CARLO GAVAZZI

Certus Multifunction safety module

Instruction manual

Manuale d'istruzione

Betriebsanleitung

Manuel d'instructions

Manual de instrucciones

Brugervejledning

使用手册

Carlo Gavazzi Automation Via Milano 13, 20020 Lainate (Milano) Italy

Table of contents

CERTUS - Instruction manual
Multifunction safety module

Ownership

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.

1. Introduction

CERTUS

Description

Certus offers a range of safety modules, compliant with international standards, designed to provide the most comprehensive protection for equipment and personnel. They enable safety functions, accepting different types of input using the same product. This means cost saving and fewer product codes to manage.

All rights to this document are reserved by Carlo Gavazzi Automation S.p.A. Copies may be made for internal use only.
Please do not hesitate to make any suggestions for improving this document.

Validity of documentation

This documentation is valid only for Certus Family products 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 moving parts of the machine.
The CERTUS modules provide a safety-related interruption of a safety circuit.
The safety modules are compliant with the requirements of EN ISO 13849-1, EN 61508, EN 62061 and EN 81-20 and -50 (only CL20D2A) and may be used in applications with:

Device		
	CM22D0A / CM40D0A / CM30D1A	**CL20D2A**
1 E-stop	•	
2 E-gate	•	
3 Limit switch	•	
4 Non-contact switch	•	
5 Safety light curtains (ESPE Type 4, Type 2)	•	
6 Safety light beam (single beam)	•	
7 Safety mat	•	
8 Lift levelling		•

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, it makes sense to use harmonized standards like EN ISO 13849-1 and/or EN 62061.

Before using a Certus multifunction 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 from a technical standpoint.

Certus modules are built to the following safety levels: SIL 3, SIL_{CL} 3, PL e, Cat. 4, in accordance with the applicable standards. However, the definitive SIL and 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/configuration of the Certus module is the sole responsibility of the installer or the user.

The device must be installed/configured 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 Certus 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 Standars

In 2014 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 Certus CL20D2A module is compliant with these Standards (EN 81-20 and EN 81-50).

2.3 Assistant system Software

http://www.gavazzi-automation.com/nsc/HQ/EN/safety_modules

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

3. Features

Certus offers a range of safety modules, compliant with international standards, designed to provide the most comprehensive protection for equipment and personnel. They enable safety functions, accepting different types of input. This means cost saving and fewer product codes.

Features	Description
4 OSSD safety outputs	Certus provides up to 4 Output Signal Switching Devices. The correct opening and closing of the safety function OSSDs is tested automatically
Selectable delay time	Can be easily set via the hex-switch, selected from a choice of 15 pre-defined configurations, from 0 to 30 sec. The main model CM22D0A can include 2 delayed digital outputs
2 auxiliary outputs	All the modules provide at least 1 auxiliary output. Up to 2 auxiliary outputs for CL20D2A
4 LEDs on the front panel	This indicate the status and any possible errors during operation
Manual or automatic start selectable	

Certus modules can be connected using different types of input: E-stop, E-gate, limit switch, non-contact switch, safety light curtains (ESPE Type 4, Type2), safety light beam (single beam), safety mat, lift levelling.

Information:
See **Paragraph 6** (Devices) for types of unit

| Safety parameters		
	55°C (CMxxxx)	**65°C (CL20D2A)**
ISO 13849-1 Cat.	Cat. 4	
ISO 13849-1 Performance Level	PL e	
IEC 61508 Safety Integrity Level	SIL_{CL} 3	
IEC 62061 Safety Integrity Level	SIL 3	
DIN EN 81-20:2014-11	No	Yes
DIN EN 81-50:2015-02	No	Yes
MTTFd	2403 a	1268 a
PFH	1,89 E-09	3,58 E-09
SFF	99%	99%
DCavg	99%	99%
ß	2,00 E-02	2,00 E-02
ß$_D$	1,00 E-02	1,00 E-02
MTTR	8h	8h
MRT	8h	8h

Note: The values for PL, SIL, Cat. are maximum values and may differ according to the chosen application and/or the chosen trigger elements

Information:
Safety functions were not evaluated by UL

4. Functional block diagram
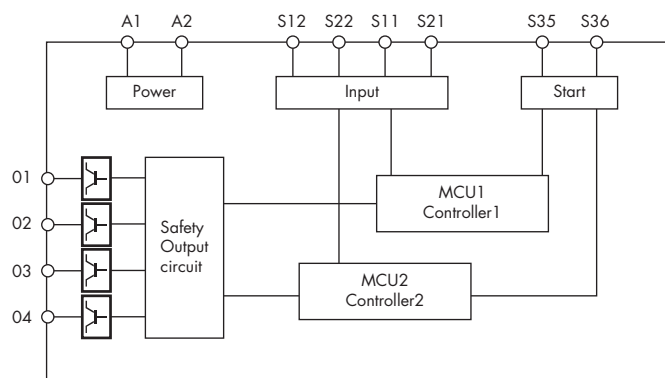
5. Function description

Function description		
Release Outputs (Safety)	A	The release circuits are provided by the outputs O1,O2,O3,O4
	B	Their correct functionality is permanently monitored
Trigger Inputs	A	The trigger outputs are provided by the outputs S11 S21
	B	Their correct functionality is permanently monitored
Failure	A	A faulty device must be exchanged immediately, means the machine must never be driven by a faulty device
	B	The Mean Time To Repair is assumed to be 8 hours
	C	The error code shown should be reported
	D	A list of error codes is shown in **paragraph 14.3**
Safe Condition	A	CERTUS switches into safe condition when an error occurs repeatedly (software filter)
	B	All release outputs (NOs AND NCs) and the trigger outputs are LOW
	C	The safe condition can only be reversed by a power-on- reset (switch CERTUS off and on)
Fail-Safe	A	In case of a Fail-Safe all outputs (S11, S21, O1,O2,O3,O4) are switched off
Software	A	In a fail safe mode, the software remains in a special state which can only be reverse by a power-on reset
	B	A blinkcode indicating the error condition is given on the LED CHANNEL. The LED POWER will also be blinking **(see paragraph 14.2)**

6. Devices

6.1 Device

		CM22D0A	CM40D0A	CM30D1A	CL20D2A
Output	**NO**	2	4	3	2
	NO delayed	2	0	0	0
	Aux NC	0	0	1	1
	Aux NO	0	0	0	1
	Assembly with hex-switch	✓	-	-	-
	Comment				Lift

6.2 Device with HEX-Switch

CM22D0A	A	Includes 4NO or...
	B	Includes 3NO 1NC or...
	C	2NO undelayed + 2NO delayed
	D	The delay can easily be selected via the hex switch on the front panel by using a screwdriver. **(See paragraph 11.1)**

6.3 Device without HEX-Switch

CM40D0A	A	Provides 4 semiconductor safety outputs (OSSD) not delayed
CM30D1A	A	Provides 3 semiconductor safety outputs (OSSD) not delayed
	B	1 auxiliary output (NC) not delayed

