Технические характеристики
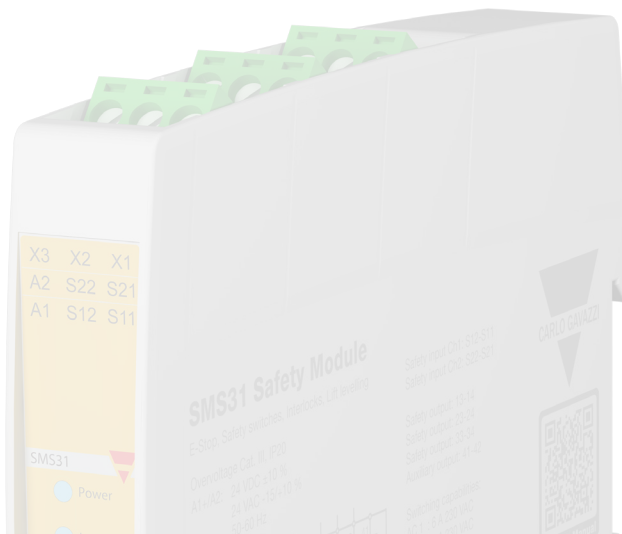
SM
Multifunction safety modules

The SM range of multifunction safety modules, designed in Category 4, Performance Level "e" in accordance with the Machine Directive EN ISO 13849-1, provides for safety control outputs with electromechanical forcibly guided relays and can monitor a vast range of electromechanical safety devices.

SMS20 and **SMS31** safety modules are designed to provide for a safe interruption of safety circuits in applications with emergency stops, safety gates, safety magnetic switches, safety limit switches and electromechanical interlocks. They are also used to control safely the safety circuits of the lift car levelling, detection of uncontrolled movements of the cabin and the lift pit inspection, in compliance with the Lifts Standards EN81-20 and EN81-50.

SMSA31 safety module monitors and controls safely the safety circuits in safety gates, single or multiple accesses, with safety magnetic switches and safety limit switches switching the safety inputs in anti-valent mode (NO+NC signals).

SM2H21 is the solution to monitor and control safely the operation of two-hand control consoles (Type III C according to EN 574-1).
The device enables the safety control outputs only if the two buttons of the console are activated by the operator simultaneously or with a max interval of 500 ms from each other.

SME41 is a safety expansion unit that operates as relay expansion unit controlled by a master safety module, so to extend the number of safety relay outputs. It can operate with master safety modules with safety relay or OSSD outputs.

CM - CL
Multifunction safety modules

CARLO GAVAZZI

The CM series are multifunction safety modules with OSSD safety control outputs and can monitor safety circuits with electromechanical and electronic safety devices (ESPE type 2 and type 4); they are designed in Category 4, Performance Level "e" in accordance with the Machine Directive EN ISO 13489-1, as well as compliant to Functional Safety SIL 3, SIL cl3 as per EN 62061 Machine Safety.
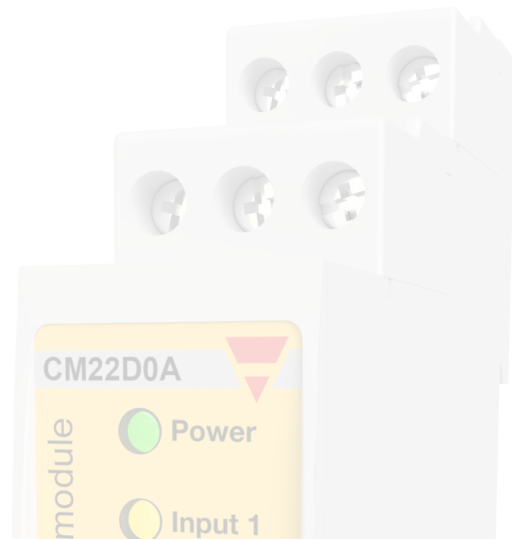
CM22D0A, **CM40D0A** and **CM30D1A** provide for a safe interruption of safety circuits with safety light curtains (ESPE type 2 and type 4), safety light beams, emergency stops, electromechanical interlocks, safety gates, safety magnetic switches, safety mats. The devices monitor and test automatically the safe state of the safety devices and provide for interruption of the safety circuit through the OSSD safety outputs, which are constantly tested to prevent short circuits. In addition, **CM22D0A** has the flexibility of providing for time delayed OSSD safety outputs, by setting the hex-switch on the front; this function is particularly important in critical machinery applications with high inertia to protect the hazardous area from undesired accesses for a certain time after having stopped the machine operation.

The **CL20D2A** safety module is a device designed to monitor safely the floor levelling and relevelling of the lift cabin in the safe zone, detection of uncontrolled movements of the cabin, in accordance with the requirements of the EN 81-20 and EN 81-50 Lifts standards.
CL20D2A can be connected to the safety magnetic or electromechanical switches of the safety circuit, to monitor the proper levelling and re-levelling of the lift cabin; it provides for 2 OSSD safety outputs to enable the lift controller to operate the cabin, as well as 2 OSSD auxiliary outputs (NO+NC).

