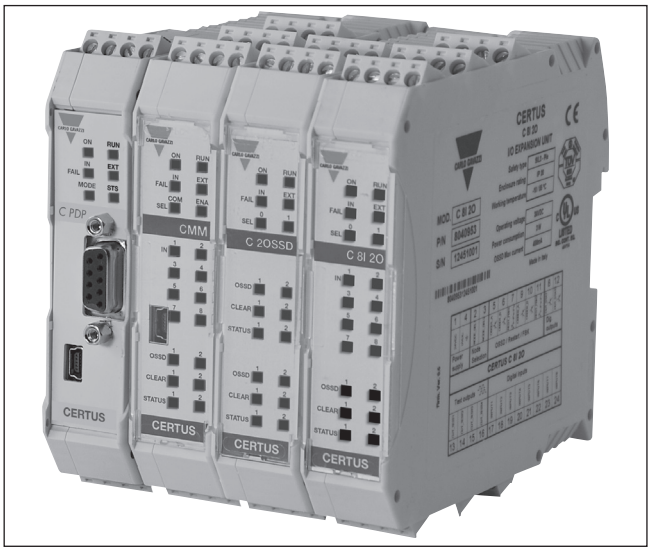
CERTUS
Configurable Safety Module



- **Reduces the number of components (less footprint and wiring)**
- **Faster electrical cabinet construction**
- **Flexible, intuitive and quick logical configuration software**
- **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**
- **Ideal for machine designers**
- **Certified to the highest safety levels: SIL +, SILCL 3, PLe, Cat.4**
- **Up to 128 inputs and 16 OSSD pairs**
- **Up to 14 expansion units in addition to the CMM Master, excluding relay modules**
- **Compact design: single module dimensions (W x H x D) 108 x 22.5 x 114.5**

Product Description

CERTUS is the new Carlo Gavazzi modular configurable safety system. This new safety device is capable of monitoring several safety photocells, emergency stops, safety mats, magnetic or mechanical switches, twohand controls etc.

Thanks to the new CERTUS modular structure, it is possible to adapt its I/O configuration and functionality to the demands of many different applications; making CERTUS a highly versatile and flexible safety system.

Ordering Key

C MM

Model
Type

Type Selection

CMM	Programmable master unit
C 8I2O	I/O expansion unit
C 8I - C 16I	Input expansion unit
C 12I - C 8TO	I/O expansion unit
C 2OSSD - C 4OSSD	Output expansion unit
C 2R - C 4R	Guided contact relay output expansion unit.
CBT	Bus transfer expansion units

Diagnostic and data communication family C PDP, C DNET, C CAN, C EIP, C ECAT, C PFNET, C OMMS	Expansion units for Diagnostics and Data Communication
Speed monitoring family C PSS, C ES1T, C ES2T, C ES1H, C ES2H, C ES1S, C ES2S	Expansion units to monitor speed (PLe): zero, max and range, plus motion direction, rotation/translation

General Data

Max. number of inputs	128
Max. number of outputs	16
Max. number of expansion units	14
Max. number of expansion units of the same type	4
Rated voltage	24VDC ± 20% Supply from class II (LVLE)

Over voltage category	II
Digital Inputs	PNP active high, according to EN 61131-2
Digital otputs	PNP active high 400mA@24VDC
Response time Master	10,6 to 12,6ms + TInput_filter

Specifications are subject to change without notice. Pictures are just an example. For special features and/or customization, please ask to our sales network. 18/03/2015

General Data

CMM + 1 Expansion unit	11,8 to 26,5 + TInput_filter
CMM + 2 Expansion units	12,8 to 28,7 + TInput_filter
CMM + 3 Expansion units	13,9 to 30,8 + TInput_filter
CMM + 4 Expansion units	15 to 33 + TInput_filter
CMM + 5 Expansion units	16 to 35 + TInput_filter
CMM + 6 Expansion units	17 to 37,3 + TInput_filter
CMM + 7 Expansion units	18,2 to 39,5 + TInput_filter
CMM + 8 Expansion units	19,3 to 41,7 + TInput_filter
CMM + 9 Expansion units	20,4 to 43,8 + TInput_filter
CMM + 10 Expansion units	21,5 to 46 + TInput_filter
CMM + 11 Expansion units	22,5 to 48,1 + TInput_filter
CMM + 12 Expansion units	23,6 to 50,3 + TInput_filter
CMM + 13 Expansion units	24,7 to 52,5 + TInput_filter
CMM + 14 Expansion units	25,8 to 56,4 + TInput_filter
Connection cable	C.G. proprietary 5-pole bus
Connection cable cross section	0,5 to 2,5 mm^2 / AWG 12 to 30 (solid/stranded)

