



MOSAIC

modular safety integrated controller

product catalog

MV
Expansion units for safety speed monitoring

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

MOR4, MOR4S8
Safety relay units with configurable outputs

M1 (Standard) or M1S (Enhanced)
Master unit, can be used as a stand-alone device or to control other expansion units

Mix, MOx
Additional Input/Output units.



Removable terminal blocks with clamp contacts



Removable terminal blocks with screw contacts

Watch the video!



YouTube

Mosaic Safety Communication (MSC)
Allows communication between the various units through a proprietary high-speed safety bus

Mosaic Configuration Memory (MCM)
Removable memory card for saving Mosaic configuration data for subsequent transfers to a new device (without using a PC) or for backup

USB Connection
USB 2.0 serial bus for the connection to Mosaic Safety Designer (MSD) software



KEY FEATURES

- Mosaic is a safety hub able to manage all safety functions of a machinery. **Configurable and scalable**, allows **cost reductions** and **minimal wiring**
- **Mosaic can manage safety sensors** and signals such as:
 - Light curtains
 - Photocells
 - Laser scanners
 - Emergency stops
 - Electromechanical switches
 - Guard-lock safety door switches
 - Magnetic switches
 - RFID switches
 - Safety mats and edges
 - Two-hands controls
 - Hand grip switches
 - Safety switch with guard locking
 - Encoders and proximities for safety speed control



SAFETY LEVEL
Up to **SIL 3**
SIL 3 - SILCL 3
PL e - Cat. 4

ADVANTAGES

Compared to “traditional” electromechanical safety-relays-based safety circuitries, Mosaic has many remarkable advantages, including:

- **Reducing the number of devices** and wiring used and, therefore, the overall size of the project
- **Speeding-up control panel construction**
- Providing **logic configuration** via a quick and **easy-to-use software**. Machine designers are always able to change configuration logic
- Simply adding or removing safety function blocks at any stage of machine design
- Is able to check the logic configuration of the application during the designing phase through the **validation function** and **Simulation** as well as to test it during the installation through the **monitor function**
- Allows **tamper-proof system** configurations as:
 - detection of tempering attempts through specific tests (i.e. mandatory test of the safety device at machine start-up)
 - protection against unauthorized changes to the project through a **2-level password**
- All logic is configured through a **graphic interface**. No more laborious wiring is needed as with traditional solutions
- A lower number of electromechanical components also means a **better Performance Level** and, therefore, a **higher Safety Level**
- The project report provides the actual values of PFH_d , DC_{avg} and $MTTF_d$ according to EN 13849-1 and EN 62061
- Master units M1 and M1S configurable via the MSD (Mosaic Safety Designer) graphic interface (provided with each Master units at no extra cost)

Connect up to 14 expansions

Communication

Speed monitoring

Safety relays

Master unit

new



MBx

Field-bus units
Profibus DP
DeviceNET
CANopen
EthernetIP
EtherCAT
Profinet
Modbus RTU
Modbus TCP
CC-Link
USB

MCT

Interface connection units
Interface module allowing the connection of remote expansions via proprietary MSC bus

MCT1

1 connection interface (1 I/O)

MCT2

2 connections interface (2 I/O)

MV0/MV1/MV2

Speed monitoring units

Safety speed monitoring (up to PL e) for: zero speed control, maximum speed control, speed range control, direction control

MV0

Input for 2 proximity switches

MV1

Input for 1 incremental encoder and 2 proximity switches (TTL, HTL o SIN/COS)

MV2

Input for 2 incremental encoders and 2 proximity switches (TTL, HTL o SIN/COS)

MOR4/S8

Safety relay with configurable output units

MOR4

4 safety relays with guided contacts
4 NO contacts (250 VAC 6 A)
It is possible to select two different configurations via MSD:

- 4 independent single channel outputs
- 2 dual channel outputs
- 4 input for Start/Restart interlock and EDM

Single channel LED signaling

MOR4S8

As MOR4, with 8 status outputs (PNP 100 mA)

MR2/MR4

Safety relay output units

MR2

2 safety relays with guided contacts
2 NO + 1 NC contacts (250 VAC 6 A)
1 NC contacts for EDM feedback

MR4

4 safety relays with guided contacts
4 NO + 2 NC contacts (240 VAC 6 A)
2 NC contacts for EDM feedback

M1

Standard master unit

8 digital inputs
2 input for Start/Restart interlock and EDM
2 pairs OSSD safety outputs (PNP 400 mA)
2 status outputs (PNP 100 mA)
4 test outputs (for short-circuits monitoring)

M1S

Enhanced master unit

8 digital inputs
4 input for Start/Restart interlock and EDM
4 single OSSD safety outputs (or 2 pairs) (PNP 400 mA)
4 status outputs (PNP 100 mA)
4 test outputs (for short-circuits monitoring)

INDUSTRY
4.0
ready

to the Master units

Additional inputs



MI8/MI16/MI12T8

Input units

MI8

8 digital inputs
4 test outputs (for short-circuits monitoring)

MI16

16 digital inputs
4 test outputs (for short-circuits monitoring)

MI12T8

12 digital inputs
8 test outputs (for short-circuits monitoring)
Can manage up to 4 independent safety mats/edges

Additional outputs



MO2/MO4

Output units

MO2

2 pairs OSSD safety outputs (PNP 400 mA)
2 input for Start/Restart interlock and EDM
2 status outputs (PNP 100 mA)

