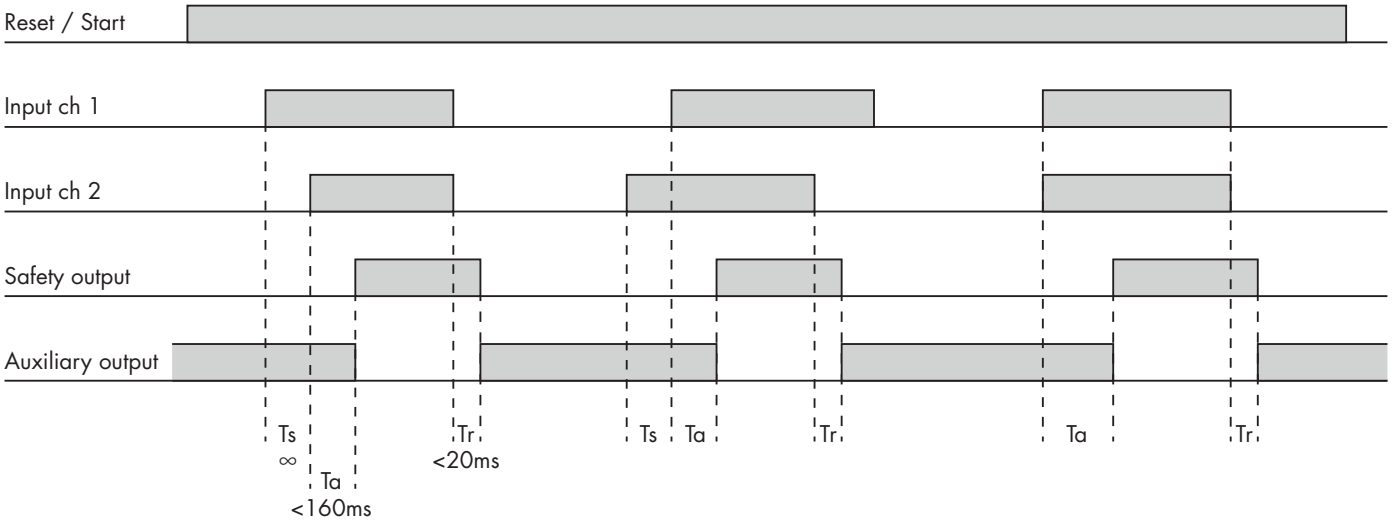
A	The start button is connected between X1 and X2. The safety inputs S12 and S22 are operated: • contact closed between S11 and S12 • contact closed between S21 and S22 The start button is pressed and the safety outputs switch ON, while the auxiliary output opens
B	The opening of at least one safety input contact forces immediately the safety outputs to the open state
C	A new operating cycle is possible only after releasing both input contacts and then operating them again



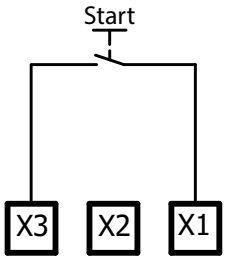
7.2.2 Automatic start



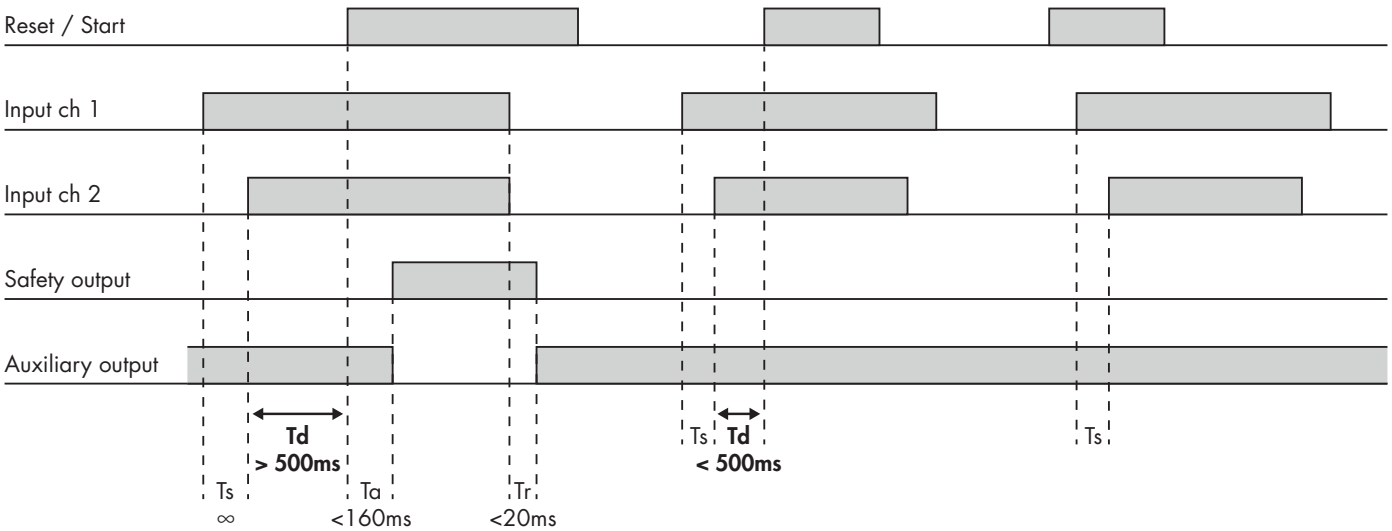
A	Connection between X1 and X2. The safety inputs S12 and S22 are operated: • contact closed between S11 and S12 • contact closed between S21 and S22 The safety outputs switch ON, while the auxiliary output opens
B	The opening of at least one safety input contact forces immediately the safety outputs to the open state
C	A new operating cycle is possible only after releasing both input contacts and then operating them again



7.2.3 Monitored manual start



A	The start button is connected between X1 and X3. The safety inputs S12 and S22 are operated: • contact closed between S11 and S12 • contact closed between S21 and S22 The start button can be pressed at least 500ms after the safety inputs are operated, to enable the safety outputs to the active state; when the safety outputs switch ON, the auxiliary output opens
B	The opening of at least one safety input contact forces immediately the safety outputs to the open state
C	A new operating cycle is possible only after releasing both input contacts and then operating them again





Information:
- The start/restart command must be installed outside the danger area in a position where the concerned danger and entire working area are clearly visible.
- It must not be possible to reach the start/restart command from the inside of the danger area.



Attention:
Use in manual start mode is mandatory where the safety device controls an access protecting a danger zone. This is to prevent a situation in which, once a person has passed through the opening, they could remain in the danger zone without being detected. Failure to comply with this rule may result in serious risks to people exposed.

7.3 Technical data

7.3.1 Timing specification

Activation time Ta	< 160ms
Release time Tr	Double channel mode: < 20ms Single channel mode: < 160ms
UCM Release time Tr	Double channel mode: < 20ms
Simultaneity Ts	Infinite
Monitored manual start delay Td	< 500ms
Min. start activation time	100ms
Recovery time DC supply @ nom conditions	< 500ms
Recovery time AC supply @ nom conditions	< 1500ms
Min. operate time with manual start	< 160ms
Min. operate time with automatic start	~ 1500ms

7.3.2 Safety specification

Safety outputs	13-14, 23-24 and 33-34
Safe state of outputs	Open
Safety inputs	S11-S12 and S21-S22
Safe state of inputs	Open
Safety function	1. The release of either one or both safety inputs will release the safety outputs. 2. The re-activation of the safety outputs is only possible after the release of both safety inputs.

7.3.3 Safety parameters

ISO 13849-1 Safety Category	Cat. 4
ISO 13849-1 Performance Level	PL e
EN 81-20	Certified
EN 81-50	Certified
$MTTF_D$ [a]	420,8
PFH_D [1/h]	1,85 E-10
DCavg	99%
ß	5,00 E-02
$ß_D$	2,00 E-02
Mission time	20 years



Warning:
EN 81-20 defines the technical requirements for lift construction.
EN 81-50 provides the framework for design and testing of lift components

7.3.4 Electrical data

Supply voltage	24 Vdc ±10%, 2 W, Class 2 24 Vac -15/+10% 50...60 Hz, 4.5 VA, Class 2
	Overvoltage category III
	Short circuit protection internal PTC
Rated insulation	4 kV coil to contacts 4 kV contact to contact

7.3.5 Inputs

Number of safety channels	2
Safety inputs (contact inputs)	S11-S12 and S21-S22
Loop resistance	Max. 1 kΩ
Input current	Typical 5 mA

7.3.6 Outputs

Number of NO safety outputs		3
Number of NC auxiliary outputs		1
Type		Voltage free contact output, relays with forcibly guided contacts
Max current rating - single output:	**EN 60947-5-1**	@ 60°C (140°F) operating temperature: AC 1: 250V / 6A / 2000 VA - AC 15: 230V / 3A DC 1: 24V / 6A - DC 13: 24V / 2.5A / 0.1 Hz
	UL 508	Pilot duty: B300 / R300
Max. total current Σ I_{th}^2:	**EN 60947-5-1**	Spacing between modules ≥100mm: 72A² @40°C (104°F) ambient temperature Modules mounted stacked: 26A² @25°C (77°F) ambient temperature Please refer to the derating curves in chapter 12
	UL 508	Pilot duty: B300 / R300
Mechanical life		> 10^7 operations
Electrical life AC1 (360 s/h)		~ 10^5 operations

7.3.7 Compatibility and conformity

Low Voltage Directive 2014/35/EU	
EN 60947-5-1	Low-voltage switchgear and controlgear - Control circuit devices and switching elements - Electromechanical control circuit devices
EMC Directive 2014/30/EU	
EN 60947-5-1	Low-voltage switchgear and controlgear - Control circuit devices and switching elements - Electromechanical control circuit devices
Machinery Directive 2006/42/EC	EC type examined by TÜV Rheinland - Cert. no. 01/205/6003.00/25
EN ISO 13849-1	Safety of machinery - safety related parts of control systems - General principles for design
EN 60204-1	Safety of machinery - Electrical equipment of machines - General requirements E-stop category 0
EN 61326-3-1	Electrical equipment for measurement, control and laboratory use. EMC requirements. Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) - General industrial applications
Lift Directive 2014/33/EU	EU type examined by TÜV Rheinland - Cert. no. 01/208/4A/6149.00/25
EN 81-20	Safety rules for the construction and installation of lifts. Part 20: passenger and goods passenger lifts
EN 81-50	Safety rules for the construction and installation of lifts. Part 50: design rules, calculations, examinations and tests of lift components
EN 12015	Electromagnetic compatibility. Product family standard for lifts, escalators and passenger. Emission
EN 12016	Electromagnetic compatibility. Product family standard for lifts, escalators and passenger. Immunity
Approvals	CE RoHS COMPLIANT c UL us LISTED

7.3.8 Environmental

Protection grade	IP40 on frontal part of the housing, IP20 on the terminals. The device has to be installed in a cabinet with protection degree of IP54.
Pollution degree	2
Operating Temperature	-25°C...+60°C (-13°F...140°F), UL: +40°C (104°F); (tested @ temp 65°C (149 °F) as per lift norm)
Storage Temperature	-30°C...+70°C (-22°F...158°F)
Ambient humidity range	R.H. ≤95% non condensing

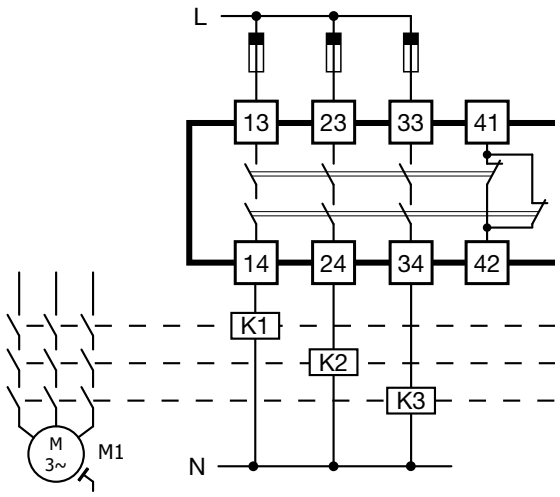


Information:
You must comply with the safety-related parameteres in order to ensure the required safety level for your plant/machine. All the units which use a safety function must be considered when calculating the overall safety level.