Max. length of connections	100m
Operating temperature	-10° to 55°C
Max. sorrounding air temperature	55°C
Storage temperature	+20° to 85°C
Relative humidity	10% to 95%
Description	Electronic housing max 24 pole, with locking latch mounting.
Enclosure material	Polyamide
Enclosure protection class	IP20
Terminal blocks protection class	IP2X
Fastening	Quick coupling to DIN rail according to EN60715
Dimensions (H x W x D)	108 x 22.5 x 114.5

Main Unit and Expansion Units Features

- **CMM stand alone main unit:**
  - 8 safety inputs, 2 OSSD pairs - 400mA output current - with separate EDM and Start/Restart, 4 test outputs and 2 programmable status outputs
  - Configurable via PC through USB interface
  - CMC (CERTUS Configuration Memory Card) slot for program storage (optional feature)

- **C 8I 2O expansion unit:**
  - 8 safety inputs, 2 OSSD pairs - 400mA output current - with separate EDM and Start/Restart, 4 test outputs and 2 programmable status outputs (same as CMM but no CPU).

- **C 8I and C 16I expansion units:**
  - 8 and 16 safety inputs, 4 test outputs.

- **C 12I 8TO expansion unit:**
  - 2 safety inpus, 8 test otputs - can control up to 4-wire safety mats.

- **C 2OSSD and C 4OSSD expansion units:**
  - 2 and 4 OSSD pairs - 400mA output current - with separate EDM and Start/Restart, 2/4 programmable status outputs.

- **C 2R and C 4R relay expansion units:**
  - 2 safety relays - 2 NO + 1 NC connectable to 1 OSSD pair.
  - 4 safety 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).

- **C DDC Data and Diagnostic Communication expansion units for connection to the most common industrial Fieldbus system:**
  - 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

- **CBT Bus transfer expansion unit, up to 50m length per connection. Maximum of 6 connections per system**

- **Speed Monitoring expansion units to monitor (PLe):**
  - Zero speed
  - Max speed
  - Speed range
  - C EIP - Ethernet IP
  - Motion direction; rotation / translation.

Characteristic of the Output Circuit

Excitation voltage	17...31 VDC
Minimum switchable voltage	10VDC
Minimum switchable curent	20 mA
Maximum switchable voltage (DC)	250VDC

Maximum switchable voltage (AC)	400VAC
Maximum switchable current	6A
Response time	12ms
Mechanical life of contacts	> 20 x 10^6

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CERTUS C 8I 2O



- **I/O expansion unit**
- **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)**
- **24 terminal points in 22.5 mm**
- **Connectable to CMM via SCC proprietary bus**

General Data

Safety Level	SIL 3 - SILCL 3 according to IEC 61508 - IEC 62061 PLe - Cat. 4 according to ISO 13849-1.
Safety inputs	8
Safety outputs	2 pairs PNP - 400mA
Programmable signal outputs	2 PNP - 400mA
Test Outputs	4
Start/Restart inputs and external device monitoring (EDM)	24VDC ± 20% Supply from class II (LVLE)
LED signal	Input/output status and fault diagnostics.
Power supply	24VDC ± 20% Supply from class II (LVLE)
Electrical connection	Removable terminal blocks, screw contact.
Operating temperature	-10° to 55°C
Storage temperature	-20° to 85°C
Protection rating	IP 20 for housing IP 2X for terminal blocks
Fastening	DIN Rail fastening according to EN 60715 standard
Dimensions (H x W x D)	108 x 22.5 x 114.5 mm

CERTUS C 8I - C 16I

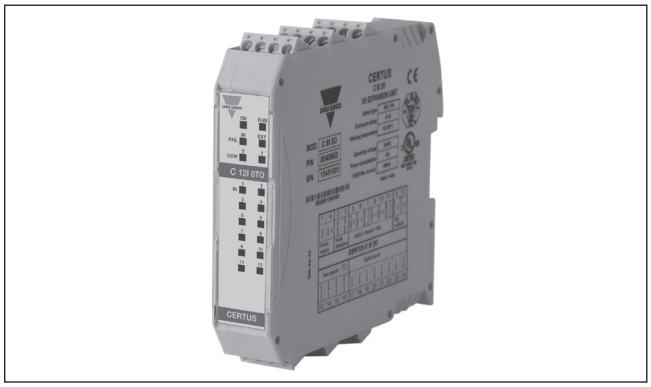


- **Input expansion unit:**
  - C 8I: 8 digital inputs
  - C 16I: 16 digital inputs
- **4 test outputs for sensor monitoring**
- **16 (C 8I) / 24 (C 16I) terminal points in 22.5 mm**
- **Connectable to CMM via SCC proprietary bus**