MO4

4 pairs OSSD safety outputs (PNP 400 mA)
4 input for Start/Restart interlock and EDM
4 status outputs (PNP 100 mA)

MO4L HC S8

High current output unit

4 single OSSD safety outputs (or 2 pairs) (PNP 2,0 A for each channel, total current 8 A)
4 input for Start/Restart interlock and EDM
8 status outputs (PNP 100 mA)



Additional inputs/outputs



MI8O2/MI8O4

Input/Output units

MI8O2

8 digital inputs
2 input for Start/Restart interlock and EDM
2 pairs OSSD safety outputs (PNP 400 mA)
2 status outputs (PNP 100 mA)
4 test outputs (for short-circuits monitoring)

MI8O4

8 digital inputs
4 input for Start/Restart interlock and EDM
4 single OSSD safety outputs (or 2 pairs) (PNP 400 mA)
4 status outputs (PNP 100 mA)
4 test outputs (for short-circuits monitoring)

Additional status outputs



MOS8/MOS16

Non-safety output units

MOS 8

8 status outputs (PNP 100 mA)

MOS16

16 status outputs (PNP 100 mA)



DIGITAL INPUTS
8

SAFETY OUTPUTS
2 pairs OSSD

EDM/RESTART
2

TEST OUTPUTS
4

STATUS OUTPUTS
2

LOGICAL OPERATORS
64

APPROVALS

- 2006/42/EC: "Machine Directive"
- 2014/30/EU: "Electromagnetic Compatibility Directive".
- 2014/35/EU: "Low Voltage Directive"
- EN 61496-1:2013 (Type 4) "Safety of machinery - Electro sensitive protective equipment - General requirements and tests"
- EN 61131-2:2007 "Programmable controllers - Part 2. Equipment requirements and tests"
- EN 61508-1:2010 (SIL3) "Functional safety of electrical / electronic / programmable electronic safety related systems - General requirements"
- EN 61508-2:2010 (SIL3) "Functional safety of electrical / electronic / programmable electronic safety related systems - Requirements for electrical/electronic/programmable electronic safety-related systems"
- EN 61508-3:2010 (SIL3) "Functional safety of electrical / electronic / programmable electronic safety related systems: Software requirements"
- EN 61508-4:2010 (SIL3) "Functional safety of electrical / electronic / programmable electronic safety related systems - Definitions and abbreviations"
- IEC 62061:2005/A2:2015 (SILCL 3) "Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems"
- EN ISO 13849-1:2008 (Cat. 4 PL e) "Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design"
- IEC 61784-3:2008 "Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions"
- UNI EN 81-20:2014 "Safety rules for the construction and installation of lifts. Lifts for the transport of persons and goods. Part 20: Passenger and goods passenger lift"
- UNI EN 81-50:2014 "Safety rules for the construction and installation of lifts. Examinations and test. Part 50: Design rules, calculations, examinations and tests of lift components"
- UL (C+US) mark for USA and Canada
- ANSI / UL 1998: "Safety Software in Programmable Components"
- The S-Mark carries the same weight in Korea as the CE-Mark does in Europe

Certifications



LIVELLO DI SICUREZZA

SIL 3

SIL3 - SILCL 3
PL e - Cat. 4



M1

STANDARD MASTER UNIT

Master unit, also usable as a stand-alone device, able to control any other expansion unit. With 8 digital inputs and 2 pairs OSSD safety outputs.

APPLICATION EXAMPLE

Standalone: To provide protection for a smaller machinery connecting for example 1 safety light curtain, 1 e-stop, 1 magnetic sensor and 1 two-hand switch.

As Master unit: To control a more complex system providing protection for bigger machineries.

TECHNICAL FEATURES

| | |
|--------------------|---|
| Digital inputs | 8 digital inputs |
| Safety outputs | 2 pairs OSSD - PNP 400 mA output current |
| EDM | 2 inputs for Start/Restart interlock and external device monitoring (EDM) |
| Status outputs | 2 programmable digital signal outputs PNP 100 mA output current |
| Test outputs | 4 test outputs for sensor monitoring |
| LED signalling | Input/output status and fault diagnostics |
| Configuration | With PC via USB interface using MSD (Mosaic Safety Designer) software |
| MSC bus connection | With MSC connector (optional) |
| MCM | Mosaic Configuration Memory (optional) |

ACCESSORIES

MSC Rear Bus connector: necessary to connect the M1 Master unit to any expansion module. As the M1 Master unit can be used as standalone, the bus connector must be ordered separately.

MCM Card (Mosaic Configuration Memory): memory card designed to store the M1 Master unit configuration as a back-up. Can be used to restore the saved configuration onto a new M1 Master unit or to duplicate the current configuration to other M1 Master units.