7.4 Function description

Not only must the output be safe, but also the complete wiring and surroundings. In order to reach cat. 4 of functional safety, two outputs must be wired as a pair, so that a defect of one output cannot cause a total loss of safety, as the other one of the pair is still able to switch off the dangerous parts of the plant (or machine). So wiring similar to the following has to be done:

7.4.1 Outputs function

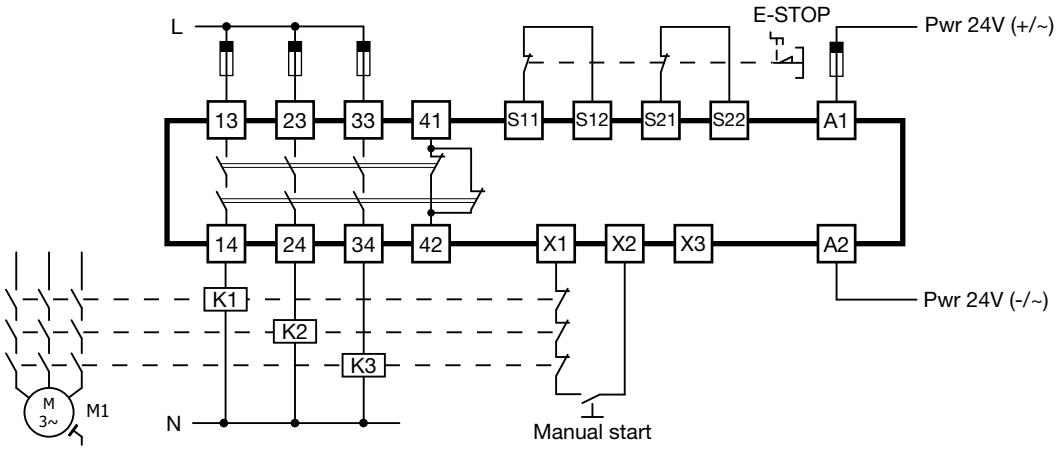


A	The NO safety outputs switch on (contacts close) and the NC auxiliary output opens, when the safety input are active and the start/reset is pressed.
B	In case of intervention of the safety inputs, the NO safety outputs are switched off and the NC auxiliary output is closed.
C	If the power supply fails, the NO safety outputs are switched off and NC auxiliary output is closed.
D	The NC auxiliary output is not a safety output

7.5 Application

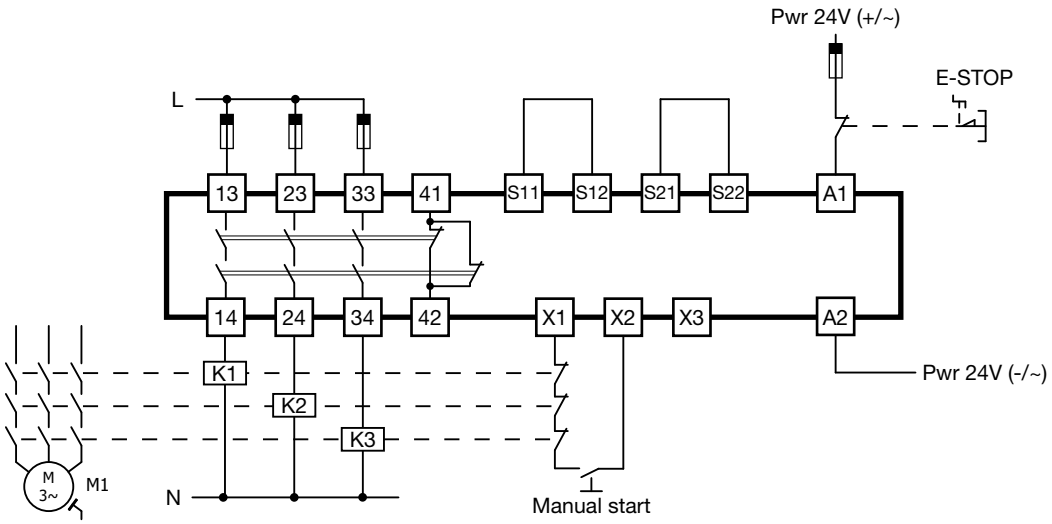
7.5.1 E-stop, safety limit switch and safety interlocks (double channel mode)

A	A cross circuit between the two channels will be recognized
B	In case of a fault the safety outputs will switch OFF
C	Suitable up to cat. 4, PLe (EN ISO 13849-1) Demand rate: once per month



7.5.2 E-stop, safety limit switch and safety interlocks (single channel mode)

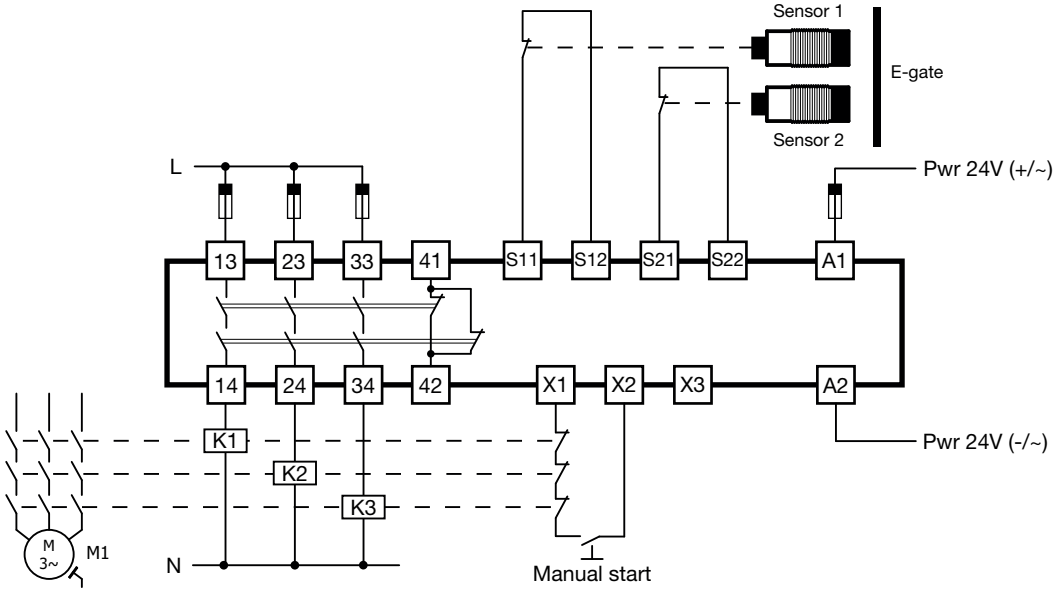
A	In case of a fault the safety outputs will switch OFF
B	Suitable up to cat. 1, PLc (EN ISO 13849-1)



Information:
- The release time in single channel mode is < 160 ms
- Automatic start not allowed in single channel mode

7.5.3 E-gate and safety non-contact switches

A	A cross circuit between the two channels will be recognized
B	In case of a fault the safety outputs will switch OFF
C	Suitable up to cat. 4, PLe (EN ISO 13849-1) Demand rate: once per month

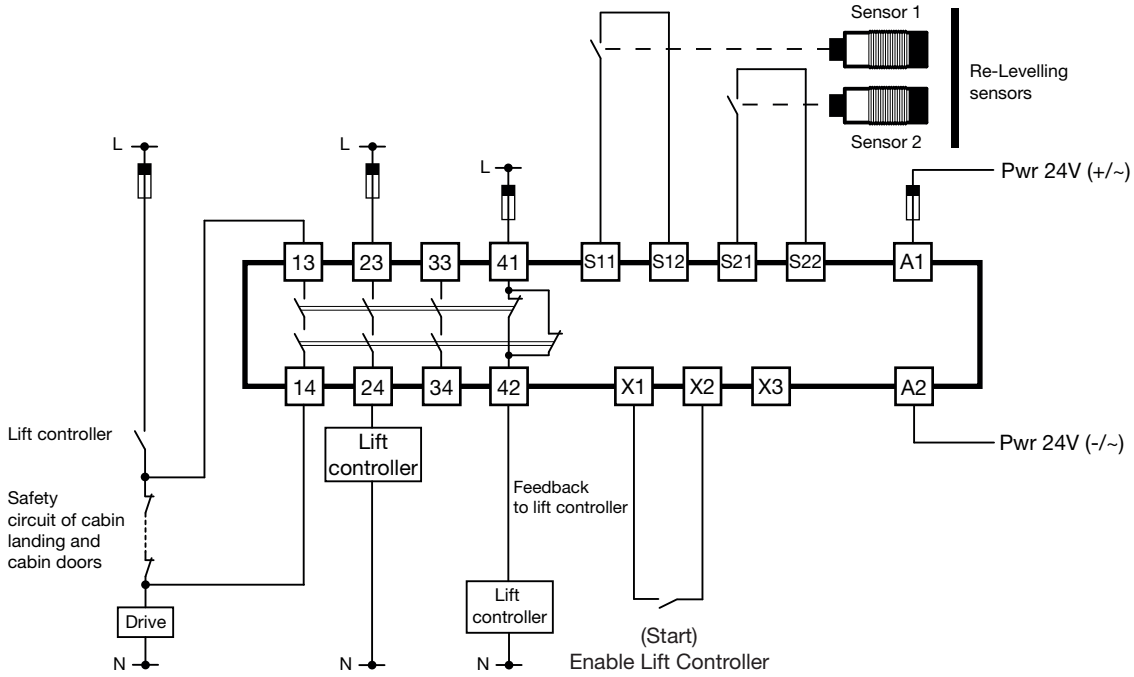


7.5.4 Lift levelling application

The SMS31 is designed to be employed in lift plants for floor levelling and relevelling of the cabin, according to the requirements of EN 81-20 and EN 81-50 Standards, and according to the 2014/33/EU Lift Directive.

Lift levelling with magnetic sensors

A	For the levelling and re-levelling functionality the Lift controller must be able to detect when the cabin is within the unlocking zone. This monitoring functionality is enabled from the lift controller by activating the "start/reset" input of the safety module. The safety module monitors the two re-levelling sensors and when the cabin is in the unlocking zone, it enables the safety outputs. One safety output must be connected to bypass the circuit that monitors the cabin landing and cabin doors, when the lift cabin is inside the unlocking zone; Otherwise, a cabin movement with open doors will not be possible. The other safety output is connected to the Lift controller to enable the re-levelling functionality, controlled by the Lift controller. The re-levelling functionality is limited to the unlocking zone, so as soon as the re-levelling sensors detect that the cabin is outside the unlocking zone, the safety outputs, at the safety module, are disabled which also disables the re-levelling functionality.
B	The inputs S12, S22 are connected to the re-levelling zone sensors



Information:
Lift car levelling safety module, designed according to Lift Directive 2014/33/EU and to safety circuit requirements of EN 81-20, EN 81-50 Standards.