6.4 Lift levelling device

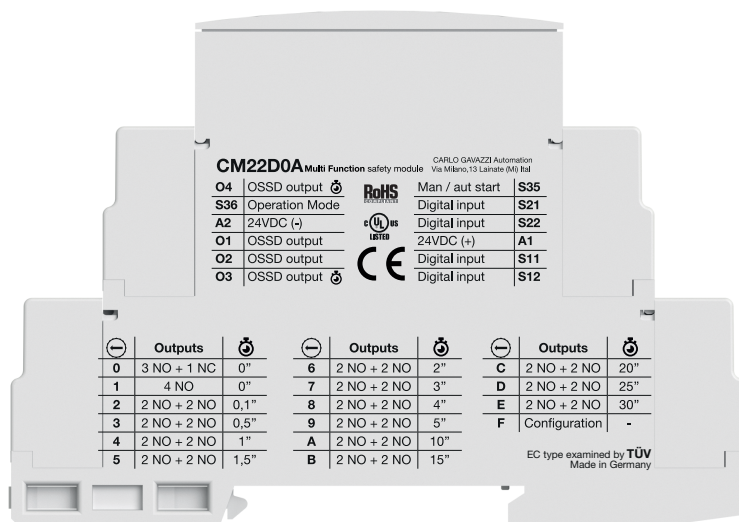| CL2OD2A	A	Made especially for lift applications
	B	Provides 2 semiconductor safety outputs (OSSD) not delayed
	C	2 auxiliary output (1 NC and 1 NO) not delayed
	D	This CERTUS module is compliant with standards EN 81-20 and 81-50

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. Terminal layout
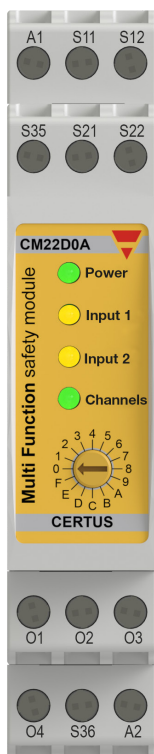
A1	24VDC (+)
S11	Digital input
S12	Digital input
S35	Man / aut start
S21	Digital input
S22	Digital input

O1	OSSD output
O2	OSSD output
O3	OSSD output
O4	OSSD output
S36	Operation Mode
A2	24VDC (-)

CM22D0A Multi Function safety module — CARLO GAVAZZI Automation, Via Milano,13 Lainate (Mi) Ital

O4	OSSD output		Man / aut start	S35
S36	Operation Mode		Digital input	S21
A2	24VDC (-)		Digital input	S22
O1	OSSD output		24VDC (+)	A1
O2	OSSD output		Digital input	S11
O3	OSSD output		Digital input	S12

	Outputs			Outputs			Outputs	
0	3 NO + 1 NC	0"	6	2 NO + 2 NO	2"	C	2 NO + 2 NO	20"
1	4 NO	0"	7	2 NO + 2 NO	3"	D	2 NO + 2 NO	25"
2	2 NO + 2 NO	0,1"	8	2 NO + 2 NO	4"	E	2 NO + 2 NO	30"
3	2 NO + 2 NO	0,5"	9	2 NO + 2 NO	5"	F	Configuration	-
4	2 NO + 2 NO	1"	A	2 NO + 2 NO	10"			
5	2 NO + 2 NO	1,5"	B	2 NO + 2 NO	15"			

EC type examined by **TÜV**
Made in Germany

8. Installation and environmental conditions

Warning:
CERTUS must be installed in a control cabinet with a protection grade of at least IP5X, otherwise dampness or dust may lead to malfunction.

Warning:
Avoid installation during storms.

Danger!
If the safety module is tampered with, 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 vertical 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:
CERTUS must only be used within an ambient temperature range of 0 - 55°C, away from any condensation or conducting fluids. To avoid possible interference, keep the connecting conductors separate from the power conductors.

9. Wiring

9.1 Power supply

The supply voltage is 24VDC ± 20%.
The external power supply fulfills the supply voltage requirements of EN 61496-1.

9.2 Wiring milestones

	1	**Warning:** Failure to comply may result in high risk for operating personnel.
	2	**Warning:** Max. terminal tightening torque: 0.4Nm (for all connections)
	3	**Danger!** To prevent contact welding, a fuse should be connected before the output contacts.
	4	**Danger!** Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.
	5	**Danger!** Ensure the wiring and EMC requirements of IEC 60204-1 are met.
	6	**Information:** Information given in **15. Technical data** must be understood.
	7	**Information:** It is good practice to separate the power supply of the control unit from that of other electrical appliances (electrical motors, inverters, frequency variators) or other sources of disturbance.
	8	**Information:** It is recommended to use conductors with section and length adequate for the terminals, currents and distances involved, ensuring that the conductors are not excessively tight, that their positioning avoids potential damage and that they are not in the way of people or things.
	9	Do not exceed the electrical ratings.

10. Function description

OSSD - Output Signal Switching Device

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 pairs, 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 carried out:
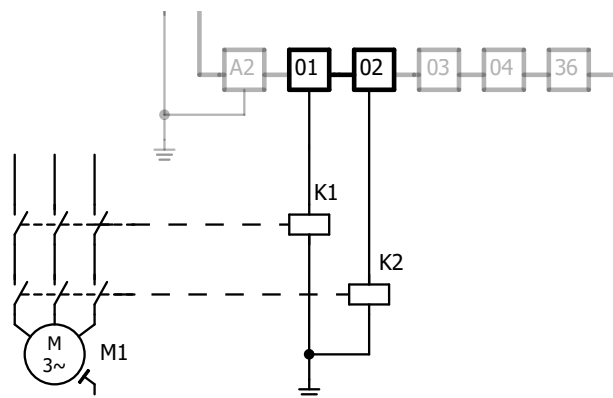
OSSD - Output signal switching device		
10.1 Normally Open (NO) Outputs	A	The NO outputs react by closing their respective NO relays. At Startup are switched off.
	B	They switch on when the safety sensors are active and the application has been started.
	C	In case of a Fail-Safe the NOs are switched off.
	D	If the power supply fails, the NOs are switched off.
10.2 Normally Closed (NC) Output	A	In most cases the NC types react alternately to the NO types, if the NOs are switched on, the NCs are switched off and vice versa
	B	During the configuration the NCs are switched off
	C	In case of a Fail-Safe the NCs are switched off
	D	If the power supply fails, the NCs are switched off
	E	The NC is not a safety output
10.3 Delayed NO Outputs	A	There are 2 NOs delayed
	B	The behaviour is off-delayed and retriggerable
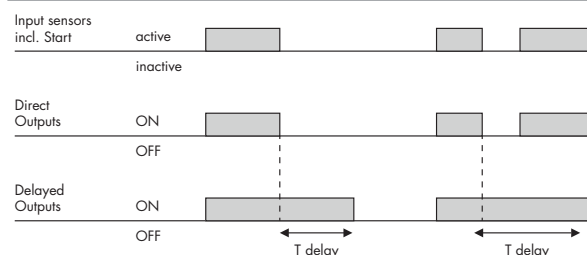
11. Available output configuration (CM22D0A only)
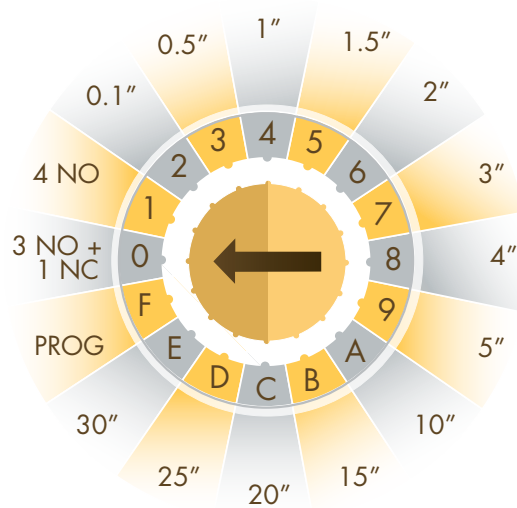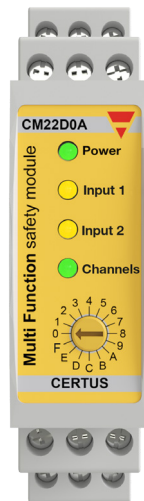
Configuration	Hex-position	Delay [s]
3 NO + 1 NC	0	0
4 NO	1	0
2 NO direct + 2 NO delayed	2	0,1
2 NO direct + 2 NO delayed	3	0,5
2 NO direct + 2 NO delayed	4	1
2 NO direct + 2 NO delayed	5	1,5
2 NO direct + 2 NO delayed	6	2
2 NO direct + 2 NO delayed	7	3
2 NO direct + 2 NO delayed	8	4
2 NO direct + 2 NO delayed	9	5
2 NO direct + 2 NO delayed	A	10
2 NO direct + 2 NO delayed	B	15
2 NO direct + 2 NO delayed	C	20
2 NO direct + 2 NO delayed	D	25
2 NO direct + 2 NO delayed	E	30
PROGRAMMING	F	-