PART NUMBERS

| Code | Description |
|---------|---|
| 1100000 | M1 Master unit - Screw terminal blocks |
| 1100002 | M1C Master unit - Clamp terminal blocks |
| 1100060 | MCM - Memory card |
| 1100061 | MSC - Mosaic Safety Communication connector |
| 1100099 | MSC-C - Mosaic Safety Communication connector with terminal end cap |
| 1100062 | USB configuration cable (A-mini B, length 1,8 m) |
| 1100079 | CPM - Polarizing keys for Mosaic connectors |



| | |
|-------------------|----------------------------|
| DIGITAL INPUTS | 8 |
| SAFETY OUTPUTS | 4 single OSSD (or 2 pairs) |
| EDM/RESTART | 4 |
| TEST OUTPUTS | 4 |
| STATUS OUTPUTS | 4 |
| LOGICAL OPERATORS | 128 |

APPROVALS

- 2006/42/EC: "Machine Directive"
- 2014/30/EU: "Electromagnetic Compatibility Directive".
- 2014/35/EU: "Low Voltage Directive"
- EN 61496-1:2013 (Type 4) "Safety of machinery - Electro sensitive protective equipment - General requirements and tests"
- EN 61131-2:2007 "Programmable controllers - Part 2. Equipment requirements and tests"
- EN 61508-1:2010 (SIL3) "Functional safety of electrical / electronic / programmable electronic safety related systems - General requirements"
- EN 61508-2:2010 (SIL3) "Functional safety of electrical / electronic / programmable electronic safety related systems - Requirements for electrical/electronic/programmable electronic safety-related systems"
- EN 61508-3:2010 (SIL3) "Functional safety of electrical / electronic / programmable electronic safety related systems: Software requirements"
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- UNI EN 81-20:2014 "Safety rules for the construction and installation of lifts. Lifts for the transport of persons and goods. Part 20: Passenger and goods passenger lift"
- UNI EN 81-50:2014 "Safety rules for the construction and installation of lifts. Examinations and test. Part 50: Design rules, calculations, examinations and tests of lift components"
- UL (C+US) mark for USA and Canada
- ANSI / UL 1998: "Safety Software in Programmable Components"

Certifications



LIVELLO DI SICUREZZA

SIL 3


SIL3 - SILCL 3
PL e - Cat. 4

M1S



ENHANCED MASTER UNIT

Master unit, also usable as a stand-alone device, able to control any other expansion unit. With 8 digital inputs, 4 single OSSD safety outputs or 2 pair OSSD safety output.

APPLICATION EXAMPLE

The enhanced version of the master unit allows to control complex system and machinery that require a greater number of safety outputs, status outputs and logical operators

TECHNICAL FEATURES

| | |
|--------------------|---|
| Digital inputs | 8 digital inputs |
| Safety outputs | 4 single OSSD (or 2 pairs) - PNP 400 mA output current |
| EDM | 4 inputs for Start/Restart interlock and external device monitoring (EDM) |
| Status outputs | 4 programmable digital signal outputs PNP 100 mA output current |
| Test outputs | 4 test outputs for sensor monitoring |
| LED signalling | Input/output status and fault diagnostics |
| Configuration | With PC via USB interface using MSD (Mosaic Safety Designer) software |
| MSC bus connection | With MSC connector (optional) |
| MCM | Mosaic Configuration Memory (optional) |

ACCESSORIES

MSC Rear Bus connector: necessary to connect the M1S Master unit to any expansion module. As the M1S Master unit can be used as standalone, the bus connector must be ordered separately.

MCM Card (Mosaic Configuration Memory): memory card designed to store the M1S Master unit configuration as a back-up. Can be used to restore the saved configuration onto a new M1S Master unit or to duplicate the current configuration to other M1S Master units.

PART NUMBERS

| Code | Description |
|---------|---|
| 1100003 | M1S Master unit - Screw terminal blocks |
| 1100004 | M1SC Master unit - Clamp terminal blocks |
| 1100060 | MCM - Memory card |
| 1100061 | MSC - Mosaic Safety Communication connector |
| 1100099 | MSC-C - Mosaic Safety Communication connector with terminal end cap |
| 1100062 | USB configuration cable (A-mini B, length 1,8 m) |
| 1100079 | CPM - Polarizing keys for Mosaic connectors |

MI8O2 - MI8O4



INPUT/OUTPUT EXPANSION UNITS

Input/output expansion unit. With 8 digital inputs and 2 (MI8O2) or 4 (MI8O4) pairs OSSD safety outputs. MI8O4 allows to configure the safety output as single channel.

APPLICATION EXAMPLE

To provide more inputs and outputs for a smaller machinery connecting for example extra safety sensors and/or e-stops buttons and to control 2 extra actuators.



DIGITAL INPUTS
8

SAFETY OUTPUTS
2 pairs OSSD (MI8O2)
4 single OSSD or 2 pairs OSSD (MI8O4)

EDM/RESTART
2 (MI8O2)
4 (MI8O4)

TEST OUTPUTS
4

STATUS OUTPUTS
2 (MI8O2)
4 (MI8O4)

TECHNICAL FEATURES

| | |
|------------------|---|
| Digital inputs | 8 digital inputs |
| Safety outputs | 2 pairs OSSD - PNP 400 mA output current (MI8O2) 4 single OSSD (or 2 pairs) - PNP 400 mA output current (MI8O4) |
| EDM | 2 (MI8O2) or 4 (MI8O4) inputs for Start/Restart interlock and external device monitoring (EDM) |
| Status outputs | 2 (MI8O2) or 4 (MI8O4) programmable digital signal outputs - PNP 100 mA output current |
| Test outputs | 4 test outputs for sensor monitoring |
| LED signalling | Input/output status and fault diagnostics |
| Connection to M1 | Via MSC connector (included) |

PART NUMBERS

| Code | Description |
|---------|---|
| 1100010 | MI8O2 Expansion unit - Screw terminal blocks |
| 1100110 | MI8O2C Expansion unit - Clamp terminal blocks |
| 1100011 | MI8O4 Expansion unit - Screw terminal blocks |
| 1100111 | MI8O4C Expansion unit - Clamp terminal blocks |
| 1100079 | CPM - Polarizing keys for Mosaic connectors |

MI8 - MI16

INPUT EXPANSION UNITS

Input expansion units with 8 (MI8) or 16 (MI16) digital inputs increase the number of inputs of an M1 Master unit.