Information:
EN 81-20: Safety rules for the construction and installation of lifts. Part 20: passenger and goods/passenger lifts.
EN 81-50: Safety rules for the construction and installation of lifts. Part 50: design rules, calculations, examinations and tests of lift components.

Lift levelling with photosensors

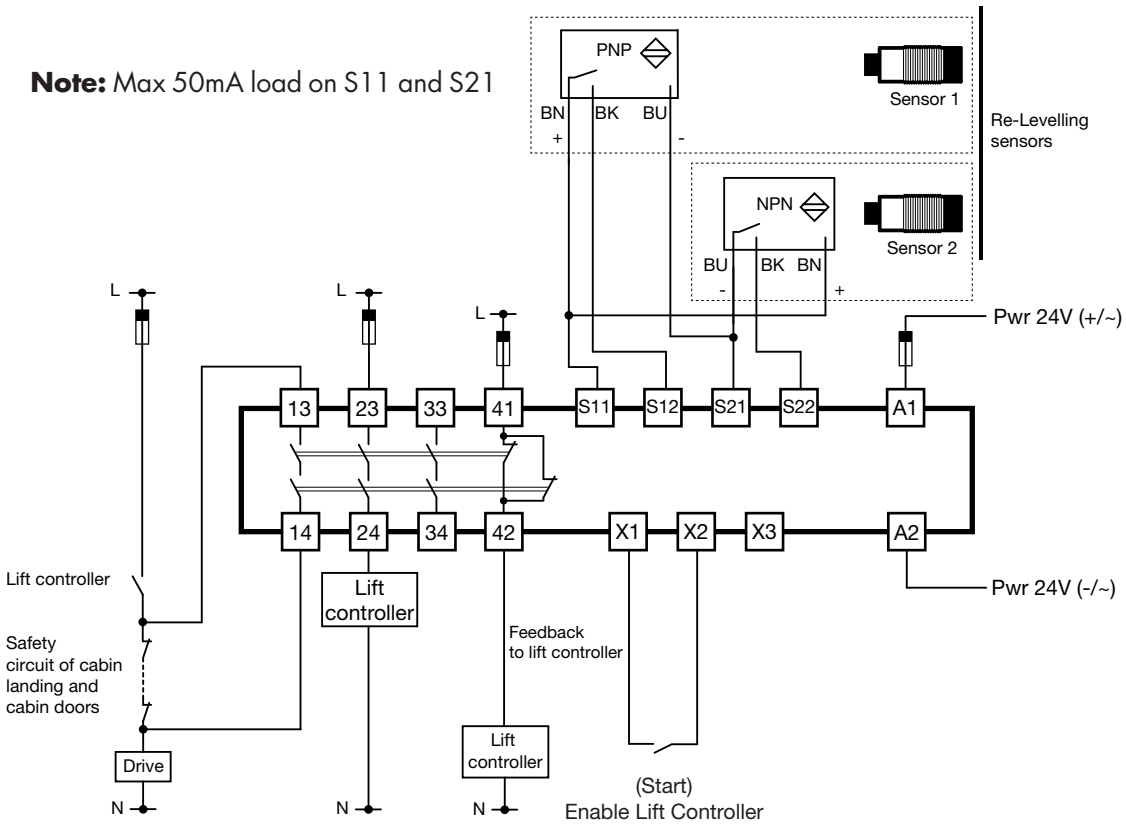
A

For the levelling and re-levelling functionality the Lift controller must be able to detect when the cabin is within the unlocking zone. This monitoring functionality is enabled from the lift controller by activating the "start/reset" input of the safety module. The safety module monitors the two re-levelling sensors and when the cabin is in the unlocking zone, it enables the safety outputs.
One safety output must be connected to bypass the circuit that monitors the cabin landing and cabin doors, when the lift cabin is inside the unlocking zone; Otherwise, a cabin movement with open doors will not be possible. The other safety output is connected to the Lift controller to enable the re-levelling functionality, controlled by the Lift controller.
The re-levelling functionality is limited to the unlocking zone, so as soon as the re-levelling sensors detect that the cabin is outside the unlocking zone, the safety outputs, at the safety module, are disabled which also disables the re-levelling functionality.

B

The inputs S12, S22 are connected to the re-levelling zone sensors

Note: Max 50mA load on S11 and S21



Information:
Lift car levelling safety module, designed according to Lift Directive 2014/33/EU and to safety circuit requirements of EN 81-20, EN 81-50 Standards.

Information:
EN 81-20: Safety rules for the construction and installation of lifts. Part 20: passenger and goods/passenger lifts.
EN 81-50: Safety rules for the construction and installation of lifts. Part 50: design rules, calculations, examinations and tests of lift components.

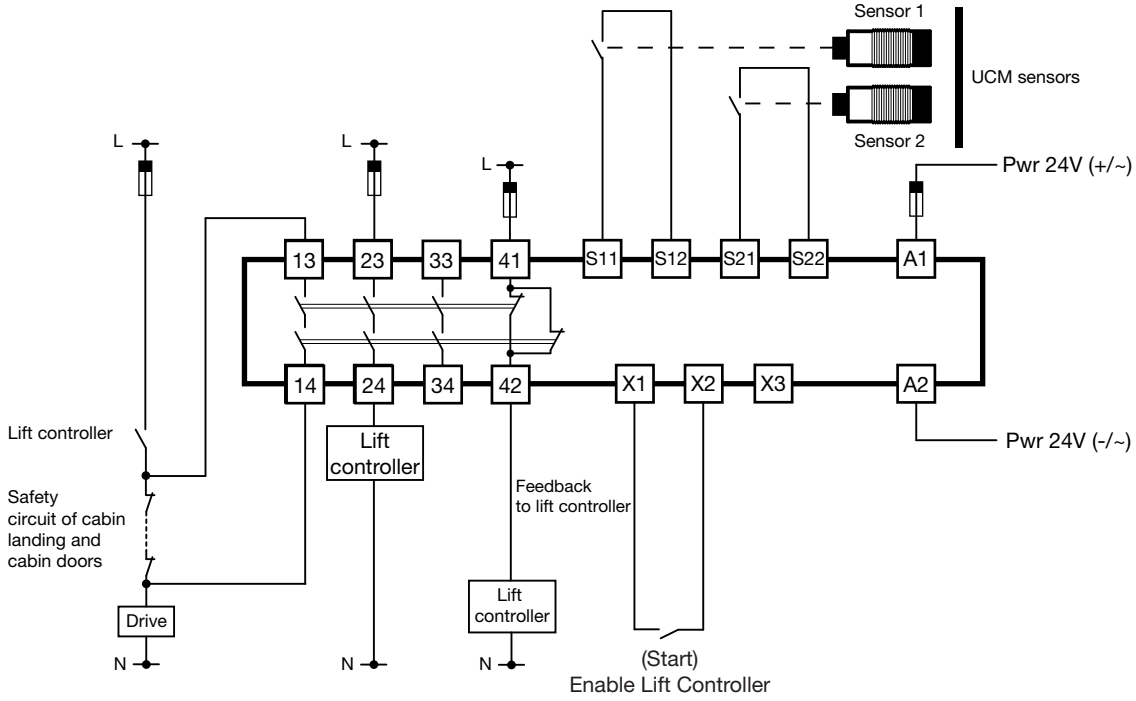
7.5.5 Unintended car movement (UCM) application

The SMS31 is designed to be employed in lift plants for protection against unintended car movements, according to the requirements of EN 81-20 and EN 81-50 Standards, and according to the 2014/33/EU Lift Directive.

Unintended car movement detection with magnetic sensors

A For the Unintended Car Movement (UCM) functionality the Lift controller must be able to detect when the cabin is within the unlocking zone. This monitoring functionality is enabled from the lift controller by activating the "start/reset" input of the safety module. The safety module monitors the two UCM sensors and when the cabin is in the unlocking zone, it enables the safety outputs.
In this situation the lift controller can open the landing door and the car door. Unintended movement of the car is detected by at least one of the two UCM sensors, latest when the car moves out of the unlocking zone with open doors. In this situation the safety module disables the safety outputs, which will stop the car immediately.

B The inputs S12, S22 are connected to the UCM sensors.





Information:
Unintended car movement safety module, designed according to Lift Directive 2014/33/EU and to safety circuit requirements of EN 81-20, EN 81-50 Standards.



Information:
EN 81-20: Safety rules for the construction and installation of lifts. Part 20: passenger and goods/passenger lifts.
EN 81-50: Safety rules for the construction and installation of lifts. Part 50: design rules, calculations, examinations and tests of lift components.

8. SMSA31

The SMSA31 module monitors both mechanical and safety magnetic sensors in antivalent function, so with 1NC + 1 NO contacts.

8.1 Terminal layout

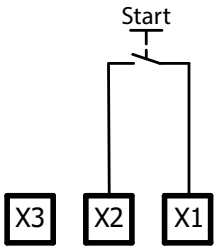


X1-X2: manual start / automatic start
X1-X3: monitored manual start
S11-S12: channel 1 NC input
S21-S22: channel 2 NO input
A1: power supply 24 Vdc (+)/Vac (~)
A2: power supply 24 Vdc (-)/Vac (~)

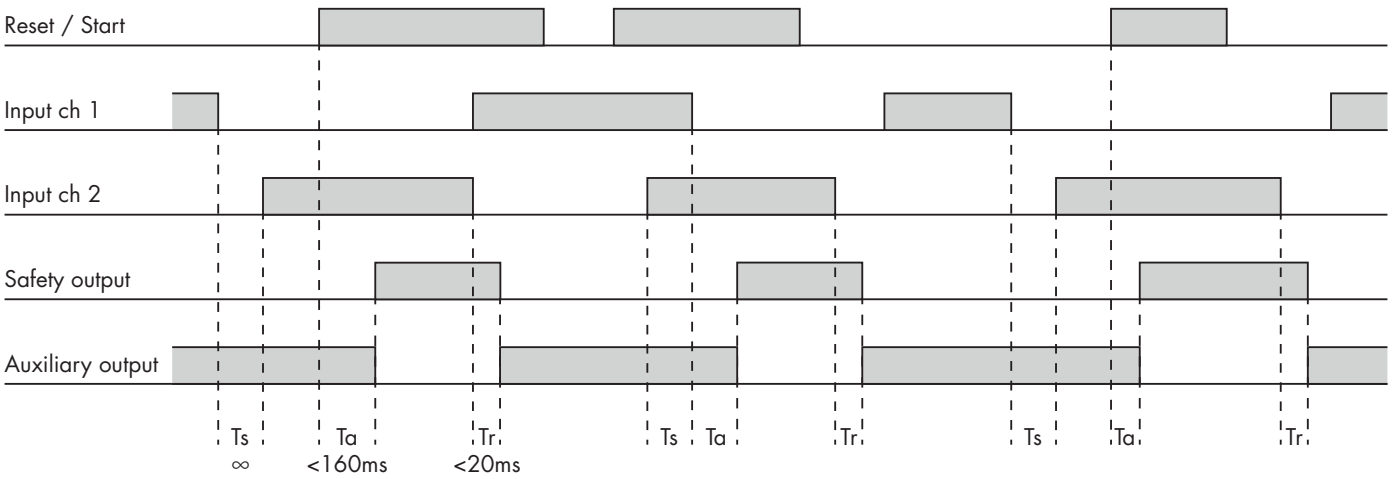
13-14: NO safety output
23-24: NO safety output
33-34: NO safety output
41-42: NC auxiliary output