11.1 Changing the output configuration via Hex-Switch

- The hex-switch should be moved only during the changing of the output configuration.
- This is the only possibility to test the hex-switch.
- From position "2" to position "E" means 2 NO OSSD output + 2 NO delayed OSSD outputs.
- The delay time is shown above.

Warning:
The Hex-switch must only be rotated clockwise.
Any move in a counter-clock direction will leads to a fail-safe situation.
The Default setting is "O" (3NO + 1NC)

11.2 Output configuration

1 | Hex-switch position

Action	A	Switch off the power supply
	B	Rotate the switch until reaching position "F"
	C	Switch ON the power supply
	D	Power and channel LED's will blink alternately and slowly

2 | Hex-switch position

Action	A	Rotate clockwise until the required position is reached (e.g. A, 2NO + 2NO delay 10")
	B	Wait app. 2.5 secs without moving the switch power and channel LED's will now blink fast
	C	Configuration accepted

3 | Hex-switch position

Action	A	Switch the module off and on again
	B	Certus wil start with a configuration
	C	If the required position is missed the switch must be turned a full rotation (only clockwise).
	D	Repeat the procedure from point **1 A** if necessary

Attention:
While power is OFF you can rotate in either direction.

Attention:
Full rotations in a clockwise direction can be made several times if the right position is passed.

12. Operation configuration

The applications below show the correct wiring for the CERTUS devices.

N° configuration	SC1	SC2	SC3	SC4	SC5	SC6
Input type	E-stop E-gate	E-stop E-gate	E-stop E-gate	ESPE type 4	ESPE type 2	Safety mat
Channel	2	2	1	2	1	
N° wires	4	3	2		2	4
Wiring						
Safety category	Cat. 4	Cat. 3	Cat. 2	Cat. 4	Cat. 2	Cat. 3
Performance level	PL e	PL d	PL c	PL e	PL c	PL e
Safety integrity level	SIL 3	SIL 2	SIL 1	SIL 3	SIL 1	SIL 2
Response time	20 msec	20 msec	20 msec	20 msec	25 msec	20 msec
Paragraph	**12.1.1**	**12.1.2**	**12.1.3**	**12.1.4**	**12.1.5**	**12.1.6**

Information:
For the delayed outputs (O3, O4) the delay has to be added.

12.1 Recognizing the Operational configuration

During the start (all outputs are switched off, also the NC-output) the connections of outputs S11 and S12 are checked. If a valid configuration is detected, the software moves into its normal operational mode and the outputs are enabled depending on the configuration. If there are mechanical trigger elements electrically open, there will be a wait until the trigger elements are closed, so their wiring can be recognized (SC1, SC2, SC3, SC6). The same happens with the electrical ESPEs (SC4, SC5).

Information:
SC4 and SC5 will be recognized indipendently of the status of the ESPE.

12.1.1 E-Stop / E-Gate 4 wire

E-stop and e-gate application	A	A cross circuit between the two channels will be recognized (fail-safe)
	B	A short circuit of VDC will be recognized
	C	A short circuit against Ground will not be recognized
	D	In case of a fault the status of the release outputs will not become HIGH

Cat 4; PLe, SIL3 possible (also depending on the output wiring and the chosen trigger elements).
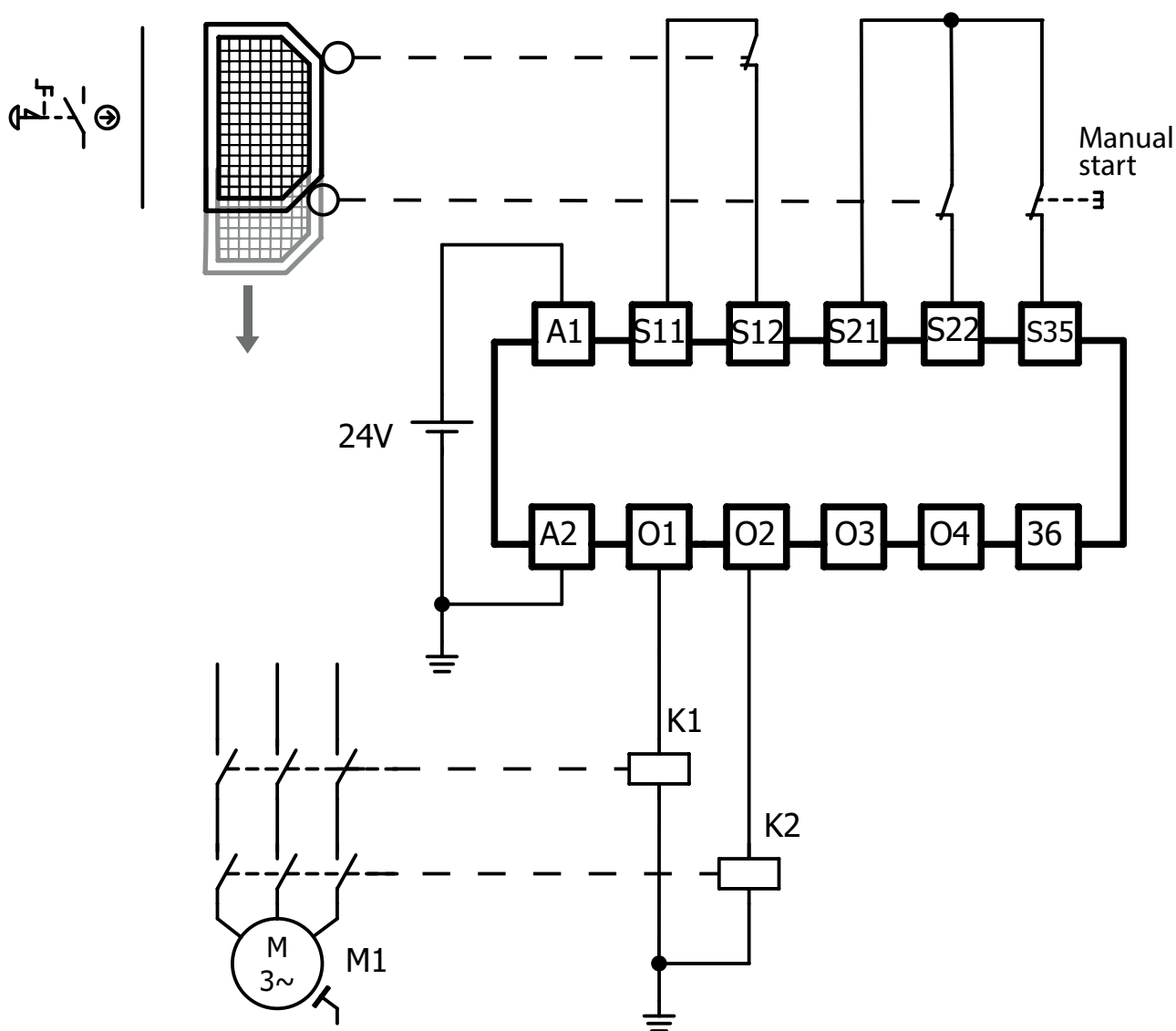
Attention:
Check correct functioning of the entire safety system (module + input device) following each re-installation. In particular, if the original operating mode was Manual, check that the unit has been reconfigured in this mode.