APPLICATION EXAMPLE

To provide more inputs for a smaller machinery connecting for example extra safety sensors and/or e-stops buttons.



DIGITAL INPUTS
8 (MI8)
16 (MI16)

TEST OUTPUTS
4

TECHNICAL FEATURES

| | |
|------------------|---|
| Digital inputs | 8 digital inputs |
| Test outputs | 4 test outputs for sensor monitoring |
| LED signalling | Input/output status and fault diagnostics |
| Connection to M1 | Via MSC connector (included) |

PART NUMBERS

| Code | Description |
|---------|--|
| 1100020 | MI8 Expansion unit - Screw terminal blocks |
| 1100120 | MI8C Expansion unit - Clamp terminal blocks |
| 1100021 | MI16 Expansion unit - Screw terminal blocks |
| 1100121 | MI16C Expansion unit - Clamp terminal blocks |
| 1100079 | CPM - Polarizing keys for Mosaic connectors |

MI12T8

INPUT EXPANSION UNIT

Input expansion unit for safety mats and edges. With 12 digital inputs and 8 test outputs for sensor monitoring.

APPLICATION EXAMPLE

With 8 test outputs can manage up to 4 independent safety mats or edges. Test output signals are used to monitor overloads and short circuits on input lines.



DIGITAL INPUTS
12

TEST OUTPUTS
8

TECHNICAL FEATURES

| | |
|------------------|---|
| Digital inputs | 12 digital inputs |
| Test outputs | 8 test outputs for sensor monitoring |
| LED signalling | Input/output status and fault diagnostics |
| Connection to M1 | Via MSC connector (included) |

PART NUMBERS

| Code | Description |
|---------|---|
| 1100022 | MI12T8 Expansion unit |
| 1100079 | CPM - Polarizing keys for Mosaic connectors |

MO2 - MO4

OUTPUT EXPANSION UNITS

Output expansion units with 2 (MO2) or 4 (MO4) safety outputs pairs increase the number of safety outputs of an M1 Master unit.

APPLICATION EXAMPLE

To provide more safety outputs in machine where different actuators need to be controlled. For example automatic packaging machines, etc.



SAFETY OUTPUTS
2 (MO2)
4 (MO4)

EDM/RESTART
2 (MO2)
4 (MO4)

STATUS OUTPUTS
2 (MO2)
4 (MO4)

TECHNICAL FEATURES

| | |
|------------------|--|
| Safety outputs | MO2 - 2 OSSD pairs - PNP 400mA output current MO4 - 4 OSSD pairs - PNP 400mA output current |
| EDM | MO2 - 2 inputs for Start/Restart interlock and external device monitoring (EDM) MO4 - 4 inputs for Start/Restart interlock and external device monitoring (EDM) |
| Status outputs | MO2 - 2 programmable digital signal outputs - PNP 100 mA output current MO4 - 4 programmable digital signal outputs - PNP 100 mA output current |
| LED signalling | Input/output status and fault diagnostics |
| Connection to M1 | Via MSC connector (included) |

PART NUMBERS

| Code | Description |
|---------|---|
| 1100030 | MO2 Expansion unit - Screw terminal blocks |
| 1100130 | MO2C Expansion unit - Clamp terminal blocks |
| 1100031 | MO4 Expansion unit - Screw terminal blocks |
| 1100131 | MO4C Expansion unit - Clamp terminal blocks |
| 1100079 | CPM - Polarizing keys for Mosaic connectors |

MO4L HC S8

HIGH CURRENT OUTPUT EXPANSION UNIT

Output expansion unit with 2 pairs OSSD or 4 single OSSD high current safety outputs (PNP 2,0 A per channel, 8 A in total), 4 relative inputs for external feedback contacts (EDM) and 8 status output.

APPLICATION EXAMPLE

To provide 2 different high current output configurations (configurable with MSD configuration software)

- 4 single OSSD (1 safety output per channel with 4 feedback inputs)
- 2 pairs OSSD (2 safety output per channel with 2 feedback inputs)



SAFETY OUTPUTS
4 single OSSD (or
2 pairs)

EDM/RESTART
4

STATUS OUTPUTS
8



TECHNICAL FEATURES

| | |
|------------------|---|
| Safety outputs | 4 single OSSD (or 2 pairs) Solid state safety outputs PNP 2 A output current active high |
| EDM | 4 inputs for Start/Restart interlock and external device monitoring (EDM) |
| Output current | 2A max per channel (total current 8A) |
| Status outputs | PNP 100 mA output current |
| LED signalling | Output status and fault diagnostics |
| Connection to M1 | Via MSC connector (included) |

PART NUMBERS

| Code | Description |
|---------|--|
| 1100032 | MO4LHCS8 Expansion unit - Screw terminal blocks |
| 1100132 | MO4LHCS8C Expansion unit - Clamp terminal blocks |
| 1100079 | CPM - Polarizing keys for Mosaic connectors |

MR2 - MR4

SAFETY RELAY UNITS

Output expansion units provide 2 (MR2) or 4 (MR4) safety relays outputs with guided contacts connectable to 2 or 4 independent OSSD pairs. These units can also be used separately from the Mosaic system.

APPLICATION EXAMPLE

To provide 2 or 4 guided contact safety relay in applications where there is the need to cut the actuators power supply. Each NO contact is interrupted twice by the integrated safety relays.