General Data

Safety Level	SIL 3 - SILCL 3 according to IEC 61508 - IEC 62061 PLe - Cat. 4 according to ISO 13849-1.
Safety inputs	8 - 16
Test Outputs	4
LED signal	Input/output status and fault diagnostics.
Power supply	24VDC ± 20% Supply from class II (LVLE)
Electrical connection	Removable terminal blocks, screw contact.
Operating temperature	-10° to 55°C
Storage temperature	-20° to 85°C
Protection rating	IP 20 for housing IP 2X for terminal blocks
Fastening	DIN Rail fastening according to EN 60715 standard
Dimensions (H x W x D)	108 x 22.5 x 114.5 mm

CERTUS C 12I 8TO

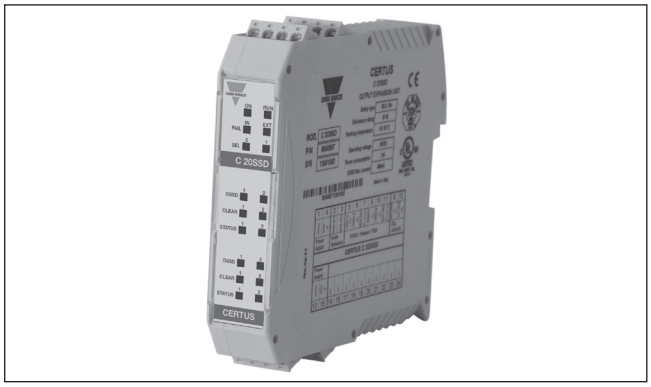


- **Input expansion unit: 12 digital inputs**
- **8 test outputs for sensor monitoring: can control up to four 4-wire safety mats**
- **24 terminal points in 22.5 mm**
- **Connectable to CMM via SCC proprietary bus**

General Data

Safety Level	SIL 3 - SILCL 3 according to IEC 61508 - IEC 62061 PLe - Cat. 4 according to ISO 13849-1.
Safety inputs	12
Test Outputs	8
LED signal	Input/output status and fault diagnostics.
Power supply	24VDC ± 20% Supply from class II (LVLE)
Electrical connection	Removable terminal blocks, screw contact.
Operating temperature	-10° to 55°C
Storage temperature	-20° to 85°C
Protection rating	IP 20 for housing IP 2X for terminal blocks
Fastening	DIN Rail fastening according to EN 60715 standard
Dimensions (H x W x D)	108 x 22.5 x 114.5 mm

CERTUS C 2OSSD and 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 22.5 mm**
- **Connectable to CMM via SCC proprietary bus**

General Data

Safety Level	SIL 3 - SILCL 3 according to IEC 61508 - IEC 62061 PLe - Cat. 4 according to ISO 13849-1.
Safety outputs	2/4 pairs PNP - 400mA
Programmable signal outputs	2/4 PNP - 400mA
Start/Restart inputs and external device monitoring (EDM)	2/4
LED signal	Input/output status and fault diagnostics.
Power supply	24VDC ± 20% Supply from class II (LVLE)
Electrical connection	Removable terminal blocks, screw contact.
Operating temperature	-10° to 55°C
Storage temperature	-20° to 85°C
Protection rating	IP 20 for housing IP 2X for terminal blocks
Fastening	DIN Rail fastening according to EN 60715 standard
Dimensions (H x W x D)	108 x 22.5 x 114.5 mm

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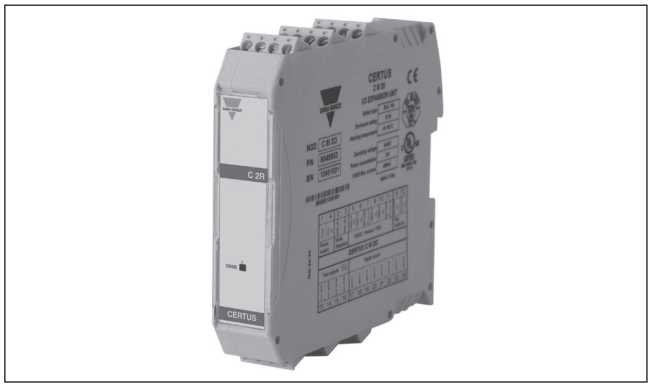
CERTUS C 2R and C 4R



