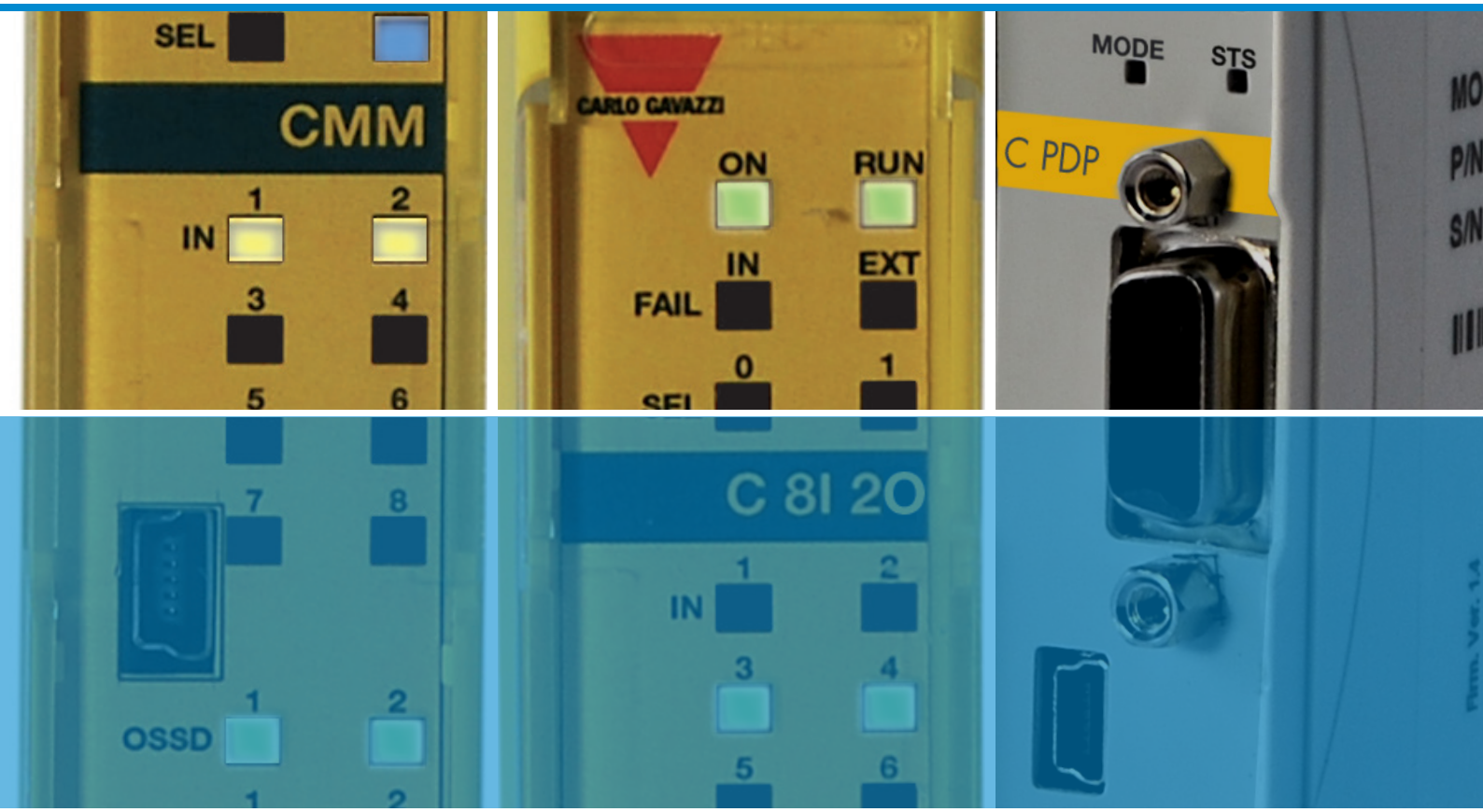
CARLO GAVAZZI
Automation Components

CARLO GAVAZZI



CERTUS Installation Manual

(Copy of the original instructions)

Dispose of the product in an eco-compatible manner and in accordance with national legislation.

For Countries in the European Union:
Pursuant to the Directive no. 2012/19/EU on waste electrical and electronic equipment (WEEE)

The crossed out wheelie-bin symbol on the equipment or its packaging means that when the product reaches the end of its useful life it must be collected separately from other waste.
Proper separate collection of the discarded equipment for later environment-friendly recycling, processing and disposal, helps to avoid any negative impact on the environment and health and encourages re-use and recycling of the materials the equipment is made of.
In each individual Member State of the European Union this product is required to be disposed of in accordance with Directive **2012/19/EU** as implemented in the Member State where the product is disposed of.
For further information please contact Carlo Gavazzi or your local dealer.

CONTENTS

Introduction

Contents of this Handbook

This handbook describes how to use the Certus programmable safety module and its expansion units (“SLAVES”); it includes:

- a description of the system
- method of installation
- connections
- signals
- troubleshooting
- use of the configuration software

Important safety instructions

⚠ This safety alert symbol indicates a potential personal safety hazard. Failure to comply with instructions bearing this symbol could pose a very serious risk to personnel.
⇒ This symbol indicates an important instruction

⚠ The Certus is built to the following safety levels: SIL 3, SILCL 3, PL e, Cat. 4, Type 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.
⚠ Read the “Applicable Standards” section carefully.
⚠ Perform an in-depth risk analysis to determine the appropriate safety level for your specific application, on the basis of all the applicable standards.
⚠ Programming/configuration of the Certus is the sole responsibility of the installer or user.
⚠ The device must be programmed/configured in accordance with the application specific risk analysis and all the applicable standards.
⚠ Once you have programmed/configured and installed the Certus and all the relative devices, run a complete application safety test (see “TESTING the system”, page 57).
⚠ Always test the complete system whenever new safety components are added (see the “TESTING the system” section, page 57).
Carlo Gavazzi is not responsible for these operations or any risks in connection there with.
⚠ Reference should be made to the handbooks and the relative product and/or application standards to ensure correct use of devices connected to the Certus within the specific application.
⚠ The ambient temperature in the place 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 competent safety authorities or the competent trade association.

Abbreviations and Symbols

CMC = CERTUS Configuration Memory Card: memory chip for CERTUS CMM (accessory)
SCC = CERTUS Safety Communication: proprietary bus for expansion units
CCS = CERTUS Configuration Software: CERTUS configuration SW running in Windows
OSSD = Output Signal Switching Device: solid state safety output
MTTFd = Mean Time to Dangerous Failure
PL = Performance Level
PFHd = Probability of a dangerous failure per Hour
SIL = Safety Integrity Level
SILCL = Safety Integrity Level Claim Limit
SW = Software

Applicable Standards

Certus complies with the following European Directives:

- 2006/42/EC “Machinery Directive”
- 2004/108/EC “Electromagnetic Compatibility Directive”
- 2006/95/EC “Low Voltage Directive”

and is built to the following standards:

CEI EN 61131-2	Programmable controllers, part 2: Equipment requirements and tests
ISO 13489-1	Safety of machinery: Safety related parts of control systems. General principles for design
EN 61496-1	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
IEC 61508-1	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3	Digital data communication for measurement and control: Functional safety fieldbuses.
IEC 62061	Safety of machinery. Functional safety of safety-related electrical, electronic and programmable electronic control systems

Overview

Certus is a modular safety controller. It consists of a master unit (CMM), which can be configured using the CCS graphic interface, and a number of expansion units connected to the CMM via the proprietary SCC bus.
The CMM can also be used as a stand-alone device. It has 8 safety inputs and 2 independent programmable dual channel outputs.

⇒ The following expansions are available:
- Input/Output expansions (C 8I 2O, C 12I 8TO)
- Input expansions (C 8I, C 16I, C PSS, C ES1 and C ES2)
- Output expansions (C 2OSSD and C 4OSSD)
- Guided contact safety relay output modules (C 2R and C 4R) and
- Data and diagnostic communication expansion units to the main fieldbuses:
  C PDP (Profibus DP), C CAN (CANOpen), C DNE (DeviceNET), C EIP (Ethernet IP), C PFN (PROFINET), C ECA (EtherCAT).

Certus is capable of monitoring the following safety sensors and commands:

- Optoelectronic sensors (safety light curtains, scanners, safety photocells), mechanical switches, safety mats, emergency stops, two-hand controls, all managed by a single flexible and expandable device.

- The system must consist of just one Master module CMM and a number of electronic expansions that can range from 0 to a maximum of 14, not more than 4 of which of the same type. There is no limit to the number of relay modules that can be installed.

- With 14 expansions, the system can have up to 128 inputs, 16 dual channel safety outputs and 16 status outputs. The MASTER and its SLAVE units communicate via the 5-way SCC bus (Carlo Gavazzi proprietary bus), physically arranged on the rear panel of each unit.

- Furthermore 8 inputs and 16 outputs probe controllable (by Fieldbus) are available.

- The CCS software is capable of creating complex logics, using logical operators and safety functions such as muting, timer, counters, etc.

- All this is performed through an easy and intuitive graphic interface.
  The configuration performed on the PC is sent to the CMM via USB connection; the file resides in the CMM and can also be saved on the proprietary CMC memory chip (accessory). The configuration can therefore quickly be copied to another CMM unit.

⇒ The Certus system is certified to the maximum safety level envisaged by the applicable industrial safety standards (SIL 3, SILCL 3, PL e, Cat. 4).

The C PSS, C ES1 and C ES2 CERTUS expansion units can be used to control the following (up to PLe):

- Zero speed, Max. speed, Speed range;
- Direction of movement, rotation/translation;

Up to 4 speed thresholds can be set for each logic output (axis).

Each unit incorporates two logic outputs that can be configured using the MSD software and is thus capable of controlling up to two independent axes.

Product Composition

The Certus CMM is supplied with:

- CD-ROM containing the free CCS SW, this PDF multi-language handbook and other product literature.
- Multi-language installation sheet.

⇒ NB: the rear panel SCC connector and CMC memory can be ordered separately as accessories.

The expansion units are supplied with:

- Multilingual Installation sheet.
- Carlo Gavazzi panel SCC connector (not present in the C 2R and C 4R which are connected via terminal blocks only)

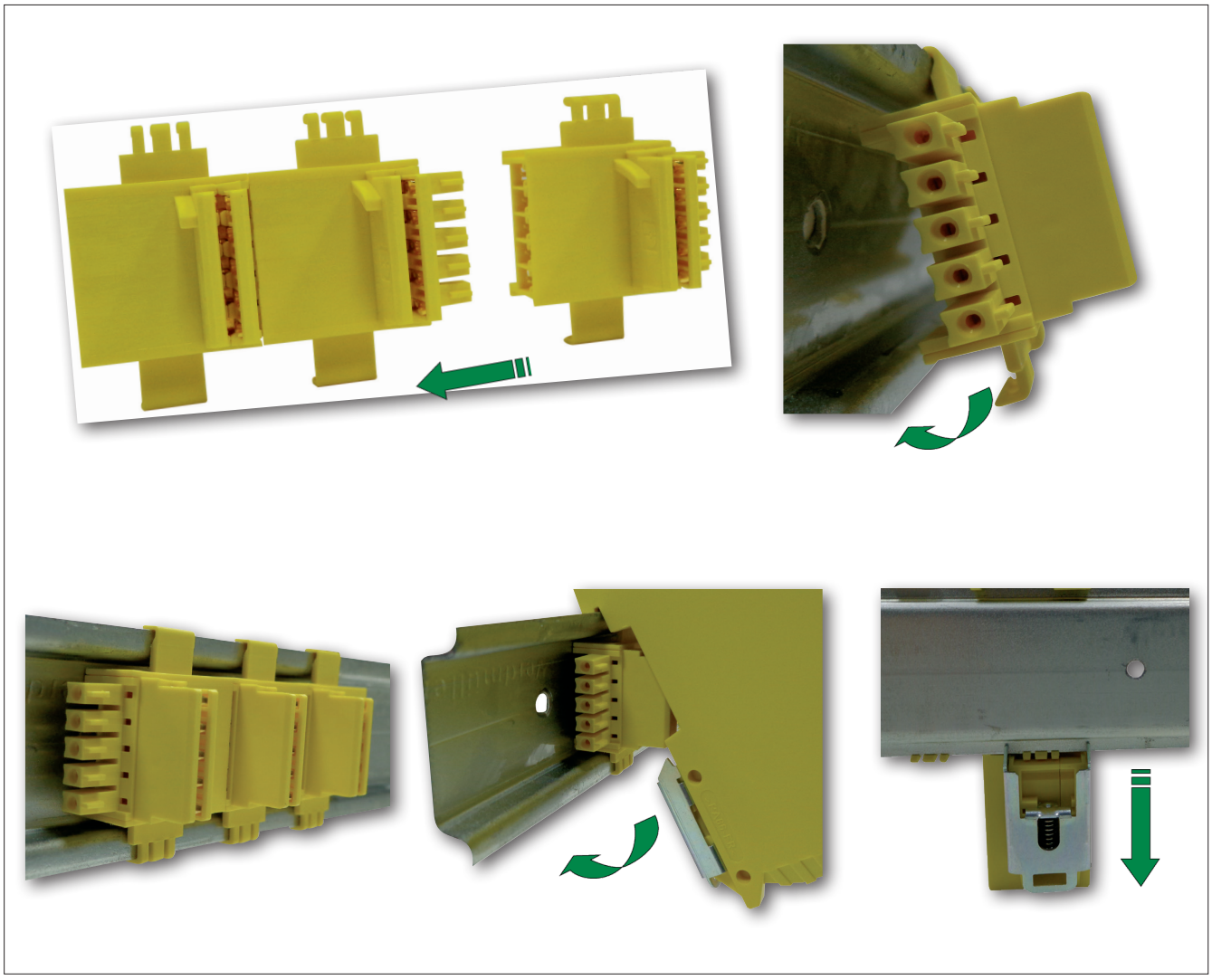
⇒ NB: to install an expansion unit (excluding relays) you will need the SCC connector supplied with the unit plus another SCC for the connection to the CMM. This can be ordered separately as an accessory.

Installation

Mechanical Fastening

Fix the Certus system units to a 35mm DIN rail as follows:

1. Connect the same number of “SCC” 5-pole rear panel connectors as the number of units to be installed.
2. Fix the train of connectors thus obtained to the DIN 35mm (EN 5022) rail (hooking them at the top first).
3. Fasten the units to the rail, arranging the contacts on the base of the unit on the respective connector. Press the unit gently until you feel it snap into place.
4. To remove a unit, use a screwdriver to pull down the locking latch on the back of the unit; then lift the unit upwards and pull.

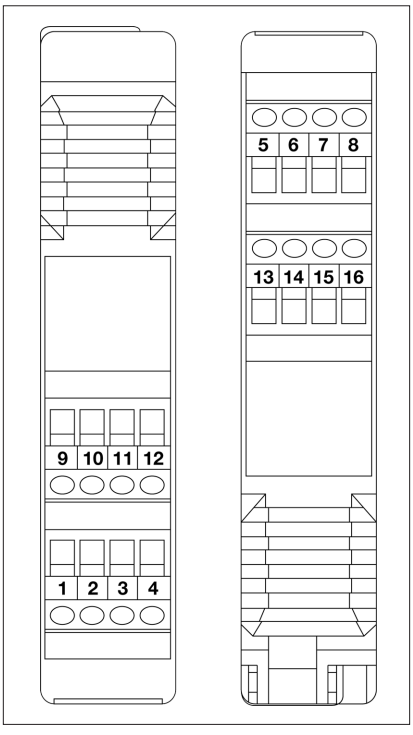


Calculation of Safety Distance of an ESPE Connected to Certus

Any Electro-Sensitive Protective Equipment device connected to Certus, must be positioned at a distance equal to or greater than the minimum safety distance S so that the dangerous point can be reached only after stopping the dangerous movement of the machine.

⚠ The European standard:
- ISO 13855:2010- (EN 999:2008) Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body.[1]
provides the elements to calculate the proper safety distance.
⚠ Carefully read the installation manual of each device for specific information on the correct positioning.
⚠ Remember that the total response time depends on:
Certus response time + ESPE response time + response time of the machine (i.e. the time taken by the machine to stop the dangerous movement from the moment in which the stop signal is transmitted).

Electrical Connections



The Certus system units are provided with terminal blocks for the electrical connections. Each unit can have 8, 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.

⇒ Terminal tightening torque: 5÷7lb-in (0,6÷0,7 Nm).

⚠ Install safety units in an enclosure with a protection class of at least IP54.
⚠ Connect the module when it is not powered.
⚠ The supply voltage to the units must be 24Vdc ±20% (PELV, in compliance with the standard EN 60204-1 (Chapter 6.4).
⚠ Do not use the Certus to supply external devices.
⚠ The same ground connection (0VDC) must be used for all system components

1"Describe the methods that designers can use to calculate the minimum safety distance from a specific dangerous point for the safety devices, particularly Electro-sensitive devices (eg. light curtains), safety-mats or pressure sensitive floors and bimanual control. It contains a rule to determine the placement of safety devices based on approach speed and the stopping time of the machine, which can reasonably be extrapolated so that it also includes the interlocking guards without guard locking."

Instructions Concerning Connection Cables

⇒ Wire size range: AWG 12÷30, (solid/stranded) (UL).
⇒ Use 60/75°C copper (Cu) conductor only.
⇒ We recommend the use of separate power supplies for the safety module and for other electrical power equipment (electric motors, inverters, frequency converters) or other sources of disturbance.
⇒ Cables used for connections of longer than 50m must have a cross-section of at least 1mm² (AWG16).

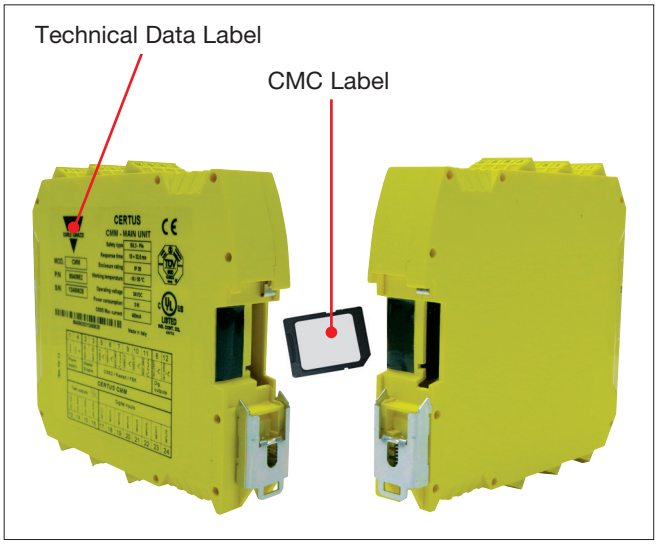
Connectionis of each single Certus system unit are listed in the table below:

Master CMM				
Terminal	**Signal**	**Type**	**Description**	**Operation**
1	24VDC	-	24VDC power supply	-
2	MASTER_ENABLE2	Input	Master Enable 1	Input (“type B” according to EN61131-2)
3	MASTER_ENABLE2	Input	Master Enable 2	Input (“type B” according to EN 61131-2)
4	GND	-	0VDC power supply	PNP active high
5	OSSD2_A	Output	Static output 1	PNP active high
6	OSSD1_B	Output		PNP active high
7	RESTART_FBK1	Input	Feedback/Restart	Input according to EN61131-21
8	OUT_STATUS1	Output	Programmable digital output	PNP active high
9	OSSD2_A	Output	Static output 2	PNP active high
10	OSSD2_B	Output		PNP active high
11	RESTART_FBK2	Input	Feedback/Restart 2	Input according to EN61131-2
12	OUT_STATUS2	Output	Programmable digital output	PNP active high
13	OUT_TEST1	Output	Short circuit detected output	PNP active high
14	OUT_TEST2	Output	Short circuit detected output	PNP active high
15	OUT_TEST3	Output	Short circuit detected output	PNP active high
16	OUT_TEST4	Output	Short circuit detected output	PNP active high
17	INPUT1	Input	Digital input 1	Input according to EN61131-2
18	INPUT2	Input	Digital input 2	Input according to EN61131-2
19	INPUT3	Input	Digital input 3	Input according to EN61131-2
20	INPUT4	Input	Digital input 4	Input according to EN61131-2
21	INPUT5	Input	Digital input 5	Input according to EN61131-2
22	INPUT6	Input	Digital input 6	Input according to EN61131-2
23	INPUT7	Input	Digital input 7	Input according to EN61131-2
24	INPUT8	Input	Digital input 8	Input according to EN61131-2

USB Input

The Certus master CMM includes a USB 2.0 connector for connection to a Personal Computer where the **CCS** (Certus Configuration Software) configuration SW resides.
A USB cable of the correct size is available as an accessory **(CSU)**.

Certus Configuration Memory (CMC)



A backup memory, called CMC (optional) can be installed in the Certus master CMM and used to save the SW configuration parameters.
The CMC is written each time a new project is sent from the PC to the CMM.

⇒ Always switch the CMM off before logging on to/logging off from the CMC.

Insert the card in the slot in the rear panel of the CMM (in the direction shown in Figure 3 - CMC).

MULTIPLE LOAD function
To perform the configuration of several CMM modules without using a PC and the USB connector, you can save the desired configuration on a single CMC and then use it to download data on the modules CMM to be configured.

⚠ If the file contained in the CMC is not identical to the one contained in CMM, an overwrite operation that will permanently delete the configuration data contained in CMM will be performed.
WARNING: ALL DATA PREVIOUSLY CONTAINED IN CMM WILL BE LOST.

RESTORE function
If the CMM unit is damaged, you can replace it with a new one; having already saved all the configurations on the CMC, all you need to do is insert the CMC in the new CMM and switch on the Certus system, that will immediately load the backup configuration. In this way, the work interruptions will be minimized.

⇒ The LOAD and RESTORE functions can be disabled via SW. (see Figure 29)

⇒ In order to be used, the expansion units must be addressed at the time of installation (see the NODE SEL section).

⚠ Each time CMC is used, carefully check that the chosen configuration is the one that was planned for that particular system. Try again a fully functional test of the system composed of Certus plus all devices connected to it (see the TESTING the system section).

C 8I 2O Expansion Module				
Terminal	**Signal**	**Type**	**Description**	**Operation**
1	24VDC	-	24VDC power supply	-
2	NODE_SEL0	Input	Node selection	Input (“type B” according to EN61131-2)
3	NODE_SEL1	Input		Input (“type B” according to EN 61131-2)
4	GND	-	0VDC power supply	-
5	OSSD1_A	Output	Static output 1	PNP active high
6	OSSD1_B	Output		PNP active high
7	RESTART_FBK1	Input	Feedback/Restart	Input according to EN61131-21
8	OUT_STATUS1	Output	Programmable digital output	PNP active high
9	OSSD2_A	Output	Static output 2	PNP active high
10	OSSD2_B	Output		PNP active high
11	RESTART_FBK2	Input	Feedback/Restart 2	Input according to EN61131-2
12	OUT_STATUS2	Output	Programmable digital output	PNP active high
13	OUT_TEST1	Output	Short circuit detected output	PNP active high
14	OUT_TEST2	Output	Short circuit detected output	PNP active high
15	OUT_TEST3	Output	Short circuit detected output	PNP active high
16	OUT_TEST4	Output	Short circuit detected output	PNP active high
17	INPUT1	Input	Digital input 1	Input according to EN61131-2
18	INPUT2	Input	Digital input 2	Input according to EN61131-2
19	INPUT3	Input	Digital input 3	Input according to EN61131-2
20	INPUT4	Input	Digital input 4	Input according to EN61131-2
21	INPUT5	Input	Digital input 5	Input according to EN61131-2
22	INPUT6	Input	Digital input 6	Input according to EN61131-2
23	INPUT7	Input	Digital input 7	Input according to EN61131-2
24	INPUT8	Input	Digital input 8	Input according to EN61131-2

C 8I Expansion Module				
Terminal	**Signal**	**Type**	**Description**	**Operation**
1	24VDC	-	24VDC power supply	-
2	NODE_SEL0	Input	Node selection	Input (“type B” according to EN61131-2)
3	NODE_SEL1	Input		Input (“type B” according to EN 61131-2)
4	GND	-	0VDC power supply	-
5	INPUT 1	Input	Digital Input 1	Input according to EN61131-2
6	INPUT 2	Input	Digital Input 2	Input according to EN61131-2
7	INPUT 3	Input	Digital Input 3	Input according to EN61131-2
8	INPUT 4	Input	Digital Input 4	Input according to EN61131-2
9	OUT_TEST1	Output	Short circuit detected output	PNP active high
10	OUT_TEST2	Output	Short circuit detected output	PNP active high
11	OUT_TEST3	Output	Short circuit detected output	PNP active high
12	OUT_TEST4	Output	Short circuit detected output	PNP active high
13	INPUT 5	Input	Digital Input 5	Input according to EN61131-2
14	INPUT 6	Input	Digital Input 6	Input according to EN61131-2
15	INPUT 7	Input	Digital Input 7	Input according to EN61131-2
16	INPUT 8	Input	Digital Input 8	Input according to EN61131-2

C 12I 8TO Expansion Module				
Terminal	**Signal**	**Type**	**Description**	**Operation**
1	24VDC	-	24VDC power supply	-
2	NODE_SEL0	Input	Node selection	Input (“type B” according to EN61131-2)
3	NODE_SEL1	Input		Input (“type B” according to EN 61131-2)
4	GND	-	0VDC power supply	-
5	INPUT1	Input	Digital input 1	Input according to EN61131-2
6	INPUT2	Input	Digital input 2	Input according to EN61131-2
7	INPUT3	Input	Digital input 3	Input according to EN61131-2
8	INPUT4	Output	Digital input 4	Input according to EN61131-2
9	OUT_TEST1	Output	Short circuit detected output	PNP active high
10	OUT_TEST2	Output	Short circuit detected output	PNP active high
11	OUT_TEST3	Output	Short circuit detected output	PNP active high
12	OUT_TEST4	Output	Short circuit detected output	PNP active high
13	INPUT5	Input	Digital input 5	Input according to EN61131-2
14	INPUT6	Input	Digital input 6	Input according to EN61131-2
15	INPUT7	Input	Digital input 7	Input according to EN61131-2
16	INPUT8	Input	Digital input 8	Input according to EN61131-2
17	OUT_TEST5	Output	Short circuit detected output	PNP active high
18	OUT_TEST6	Output	Short circuit detected output	PNP active high
19	OUT_TEST7	Output	Short circuit detected output	PNP active high
20	OUT_TEST8	Output	Short circuit detected output	PNP active high
21	INPUT9	Input	Digital input 9	Input according to EN61131-2
22	INPUT10	Input	Digital input 10	Input according to EN61131-2
23	INPUT11	Input	Digital input 11	Input according to EN61131-2
24	INPUT12	Input	Digital input 12	Input according to EN61131-2

C 16I Expansion Module				
Terminal	**Signal**	**Type**	**Description**	**Operation**
1	24VDC	-	24VDC power supply	-
2	NODE_SEL0	Input	Node selection	Input (“type B” according to EN61131-2)
3	NODE_SEL1	Input		Input (“type B” according to EN 61131-2)
4	GND	-	0VDC power supply	-
5	INPUT1	Input	Digital input 1	Input according to EN61131-2
6	INPUT2	Input	Digital input 2	Input according to EN61131-2
7	INPUT3	Input	Digital input 3	Input according to EN61131-2
8	INPUT4	Output	Digital input 4	Input according to EN61131-2
9	OUT_TEST1	Output	Short circuit detected output	PNP active high
10	OUT_TEST2	Output	Short circuit detected output	PNP active high
11	OUT_TEST3	Output	Short circuit detected output	PNP active high
12	OUT_TEST4	Output	Short circuit detected output	PNP active high
13	INPUT5	Input	Digital input 5	Input according to EN61131-2
14	INPUT6	Input	Digital input 6	Input according to EN61131-2
15	INPUT7	Input	Digital input 7	Input according to EN61131-2
16	INPUT8	Input	Digital input 8	Input according to EN61131-2
17	INPUT9	Input	Digital input 9	Input according to EN61131-2
18	INPUT10	Input	Digital input 10	Input according to EN61131-2
19	INPUT11	Input	Digital input 11	Input according to EN61131-2
20	INPUT12	Input	Digital input 12	Input according to EN61131-2
21	INPUT13	Input	Digital input 13	Input according to EN61131-2
22	INPUT14	Input	Digital input 14	Input according to EN61131-2
23	INPUT15	Input	Digital input 15	Input according to EN61131-2
24	INPUT16	Input	Digital input 16	Input according to EN61131-2

C 4OSSD Expansion Module				
Terminal	**Signal**	**Type**	**Description**	**Operation**
1	24VDC	-	24VDC power supply	-
2	NODE_SEL0	Input	Node selection	Input (“type B” according to EN61131-2)
3	NODE_SEL1	Input		Input (“type B” according to EN 61131-2)
4	GND	-	0VDC power supply	-
5	OSSD1_A	Output	Static output 1	PNP active high
6	OSSD1_B	Output		PNP active high
7	RESTART_FBK1	Input	Feedback/Restart	Input according to EN61131-21
8	OUT_STATUS1	Output	Programmable digital output	PNP active high
9	OSSD2_A	Output	Static output 2	PNP active high
10	OSSD2_B	Output		PNP active high
11	RESTART_FBK2	Input	Feedback/Restart 2	Input according to EN61131-2
12	OUT_STATUS2	Output	Programmable digital output	PNP active high
13	24VDC	-	24VDC power supply	OSSD3/4 power supply
14	24VDC	-	24VDC power supply	OSSD3/4 power supply
15	GND	-	0VDC power supply	-
16	GND	-	0VDC power supply	-
17	OSSD4_A	Output	Static output4	PNP active high
18	OSSD4_B	Output		PNP active high
19	RESTART_FBK4	Input	Feedback/Restart	Input according to EN61131-2
20	OUT_STATUS4	Output	Programmable digital output	PNP active high
21	OSSD3_A	Output	Static output3	PNP active high
22	OSSD3_B	Output		PNP active high
23	RESTART_FBK3	Input	Feedback/Restart	Input according to EN61131-2
24	OUT_STATUS3	Output	Programmable digital output	PNP active high

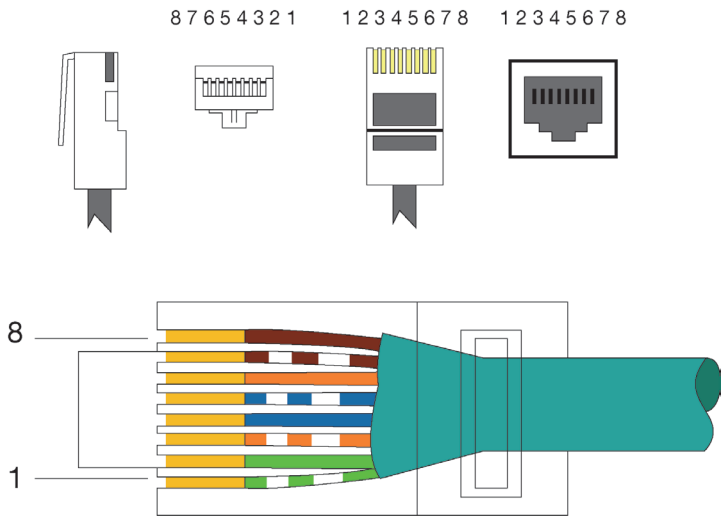
C 2OSSD Expansion Module				
Terminal	**Signal**	**Type**	**Description**	**Operation**
1	24VDC	-	24VDC power supply	-
2	NODE_SEL0	Input	Node selection	Input (“type B” according to EN61131-2)
3	NODE_SEL1	Input		Input (“type B” according to EN 61131-2)
4	GND	-	0VDC power supply	-
5	OSSD1_A	Output	Static output 1	PNP active high
6	OSSD1_B	Output		PNP active high
7	RESTART_FBK1	Input	Feedback/Restart 1	Input according to EN61131-2
8	OUT_STATUS1	Output	Condition of outputs 1A/1B	PNP active high
9	OSSD2_A	Output	Static output 2	PNP active high
10	OSSD2_B	Output		PNP active high
11	RESTART_FBK2	Input	Feedback/Restart 2	Input according to EN61131-2
12	OUT_STATUS2	Output	Condition of outputs 2A/2B	PNP active high
13	24VDC	-	24VDC power supply	OSSD1/2 power supply
14	n.c.	-	-	-
15	GND	-	0VDC power supply	-
16	n.c.	-	-	-

C 4R Expansion Module				
Terminal	**Signal**	**Type**	**Description**	**Operation**
1	24VDC	-	24VDC power supply	-
4	GND	-	0VDC power supply	-
5	OSSD1_A	Input	Control ZONE 1	PNP active
6	OSSD1_B	Input		
7	FBK_K1_K2_1	Output	Feedback K1 K2 ZONE 1	
9	A_NC1	Output	NC contact ZONE 1	
10	B_NC1	Output		
13	A_NO11	Output	NO 1 contact ZONE 1	
14	B_NO11	Output		
15	A_NO12	Output	NO 2 contact ZONE 1	
16	B_NO12	Output		
11	A_NC2	Output	NC contact ZONE 2	
12	B_NC2	Output		
17	OSSD2_A	Input	Control ZONE 2	PNP active
18	OSSD2_B	Input		
19	FBK_K1_K2_2	Output	Feedback K1 K2 ZONE 2	
21	A_NO21	Output	NO 1 contact ZONE 2	
22	B_NO21	Output		
23	A_NO22	Output	NO 2 contact ZONE 2	
24	B_NO22	Output		

C 2R Expansion Module				
Terminal	**Signal**	**Type**	**Description**	**Operation**
1	24VDC	-	24VDC power supply	-
4	GND	-	0VDC power supply	-
5	OSSD1_A	Input	Control ZONE 1	PNP active high
6	OSSD1_B	Input		
7	FBK_K1_K2_1	Output	Feedback K1 K2 ZONE 1	
9	A_NC1	Output	NC contact ZONE 1	
10	B_NC1	Output		
13	A_NO11	Output	NO1 contact ZONE 1	
14	B_NO11	Output		
15	A_NO12	Output	NO2 contact ZONE 1	
16	B_NO12	Output		

C PSS - C ES1 - C ES2				
Terminal	**Signal**	**Type**	**Description**	**Operation**
1	24VDC	-	24VDC power supply	-
2	NODE _SEL0	Input	Node selection	Input (“Type B” according to EN 61131-2)
3	NODE_SEL1	Input		
4	GND	-	0VDC power supply	-
5	PROXI1_24V	Output	PROXIMITY 1 connections (ref. “PROXIMITY INPUT FOR SPEED CONTROLLER C ES2” -> 28)	Power supply 24VDC to PROXI1
6	PROXI1_REF			Power supply 0VDC to PROXI1
7	PROXI1 IN1 (3 wires)	Input		PROXI1 NO input
8	PROXI1 IN2 (4 wires)			PROXI1 NC input
9	PROXI2_24V	Output	PROXIMITY 2 connections (ref. “PROXIMITY INPUT FOR SPEED CONTROLLER C ES2” -> 28)	Power supply 24VDC to PROXI2
10	PROXI2_REF			Power supply 0VDC to PROXI2
11	PROXI2 IN1 (3 WIRES)	Input		PROXI2 NO input
12	PROXI2 IN2 (4 WIRES)			PROXI2 NC input
13	N.C.	-	Not connected	-
14	N.C.	-		-
15	N.C.	-		-
16	N.C.	-		-

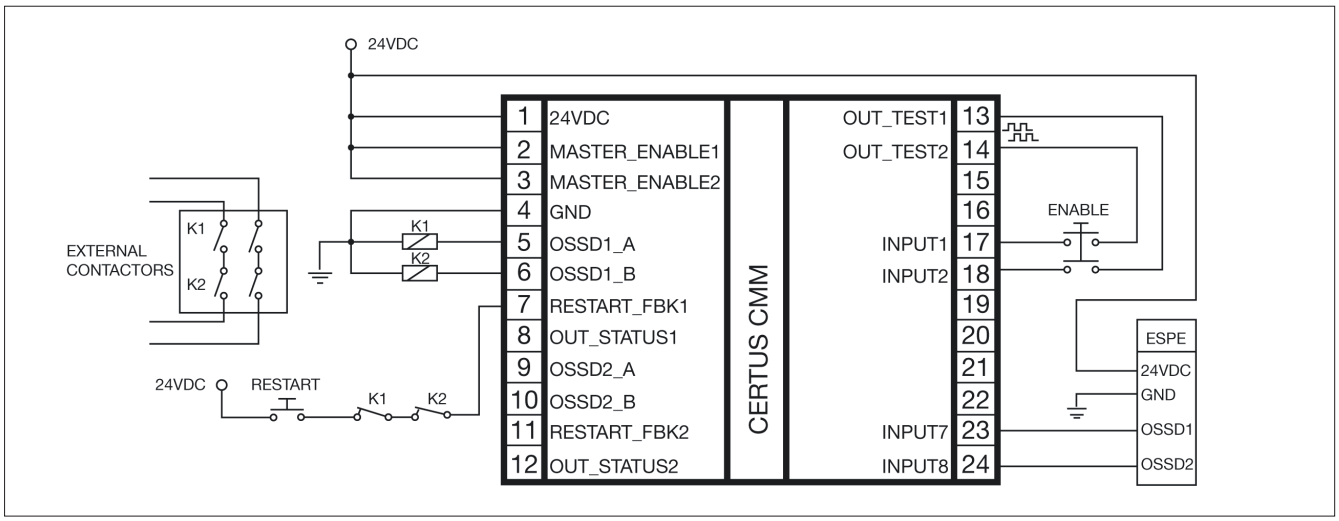
Encoder Connections with RJ45 Connector (C ES1, C ES2)



EIA/TIA-568A

PIN	MS-VT	MS-VH	MS-VS
1	5VDC	N.C.	N.C.
2	EXT_0V	EXT_0V	EXT_0V
3	N.C.	N.C.	N.C.
4	A	A	A
5	Ã	Ã	Ã
6	N.C.	N.C.	N.C.
7	B	B	B
8	B	B	B

Example of Connection of Certus to the Machine Control System



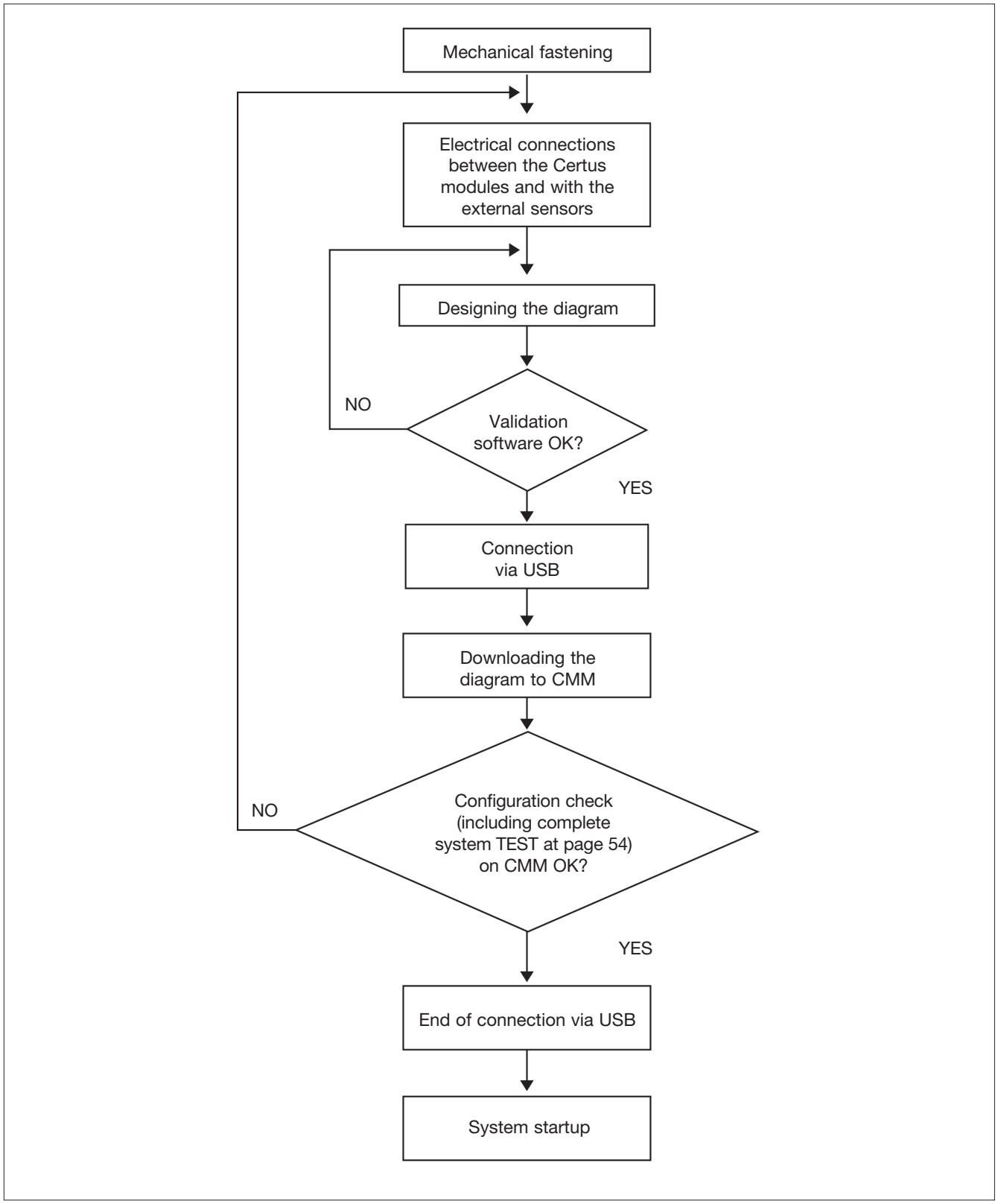
Check List After Installation

The Certus system is able to detect the faults that occurs in each own module.
Anyway to have the system perfect operation perform the following checks at start up and at least every one year:

1. Operate a complete system TEST (see “TESTING the system”)
2. Verify that all the cables are correctly inserted and the terminal blocks well screwed.
3. Verify that all the leds (indicators) light on correctly.
4. Verify the positioning of all the sensors connected to Certus.
5. Verify the correct fixing of Certus to the DIN rail.
6. Verify that all the external indicators (lamps) work properly.