SAFETY RELAY
2 (MR2)
4 (MR4)

TECHNICAL FEATURES

| | |
|------------------|--|
| Safety relays | MR2 - 2 safety relays with 6 A 250 VAC guided contacts: 2 NO + 1 NC for EDM feedback MR4 - 4 safety relays with 6 A 250 VAC guided contacts: 4 NO + 2 NC for EDM feedback |
| LED signalling | OSSD output status (input in MRx) |
| Connection to M1 | The MR2 and MR4 expansion units do not require MSC as they are wired directly to the selected OSSD |

PART NUMBERS

| Code | Description |
|---------|---|
| 1100040 | MR2 Expansion unit - Screw terminal blocks |
| 1100140 | MR2C Expansion unit - Clamp terminal blocks |
| 1100041 | MR4 Expansion unit - Screw terminal blocks |
| 1100141 | MR4C Expansion unit - Clamp terminal blocks |
| 1100079 | CPM - Polarizing keys for Mosaic connectors |

MOR4

SAFETY RELAY WITH CONFIGURABLE OUTPUTS UNITS

Output expansion units provide 4 configurable safety relays with guided contacts.

APPLICATION EXAMPLE

To provide 4 configurable guided contact safety relay. It allows to select the safety category via MSD:

- Safety Cat. 1: 4 independent single channel outputs
- Safety Cat. 2: 4 independent single channel outputs with OTE (Output Test Equipment)
- Safety Cat. 4: 2 independent double channels outputs



SAFETY RELAY
4

EDM/RESTART
4

TECHNICAL FEATURES

| | |
|------------------|---|
| Safety relays | 4 safety relays with 6 A 250 VAC guided contacts |
| EDM | 4 inputs for Start/Restart interlock and external device monitoring (EDM) |
| LED signalling | Output status and fault diagnostics |
| Connection to M1 | Via MSC connector (included). Do not use M1 OSSDs to drive relays |

PART NUMBERS

| Code | Description |
|---------|--|
| 1100042 | MOR4 Expansion unit - Screw terminal blocks |
| 1100142 | MOR4C Expansion unit - Clamp terminal blocks |
| 1100079 | CPM - Polarizing keys for Mosaic connectors |

MOR4S8

SAFETY RELAY WITH CONFIGURABLE OUTPUTS UNITS AND 8 SIGNAL OUTPUTS

Output expansion units provide 4 configurable safety relays with guided contacts.

APPLICATION EXAMPLE

To provide 4 configurable guided contact safety relay. It allows to select the safety category via MSD:

- Safety Cat. 1: 4 independent single channel outputs
- Safety Cat. 2: 4 independent single channel outputs with OTE (Output Test Equipment)
- Safety Cat. 4: 2 independent double channels outputs



SAFETY RELAY
4

EDM/RESTART
4

STATUS OUTPUTS
8

TECHNICAL FEATURES

| | |
|------------------|---|
| Safety relays | 4 safety relays with 6 A 250 VAC guided contacts |
| EDM | 4 inputs for Start/Restart interlock and external device monitoring (EDM) |
| LED signalling | Output status and fault diagnostics |
| Connection to M1 | Via MSC connector (included). Do not use M1 OSSDs to drive relays |

PART NUMBERS

| Code | Description |
|---------|--|
| 1100043 | MOR4S8 Expansion unit - Screw terminal blocks |
| 1100143 | MOR4S8C Expansion unit - Clamp terminal blocks |
| 1100079 | CPM - Polarizing keys for Mosaic connectors |



| | | |
|----------------------------|--|--|
| INPUT MV0 2 Proximities | INPUT MV1 1 Encoder 1 or 2 Proximities | INPUT MV2 1 or 2 Encoders 1 or 2 Proximities |
| AXIS MV0 2 | AXIS MV1 2 | AXIS MV2 2 |

RJ-45 (1 for MV1, 2 for MV2) connectors for encoders and terminal blocks for proximity switches.

Max. input frequency for encoders: up to 500 KHz (300 KHz for HTL encoder).

Max. input frequency for proximity switches: up to 5 KHz.

The MV2 module includes two configurable logical outputs and is therefore able to control up to two independent axis (configuration via MSD).

MV0 - MV1 - MV2

SAFETY SPEED MONITORING UNITS

Safety speed monitoring (up to PL e) for: zero speed control, max. speed, speed range and direction control.

APPLICATION EXAMPLE

Any application requiring speed monitoring for a hazardous tool. See relevant application example on [page 39](#). Maintenance speed control in rail dependent storage and retrieval equipment applications.

TECHNICAL FEATURES

| | |
|------------------|--|
| Digital inputs | MV0 - Input for 2 PNP/NPN proximity switches |
| | MV1 - Input for 1 incremental encoder (TTL, HTL or SIN/COS) and 1 or 2 PNP/NPN proximity switches |
| | MV2 - Input for 1 or 2 incremental encoder (TTL, HTL or SIN/COS) and 1 or 2 PNP/NPN proximity switches |
| | |
| Speed thresholds | Up to 4 logically selectable speed thresholds (freely configurable via MSD) for each logical output (axis) |
| LED signalling | Input/output status and fault diagnostics |
| Connection to M1 | Via MSC connector (included) |