- **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**

General Data

Safety Level	SIL 3 - SILCL 3 according to IEC 61508 - IEC 62061 PLe - Cat. 4 according to ISO 13849-1.
Safety relay outputs	2 NO + 1 NC 6A 250VAC 4 NO + 2 NC 6A 250VAC
Programmable signal outputs	2 PNP - 400mA
LED signal	Output status
Power supply	24VDC ± 20% Supply from class II (LVLE)

Electrical connection	Removable terminal blocks, screw contact.
Operating temperature	-10° to 55°C
Storage temperature	-20° to 85°C
Protection rating	IP 20 for housing IP 2X for terminal blocks
Fastening	DIN Rail fastening according to EN 60715 standard
Dimensions (H x W x D)	108 x 22.5 x 114.5 mm

CERTUS C DDC



- **Expansion unit for the connection to the most common industrial Fieldbus system for diafnostic 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**

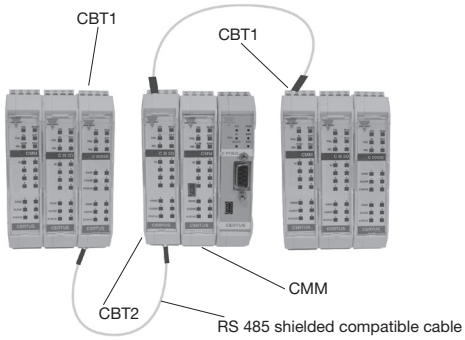
General Data

LED signal	Diagnostic
Power supply	24VDC ± 20% Supply from class II (LVLE)
Electrical connection	Removable terminal blocks, screw contact.
Operating temperature	-10° to 55°C

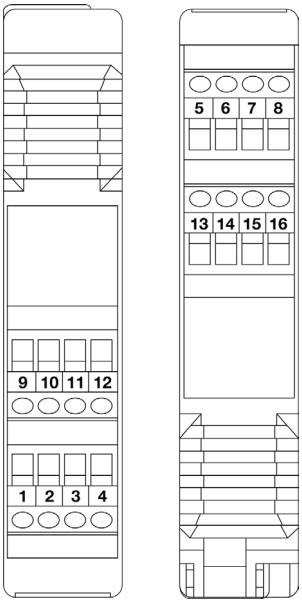
Storage temperature	-20° to 85°C
Protection rating	IP 20 for housing IP 2X for terminal blocks
Fastening	DIN Rail fastening according to EN 60715 standard
Dimensions (H x W x D)	108 x 22.5 x 114.5 mm

CERTUS Bus Transfer (CBT)

CERTUS CBT is an expansion module which allows the connection of the CMM with other expansion unit modules placed at great distances. Up to 50m per connection. Maximum 6 connections/system.
Through the use of a shielded cable (compatible with RS485 standard) two CBT modules placed at the desired distance can be linked together.
Each CBT2 has two independent connection channel; the connection of two CBT2 can be performed by wiring a channel of your choice.
CBT1 has only one channel and must be connected as the first or last module.



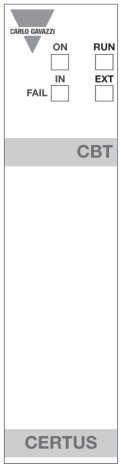
Electrical Connection



TERMINAL	SIGNAL		TYPE
	CBT1	CBT2	
1	24VDC	24VDC	Power supply 24VDC
2	n.c.	n.c.	-
3		BRAIDING CH2	-
4	0VDC	n.c.	Power supply 24VDC
5	n.c.	n.c.	-
6	n.c.	n.c.	-
7	**BRAIDING CH1**	**n.c.**	-
8	n.c.		-
9	n.c.	CH 2 - A	Be sure to connect to the corresponding terminals of the remote CBT: A < - > A B < - > B C < - > C D < - > D BRAIDING < - > BRAIDING You can also connect CH1 with CH2 (CBT2)
10	n.c.	CH 2 - B	
11	n.c.	CH 2 - C	
12	n.c.	CH 2 - D	
13	**CH 1 - A**	**CH 1 - A**	
14	**CH 1 - B**	**CH 1 - B**	
15	**CH 1 - C**	**CH 1 - C**	
16	**CH 1 - D**	**CH 1 - D**	

The CERTUS system units are provided with terminal blocks for the electrical connections. Each unit can have 16 or 24 terminals. Each unit also has a rear panel plug-in connector (for communication with the master and with the other expansion units). The C 2R and C 4R are connected via terminal blocks only.