Information:
Please note that on e-stop applications an automatic start is not possible.

12.1.2 E-Stop / E-Gate 3 wire

E-stop and e-gate application	A	A cross circuit between the two channels will not be recognized
	B	A short circuit of VDC will be recognized
	C	A short circuit against Ground will not be recognized but the status of the release outputs will not become HIGH
	D	3 wires are needed

Cat 3; PLd; SIL2 possible (also depending on the output wiring and the chosen trigger elements).

Attention:
Check correct functioning of the entire safety system (module + input device) following each re-installation. In particular, if the original operating mode was Manual, check that the unit has been reconfigured in this mode.

Information:
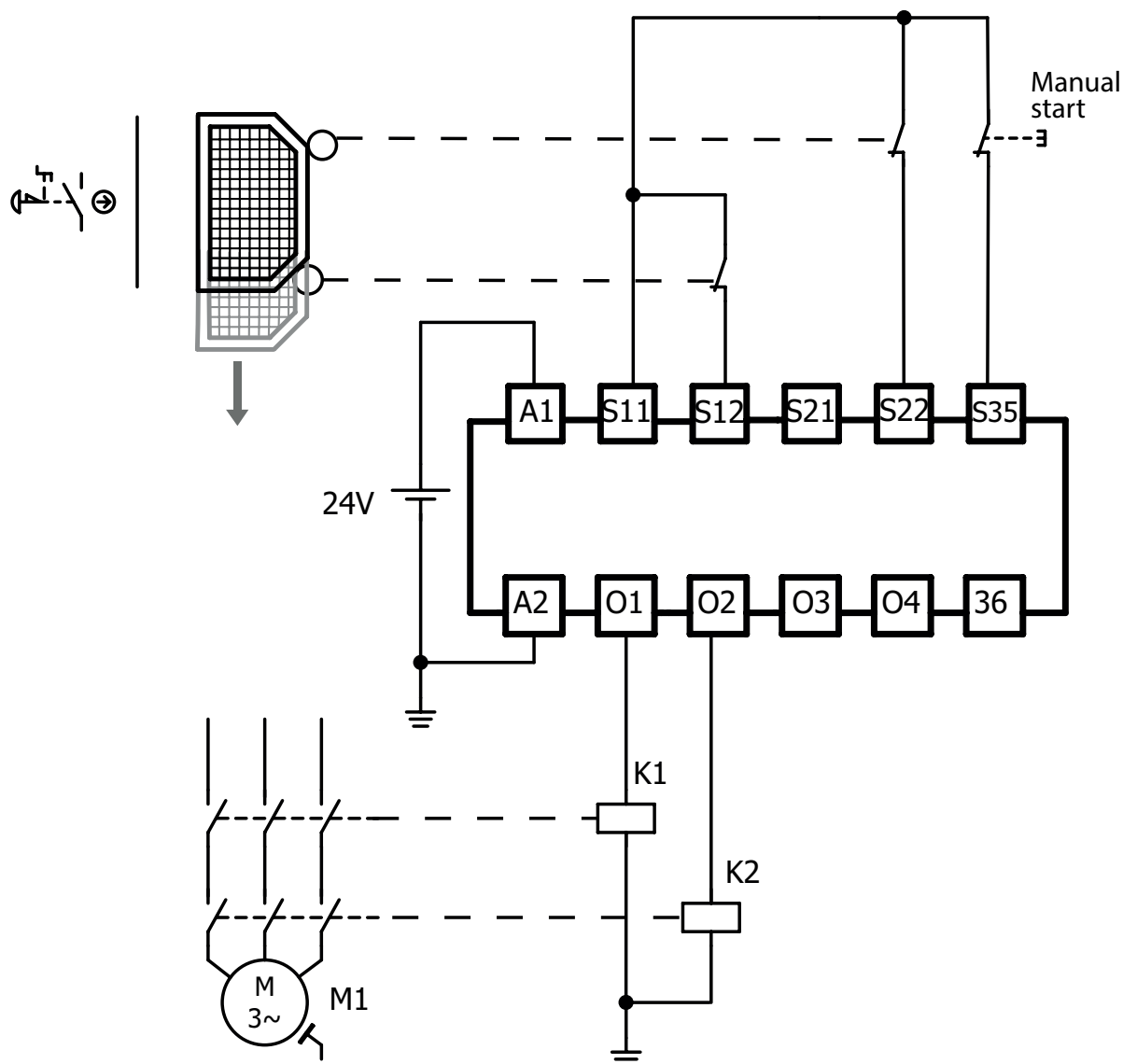Please note that on e-stop applications an automatic start is not possible.

12.1.3 E-stop / E-Gate 2 wire

E-stop and e-gate applications	A	This is an e-stop and e-gate application with only one channel and a one-channel trigger element
	B	A short circuit against VDC will be recognized
	C	A short circuit against Ground will not be recognized but the status of the outputs will not become HIGH