⇒ After installation, maintenance and after any eventual configuration change perform a System TEST as described in the paragraph “TESTING the system”.

Operating Diagram



Input

Master Enable

The Certus CMM master has two inputs: Master_Enable1 and Master_Enable2.

⇒ These signals must both be permanently set to logic level 1 (24VDC) for the Certus to operate. If the user needs to disable the Certus simply lower these inputs to logic level 0 (0VDC).

Nodel Sel

The NODE_SEL0 and NODE_SEL1 inputs (on the SLAVE units) are used to attribute a physical address to the slave units with the connections shown in Table 10:

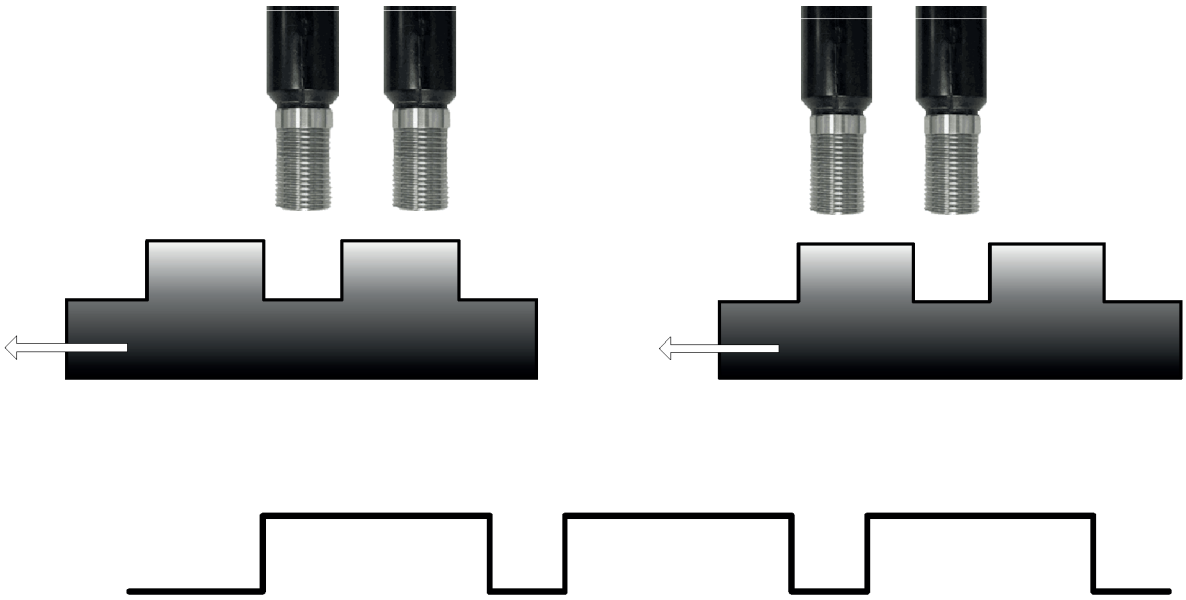
	NODE_SEL1 (Terminal 3)	NODE_SEL0 (Terminal 2)
NODE 0	0 (or not connected)	0 (or not connected)
NODE 1	0 (or not connected)	24VDC
NODE 2	24VDC	0 (or not connected)
NODE 3	24VDC	24VDC

Proximity Input for Speed Controller C ES2

Configuration With Interleaved Proximity

When an axis of the C ES2 module is configured for a measurement with two proximity switches, these can be configured in interleaved mode. Under the conditions listed below the system reaches a Performance Level = PLe:

Proximity switches must be fitted such that the recorded signals overlap.
Proximity switches must be fitted such that at least one is always activated.



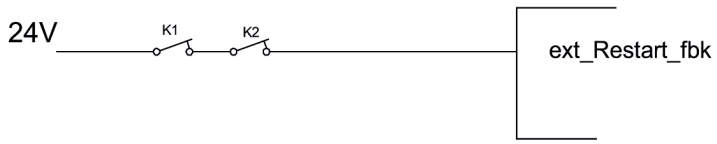
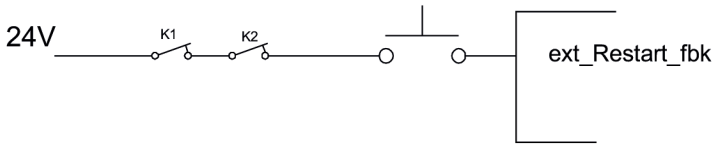
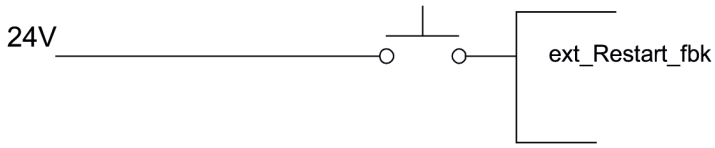
In addition:

- The proximity switches must be PNP type
- The proximity switches must be NO type (Output ON when detecting metal)
- With the above conditions fulifilled, the DC value is equal to 90%
- The two proximity switches must be of the same model, with MTTF > 70 years

Restart_FBK

The RESTART_FBK signal input allows the Certus to verify an EDM (External Device Monitoring) feedback signal (series of contacts) from the external contactors, and to monitor Manual/Automatic operation (See the list of possible connections in Table 11).

⚠ If the application requires it, the response time of the external contactors must be verified by an additional device.
⚠ 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..

MODE OF OPERATION	EDM	RESTART_FBK
AUTOMATIC	With K1_K2 control	
	Without K1_K2 control	
MANUAL	With K1_K2 control	
	Without K1_K2 control	

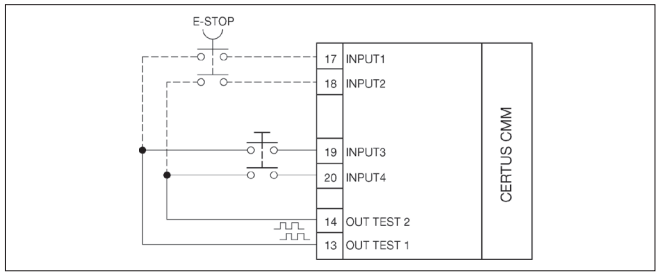
Outputs

Out Status

The OUT STATUS signal is a programmable digital output that can indicate the status of:
- An input.
- An output.
- A node of the logic diagram designed using the CCS.

Out Test

The OUT TEST signals must be used to monitor the presence of short-circuits or overloads on the inputs (Figure 5).



⇒ The maximum number of controllable inputs for each output OUT TEST is:
- 2 INPUT (parallel connection) **(CMM, C 8I 2O, C 8I, C 12I 8TO)**
- 4 INPUT (parallel connection) **(C 16I)**

OSSD (CMM, C 8I 2O)

The OSSD (static semiconductor safety outputs) are short circuit protected, cross circuit monitored and supply:
- In the ON condition: Uv-0,75V ÷ Uv (where Uv is 24V ± 20%)
- In the OFF condition: 0V ÷ 2V r.m.s.

The maximum load of 400mA@24V corresponds to a minimum resistive load of 60Ω.
The maximum capacitive load is 0.82µF. The maximum inductive load is 30mH.

OSSD (C 2OSSD, C 4OSSD)

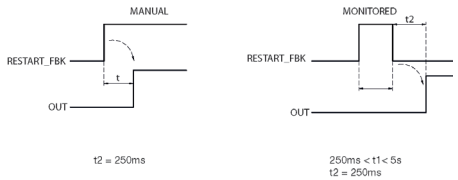
The OSSD (static semiconductor safety outputs) are short circuit protected, cross circuit monitored and supply:
- In the ON condition: Uv-0,75V ÷ Uv (where Uv is 24V ± 20%)
- In the OFF condition: 0V ÷ 2V r.m.s.

The maximum load of 400mA@24V corresponds to a minimum resistive load of 60Ω.
The maximum capacitive load is 0.82µF. The maximum inductive load is 30mH.

⇒ It is not allowed the connection of external devices to the outputs, except as expected in the configuration performed with the CCS software.

Each OSSD output can be configured as shown in Table 12:

Automatic	The output is activated according to le configurations set by the CCS SW only if the corresponding RESTART_FBK input is conected to 24VDC.
Manual	The output is activated according to le configurations set by the CCS SW only if corresponding RESTART_FBK input FOLLOWS A LOGIC TRANSITION OF 0-->1
Monitored	The output is activated according to le configurations set by the CCS SW only if the corresponding RESTART_FBK input FOLLOWS A LOGIC TRANSITION OF 0-->1-->0.



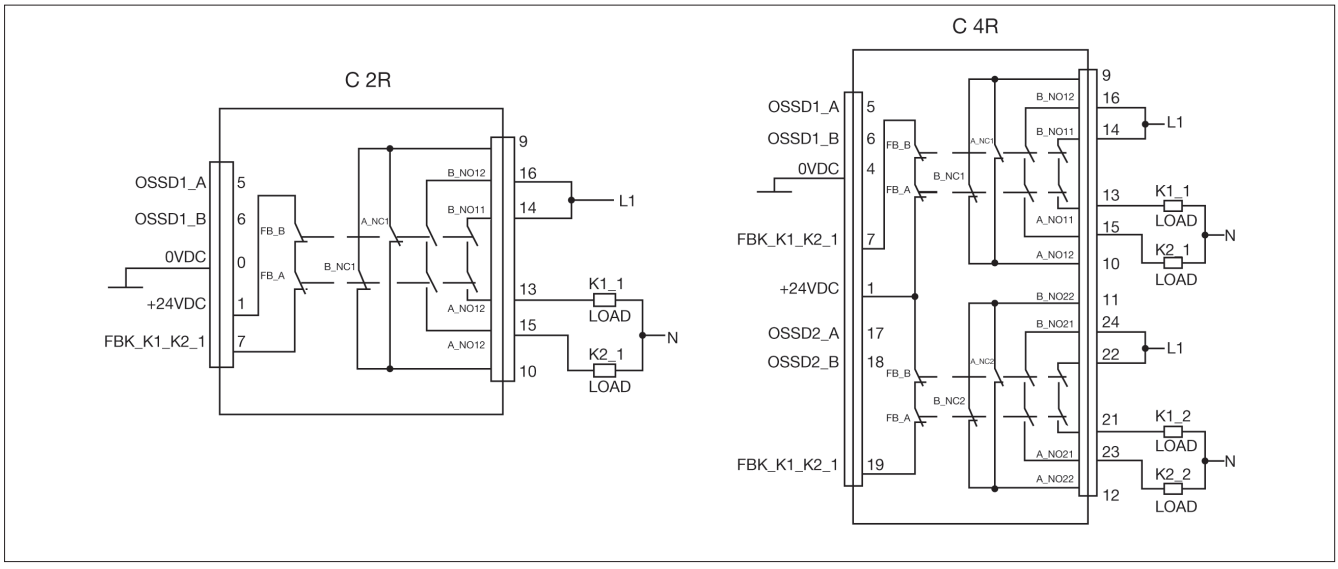
Characteristics of the Output Circuit

The C 2R / C 4R units use guided contact safety relays, each of which provides **two NO contacts and one NC contact in addition to the NC feedback contact**.
The C 2R unit uses two safety relays and the C 4R uses four.

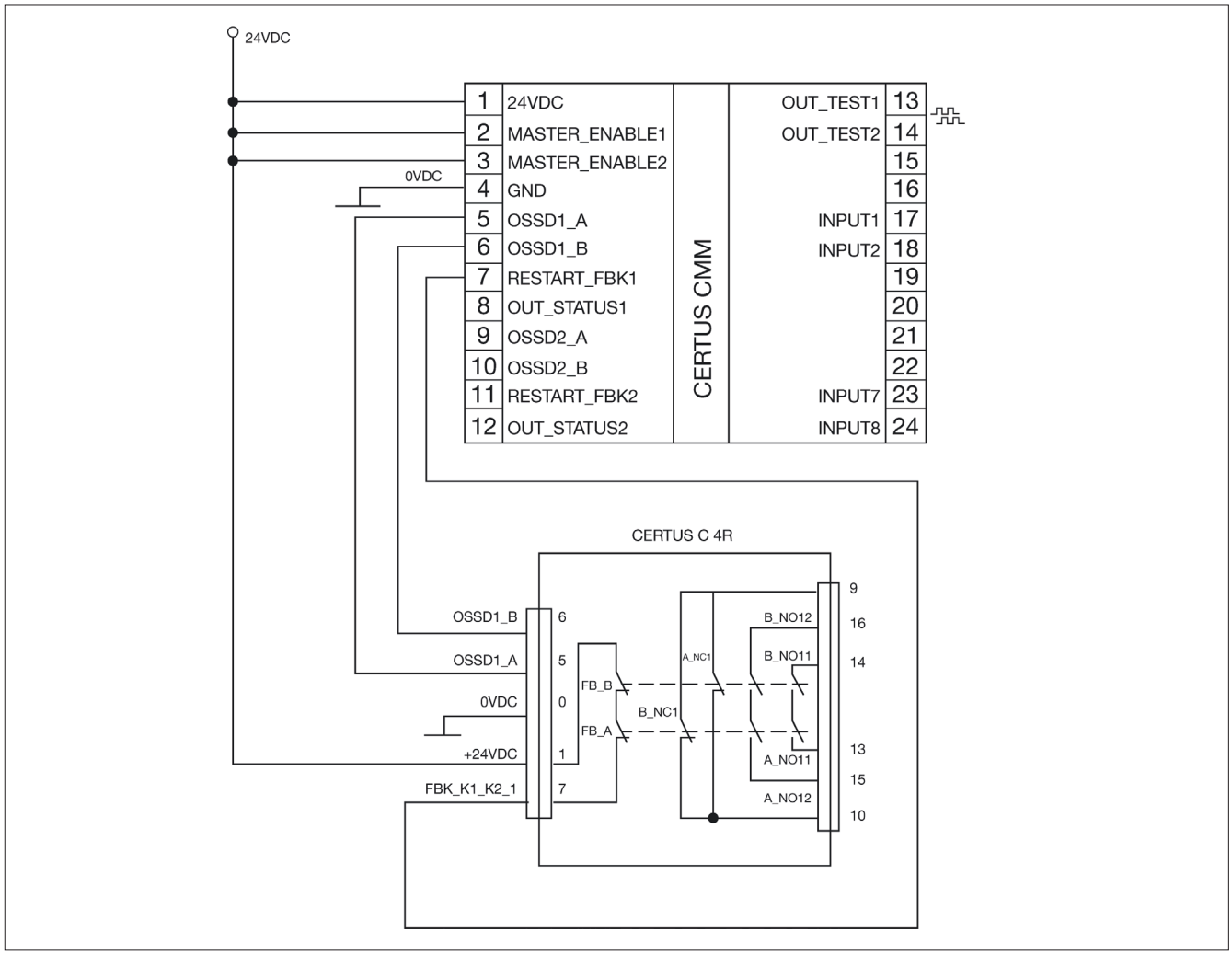
Excitation voltage	**17...31 VDC**
Minimum switchable voltage	**10 VDC**
Minimum switchable current	**20 mA**
Maximum switchable voltage (DC)	**250VDC**
Maximum switchable voltage (AC)	**400VAC**
Maximum switchable current	**6A**
Response time	**12ms**
Mechanical life of contacts	**> 20 x 106**

⇒ To guarantee correct isolation and avoid the risk of premature ageing of or damage to the relays, each output line must be protected using a delay 3.5A fuse and the load characteristics must be consistent with those specified in Table 12.
⇒ See the “C 2R - C 4R” section (for further details on these relays).

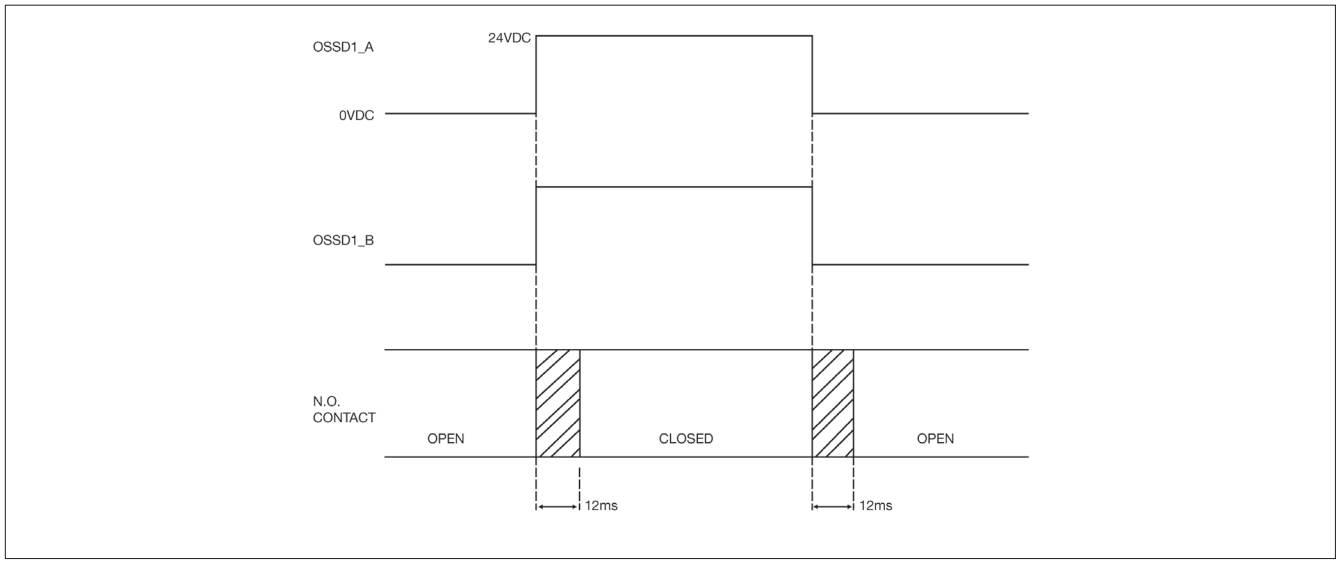
C 2R / C 4R Internal Contacts Diagram



Example of C 2R Module Connection with Static OSSD Outputs of a Module CMM



Switching Operation Timing Diagram



If a relay module is connected, the response time of the OSSD linked, must be increased of 12ms

Technical Features

General System Characteristics
Safety Level Parameters

Parameter	Value	Standard
PFH_d	See the technical data tables for each module	IEC 61508:2010
SIL	3	
SFF	99,8%	
HFT	1	
Safety Standard	Type B	
SILCL	3	IEC 62061:2005
Type	4	EN 61496-1: 2013
PL	e	EN ISO 13849-1:2008 EN 62061:2005
Dc_{avg}	High	
MTTFd (years)	30÷100	
Category	4	
Device lifetime	20 years	
Pollution degree	2	

General Data

Max number of inputs	128		
Max number of outputs	16		
Max number of slave units (excluding C 2R - C 4R)	14		
Max number of slave units of the same type (excluding C 2R - C 4R)	4		
Rated voltage	24VDC ± 20% / Supply from class II (LVLE)		
Over voltage category	II		
Digital INPUTS	PNP active high (EN 61131-2)		
OSSD (CMM, C 8I 2O, C 2OSSD, C 4OSSD)	PNP active high - 400mA@24VDC max (each OSSD)		
Digital OUTPUTS	PNP active high - 100mA@24VDC max		
Response time (ms) **This response times depends on the following parameters:** **1) Number of Slave modules installed** **2) Number of Operators** **3) Number of OSSD outputs** **Failure Response time (ms)** **This parameter corresponds to the response time, with the exception of C ES modules with Encoder/Proximity inerface where is 2s.**	Master	10,6 ÷ 12,6	+ TInput_filter
	CMM + 1 Slave	11,8 ÷ 26,5	+ TInput_filter
	CMM + 2 Slave	12,8 ÷ 28,7	+ TInput_filter
	CMM + 3 Slave	13,9 ÷ 30,8	+ TInput_filter
	CMM + 4 Slave	15 ÷ 33	+ TInput_filter
	CMM + 5 Slave	16 ÷ 35	+ TInput_filter
	CMM + 6 Slave	17 ÷ 37,3	+ TInput_filter
	CMM + 7 Slave	18,2 ÷ 39,5	+ TInput_filter
	CMM + 8 Slave	19,3 ÷ 41,7	+ TInput_filter
	CMM + 9 Slave	20,4 ÷ 43,8	+ TInput_filter
	CMM + 10 Slave	21,5 ÷ 46	+ TInput_filter
	CMM + 11 Slave	22,5 ÷ 48,1	+ TInput_filter
	CMM + 12 Slave	23,6 ÷ 50,3	+ TInput_filter
	CMM + 13 Slave	24,7 ÷ 52,5	+ TInput_filter
	CMM + 14 Slave	25,8 ÷ 54,6	+ TInput_filter
CMM> module connection	Carlo Gavazzi proprietary 5-pole bus (SCC)		
Connection cable cross-section	0,5 ÷ 2,5 mm^2 / AWG 12÷30 (solid/stranded)		
Max length of connections	100m		
Operating temperature	-10 ÷ 55°C		
Max surrounding air temperature	55°C (UL)		
Storage temperature	-20 ÷ 85°C		
Relative humidity	10% ÷ 95%		
Max. altitude (above sea level)	2000m		

⇒ T_{Input_filter} = max filtering time from among those set on project inputs (see “INPUTS” section”).

Enclosure

Description	Electronic housing max 24 pole, with locking latch mounting
Enclosure material	Polyamide
Enclosure protection class	IP20
Terminal blocks protection class	IP2
Fastening	Quick coupling to rail according to EN 60715
Dimensions (h x l x d)	108 x 22.5 x 114.5

CMM Module

PFH_d (IEC 61508:1998)	6.06E-9
Rated voltage	24VDC ± 20%
Dissipated power	3W max
Unit enable (No./description)	2 / PNP active high “type B” according to EN 61131-2
Digital INPUTS (No./description)	8 / PNP active high according to EN 61131-2
INPUT FBK/RESTART (No./ description)	2 / EDM control / possible Automatic or Manual operation with RESTART button
Test OUTPUT (No./description)	4 / to check for short-circuits - overloads
Digital OUTPUTS (No./description)	2 / programmable - PNP active high3
OSSD (No./description)	2 pairs / solid state safety outputs PNP active high 400mA@24VDC max
SLOT for CMC card	Available
Connection to PC	USB 2.0 (Hi Speed) - Max cable length: 3m
Connection to slave units	via SCC 5-way Carlo Gavazzi proprietary bus

C 8I 2O Module

PFH_d (IEC 61508:1998)	5.72E-9
Rated voltage	24VDC ± 20%
Dissipated power	3W max
Digital INPUTS (No./description)	8 / PNP active high according to EN 61131-2
Test OUTPUT (No./description)	8 / to check for short-circuits - overloads
Digital OUTPUTS (No./description)	2 / programmable - PNP active high
OSSD (No./description)	2 pairs / solid state safety outputs: PNP active high – 400mA@24VDC max
Connection to CMM	via SCC 5-way Carlo Gavazzi proprietary bus

C 8I - C 16I Modules

Model	C 8I	C 16I
PFH_d (IEC 6150:1998)	5.75E-9	7.09E-9
Rated voltage	24VDC ± 20%	
Dissipated power	3W max	
Digital INPUTS (No./description)	8	16
	PNP active high according to EN 61131-2	
Test OUTPUT (No./description)	4 / to check for short-circuits - overloads	
Connection to CMM	via SCC 5-way Carlo Gavazzi proprietary bus	

C 12I 8TO Modules

FH_d (IEC 61508:1998)	3.24E-9
Rated voltage	24VDC ± 20%
Dissipated power	3W max
Digital INPUTS (No./description)	12
	PNP active high according to EN 61131-2
Test OUTPUT (No./description)	8 / to check for short-circuits - overloads
Connection to CMM	via SCC 5-way Carlo Gavazzi proprietary bus

C 2OSSD - C 4OSSD Modules

Model	C 2OSSD	C 4OSSD
PFH_d (IEC 6150:1998)	3.16E-9	3.44E-9
Rated voltage	24VDC ± 20%	
Dissipated power	3W max	
Digital INPUTS (No./description)	2	4
	programmable - PNP active high	
OSSD (No./description)	2	4
	Solid state safety outputs: PNP active high 400mA@24VDC max	
Connection to CMM	via SCC 5-way Carlo Gavazzi proprietary bus	

C 2R - C 4R Modules

Model		C 2R	C 4R
Rated voltage		24VDC ± 20%	
Dissipated power		3W max	
Switching voltage		240 VAC	
Switching current		6A max	
N.O. contacts		2 N.A. + 1 N.C.	4 N.A. + 2 N.C.
FEEDBACK contacts		1	2
Response time		12ms	
Mechanical life of contacts		> 20 x 106	
B10d	AC15 230V	I = 3A: 300.000 I = 1A: 750.000	
	AC15 230V	I <= 2A: 10.000.000	
Connection to output module		Via front-panel terminal strip (no connection via SCC bus)	

C 2R – C 4R: TECHNICAL DATA CONCERNING SAFETY											
FEEDBACK CONTACT PRESENT						FEEDBACK CONTACT MISSING					
PFHd	SFF	MTTFd	DCavg			PFHd	SFF	MTTFd	DCavg		
3,09E-10	99,6%	2335,94	98,9%	tcycle1	DC13 (2A)	9,46E-10	60%	2335,93	0	tcycle1	DC13 (2A)
8,53E-11	99,7%	24453,47	97,7%	tcycle2		1,08E-10	87%	24453,47	0	tcycle2	
6,63E-11	99,8%	126678,49	92,5%	tcycle3		6,75E-11	97%	126678,5	0	tcycle3	
8,23E-09	99,5%	70,99	99,0%	tcycle1	AC15 (3A)	4,60E-07	50%	70,99	0	tcycle1	AC15 (3A)
7,42E-10	99,5%	848,16	99,0%	tcycle2		4,49E-09	54%	848,15	0	tcycle2	
1,07E-10	99,7%	12653,85	98,4%	tcycle3		1,61E-10	79%	12653,85	0	tcycle3	
3,32E-09	99,5%	177,38	99,0%	tcycle1	AC15 (1A)	7,75E-08	51%	177,37	0	tcycle1	AC15 (1A)
3,36E-10	99,6%	2105,14	98,9%	tcycle2		1,09E-09	60%	2105,14	0	tcycle2	
8,19E-11	99,7%	28549,13	97,5%	tcycle3		1,00E-10	88%	28549,13	0	tcycle3	

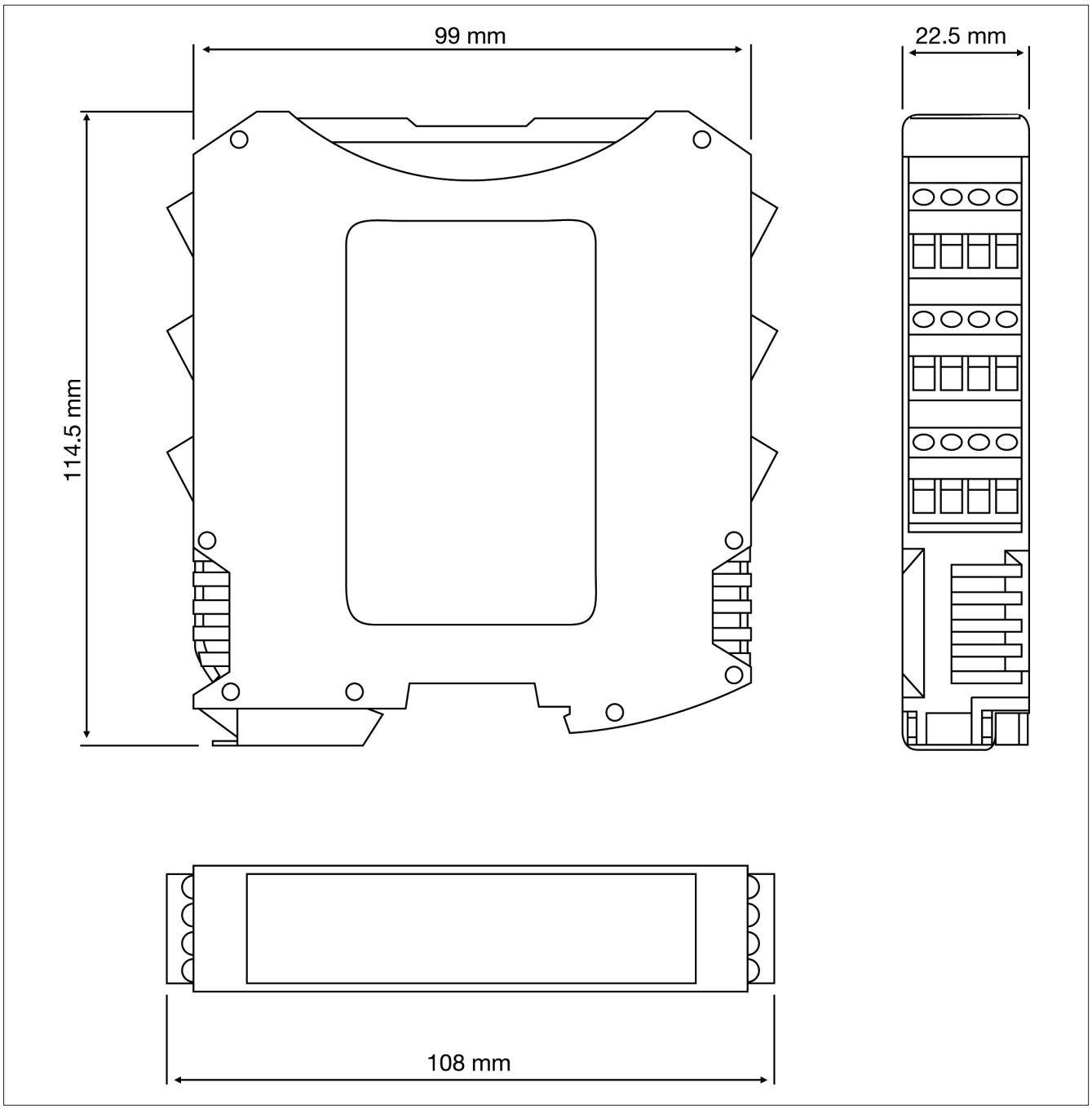
tcycle1: 300s (1 commutation every 5 minutes)
tcycle2: 3600s (1 commutation every hour)
tcycle\3: 1 commutation every day
(PFHd according IEC61508, MTTFd and DCavg according ISO13849-1)

C PSS - C ES1 - C ES2 Modules

Condition (-> Speed control type function blocks)	Overspeed	Stand still	Window speed
Safe state	Overspeed	NO Stand still	Out of window

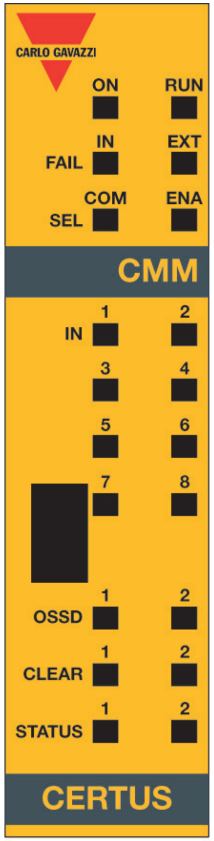
Model	**C PSS**	**C ES1**	**C ES2**
PFH_d	5,98E-09	-	-
PFH_d (TTL)	-	7,08E-09	8,18E-09
PFH_d (sin/cos)	-	7,94E-09	9,89E-09
PFH_d (HTL24)	-	6,70E-09	7,42E-09
Rated voltage	24VDC ±20%		
Dissipated power max	3W		
Encoder interface	-	TTL (Models C ES1T - C ES2T) HTL (Models C ES1H - C ES2H) sin/cos (Models C ES1S - C ES2S)	
Encoder input signals electrically insulated in accordance with EN 61800-5	Rated insulation voltage 250V Overvoltage category II Rated impulse withstand voltage 4.00 kV		
Max number of axis	2		
Max number of encoders	0	1	2
Max encoder frequency	-	500KHz (HTL: 300KHz)	
Encoder connections	-	RJ45	
Max number of proximity	2		
Max proximity frequency	5KHz		
Proximity connections	Terminal blocks		
Proximity type	PNP/NPN - 3/4 cables		
Connection to CMM	via SCC 5-way CERTUS Safety Communication proprietary bus		