CE RoHS COMPLIANT c(UL)us LISTED

SM - CM - CL
Multifunction safety modules

Industrial machinery

This module provides a safety-related interruption of a safety circuit. It is used in applications with: E-stop, E-gate, limit switch, non contact switch, safety light curtains (ESPE Type 4, Type 2), safety light beam (single beam), safety mat. The Certus multifunction safety module is designed to provide the most comprehensive protection for equipment and personnel. It enables safety functions, accepting different types of input. This safety module is able to monitor multiple safety functions of industrial machinery, protecting operators from dangerous moving parts of the machine.
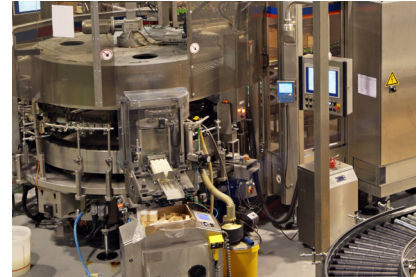

Two-hand control consoles

The SM2H21 safety module is designed in Category 4, Performance Level e in accordance with the Machine Directive EN ISO 13849-1 to monitor and control safely the operation of twohand control consoles (Type III C according to EN 574-1). The device enables the safety control outputs only if the two buttons of the console are activated by the operator simultaneously or with a max interval of 500 ms from each other. The release of at least one push button of the two-hands console forces immediately the safety outputs to the open state. A new operating cycle is possible only after releasing both push buttons and operating them again.

Emergency stops monitoring

Emergency stops are widely used on machinery to prevent accidents and stop machine operation in case of dangerous situations; the SM and CM series safety modules monitor the safe interruption of the E-stops with manual, automatic or monitored manual start.
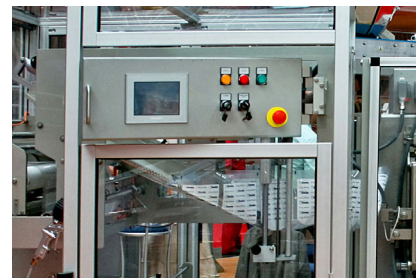
Control of interlocks on safety gates

Hazardous areas have to be protected from accesses when the machine is in operation; the safety module monitors the emergency stop signals and controls the interlock (electrically interlocked) to lock and unlock the safety access. The interlock can be controlled with a delayed intervention, to allow for motors or machine with high inertia to stop prior to allow access in the dangerous area.

### Dangerous moving parts of the machinery

To ensure safe protection on machinery with dangerous and high inertia moving parts, the CM22D0A safety module can be used to operate safely and with adjustable delayed intervention the safety gate, so to allow for the machine to stop before entering in the hazardous area.

Applications

Conveyors

Increased automation in the logistic industry requires wide use of conveyors for safe and efficient material handling and transportation. To ensure a safe use and prevention of accidents, they are equipped with pull wire safety switches and emergency stops, that would safely stop the motors in case of a dangerous situation.
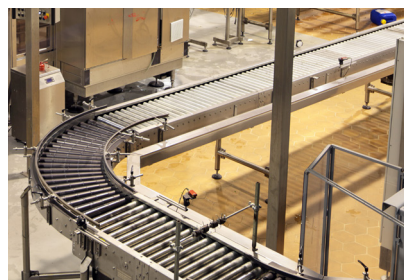
Recycling machinery

Crushers for plastics and metal parts are widely used in the waste recycling industry, to crush all kinds of soft and hard parts, grinding the plastic blocks, strip shaped aluminum parts for an easier recycling of the materials.
The operation of the cutting blades is controlled by motors drives and protected by emergency stop safety circuits, both with e-stop pushbuttons and pull-wire safety limit switches.

Car wash equipment

Serious injuries can occur in car wash operations such as lacerations, amputations, strains, struck-by moving parts; conveyor and in-bay automatic car washes have higher accident exposures from equipment operations.
Precautions are taken by installing emergency stop circuits with manual reset, to ensure the re-start of the equipment only after the emergency situation has been addressed and resolved.

Lift levelling

The SMS20, SMS31 and CL20D2A are 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. The modules monitor the two re-levelling sensors (magnetic or photosensors) and when the cabin is in the re-levelling zone, they enable 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 re-levelling zone; further to the landing and re-levelling of the cabin at the floor, the safety module detects eventual faults and the lift controller will stop the lift.
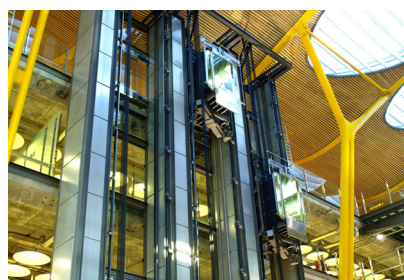
Lift inspection and maintenance

Maintenance activities in the lifts pit or machine room are high risk activity, hence the maintenance area have to be protected from inadvertent operations or unauthorized personnel. A solution frequently used is the installation of safety circuits with emergency stops and electromechanical interlocks.