Cat 2; PLc, SIL1 possible (also depending on the output wiring and the chosen trigger elements).
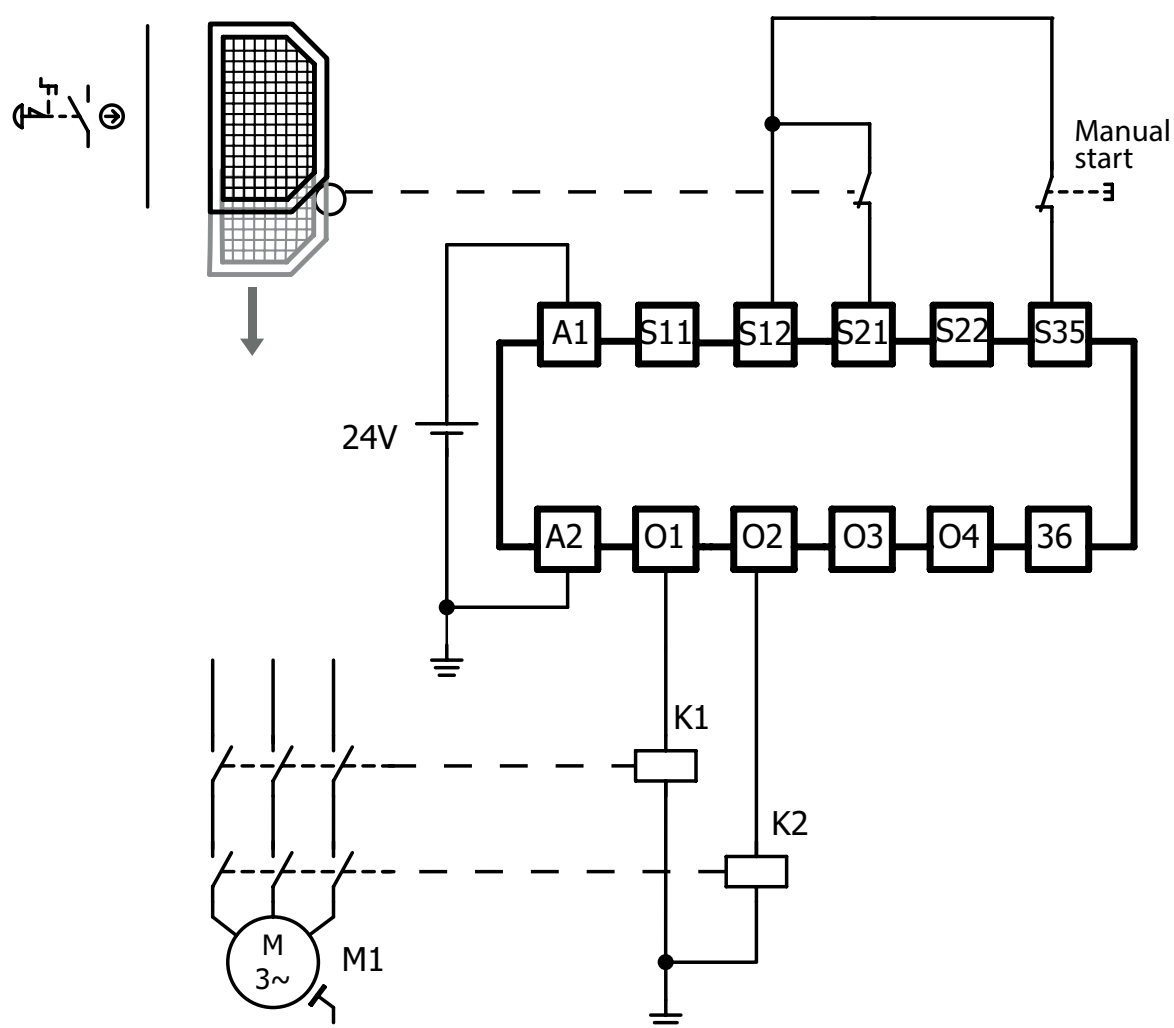
	Attention:
	Check correct functioning of the entire safety system (module + input device) following each re-installation. In particular, if the original operating mode was Manual, check that the unit has been reconfigured in this mode.
	Information:
	Please note that on e-stop applications an automatic start is not possible.
	Information:
	With single-channel wiring the safety level of the machine/plant may be lower than the safety level of the unit.

12.1.4 ESPD – (type 4 / type 2) two channels

ESPE applications (ElectroSensitive Protective Element)		
	A	A cross circuit between the two channels will not be recognized
	B	A short circuit of VDC will not be recognized
	C	A short circuit against Ground will not be recognized, but the status of the release output will not become HIGH
	D	The ESPD devices should recognize the above faults
	E	3 wires are needed

Cat 4; PLe; SIL3 possible (depending on the ESPE)

Attention:
Check correct functioning of the entire safety system (module + input device) following each re-installation. In particular, if the original operating mode was Manual, check that the unit has been reconfigured in this mode.

12.1.5 Testable ESPD (type 2 / type 4)

Testable ESPE type 2 applications (ElectroSensitive Protective Element)		
	A	A short circuit of VDC will be recognized
	B	A short circuit against Ground will not be recognized
	C	The status of the release output will not become HIGH
	D	The testing is initiated by CERTUS
	E	Up to 4 pairs of single beam

Cat 2; PLc; SIL1 possible (depending on the ESPE)

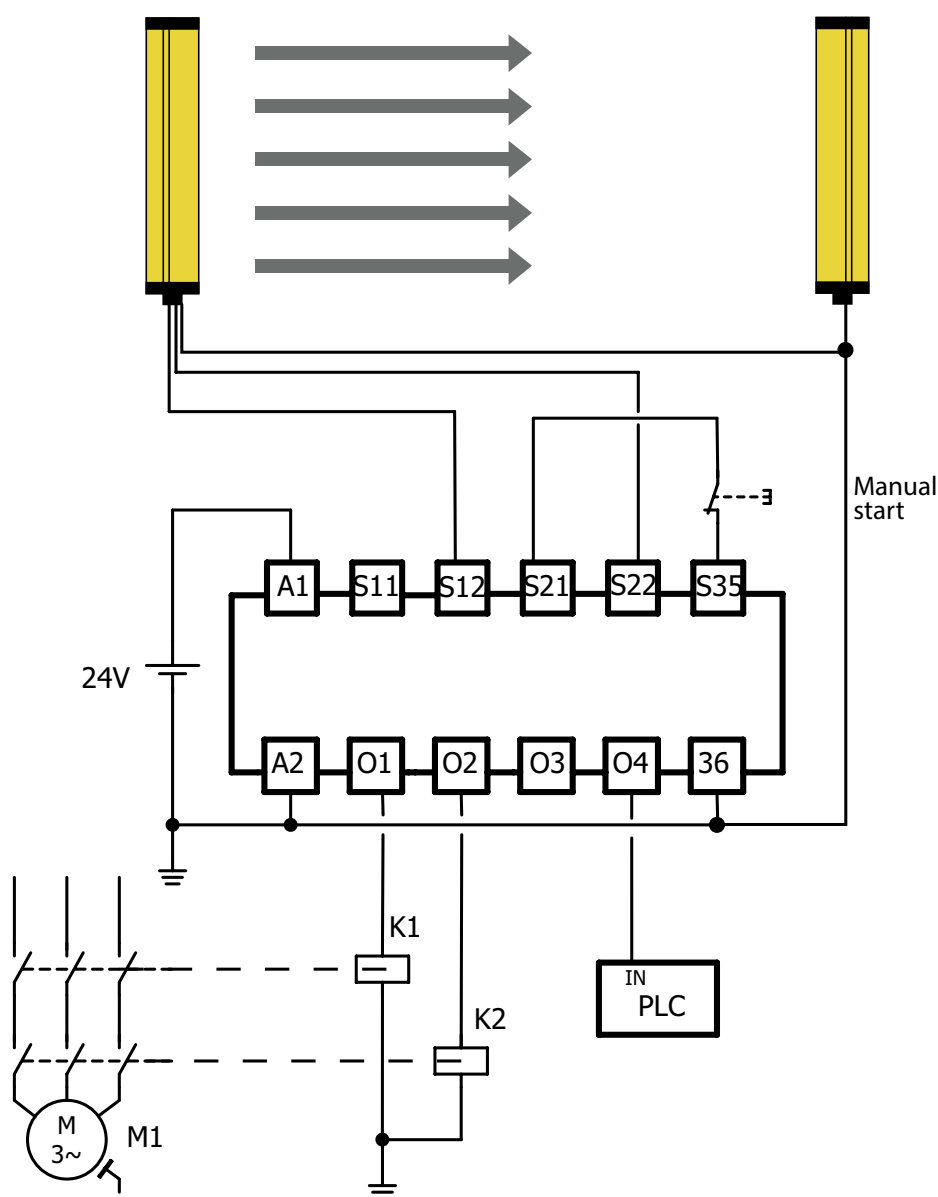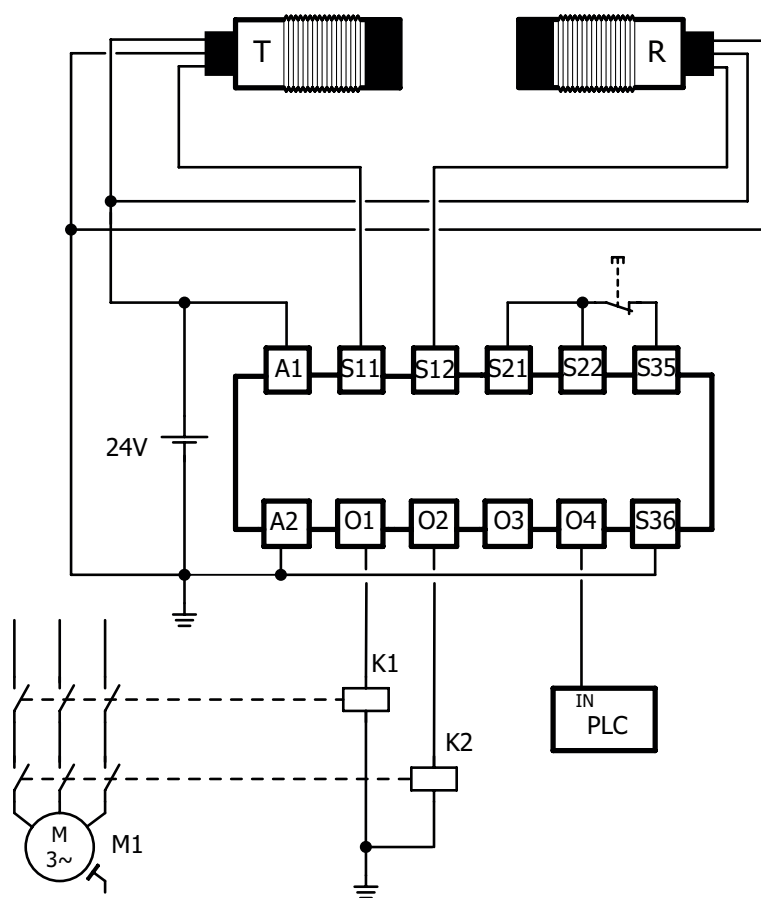|		
Attention: Check correct functioning of the entire safety system (module + input device) following each re-installation. In particular, if the original operating mode was Manual, check that the unit has been reconfigured in this mode.		
Information: With single-channel wiring the safety level of the machine/plant may be lower than the safety level of the unit.		
Attention: Press the START button for 2 seconds to runs a test of the safety light beams.		