Mechanical Dimension



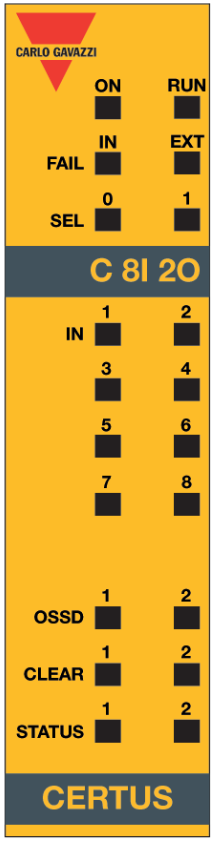
Signals

Master CMM (figure 10)



MEANING	LED								
	Run Green	IN Fail Red	EXT Fail Red	COM Orange	ENA Blue	IN1÷8 Yellow	OSDD1/2 Red/Green	Clear1/2 Yellow	Status1/2 Tellow
Power on - initial TEST	ON	ON	ON	ON	ON	ON	Red	ON	ON
CMC recognised	OFF	OFF	OFF	ON (max 1s)	ON (max 1s)	OFF	Red	OFF	OFF
Writing/loading/ diagram to/ from CMC card	OFF	OFF	OFF	5 flashes	5 flashes	OFF	Red	OFF	OFF
CCS requesting connection: internal configuration not present	OFF	OFF	OFF	Flashes only	OFF	OFF	Red	OFF	OFF
CCS requesting connection: (slave module or node number not correct) (ref. System composition)	OFF	OFF	OFF	Flashes quickly	OFF	OFF	Red	OFF	OFF
CCS requesting connection: (slave module missing or not ready). (ref. System composition)	Flashes quickly	OFF	OFF	Flashes quickly	Flashes quickly	OFF	Red	OFF	OFF
CCS connected CMM stopped	OFF	OFF	OFF	ON	ON	OFF	Red	OFF	OFF

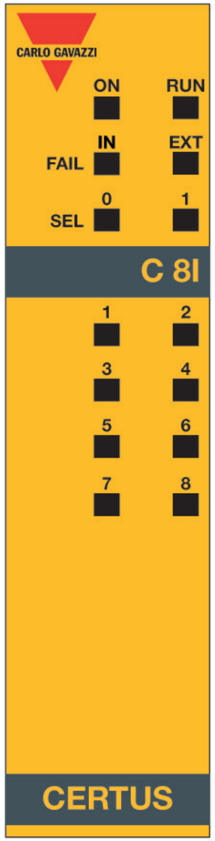
C 8I 2O



MEANING	LED							
	Run Green	**IN Fail Red**	**EXT Fail Red**	**SEL Orange**	**IN1÷8 Yellow**	**OSDD1/2 Red/Green**	**Clear1/2 Yellow**	**Status1/2 Tellow**
Power on initial test	**ON**	**ON**	**ON**	ON	ON	RED	ON	ON

MEANING	LED							
	Run Green	**IN Fail Red**	**EXT Fail Red**	**IN1÷8 Yellow**	**SEL Orange**	**OSDD1/2 Red/Green**	**Clear1/2 Yellow**	**Status1/2 Tellow**
Normal operation	**OFF** if the unit is waiting for the first communication from the MASTER **FLASHES** if no INPUT or OUTPUT requested by the configuration **ON** if INPUT or OUTPUT requested by the configuration	**OFF**	**OFF**	INPUT condition	Shows the NODE_ SEL0/1 signal table	RED with output OFF GREEN with output ON	ON waiting for RESTART Flashes No feedback	Output condition
			ON incorrect external connection detected	Only the number of the INPUT with the incorrect connection **flashes**				

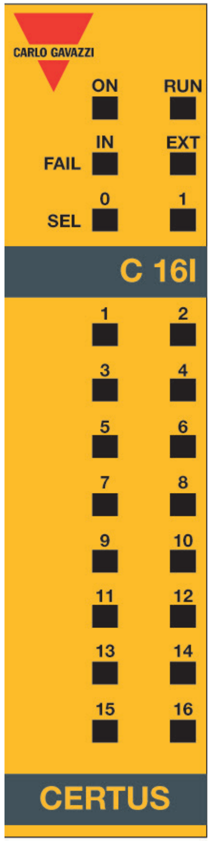
C 8I



MEANING	LED				
	Run Green	**IN Fail Red**	**EXT Fail Red**	**SEL Orange**	**IN1÷8 Yellow**
Power on initial test	**ON**	**ON**	**ON**	ON	ON

MEANING	LED				
	Run Green	**IN Fail Red**	**EXT Fail Red**	**SEL Orange**	**IN1÷8 Yellow**
Normal operation	**OFF** if the unit is waiting for the first communication from the MASTER **FLASHES** if no INPUT or OUTPUT requested by the configuration **ON** if INPUT or OUTPUT requested by the configuration	**OFF**	**OFF**	**Shows the NODE_SEL0/1 signal table**	Input condition
			ON incorrect external connection detected		Only the number of the INPUT with the incorrect connection **flashes**

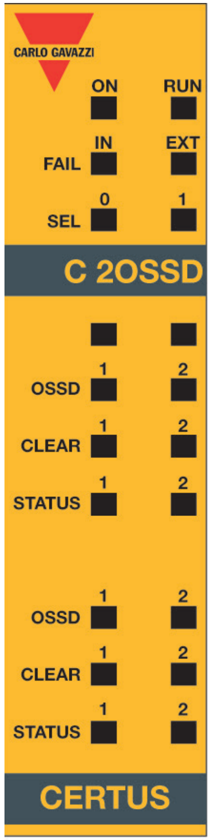
C 16I



MEANING	LED				
	Run Green	**IN Fail Red**	**EXT Fail Red**	**SEL Orange**	**IN1÷16 Yellow**
Power on initial test	**ON**	**ON**	**ON**	ON	ON

MEANING	LED				
	Run Green	**IN Fail Red**	**EXT Fail Red**	**SEL Orange**	**IN1÷16 Yellow**
Normal operation	**OFF** if the unit is waiting for the first communication from the MASTER **FLASHES** if no INPUT or OUTPUT requested by the configuration **ON** if INPUT or OUTPUT requested by the configuration	**OFF**	**OFF**	**Shows the NODE_SEL0/1 signal table**	Input condition
			ON incorrect external connection detected		Only the number of the INPUT with the incorrect connection **flashes**

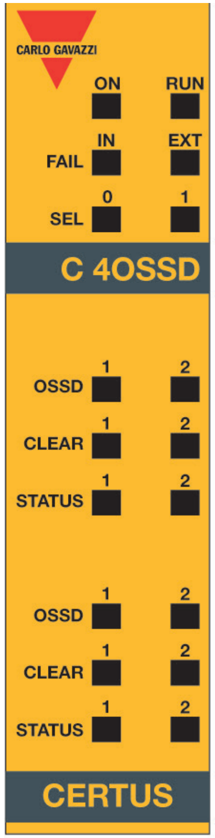
C 2OSSD



MEANING	LED						
	Run Green	**IN Fail Red**	**EXT Fail Red**	**SEL Orange**	**OSSD1/2 Red Green**	**Clear1/2 Yellow**	**Status1/2 Yellow**
Power on initial test	**ON**	**ON**	**ON**	**ON**	Red	ON	ON

MEANING	LED						
	Run Green	**IN Fail Red**	**EXT Fail Red**	**SEL Orange**	**OSSD1/2 Red/Green**	**Clear1/2 Yellow**	**Status1/2 Yellow**
Normal operation	**OFF** if the unit is waiting for the first communication from the MASTER **FLASHES** if no INPUT or OUTPUT requested by the configuration **ON** if INPUT or OUTPUT requested by the configuration	**OFF** op. OK	**OFF** op. OK	**Shows the NODE_SEL0/1 signal table**	**Red** with output OFF	**ON** waiting for RESTART	OUTPUT condition
					Green with output ON	**Flashes** NO feedback	

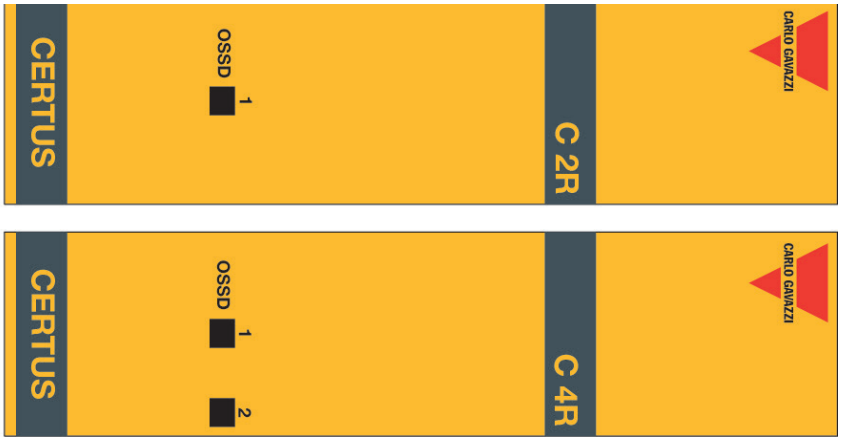
C 4OSSD



MEANING	LED						
	Run Green	**IN Fail Red**	**EXT Fail Red**	**SEL Orange**	**OSSD1/4 Red Green**	**Clear1/4 Yellow**	**Status1/4 Yellow**
Power on initial test	**ON**	**ON**	**ON**	**ON**	Red	ON	ON

MEANING	LED						
	Run Green	**IN Fail Red**	**EXT Fail Red**	**SEL Orange**	**OSSD1/4 Red/Green**	**Clear1/4 Yellow**	**Status1/4 Yellow**
Normal operation	**OFF** if the unit is waiting for the first communication from the MASTER **FLASHES** if no INPUT or OUTPUT requested by the configuration **ON** if INPUT or OUTPUT requested by the configuration	**OFF** op. OK	**OFF** op. OK	**Shows the NODE_SEL0/1 signal table**	**Red** with output OFF	**ON** waiting for RESTART	OUTPUT condition
					Green with output ON	**Flashes** NO feedback	

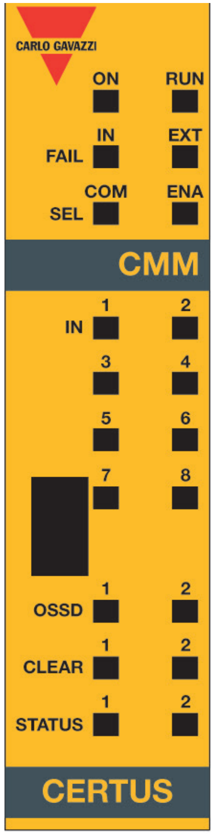
C 2R - C 4R



MEANING	LED
Normal operation	ON with output activated

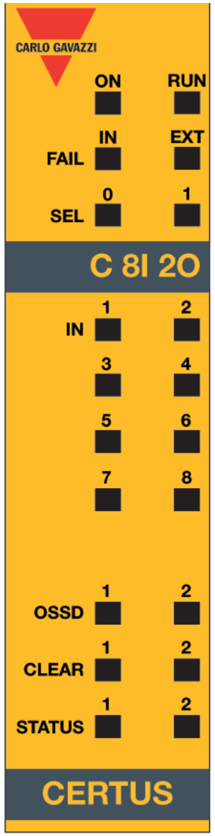
MEANING	LED	
	OSSD1 Green	OSSD2 Green
Normal operation	ON with output activated	

CMM



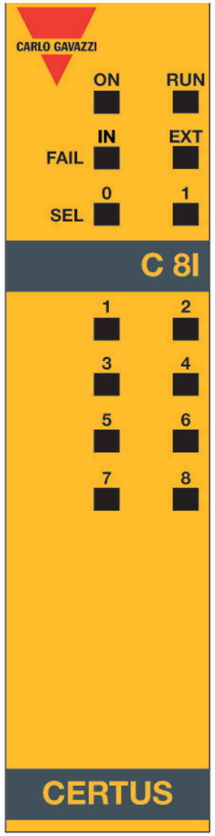
MEANING	LED									REMEDY
	Run Green	IN Fail Red	EXT Fail Red	COM Orange	IN÷8 Yellow	ENA Blue	OSSD1/2 Red/Green	Clear1/2 Yellow	Status1/2 Yellow	
Internal fault	OFF	**2 or 3 flashes**	OFF	OFF	OFF	OFF	Red	OFF	OFF	Return the unit to Carlo Gavazzi to be repaired
Configuration error	OFF	**4 flashes**	OFF	OFF	OFF	OFF	**5 flashes**	**5 flashes**	**5 flashes**	Upload the project to the Certus again. If the problem persists return the CMM to Carlo Gavazzi to be repaired
OSSD output error	OFF	**5 flashes**	OFF	OFF	OFF	OFF	**4 flashes (only the LED corresponding to the output in FAIL mode)**	OFF	OFF	Check the OSSD1/2 connections If the problem persists return the CMM to Carlo Gavazzi to be repaired
Error in communication with slave	OFF	**5 flashes**	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Restart the system. If the problem persists return the CMM to Carlo Gavazzi to be repaired
Slave unit error	OFF	**ON**	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Restart the system Check which unit is in FAIL mode
CMC error	OFF	**6 flashes**	OFF	**6 flashes**	**6 flashes**	OFF	OFF	OFF	OFF	Replace the CMC

C 8I 2O



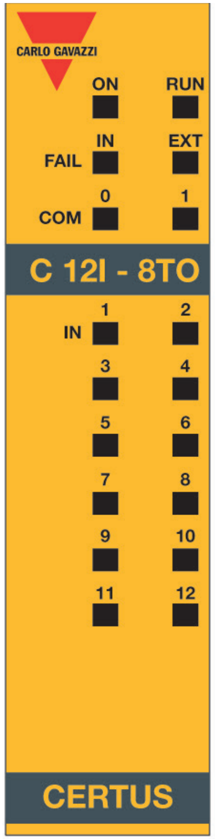
MEANING	LED								REMEDY
	Run Green	IN Fail Red	EXT Fail Red	SEL Orange	IN÷8 Yellow	OSSD1/2 Red/Green	Clear1/2 Yellow	Status1/2 Yellow	
Internal fault	OFF	**2 or 3 flashes**	OFF		OFF	Red	OFF	OFF	Return the unit to Carlo Gavazzi to be repaired.
Compatibilty error	OFF	**5 flashes**	OFF		**5 flashes**	**5 flashes**	**5 flashes**	**5 flashes**	Firmware version not compatible with CMM, return to Carlo Gavazzi for Firmware upgrade.
OSSD output error	OFF	**4 flashes**	OFF	Show the physical address of the unit	OFF	**4 flashes (only the LED corresponding to the output in FAIL mode)**	OFF	OFF	Check OSSD1/2 connections If the problem persists, return the C 8I 2O to Carlo Gavazzi to be repaired.
Error in communication with master	OFF	**5 flashes**	OFF		OFF	OFF	OFF	OFF	Restart the system If the problem persists, return the C 8I 2O to Carlo Gavazzi to be repaired.
Error on other slave or CMM	OFF	**ON**	OFF		OFF	OFF	OFF	OFF	Restart the system Check which unit is in FAIL mode.
Same type of slave with same address detected	OFF	**5 flashes**	**5 flashes**		OFF	OFF	OFF	OFF	Change the unit's address (see NODE SEL).

C 8I



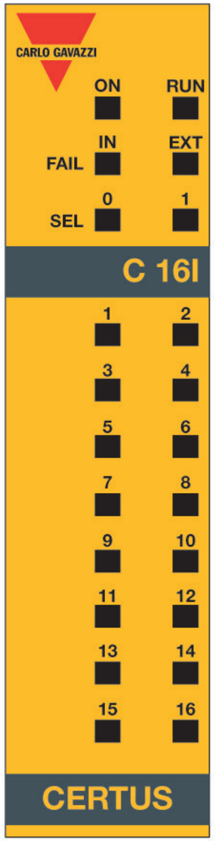
MEANING	LED								REMEDY
	Run Green	**IN Fail Red**	**EXT Fail Red**	**SEL Orange**	**IN÷8 Yellow**	**OSSD1/2 Red/Green**	**Clear1/2 Yellow**	**Status1/2 Yellow**	
Internal fault	OFF	**2 or 3 flashes**	OFF	Show the physical address of the unit	OFF	Red	OFF	OFF	Return the unit to Carlo Gavazzi to be repaired.
Compatibilty error	OFF	**5 flashes**	OFF		**5 flashes**	**5 flashes**	**5 flashes**	**5 flashes**	Firmware version not compatible with CMM, return to Carlo Gavazzi for Firmware upgrade.
Error in communication with master	OFF	**5 flashes**	OFF		OFF	OFF	OFF	OFF	Check OSSD1/2 connections. If the problem persists, return the C 8I O2 to Carlo Gavazzi to be repaired.
Error on other slave or CMM	OFF	**ON**	OFF		OFF	OFF	OFF	OFF	Restart the system Check wich unit is in Fail mode.
Same type of slave with same address detected	OFF	**5 flashes**	**5 flashes**		OFF	OFF	OFF	OFF	Change the unit's address (see **NODE SEL**).

C 12I 8TO



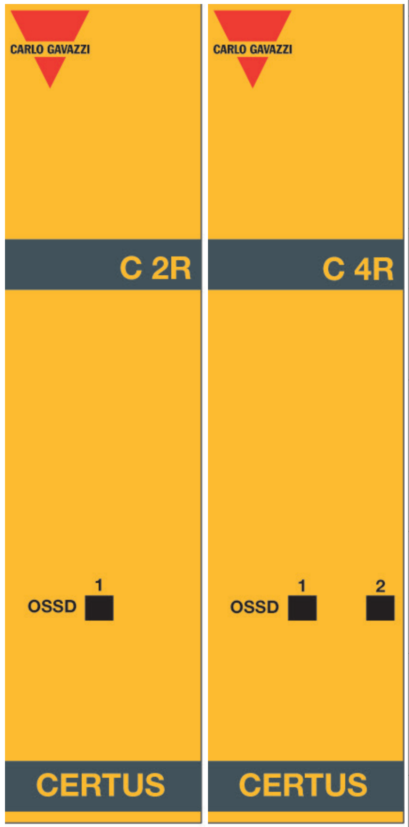
MEANING	LED								REMEDY
	Run Green	IN Fail Red	EXT Fail Red	SEL Orange	IN÷8 Yellow	OSSD1/2 Red/Green	Clear1/2 Yellow	Status1/2 Yellow	
Internal fault	OFF	**2 or 3 flashes**	OFF		OFF	Red	OFF	OFF	Return the unit to Carlo Gavazzi to be repaired.
Compatibilty error	OFF	**5 flashes**	OFF		**5 flashes**	**5 flashes**	**5 flashes**	**5 flashes**	Firmware version not compatible with CMM, return to Carlo Gavazi for Firmware upgrade.
Error in communication with master	OFF	**5 flashes**	OFF	Show the physical address of the unit	OFF	OFF	OFF	OFF	Restart the system. If the problem persists, return the C 12I 8TO to Carlo Gavazzi to be repaired.
Error on other slave or CMM	OFF	**ON**	OFF		OFF	OFF	OFF	OFF	Restart the system Check wich unit is in Fail mode.
Same type of slave with same address detected	OFF	**5 flashes**	**5 flashes**		OFF	OFF	OFF	OFF	Change the unit's address (see **NODE SEL**).

C 16I

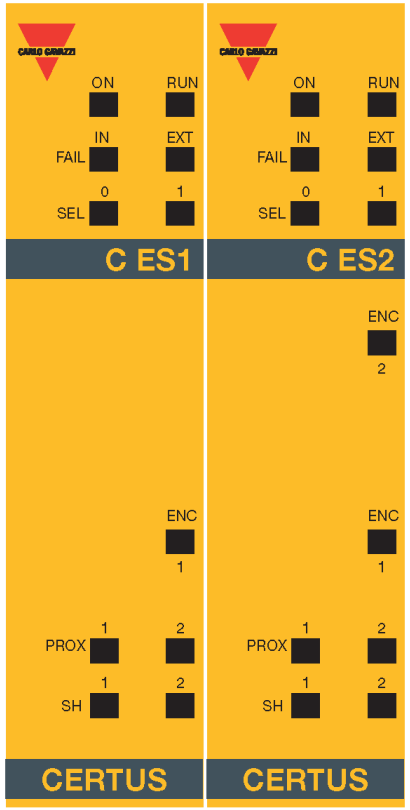


MEANING	LED								REMEDY
	Run Green	IN Fail Red	EXT Fail Red	SEL Orange	IN÷8 Yellow	OSSD1/2 Red/Green	Clear1/2 Yellow	Status1/2 Yellow	
Internal fault	OFF	**2 or 3 flashes**	OFF		OFF	Red	OFF	OFF	Return the unit to Carlo Gavazzi to be repaired.
Compatibilty error	OFF	**5 flashes**	OFF		**5 flashes**	**5 flashes**	**5 flashes**	**5 flashes**	Firmware version not compatible with CMM, return to Carlo Gavazzi for Firmware upgrade.
Error in communication with master	OFF	**5 flashes**	OFF	Show the physical address of the unit	OFF	OFF	OFF	OFF	Restart the system. If the problem persists, return the C 16I to Carlo Gavazzi to be repaired.
Error on other slave or CMM	OFF	**ON**	OFF		OFF	OFF	OFF	OFF	Restart the system Check wich unit is in Fail mode.
Same type of slave with same address detected	OFF	**5 flashes**	**5 flashes**		OFF	OFF	OFF	OFF	Change the unit's address (see **NODE SEL**).

C 2R - C 4R



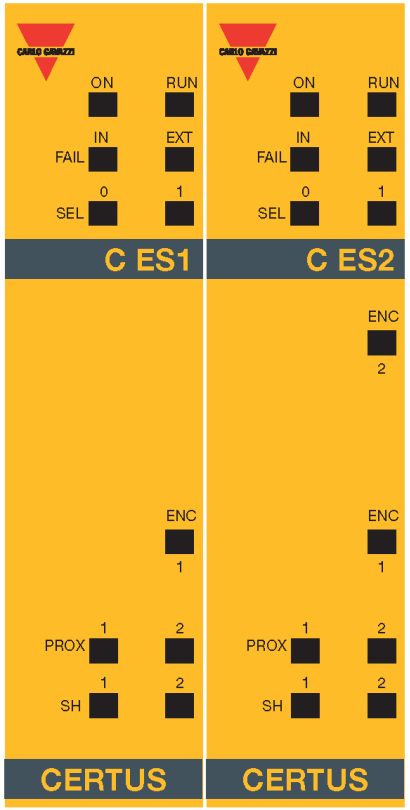
MEANING	LED							REMEDY
	Run Green	IN Fail Red	EXT Fail Red	SEL Orange	OSSD1/2 Red/Green	Clear1/2 Yellow	Status1/2 Yellow	
Internal fault	OFF	**2 or 3 flashes**	OFF	Show the physical address of the unit	Red	OFF	OFF	Return the unit to Carlo Gavazzi to be repaired
Compatibilty error	OFF	**5 flashes**	OFF		**5 flashes**	**5 flashes**	**5 flashes**	Firmware version not compatible with CMM, return to Carlo Gavazzi for Firmware upgrade.
OSSD output error	OFF	**4 flashes**	OFF		**4 flashes (only the LED corresponding to the output in Fail mode)**	OFF	OFF	Check OSSD1/2 connections If the problem persists, return the C 2OSSD/4 to Carlo Gavazzi to be repaired
Error in communication with master	OFF	**5 flashes**	OFF		OFF	OFF	OFF	Restart the system If the problem persists, return the C 2OSSD/4 to Carlo Gavazzi to be repaired
Error on other slave or CMM	OFF	**ON**	OFF		OFF	OFF	OFF	Restart the system Check which unit is in FAIL mode
Same type of slave with same address detected	OFF	**5 flashes**	**5 flashes**		OFF	OFF	OFF	Change the unit's address (see NODE SEL)
Power supply missing on SSD 3,4 (C 4OSSD only)	ON	OFF	ON		**Red flashes**	**flashes**	Output condition	Connect 13 and 14 pin to power supply
Error on node detection circuit	OFF	**3 flashes**	OFF	**3 flashes**	OFF	OFF	OFF	Return the C 2R / C 4R to Carlo Gavazzi to be repaired



MEANING	LED						
	Run Green	IN Fail Red	EXT Fail Red	SEL Orange	ENC* Yellow	Prox Yellow	SH Yellow
Power on initial test	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**

MEANING	LED						
	Run Green	IN Fail Red	EXT Fail Red	SEL Orange	ENC* Yellow	Prox Yellow	SH Yellow
Normal operation	**OFF** if the unit is waiting for the first communication from the MASTER **FLASHES** if no INPUT or OUTPUT requested by the configuration **ON** if INPUT or OUTPUT requested by the configuration	**OFF** op. OK	**OFF** op. OK	**Shows the NODE_SEL0/1 signal table**	**ON** Encoder connected and operative	**ON** Proximity connected and operative	**OFF** Axis in normal speed range **ON** Axis in stand still **BLINKING** Axis in overspeed

*** Not present in C PSS module**



MEANING	LED							Remedy
	Run Green	IN Fail Red	EXT Fail Red	SEL Orange	ENC* Yellow	Prox Yellow	SH Yellow	
Internal fault	OFF	2 or 3 flashes	OFF	Shows the physical address of the unit	OFF	OFF	OFF	Return to the unit to Carlo Gavazzi to be repaired
Compatibility error	OFF	5 flashes	OFF		OFF	OFF	OFF	Frimware version not compatible with CMM, return to Carlo Gavazzi for FW upgrade
Encoder not conncted but requested from the configuration Encoder external error	OFF	OFF	3 flashes		3 flashes	OFF	OFF	Verify encoder connection and power supply. Verify input frequency (in range)
Encoder Internal error	OFF	3 flashes	OFF		3 flashes	OFF	OFF	Change the encoder. Return the unit to Carlo Gavazzi to be repaired
Proximity not connected but requested from the configuration. Proximity external error	OFF	OFF	3 flashes		OFF	3 flashes	OFF	verify proximity connection and power supply. Verify input frequency (in range)
Proximity internal error		3 flashes	OFF			3 flashes		Change the proximity. Return the unit to Carlo Gavazzi to be repaired.
Same type of slave with same address detected	OFF	5 flashes	5 flashes		OFF	OFF	OFF	Change the units address (see NODE SEL)
Error on node detection circuit	OFF	3 flashes	OFF	3 flashes	OFF	OFF	OFF	Return the unit to Carlo Gavazzi to be repaired

*** Not present in C PSS module**

Certus Configuration Software (CCS)

The “CERTUS CONFIGURATION SOFTWARE” application software can be used to configure a logic diagram of the connections between the Certus (Master + expansions) and the components of the system being developed.
The Certus and its SLAVE units will thus monitor and control the connected safety components.
The CCS uses a versatile graphic interface to establish the connections between the various components, as described below:

Installing the Software
PC Hardware Requirements

- RAM: 256 MB (adequate to run Windows XP SP3 + Framework 3.5)
- Hard disk: > 300Mbyte of free space
- USB connector: 1.1 or 2.0
- CD-ROM drive

PC Software Requirements

- Windows XP with Service Pack 3 installed (or higher OS).

⇒ Microsoft Framework 3.5 (or higher) must be installed on the PC.

How to Install CCS

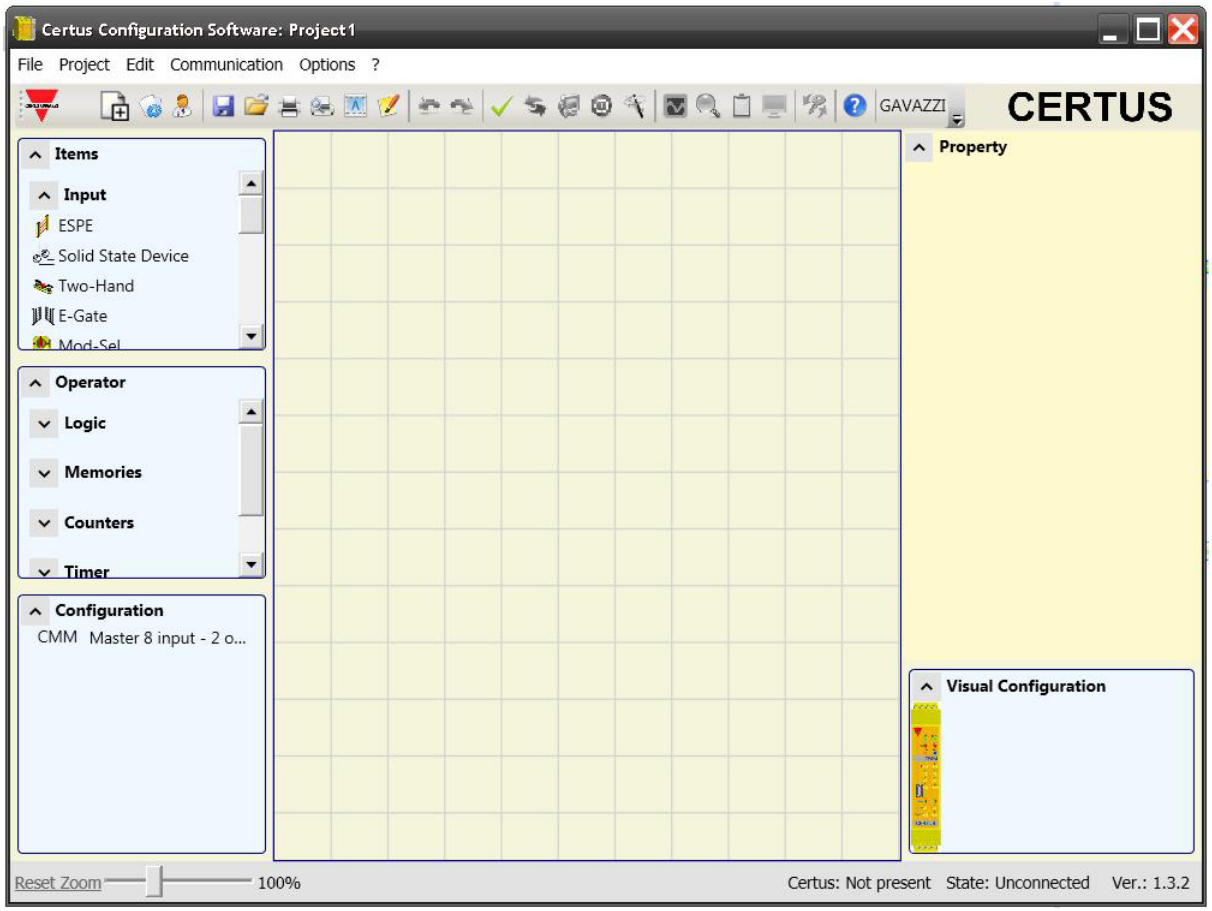
- Insert the installation CD;
- Wait for the auto-run installer to request the SW setup program;

Alternatively follow the path D:/;
- Double-click on the “SetupCSS.exe”

When the installation procedure is complete a window is displayed asking you to close the setup program.

Fundamentals

Once the CCS has been correctly installed it creates an icon on the desktop.
To launch the program: double-click on this icon. => 
The opening screen shown below is displayed:



You are now ready to create your project.

Standard Tool Bar

The standard tool bar is show in Fig. 26. The meanings of the icons are listed below:

1 CREATE A NEW PROJECT

2 CHANGE CONFIGURATION (composition of different modules)

3 CHANGE USER PARAMETERS (name, company, etc.)

4 SAVE THE ACTUAL PROJECT

5 LOAD AN EXISTING PROJECT (FROM THE PC)

6 PRINT THE PROJECT SCHEMATIC

7 PRINT PREVIEW

8 PRINTING AREA

9 PRINT THE PROJECT REPORT

10 UNDO (CANCEL THE LAST COMMAND)

11 REDO (RESTORE THE LAST CANCELLATION)

12 VALIDATE THE PROJECT

13 CONNECT TO CERTUS

14 SEND PROJECT TO CERTUS

15 DISCONNECT FROM CERTUS

16 DOWNLOAD AN EXISTING PROJECT (FROM CERTUS)

17 MONITOR (Real time I/O status - graphic)

18 MONITOR (Real time I/O status - textual)

19 DOWNLOAD LOG FILE

20 SHOW SYSTEM CONFIGURATION

21 CHANGE PASSWORD

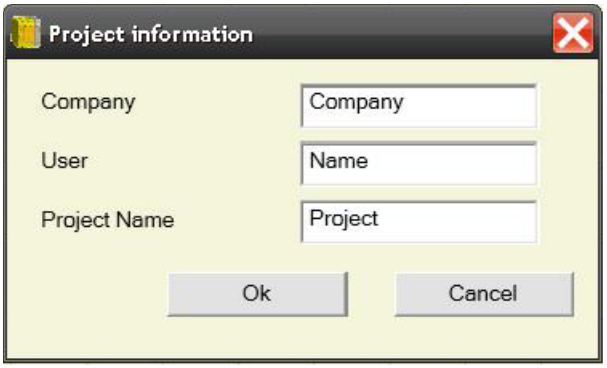
22 HELP ON-LINE

23 PASSWORD RECOVERY

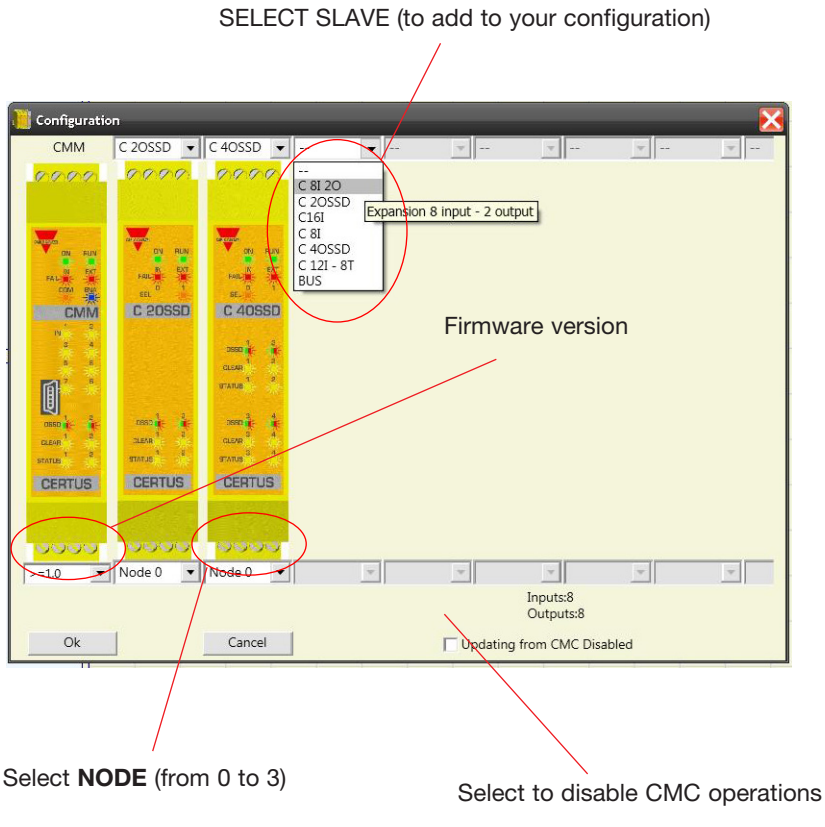
Textual Tool Bar

Optionally the textual tool bar show below is also available (drop down).

Create a New Project (configure the Certus system)
Select icon CREATE (Figure 26) from the standard tool bar to start a new project. The user authentication window is displayed (Figure 28).



Next the CCS displays a window showing the CMM only.
You may add the various units needed to create your system, using the pull-down menus at the top of the screen (select slave) and at the bottom to select the relative node (0÷3).

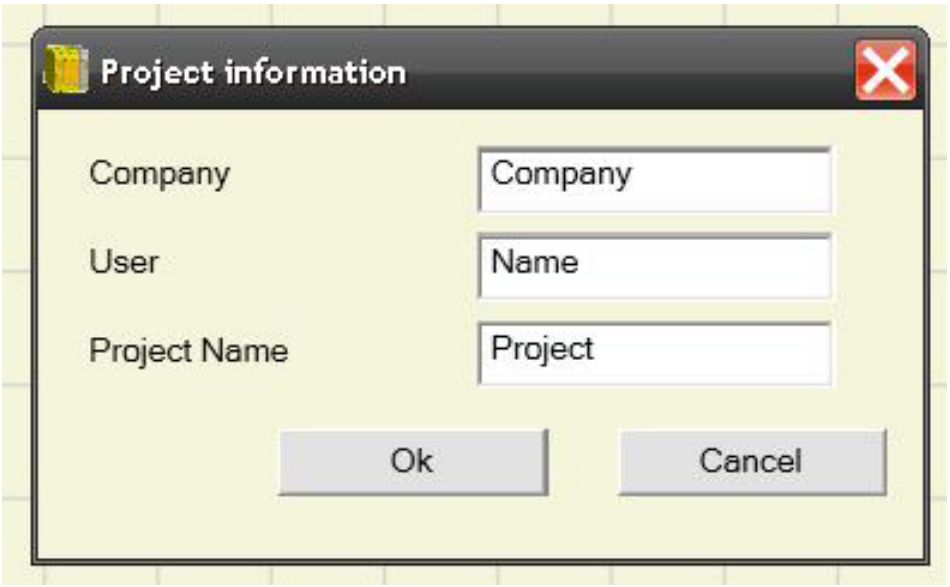


Edit Configuration (composition of the various modules)

The change of the system composition is obtained with the icon. 
The configuration window is showed again (Figure 26).