Selectable delay time

OSSD safety outputs

Lift directive compliance
EN81-20
EN81-50

ESPE Type 4, Type 2

Automatic, manual or ...
START
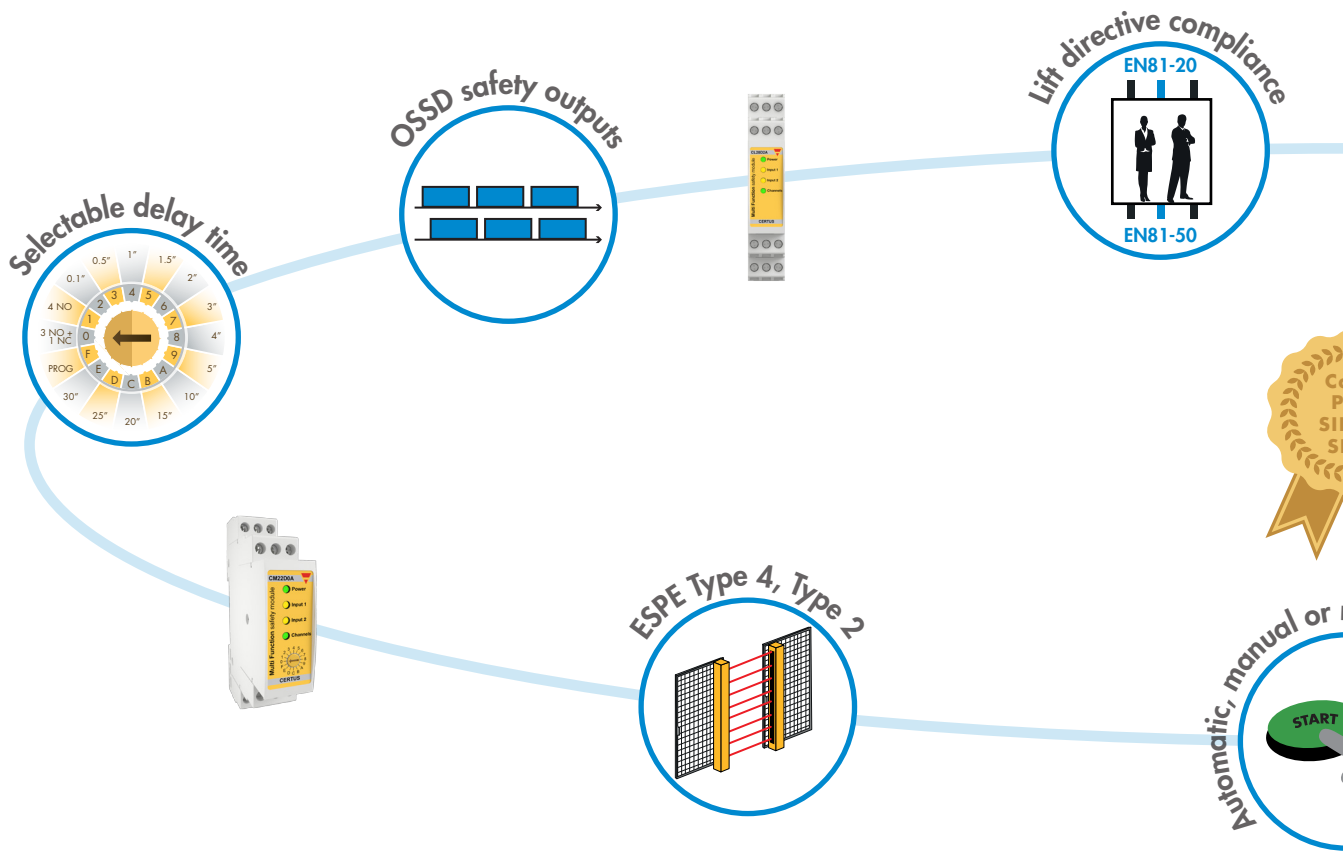
Overview

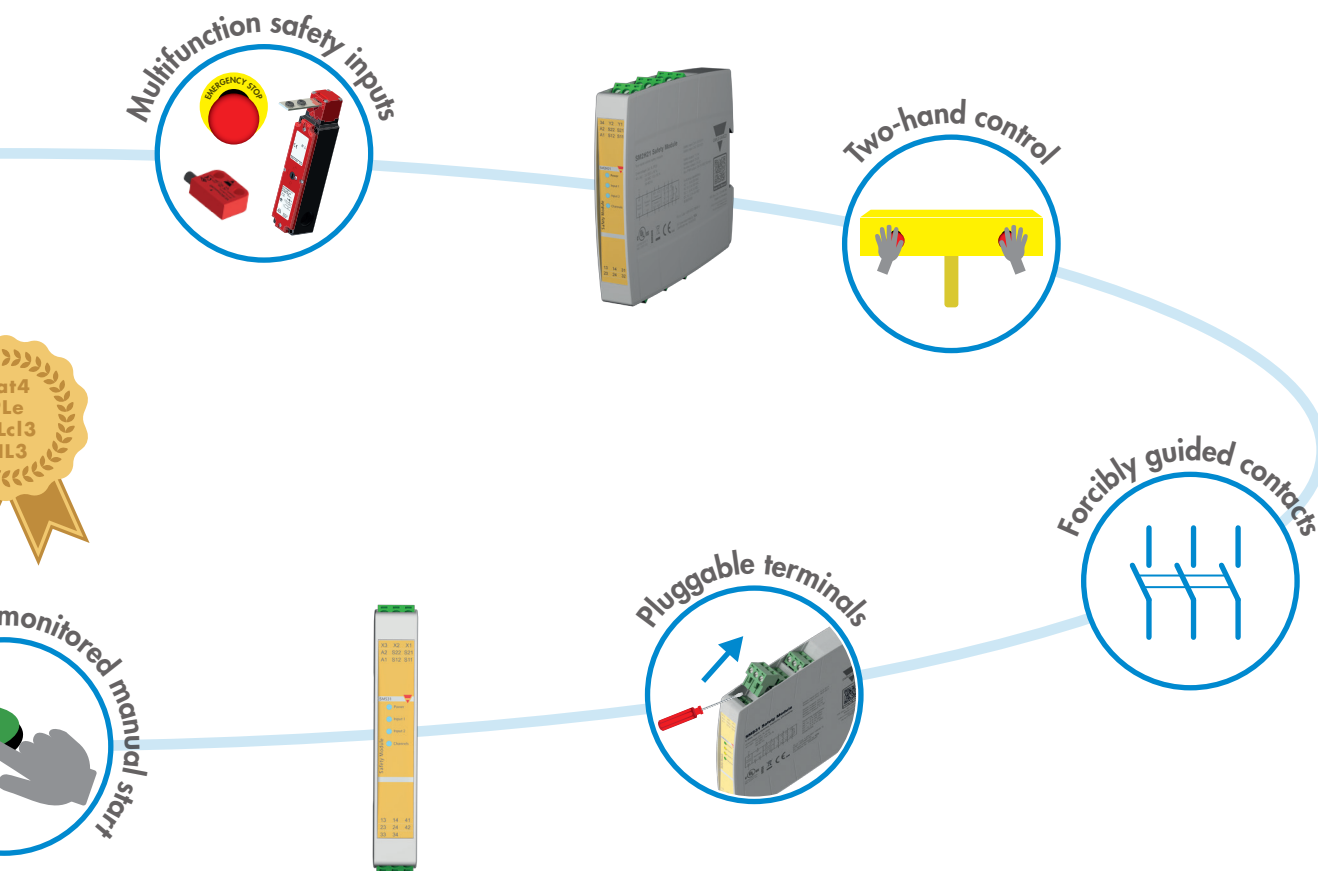|		CM22D0A	CM30D1A	CM40D0A	CL20D2A
Safety functions		E-stop, ESPE Type 4 and Type 2, E-gate, safety magnetic switches, interlocks, limit switches, safety mats	E-stop, ESPE Type 4 and Type 2, E-gate, safety magnetic switches, interlocks, limit switches, safety mats	E-stop, ESPE Type 4 and Type 2, E-gate, safety magnetic switches, interlocks, limit switches, safety mats	Lift levelling, safety magnetic switches, ESPE Type 4 and Type 2, safety mats
Safety outputs					
	Type	OSSD (Output Signal Switching Devices)			
	Number	Selectable via hex-switch: 2 delayed + 2 instantaneous or 4 instantaneous or 3 instantaneous	3 instantaneous	4 instantaneous	2 instantaneous
Auxiliary outputs		1 instantaneous	1 instantaneous	-	2 instantaneous
Start mode		Automatic, manual or monitored manual	Automatic, manual or monitored manual	Automatic, manual or monitored manual	Automatic, manual or monitored manual
Connection type		Screw terminals			
Safety parameters		Cat. 4, PL e, SIL 3, SILcl 3	Cat. 4, PL e, SIL 3, SILcl 3	Cat. 4, PL e, SIL 3, SILcl 3	Cat. 4, PL e, SIL 3, SILcl 3, EN81-20, EN81-50
Approvals		CE, cULus, EC type examined by TÜV			
Power supply		24 Vdc ±20%			
Dimensions (H x W x D)		90 x 17,5 x 63 mm			