12.1.6 Safety Mat

Safety mat applications (4 wire)		A	The two mat circuits are permanently monitored
		B	A shortening in the two mat circuits is interpreted as an entered mat and leads to the outputs to being switched off (but the NC-circuit, which will be switched on)
		C	A short circuit of VDC will be recognized
		D	A short circuit against Ground will be recognized
		E	A broken wire will also be recognized

Cat 3; PLe; SIL2 possible (depending on the Safety Mat)

Attention:
It is mandatory not to exceed the resistive rating. This should be kept at <200 Ohm

Attention:
Check correct functioning of the entire safety system (module + input device) following each re-installation. In particular, if the original operating mode was Manual, check that the unit has been reconfigured in this mode.

Information:
With single-channel wiring the safety level of the machine/plant may be lower than the safety level of the unit.

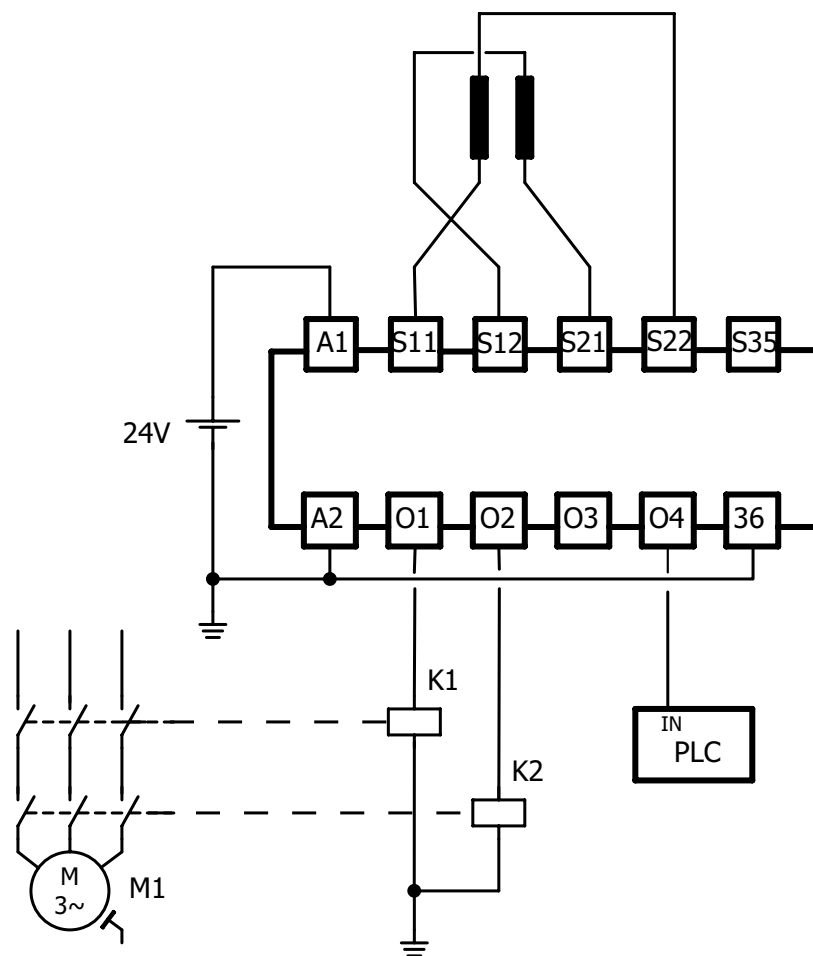## 12.2 Lift levelling application (CL20D2A only)

The CL20D2A 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 European Standards, and according to the 2014/33/EU Lift Directive.