Signals



MEANING	LED			
	ON (GREEN)	RUN (GREEN)	IN FAIL (RED)	EXT FAIL (RED)
INITIAL TEST	ON	ON	ON	ON
NORMAL OPERATION	ON	OFF > BLINKING > ON	OFF Operation OK	OFF Operation OK
INTERNAL FAULT DETECTED (Not recoverable. Restart the system)	ON	OFF	BLINKING Follows CMM error codification (see CERTUS MANUAL)	OFF
FAULT DETECTED ON TERMINAL CONNECTION (Recoverable)	ON	OFF	OFF	ON

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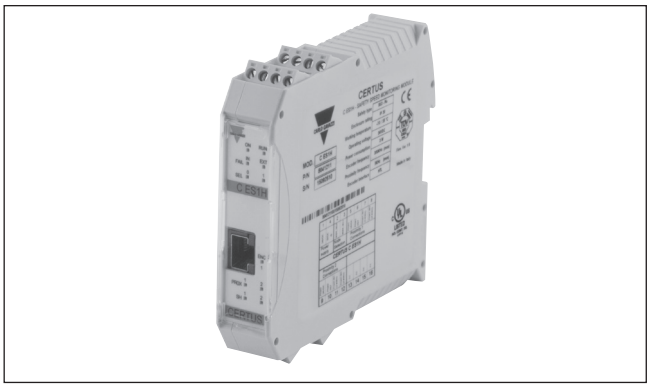
Technical Data

Interface module	CERTUS CBT1 CERTUS CBT2
Connection channels	
CERTUS CBT1	1
CERTUS MC2	2
Connection	SCC 5-poles rear connector Terminal block 16 poles.
Modules connections	Max. number of connectable CBT=6. The possible bus module present in the system can be only allocated close to the first remote CBT or to CMM directly.

Max length of connection	<100m (each section)
Operating temperature	-10° to 55°C
Storage temperature	-20° to 85°C
Relative humidity	10% to 95%
Dimensions (H x W x D)	108 x 22.5 x 114.5 mm

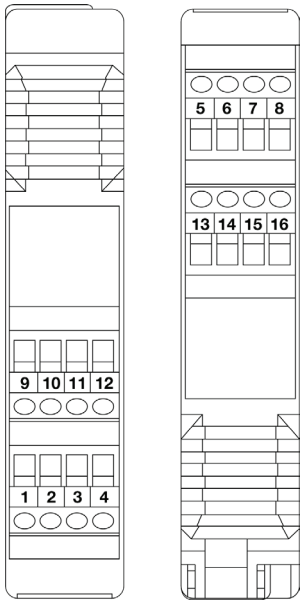
CERTUS Safety Speed Monitoring (C PSS, C ES1 and C ES2)



Speed Monitoring expansion units to monitor (PLe):

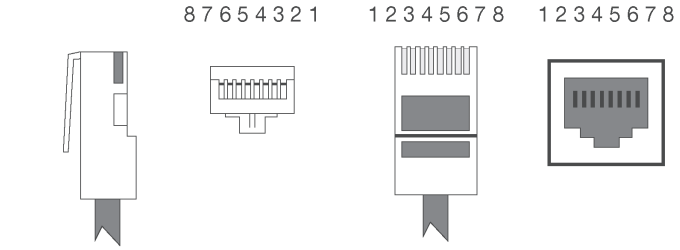
- **Zero speed**
- **Max speed**
- **Speed range**
- **Motion direction; rotation / translation**
- **Allow the configuration of up to 4 speed thresholds for each logic output (axis). Each unit integrates 2 configurable logic outputs being capable to control up to 2 independent axes. RJ45 for encoder connections (1 of CES1, CES2 of 2) and terminal blocks for connection of proximity (up to 2 proximity switches per module).**
- **Inputs frequency: Encoder up to 500 KHz (300 KHz for HTL); Proximity up to 5 KHz.**