Multifunction safety inputs

Two-hand control

Forcibly guided contacts

monitored manual start

Pluggable terminals

|	SMS20	SMS31	SMSA31	SM2H21	SME41
	E-stop, E-gate, safety magnetic switches, interlocks, limit switches, lift levelling	E-stop, E-gate, safety magnetic switches, interlocks, limit switches, lift levelling	E-gate, safety magnetic switches in antivalent mode	Two-hand control device	Relay expansion unit
	Voltage free contact output, relays with forcibly guided contacts				
	2 NO	3 NO	3 NO	2 NO	4 NO
	-	1 NC	1 NC	1 NC + 1PNP	1 NC
	Automatic, manual or monitored manual	Automatic, manual or monitored manual	Automatic, manual or monitored manual	Two-hand control device	-
	Pluggable screw terminals				
	Cat. 4, PL e, EN81-20, EN81-50	Cat. 4, PL e, EN81-20, EN81-50	Cat. 4, PL e	Cat. 4, PL e	Cat. 4, PL e
	CE, cULus, EC type examined by TÜV				
	24 Vdc ±10% or 24 Vac -15/+10%, 50÷60 Hz				
	110,8 x 17,5 x 121,1 mm				

CERTUS
Certus Configurable Modular Safety Module

Certus is a new modular configurable safety module for the protection of people, machines and manufacturing plants, offering a maximum of 128 inputs and 16 pairs of programmable solid state outputs in a compact modular system.

The new Certus configurable system manages and monitors several safety sensors and commands at the same time, such as safety light curtains, photocells, emergency stops, two-hand controls, mechanical switches, laser scanners, and safety mats.

Certus offers a robust versatile safety logic and far more flexibility than standard safety modules based on traditional components, such as relay safety modules.