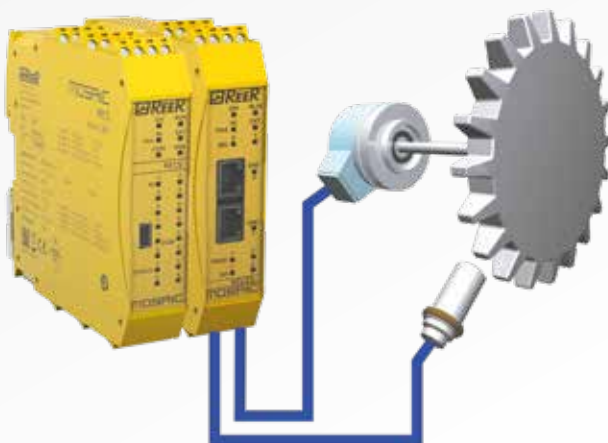
ACCESSORIES

SAFECODER - Safety Sin/Cos incremental encoder. [See page 15](#)

MVSC xx - Speed monitoring sniffer cable. [See page 20](#)

PART NUMBERS

| Code | Description |
|---------|---|
| 1100077 | MV0 - Proximities switch expansion module |
| 1100070 | MV1T - 1 TTL incremental encoder + 1 or 2 PNP/NPN proximity switches expansion module |
| 1100086 | MV1TB - 1 TTL incremental encoder (24 VDC) + 1 or 2 PNP/NPN proximity switches expansion module |
| 1100071 | MV1H - 1 HTL incremental encoder + 1 or 2 PNP/NPN proximity switches expansion module |
| 1100072 | MV1S - 1 SIN/COS incremental encoder + 1 or 2 PNP/NPN proximity switches expansion module |
| 1100073 | MV2T - 1 or 2 TTL incremental encoders + 1 or 2 PNP/NPN proximity switches expansion module |
| 1100087 | MV2TB - 1 or 2 TTL incremental encoders (24 VDC) + 1 or 2 PNP/NPN proximity switches expansion module |
| 1100074 | MV2H - 1 or 2 HTL incremental encoders + 1 or 2 PNP/NPN proximity switches expansion module |
| 1100076 | MV2S - 1 or 2 SIN/COS incremental encoders + 1 or 2 PNP/NPN proximity switches expansion module |
| 1100079 | CPM - Polarizing keys for Mosaic controller connectors |



MCT1 - MCT2

REMOTE INTERFACE UNITS

Interface module allowing the connection of remote expansions units via the MSC bus.

APPLICATION EXAMPLE

Ideal solution for the interconnection of the safety functions of more machineries on a single production line. MCT1 and MCT2 are not shown in MSD configuration software as do not count as expansions.



CONNECTION INTERFACE
1 (MCT1)
2 (MCT2)

TECHNICAL FEATURES

| | |
|------------------|---|
| Connection | MCT1 - 1 connection: 1 input or 1 output to be placed at the beginning or at the end of the network MCT2 - 2 connections: 1 input and 1 output |
| Cable | Shielded RS 485 serial interface compatible cable (4 wires + shield) via the connector block. We recommend the use of ReeR's cables for a correct operation of the system |
| Total distance | Up to 50 m for each connection (total distance up to 250 m). Max. 5 MCT expansions units |
| LED signalling | Module status and fault diagnostics |
| Connection to M1 | Via MSC connector (included) |

PART NUMBERS

| Code | Description |
|---------|--|
| 1100058 | MCT1 Expansion unit |
| 1100057 | MCT2 Expansion unit |
| 1100063 | MCT25 - Serial cable for MSC bus transfer 25 m |
| 1100064 | MCT50 - Serial cable for MSC bus transfer 50 m |
| 1100065 | MCT100 - Serial cable for MSC bus transfer 100 m |

HM1

DISPLAY UNIT

Alphanumeric display. It displays the messages programmed using the HSD software.



APPLICATION EXAMPLE

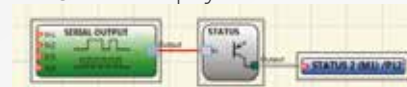
Used in control panels to display status messages as diagnostic or operation functions of the safety system. Can be also used to display other functioning messages of the machine or the plant.

TECHNICAL FEATURES

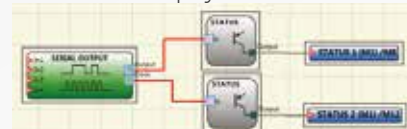
| | |
|---------|---|
| Display | Green display LCD 2x16 |
| Ports | 2 configurable RS 485 serial ports USB port for messages on display programming |
| Inputs | 4 inputs for the connection with Mosaic: 2 synchronous serial ports (clock + data) or 4 asynchronous serial ports (data) |

HM1 can be connected to Mosaic 3 ways:

Wired to a status output connected to the serial operator, asynchronous serial connection
Max 32 status displayed.



Connection to M1
Wired to 2 status outputs connected to the serial operator, synchronous serial connection
Max 16 status displayed.



Wired to the serial MBx module via RS 485 serial port, all I/O statuses and diagnostic displayed.

PART NUMBERS

| Code | Description |
|---------|----------------------------------|
| 1100090 | HM1 Expansion unit |
| 1100062 | USB cable A-mini B, length 1,8 m |

MBs

FIELD-BUS EXPANSION UNITS

Expansion unit for connection to the most common industrial Field-bus systems for diagnostics and data communication.

APPLICATION EXAMPLE

In all applications where it is required to communicate between the machine's safety system and the PLC control.