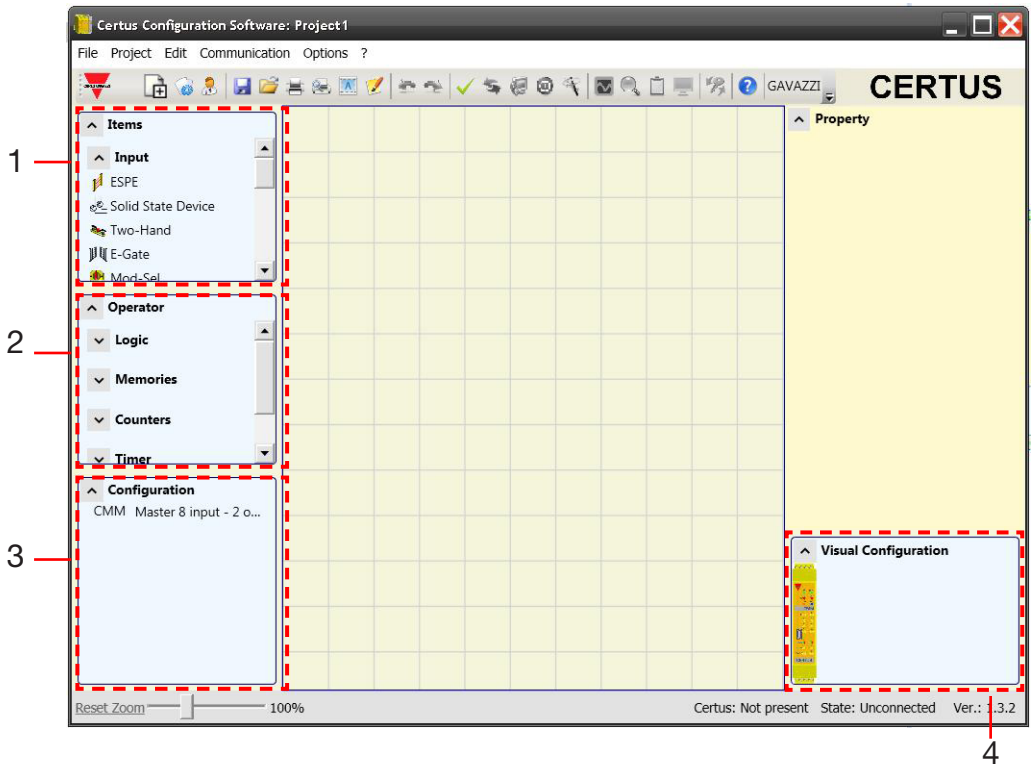
Change User Parameters

The change of user parameters is obtained with the icon. 
The dialog user identification request appears (Figure 30). To accomplish this operation is not necessary to Log out from Certus. Generally it serves when a new user must create a new project (even using a previously created).



Objects - Operator - ConfigurationTool Bars

Four large tool windows are displayed to the left and right of the main window (shown in Figure 31):



1 > OBJECT TOOL WINDOW

This contains the various function blocks that will make up your project; these blocks are divided into 3 different types:

- physical
- inputs
- outputs
- comments

2 > OPERATOR TOOL WINDOW

This contains the various function blocks for connecting the objects in point 1; these blocks are divided into 6 different types:

- logical
- muting
- memories
- counters
- press
- timers

3 > CONFIGURATION TOOL WINDOW

This contains the description of your project composition.

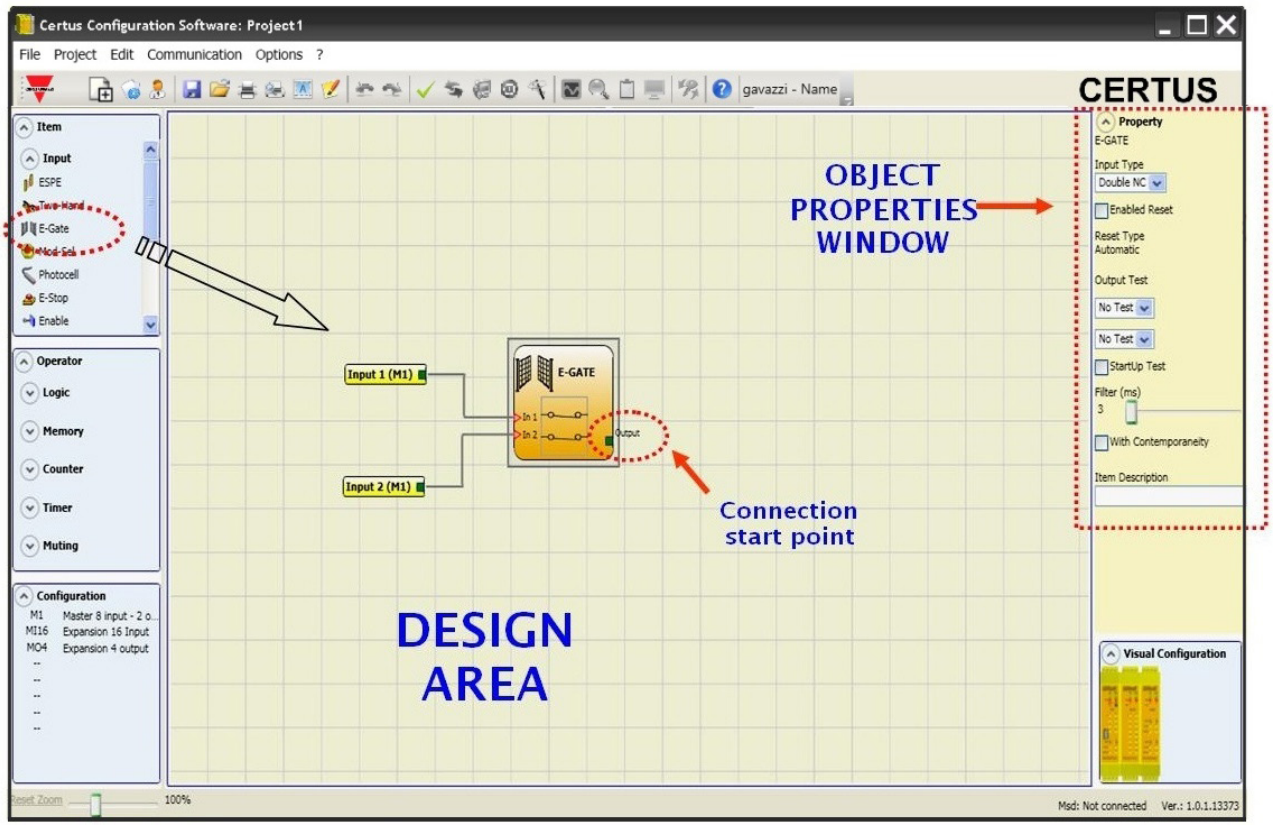
4 > CONFIGURATION TOOL WINDOW (view)

This contains the graphic representation of your project composition.

Creating the Diagram

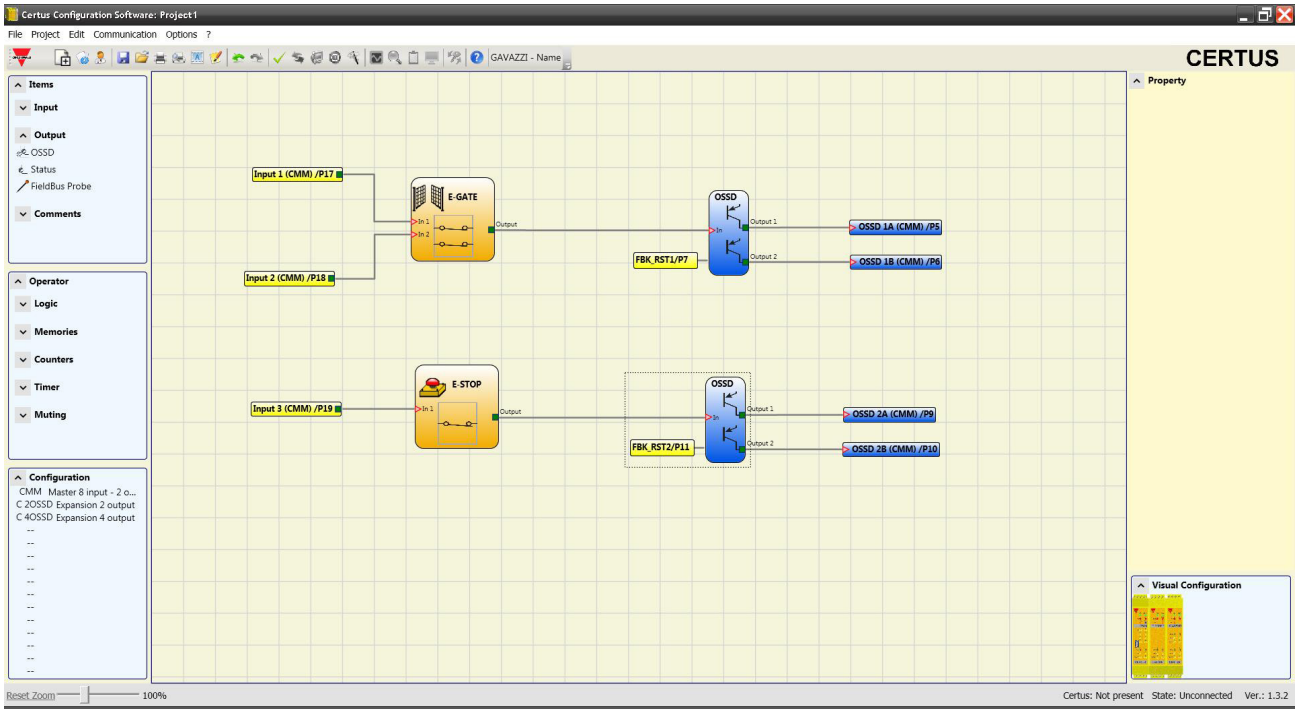
Once you have selected your system composition, you are ready to configure the project. The logic diagram is created using a DRAG&DROP function:

- Select the objects as required from the windows described previously (each single object is described in detail in the following sections) and drag it into the design area.
- Now when you select the object the PROPERTIES window is enabled, where you must fill in the fields as required.
- When you need to set a specific numerical value with a slide (eg filter) use the left and right arrows on your keyboard or click the sides of the slider of the slide.
- Connect the objects by moving the mouse over the required pin and then dragging it onto the pin to be connected.
- If the scheme requires the PAN function (moving working area in the window), select the object to move and use the arrow keys on your keyboard.
- When you need to duplicate an object, select it and press CTRL+C / CTRL+V keys on your keyboard.
- When you need to delete an object or a link, select it and press DEL key on your keyboard.



Example of a Project

Figure 33 shows an example of a project in which the CMM unit only is connected to two safety blocks (E-GATE and E-STOP). The CMM inputs (1,2,3) for connecting the contacts of the safety components are shown on the left, in yellow. The Certus outputs (from 1 to 4) are activated according to the conditions defined in E-GATE and E-STOP (see the E-GATE - E STOP sections). By clicking on a block to select it, you enable the PROPERTIES WINDOW on the right, which you can use to configure the block activation and test parameters (see the E-GATE - E STOP sections).



At the end of the project design stage (or at intermediate steps) you can save the current configuration using the icon SAVE on the standard tool bar.

⇒ Now the finished project must be verified. Execute the VALIDATE command (Icon  on the standard toolbar).

If the validation is successful, a sequential number is assigned to the input and output of the project. Then, this number is also listed in the REPORT and in the MONITOR of CCS.
Only if the validation is successful we will proceed to send the configuration.

⚠ The validation function only verifies the consistency of programming with respect to the characteristics of the Certus system. It does not guarantee that the device has been programmed to meet all the safety requirements for the application.

Project Report

Print of the System composition with properties of each block. (Icon  on the standard toolbar).

Project Report generated by Certus Configuration Software 1.2.0

Project Name: Sch24 SOLID STATE DEVICE
User: Bianchi
Company: Carlo Gavazzi
Date: 07/11/2011 14.28.48
Schematic CRC: 3A4BH

Certus: Cofiguration
Module CMM (Configured Firmware version: >=1.0
Module C 8I 2O Node 0
Module C 8I 2O Node 1
Module C 4OSSD Node 0
Module C 12I - 8T Node 0

Certus: Safety information's
PFHd (according to IEC 61508): 2,42E-008 (1/h)
MTTFd (according to EN ISO 13849-1) : 85 years
DCavg (according to EN ISO 13849-1): 98.07%

Resources used

INPUT: 22% (8/36)
Functional Blocks: 3

Timing: 6% (1/16)
Total number blocks: 5% (3/64)

OSSD: 50% (5/10)
STATUS: 20% (2/10)

Electrical diagram

SSD
Functional Block 1
Filter (ms): 3
Conteporaneity (ms): 10
Reset Type: Automatic
StartUp Test: True
Connections:
CMM INPUT1/TERMINAL17
CMM INPUT2/TERMINAL18

SSD
Functtional Block 2
Filter (ms): 100
Contemporaneity (ms): 500
Reset Type: Manual
StartUp Test: False
Connections:
C 8I 2O - 0 INPUT1/Terminal17
C 8I 2O - 0 INPUT2/Terminal18
C 8I 2O - 0 INPUT3/Terminal19

SSD
Functional Block 3
Filter (ms): 250
Contemporaneity (ms): 1000
Reset Type: Monitored
StartUp Test: False

⚠ This definition of PL and of the other related parameters as set forth in ISO 13849 1 only refers to the functions implemented in the Certus system by the CCS configuration software, assuming configuration has been performed correctly.
⚠ The actual PL of the entire application and the relative parameters must consider data for all the devices connected to the Certus system within the scope of the application.
⚠ This must only be performed by the user/installer.

Connect to Certus

After connecting CMM to the PC via CSU cable (USB) use the icon for the connection.
A window appears to request the password. Enter the password (see “Password protection”).

Sending the Configuration to the Certus

To send the saved configuration from a PC to CMM use the icon on the standard toolbar and wait the execution. CMM will save the project in its internal memory and if present) in CMC memory. (Password Required: level 2).

⇒ This function is possible only after project validation with OK result.

Download a Configuration File (Project) From Certus CMM

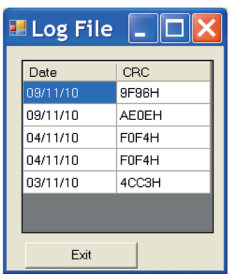
To download a project from Certus CMM to CCS use the icon on the Standard toolbar. CCS will display the project residing in CMM. (Sufficient Password level 1).

⇒ If the project must be used on other modules CMM verify the components effectively connected (ref. “System composition” on page 54).
⇒ The perform a “Project Validation” (page 51) and a “System” (page 57).

Configuration LOG

⇒ Within the configuration file (project), are included the creation date and CRC (4-digit hexadecimal identification) of a project that are stored in CMM.
⇒ This logbook can record up to 5 consecutive events, after which these are overwritten, starting from the least recent event.

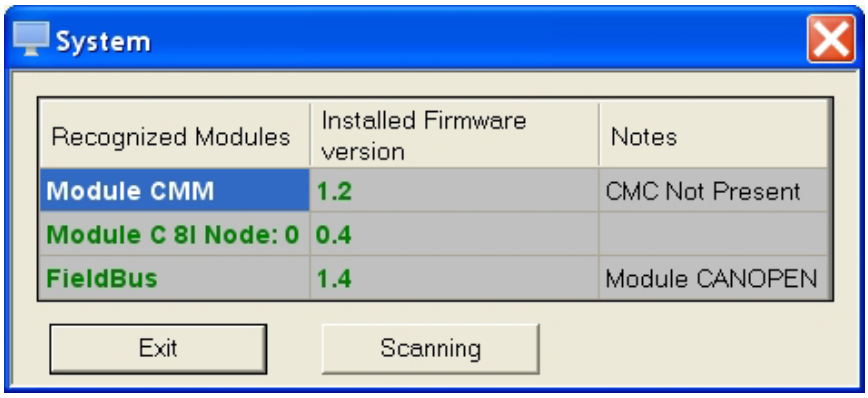
The log file can be visualized using the icon in the standard tool bar.
(Password Required: level 1



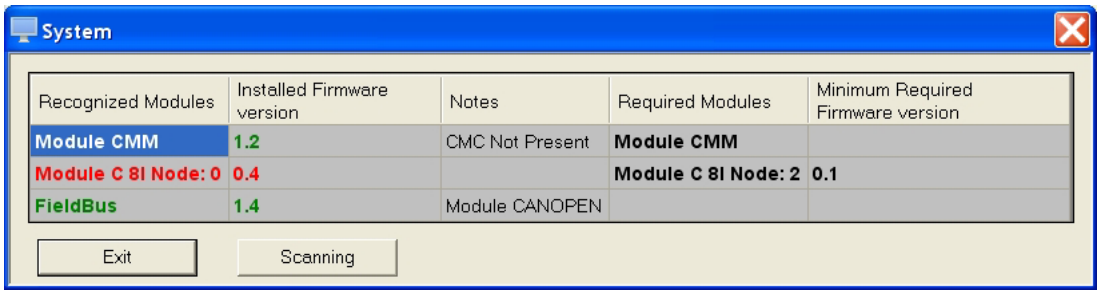
System Composition

The check of the actual composition of the Certus system is obtained using the icon  (Password Required: level 1). A pop-up window will appear with:

- Connected modules;
- Firmware version of each module;
- Node number (physical address) of each module.



If the modules found are not correct the following window will appear; e.g. C 12I 8TO node number not correct (displayed in red color text).

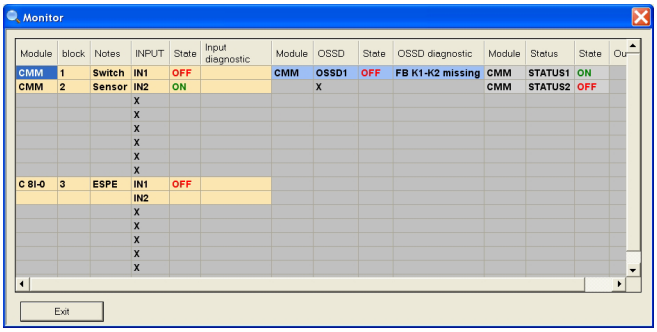


To disconnect the PC from CMM use the icon  ; when the system is disconnected it is resetted and it starts with the sent project.

⇒ If the system is not composed of all modules provided by the configuration, after the disconnection, CMM indicates the incongruity and does not starts. (See SIGNALS).

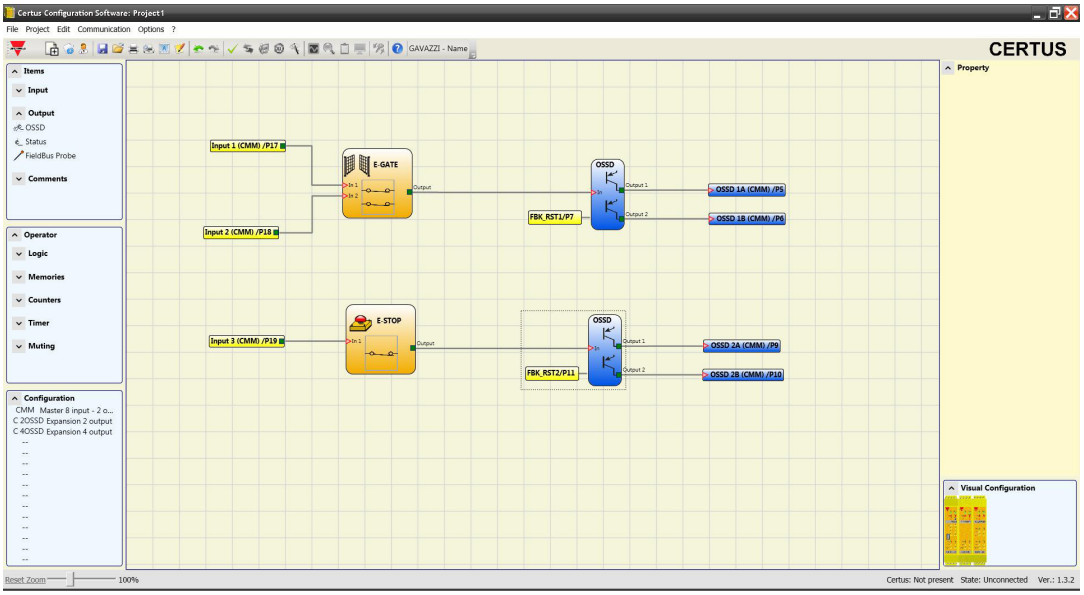
MONITOR (I/O status in real time - textual)

To activate the monitor use the icon  . (Password Required: level 1).
A pop-up window will appear (in real time) with:
- Status of the inputs (when the object has two or more input connections to Certus, the MONITOR will show as active only the first), see the example in figure;
- Inputs Diagnostics;
- OSSD State;
- OSSD Diagnostics;
- Status of digital outputs;
- OUT TEST diagnostics



MONITOR (I/O status in real time - textual - graphic)

To activate/deactivate the monitor use the icon  . (Password Required: level 1).
The color of links (Figure 33) allows you to view the diagnostics (in real time) with:
RED = OFF
GREEN = ON
DASHED ORANGE = Connection Error
DASHED RED = Pending enable (for example RESTART)
Placing the mouse pointer over the link, you can display the diagnostics.



Password Protection

The CCS requests a password in order to upload and save the project.

⇒ The password entered as default must be modified to avoid manipulation (level 2 password) or so that the configuration loaded on Certus (level 1 password) is not visible.

Level 1 Password

All operators using the CMM system must have a Level 1 PASSWORD.
This password allows only to view the LOG file, composition of the system and MONITOR in real time and upload operations.
The first time the system is initialised the operator must use the password “” (ENTER key).

Designers who know the level 2 password can enter a new level 1 password (alphanumerical, max 8 characters).

⇒ Operators who know this password are enabled to upload (from CMM to PC), modify or save the project.

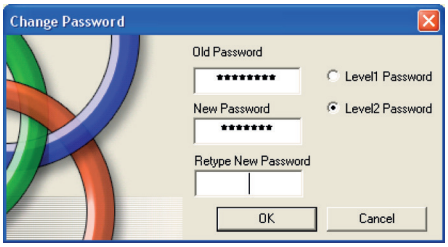
Level 2 Password

Designers authorised to work on the creation of the project must know a Level 2 PASSWORD. The first time the system is initialised the operator must use the password “SAFEPASS” (all capital letters).
Designers who know the level 2 password can enter a new level 2 password (alphanumerical, max 8 characters).

⇒ This password enables the project to be uploaded (from PC to CMM), modified and saved. In other words, it allows total control of the PC => Certus system.
⇒ When a new project is UPLOADED the level 2 password could be changed.
⇒ Should you forget either of these passwords, please contact Carlo Gavazzi which will provide an unlock file (when the unlock file is saved in the right directory  icon will appear on the toolbar). When the icon is activated, the password level 1 and level 2 are restored to their original values. This password is only given to the designer and can only be used once.

Password Change

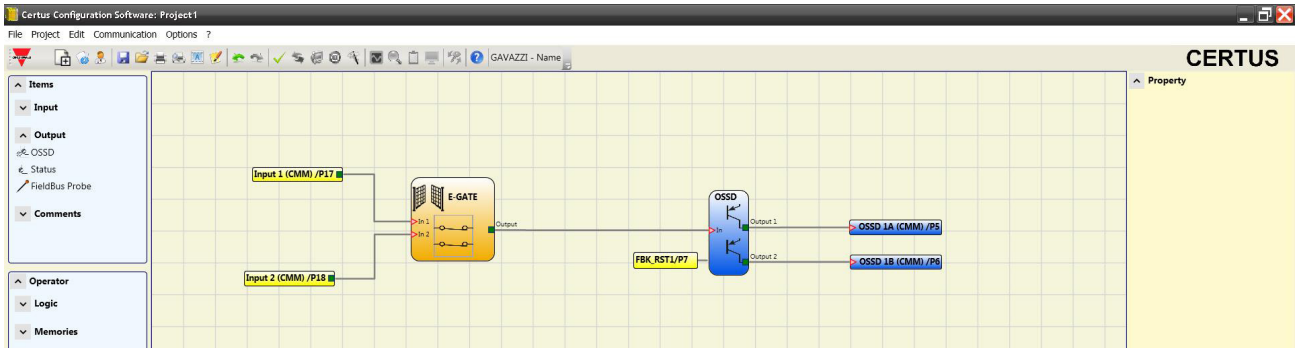
To activate the PASSWORD Change use icon  , after connecting with Level 2 Password. A window appears (Figure 40) allowing the choice of the new password; insert the old and new passwords in the appropriate fields (max 8 characters). Click OK.
At the end of the operation disconnect to restart the system.
If CMC is present the new password is also saved in it.



Testing the System

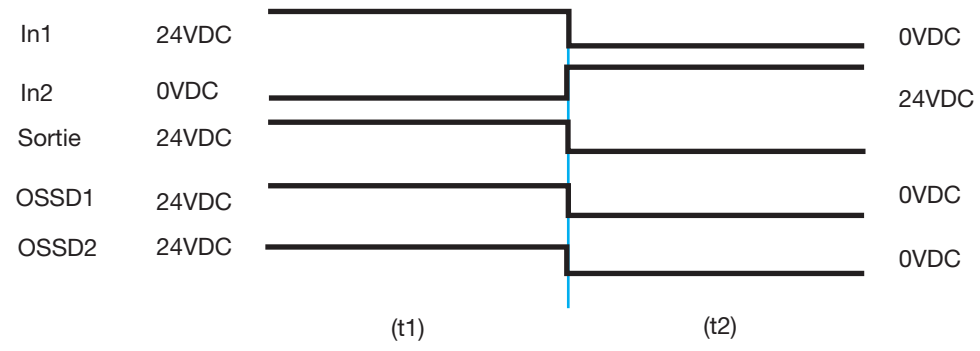
⚠ After validating and uploading the project to the CMM and connecting all the safety devices, you must test the system to verify its correct operation.

This is done by forcing a change of status for each safety device connected to the Certus to check that the status of the outputs actually changes.
The following example is helpful for understanding the TEST procedure.



(t1) In the normal operating condition (E-GATE closed) Input1 is closed, Input2 is open and the output of the E-GATE block is set to high logic level; in this mode the safety outputs (OSSD1/2) are active and the power supply to the relative terminals is 24VDC.

(t2) When the E-GATE is **physically** opened, the condition of the inputs and thus of the outputs of the E-GATE block will change: (OUT= 0VDC--->24VDC); **the condition of the OSSD1 OSSD2 safety outputs will change from 24VDC to 0VDC**. If this change is detected the mobile E-GATE is connected correctly.



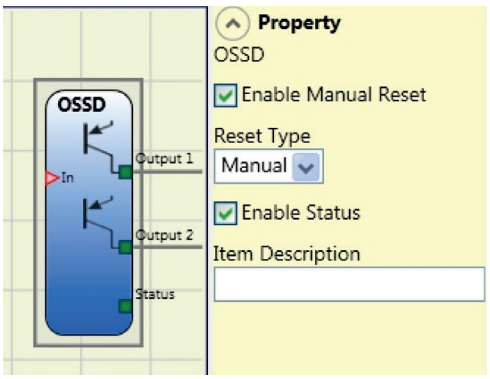
⚠ For the correct installation of each external sensor/component refer to their installation manual.
⚠ This test must be performed for each safety component in the project.

Objection Function Blocks

The CCS requests a password in order to upload and save the project.

Output Object
OSSD (safety outputs)

The OSSD semiconductor safety outputs require no maintenance, Output1 and Output2 supply 24Vdc if the input is 1 (TRUE), whereas they supply 0Vdc if the input is 0 (FALSE).



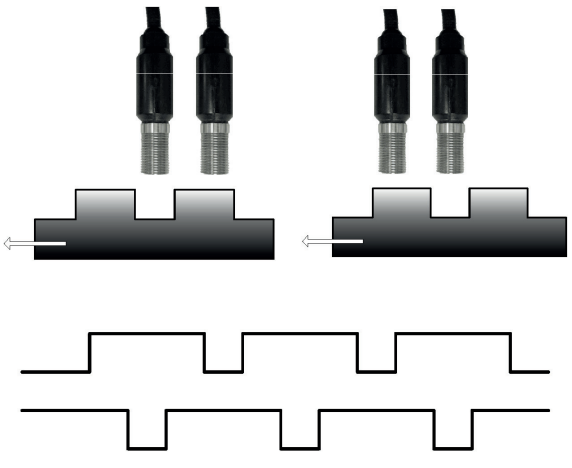
⇒ Each pair of OSSD has an entrance on RESTART_FBK. This input must always be connected as described in paragraph RESTART_FBK.

This input must always be connected as described in paragraph PROXIMITY INPUT FOR SPEED CONTROLLER C ES2.

Configuration with Interleaved Proximity (Fig. 5)

When an axis of the C ES2 module is configured for a measurement with two proximity switches, these can be configured in interleaved mode. Under the conditions listed below the system reaches a Performance Level = PLe.

- Proximity switches must be fitted such that the recorded signals overlap.
- Proximity switches must be fitted such that at least one is always activated.

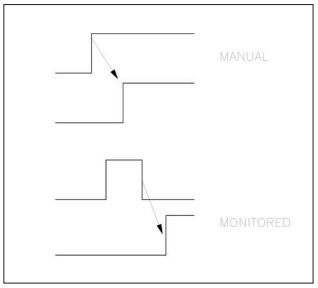


In addition:

- The proximity switches must be PNP type.
- The proximity switches must be NO type (Output ON when detecting metal).
- With the above conditions fulfilled, the DC value is equal to 90%.
- The two proximity switches must be of the same model, with MTFF > 70 years.

Parameters

Manual reset: If selected this enables the request to reset each time the input signal falls. Otherwise, enabling of the output directly follows the input conditions.

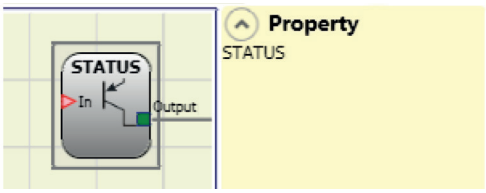


There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

Enable status: If checked enables the connection of the current status of the OSSD with a STATUS.

Status (signal output)

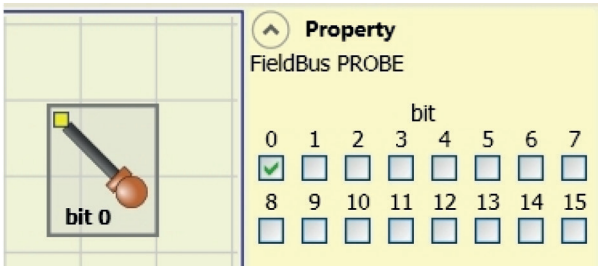
STATUS output (NOT SAFETY OUTPUT) makes it possible to monitor any point on the diagram by connecting it to the input. The output returns 24Vdc if the input is 1 (TRUE), or 0Vdc if the input is 0 (FALSE).



⚠ WARNING: The STATUS output is NOT a safety output

Fieldbus Probe

Element that permits display of the status of any point of the scheme on the fieldbus. Up to 16 probes can be inserted and the bit on which status is represented must be entered for each. States are represented with 2 bytes on the fieldbus. (For more detailed information, consult the fieldbus manual on the CCS CD-ROM).

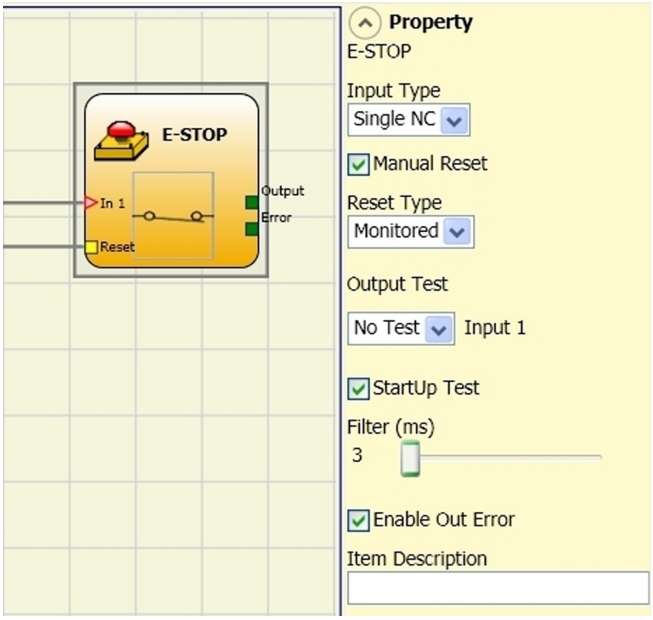


⚠ PROBESTATUS output is NOT a safety output

Input Object

E-Stop (emergency stop)

E-STOP function block verifies an emergency stop device inputs status. If the emergency stop button has been pressed the output is 0 (FALSE). If not the output is 1 (TRUE).

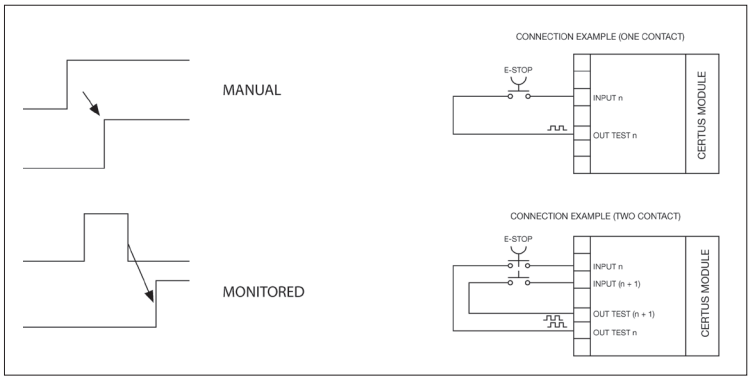


Parameters

Input type:
- Single NC – allows connection of one-way emergency stops
- Double NC – allows connection of twoway emergency stops.

Manual reset: If selected this enables the request to reset each time the emergency stop is activated. Otherwise, enabling of the output directly follows the input conditions.

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.



⇒ WARNING: If the Manual Reset is active, a consecutive Input have to be used. Example: Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the emergency stop (mushroom pushbutton). This additional test makes it possible to detect and manage any short-circuits between the lines. This additional control permits detection and management of any short-circuits between the lines. To enable this control, the test output signals must be configured (amongst those available). Test at start-up: If selected this enables the test at startup of the external component (emergency stop). This test is performed by pressing and releasing the pushbutton to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the emergency stop. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts.
The length of the filter affects the calculation of the unit's total response time.

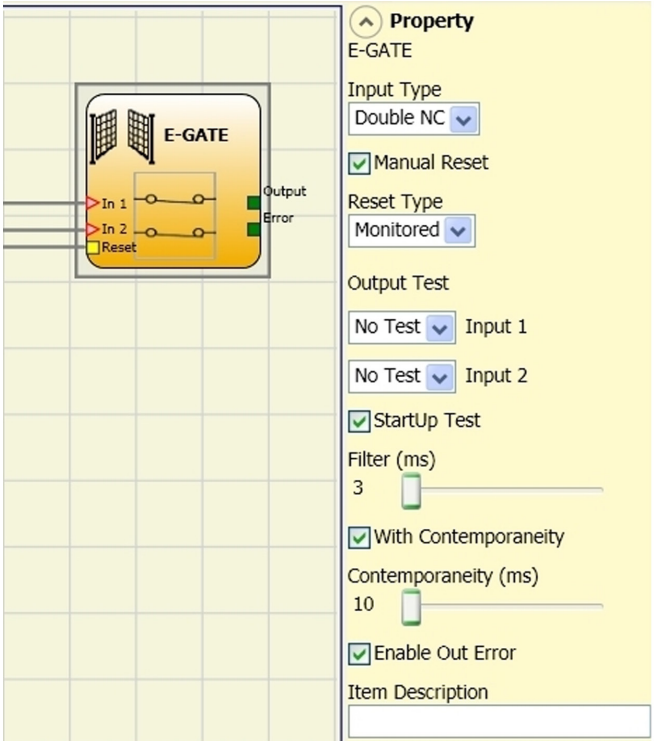
With Contemporaneity: If selected this activates the test to verify concurrent switching of the signals coming from the emergency stop.