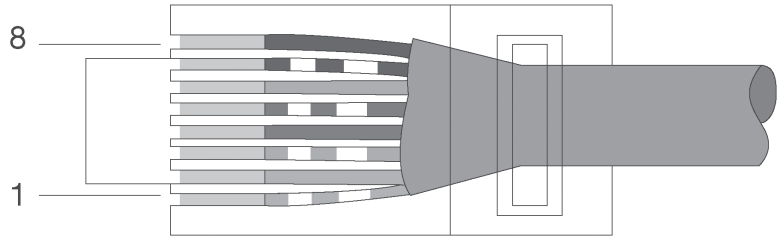
Electrical Connection



PIN	SIGNAL	IN / OUT	FUNCTION
1	24V	OUT	24VDC Power supply
2	NODE_SEL0	OUT	Node selection
3	NODE_SEL0	OUT	
4	GND	OUT	0VDC Power supply
5	PROXI1_24V	OUT	PROXIMITY 1 connections
6	PROXI_1REF	OUT	
7	PROXI1 IN1 (3 wires)	IN	
8	PROXI1 IN2 (4 wires)	IN	
9	PROXI2_24V	OUT	PROXIMITY 2 connections
10	PROXI2_REF	OUT	
11	PROXI2 IN1 (3 wires)	IN	
12	PROXI2 IN2 (4 wires)	IN	
13	N.C		Not connected
14	N.C		
15	N.C		
16	N.C		

Encoder Connection with RJ45 Connector (C ES1, C ES2)





PIN		COLOR	MVT	MVH	MVS
1	**INPUT**	BROWN	5VDC	N.C.	N.C.
2		WHITE	EXT_0V	EXT_0V	EXT_0V
3		BLUE	N.C.	N.C.	N.C.
4		GREEN	A	A	A
5		YELLOW	A	A	A
6		RED	N.C.	N.C.	N.C.
7		GREY	B	B	B
8		PINK	B	B	B

ON	RUN	IN FAIL	EXT FAIL	SEL	ENC	PROX	SH
GREEN	**GREEN**	**RED**	**RED**	**ORANGE**	**YELLOW**	**YELLOW**	**YELLOW**
ON Module turned on	**OFF** the module waits for the first CMM	**OFF** Operation OK	**OFF** Operation OK	Brings back the table of signals NODE/ SEL0/1	**ON** Encoder connected and operative	**ON** Proximity connected and operative	**OFF** axis normal speed range
	BLINKING configuration does not require INPUT or OUTPUT from module				**BLINKING** Encoder not connected but requested from the configuration	**BLINK 0,5s** Proximity not conneted but requested from the configuration	**BLINKING** axis in over-speed
	ON configuration requires INPUT or OUTPUT from module					**BLINK 2 s.** Proximity malfunction	**ON** axis in stand still

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Technical Data Concerning Safety



	C PSS	C ES1	C ES2
Device lifetime	20 years		
Safety level	SIL 3 - PLe - Category 4		
PFHd	5,98E-09	7,08E-09 (TTL)	8,18E-09 (TTL)
		7,93E-09 (SIN/COS)	9,89E-09 (SIN/COS)
		6,70E-09 (HTL)	7,42E-09 (HTL)
MTTFd	500,33	337,72 (TTL)	254,88 (TTL)
		269,49 (SIN/COS)	184,41 (SIN/COS)
		380,05 (HTL)	306,40 (HTL)
DCavg	99,0%		

	C PSS	C ES1	C ES2
Rated voltage	-		
Power dissaption max	3W		
Encoder interface		TTL (MV1T - MV2T models) HTL (MV1H - MV2H models	
Encoder input signals electrically insulated in accordance with		Rated insulation voltage 250V Overvoltage category II Rated impulsewithstand voltage 4.00kv	
Max number of axes	2		
Max number of encoders	0	1	2
max encoder frequency	-	500KHz (HTL: 300KHz)	
Encoder connections	-	RJ45 connector	
Max number of proximity	2		
Max proximity frequency	5KHz		
Proximity connections	Terminal blocks		
Proximity type	PNP/NPN -3/4 wires		
CMM connections	Via MSC Bus		
Operating temperature	-10 ÷ 55°C		
Storage temperaature	-20 ÷ 85°C		
Relative humidity max	95%		
Dimensions (H x L x P)	108 x 22,5 x 114,5		

Configuration Memory Card (CMC)



CMC is a memory card supplied as an accessory to save the CERTUS configuration data for transfer to a new CMM without using a computer.

- Each time CMC is used, carefully check that the chosen configuration is the one that was planned for that particular system.
- If the file inside the CMC does not mach the one contained in the CMM, the CMC will overwrite the CMM erasing definitely the old data. WARNING: **ALL DATA PREVIOUSLY CONTAINED IN THE CMM (PASSWORD INCLUDED) WILL BE OVERWRITTEN**.
- Perform again a fully functional test of the system composed of CERTUS plus all devices connected to it.