MBP - Profibus DPM
MBD - DeviceNET
MBC - CANopen
MBEC - EtherCAT
MBEI - Ethernet IP
MBEP - PROFINET
MBU - Universal Serial Bus
MBMR - ModBus RTU
MBEM - ModBus TCP
MBCCL - CC-Link

TECHNICAL FEATURES

| | |
|------------------|---|
| Ports | RS 485 serial ports for I/O Bus expansion USB port for configuration |
| Connection to M1 | Via MSC connector (included) |

PART NUMBERS

| Code | Description |
|---------|--|
| 1100050 | MBP Profibus DP expansion module |
| 1100051 | MBD DeviceNET expansion module |
| 1100052 | MBC CANopen expansion module |
| 1100053 | MBEC EtherCAT expansion module |
| 1100054 | MBEI EtherNET/IP expansion module |
| 1100059 | MBCCL CC-link expansion module |
| 1100085 | MBEI2B EtherNET/IP expansion module (with two connectors) |
| 1100055 | MBEP PROFINET expansion module |
| 1100056 | MBU Universal Serial Bus expansion module |
| 1100082 | MBMR Modbus RTU expansion module |
| 1100083 | MBEM Modbus TCP expansion module |

MOS8 - MOS16

AUTOMATION OUTPUT EXPANSION UNITS

Non-safety output expansion units.

APPLICATION EXAMPLE

Modules for automation where non-safety outputs are required. In this way the Mosaic controller can also be used as a PLC for automation.



STATUS OUTPUTS
8 (MOS8)
16 (MOS16)

TECHNICAL FEATURES

| | |
|------------------|--|
| Status outputs | MOS8 - 8 programmable digital signal outputs - PNP 100 mA output current MOS16 - 16 programmable digital signal outputs - PNP 100 mA output current |
| LED signalling | Output status and fault diagnostics |
| Connection to M1 | Via MSC connector (included) |

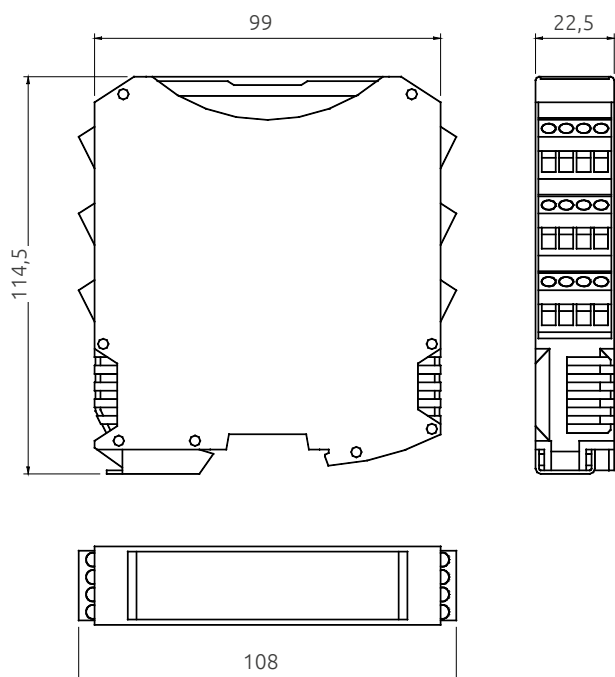
PART NUMBERS

| Code | Description |
|---------|----------------------|
| 1100091 | MOS8 Expansion unit |
| 1100092 | MOS16 Expansion unit |

TECHNICAL FEATURES SUMMARY

COMPARISON BETWEEN SYSTEMS COMPOSED BY M1 / M1S + 14 EXPANSION MODULES

| Main unit | M1 | M1S | Note |
|---|--|-----|--|
| Maximum number of expansion units | 14 | 14 | |
| USB port | yes | yes | |
| MCM card slot | yes | yes | |
| Connection with MSC bus | yes | yes | |
| MSC connector provided | no | no | |
| Safety input | 128 | 128 | |
| Start/Restart inputs and External Device Monitoring | 16 | 32 | |
| Fieldbus input | 8 | 32 | The M1S main unit uses a new "footprint map" for data exchange with the fieldbus units |
| Safety outputs (OSSD) | 16 | 32 | The M1S main unit provides 4 single OSSD safety outputs or 2 Pairs OSSD safety outputs |
| Programmable status outputs | 32 | 48 | The status outputs of the M1S main unit can be converted to feedback inputs (up to 4 feedback inputs for the 4 single OSSD safety outputs) |
| Maximum number of operators managed by the MSD software | 64 | 128 | |
| Maximum number of managed timers | 32 | 48 | |
| Maximum number of "Muting" operators | 4 | 8 | |
| Maximum number of operators "Safety Guard Lock" | 4 | 8 | |
| Maximum number of "Fieldbus Probe" outputs | 16 | 32 | |
| Safety level | SIL 3 – SILCL 3 according to IEC 61508 - IEC 62061 PL e – Cat. 4 according to ISO 13849-1 | | |