8.2 Operating modes

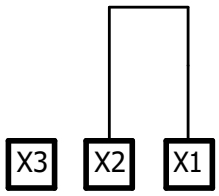
8.2.1 Manual start



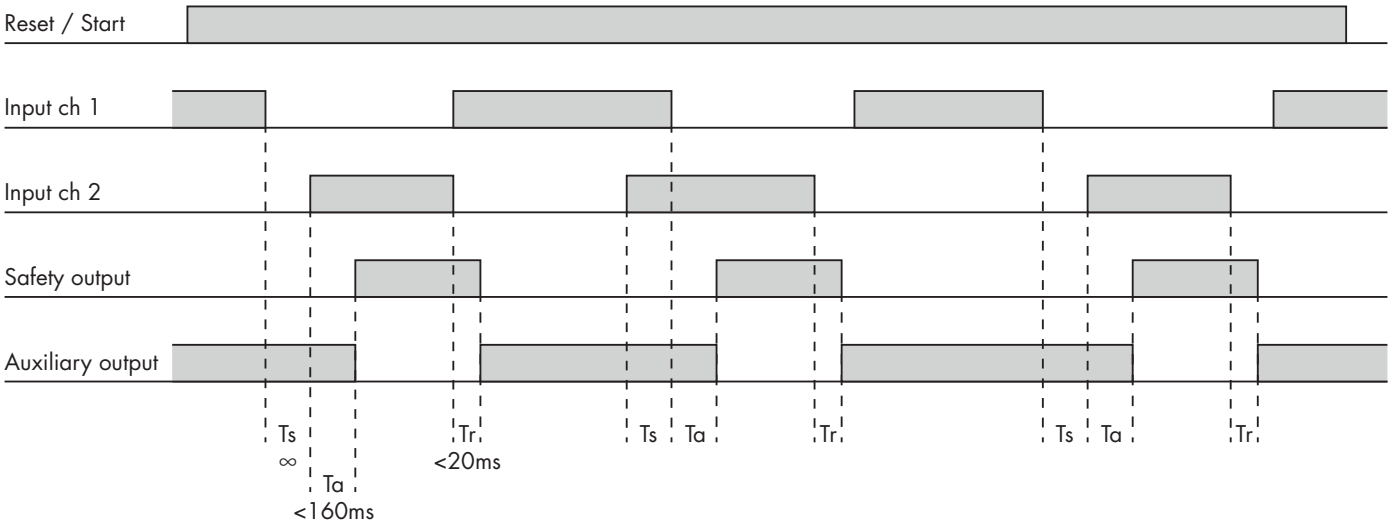
A	The start button is connected between X1 and X2. The safety inputs S12 and S22 are operated: • contact open between S11 and S12 • contact closed between S21 and S22 The start button is pressed and the safety outputs switch ON, while the auxiliary output opens
B	The change of state of at least one safety input forces immediately the safety outputs to the open state
C	A new operating cycle is possible only after releasing both input contacts and then operating them again



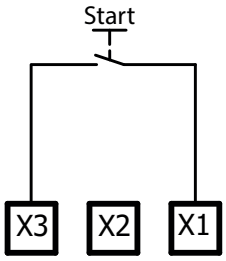
8.2.2 Automatic start



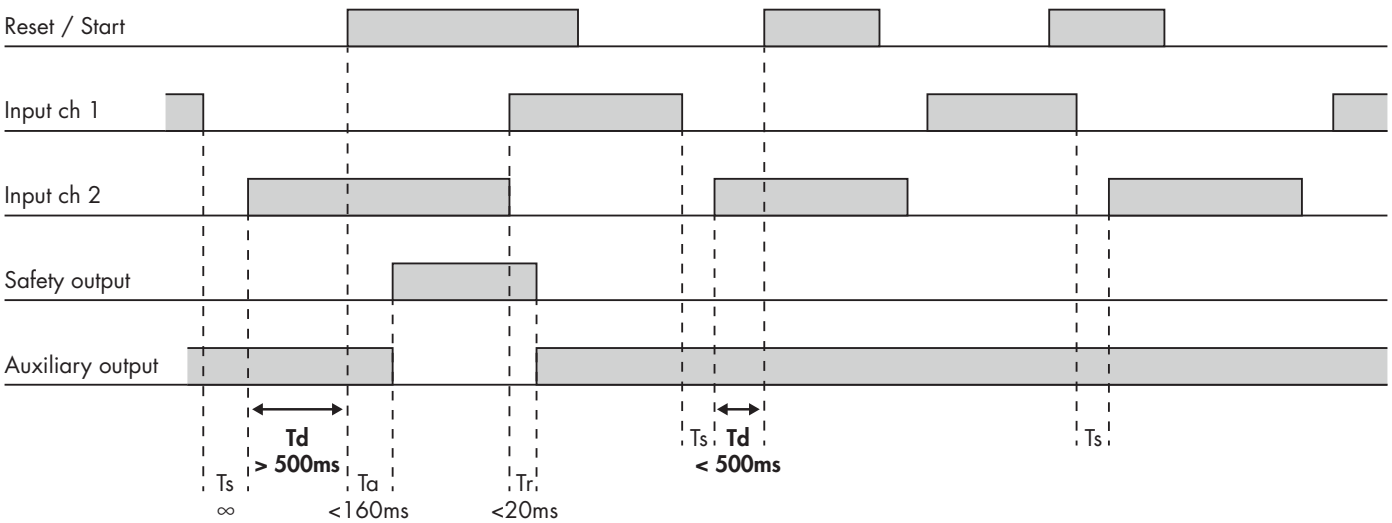
A	Connection between X1 and X2. The safety inputs S12 and S22 are operated: • contact open between S11 and S12 • contact closed between S21 and S22 The safety outputs switch ON, while the auxiliary output opens
B	The change of state of at least one safety input forces immediately the safety outputs to the open state
C	A new operating cycle is possible only after releasing both input contacts and then operating them again



8.2.3 Monitored manual start



A	The start button is connected between X1 and X3. The safety inputs S12 and S22 are operated: • contact open between S11 and S12 • contact closed between S21 and S22 The start button can be pressed at least 500ms after the safety inputs are operated, to enable the safety outputs to the active state; when the safety outputs switch ON, the auxiliary output opens
B	The change of state of at least one safety input forces immediately the safety outputs to the open state
C	A new operating cycle is possible only after releasing both input contacts and then operating them again





Information:
- The start/restart command must be installed outside the danger area in a position where the concerned danger and entire working area are clearly visible.
- It must not be possible to reach the start/restart command from the inside of the danger area.



Attention:
Use in manual start mode is mandatory where the safety device controls an access protecting a danger zone. This is to prevent a situation in which, once a person has passed through the opening, they could remain in the danger zone without being detected. Failure to comply with this rule may result in serious risks to people exposed.

8.3 Technical data

8.3.1 Timing specification

Activation time Ta	< 160ms
Release time Tr	Double channel mode: < 20ms Single channel mode: < 160ms
Simultaneity Ts	Infinite
Monitored manual start delay Td	< 500ms
Min. start activation time	100ms
Recovery time DC supply @ nom conditions	< 500ms
Recovery time AC supply @ nom conditions	< 1500ms
Min. operate time with manual start	< 160ms
Min. operate time with automatic start	~ 1500ms

8.3.2 Safety specification

Safety outputs	13-14, 23-24 and 33-34
Safe state of outputs	Open
Safety inputs	S11-S12 and S21-S22
Safe state of inputs	S11-S12 Closed, S21-S22 Open
Safety function	1. The release of either one or both safety inputs will release the safety outputs. 2. The re-activation of the safety outputs is only possible after the release of both safety inputs.

8.3.3 Safety parameters

ISO 13849-1 Safety Category	Cat. 4
ISO 13849-1 Performance Level	PL e
$MTTF_D$ [a]	420,8
PFH_D [1/h]	1,85 E-10
DCavg	99%
ß	5,00 E-02
$ß_D$	2,00 E-02
Mission time	20 years

8.3.4 Electrical data	
Supply voltage	24 Vdc ±10%, 2 W, Class 2 24 Vac -15/+10% 50...60 Hz, 4.5 VA, Class 2
	Overvoltage category III
	Short circuit protection internal PTC
Rated insulation	4 kV coil to contacts 4 kV contact to contact

8.3.5 Inputs	
Number of safety channels	2
Safety inputs (contact inputs)	S11-S12 and S21-S22
Loop resistance	Max. 1 kΩ
Input current	Typical 5 mA

8.3.6 Outputs		
Number of NO safety outputs		3
Number of NC auxiliary outputs		1
Type		Voltage free contact output, relays with forcibly guided contacts
Max current rating - single output:		@ 60°C (140°F) operating temperature: AC 1: 250V / 6A / 2000 VA - AC 15: 230V / 3A DC 1: 24V / 6A - DC 13: 24V / 2.5A / 0.1 Hz
	EN 60947-5-1	
	UL 508	Pilot duty: B300 / R300
Max. total current Σ I_{th}^2:		Spacing between modules ≥100mm: 72A² @40°C (104°F) ambient temperature Modules mounted stacked: 26A² @25°C (77°F) ambient temperature Please refer to the derating curves in chapter 12
	EN 60947-5-1	
	UL 508	Pilot duty: B300 / R300
Mechanical life		> 10^7 operations
Electrical life AC1 (360 s/h)		~ 10^5 operations

8.3.7 Compatibility and conformity		
Low Voltage Directive 2014/35/EU		
	EN 60947-5-1	Low-voltage switchgear and controlgear - Control circuit devices and switching elements - Electromechanical control circuit devices
EMC Directive 2014/30/EU		
	EN 60947-5-1	Low-voltage switchgear and controlgear - Control circuit devices and switching elements - Electromechanical control circuit devices
Machinery Directive 2006/42/EC		EC type examined by TÜV Rheinland - Cert. no. 01/205/6003.00/25
	EN ISO 13849-1	Safety of machinery - safety related parts of control systems - General principles for design
	EN 60204-1	Safety of machinery - Electrical equipment of machines - General requirements
	EN 61326-3-1	Electrical equipment for measurement, control and laboratory use. EMC requirements. Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) - General industrial applications
Approvals		CE RoHS COMPLIANT c UL us LISTED

8.3.8 Environmental

Protection grade	IP40 on frontal part of the housing, IP20 on the terminals. The device has to be installed in a cabinet with protection degree of IP54.
Pollution degree	2
Operating Temperature	-25°C...+60°C (-13°F...140°F), UL: +40°C (104°F)
Storage Temperature	-30°C...+70°C (-22°F...158°F)
Ambient humidity range	R.H. ≤95% non condensing

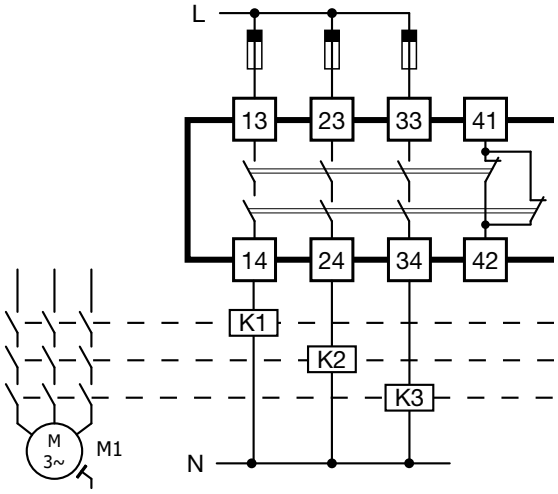


Information:
You must comply with the safety-related parameteres in order to ensure the required safety level for your plant/machine. All the units which use a safety function must be considered when calculating the overall safety level.