Contemporaneity (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the emergency stop.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: This allows a description of the component's function to be entered.
The text is displayed in the top part of the symbol.

E-GATE (safety device)

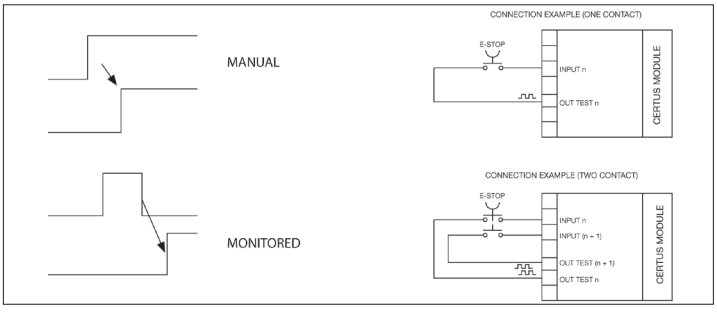


E-GATE function block verifies a mobile guard or safety gate device input status. If the mobile guard or safety gate is open, the output is 0 (FALSE). Otherwise the output is 1 (TRUE).

Parameters

Input type:
- Double NC – Allows connection of components with two NC contacts
- Double NC/NO – Allows connection of components with one NO contact and one NC.

Enable reset: If selected this enables the request to reset each time the mobile guard/safety gate is activated. Otherwise, enabling of the output directly follows the input conditions.
There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1 Parameters If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.



⇒ WARNING: If the Manual Reset is active, a consecutive Input has to be used. Example: input and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the component contacts. This additional control permits detection and management of any short-circuits between the lines. To enable this control, the test output signals must be configured (amongst those available).

Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by opening the mobile guard or safety gate to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

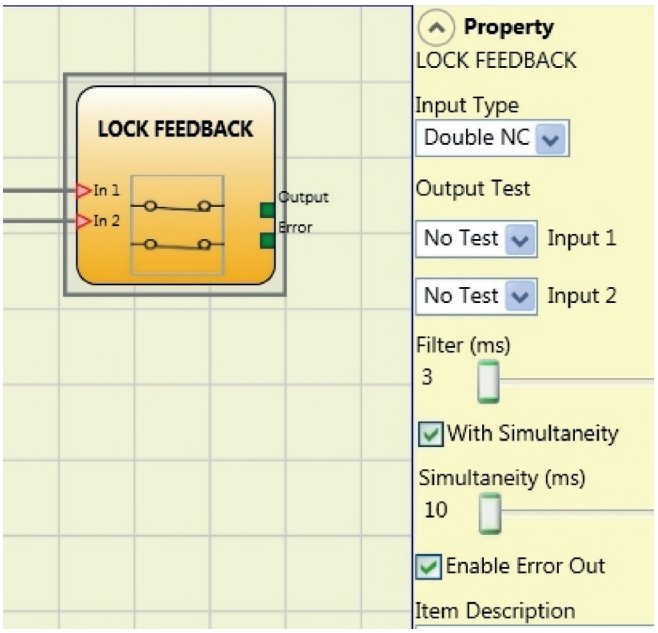
With Contemporaneity: If selected this activates the test to verify concurrent switching of the signals coming from the external contacts.

Contemporaneity (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the external contacts.

Enable Error Out: If selected reports a fault detected by the function block. Item description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

Lock Feedback

The function block LOCK FEEDBACK verifies the lock status of the guard lock device for mobile guard or safety gate. In the case where the inputs indicate that the guard is locked the Output will be 1 (TRUE). Otherwise the output is 0 (FALSE).

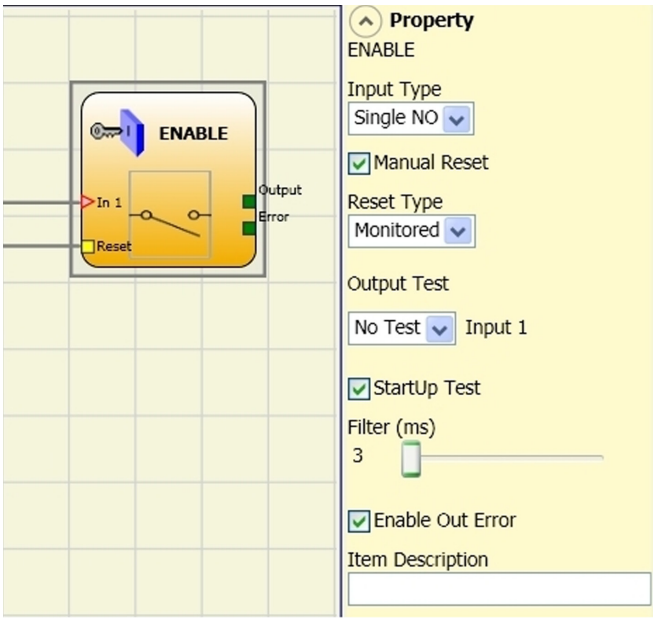


Parameters

Input type
Single NC – Allows connection of components with one NC contact;
Double NC – Allows connection of components with two NC contacts.
Double NC/NO – Allows connection of components with one NO contact and one NC.
Output test: This is used to select which test output signals are to be sent to the component contacts. This additional control permits detection and management of any short-circuits between the lines. To enable this control, the test output signals must be configured (amongst those available).
Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.
With Simultaneity: If selected this activates the test to verify concurrent switching of the signals coming from the external contacts.
Simultaneity (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the external contacts.
Enable Error Out: If selected reports a fault detected by the function block.
Item description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

ENABLE (enable key)

ENABLE function block verifies a manual key device Input status. If the key is not turned the output is 0 (FALSE). Otherwise the output is 1 (TRUE).

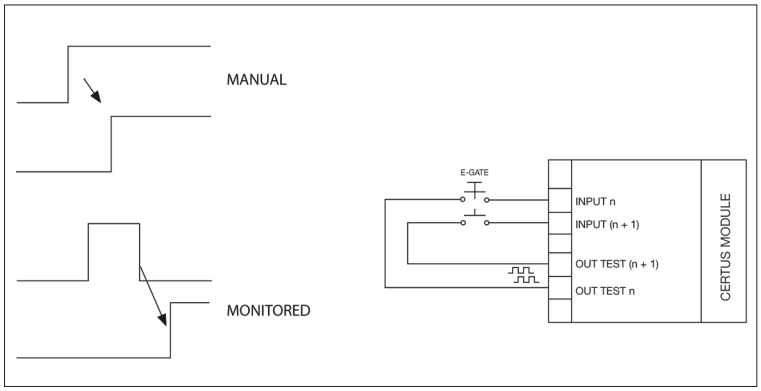


Parameters

Enable reset: If selected this enables the request to reset each time the command is activated. Otherwise, enabling of the output directly follows the input conditions.
There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1.

If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.

⇒ WARNING: If the Manual Reset is active, a consecutive Input have to be used. Example: Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.



Output test: This is used to select which test output signals are to be sent to the component contacts. This additional control permits detection and management of any short-circuits between the lines. To enable this control, the test output signals must be configured (amongst those available).

Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by opening and activating the enable key to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

With Contemporaneity: If selected this activates the test to verify concurrent switching of the signals coming from the external contacts.

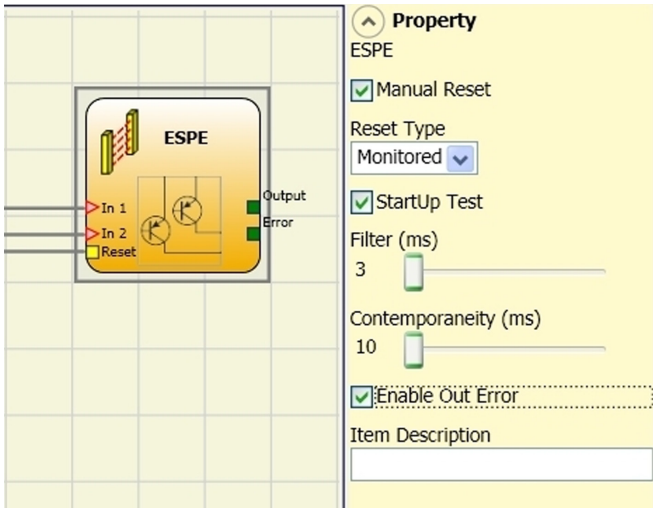
Contemporaneity (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the external contacts.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

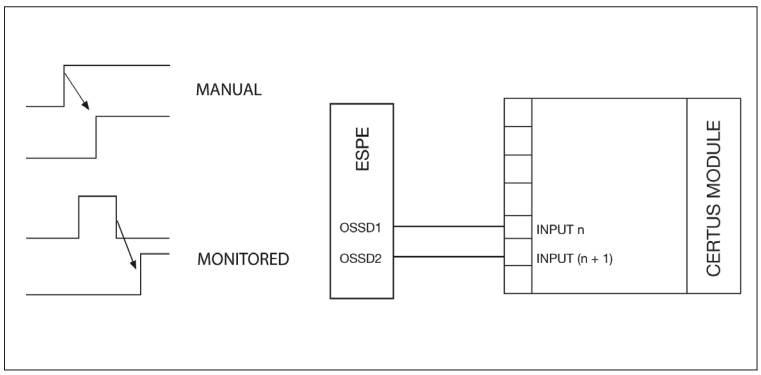
ESPE (optoelectronic safety light curtain / laser scanner)

ESPE function block verifies an optoelectronic safety light curtain (or laser scanner) inputs state. If the area protected by the light curtain is occupied, (light curtain outputs FALSE) the output is 0 (FALSE). Otherwise, with the area clear and outputs to 1 (TRUE) the output is 1 (TRUE).



Parameters

Enable reset: If selected this enables the request to reset each time the area protected by the safety light curtain is occupied. Otherwise, enabling of the output directly follows the input conditions.
There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.



⇒ WARNING: If the Manual Reset is active, a consecutive Input have to be used. Example : Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.

OUT TEST signals cannot be used in case of safety static output ESPE because the control is carried out from the ESPE.

Test at start-up: If selected this enables the test at start-up of the safety light curtain. This test
is performed by occupying and clearing the area protected by the safety light curtain to run a complete function test and enable the output. This test is only requested at machine startup (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the safety light curtain. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts.
The length of the filter affects the calculation of the unit's total response time.
With Contemporaneity: If selected this activates the test to verify concurrent switching of the signals coming from the safety light curtain.

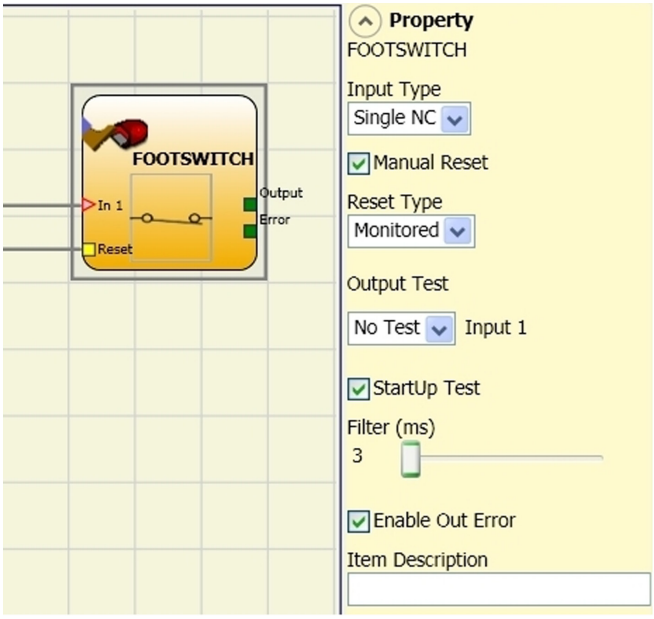
Contemporaneity (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the safety light curtain.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: This allows a description of the component's function to be entered.
The text is displayed in the top part of the symbol.

Footswitch (safety pedal)

The FOOTSWITCH function block verifies the status of the inputs of a safety pedal device. If the pedal is not pressed the output is 0 (FALSE). Otherwise the output is 1 (TRUE).

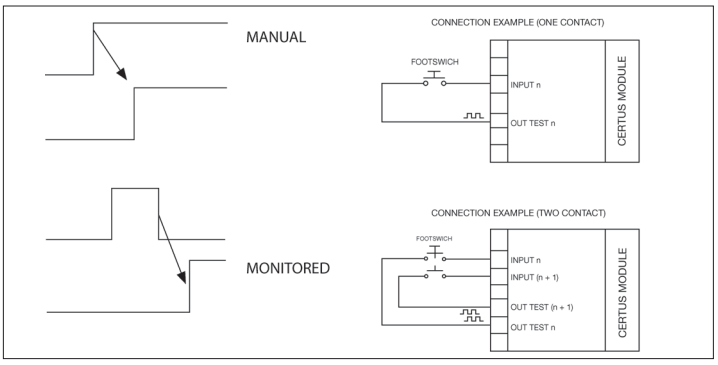


Parameters

Input type:
- Single NC – Allows connection of pedals with one NC contact
- Single NO – Allows connection of pedals with one NO contact.
- Double NC – Allows connection of pedals with two NC contacts
- Double NC/NO – Allows connection of pedals with one NO contact and one NC.

Manual reset: If selected this enables the request to reset each time the safety pedal is activated. Otherwise, enabling of the output directly follows the input conditions.

There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.



⇒ WARNING: If the Manual Reset is active, a consecutive Input have to be used. Example: Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the component contacts. This additional control permits detection and management of any short-circuits between the lines. To enable this control, the test output signals must be configured (amongst those available).

Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by pressing and releasing the footswitch to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

With Contemporaneity: If selected this activates the test to verify concurrent switching of the signals coming from the external contacts.

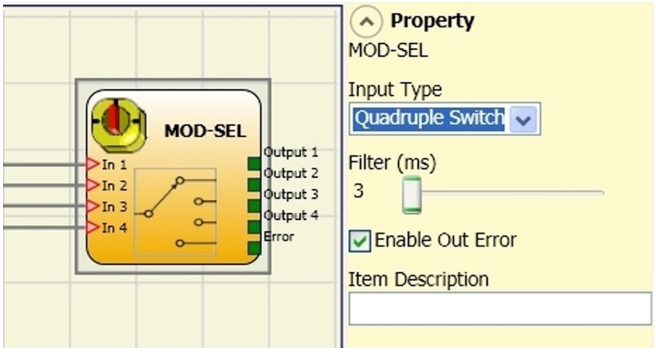
Contemporaneity (ms): This is only active if the previous parameter is enabled. It defines the maximum time (in msecs) between the switching of two different signals from the external contacts.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

MOD-SEL (safety selector)

The MOD-SEL function block verifies the status of the inputs from a mode selector (up to 4 inputs): If only one input is 1 (TRUE) the corresponding output is also 1 (TRUE). In all other cases, and thus when all inputs are 0 (FALSE) or more than one input is 1 (TRUE) all the outputs are 0 (FALSE).



Parameters

Input type:
- Double selector – Allows connection of two-way mode selectors.
- Triple selector – Allows connection of three-way mode selectors.
- Quadruple selector - Allows connection of four-way mode selectors.

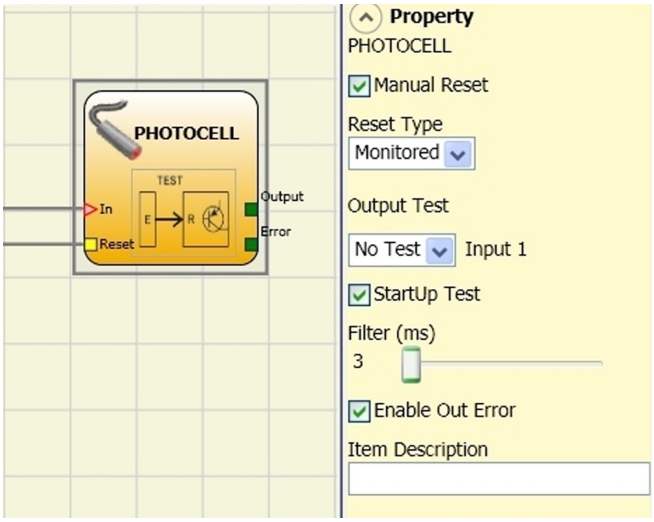
Filter (ms): This is used to filter the signals coming from the mode selector. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

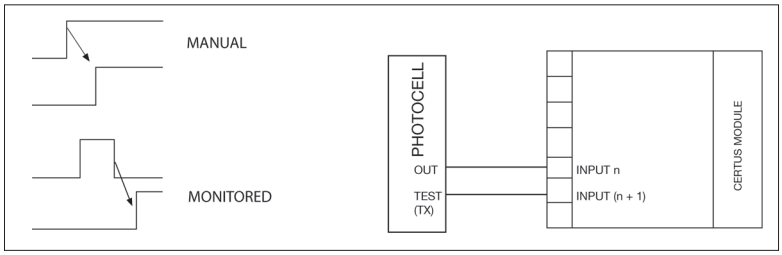
Photocell (safety selector)

The PHOTOCELL function block verifies the status of the inputs of an optoelectronic safety photocell. If the beam of the photocell is occupied (photocell output FALSE) the output is 0 (FALSE). Otherwise with the beam clear and an output of 1 (TRUE) the output is 1 (TRUE).



Parameters

Manual reset: If selected this enables the request to reset each time safety photocell is activated. Otherwise, enabling of the output directly follows the input conditions.
There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.



⇒ WARNING: If the Manual Reset is active, a consecutive Input have to be used. Example: Input 1 is used for the fuctional block, then Input 2 have to be used for the Reset Input.

Output test: This is used to select which test output are to be sent to the photocell test input. This additional control permits detection and management of any short-circuits between the lines. To enable this control, the test output signals must be configured (amongst those available).

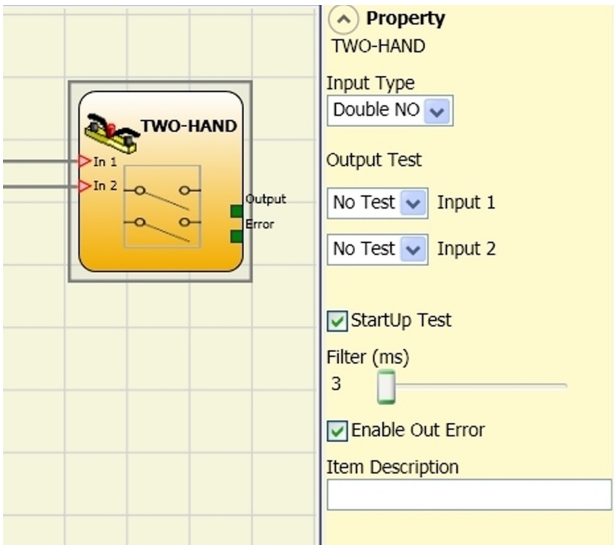
Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by occupying and clearing the photocell to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

Two-Hand (bimanual control)



The TWO HAND function block verifies the status of the inputs of a two hand control switch. Only if both the press-buttons are pressed within 500 msec the output is 1 (TRUE). Otherwise the output is 0 (FALSE).

Input type:
- Double NO – Allows connection of twohand switch with one NO contact for each button.
- Quadruple NC-NO - Allows connection of two- hand switch with a double NO/NC contact for each button.

Output test: This is used to select which test output signals are to be sent to the component contacts. This additional control permits detection and management of any short-circuits between the lines. To enable this control, the test output signals must be configured (amongst those available).

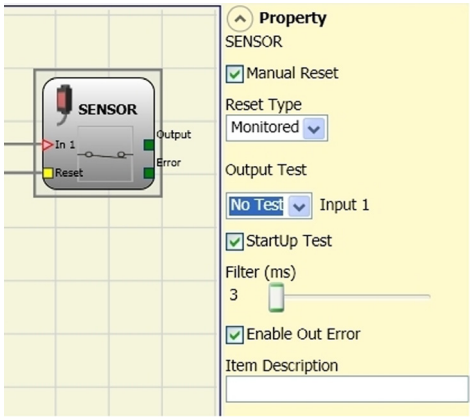
Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by pressing the two buttons (within 500 msec) and releasing them to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

Filter (ms): This is used to filter the signals coming from the mode selector. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

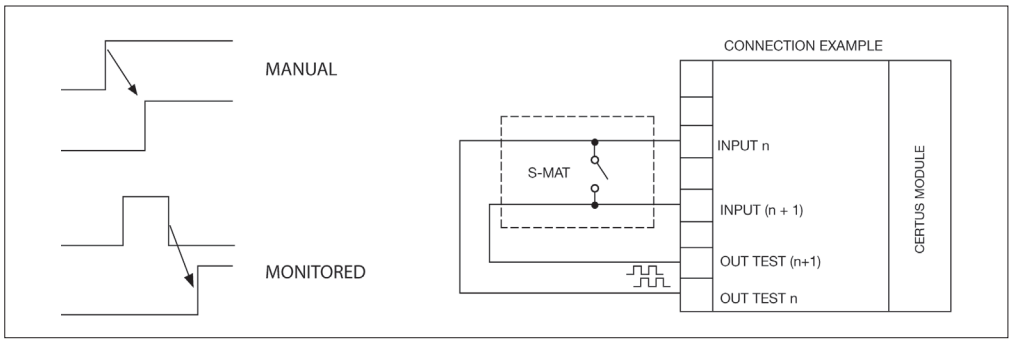
Sensor



The SENSOR function block verifies the status of the input of a sensor (not a safety sensor). If the beam of the sensor is occupied (sensor output FALSE) the output is 0 (FALSE). Otherwise, with the beam clear and an output of 1 (TRUE) then the output is 1 (TRUE).

Sensor

Manual reset: If selected this enables the request to reset each time the area protected by the sensor is occupied. Otherwise, enabling of the output directly follows the input conditions. There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.



⇒ WARNING: If the Manual Reset is active, a consecutive Input have to be used. Example : Input 1 is used for the fuctional block, then Input 2 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the sensor. This additional control permits detection and management of any short-circuits between the lines. To enable this control, the test output signals must be configured (amongst those available).

Test at start-up: If selected this enables the test at start-up of the sensor. This test is performed by occupying and clearing the area protected by the sensor to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

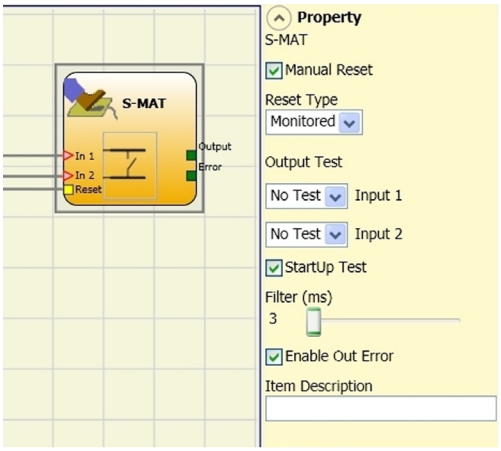
Filter (ms): This is used to filter the signals coming from the sensor. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: This allows a description of the component's function to be entered.
The text is displayed in the top part of the symbol.

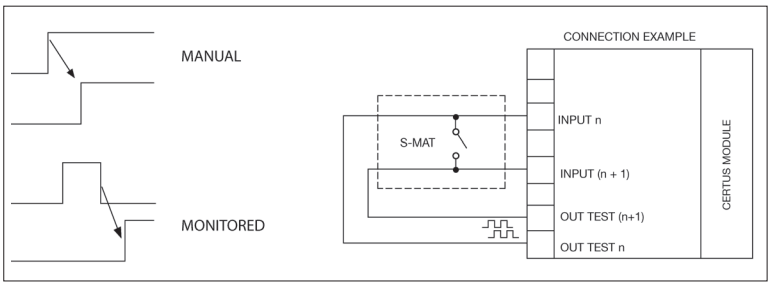
S-MAT (safety selector)

The S-MAT function block verifies the status of the inputs of a safety mat. If a person stands on the mat the output is 0 (FALSE). Otherwise, with the mat clear, the output is 1 (TRUE).



Parameters

Manual reset: If selected this enables the request to reset each time the mobile guard/safety gate is activated. Otherwise, enabling of the output directly follows the input conditions. There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.



⇒ If the Manual Reset is active, a consecutive Input have to be used. Example : Input 1 and Input 2 are used for the fuctional block, then Input 3 have to be used for the Reset Input.
⇒ Each output OUT TEST can be connected to only one input S-MAT (it is not allowed parallel connection of 2 inputs).
⇒ The function block S-MAT can not be used with 2-wire components and termination resistance.

Output test: This is used to select which test output signals are to be sent to the s mat contact. This additional control permits detection and management of any short-circuits between the lines. To enable this control, the test output signals must be configured (amongst those available). Test signals are mandatory.

Test at start-up: If selected this enables the test at start-up of the external component. This test is performed by pressing and releasing the safety mat to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).

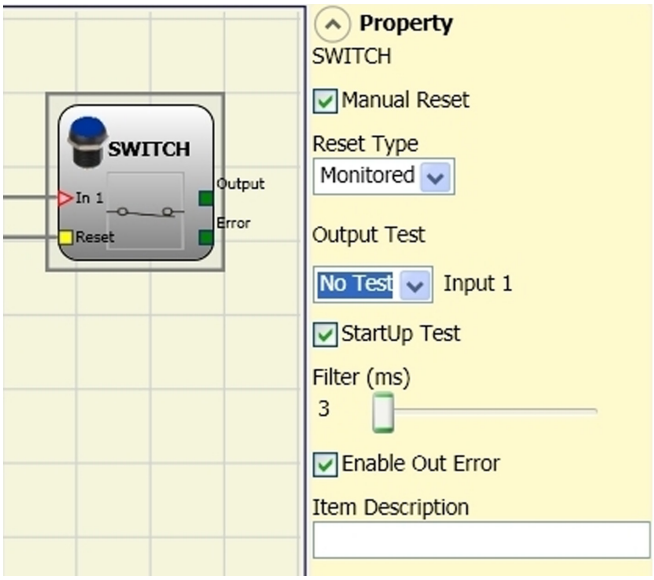
Filter (ms): This is used to filter the signals coming from the external contacts. The filter can be configured to between 3 and 250 ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

Switch

SWITCH function block verifies the input status of a pushbutton or switch (NOT SAFETY SWITCHES).
If the pushbutton is pressed the output is 1 (TRUE). Otherwise, the output is 0 (FALSE).

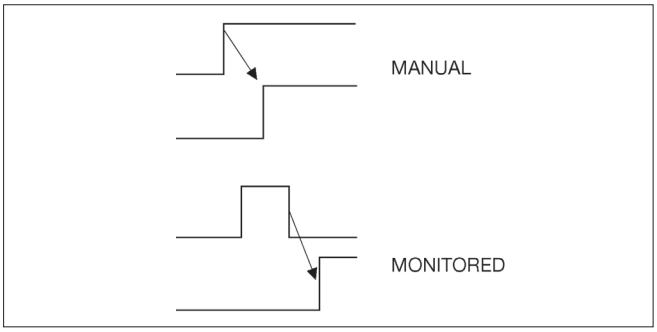


Parameters

Manual reset: If selected this enables the request to reset each time the device is activated.
Otherwise, enabling of the output directly follows the input conditions.

There are two types of reset:
Manual and Monitored.

When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.



⇒ WARNING: If the Manual Reset is active, a consecutive Input have to be used. Example: Input 1 is used for the fuctional block, then Input 2 have to be used for the Reset Input.

Output test: This is used to select which test output signals are to be sent to the switch.
This additional control permits detection and management of any short-circuits between the lines.
To enable this control, the test output signals must be configured (amongst those available)

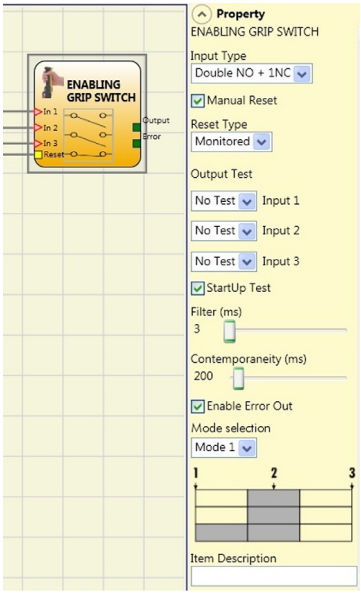
Test at start-up: If selected this enables the test at start-up of the switch. This test is performed by opening and closing the switch contact to run a complete function test and enable the output. This test is only requested at machine start-up (when the unit is switched on).
Filter (ms): This is used to filter the signals coming from the switch. The filter can be configured to between 3 and 250ms and eliminates any bouncing on the contacts. The length of the filter affects the calculation of the unit's total response time.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: This allows a description of the component's function to be entered. The text is displayed in the top part of the symbol.

Enabling Grip Switch

The ENABLING GRIP functional block checks the status of the Inx inputs of an enabling grip. If this is not gripped (position 1) or is gripped completely (position 3), the OUTPUT will be 0 (FALSE). If it is gripped to middle position (position 2), the OUTPUT will be 1 (TRUE).
Refer to truth tables at the bottom of the page.



⇒ The ENABLING GRIP functional block requires that the assigned module has a minimum Firmware version as Table below:

CMM	C 8I 2O	C 8I	C 16I	C 12I 8TO
1.0	0.4	0.4	30.4	0.0

Enabling Grip Switch

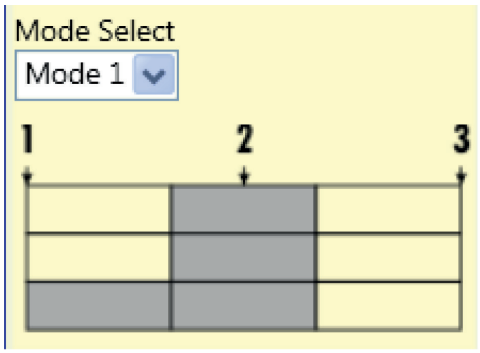
Type of inputs:
- Double NO – Permits connection of an enabling grip with 2 NO contacts.
- Double NO+1NC – Permits connection of an enabling grip switch with 2 NO contacts + 1 NC contact.

Test outputs: Permits selection of the test output signals to be sent to the enabling grip. This additional control permits detection and management of any short-circuits between the lines. To enable this control, the test output signals must be configured (amongst those available).

Power-on test: If selected, enables the power-on test of the external component (Enabling Grip). To run the test, the device must be gripped and released to carry out a complete functional check and enable the Output terminal. This control is required only at machine start-up (power-on of the module).
Simultaneity (ms): always active. Determines that maximum permissible time (msec) between switching of the various signals from the external contacts of the device.

Filter (ms): Permits filtering of signals from the device control. This filter can be set to between 3 and 250ms and eliminates any rebounds on the contacts. The duration of the filter affects calculation of module total response time.

Table Mode 1 (device 2NO - 1NC)

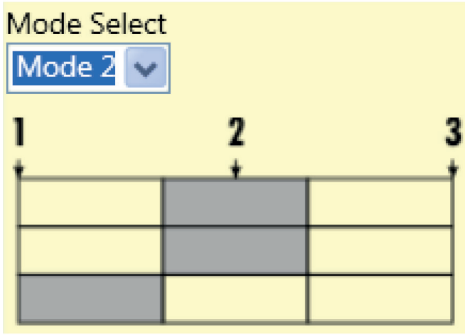


POSITION 1: enabling grip fully released
POSITION 2: enabling grip pressed to middle position
POSITION 3: enabling grip fully pressed.

(Only with 21NO + 1NC)

	Position		
Input	**1**	**2**	**3**
IN1	0	1	0
IN2	0	1	0
IN3	0	1	0
OUT	**0**	**1**	**0**

Table Mode 1 (device 2NO - 1NC)



POSITION 1: enabling grip fully released
POSITION 2: enabling grip pressed to middle position
POSITION 3: enabling grip fully pressed.

(Only with 21NO + 1NC)

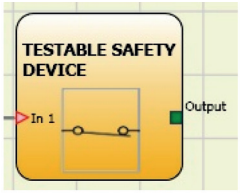
	Position		
Input	**1**	**Input**	**1**
IN1	0	1	0
IN2	0	1	0
IN3	1		0
OUT	**0**	**1**	**0**

Enable Error Out: If selected reports a fault detected by the function block. Item description: Permits insertion of a descriptive text of the function of the component.
This text will be displayed in the top part of the symbol.

Testable Safety Device

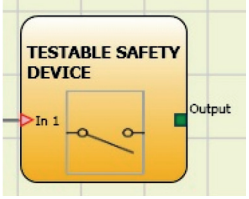
The TESTABLE SAFETY DEVICE functional block checks the status of the Inx inputs of a single or double safety sensor, both NO and NC. Refer to the tables below to check type of sensor and behaviour.

(Single NC)

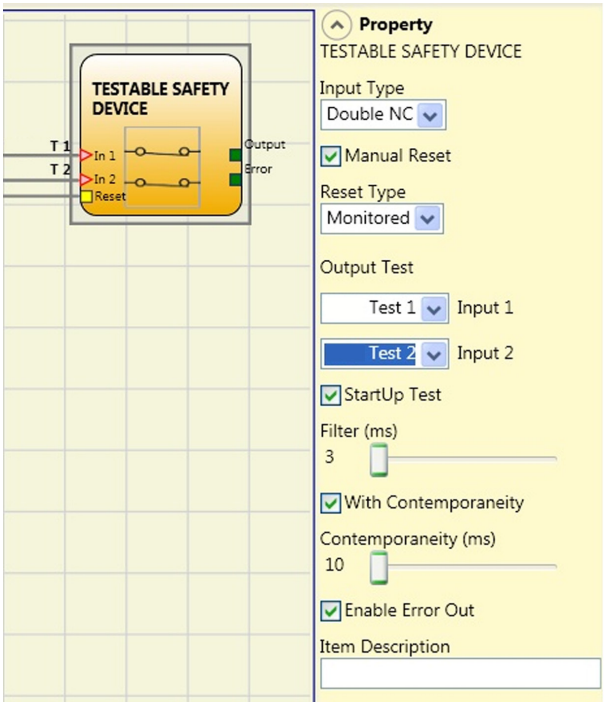


IN1	OUT
0	0
1	1

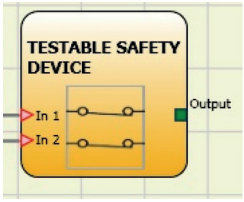
(Single NO)



IN1	OUT
0	0
1	1

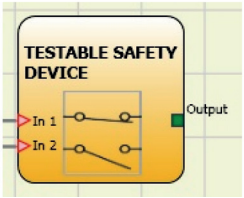


(Double NC)



IN1	IN2	OUT	Simultaneity error*
0	0	**0**	-
1	1	**0**	X
0	0	**0**	X
1	1	**0**	-

(Double NC-NO)



IN1	IN2	OUT	Simultaneity error*
0	0	**0**	X
0	1	**0**	-
1	0	**1**	-
1	1	**0**	X

* Simultaneity error = the maximum time between switching of the single contacts has been exceeded.

Parameters

Manual Reset: If selected, enables the reset request after each activation of the device. Otherwise, enabling of the output follows directly the conditions of the inputs. Reset may be of two types: Manual and Monitored. Selecting the Manual option, only transition of the signal from 0 to 1 is checked. If Monitored is selected, double transition from 0 to 1 and return to 0 is checked.

⇒ WARNING: if Reset is enabled, the input consecutive to those used by the functional block must be used. For example: If inputs 1 and 2 are used for the functional block, input 3 must be used for Reset.

Power-on test: If selected, enables the power-on test of the device. This test requires activation and de-activation of the device in order to run a complete functional check and enable the Output terminal. This test is required only at machine start-up (power-on of the module).

Filter (ms): Permits filtering of signals from the device. This filter can be set to between 3 and 250 ms and eliminates any rebounds on the contacts. The duration of the filter affects calculation of module total response time.

With contemporaneity: If selected, activates control of simultaneity between switching of signals from the device.

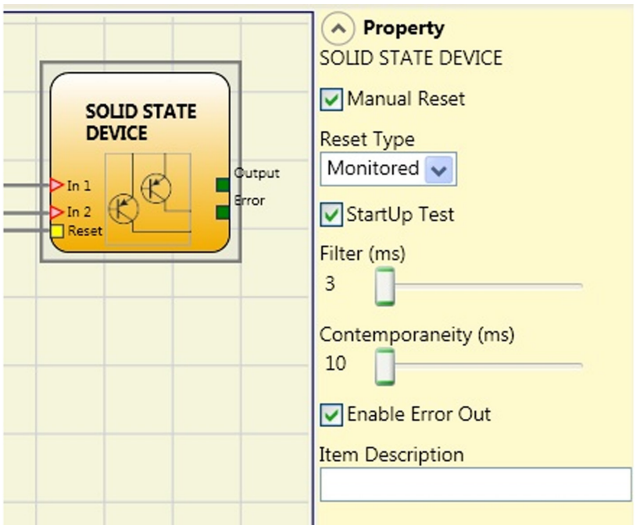
Contemporaneity (ms): Is active only if the previous parameter is enabled. Determines the maximum permissible time (msec) between switching of two different signals from the sensor.

Enable Error Out: If selected reports a fault detected by the function block.

Item description: Permits insertion of a descriptive text of the function of the component. This text will be displayed in the top part of the symbol.