The flexible Certus safety module also allows decentralization via its CBT module, allowing parts of the Certus system to be mounted in remote cabinets if required.
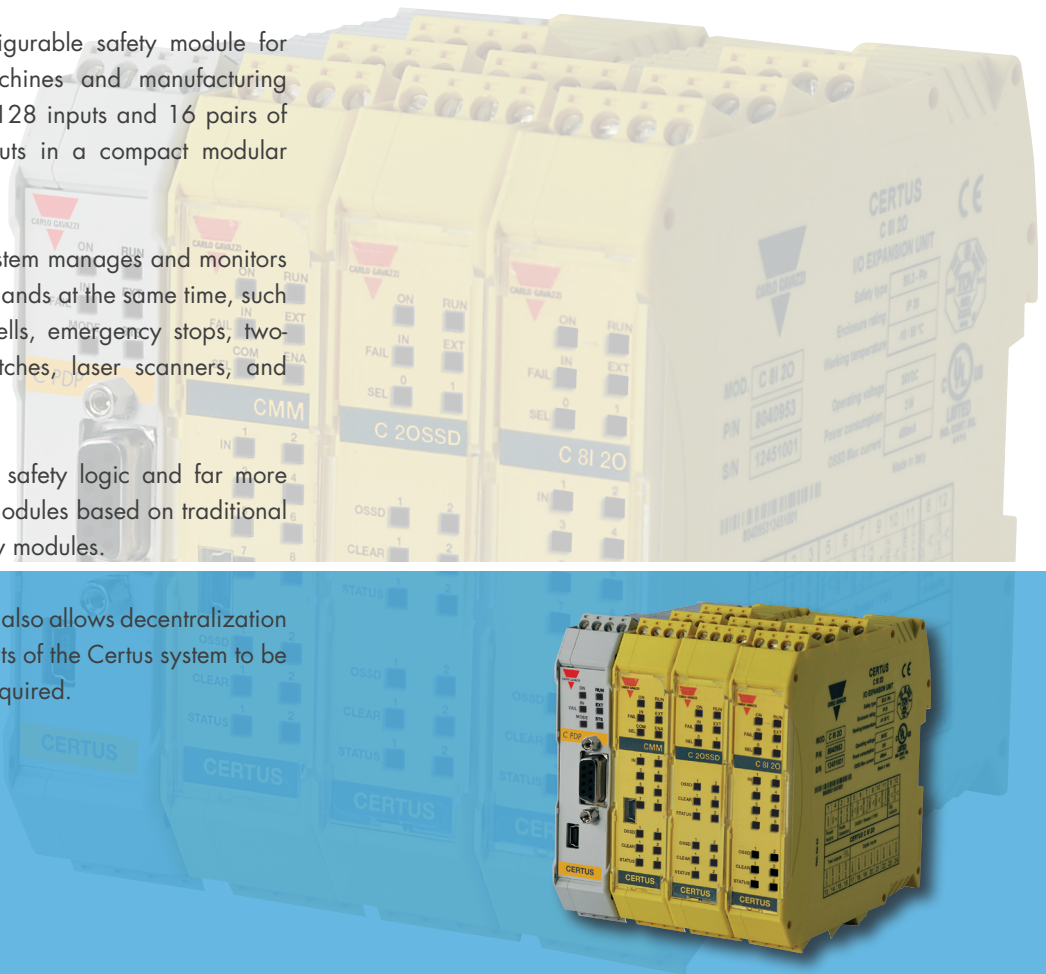
Versatile and flexible configurable modules

The Certus modular system is comprised of:

- A Configurable Master Module (CMM), which can be used in stand-alone mode, featuring 8 safety inputs and 2 separate programmable dual channel solid state outputs.

- A maximum of 14 expansion modules connectable to the Master Module via the Safety Communication Connector (SCC) proprietary bus to deliver up to 128 inputs and 16 OSSD pairs.

The Certus system is configurable via the Certus Configuration Software (CSS) graphic interface, which is provided with each Master Module at no extra cost. The Master Module and the expansion modules communicate via the 5 way Safety Communication Connector (SCC) proprietary bus, located in the back of each module. Through the Certus Bus Transfer (CBT) it is possible to remote the I/O expansion modules.

The Certus Configuration Software (CCS), installable in a standard PC, can be used to create complex logical conditions using logical operators and safety functions, such as: muting, timer, counters, memories, etc. via an intuitive graphic interface. Configuration data is transferred to the Master Module via a USB link.
A specific configuration held on the Master Module can be saved to the optional Configuration Memory Card (CMC), allowing its transference to another Master Module in a few easy steps. Welcome to simplified plant installation and machine maintenance!

Key features, advantages and benefits.
• Reduces the number of components (less footprint and wiring).
• Faster electrical cabinet construction.
• Flexible, intuitive and quick logical configuration software.
• Ideal for machine designers.
• Easy to set up tamper-proof safety systems.
• Simplifies machine maintenance through the Configuration
• Memory Card, which can be used to transfer the configuration program to a new Certus in just a few simple steps.
• Certified to the highest safety levels: SIL +, SILCL 3, PL e, Cat.4.

Safety management of a machining centre with alternated load / unload

The operator is required to position the workpiece with the forklift.

The area is protected by two horizontal safety light curtains. In this case, each light curtain must be equipped with the muting function to allow personnel access to the hazardous area when there is no danger. One of the two light curtains (the one facing the tool working area) is active, while the other is muted to allow load/unload by the operator. The muting condition of the two safety light curtains will be inverted when the tool is required to operate on the opposite side of the machine. The machine is completely protected by a fence with an acces gate equipped with a safety switch.

When the gate is opened, the system stops. The related manual restart control is located close to each safety light curtain. The system is equipped with three emergency push buttons which, if activated, stop the machine.
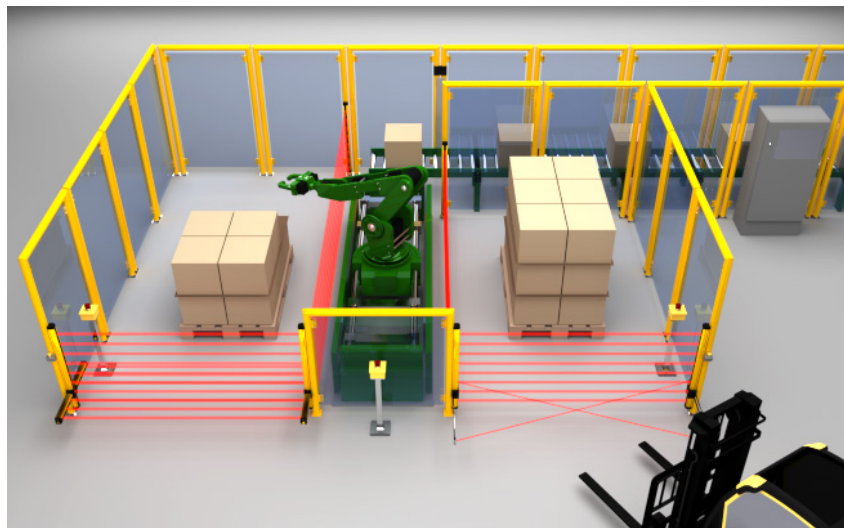
Total safety devices:
- 2 Safety light curtains
- 2 Restart buttons for the safety light curtains
- 1 Safe gate switches
- 1 Emergency push buttons

Our Solution:
- One CERTUS Master Module (CMM)
- One input expansion unit with eight digital inputs (C 8I)

Safety management of a palletising system with two robotic cells

The system is formed by a conveyor that transports boxes to two robotic palletisation cells.