8.4 Function description

Not only must the output be safe, but also the complete wiring and surroundings. In order to reach cat. 4 of functional safety, two outputs must be wired as a pair, so that a defect of one output cannot cause a total loss of safety, as the other one of the pair is still able to switch off the dangerous parts of the plant (or machine). So wiring similar to the following has to be done:

8.4.1 Outputs function

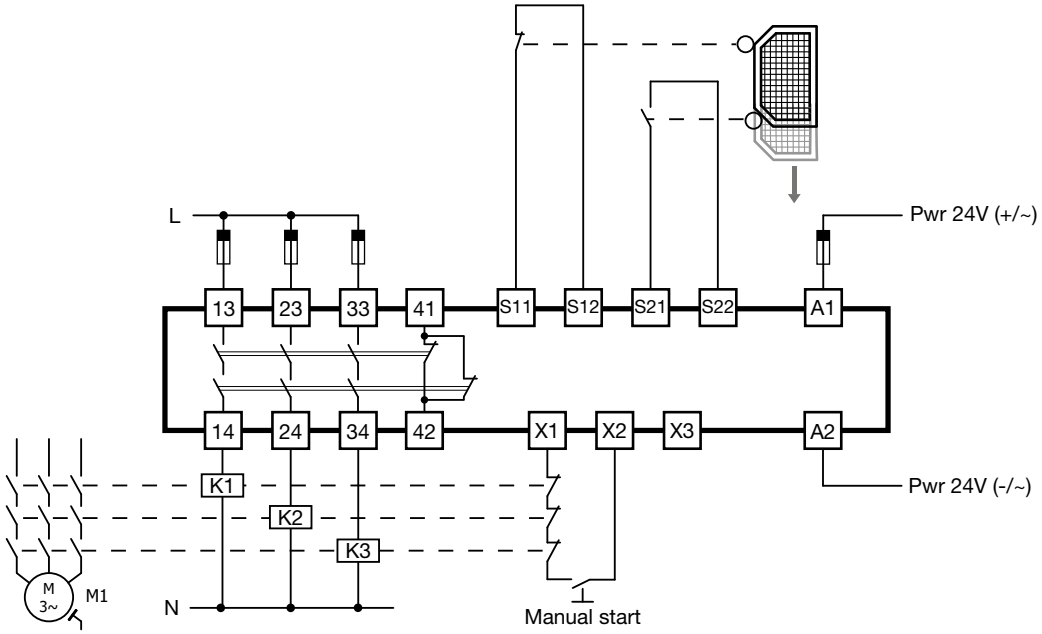


A	The NO safety outputs switch on (contacts close) and the NC auxiliary output opens, when the safety inputs are active and the start/reset is pressed.
B	In case of intervention of the safety inputs the NO safety outputs are switched off and the NC auxiliary output is closed.
C	If the power supply fails, the NO safety outputs are switched off and NC auxiliary output is closed.
D	The NC auxiliary output is not a safety output

8.5 Application

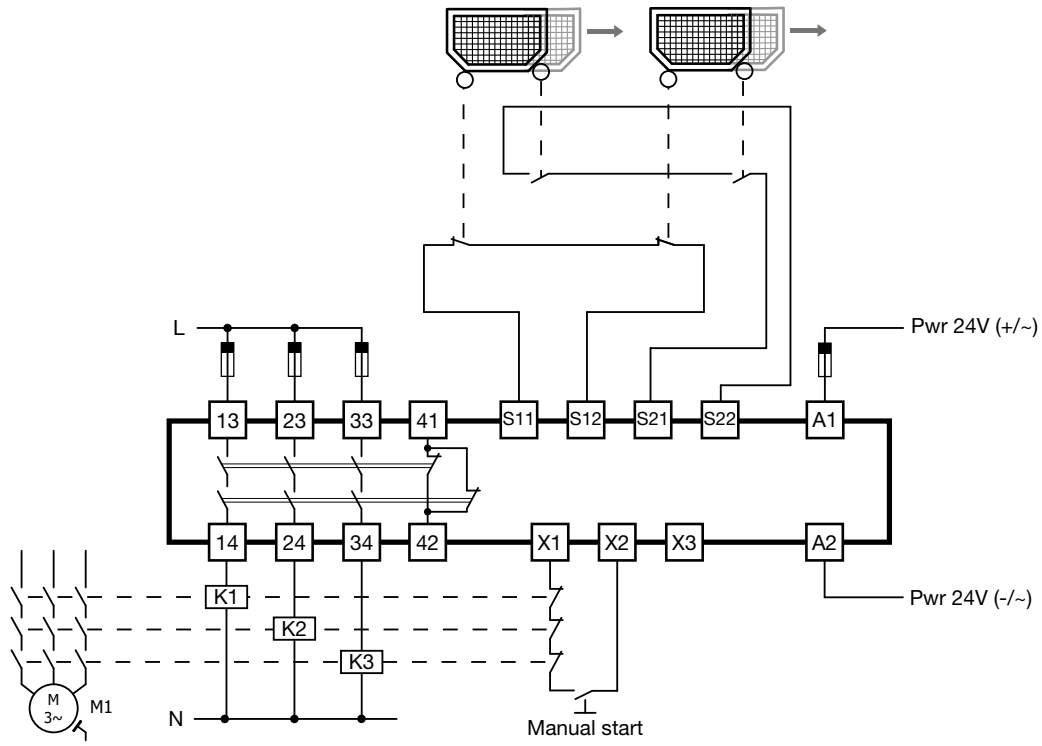
8.5.1 E-gate, safety limit switch and one access monitoring (double channel mode)

A	A cross circuit between the two channels will be recognized
B	In case of a fault the safety outputs will switch OFF
C	Suitable up to cat. 4, PLe (EN ISO 13849-1) Demand rate: once per month



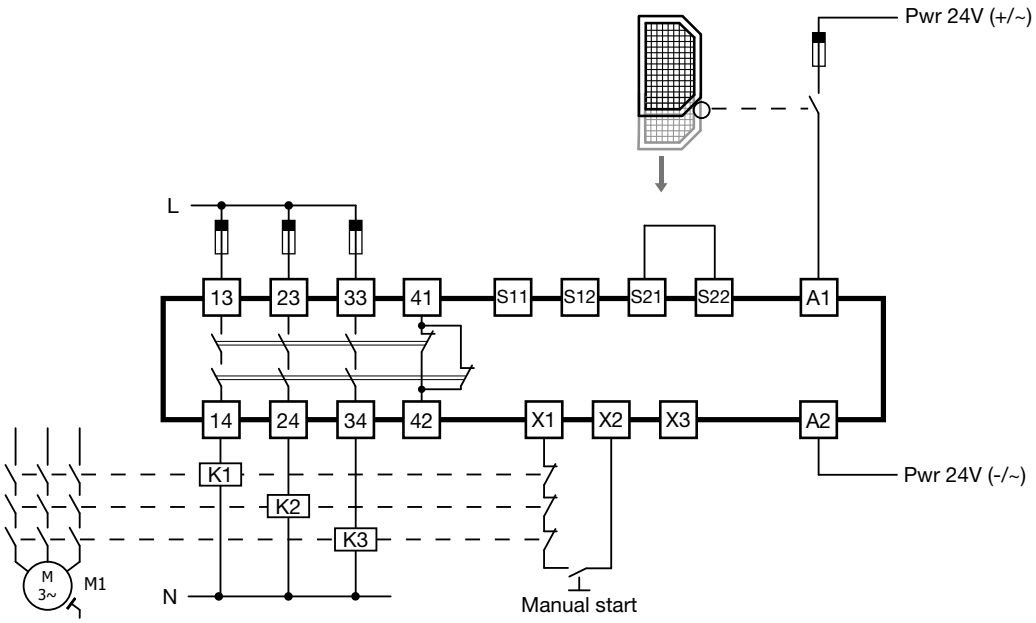
8.5.2 E-gate, safety limit switch and two accesses monitoring (double channel mode)

A	A cross circuit between the two channels will be recognized
B	In case of a fault the safety outputs will switch OFF
C	Suitable up to cat. 4, PLe (EN ISO 13849-1) Demand rate: once per month



8.5.3 E-gate, safety limit switch and one access monitoring (single channel mode)

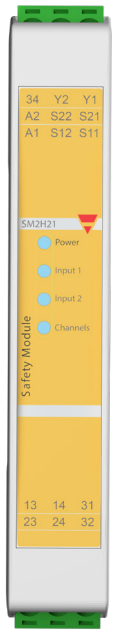
A	In case of a fault the safety outputs will switch OFF
B	Suitable up to cat. 1, PLc (EN ISO 13849-1)



9. SM2H21

The SM2H21 can be used in THCD (Two Hand Control Device) applications up to level III-C according to EN 574 / EN 13851.

9.1 Terminal layout

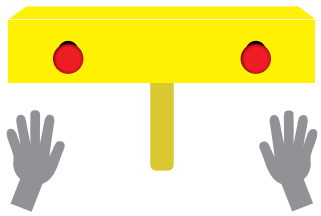


S11-S12: channel 1 NO input
S21-S22: channel 2 NO input
Y1-Y2: NC feedback input
A1: power supply 24 Vdc (+)/Vac (~)
A2: power supply 24 Vdc (-)/Vac (~)

13-14: NO safety output
23-24: NO safety output
31-32: NC auxiliary output
34: PNP auxiliary output

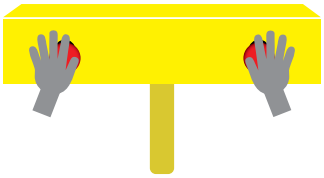
9.2 Function description

9.2.1 Two-hands console released

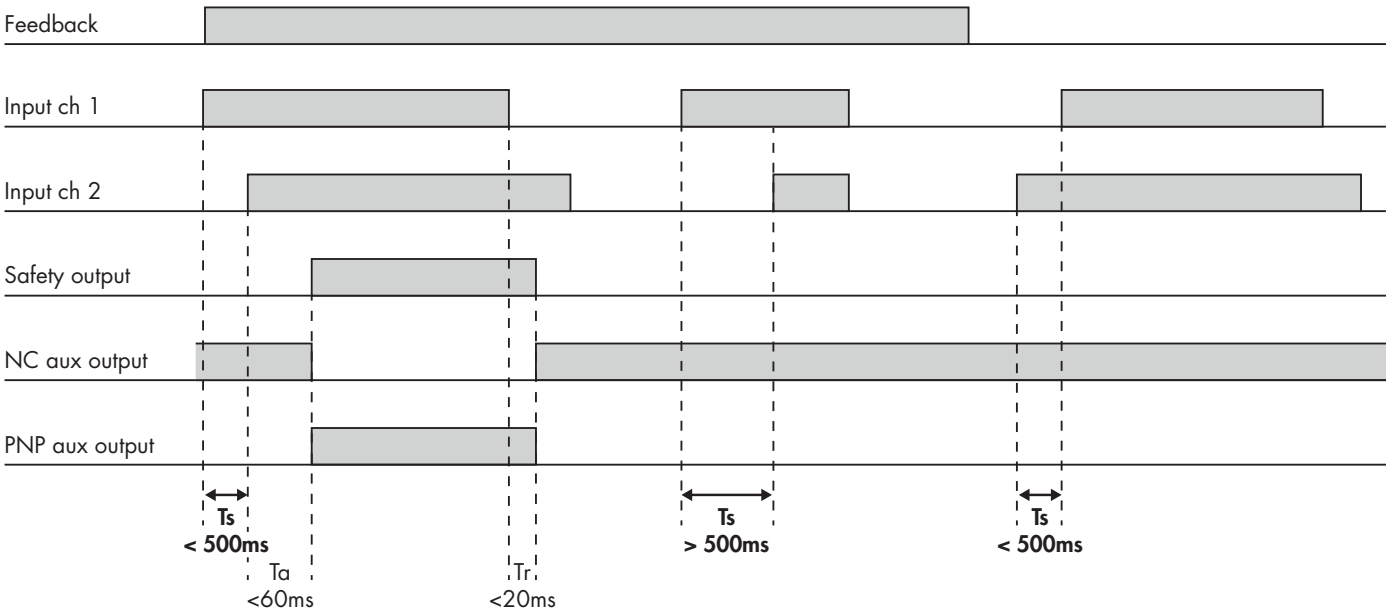


A	If the push buttons of the two-hands console are not operated, the channel 1 (S11-S12) and channel 2 (S21-S22) inputs are open, while the NC contact of S1 (on the console) is closed between S11 and S22, and the NC contact of S2 (on the console) is closed between S12 and S21.
B	The NO safety outputs are switched off.