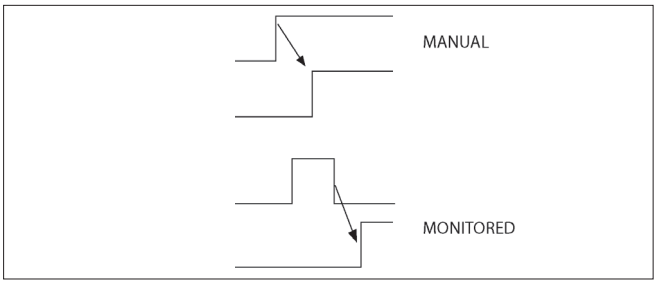
Solid State Device

The SOLID STATE DEVICE functional block checks the status of the Inx inputs. If the inputs are at 24VDC, the Output will be 1 (TRUE), otherwise the OUTPUT will be 0 (FALSE).



Parameters

Manual Reset: If selected, enables the reset request after each occupation of the area protected by the light curtain.
Otherwise, enabling of the output follows directly the conditions of the inputs. Reset may be of two types: Manual and Monitored. Selecting the Manual option, only transition of the signal from 0 to 1 is checked.
If Monitored is selected, double transition from 0 to 1 and return to 0 is checked.



⚠ WARNING: if Reset is enabled, the input consecutive to those used by the functional block must be used. For example: if inputs 1 and 2 are used for the functional block, input 3 must be used for Reset.

Power-on test: If selected, enables the power-on test of the safety device. This test requires activation and de-activation of the device in order to run a complete functional check and enable the Output terminal. This test is required only at machine start-up (power-on of the module).

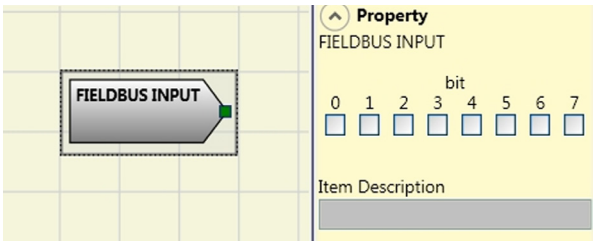
Filter (ms): Permits filtering of signals from the safety device. This filter can be set to between 3 and 250 ms and eliminates any rebounds on the contacts. The duration of the filter affects calculation of module total response time.

Contemporaneity (ms): Determines that maximum permissible time (msec) between switching of two different signals from the device.

Enable Error Out: If selected reports a fault detected by the function block.
Item description: Permits insertion of a descriptive text of the function of the component. This text will be displayed in the top part of the symbol.

Fieldbus Input

Element that permits insertion of a nonsafety input whose status is modified via the fieldbus.
Up to 8 virtual inputs can be inserted and the bit on which status is to be modified must be selected for each. They are represented with one byte on the fieldbus. (For more detailed information, consult the fieldbus manual on the CCS CD-ROM).



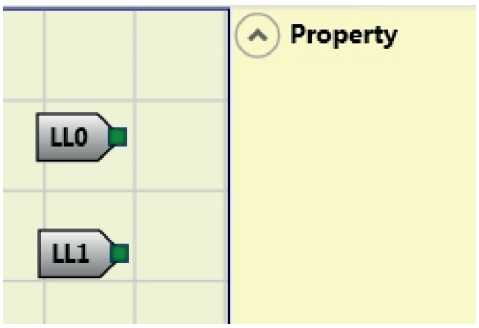
WARNING: The Fieldbus Input is NOT a safety input.

LL0 - LL1

These allow a predefined logical level to be enteredon a component's input.

LL0= Logical Level 0
LL1= Logical Level 1

IMPORTANT: LL0 and LL1 cannot be used to disable the logical ports in the diagram.



Comments

This allows a description to be entered and placed in any point of the diagram.

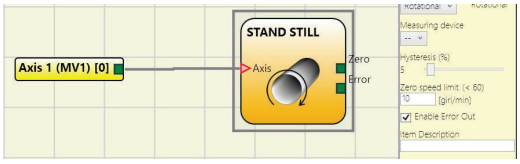
Title

Automatically adds the name of the manufacturer, the designer, the project name and the CRC.

Speed Control Type Function Blocks

Warning Concerning Safety

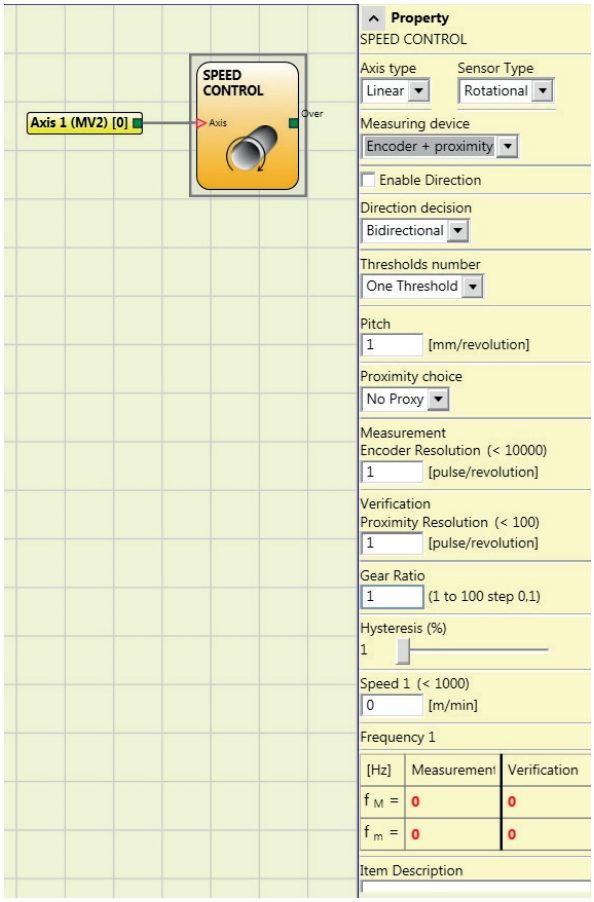
• An external error or malfunction deriving from encoder/proximity or its wiring, does not necessarily involve a change of safety status of the normal output (i.e. "Zero") of the function block. Failures or malfunctions of encoder/proximity switch or its wiring are then recognized by the module, managed and specified via the diagnostic bit on every function block ("Enable Error Out").
• To ensure the safety features the diagnostic bit has to be used in the configuration program created by the user to cause a possible deactivation of the outputs if the axis is working. In absence of encoder/proximity external anomalies, Error bit will be equal to 0 (zero).
• In presence of encoder/proximity external anomalies, error_out bit will be equal to 1 (one):
- Absence of encoder or proximity.
- Absence of one or more wiring from encoder/proximity.
- Absence of encoder power supply (only model with TTL external power supply).
- Error of congruence frequencies between signals from encoder/proximity.
- Phase error between signals from the encoder or duty cycle error of a single phase.



Speed Control Type Function Blocks

Speed Control

The **Speed Control** function block monitors the speed of a device generating an output 0 (FALSE) when the measured speed exceeds a predetermined threshold. In the case in which the speed is below the predetermined threshold the output will be 1 (TRUE).



Parameters

Axis type: It defines the type of axis controlled by the device. It will be Linear in the case of a translation and will be Rotary in the case of motion around an axis.

Sensor Type: In the event that the previous parameter is Linear, the Sensor Type defines the type of sensor connected to the module inputs. It can be Rotary (e.g. shaft encoder) or Linear (e.g. optical array). This choice allows to define the following parameters.

Measuring device: It defines the type of sensor(s) used. The possible choices are:

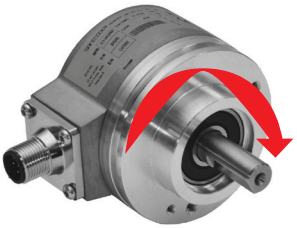
- Encoder
- Proximity
- Encoder+Proximity
- Proximity1+ Proximity2
- Encoder1+ Encoder2

Enable direction: Enabling this parameter, the DIR output is enabled on the function block. This output will be 1 (TRUE) when the axis rotates Counterclockwise and will be 0 (FALSE) when the axis rotates Clockwise

Direction decision: It defines the direction of rotation for which the set thresholds are made active. The possible choices are:

- Bidirectional
- Clockwise
- Counterclockwise

If Bidirectional is selected, the excess of the set threshold is detected whether the axis rotates clockwise or counterclockwise. Selecting Clockwise or Counterclockwise, this is detected only when the axis rotates in the selected direction.



Example of Clockwise axis rotation

2 threshold settings

In	Threshold no.
0	Speed 1
1	Speed 2

4 threshold settings

In2	In1	Threshold no.
0	0	Speed 1
0	1	Speed 2
1	0	Speed 3
1	1	Speed 4

Threshold number: It allows you to enter the number of thresholds for the maximum value of speed. Changing this value will increase/decrease the number of thresholds that can be entered from a minimum of 1 to a maximum of 4. In the case of thresholds greater than 1, the input pins for the selection of the specific threshold will appear in the lower part of the function block.

If the Axis Type chosen was linear, this field allows you to enter the sensor pitch to obtain a conversion between sensor revolutions and distance travelled.

Pitch: If the axis type chosen was linear, this field allows you to enter the sensor pitch to obtain a conversion between sensor revolutions and distance travelled.

Proximity choice: It allows you to choose the type of proximity sensor from PNP, NPN, Normally Open (NA) and Normally Closed (NC), with 3 or 4 wires.

(In order to ensure a Performance Level = PLe use a proximity switch type PNP NO: ref. “Interleaved proximity ->).

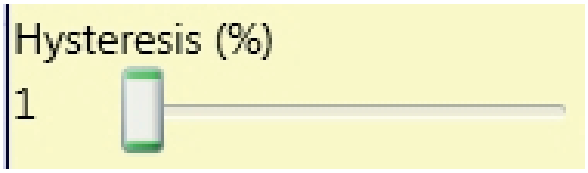
No Proximity
PNP 3-wire NC
PNP 3-wire NO
NPN 3-wire NO
NPN 3-wire NC
PNP 4-wire NC/NO
NPN 4-wire NC/NO
PNP/NPN 4-wire NC/NC
PNP/NPN 4-wire NO/NO

Measurement: Enter in this field the number of pulses/revolution (in the case of rotary sensor) or µm/pulse (linear sensor) relating to the sensor used

Verification: Enter in this field the number of pulses/revolution (in the case of rotary sensor) or µm/pulse (linear sensor) relating to the second sensor used.

Gear Ratio: This parameter is active if there are two sensors on the selected axis. This parameter allows you to enter the ratio between the two sensors. If both sensors are on the same moving parts, the ratio will be 1 otherwise the number corresponding to the report must be entered. E.g. there are an encoder and a proximity switch, and the latter is on a moving part that (due to a gear reduction ratio) rotates at twice the speed of the encoder. Therefore, this value must be set at 2.

Hysteresis (%): It represents the percentage hysteresis value below which the speed change is filtered. Enter a value other than 1 to avoid continuous switching as the input changes.



Speed 1, 2, 3, 4: Enter in this field the maximum speed value above which the function block output (OVER) will be 0 (FALSE). If the measured speed is less than the set value, the function block output (OVER) will be 1 (TRUE).

Frequency: It shows the maximum calculated frequency values fM and fm (decreased by the hysteresis set). If the displayed value is GREEN, the calculation of frequency gave a positive result. If the displayed value is RED, it is necessary to change the parameters given in the following formulas.

KEY:

f = frequency

Rpm = rotational speed

Resolution = measurement

1. Rotary axis, rotary sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{\mathrm{rpm[rev/min]}}{60} * \mathrm{Resolution[pulses/rev]}$$

2. Linear axis, rotary sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{speed[\mathrm{m/min}]*1000}{60 * pitch[\mathrm{mm/rev}]} * \mathrm{Re}\, solution[\mathrm{pulses/rev}]$$

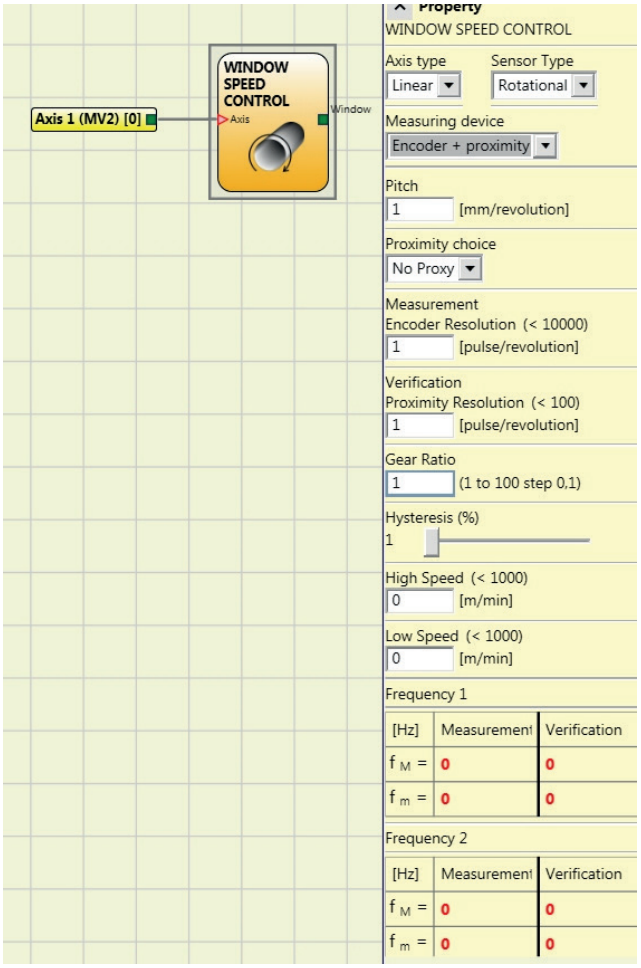
3. Linear axis, linear sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{\mathrm{speed[mm/s]}*1000}{\mathrm{Resolution[\mu m/pulse]}}$$

4. Hysteresis. To be changed only if: fM=green; fm=red

Window Speed Control

The Window Speed Control function block monitors the speed of a device, generating the Zero to 1 (TRUE) output when the speed is within a prefixed range.



Parameters

Axis type: It defines the type of axis controlled by the device. It will be Linear in the case of a translation and will be Rotary in the case of motion around an axis.

Sensor Type: In the event that the previous parameter is Linear, the Sensor Type defines the type of sensor connected to the module inputs. It can be Rotary (e.g. shaft encoder) or Linear (e.g. optical array). This choice allows to define the following parameters.

Measuring device: It defines the type of sensor(s) used. The possible choices are:
Encoder
Proximity
Encoder+Proximity
Proximity1+ Proximity2
Encoder1+ Encoder2

Pitch: If the Axis Type chosen was linear, this field allows you to enter the sensor pitch to obtain a conversion between sensor revolutions and distance travelled.

Proximity choice: It allows you to choose the type of proximity sensor from PNP, NPN, Normally Open (NA) and Normally Closed (NC), with 3 or 4 wires.

(In order to ensure a Performance Level = PLe use a proximity switch type PNP NO: ref. “Interleaved proximity ->).

No Proximity
PNP 3-wire NC
PNP 3-wire NO
NPN 3-wire NO
NPN 3-wire NC
PNP 4-wire NC/NO
NPN 4-wire NC/NO
PNP/NPN 4-wire NC/NC
PNP/NPN 4-wire NO/NO

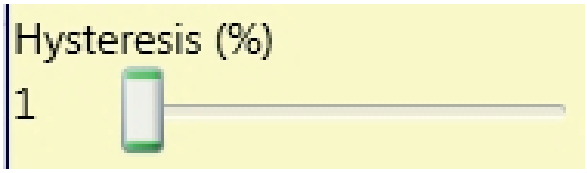
Proximity choice

Measurement: Enter in this field the number of pulses/revolution (in the case of rotary sensor) or µm/pulse (linear sensor) relating to the sensor used.

Verification: Enter in this field the number of pulses/revolution (in the case of rotary sensor) or µm/pulse (linear sensor) relating to the second sensor used.

Gear Ratio: This parameter is active if there are two sensors on the selected axis. This parameter allows you to enter the ratio between the two sensors. If both sensors are on the same moving parts, the ratio will be 1 otherwise the number corresponding to the report must be entered. E.g. there are an encoder and a proximity switch, and the latter is on a moving part that (due to a gear reduction ratio) rotates at twice the speed of the encoder. Therefore, this value must be set at 2.

Hysteresis (%): It represents the percentage hysteresis value below which the speed change is filtered. Enter a value other than 1 to avoid continuous switching as the input changes.



High speed:
Enter in this field the maximum speed value above which the output of the function block (ZERO) will be 0 (FALSE). If the measured speed is less than the set value, the output (ZERO) of the function block will be 1 (TRUE).

Low speed: It shows the maximum calculated frequency values fM and fm (decreased by the hysteresis set). If the displayed value is GREEN, the calculation of frequency gave a positive result.
If the displayed value is RED, it is necessary to change the parameters given in the following formulas.

KEY:

f = frequency
Rpm = rotational speed
Resolution = measurement

1. Rotary axis, rotary sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{\mathrm{rpm[rev/min]}}{60} * \mathrm{Resolution[pulses/rev]}$$

2. Linear axis, rotary sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{speed[\mathrm{m/min}] * 1000}{60 * pitch[\mathrm{mm/rev}]} * \mathrm{Re}\,solution[\mathrm{pulses/rev}]$$

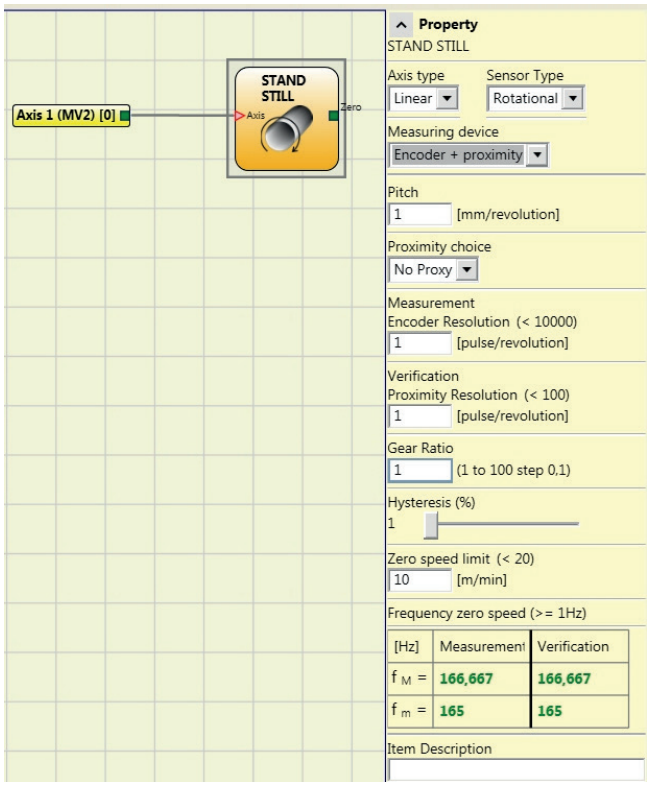
3. Linear axis, linear sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{\mathrm{speed[mm/s]} * 1000}{\mathrm{Resolution[\mu m/pulse]}}$$

4. Hysteresis. To be changed only if: fM=green; fm=red

Stand Still

The StandStill and Speed Control function block monitors the speed of a device, generating the Zero to 1 (TRUE) output when the speed is lower than a selected value.



Parameters

Axis type: It defines the type of axis controlled by the device. It will be Linear in the case of a translation and will be Rotary in the case of motion around an axis.

Sensor Type: In the event that the previous parameter is Linear, the Sensor Type defines the type of sensor connected to the module inputs. It can be Rotary (e.g. shaft encoder) or Linear (e.g. optical array). This choice allows to define the following parameters.

Measuring device: It defines the type of sensor(s) used. The possible choices are:

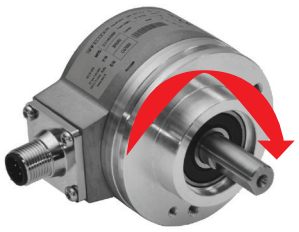
- Encoder
- Proximity
- Encoder+Proximity
- Proximity1+ Proximity2
- Encoder1+ Encoder2

Pitch: If the Axis Type chosen was linear, this field allows you to enter the sensor pitch to obtain a conversion between sensor revolutions and distance travelled.

Proximity choice: It allows you to choose the type of proximity sensor from PNP, NPN, Normally Open (NA) and Normally Closed (NC), with 3 or 4 wires.
(In order to ensure a Performance Level = PLe use a proximity switch type PNP NO: ref. “Interleaved proximity ->).

Measurement: Enter in this field the number of pulses/revolution (in the case of rotary sensor) or µm/pulse (linear sensor) relating to the sensor used

Verification: Enter in this field the number of pulses/revolution (in the case of rotary sensor) or µm/pulse (linear sensor) relating to the second sensor used.



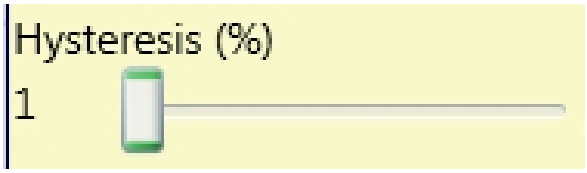
Example of Clockwise axis rotation

No Proximity
PNP 3-wire NC
PNP 3-wire NO
NPN 3-wire NO
NPN 3-wire NC
PNP 4-wire NC/NO
NPN 4-wire NC/NO
PNP/NPN 4-wire NC/NC
PNP/NPN 4-wire NO/NO

Proximity choice

Gear Ratio: This parameter is active if there are two sensors on the selected axis. This parameter allows you to enter the ratio between the two sensors. If both sensors are on the same moving parts, the ratio will be 1 otherwise the number corresponding to the report must be entered. E.g. there are an encoder and a proximity switch, and the latter is on a moving part that (due to a gear reduction ratio) rotates at twice the speed of the encoder. Therefore, this value must be set at 2.

Hysteresis (%): It represents the percentage hysteresis value below which the speed change is filtered. Enter a value other than 1 to avoid continuous switching as the input changes.



Zero speed limit:
Enter in this field the maximum speed value above which the output of the function block (ZERO) will be 0 (FALSE). If the measured speed is less than the set value, the output (ZERO) of the function block will be 1 (TRUE).

Frequency zero speed/Frequency1/ Frequency2: It shows the maximum calculated frequency values fM and fm (decreased by the hysteresis set). If the displayed value is GREEN, the calculation of frequency gave a positive result.
If the displayed value is RED, it is necessary to change the parameters given in the following formulas:

KEY:

f = frequency
Rpm = rotational speed
Resolution = measurement

1. Rotary axis, rotary sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{\mathrm{rpm[rev/min]}}{60} * \mathrm{Resolution[pulses/rev]}$$

2. Linear axis, rotary sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{speed[\mathrm{m/min}]*1000}{60 * pitch[\mathrm{mm/rev}]} * \mathrm{Re}\,solution[\mathrm{pulses/rev}]$$

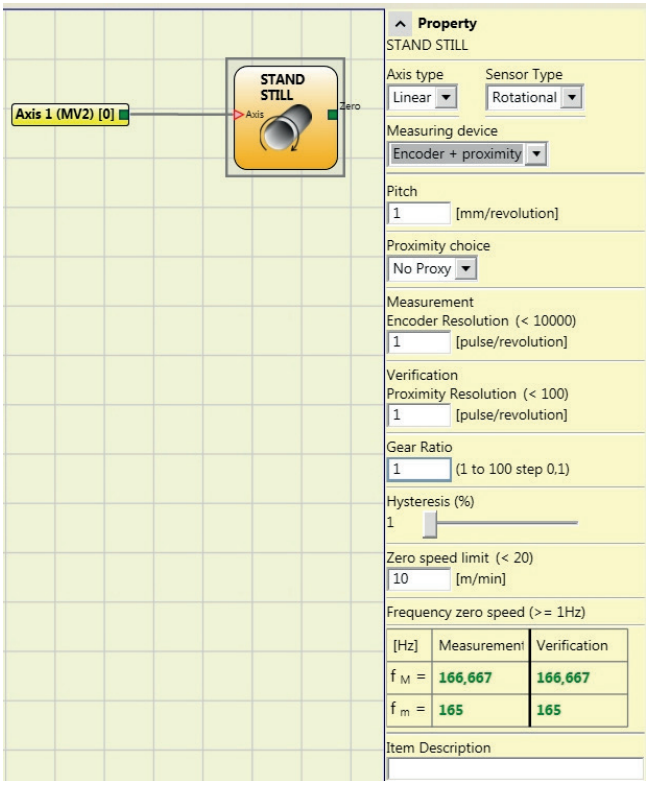
3. Linear axis, linear sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{\mathrm{speed[mm/s]}*1000}{\mathrm{Resolution[\mu m/pulse]}}$$

4. Hysteresis. To be changed only if: fM=green; fm=red

Stand Still and Speed Control

The **StandStill and Speed Control** function block monitors the speed of a device, generating the Zero to 1 (TRUE) output when the speed is lower than a selected value. In addition, it generates the Over = 0 (FALSE) output if the measured speed exceeds a predetermined threshold.



Parameters

Axis type: It defines the type of axis controlled by the device. It will be Linear in the case of a translation and will be Rotary in the case of motion around an axis.

Sensor Type: In the event that the previous parameter is Linear, the Sensor Type defines the type of sensor connected to the module inputs. It can be Rotary (e.g. shaft encoder) or Linear (e.g. optical array). This choice allows to define the following parameters.

Measuring device: It defines the type of sensor(s) used. The possible choices are:

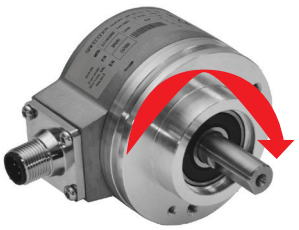
- Encoder
- Proximity
- Encoder+Proximity
- Proximity1+ Proximity2
- Encoder1+ Encoder2

Enable direction: Enabling this parameter, the DIR output is enabled on the function block. This output will be 1 (TRUE) when the axis rotates Counterclockwise and will be 0 (FALSE) when the axis rotates Clockwise.

Direction decision: It defines the direction of rotation for which the set thresholds are made active. The possible choices are:

- Bidirectional
- Clockwise
- Counterclockwise

If Bidirectional is selected, the excess of the set threshold is detected whether the axis rotates clockwise or counterclockwise. Selecting Clockwise or Counterclockwise, this is detected only when the axis rotates in the selected direction.



Example of Clockwise axis rotation

In1	Threshold no.
0	Speed 1
1	Speed 2

In1	In2	Threshold no.
0	0	Speed 1
0	1	Speed 2
1	0	Speed 3
1	1	Speed 4

Threshold number: It allows you to enter the number of thresholds for the maximum value of speed. Changing this value will increase/decrease the number of thresholds that can be entered from a minimum of 1 to a maximum of 4. In the case of thresholds greater than 1, the input pins for the selection of the specific threshold will appear in the lower part of the function block.

Pitch: If the Axis Type chosen was linear, this field allows you to enter the sensor pitch to obtain a conversion between sensor revolutions and distance travelled.

Proximity choice: It allows you to choose the type of proximity sensor from PNP, NPN, Normally Open (NA) and Normally Closed (NC), with 3 or 4 wires. (In order to ensure a Performance Level = PLe use a proximity switch type PNP NO: ref. “Interleaved proximity).

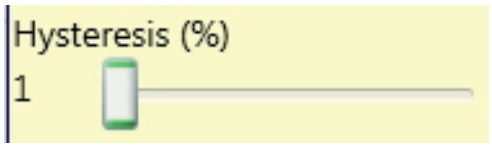
No Proximity
PNP 3-wire NC
PNP 3-wire NO
NPN 3-wire NO
NPN 3-wire NC
PNP 4-wire NC/NO
NPN 4-wire NC/NO
PNP/NPN 4-wire NC/NC
PNP/NPN 4-wire NO/NO

Measurement: Enter in this field the number of pulses/revolution (in the case of rotary sensor) or µm/pulse (linear sensor) relating to the sensor used.

Verification: Enter in this field the number of pulses/revolution (in the case of rotary sensor) or µm/pulse (linear sensor) relating to the second sensor used.

Gear Ratio: This parameter is active if there are two sensors on the selected axis. This parameter allows you to enter the ratio between the two sensors. If both sensors are on the same moving parts, the ratio will be 1 otherwise the number corresponding to the report must be entered. E.g. there are an encoder and a proximity switch, and the latter is on a moving part that (due to a gear reduction ratio) rotates at twice the speed of the encoder. Therefore, this value must be set at 2.

Hysteresis (%): It represents the percentage hysteresis value below which the speed change is filtered. Enter a value other than 1 to avoid continuous switching as the input changes.



Zero speed limit:
Enter in this field the maximum speed value above which the output of the function block (ZERO) will be 0 (FALSE). If the measured speed is less than the set value, the output (ZERO) of the function block will be 1 (TRUE).

Speed 1, 2, 3, 4: Enter in this field the maximum speed value above which the function block output (OVER) will be 0 (FALSE). If the measured speed is less than the set value, the function block output (OVER) will be 1 (TRUE).

Frequency zero speed/Frequency1/Frequency2: It shows the maximum calculated frequency values fM and fm (decreased by the hysteresis set). If the displayed value is GREEN, the calculation of frequency gave a positive result. If the displayed value is RED, it is necessary to change the parameters given in the following formulas.

KEY:

f = frequency

Rpm = rotational speed

Resolution = measurement

1. Rotary axis, rotary sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{\mathrm{rpm[rev/min]}}{60} * \mathrm{Resolution[pulses/rev]}$$

2. Linear axis, rotary sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{speed[\mathrm{m/min}]*1000}{60 * pitch[\mathrm{mm/rev}]} * \mathrm{Re}\, solution[\mathrm{pulses/rev}]$$

3. Linear axis, linear sensor. The frequency obtained is:

$$f[\mathrm{Hz}] = \frac{\mathrm{speed[mm/s]}*1000}{\mathrm{Resolution[\mu m/pulse]}}$$

4. Hysteresis. To be changed only if: fM=green; fm=red

Operation Function Blocks

All the input of these operators could be inverted (logical NOT). It could be done clicking with the right mouse key on the input to be inverted. A little circle will be showed on the inverted input. To cancel the inversion, simply click another time on the same input pin.

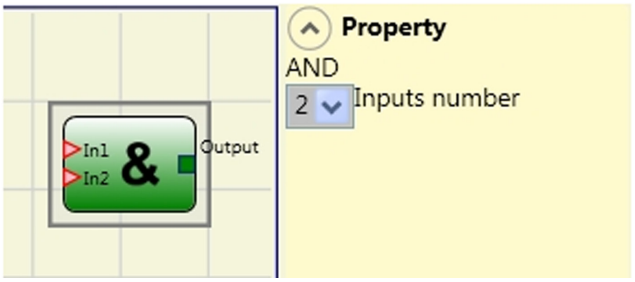
⚠ The maximum number of user blocks is 64

Logical Operators

AND

Logical AND returns an output of 1 (TRUE) if all the inputs are 1 (TRUE).

In1	In2	Inx	Out
0	0	0	0
1	0	0	0
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	1



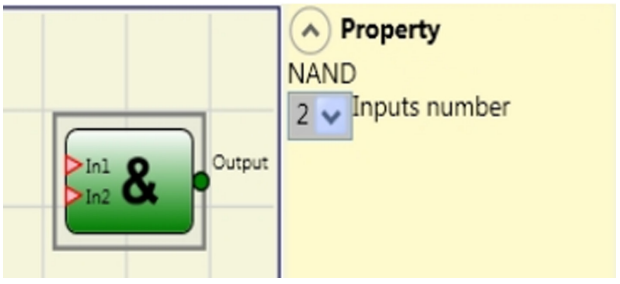
Parameters

Number of inputs: this is used to set between 2 and 8 inputs.

NAND

Logical NAND returns an output of 0 (FALSE) if all the inputs are 1 (TRUE).

In1	In2	Inx	Out
0	0	0	1
1	0	0	1
0	1	0	1
1	1	0	1
0	0	1	1
1	0	1	1
0	1	1	1
1	1	1	0

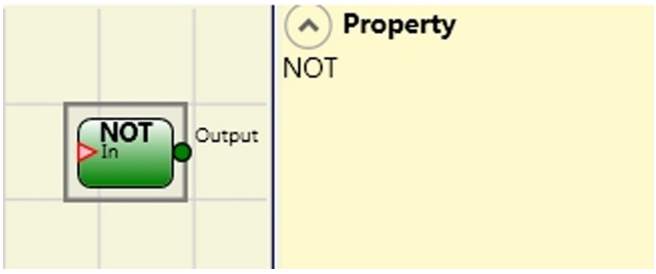


Parameters

Number of inputs: this is used to set between 2 and 8 inputs.

NOT

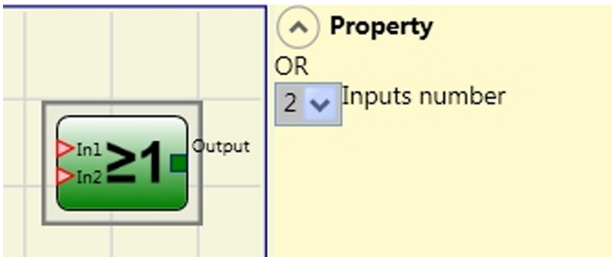
Logical NOT inverts the logical status of the input.



In1	Out
0	1
1	0

OR

Logical OR returns an output of 1 (TRUE) if at least one of the inputs is 1 (TRUE).



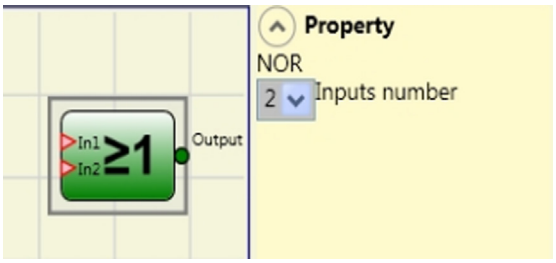
In1	In2	Inx	Out
0	0	0	0
1	0	0	1
0	1	0	1
1	1	0	1
0	0	1	1
1	0	1	1
0	1	1	1
1	1	1	1

Parameters

Number of inputs: this is used to set between 2 and 8 inputs.

NOR

Logical NOR returns an output of 0 (FALSE) if at least one of the inputs is 1 (TRUE).



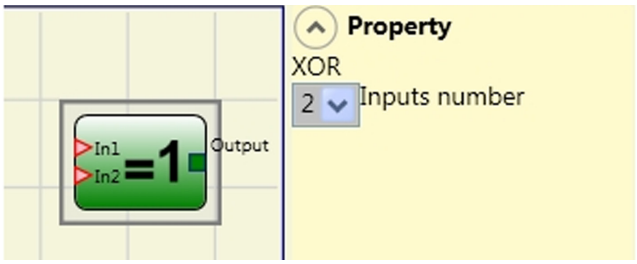
In1	In2	Inx	Out
0	0	0	1
1	0	0	0
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	0

Parameters

Number of inputs: this is used to set between 2 and 8 inputs.

XOR

Logical XOR returns an output 0 (FALSE) if the input's number at 1 (TRUE) is even or the inputs are all 0 (FALSE).



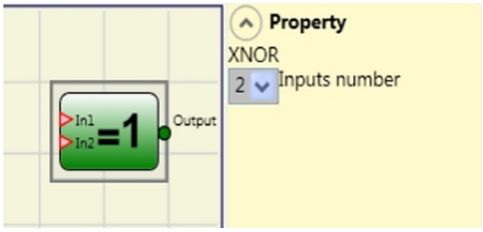
In1	In2	Inx	Out
0	0	0	0
1	0	0	1
0	1	0	1
1	1	0	0
0	0	1	1
1	0	1	0
0	1	1	0
1	1	1	1

Parameters

Number of inputs: this is used to set between 2 and 8 inputs.

XNOR

Logical XNOR returns an output 1 (TRUE) if the input's number at 1 (TRUE) is even or the inputs are all 0 (FALSE).



In1	In2	Inx	Out
0	0	0	1
1	0	0	0
0	1	0	0
1	1	0	1
0	0	1	0
1	0	1	1
0	1	1	1
1	1	1	0

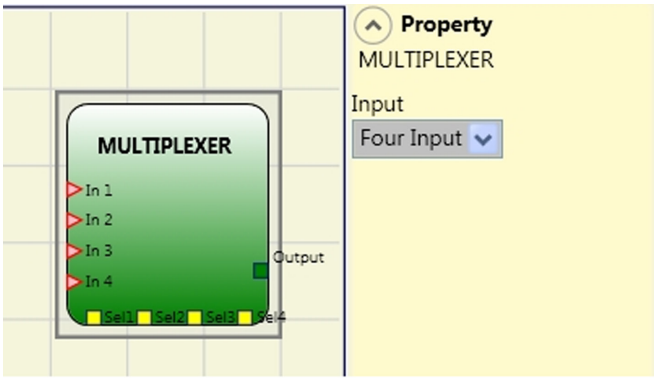
Parameters

Number of inputs: this is used to set between 2 and 8 inputs.