Lift levelling		
	A	2 OSSD safety outputs
	B	2 OSSD auxiliary outputs, 1NC, 1NO
	C	All these output are not delayed
	D	Possibility of connecting mechanical or magnetic switches (reed contact)
	E	The inputs S12, S22 are the door zone sensors
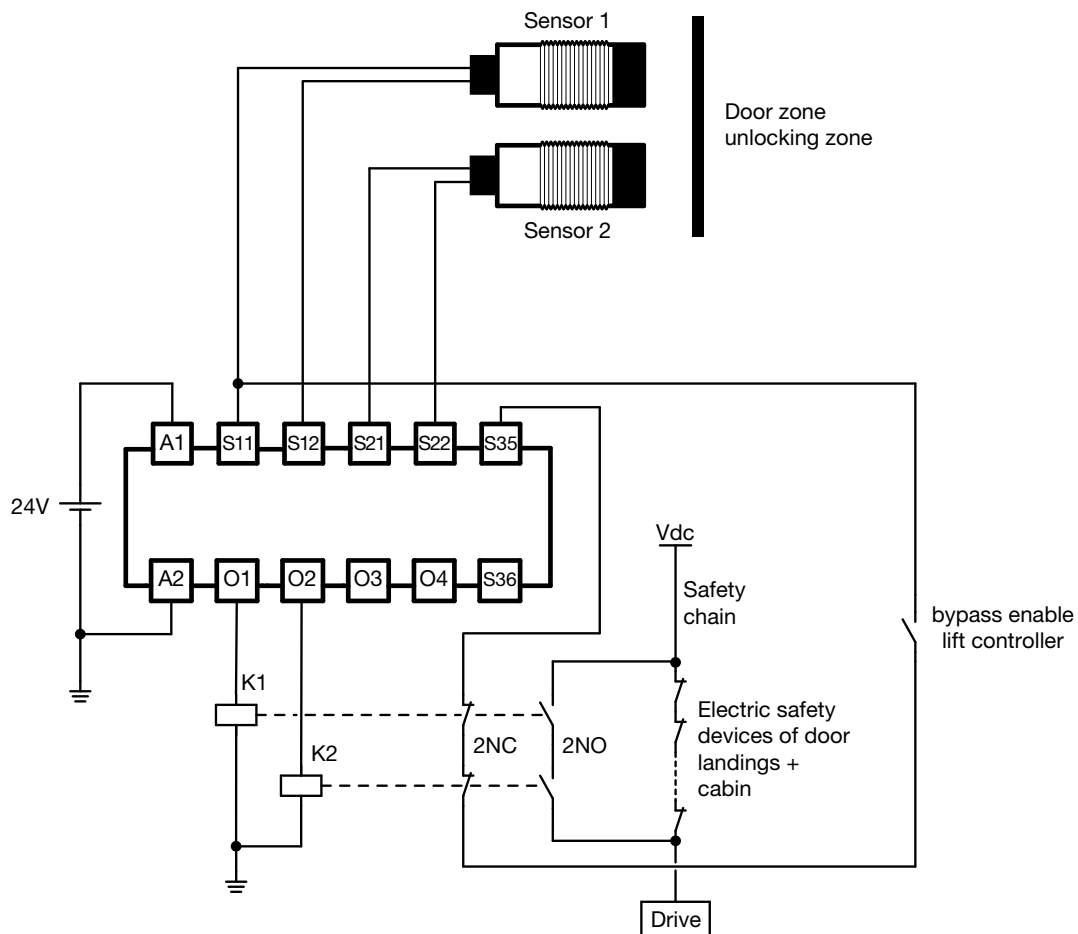
Information:
Correct sensors connection it is related to their type (relays outputs, OSSD outputs, etc..)

Information:
K1 and K2 must be forcibly guided relays, their impulse strenght (surge voltage strenght) depend on the operating voltage of the safety chain (in accordance with EN 60664-1 overvoltage category III)
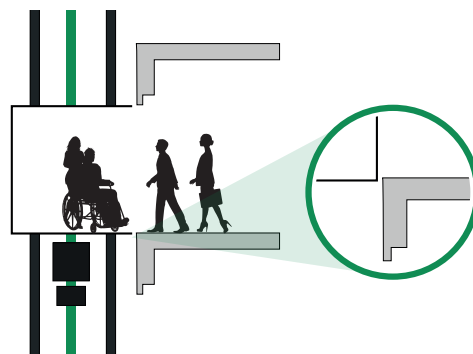
12.3 Lift levelling example

The module must be connected to the lift plant and to the lift controller board in order to bypass the output of the landing and cabin doors circuit, following the landing of the cabin to the floor, allowing the lift cabin to be re-levelled to the floor and allowing the detection of faults. The module checks the status of two independent inputs and consequently changes the status of the safety outputs enabled by the lift controller.

Lift levelling example

The module monitors the correct cabin position inside the unlocking zone.	A	
The safety outputs have to be connected to the landing doors circuits and cabin doors, in order to bypass the outputs when the lift is inside the unlocking zone	B	
The auxiliary output has to be connected to the lift controller board, in order to check its status when the cabin is in the unlocking zone	C	
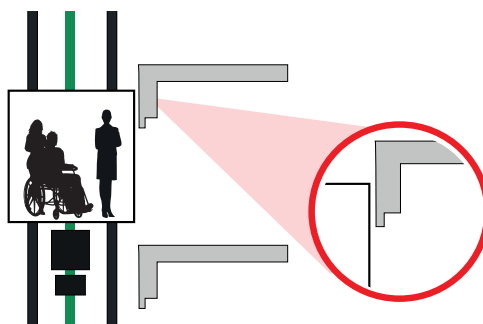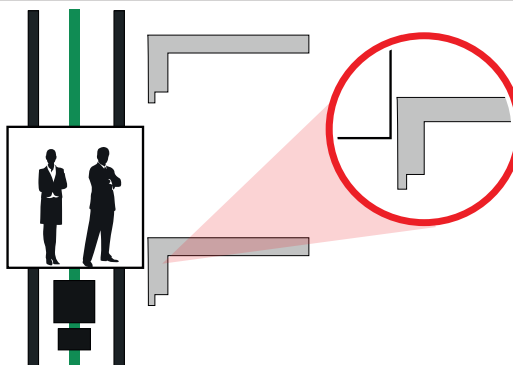
Information:
Lift car levelling safety module, designed according to Lift Directive 2014/33/EU and to safety circuit requirements of EN 81-20, EN 81-50 Standards.
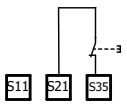
Information:
EN 81-20: 2014: Safety rules for the construction and installation of lifts. Part 20: passenger and goods/passenger lifts.
EN 81-50: 2014: Safety rules for the construction and installation of lifts. Part 50: design rules, calculations, examinations and tests of lift components.

13. Start behaviour

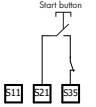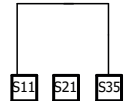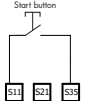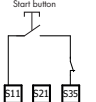| Start behaviour		
13.1 Manual start	A	The start button is monitored. Any change of the input level must be recognized to accept the start signal
	B	The outputs are switched on after the start button is released (moved from HIGH to LOW at S35; **mode MS1**)
	C	An erreously permanently HIGH- or LOW-level does not lead to a dangerous situation as the outputs does not become HIGH
	D	Contacts (NC) of an external contactor can be wired in series for monitoring (**mode MS1b**)
13.2 Automatic start	A	The start button is not monitored. The terminals may be permanently bridged.
	B	The outputs are switched on after the start button is pushed (simply HIGH level; **mode MS2**)
	C	An erreously permanently HIGH-level may lead to a dangerous situation as the outputs immediately become HIGH
	D	Contacts (NC) of an external contactor can be wired in series for monitoring (**mode MS2c**)

Start mode	Mode	Wiring
Manual start (start button monitored)	**MS1a**	S11 S21 S35
Manual start with feedback from external contactor expansion	**MS1b**	Start button S11 S21 S35
Automatic start	**MS2a**	S11 S21 S35
Automatic start without monitoring of the start button	**MS2b**	Start button S11 S21 S35
Automatic start without monitoring of the start button	**MS2c**	Start button S11 S21 S35

Information:
- The Restart command must be installed outside the danger area in a position where the danger area and the entire work area concerned are clearly visible.
- It must not be possible to reach the control from inside the danger area.

Attention:
Use in manual mode (start/restart interlock activated) 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 (use as a trip device according to IEC 61496). Failure to comply with this rule may result in serious risks to people exposed.