9.2.2 Two-hands console operated



A	If the push buttons of the two-hands console are pressed simultaneously or with a delay time of max 0.5s, the channel 1 (S11-S12) and channel 2 (S21-S22) inputs are closed
B	The NO safety outputs switch ON, the NC auxiliary output opens and the PNP auxiliary output is ON (+24Vdc)
C	The release of at least one push button of the two-hands console forces immediately the safety outputs to the open state, the NC auxiliary output to the close state and PNP auxiliary output is OFF
D	A new operating cycle is possible only after releasing both push buttons and operating them again



9.3 Technical data

9.3.1 Timing specification

Activation time Ta	< 60ms
Release time Tr	< 20ms
Simultaneity Ts	< 500ms

9.3.2 Safety specification

Safety outputs	13-14 and 23-24
Safe state of outputs	Open
Safety inputs	S11-S12 and S21-S22
Safe state of inputs	Open
Safety function	1. The release of either one or both safety inputs will release the safety outputs. 2. The re-activation of the safety outputs is only possible after the release of both safety inputs.

9.3.3 Safety parameters

ISO 13849-1 Safety Category	Cat. 4
ISO 13849-1 Performance Level	PL e
$MTTF_D$ [a]	422,1
PFH_D [1/h]	1,35 E-10
DCavg	99%
ß	5,00 E-02
$ß_D$	2,00 E-02
Mission time	20 years

9.3.4 Electrical data

Supply voltage	24 Vdc ±10%, 2 W, Class 2 24 Vac -15/+10% 50÷60 Hz, 4.5 VA, Class 2
	Overvoltage category III
	Short circuit protection internal PTC
Rated insulation	4 kV coil to contacts 4 kV contact to contact

9.3.5 Inputs	
Number of safety channels	2
Safety inputs (contact inputs)	S11-S12 and S21-S22
Loop resistance	Max. 30 Ω (eq. 2500m 1,5mm² Cu)
Input current	Typical 30 mA

9.3.6 Outputs		
Number of NO safety outputs		2
Number of NC auxiliary outputs		1
Number of PNP auxiliary outputs		1; PNP collector, 24 Vdc, min external resistive load 2.4 kΩ
NO and NC outputs type		Voltage free contact output, relays with forcibly guided contacts
Max current rating - single output:	**EN 60947-5-1**	@ 60°C (140°F) operating temperature: AC 1: 250V / 6A / 2000 VA - AC 15: 230V / 3A DC 1: 24V / 6A - DC 13: 24V / 2.5A / 0.1 Hz
	UL 508	Pilot duty: B300 / R300
Max. total current Σ Ith²:	**EN 60947-5-1**	Spacing between modules ≥100mm: 72A² @40°C (104°F) ambient temperature Modules mounted stacked: 26A² @25°C (77°F) ambient temperature Please refer to the derating curves in chapter 12
	UL 508	Pilot duty: B300 / R300
Mechanical life		> 10^7 operations
Electrical life AC1 (360 s/h)		~ 10^5 operations

9.3.7 Compatibility and conformity		
Low Voltage Directive 2014/35/EU	**EN 60947-5-1**	Low-voltage switchgear and controlgear - Control circuit devices and switching elements - Electromechanical control circuit devices
EMC Directive 2014/30/EU	**EN 60947-5-1**	Low-voltage switchgear and controlgear - Control circuit devices and switching elements - Electromechanical control circuit devices
Machinery Directive 2006/42/EC		EC type examined by TÜV Rheinland - Cert. no. 01/205/6003.00/25
	EN ISO 13849-1	Safety of machinery - safety related parts of control systems - General principles for design
	EN 60204-1	Safety of machinery - Electrical equipment of machines - General requirements
	EN ISO 13851	Safety of machinery - Two-hand control devices - Principles for design and selection. Two-hand control type III-C
	EN 61326-3-1	Electrical equipment for measurement, control and laboratory use. EMC requirements. Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) - General industrial applications
Approvals		CE RoHS COMPLIANT c UL us LISTED

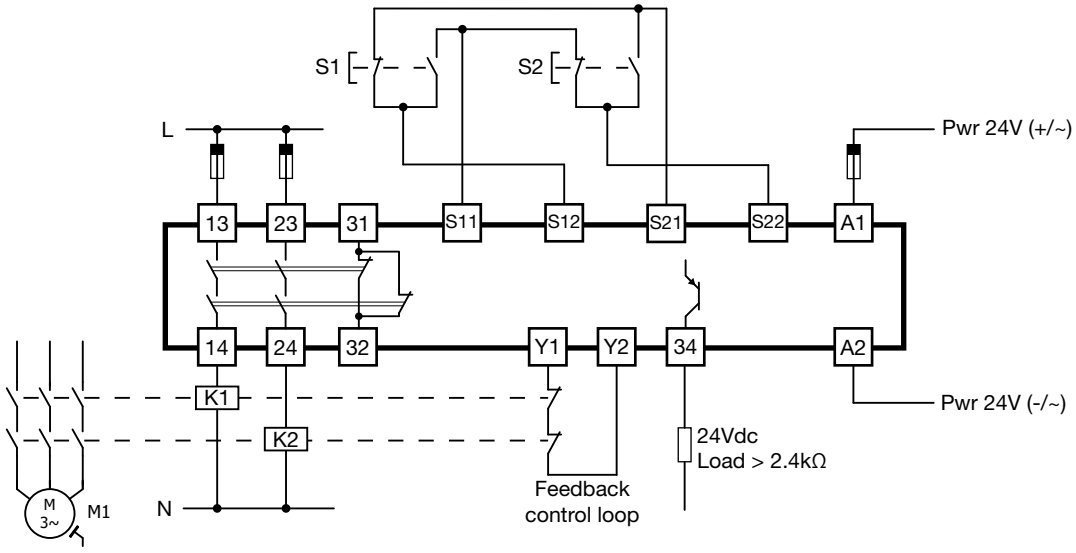
9.3.8 Environmental	
Protection grade	IP40 on frontal part of the housing, IP20 on the terminals. The device has to be installed in a cabinet with protection degree of IP54.
Pollution degree	2
Operating Temperature	-25°C...+60°C (-13°F...140°F), UL: +40°C (104°F)
Storage Temperature	-30°C...+70°C (-22°F...158°F)
Ambient humidity range	R.H. ≤95% non condensing



Information:
You must comply with the safety-related parameteres in order to ensure the required safety level for your plant/machine. All the units which use a safety function must be considered when calculating the overall safety level.

9.4 Wiring diagram

Cat 4; PLe, possible (also depending on the output wiring and the chosen trigger elements).



10. SME41

The SME41 is intended to expand the number of safety outputs of a master safety module. It must be wired correctly to a master safety module to reach the needed safety category.
It can be used as an extension unit of safety modules with free-of-voltage relay output; it can also be used with the CM or CL series safety modules with OSSD safety outputs, to provide for safety relay outputs.

10.1 Terminal layout



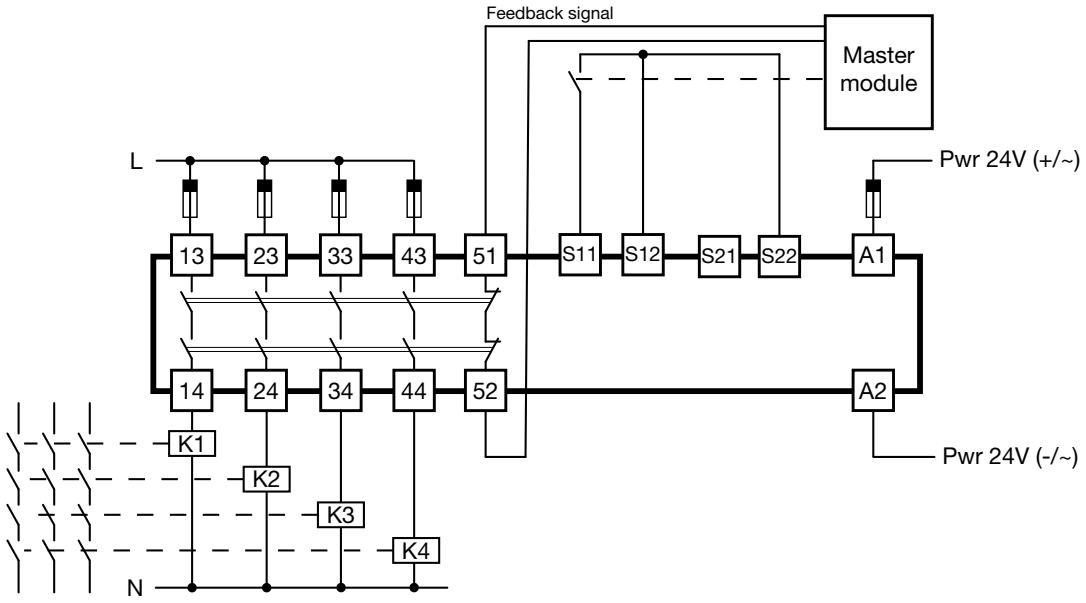
S11-S12: channel 1 NO input
S21-S22: channel 2 NO input
A1: power supply 24 Vdc (+)/Vac (~)
A2: power supply 24 Vdc (-)/Vac (~)

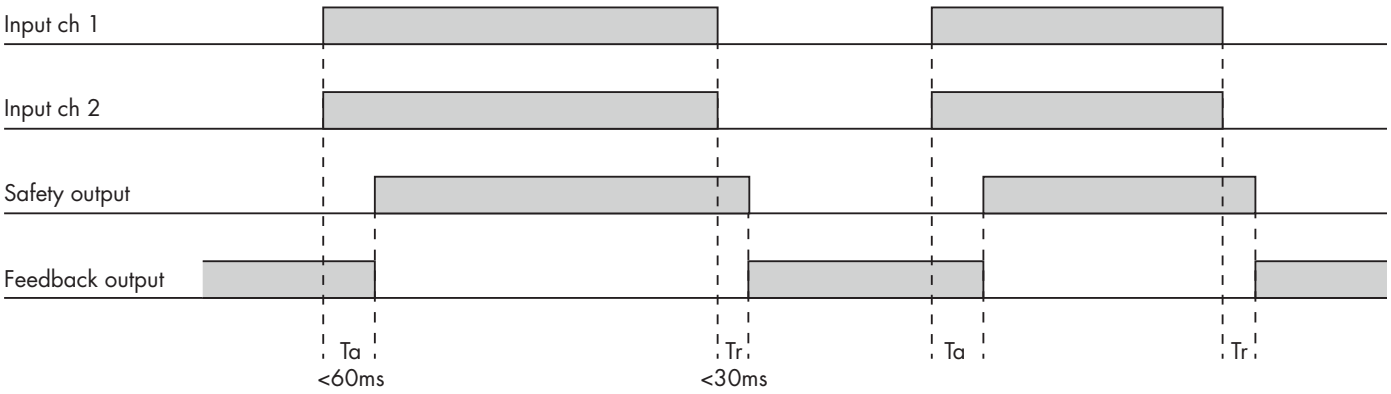
13-14: NO safety output
23-24: NO safety output
33-34: NO safety output
43-44: NO safety output
51-52: NC feedback output