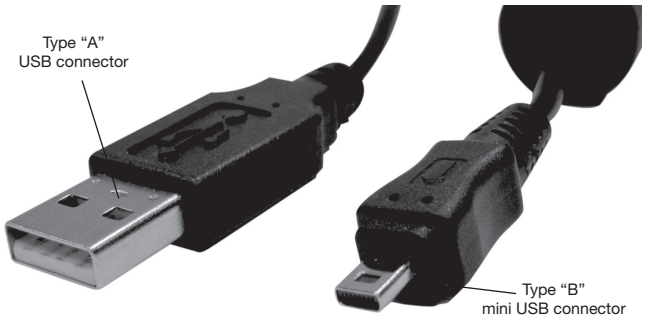
Technical Data

Interface module	CERTUS CMM
Connections	8 poles connector
Operating temperature	-10° to 55°C
Storage temperature	-20° to 85°C
Relative humidity	10% to 95%
Dimensions (H x W x D)	21.5 x 2 x 18mm

CERTUS USB Connection Cable (C USB)

C USB is an interconnection cable necessary to connect CERTUS CMM to the PC with the CCS (CERTUS configuration software) installed.

- Connect the C USB cable only with CCS software installed: the driver necessary to the identification of CMM is contained in the software.
- The cable has two connectors:
  1) type “A” USB connecto for the connection to the computer
  2) type “B” mini-USB connector for the connection to the CMM module.
- The lenght of the C USB is 1.8m=> DO NOT USE OTHER CABLES OR LONGER THAN 3m.
  The configuration software automatically recognises a connected CMM module and reports it on the status bar.



Technical Data

Nominal current (max)	100mA
Nominal voltage	5VDC
Connections	1 connector type “A” 1 connector type “B”
Lenght	1.8m

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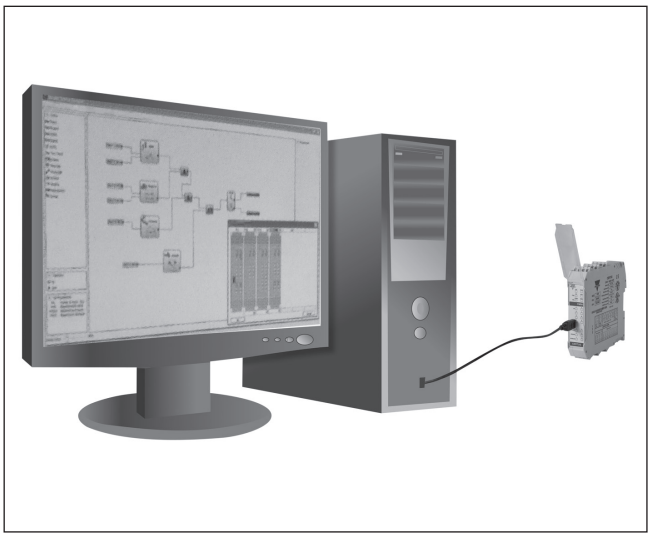
CERTUS Configuration Software (CCS)



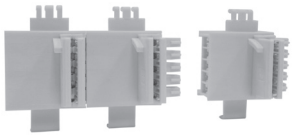
The CERTUS Configuration Software (CCS) is a userfriendly configuration tool to program the CMM in just a few simple steps. By clicking on the functional icons it is easy to “Drag&Drop” configurable safety functions.

The accurate functional test incorporated in the CCS, immediately detects potential configuration errors. This also guarantees that configuration errors do not lead to an unsafe situation and valuable time is not lost during machine commissioning.

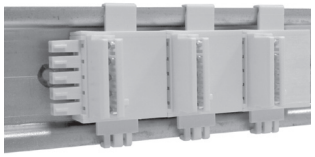
In addition, the multi-level password management of CCS gives furter security against non-authorized access to the configuration software. Through the MONITOR I/O feature is possibe to perform a real time monitoring of the I/Os status and diagnostc of a working CERTUS system.

CERTUS Safety Communication Connector (SCC)

The SCC is a 5 poles connector that permits the interconnection between the CERTUS modules.



1. Connect the same number of “SCC” 5-pole rear panel connectors as the number of units to be installed (except for the relays modules that do not need this connector).



2. Fix the train of connectors to the DIN rail: (hooking them at the top first).
THE FEMALE CONNECTOR MUST BE ON THE LEFT (FRONT VIEW).