The area is protected by a fence with three access gates (one for each robotic cell and one for the conveyor area) equipped with a safety switch. When the conveyor area gate is opened the entire area stops.

The muting condition of the two safety light curtains will be inverted when the tool is required to operate on the opposite side of the machine. The machine is completely protected by a fence with an acces gate equipped with a safety switch.

When the gate is opened, the system stops. The related manual restart control is located close to each safety light curtain. The system is equipped with three emergency push buttons which, if activated, stop the machine.
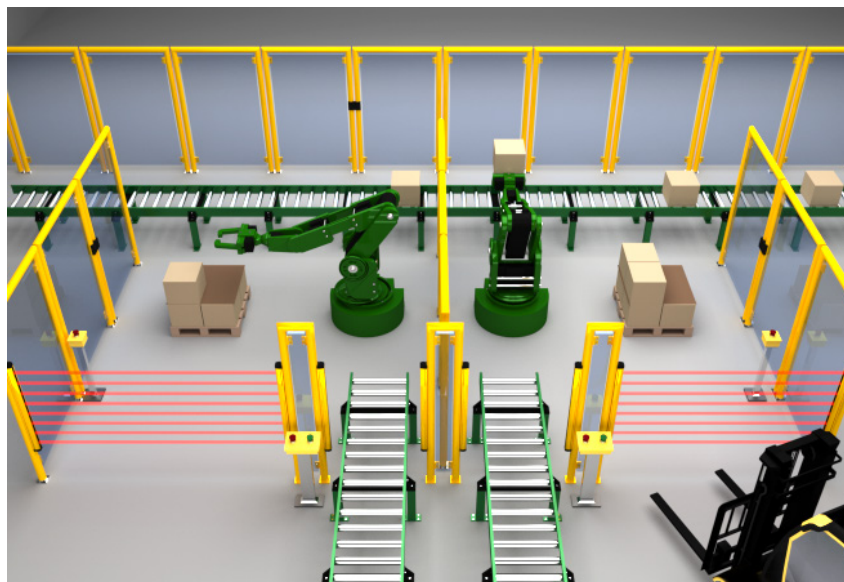
Total safety devices:
- 2 Safety light curtains
- 2 Restart buttons for the safety light curtains
- 3 Safe gate switches
- 4 Emergency push buttons

Our Solution:
- One CERTUS Master Module (CMM)
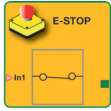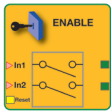- One input expansion unit with eight digital inputs (C 8I)
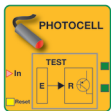
CERTUS
Certus Configurable Safety Module

E-STOP checks the status of the inputs connected to an emergency stop device.
Test outputs may be used.
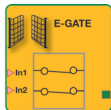Configurable inputs for contacts: 1 NC or 2 NC.

ENABLE checks the status of the inputs connected to a key type manual control device.
Test outputs may be used.
Configurable inputs for contacts: 1 NO or 2 NO.
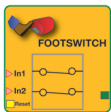
FOOTSWITCH checks the status of the inputs connected to a safety footswitch.
Test output may be used.
Configurable inputs for contacts: 1 NC or 1 NO or 2NC or1 NO + 1NC

SAFETY PHOTOCELL checks the status of the inputs connected to one or to a series of two non selfmonitored safety photocells.
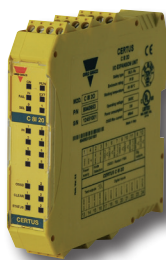Test outputs may be used.

E-GATE - DEVICE FOR MOVABLE GUARDS checks the status of the inputs connected to a device for movable guards, such as doors and gates.
Test outputs may be used.
Configurable inputs for contacts: 2 NC or 1NC + 1 NO.

ESPE - OPTO ELECTRONIC SAFETY BARRIER OR SAFETY LASER SCANNER checks the status of the inputs of a safety light courtain or a safety laser scanner with two self-monitored static outputs.
Any device with OSSD is accepted.
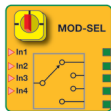
MOD-SEL - SAFETY SELECTOR checks the status of the inputs connected to a functioning mode selector (up to 4 inputs). Configurable inputs for two, three or four position selectors.

CERTUS C 8I 2O	CERTUS C 8I - C 16I	CERTUS C 12I 8TO
• I/O expansion unit	• Input expansion unit:	• Input expansion unit: 12 digital inputs
• 8 digital inputs	- C 8I: 8 digital inputs	• 8 test outputs for sensor monitoring: can control up to four 4-wire safety mats
• 2 OSSD pairs with 400mA output current	- C 16I: 16 digital inputs	• 24 terminal points in 22.5mm
• 4 test outputs for sensor monitoring	• 4 test outputs for sensor monitoring	• Connectable to CMM via SSC proprietary bus
• 2 Programmable digital signal outputs	• 16/24 terminal points in 22.5 mm	
• 2 Inputs for Start/Restart interlock and external device monitoring (EDM)	• Connectable to CMM via SCC proprietary bus	
• 24 terminal points in 22.5mm		
• Connectable to CMM via SCC proprietary bus		
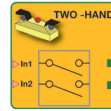
TWO-HANDS - SAFETY CONTROL checks the status of the inputs connected to a two-hand safety control device. Configurable inputs for contacts: 2 NC or 2NO + 2 NC.
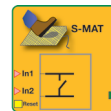
S -MAT checks the status of the inputs connected to a safety mat or safety edge.
Test outputs must be used. Cannot be used with 2-wire safety mats with terminal resistance.