10.2 Application

10.2.1 Extension module in single channel mode

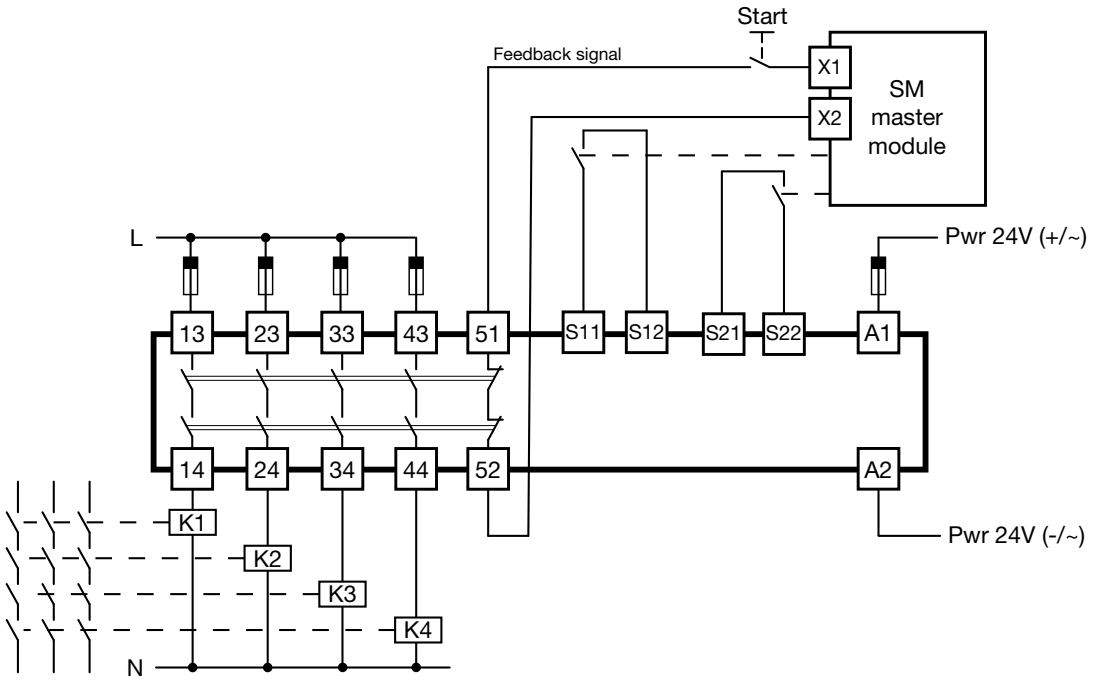
A	• Connection of NO safety output of the master module between S11-S12 for input 1 • Connection between S12-S22 for input 2 The safety relay output from a master safety module is activated and the safety outputs of SME41 switch ON, while the NC feedback output opens.
B	The opening of the safety relay output of the master module forces immediately the safety outputs of SME41 to the open state, and the NC feedback output to the close state.
C	Suitable up to cat. 2, PLd (EN ISO 13849-1)

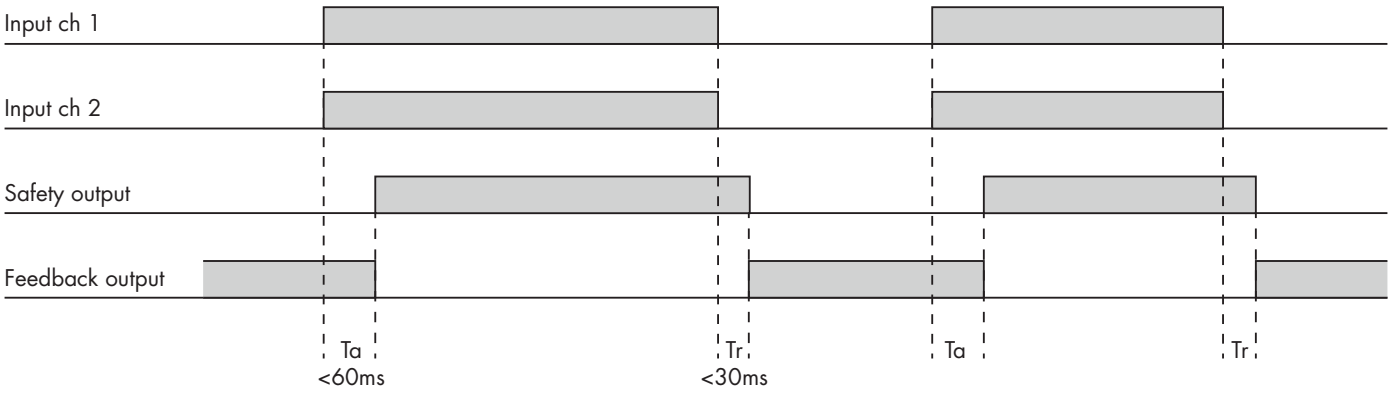




10.2.2 Extension module in double channel mode

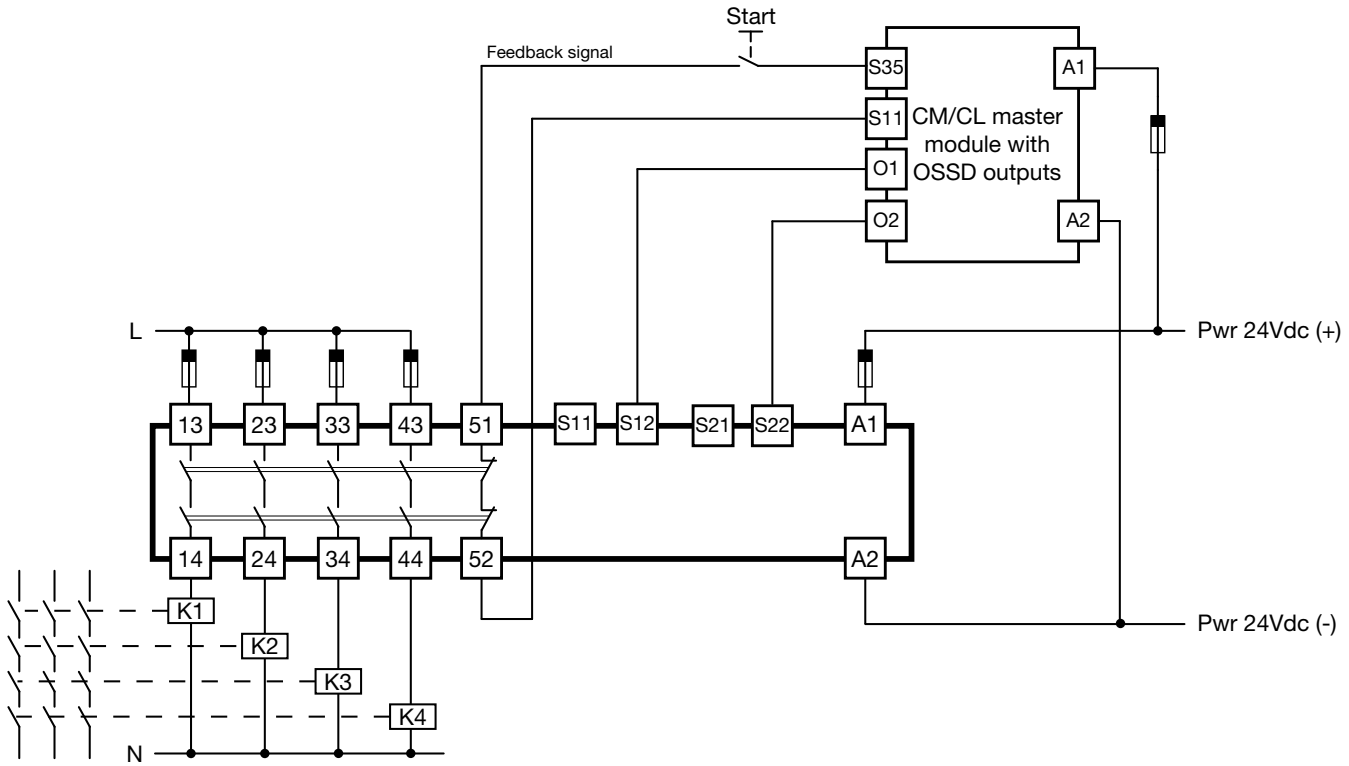
A	• Connection of NO safety output 1 of the master module between S11-S12 for input 1 • Connection of NO safety output 2 of the master module between S21-S22 for input 2 When the safety relay outputs of the master safety module are activated, the safety outputs of SME41 switch ON, while the NC feedback output opens.
B	The opening of at least one safety relay output of the master module forces immediately the safety outputs of SME41 to the open state, and the NC feedback output to the close state.
C	The NO safety outputs of SME41 will switch ON again if both input 1 and input 2 are activated.
D	Suitable up to cat. 4, PLe (EN ISO 13849-1) Demand rate: once per month

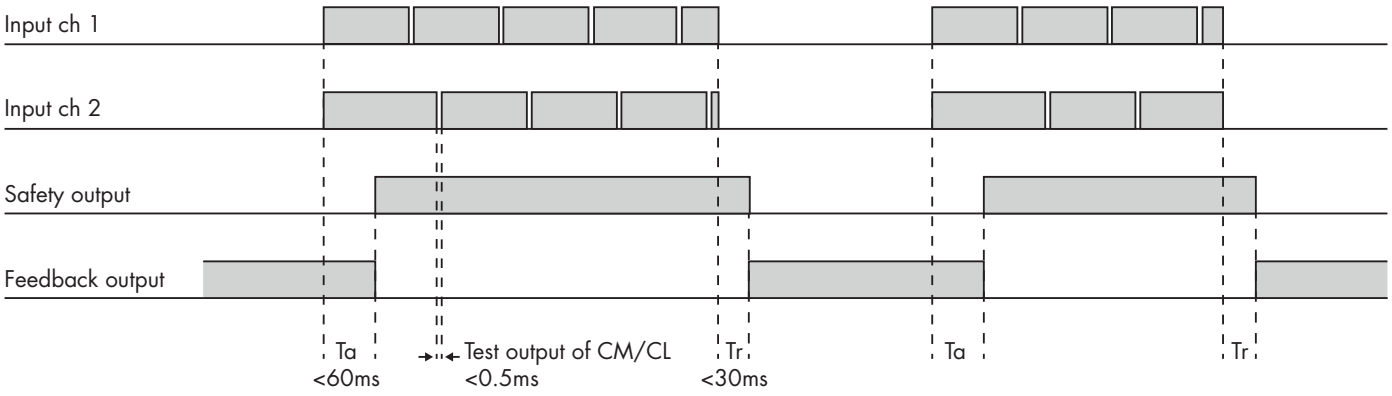




10.2.3 Extension module for CM/CL safety modules with OSSD safety outputs

A	If the SME41 is used as extension unit for CM/CL safety module series, both devices have to be supplied with 24Vdc. The OSSD safety outputs of the CM/CL have to be connected to the S12 and S22 input; the choice of the OSSD outputs O1, O2, O3 or O4 is depending on CM/CL type and configuration respectively.
B	• Connection of OSSD 1 of the CM or CL master module on S12 for input 1 • Connection of OSSD 2 of the CM or CL master module on S22 for input 2 When both OSSD safety outputs of the master module are activated (high level), the safety outputs of SME41 switch ON, while the NC feedback output opens.
C	The OFF state of at least one OSSD safety output of the master module forces immediately the safety outputs of SME41 to the open state, and the NC feedback output to the close state.
D	The NO safety outputs of SME41 will switch ON again if both input 1 and input 2 are activated.
E	Suitable up to cat. 4, PLe (EN ISO 13849-1) Demand rate: once per month





10.3 Technical data

10.3.1 Timing specification

Activation time Ta	< 60ms
Release time Tr	< 30ms
Simultaneity Ts	Infinite

10.3.2 Safety specification

Safety outputs	13-14, 23-24, 33-34, and 43-44
Safe state of outputs	Open
Safety inputs	S11-S12 and S21-S22
Safe state of inputs	Open
Safety function	The release of either one or both safety inputs will release the safety outputs.