MULTIPLEXER

Logical MULTIPLEXER forwards the signal of the inputs to the output according to the Sel selection. If the SEL1÷SEL4 have only one bit set, the selected In n is connected to the Output. If the SEL inputs are:
- more than one = 1 (TRUE)
- none = 1 (TRUE)

the output is set to 0 (FALSE) independently from the In n values.



Parameters

Number of inputs: this is used to set between 2 and 4 inputs.

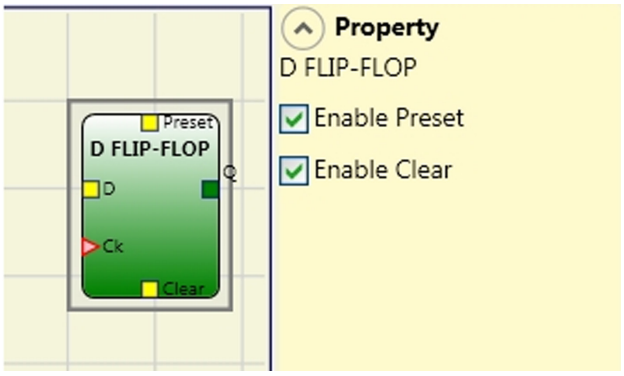
Memory Operators

MEMORY operators can be used if you decide to save any data (TRUE or FALSE) from other project components.
Status changes are performed according to the truth tables shown for each operator.

D Flip Flop (max number = 16)

The D FLIP FLOP operator saves the previously set status on output Q according to the following truth table.

Preset	Clear	Ck	D	Q
1	0	X	X	1
0	1	X	X	0
1	1	X	X	0
0	0	L	L	Keep memory
0	0	Rising edge	1	1
0	0	Rising edge	0	0



Parameters

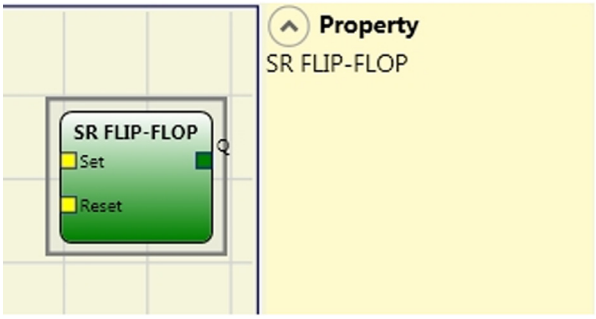
Preset: If selected enables output Q to be set to 1 (TRUE).

Clear: If selected enables the saving process to be reset.

SR Flip Flop

SR FLIP FLOP operator brings output Q at 1 with Set, 0 with Reset.
See the following truth table.

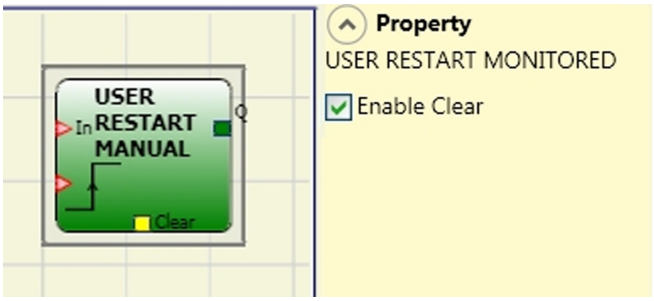
Set	Reset	Q
0	0	Keep memory
0	1	0
1	0	1
1	1	0



User Restart Manual (max number= 16 with restart monitored)

The USER RESTART MANUAL operator saves the restart signal according to the following truth table.

Set	Reset	Q
0	0	Keep memory
0	1	0
1	0	1
1	1	0



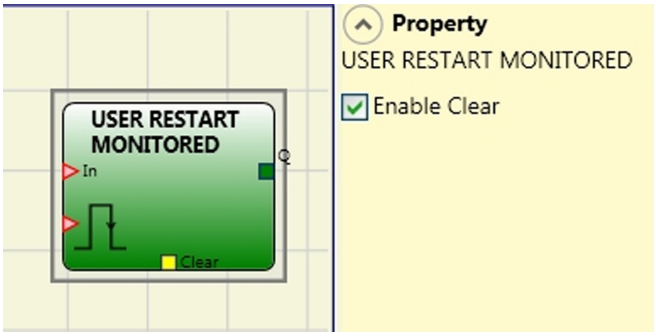
Parameters

Clear enable: If selected enables the saving process to be reset.

User Restart Monitored (max number= 16 with restart manual)

The USER RESTART MONITORED operator is used to save the restart signal according to the following truth table.

Clear	Restart	In	Q
1	X	X	X
X	X	0	0
0	L	1	0
0	Rising Edge	1	Keep memory
0		1	1



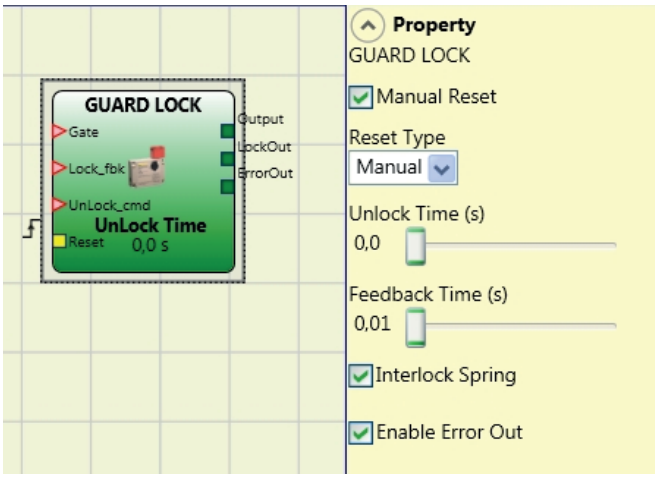
Parameters

Clear enable: If selected enables the saving process to be reset.

Guard Lock Operatos

Guard Lock

The GUARD LOCK operator controls locking/unlocking of an **ELECTROMECHANICAL GUARD LOCK** by analysing consistency between the Lock command and the status of an E-GATE and a FEEDBACK. The main ouput is 1 (TRUE) when the guard lock is closed and locked.



Operating principles.
The function acts as a gate safety lock.

1) The GATE input must always be connected to an E_GATE lock input (guard feedback).
2) The Lock_fbk input must always be connected to a LOCK FEEDBACK (feedback coil lock) input element.
3) The UnLock_cmd input can be connected freely in the diagram and determines the request to unlock (when in LL1 state).
4) The OUTPUT signal of this element is 1 (TRUE) if the guard is closed and locked. When an unlock command is applied to the UnLock_cmd input, the OUTPUT signal is set to “0” and the guard is unlocked (LockOut output) after a time UnLock_Time configurable as parameter. This output goes to 0 (FALSE) even when error conditions are present (eg. open door with lock locked, Feedback Time that exceeds the maximum allowed, ...).
5) Lockout signal controls the locking/unlocking of the guard.

Parameters
Unlock Time (s):
The time that must pass between the UnLock_cmd input reaching and the real guard unlock (Lockout output).

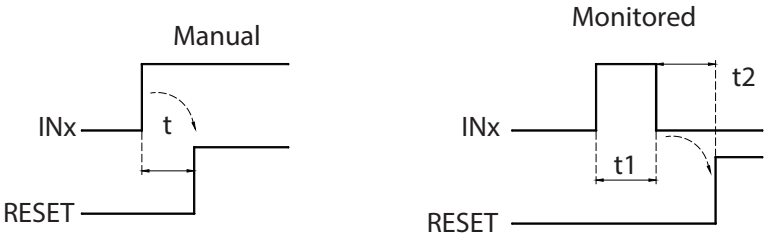
0 ms ÷ 1 s Step 100 ms
1.5 s ÷ 10 s Step 0.5 s
15 s ÷ 25 s Step 5 s

Feedback Time (s):
Maximum delay accepted between LockOut output and Lock_fbk input (must be the one shown on the lock data sheet with appropriate gap decided by the operator).

10 ms ÷ 100 s Step 10 ms
150 ms ÷ 1 s Step 50 ms
1.5 s ÷ 3 s Step 0.5 s

Interlock Spring: The guard is locked passively and released actively, i.e. the mechanical force of the spring keeps it locked. The guard thus continues to be locked even when the power supply is disconnected.

Manual Reset.
There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified



t = 250 ms

t1 > 250 ms
t2 = 250 ms

Important: for Manual reset always use the input immediately after those used by the function block. E.g.: if inputs 1 and 2 are used for the function block, use input 3 for Reset.

Enable error out: This can be selected to enable a signal (Error Out) to indicate a lock malfunction. When Error Out = 1 (TRUE) there is a fault in the lock.

Counter Operators

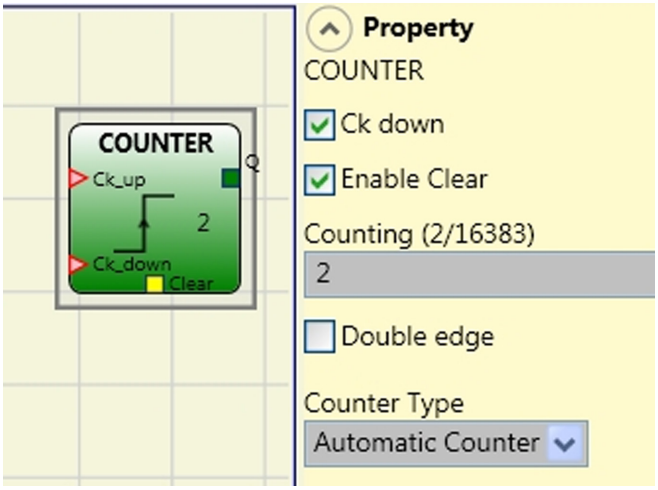
COUNTER operator is a pulse counter that sets output Q to 1 (TRUE) as soon as the desired count is reached.

Counter (max number = 16)

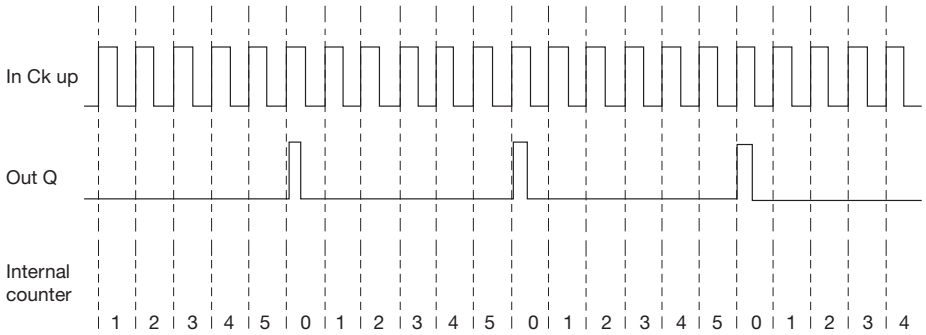
The operator COUNTER is a pulse counter. There are 3 operationg modes:

1) AUTOMATIC
2) MANUAL
3) AUTOMATIC + MANUAL

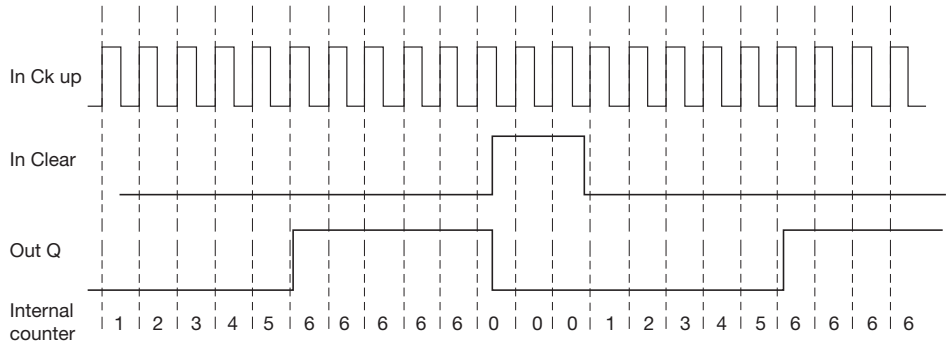
Counter value is 6 for all examples



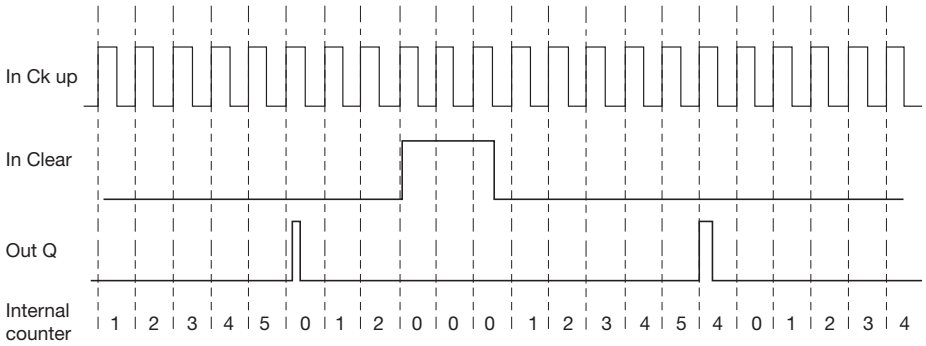
1) The counter generates a pulse duration equal to the system response time as soon as the set count is reached. If the CLEAR pin is not enabled this is the default mode.



2) The counter leads to 1 (TRUE) the output Q as soon as it reaches the set count. The output Q goes to 0 (FALSE) when the signal CLEAR is activated.



3) The counter generates pulse duration equal to the system rsposnse time as soon as the set count is reached. If the CLEAR signal is activated, the internal count goes back to 0.



Parameters

Clear Enable: If selected this enables the request to clear in order to restart the counter setting output Q to 0 (FALSE). It also offers the possibility of enabling or not enabling (Automatic Enable) automatic operation with manual reset.

If this is not selected operation is automatic. Once the set count is reached output Q is set to 1(TRUE) and stays in this condition for two internal cycles after which it is resetted.

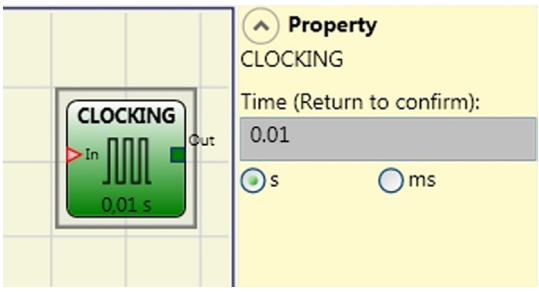
Ck down: Enables counting down.
Two-way: If selected it enables counting on both the rising and falling edges.

Timer Operators (max number = 16)

TIMER operators allow you to generate a signal (TRUE or FALSE) for a user-definable period.

Clocking

CLOCKING operator generates a clock signal output with the desired period if the input In is 1 (TRUE).

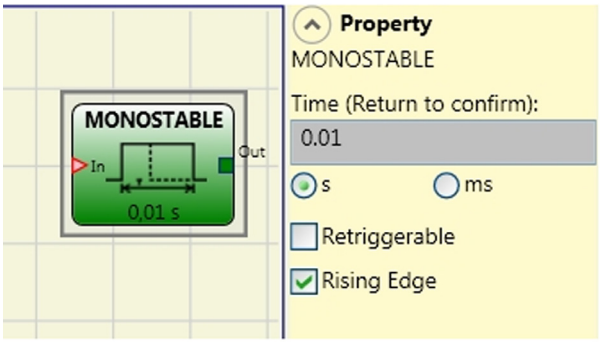


Parameters

Time: The period can be set to between 10 ms and 1093.3 s.

Monostable

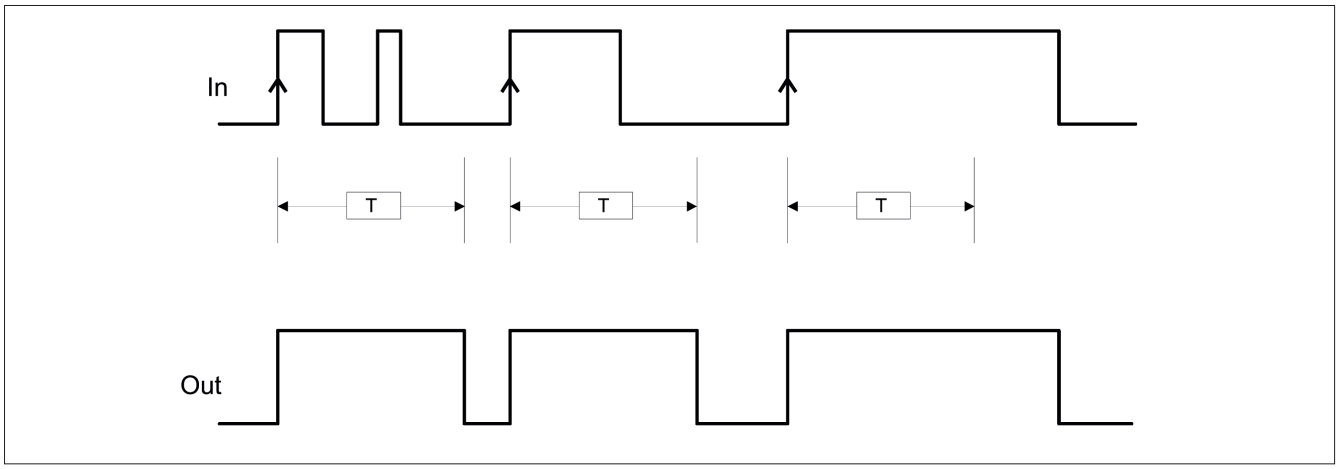
The MONOSTABILE operator generates a level 1 (TRUE) output activated by the rising edge of the input and remains in this condition for the set time.



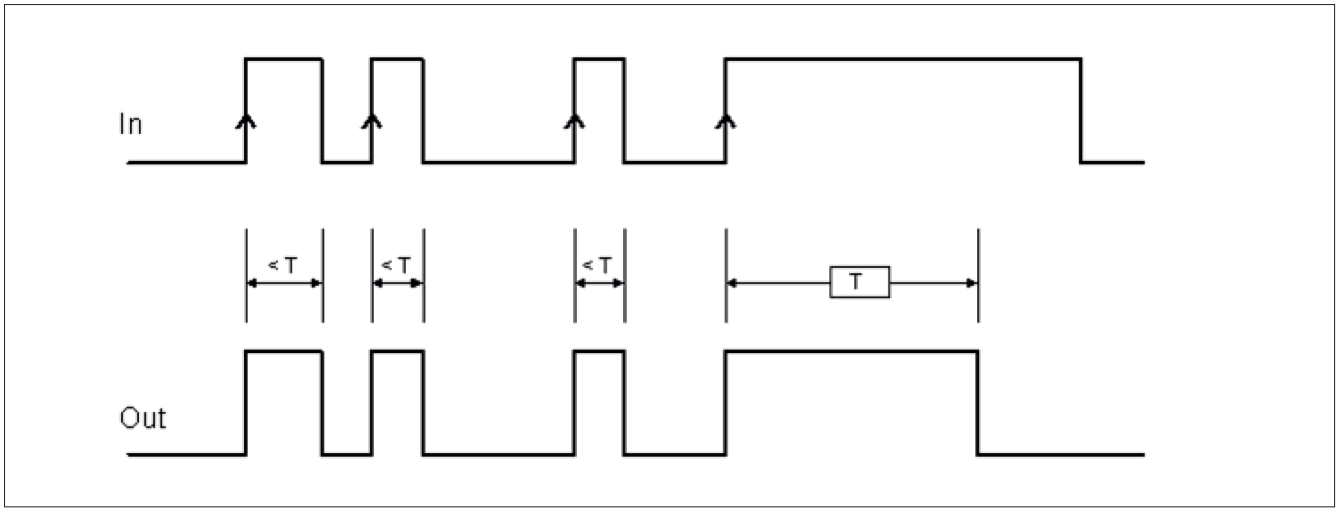
Parameters

Time: The delay can be set to between 10 ms and 1093.3 s.

Rising edge: If selected, the output is set to 1 (TRUE) on the input signal's rising edge where it remains for the set time, which can be extended for as long as the input stays at 1 (TRUE).



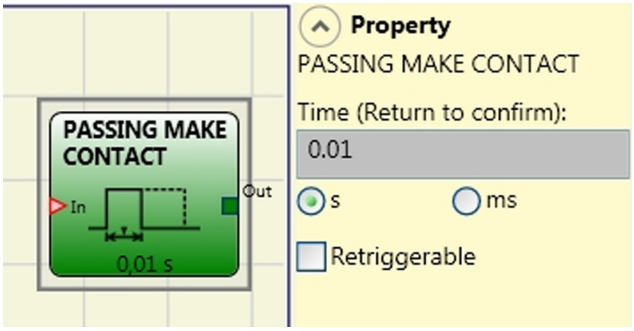
If not selected the logic is inverted, the output is set to 0 (FALSE) on the input signal's falling edge, where it remains for the set time, which can be extended for as long as the input stays at 0 (FALSE).

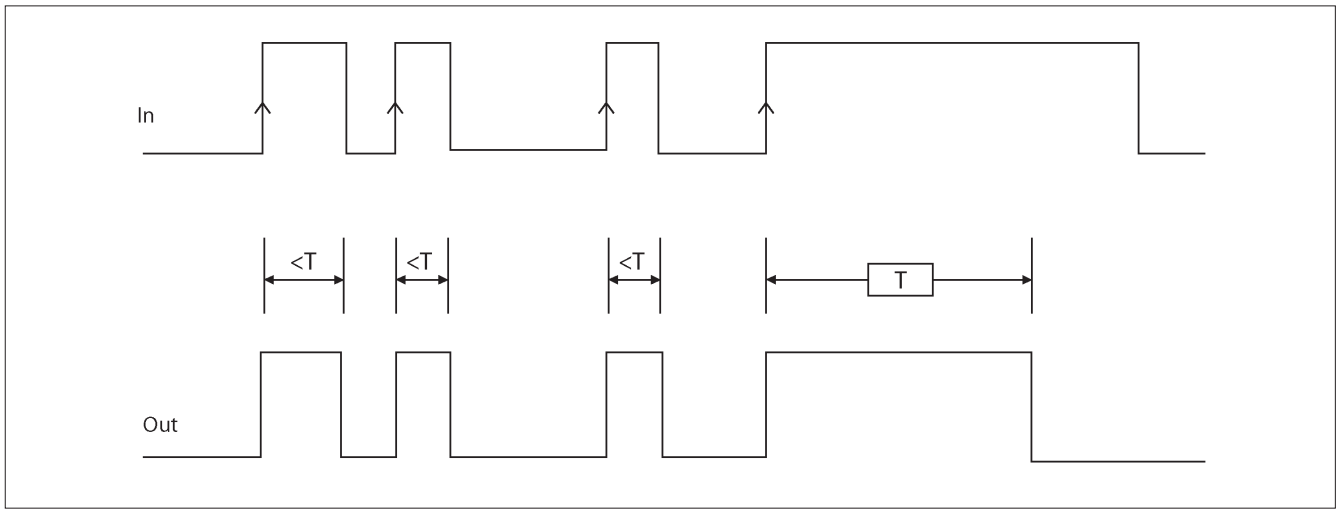


Retriggerable: If selected the time is reset each time the input status changes.

Passing Make Contact

In the PASSING MAKE CONTACT operator the output follows the signal on the input. However, if this is 1 (TRUE) for longer than the set time, the output changes to 0 (FALSE). When there is an input falling edge, the timer is cleared.

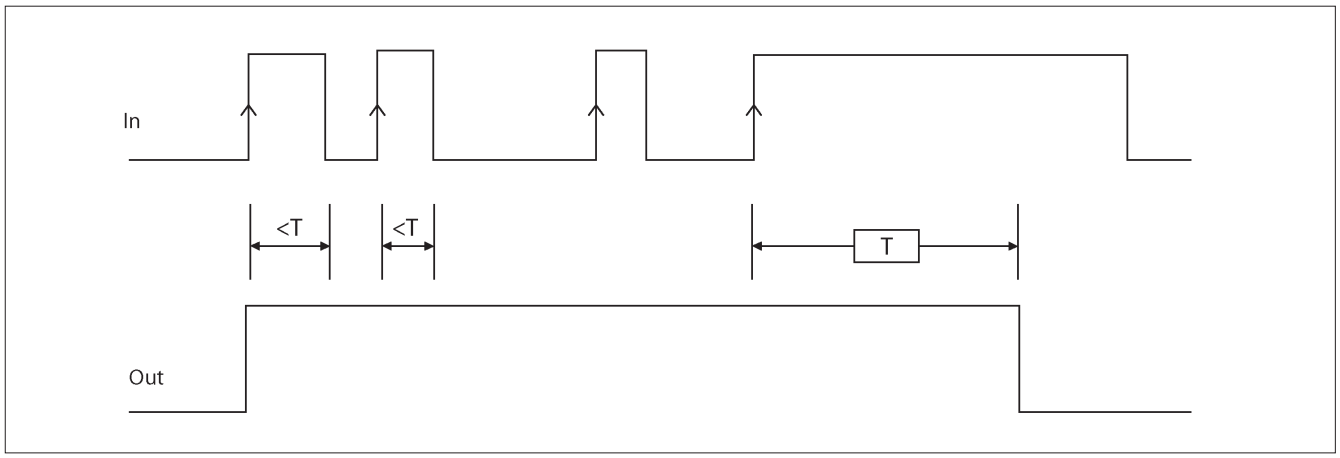




Parameters

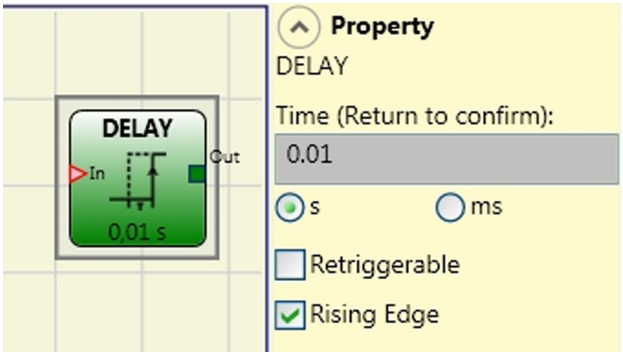
Time: The delay can be set to between 10 ms and 1093.3 s.

Retriggerable: If selected the time is not reset when there is an input falling edge. The output stays 1 (TRUE) for all the selected time. When there is a new input rising edge, the timer restart again.



Delay

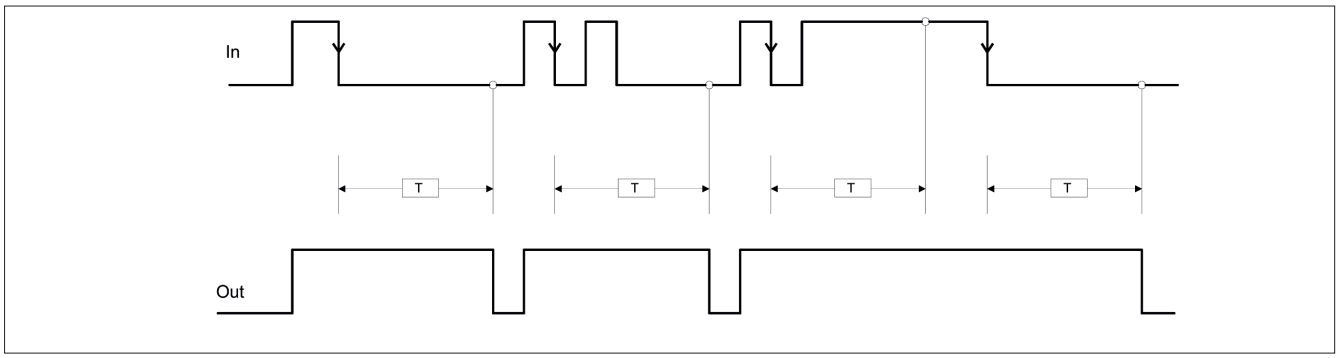
DELAY operator applies a delay to a signal by setting the output to 1 (TRUE) after the set time, against a change in the level of the input signal.



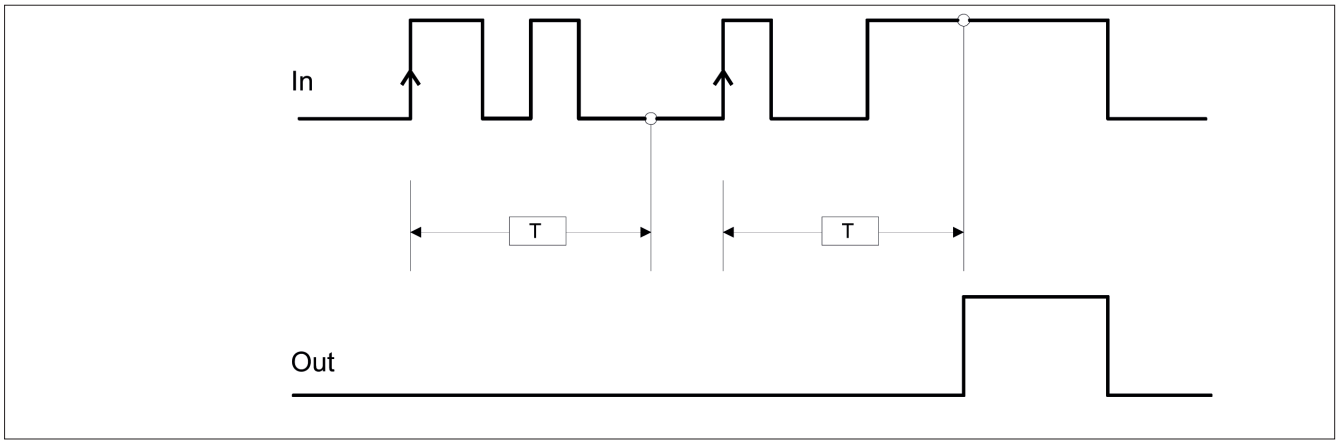
Parameters

Time: The delay can be set to between 10 ms and 1093.3 s.

Rising edge: If selected, the delay starts on the input signal's rising edge at the end of which the output changes to 1 (TRUE) if the input is 1 (TRUE) where it remains for as long as the input stays at 1 (TRUE).



If not selected the logic is inverted, the output is set to 1 (TRUE) on the input signal's rising edge, the delay starts on the input signal's falling edge, at the end of the set time the output changes to 0 (FALSE) if the input is 0 (FALSE) otherwise it remains 1 TRUE.



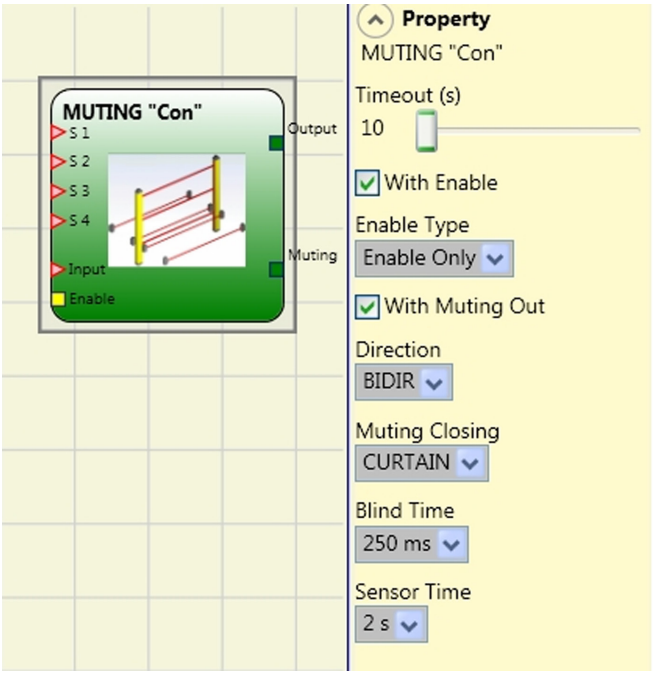
Retriggerable: If selected the time is reset each time the input status changes.

Muting Operators (max number = 4)
"Concurrent Muting"

The activation of the Muting function occurs following interruption of the sensore S1 and S2 beam (the order does not matter) within a time range from 2s and 5s decided by the operator (or S3 and S4 with material that is moving in the dirction opposite).

The MUTING operator with "Concurrent" logic performs muting of the input signal through sensor inputs S1, S2, S3 and S4.

⇒ Preliminary condition: The Muting cycle can only start if all the sensors are 0 (FALSE) and inputs are 1 (TRUE) (barrier free).



Parameters

Timeout (sec): Sets the time, between 10 secs and unlimited, within which the Muting cycle must end. If the cycle is not complete at the end of this time, Muting is immediately discontinued.

Enable: If selected it enables the possibility of enabling or not enabling the Muting function. Otherwise the Muting function is always enabled.
There are two Enable modes: Enable/Disable and Enable Only. If Enable/Disable is selected the Muting cycle cannot start if Enable is fixed at 1 (TRUE) or 0 (FALSE) but is only activated with a rising edge. To disable muting, set Enable to 0 (FALSE). In this mode the falling edge disables Muting regardless of the condition. If Enable Only is selected Muting cannot be disabled but Enable must be set to 0 (FALSE) in order to enable a new rising edge for the next Muting cycle.

Direction: The order in which the sensors are occupied can be set. If set to BIDIR they can be occupied in both directions, from S1&S2 to S3&S4 and from S3&S4 to S1&S2, if set to UP they can be occupied from S1&S2 to S3&S4 and if set to DOWN from S3&S4 to S1&S2.

Muting Close: There are two types, CURTAIN and SENSOR. If you select CURTAIN muting closes when the input signal rises, if you select SENSOR it closes when the third sensor has been cleared.

Select CURTAIN

S1	S2	Input	S3	S4	Muting
0	0	1	0	0	0
1	0	1	0	0	0
1	1	1	0	0	1
1	1	X	0	0	1
1	1	X	1	1	1
0	0	0	1	1	1
0	0	1	1	1	0
0	0	1	0	0	0

Select SENSOR

S1	S2	Input	S3	S4	Muting
0	0	1	0	0	0
1	0	1	0	0	0
1	1	1	0	0	1
1	1	X	0	0	1
1	1	X	1	1	1
0	0	0	1	1	1
0	0	1	1	1	0
0	0	1	0	0	0
0	0	1	0	0	0

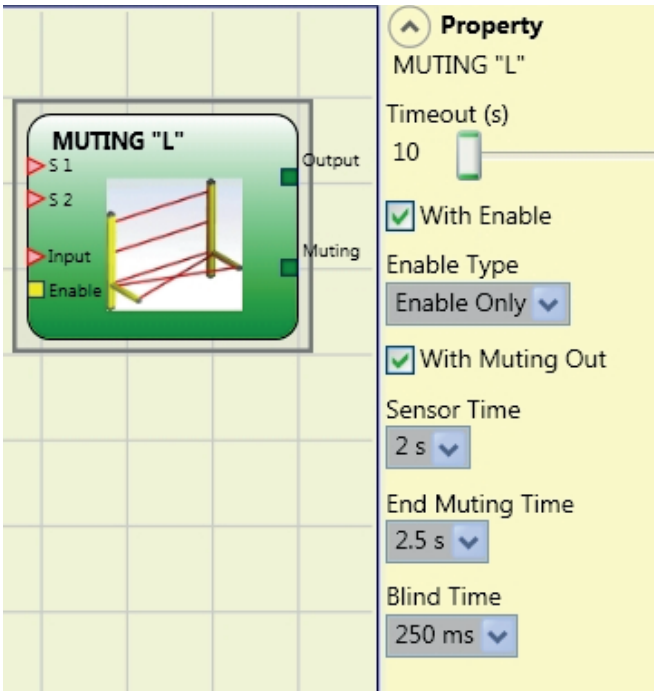
Blind Time: Only with Muting Close=Curtain, blind time is enabled if you know that after the complete transition of the pallet (muting cycle close) some protruding objects could still occupy the light curtain and send the input to 0 (FALSE). During blind time the input remains 1 (TRUE). Blind Time can range from 250 msecs to 1 second.

Sensor time: A difference of between 2 and 5 seconds can be set for activating the sensors.

Muting “L”

The activation of the Muting function occours following interruption of the sensors S1 and S2 beam (the order does not matter) within a time range from 2s and 5s decide by the operator. The state of the Muting ends after the liberation of the guarded opening.

The Muting operator with “L” logic performs muting of the input signal through sensor inputs S1 and S2.



⇒ Preliminary condition: The Muting cycle can only start if S1 and S2 are 0 (FALSE) and the inputs are 1 (TRUE) (barrier free).

Parameters

Timeout (sec): Sets the time, between 10 secs and unlimited, within which the Muting cycle must end. If the cycle is not complete at the end of this time, Muting is immediately discontinued.

Enable: If selected it enables the possibility of enabling or not enabling the Muting function. Otherwise the Muting function is always enabled.
There are two Enable modes: Enable/Disable and Enable Only. If Enable/Disable is selected the Muting cycle cannot start if Enable is fixed at 1 (TRUE) or 0 (FALSE) but is only activated with a rising edge. To disable muting, set Enable to 0 (FALSE). In this mode the falling edge disables Muting regardless of the condition. If Enable Only is selected Muting cannot be disabled but Enable must be set to 0 (FALSE) in order to enable a new rising edge for the next Muting cycle.