14. Operation

A blinkcode describing any error condition can be seen via the LED Channels, with the LED light POWER blinking

14.1 Status indicator

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

Status indicator			
LED	**Colour**	**Action**	**Meaning**
Power	**Green**	ON	CERTUS is switched on and working
		Blinking slowly	An error has occured
IN1, IN2	**Yellow**	HIGH in inputs 1/2 detected	The status of the inputs are mirrored, regardless of the status of the device
Channels	**Green**	OFF	Triggers not activated (i.e. at least one estop switch is open)
		Blinking slowly	Triggers are activated (i.e. both E-stop switches are closed); waiting for start.
		Blinking fast	Output delay active (only delayed configurations)
		ON	Triggers are activated; start is performed; the outputs are active (NCs HIGH; NOs LOW)
		Error code	Please see error code description in **Paragraph 14.2**

14.2 Blink code

The blinkcode can be seen in any case of error, according to the following timing (Example error code 25):
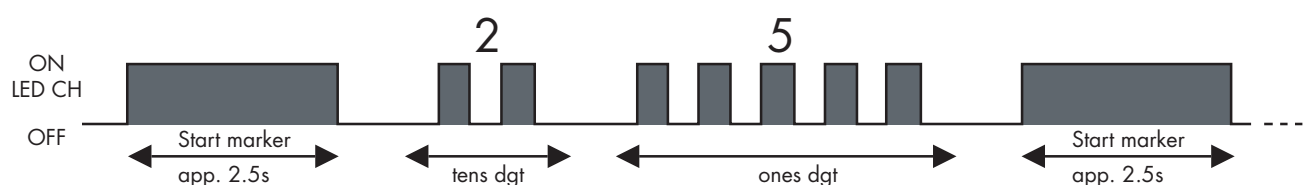
14.3 Error code

Error code	Blinkcode	Meaning
STATE_X_CFG_2	17	Error recognizing a configuration, check wiring
STATE_X_CFG_UNKNOWN	18	Error recognizing a configuration, check wiring
STATE_X_OUTPUT_PWR	21	Output error, maybe cross circuited or permanently earthed or +24VDC
STATE_X_OUTPUT_14_44	22	Output error, maybe cross circuited or permanently earthed or +24VDC
STATE_X_OUTPUT_S11	23	S11 error (Loopback) please see remark below
STATE_X_OUTPUT_S21	24	S21 error (Loopback) please remark: in the case of a short circuit to ground of S11/S21 error STATE_X_OUTPUT_S2 is dominant due to a common PTC
STATE_X_INPUT_S11	25	Error on an input that is wired to S11 (SC1 .. SC3) only
STATE_X_INPUT_S21	26	Error on an input that is wired to S21 (SC1 .. SC3) only
STATE_X_MAT	27	Mat error, at least one circuit is open
STATE_X_S36	28	Error S36 changed
STATE_X_S35_START	29	Error start configuration, most probably changed
STATE_X_REC	32	Error in configuration recognition (different results)
STATE_X_REC_S	33	Error in configuration recognition (different results)
STATE_X_COMPEEPROM	34	Error: Hex switch does not match EEPROM
STATE_X_ESPD	35	Error in communication with ESPD type
STATE_X_ESPD_S21S22	36	Error in S21-S22 bridge

15. Technical data

Power supply	
Power supply	19.2 - 28.8 VDC
	The external power supply fulfills the supply voltage requirements of the EN 61496-1.

Inputs	
Number of channels	2
Trigger inputs	S12 and S22
Input voltage (Acc. to EN61131)	24 VDC (>12V = HIGH) 24VDC (<2V = LOW) Class 2 or LV/LC
Input current	>6mA, typical 8mA
Operating mode	Manual or Automatic
Number of connectable light curtains ESPE (SC4 configuration)	2
Number of testable single beam ESPE (SC5 configuration)	4

Outputs	
Number of output	4
Number of safety outputs	4
Instantaneous safety outputs	2
Delayed safety outputs	2
NC auxiliary output	1 (CL2OD2A)
NO auxiliary output	1 (CL2OD2A)
Type	Semiconductor
Output voltage	24VDC
Max. current	≤ 400 mA (UL: 350mA)*
Max. drop voltage	≤ 2V

* @55°C for CMxxxx, @65°C for CL20D2A

Safety parameters		
	55°C (CMxxxx)	**65°C (CL20D2A)**
ISO 13849-1 Cat.	Cat. 4	
ISO 13849-1 Performance Level	PL e	
IEC 61508 Safety Integrity Level	SIL 3	
IEC 62061 Safety Integrity Level	SIL$_{CL}$ 3	
DIN EN 81-20:2014-11	No	Yes
DIN EN 81-50:2015-02	No	Yes
MTTFd	2403 a	1268 a
PFH	1,89 E-09	3,58 E-09
SFF	99%	99%
DCavg	99%	99%
ß	2,00 E-02	2,00 E-02
ß$_D$	1,00 E-02	1,00 E-02
MTTR	8h	8h
MRT	8h	8h

Compatibility and conformity

Approvals	EC type examined by **TÜV**

CE   RoHS COMPLIANT   c UL us LISTED

Environmental

Protection grade	IP 5X
Operating Temperature	0 ÷ 55°C

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.

16. Dimensions mm

17. Inspection and maintenance

Inspection and maintenance		
Inspection	A	The integrity of the module and of all the connected devices must be checked regularly according to the risk evaluation of the plant, under the complete responsibility of the user.
	B	In particular it is necessary to perform regular tests on board in order to verify that the input devices are not faulty.
Maintenance	A	Activate the safety function and check whether all the relevant safety contacts open correctly.
	B	During the configuration the NC outputs are switched off.
	C	The safety module doesn't require internal maintenance.
	D	It must be periodically cleaned - with plant and module switched off - together with all the connected devices, removing any dust, liquids or condensation.

Attention:
The safety functions should only be checked by qualified personnel.

Attention:
In the event of a switch-off of the module or of the machine it is necessary to perform a test in order to verify the integrity of the module and the external device system.

18. EU/EC Declaration of Conformity

CARLO GAVAZZI
Automation Components

CARLO GAVAZZI

Issue No.:009LA04052017_DRAFT

EU/EC Declaration of Conformity

(DRAFT version, to be used for TUV Nord CERT GmbH verification)

We

CARLO GAVAZZI AUTOMATION SPA,

Via Milano 13, 20020 - LAINATE – ITALY. Tel. +39 02 93176 1 - Fax +39 02 93176 304

declare that the products

Certus Multifunctional Safety Relays CM22D0A, CM40D0A, CM30D1A, CL20D2A

are in conformity with the applicable essential requirements of the following Directives:

Machinery Directive 2006/42/EC

EN 62061:2005+A1:2013+A2:2015	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
EN ISO 13849-1:2015	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN 61508:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems
EC Type Examination:	TÜV Nord CERT GmbH (notified body 0044), cert. n. 44 205 15 176906

EMC Directive 2014/30/EU

EN 61326-3-1:2008	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 3-1: Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety)
EN 61000-6-4+A1:2011	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

RoHS Directive 2011/65/EU

EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Person that is authorised to compile the technical file is:

Mr. Adriano Salvadore, Via Milano 13, 20020 - LAINATE – ITALY Tel.: +39 02 93176.1

CE

CE marking: design and manufacturing follow the provisions of the European Directives above mentioned

Place/date	Lainate, May 12st, 2017
Signature	_____
Name	Vittorio Rossi (Managing Director)

Notes:
This Manufacturer's Declaration of Conformity is only valid under the condition that:
- the above-mentioned products are protected against accidental touch and are installed as prescribed in the installation documentation.
- we are correctly informed about RoHS compliance of all components and raw material by the relevant suppliers.
- we undertake to transmit, in response to a reasoned request by the national authorities relevant information about the safety modules. The safety modules must not be put into service until the final machinery incorporating them has been declared to conformity with the provisions of Machinery Directive, where appropriate.

EQA CERTIFIED ISO 9001 ANAB
cert. N. QA130463

EQA CERTIFIED ISO 14001 ANAB
cert. N. EA130475