10.3.3 Safety parameters

ISO 13849-1 Safety Category	Cat. 4*
ISO 13849-1 Performance Level	PL e*
MTTFD [a]	363,4
PFHD [1/h]	1,59 E-10
DCavg	99%*
ß	5,00 E-02
ßD	2,00 E-02
Mission time	20 years



***Information:**
The SME41 is an expansion module with no internal diagnostics. To attain Cat 4, PL e according to EN ISO 13849-1, the SME41 must be used with a Cat 4, PL e master module and the NC feedback output of SME41 (contacts 51-52) must be connected in series with the start signal of the master module (as shown in sections 10.2.2 and 10.2.3). This must be done to prevent any start/restart of the system if an internal failure in the SME41 has occurred.

10.3.4 Electrical data

Supply voltage	24 Vdc ±10%, 2 W, Class 2 24 Vac -15/+10% 50÷60 Hz, 4.5 VA, Class 2
	Overvoltage category III
	Short circuit protection internal PTC
	Rated insulation voltage 4 kV
Rated insulation	4 kV coil to contacts 4 kV contact to contact

10.3.5 Inputs

Number of safety channels	2
Safety inputs (contact inputs)	S11-S12 and S21-S22
Loop resistance	Max. 1 kΩ
Input voltage	0 - 35 VDC
Input current	Typical 5 mA

10.3.6 Outputs	
Number of NO safety outputs	4
Number of NC feedback output	1
Outputs type	Voltage free contact output, relays with forcibly guided contacts
Max current rating - single output: **EN 60947-5-1**	@ 60°C (140°F) operating temperature: AC 1: 250V / 6A / 2000 VA - AC 15: 230V / 3A DC 1: 24V / 6A - DC 13: 24V / 2.5A / 0.1 Hz
UL 508	Pilot duty: B300 / R300
Max. total current Σ I_{th}^2: **EN 60947-5-1**	Spacing between modules ≥100mm: 72A² @40°C (104°F) ambient temperature Modules mounted stacked: 26A² @25°C (77°F) ambient temperature Please refer to the derating curves in chapter 12
UL 508	Pilot duty: B300 / R300
Mechanical life	> 10^7 operations
Electrical life AC1 (360 s/h)	~ 10^5 operations

10.3.7 Compatibility and conformity	
Low Voltage Directive 2014/35/EU **EN 60947-5-1**	Low-voltage switchgear and controlgear - Control circuit devices and switching elements - Electromechanical control circuit devices
EMC Directive 2014/30/EU **EN 60947-5-1**	Low-voltage switchgear and controlgear - Control circuit devices and switching elements - Electromechanical control circuit devices
Machinery Directive 2006/42/EC	Certified by TÜV Rheinland - Cert. no. 968/FSP 2849.00/25
EN ISO 13849-1	Safety of machinery - safety related parts of control systems - General principles for design
EN 60204-1	Safety of machinery - Electrical equipment of machines - General requirements
EN 61326-3-1	Electrical equipment for measurement, control and laboratory use. EMC requirements. Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) - General industrial applications
Approvals	CE RoHS COMPLIANT c UL us LISTED

10.3.8 Environmental	
Protection grade	IP40 on frontal part of the housing, IP20 on the terminals. The device has to be installed in a cabinet with protection degree of IP54.
Pollution degree	2
Operating Temperature	-25°C...+60°C (-13°F...140°F), UL: +40°C (104°F)
Storage Temperature	-30°C...+70°C (-22°F...158°F)
Ambient humidity range	R.H. ≤95% non condensing

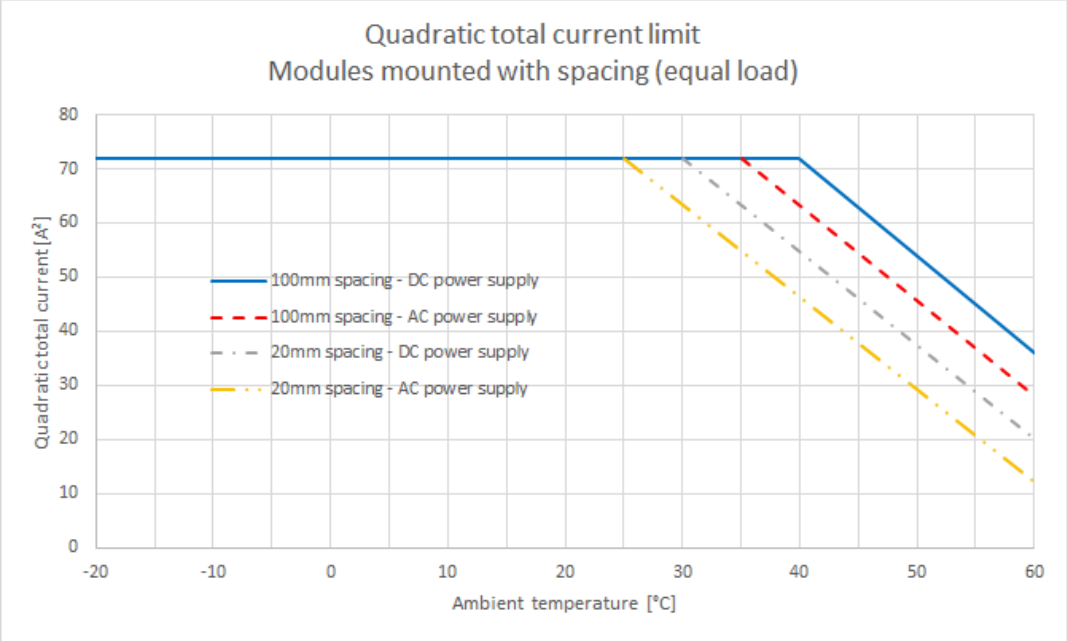
11. LED information

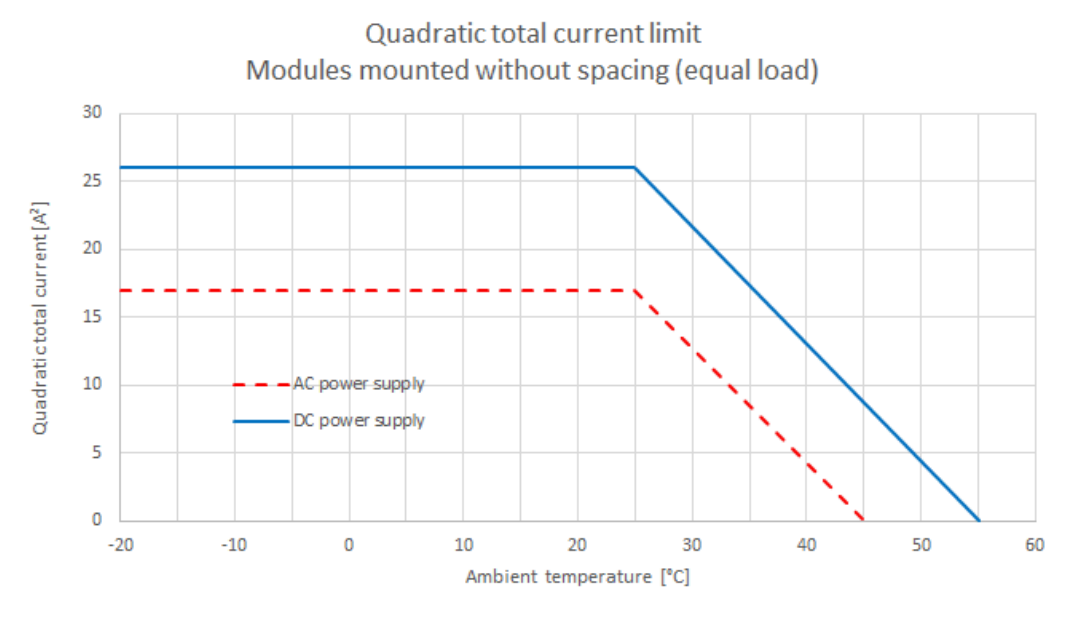
4 LEDs on the front panel indicate the status and any errors during operation:

Status indicator			
LED	**Colour**	**Status**	**Meaning**
Power 	**Green**	ON	SM is powered
IN1, IN2 	**Yellow**	Input 1 OFF Input 2 OFF	The safety devices connected to the inputs 1 and 2 are not active (e.g. contacts open); the safety module cannot enable the safety outputs
		Input 1 ON Input 2 OFF	The safety device connected to the input 1 is active (e.g. contact closed), while the input 2 is not active (e.g. contact open); the safety module cannot enable the safety outputs
		Input 1 OFF Input 2 ON	The safety device connected to the input 2 is active (e.g. contact closed), while the input 1 is not active (e.g. contact open); the safety module cannot enable the safety outputs
		Input 1 ON Input 2 ON	The safety devices connected to the inputs 1 and 2 are active (e.g. contacts closed); the safety module can enable the safety outputs
Channels 	**Green**	OFF	The NO safety outputs are open and the NC auxiliary output is closed
		ON	The NO safety outputs are closed and the NC auxiliary output is open

12. Total current Σ Ith²

Quadratic total current [A²] = Output 1 current[A]² + Output 2 current[A]² + Output n current[A]²





13. Annex A: Glossary

Term	Definition
Activation time (Ta)	The activation time is the time from the start/reset is activated and until the safety outputs are energized (HIGH state).
Release time (Tr)	The release time is the time from one of the inputs is released until the outputs are de-energized (LOW state).
Simultaneity (Ts)	The time from one input is activated until the other input is activated.
Monitored manual start delay (Td)	Delay from inputs are activated till start/reset can be activated. Ensures that start/reset must be activated AFTER inputs are activated.
Min. start activation time	The time required to activate the start signal.
Recovery time	The recovery time is the time for the safety inputs to be in the LOW state before returning to the HIGH state.
Min. operate time	The operate time is the time from the system is initiated until the module is functional and specified behavior is observed. The system is initiated either by the activation of start in manual start/reset or by the HIGH state of the two inputs in automatic start/reset.