Sensors time: Sets the maximum time (between 2 and 5 seconds) between activating two muting sensors.

End of Muting time: Sets the maximum time (from 2.5 to 6 seconds) that must elapse between the release of the first sensor and the release of guarded opening.
The ends of this time determines the end of the Muting function.

Blind timer: Enabled if you know that after the complete transition of the pallet (muting cycle close) some protruding objects could still occupy the light curtain and send the input to 0 (FALSE). During blind time the input remains 1 (TRUE). Blind Time can range from 250 msecs to 1 second.

Select CURTAIN

S1	S2	Input	S3	S4	Muting
0	0	1	0	0	0
1	0	1	0	0	0
1	1	1	0	0	1
1	1	x	0	0	1
1	1	x	1	0	1
1	1	x	1	1	1
0	1	x	1	1	1
0	0	0	1	1	1
0	0	1	1	1	0
0	0	1	0	1	0
0	0	1	0	0	0

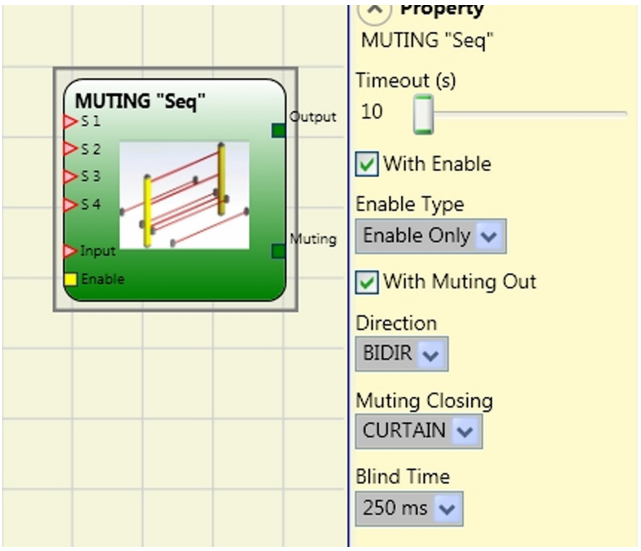
Select SENSOR

S1	S2	Input	S3	S4	Muting
0	0	1	0	0	0
1	0	1	0	0	0
1	1	1	0	0	1
1	1	x	0	0	1
1	1	x	1	0	1
1	1	x	1	1	1
0	1	x	1	1	1
0	0	0	1	1	1
0	0	1	1	1	0
0	0	1	0	1	0
0	0	1	0	0	0

Blind Time: Only with Muting Close=Curtain, blind time is enabled if you know that after the complete transition of the pallet (muting cycle close) some protruding objects could still occupy the light curtain and send the input to 0 (FALSE). During blind time the input remains 1 (TRUE). Blind Time can range from 250 msecs to 1 second.

"Sequential" Muting

The activation of MUTING function occours following sequential interruption of the sensors S1 and S2, subsequently S3 and S4 sensors (without time limit). If the pallet proceeds in the opposite direction the correct sequence is: S4, S3, S2, S1.



The MUTING operator with "Sequential" logic performs muting of the input signal through sensor inputs S1, S2, S3 and S4.

⇒ Preliminary condition: The Muting cycle can only start if all the sensors are 0 (FALSE) and the inputs are 1 (TRUE) (barriere freee).

Parameters

Timeout (sec): Sets the time, between 10 secs and unlimited, within which the Muting cycle must end. If the cycle is not complete at the end of this time, Muting is immediately discontinued.

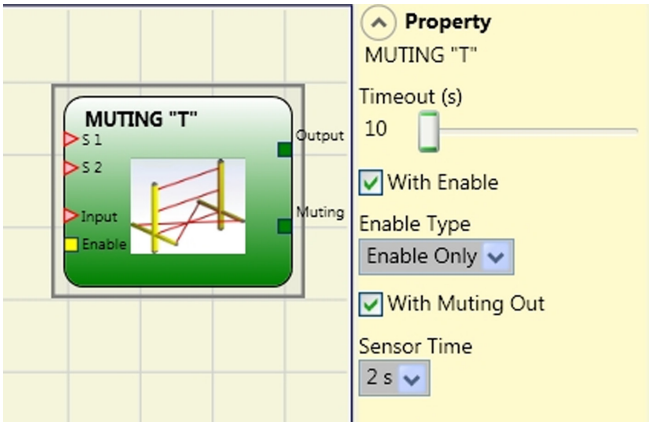
Enable: If selected it enables the possibility of enabling or not enabling the Muting function. Otherwise the Muting function is always enabled.
There are two Enable modes: Enable/Disable and Enable Only. If Enable/Disable is selected the Muting cycle cannot start if Enable is fixed at 1 (TRUE) or 0 (FALSE) but is only activated with a rising edge. To disable muting, set Enable to 0 (FALSE). In this mode the falling edge disables Muting regardless of the condition. If Enable Only is selected Muting cannot be disabled but Enable must be set to 0 (FALSE) in order to enable a new rising edge for the next Muting cycle.

Direction: The order in which the sensors are occupied can be set. If set to BIDIR they can be occupied in both directions, from S1 to S4 and from S4 to S1, if set to UP they can be occupied from S1 to S4 and if set to DOWN from S4 to S1.

Muting Close: There are two types, CURTAIN and SENSOR. If you select CURTAIN muting closes when the input signal rises, if you select SENSOR it closes when the last sensor has been cleared.

Muting “T”

The MUTING operator with “T” logic performs muting of the input signal through sensor inputs S1 and S2.



⇒ Preliminary condition: The Muting cycle can only start if S1 and S2 are 0 (FALSE) and the inputs are 1 (TRUE) (barrier free).

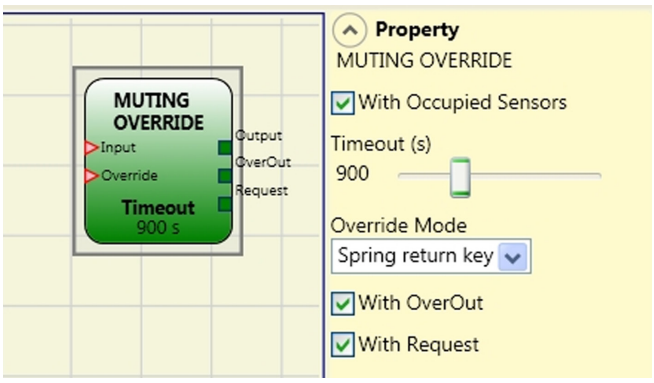
Parameters

Timeout (sec): Sets the time, between 10 secs and unlimited, within which the Muting cycle must end. If the cycle is not complete at the end of this time, Muting is immediately discontinued.

Enable: If selected it enables the possibility of enabling or not enabling the Muting function. Otherwise the Muting function is always enabled. There are two Enable modes: Enable/Disable and Enable Only. If Enable/Disable is selected the Muting cycle cannot start if Enable is fixed at 1 (TRUE) or 0 (FALSE) but is only activated with a rising edge. To disable muting, set Enable to 0 (FALSE). In this mode the falling edge disables Muting regardless of the condition. If Enable Only is selected Muting cannot be disabled but Enable must be set to 0 (FALSE) in order to enable a new rising edge for the next muting cycle.

Sensor time: A difference of between 2 and 5 seconds can be set for activating the sensors.

Muting Override (max number= 16)



The Override function must be used when the machine stops due to incorrect Muting activation sequences with the material obstructing the guarded opening. The function activates the OSSD outputs making it possible to remove the material that is obstructing the guarded opening.

The operator must be connected after the Muting operator (Muting OUTPUT directly to the Override INPUT). The operator permits override of the directly connected Muting Input. Override can be activated only if Muting is not active (INPUT=0) and at least one Muting sensor is occupied (or the light curtain is occupied). Override ends when the light curtain and sensors are cleared and the Output switches to logical "0" (FALSE). Override can be set to pulsed or maintained action mode.

Override with maintained action control.
This function must be activated maintaining the Override command active (OVERRIDE=1) during all subsequent operations. However, a new Override can be activated, de-activating ad re-activating the command. When the light curtain and sensors are cleared (gap free) or on expiry of the timeout, Override ends without the need for further commands.

Override with pulsed action
This function is enabled activating the Override command (OVERRIDE=1).
Override ends when the light curtain and sensors are cleared (gap free) or on expiry of the timeout. The function can be restarted only if the Override command is re-activated (OVERRIDE=1).

Parameters

With sensors occupied: Must be selected with "T" sequential, simultaneous muting; with "L" muting, must not be selected.

⇒ Otherwise, a warning is displayed in the compilation phase and in the report.
⇒ The user must adopt additional safety measures during the Override phase.

"With sensor occupied" selected	Sensor occupied	Light curtain occupied	Input	Override request	Overide output
X	X	-	0	1	1
	-	X	0	1	1
	X	-	0	1	1
	X	X	0	1	1

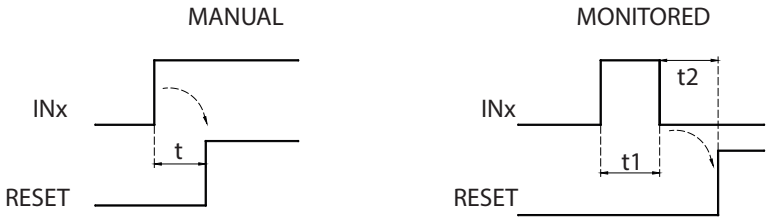
Timeout (sec): Used to set the time, between 10 sec and infinity, by which the Override function must end.

Override mode: Used to configure the type of Override (pulsed or maintained action).
With OverOut: Used to activate an Override active signalling output (active when high).
With Request: Used to activate a signalling output (active when high) indicating that the Override function can be activated.

Manual Reset:

- Should the INPUT be active (TRUE), the reset enables the output of the function block.
- Should the INPUT be not active (FALSE), the output of the function block follows the OVERRIDE request.

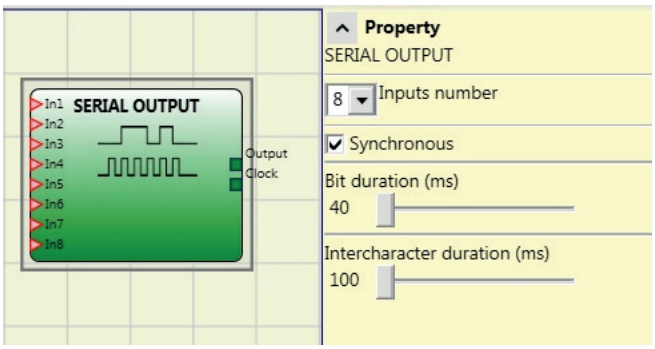
There are two types of reset: Manual and Monitored. When Manual is selected the system only verifies the signal's transition from 0 to 1. If Monitored is selected the double transition from 0 to 1 and then back to 0 is verified.



Miscellaneous Function Blocks

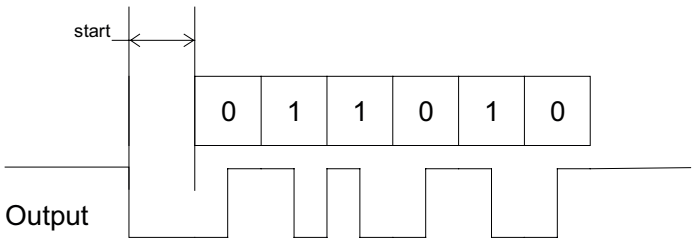
Serial Output

The Serial Output operator outputs the status of up to 8 inputs, serialising the information.



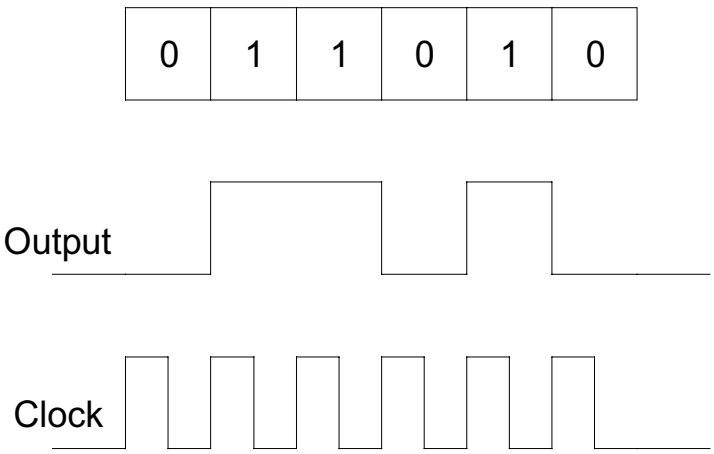
Operating principles.
This operator outputs the status of all the connected inputs in two different ways:

Asynchronous serialisation:
1) The status of the line in the idle condition is 1 (TRUE);
2) The start data transmission signal is 1 bit = (FALSE);
3) Transmission of n bits with the status of the connected inputs encoded using the Manchester method:
 - Status 0: rising edge of the signal at the centre of the bit
 - Status 1: falling edge of the signal at the centre of the bit
4) Intercharacter interval is 1 (TRUE) to allow synchronisation of an external device.



Therefore, with the Asynchronous method the Clock output is not present.

Synchronous serialisation:
1) The output and the clock in the idle condition are 0 (FALSE);
2) Transmission of n bits with the input status using OUTPUT as data, CLOCK as the timing base;
3) Intercharacter interval is 0 (FALSE) to allow synchronisation of an external device.



Parameters

Number of inputs: Defines the number of inputs of the function block, which may be 2÷8 (asynchronous) or 3÷8 (synchronous).

Bit length (ms): Enter the value corresponding to the length of each single bit (input n) in the pulse train that makes up the transmission.

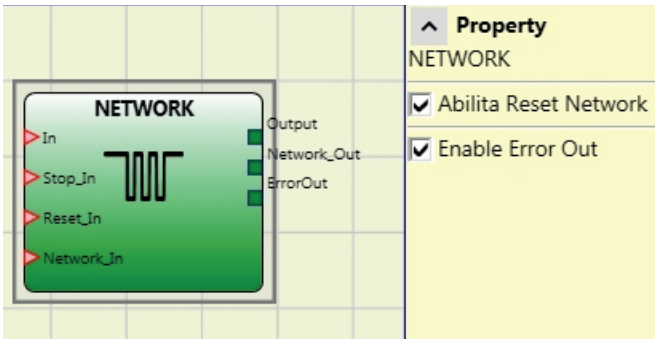
40 ms ÷ 200 ms (Step 10 ms)
250 ms ÷ 0.95 s (Step 50 ms)

Intercharacter interval (ms): Enter the time that must pass between the transmission of one pulse train and the next.

100 ms ÷ 2.5 s (Step 100 ms)
3 s ÷ 6 s (Step 500 ms)

Network

The Network operator is used to distribute Stop and Reset commands via a simple local network. **Use Network_in** and **Network_out** to exchange START, STOP and RUN signals between the different nodes.



Operating principles.
This operator allows stop and reset commands to be distributed simply in a local Mosaic network.

The Network operator requires the following:

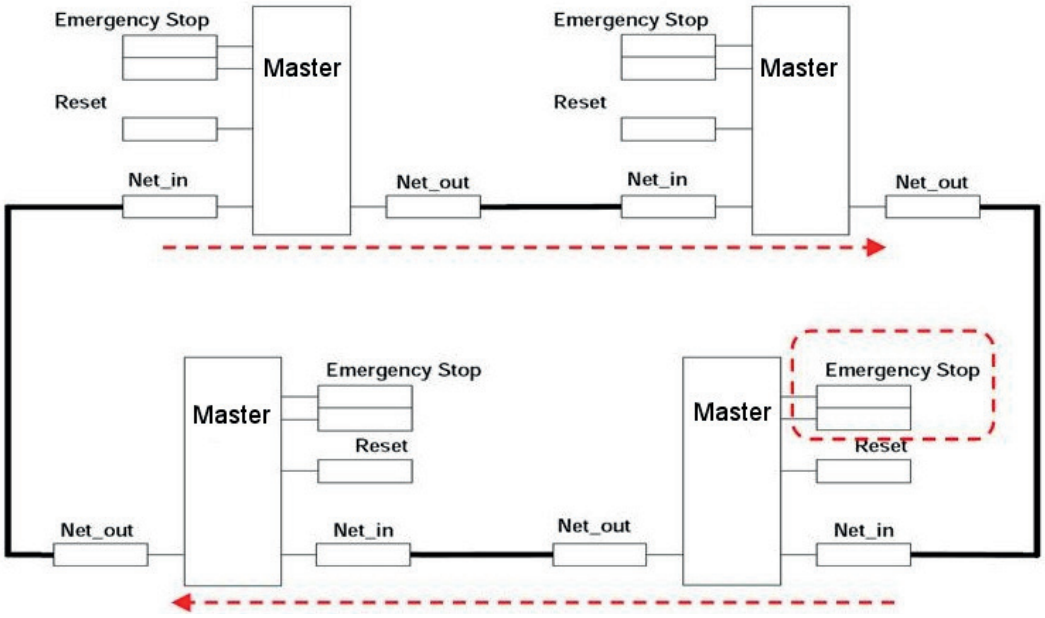
1) the **Network_In** input connected to a single or double input must be connected to the **Network_Out** output of the preceding unit in the local network.
2) the **Network_Out** output connected to a STATUS signal or OSSD output, must be connected to the **Network_in** input of the next unit in the local network.
3) the **Stop_In** and Reset_In inputs must be connected to input devices that act as Stop (e.g. E-STOP) and Reset (e.g. SWITCH), respectively.
4) the In input can be connected freely in the diagram (e.g. input function blocks or results of logical combinations).
5) **Output** can be connected freely in the diagram. **Output** is 1 (TRUE) when the IN input is 1 (TRUE) and the function block has been restarted.

Parameters

Enable Reset Network: when selected this allows the distribution network to reset the function block. If not enabled, the function block can only be reset via the local **Reset_In** input.

Enable error out: if selected this enables the presence of the **Error_Out** status signal.

Example of application:



Network data flow

⇒ The RESET commands must be installed outside all the danger areas of the network in positions where the danger areas and the entire work areas are clearly visible.
⇒ The maximum number of MASTER modules that can be connected in network configuration is equal to 10.

Condition 1:
With reference to the figure, at power-on:

1. The OUTPUTs of the various nodes are in the 0 (FALSE) condition;
2. The STOP signal is sent via the Network_out line;
3. When the RESET command is pressed on one of the nodes all the nodes that are present are started when the START signal is sent;
4. As the end result, the OUTPUT of all the connected nodes is in condition 1 (TRUE) if the various IN inputs are in condition 1 (TRUE);
5. The RUN signal is sent via the network of the 4 nodes present.

Condition 2:
With reference to the figure, when the emergency stop is pressed in one of the four nodes:

1. The OUTPUT moves to condition 0 (FALSE);
2. The STOP signal is sent via the Network_out line;
3. The next node receives the stop code and deactivates the output;
4. The stop command generates the stop code for all Network_in and Network_out lines;
5. As the end result, the OUTPUT of all the connected nodes is in condition 0 (FALSE).
6. When the emergency stop is restored to the normal position, all the nodes can be restarted by sending the START signal with a single reset. The latter condition does not occur when ENABLE RESET NETWORK is not enabled. In that case, the local reset method must be used.

Response Time
The response time of the network starting from emergency stop is given by the formula:

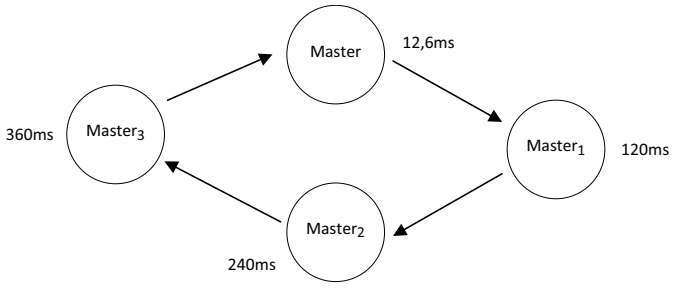
$$t_{rTot} = (120ms \times n°module)\ (max\ 10)$$

Emergency Stop Pressure	MASTER
	trMASTER
	12,6ms

MASTER n°1
120ms x n°module
120ms

MASTER n°2
120ms x n°module
240ms

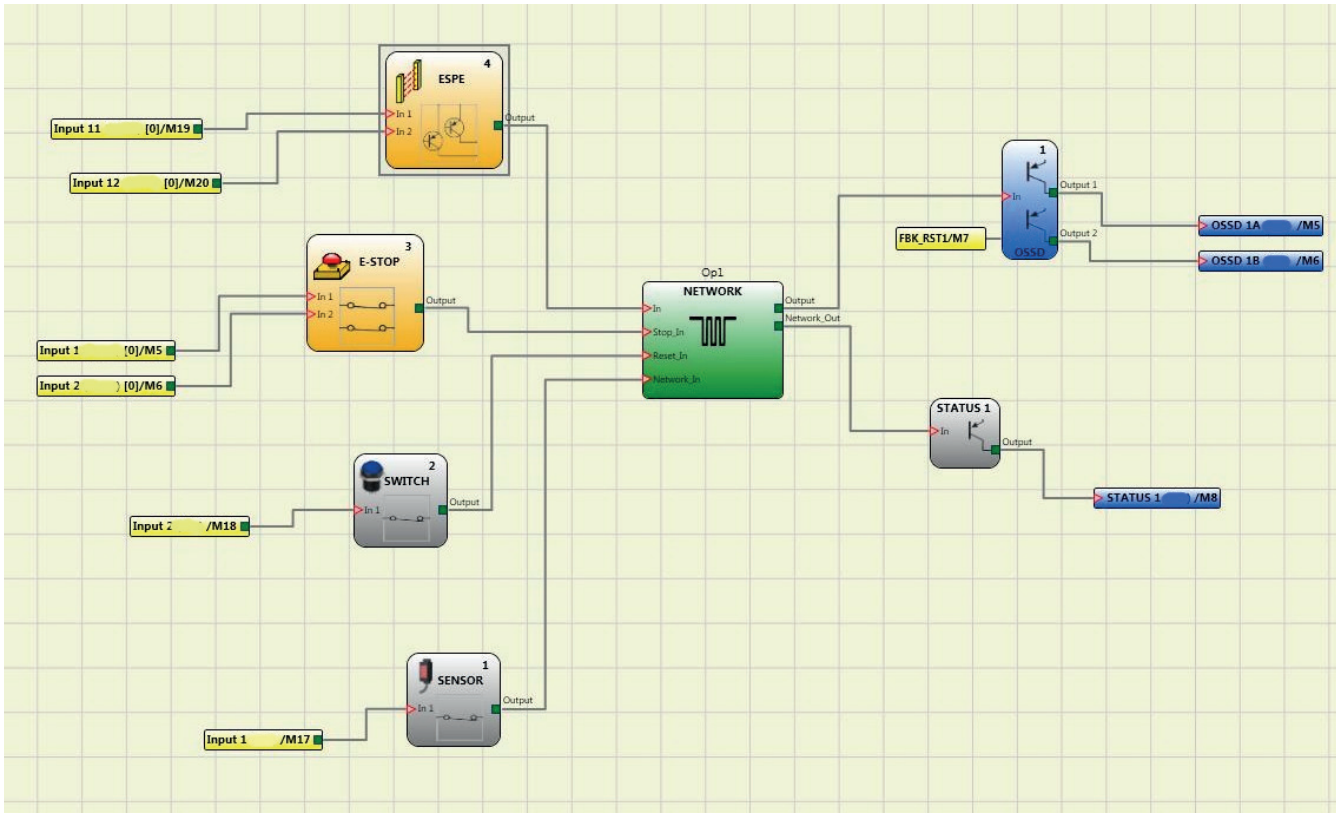
MASTER n°3
120ms x n°module
240ms



Master CMM Signal with Network Operative

		Network functional block signals				
		Network in		Network out (OSSD)	Network out (STATUS)	Reset in
	LED	FAIL EXT	IN (1)	OSSD (2)	STATUS	IN (3)
STATUS	STOP	OFF	OFF	RED	OFF	OFF
	CLEAR	OFF	BLINKING	RED/GREEN (BLINKING)	BLINKING	BLINKING
	RUN	OFF	ON	GREEN	ON	ON
	FAIL	ON	BLINKING	-	-	-

(1)Corresponding to the input where is wired Network IN
(2)Corresponding to the input where is wired Network OUT
(3)Corresponding to the input where is wired Reset IN

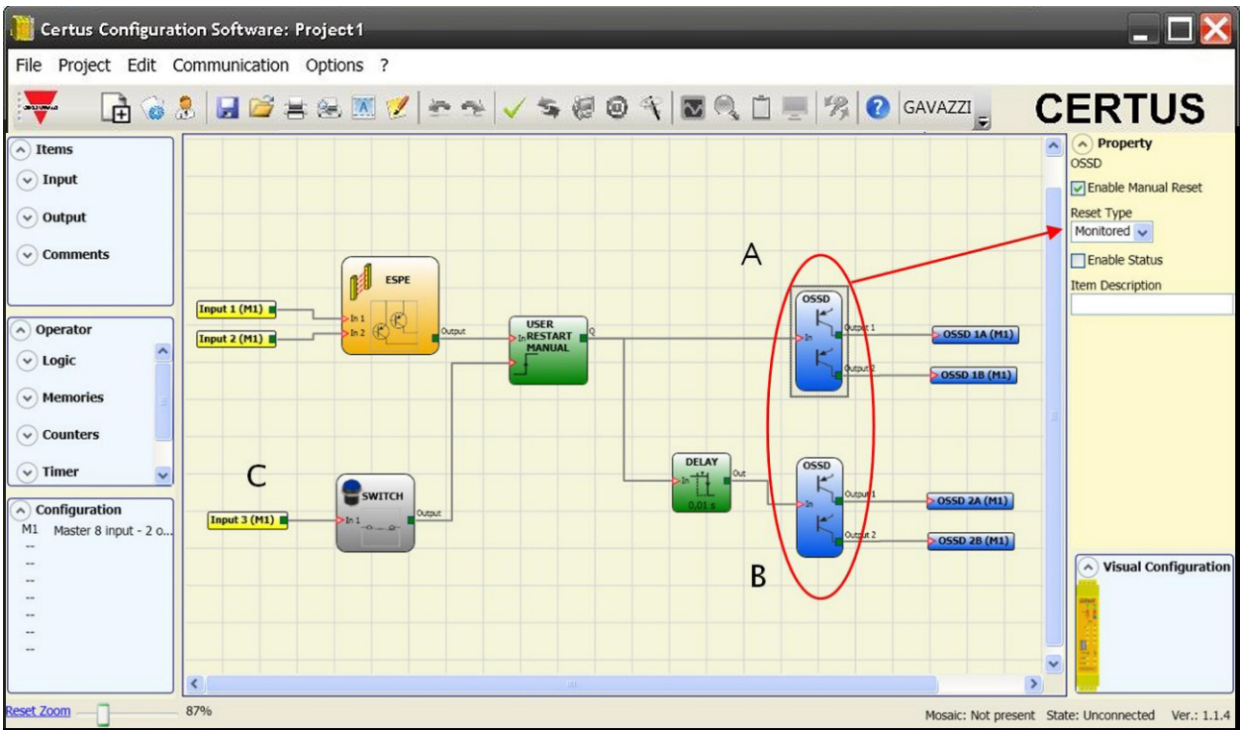


Example of use of the NETWORK block

Special Applications

Output delay with manual

If you need to have two OSSD output with one of them delayed (in MANUAL mode) use the following scheme:



⇒ Whereas the operating mode of the logical DELAY (see DELAY paragraph) the application must be the following:
- The two outputs have to be programmed with RESET TYPE manual (monitored) using the function USER MANUAL RESTART

⇒ You must physically connect the button RESTART to the inputs RESTART_FBK1/2 of the OSSD A and B used (see section connections (p. 12) and to the INPUT3 (C).

CERTUS Fail Codes

In case of malfunction the Mosaic system transmits to the CERTUS Configuration Software CCS a code corresponding to the error detected by the CERTUS CMM master.
To read the code, proceed as follows:
- connect the CERTUS CMM master (indicating FAIL by led) to the PC using the USB cable;
- launch the software CCS, a window appears with the error code occurred.

The following table lists all possible errors detected and their solution.

CODE	FAIL	RESOLUTIOIN
19D	The two M1microcontrollers do not see the same hw/sw configuration	CHECK CORRECT INSERTION OF CMM AND EXPANSION MODULES CONNECTORS MSC. POSSIBLY REPLACE THE CONNECTORS
66D	2 or more same expansion modules with the same node number	CHECK THE CONNECTIONS PIN 2, 3 EXPANSION MODULES
68D	Exceeded max expansion modules number	DISCONNECT THE MODULES IN EXCESS (MAX.14)
70D	One or more modules have detected a change in the node number	CHECK THE CONNECTIONS OF PIN 2, 3 EXPANSION MODULES
73D	A slave module has detected an external error	CHECK THE ERROR CODE ON MODULE FOR MORE INFORMATION
131D	from a C ES2, C ES1 or C PSS - detected disconnection Proxi 1 or 2	CHECK THE PROXI CONNECTIONS. VERIFY THAT THE PROXI CONSUMPTION IS HIGHER THAN OR EQUAL TO 2mA. IF IT IS DIFFERENT, CONNECT A 12KΩ LOAD RESISTANCE BETWEEN PIN 5-6 AND PIN 9-10
132D	from a C ES2 - detected disconnection Encoder 1 and 2	CHECK THE ENCODER1,2 CONNECTIONS. IN THE CASE OF ENCODER TTL VERIFY THAT THE EXTERNAL POWER SUPPLIED TO THE MODULE IS > 4,9VDC
136D (Proxi1) 146D (Proxi2)	From a module CES 2, C ES1 or C PSS: over-frequency detected on Proximity input	THE INPUT FREQUENCY MUST BE < 5KHz
139D (Encoder1) 149D (Encoder2)	From a module CES 2, C ES1 or C PSS: encoder input signals not Standard (duty cycle, phase displacement)	THE DUTY CYCLE MUST BE: 50%+33% OF THE PERIOD (HTL, TTL). THE PHASE DISPLACEMENT MUST BE: 90°+33% (HTL, TTL) (not applicable to SIN / COS)
140D (Encoder1) 150D (Encoder2)	From a module C ES2, C ES1 or C PSS: over-frequency detected on Encoder input	THE INPUT FREQUENCY MUST BE: < 500KHz (TTL, SIN/COS); < 300KHz (HTL).
142D	from a CES 1 or C ES2 - detected disconnection Encoder 1	CHECK THE ENCODER1 CONNECTIONS. IN THE CASE OF ENCODER TTL VERIFY THAT THE EXTERNAL POWER SUPPLIED TO THE MODULE IS > 4,9VDC
144D	rom a C ES2 , C ES1 or C PSS - detected disconnection Proxi 1	CHECK THE PROXI CONNECTIONS. VERIFY THAT 3THE PROXI CONSUMPTION IS HIGHER THAN OR EQUAL TO 2mA. IF IT IS DIFFERENT, CONNECT A 12KΩ LOAD RESISTANCE BETWEEN PIN 5-6
152D	from a C ES2 - detected disconnection Encoder 2	CHECK THE ENCODER2 CONNECTIONS. IN THE CASE OF ENCODER TTL VERIFY THAT THE EXTERNAL POWER SUPPLIED TO THE MODULE IS > 4,9VDC
154D	from a C ES2, C ES1 or C PSS detected disconnection Proxi 2	CHECK THE PROXI CONNECTIONS. VERIFY THAT THE PROXI CONSUMPTION IS HIGHER THAN OR EQUAL TO 2mA. IF IT IS DIFFERENT, CONNECT A 12KΩ LOAD RESISTANCE BETWEEN PIN 9-10
194D 197D 198D 199D 201D 202D 203D 205D	Errors solid state output OSSD1	CHECK THE OSSD1 CONNECTIONS RELATIVE TO THE MODULE IN ERROR
208D 211D 212D 213D 215D 216D 217D 219D	Errors solid state output OSSD2	CHECK THE OSSD2 CONNECTIONS RELATIVE TO THE MODULE IN ERROR
222D 225D 226D 227D 229D 230D 232D 233D	Errors solid state output OSSD3	CHECK THE OSSD3 CONNECTIONS RELATIVE TO THE MODULE IN ERROR
236D 239D 240D 241D 243D 244D 245D 247D	Errors solid state output OSSD3	CHECK THE OSSD3 CONNECTIONS RELATIVE TO THE MODULE IN ERROR

Accessories and Spare Parts

Description	Model
Certus main unit (8 inputs / 2 double OSSD)	**CMM**
Certus I/O expansion unit (8 inputs / 2 double OSSD)	**C 8I 2O**
Certus input expansion unit (8 inputs)	**C 8I**
Certus input expansion unit (16 inputs)	**C 16I**
Certus input expansion unit (12 input, 8 test output)	**C 12I 8T**
Certus output expansion unit (2 double OSSD)	**C 2OSSD**
Certus output expansion unit (4 double OSSD)	**C 4OSSD**
Certus safety relay unit (2 relays)	**C 2R**
Certus safety relay unit (4 relays)3	**C 4R**
Certus PROFIBUS C PDP interface unit	**C PDP**
Certus C DNE DeviceNET	**C DNE**
Certus C CAN interface unit	**C CAN**
Certus C ECA interface unit	**C ECA**
Certus ETHERNET / IP interface unit	**C EIP**
Certus C PFN interface unit	**C PFN**
Certus external configuration memory	**CMC**
Certus connector for 5-way communication	**SCC**
Certus Bus transfer 1 (one input or one output)	**CBT 1**
Certus Bus transfer 2 (one input and one output)	**CBT 2**
Safety speed control expansion (1 input for TTL encoder)	**C ES1T**
Safety speed control expansion (1 input for HTL encoder)	**C ES1H**
Safety speed control expansion (1 input for Sin/Cos encoder)	**C ES1S**
Safety speed control expansion (2 input for TTL encoders)	**C ES2T**
Safety speed control expansion (2 input for HTL encoders)	**C ES2H**
Safety speed control expansion (2 inputs for Sin/Cos encoders)	**C ES2S**
Safety speed control expansion (2 inputs for proximities switches)	**C PSS**

Warranty

Carlo Gavazzi warrants that all of its Certus units shall be free from defects in material or workmanship for a period of 12 (twelve) months from the date of shipment. This warranty applies to the products under normal conditions of use.

If the product proves to be defective during the warranty period, Carlo Gavazzi will repair or replace any faulty parts without any charge for material or labour.
Carlo Gavazzi may, at its discretion, replace the defective equipment with the same type of equipment or with equipment having the same characteristics, rather than repair it.

This warranty is subject to the conditions listed below:
The customer must inform Carlo Gavazzi of the fault within twelve months from the date of delivery of the product.
The equipment and all components must be in the condition as they were at the time of delivery by Carlo Gavazzi.

The fault or defect must not been caused either directly or indirectly by:
- Improper use;
- Failure to comply with the instructions for use;
- Carelessness, misuse, incorrect maintenance;
- Repairs, modifications, adaptations not performed by Carlo Gavazzi, tampering, etc.;
- Accidents or collisions (also during transportation and as a result of force majeure);
- Other causes for which Carlo Gavazzi cannot be held liable.

The defective equipment must be delivered or shipped to Carlo Gavazzi's works to be repaired: the warranty does not cover costs of transport or the risk of damage to or loss of the equipment during shipment, which shall be borne by the customer.
All products and components that are replaced become the property of Carlo Gavazzi.
Carlo Gavazzi shall not be held liable under any other warranties or rights except for those expressly indicated above. Carlo Gavazzi shall not therefore accept claims to pay damages for expenses, interruption of work or other factors or circumstances in any way related to failure of the product or any parts thereof.

Please, visit the website www.carlogavazziautomation.com for the list of the authorised representative of each Country.

⚠ Precise, complete compliance with all standards, instructions and warnings in this handbook is essential for the correct operation of the device. Carlo Gavazzi therefore declines any responsibility for all and anything resulting from failure to comply with all or some of the aforesaid instructions.

CARLO GAVAZZI
Automation Components

CARLO GAVAZZI

Issue No.: 016LA23092016

EU/EC Declaration of Conformity

We

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

declare that the product(s)

Safety-Related Programmable Systems
CERTUS

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

Low Voltage Directive 2014/35/EU and EMC Directive 2014/30/EU

EN 61131-2:2007	**Programmable controllers - Part 2: Equipment requirements and tests**

Machinery Directive 2006/42/EC

EN ISO 13849-1:2008	**Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2006)**
EN 61496-1:2013	**Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests**
EN 62061:2005	**Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems**
IEC 61784-3:2007	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions
EN 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements
EN 61508-2-:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems
EN 61508-3-:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 3: Software requirements
EN 61508-4-:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 4: Definitions and abbreviations

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

Place/date Lainate, May 31st, 2016

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.

CERTIFIED EQA ISO 9001 cert. N. QA130463

CERTIFIED EQA ISO 14001 cert. N. EA130475

Note

Note