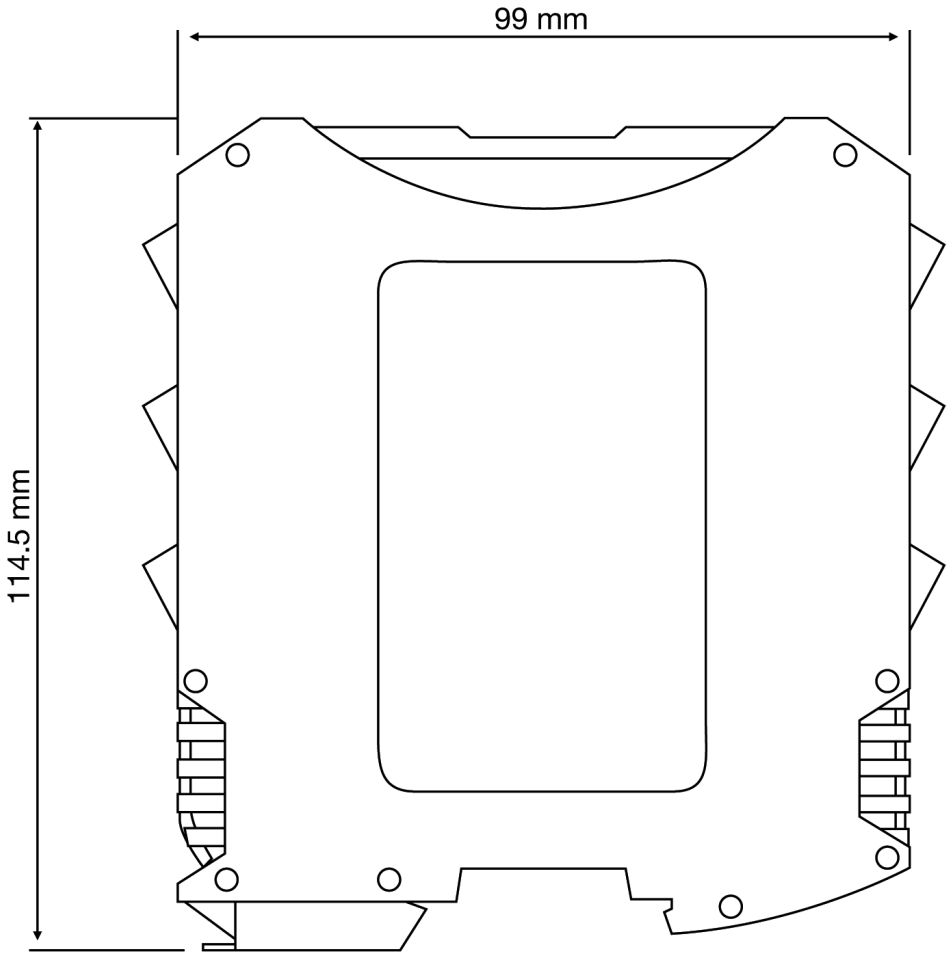
3. Fasten the units to the rail, arranging the contacts on the base of the unit on the respective connector.

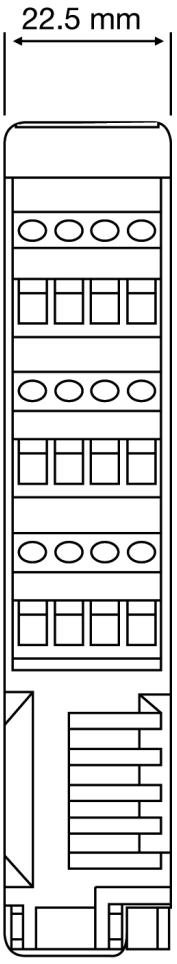
4. Press the unit gently until it snaps into place.

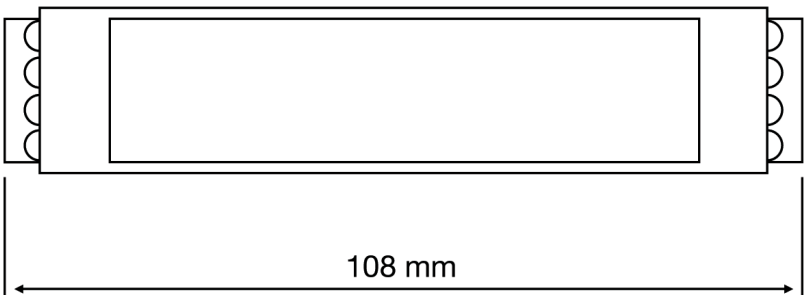
Technical Data

Connections	5 poles	**Relative humidity**	10% to 95%
Operating temperature	-10° to 55°C	**Dimensions (H x W x D)**	36.5 x 29.2 x 20.5
Storage temperature	-20° to 85°C	**Weight**	5.2g

Dimensions







Specifications are subject to change without notice. Pictures are just an example. For special features and/or customization, please ask to our sales network. 18/03/2015