ENABLING GRIP SWITCH checks the status of the inputs connected to an enabling (aka deadman) switch.
Test outputs may be used.
Configurable inputs for contacts: 2 NO+ 1NC.
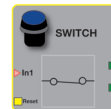
SWITCH checks the status of the input connected to a nonsafety button or switch.
A test may be used.
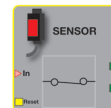
SENSOR checks the status of the input connected to a non safety sensor.
A test may be used.
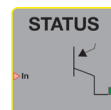
Through the **STATUS** programmable non safety output, it is possible to monitor any point of the logical scheme of the application.

OSSD is a pair of solid state PNP safety outputs. For each OSSD output, it is possible, via dedicated input, to obtain manual or automatic reset and EDM control of external relays.

CERTUS C 2OSSD - C 4OSSD

- Output expansion units:
  - C 2OSSD: 2 OSSD pairs
  - C 4OSSD: 4 OSSD pairs
- Output current - 400mA
- 2/4 programmable digital signal outputs
- 2/4 inputs for Start/Restart interlock and external device monitoring (EDM)
- 16/24 terminal points in 22.5mm
- Connectable to CMM via SSC proprietary bus

CERTUS C 2R - C 4R

- Safety relay modules:
  - C 2R: 2 relays - 2 NO + 1 NC connectable to 1 OSSD pair
  - C 4R: 4 relays - 4 NO + 2 NC connectable to 2 independent OSSD pairs
- 2/4 safety relays with 6A 250VAC guided contacts
- 1/2 NC contacts for External Device Monitoring (EDM)
- 16/24 terminal points in 22.5mm

CERTUS C DDC

Expansion unit for the connection to the most common industrial Fieldbus systems for diagnostics and data communication:

- C PDP - **Profibus DP**
- C DNET - **DeviceNET**
- C CAN - **CANOpen**
- C EIP - **Ethernet IP**
- C ECAT - **EtherCAT**
- C PFNET - **PROFINET**
- C OMMS - **Universal Serial Bus**

CERTUS
Certus Configurable Safety Module

Description of the Certus Master Module (CMM)

- Main unit, also usable as a stand-alone device, able to control any other expansion unit
- Configurable from PC via USB interface using CCS software
- 8 digital inputs
- 2 OSSD pairs with 400mA output current
- 4 test outputs for sensor monitoring
- 2 programmable digital signal outputs
- 2 inputs for Start/Restart interlock and external device monitoring (EDM)
- CMC configuration memory card slot
- LOG file containing the last 5 configuration modifications in chronological order, with date of modification
- 24 connectors in 22.5mm
- Possible connection with Carlo Gavazzi SCC rear bus for connection with other expansion units

The Certus master module is equipped with a USB 2.0 serial Bus for configuration connection to a PC with installed CSS (Certus Configuration Software).
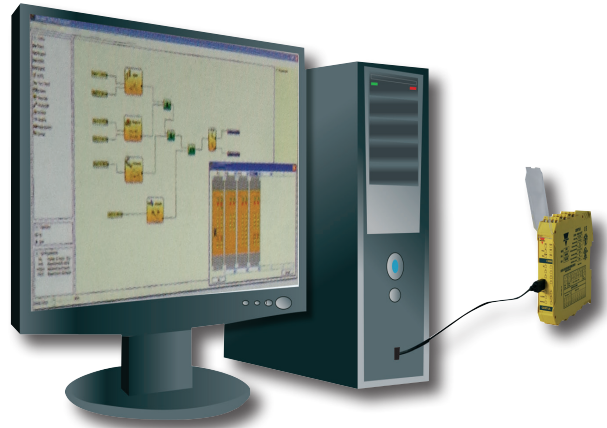
Configuration Memory Card - CMC

The Configuration Memory Card (CMC) is a proprietary removable card (optional) that can be used to save Certus configuration data for subsequent transfer to a new device/machine without using a PC.

The configuration in the CMC overwrites any other configuration present the Certus Master Module (CMM), replacing it with the configuration contained in the CMC. This configuration replacement function can be disabled on the CMM via the CCS (Certus Configuration Software).

Overwrite operations are recorded in chronological order in the CMM LOG file.

Certus CBT Bus transfer (CBT)

Certus CBT is an expansion module which allows the connection of CMM with other slave modules placed at great distances (up to 100m).

Through the use of a shielded cable (compatible with RS485 standard) two CBT modules placed at the desired distance can be linked together.
Each CBT has two independent connection channels; the connection of two CBTs can be performed by wiring a channel of your choice.

CBT has only one channel and must be connected as the first or last module.

CBT

CBT

CBT   CMM

RS 485 compatible cable
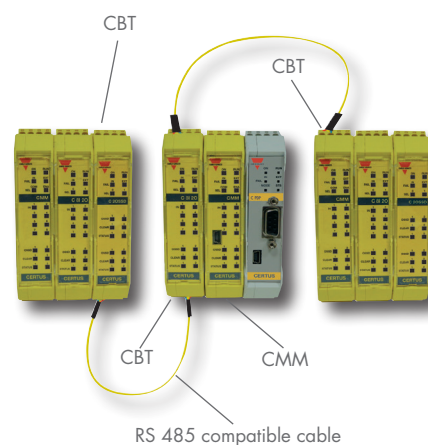
Technical Features

Module	CMM	C 8I 2O	C 8I -C 16I	C 12I 8TO	C 2OOSD - C 4OOSD	C 2R - C 4R	CBT	C DDC
Description	Programmable Master unit	I/O Expansion Units	Input Expansion Units	Input Expansion Units	Output Expansion Units	Guided contact relay output Expansion units	Bus transfer Expansion units	Expansion units for Bus*
USB	Yes	-	-	-	-	-	-	Yes
Housing for CMC	Yes	-	-	-	-	-	-	-
Connection with SCC bus	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes
SCC connector provided	No	Yes	Yes	Yes	Yes	-	Yes	Yes
Safety level	SIL 3 - SILCL 3 according to IEC 61508 - IEC 62061 PLe - Cat. 4 according to ISO 13849-1					-	-	-
Safety inputs	8	8	8 - 16	12		-	-	-
Safety outputs (OSSD)	2 PNP . 400mA	2 PNP . 400mA	-	-	2 PNP . 400mA	-	-	-
Programmable signal output	2 PNP . 400mA	2 PNP . 400mA	-	-	2 PNP . 400mA	-	-	-
Test output	4	4	4	8	-	-	-	-
Safety relay outputs	-	-	-	-	-	2 NO + 1 NC 6A 250 VAC 4 NO + 2 NC 6A 250 VAC	-	-
Start/Restart input and external device monitoring (EMD)	2	2	-	-	2 - 4	-	-	-
LED signalling	Input / Output status and fault diagnostic					Output status	Output status	Diagnostic
Power supply (VDC)	24 ± 20%							
Electrical connection	Removable terminal blocks, screw contact							
Operating temperature (°C)	-10° to 55°C							
Protection rating	-20° to 85°C							
Fastening	Rail fastening according to EN 50022-35 standard							
Dimensions h x w x d (mm)	99 x 22.5 x 114							

* Non-safety I/Os are provided using the Bus Unit.

Overview

Safety

		SMS20	SMS31	SMSA31	SM2H21	SME41
Safety functions	Emergency stop	▼	▼			
	Safety magnetic switch	▼	▼	▼		
	Safety limit switch	▼	▼	▼		
	Safety hinge	▼	▼	▼		
	Electromechanical interlock	▼	▼			
	Lift levelling	▼	▼			
	Two-hand controls				▼	
	ESPE type 2					
	ESPE type 4					
	Safety mats					
	Expansion relay unit		in combination with SME41			▼
Safety outputs	NO relay outputs	2	3	3	2	4
	OSSD delayed outputs					
	OSSD instantaneous outputs					
Auxiliary outputs	NC relay outputs		1	1	1	1
	OSSD outputs					
	PNP output				1	
Start mode	Manual	▼	▼	▼		
	Automatic	▼	▼	▼		
	Monitored manual	▼	▼	▼		
Connection type	Pluggable screw terminals	▼	▼	▼	▼	▼
	Fix screw terminals					
Safety parameters	Safety		Cat. 4 - PL e as EN ISO 13849			
	MTTFD	420,8	420,8	420,8	422,1	363,4
	PFHD	1,85 E-10	1,85 E-10	1,85 E-10	1,35 E-10	1,59 E-10
	DCavg	99%	99%	99%	99%	99%
Power supply	24 VDC/AC	▼	▼	▼	▼	▼
Dimensions	Width		17,5 mm / 0,69"			
	Height		110,8 mm / 4,36"			
	Depth		121,1 mm / 4,77"			
Approvals		CE, UL, TÜV, RoHS EN 81-20, EN 81-50	CE, UL, TÜV, RoHS EN 81-20, EN 81-50	CE, TÜV, cULus, RoHS	CE, TÜV, cULus, RoHS	CE, TÜV, cULus, RoHS

		CM22D0A	CM30D1A	CM40D0A	CL20D2A
Safety functions	Emergency stop	▼	▼	▼	▼
	Safety magnetic switch	▼	▼	▼	▼
	Safety limit switch	▼	▼	▼	▼
	Safety hinge	▼	▼	▼	-
	Electromechanical interlock	▼	▼	▼	-
	Lift levelling				▼
	Two-hand controls				
	ESPE type 2	▼	▼	▼	
	ESPE type 4	▼	▼	▼	
	Safety mats	▼	▼	▼	
	Expansion relay unit	in combination with SME41			
Safety outputs	NO relay outputs				
	OSSD delayed outputs	2 / -			
	OSSD instantaneous outputs	2 / 3 / 4	3	4	2
Auxiliary outputs	NC relay outputs	-	-		-
	OSSD outputs	- / 1 / -	1		2
	PNP output				
Start mode	Manual	▼	▼	▼	▼
	Automatic	▼	▼	▼	▼
	Monitored manual	▼	▼	▼	▼
Connection type	Pluggable screw terminals				
	Fix screw terminals	▼	▼	▼	▼
Safety parameters	Safety	Cat. 4 - PL e as EN 13849 / SIL3 as IEC 61508 / SILCL3 as IEC 62061			
	MTTFD	2403	2403	2403	1268
	PFHD	1,89 E-09	1,89 E-09	1,89 E-09	3,58 E-09
	DCavg	99%	99%	99%	99%
Power supply	24 VDC	▼	▼	▼	▼
Dimensions	Width	17,5 mm / 0,69"			
	Height	90 mm / 3,54"			
	Depth	63 mm / 2,48"			
Approvals		CE, TÜV, cULus, RoHS	CE, TÜV, cULus, RoHS	CE, TÜV, cULus, RoHS	CE, TÜV, cULus, RoHS EN 81-20, EN 81-50

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