Dimensioni in mm

MECHANICAL CHARACTERISTICS

- Compact design: single module dimensions 22.5 x 99 x 114.5 mm
- Possible connection with Reer MSC rear bus for connection with other expansion modules
- Operating temperature: -10 ... +55 °C
- Storage temperature: -20 ... +85 °C
- Protection rating: IP20 for housing, IP 2X for terminal block
- Rail fastening according to EN 50022-35 standard
- Removable terminal blocks, screw or clamp contacts
- Input/Output connectors: 24 x 22.5 mm, 6 removable terminal blocks, screw or clamp contact



screw contacts



Clamp contacts

EXPANSION UNITS TECHNICAL FEATURES

| Units | MI802 MI804 | MI8 MI16 | MI12T8 | MO2 MO4 | MO4LHCS8 | MR2 MR4 | MCT1 MCT2 | MOR4 MOR4 S8 | MV | MOS8 MOS16 | MBx |
|---|---|-------------|--------|----------------------------------|---|---|------------------------------|--|--|-------------------------------------|--------------------|
| Description | Input Output unit | Input unit | | Output unit | High Current Safety Outputs units | Guided contact relay output units | Remote interface units | Safety relay configurable output units | Safety speed monitoring units | Automation units | Field bus units |
| USB | - | - | - | - | - | - | - | - | - | - | si |
| MCM card slot | - | - | - | - | - | - | - | - | - | - | - |
| Connection with MSC bus | yes | yes | yes | yes | yes | - | yes | yes | yes | yes | yes |
| MSC connector provided | yes | yes | yes | yes | yes | - | yes | yes | yes | yes | yes |
| Safety level | SIL 3 – SILCL 3 according to IEC 61508 - IEC 62061 / PL e – Cat. 4 according to ISO 13849-1 | | | | | | | | | - | - |
| Safety input | 8 | 8 - 16 | 12 | - | | - | - | - | 2 - 4 | - | - |
| Safety outputs (OSSD) | 2 pairs (MI802) PNP 400 mA | | | 2 pairs (MO2) | 4 single or 2 pairs PNP 2A max | - | - | - | - | - | - |
| | 4 single or 2 pairs (MI804) PNP 400 mA | - | - | 4 pairs (MO4) PNP 400 mA | | | | | | | |
| Programmable status outputs | 2 (MI802) 4 (MI804) PNP 100 mA | - | - | 2 (MO2) 4 (MO4) PNP 100 mA | 8 PNP 100 mA | - | - | MOR4 S8 8 PNP 100 mA | - | 8 - 16 PNP 100 mA | - |
| Test outputs | 4 | 4 | 8 | - | - | | - | - | - | - | - |
| Safety relay outputs | - | - | - | - | - | 2 NA + 1 NC 4 NA + 2 NC 6 A 250 VAC | - | 4 NA single 6 A 250 VAC 0 2 NA pairs 6 A 250 VAC | - | - | - |
| Start/Restart inputs and External Device Monitoring | 2 (MI802) 4 (MI804) | - | - | 2 (MO2) 4 (MO4) | 4 | - | - | 4 | - | - | - |
| LED signalling | Input/output status and fault diagnostics | | | | | Output status | | | Input status and fault diag. | Output status and fault diag. | Fault diag. |
| Power supply (VDC) | 24 ± 20% | | | | | | | | | | |
| Connections | Removable terminal blocks, screw or clamp contacts | | | | | | | | | | |
| Operating temperature | -10 ... +55 °C | | | | | | | | | | |
| Storage temperature | -20 ... +85 °C | | | | | | | | | | |
| Protection rating | IP20 for housing / IP 2X for terminal block | | | | | | | | | | |
| Fastening | Rail fastening according to EN 50022-35 standard | | | | | | | | | | |
| Dimension HxWxD (mm) | 99 x 22,5 x 114 | | | | | | | | | | |



Shaft version



Hollow shaft version

APPROVALS

- 2006/42/EC "Machinery Directive"
- 2004/108/EC "Electromagnetic Compatibility (EMC)"
- EN ISO 13849-1 "Safety of machinery: Safety-related parts of control systems. Part 1: General principles for design"
- EN ISO 13849-2 "Safety of machinery: Safety-related parts of control systems. Part 2: Validation"
- IEC 61508 "Functional safety of electrical, electronic and programmable electronic safety-related systems"
- EN ISO 61800-5-2 "Adjustable speed electrical power drive systems". Part 5-2 Safety requirements - Functional
- UL (C+US) mark for USA and Canada
- BGIA - Institute for Occupational Safety and Health - Germany

Certifications



SAFETY LEVEL

SIL 3

SIL3 - SILCL 3
PL e - Cat. 4

SAFECODER

Safety Sin/Cos incremental encoder, together with Mosaic, comprise a SIL 3 certified safety function for speed monitoring. Available in two models: Shaft or Hollow shaft versions.

APPLICATION EXAMPLE

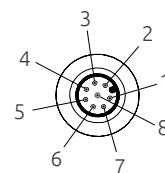
Any applications requiring speed monitoring of a rotating axis. See the application example on page 34.

Features a robust and reliable interface and the ability to handle high mechanical loads.

TECHNICAL FEATURES

| | |
|--------------------------|--|
| Shaft type | Hollow shaft version Ø 12 mm Shaft version Ø 10 mm with flat |
| Fastening | Safety-Lock™ Allow high rotational speed and high shaft load capacity |
| Protection rate | Housing and flange side IP67, shaft IP65 (optional IP67) |
| Immunity to interference | Shock and vibration resistant Insensitive to strong magnetic fields |
| Resolution | 2048 pulse rate |
| Power supply | SC3 24D2048R - 24 VDC SC3 05D2048R - 5 VDC SC3 24B2048R - 24 VDC SC3 05B2048R - 5 VDC |
| Connector | Radial M12 |

CONNECTORS



M12 8-pole

- 1 - GND
- 2 - + V
- 3 - A: Sine output
- 4 - Ā: Sine output
- 5 - B: Cosine output
- 6 - B̄: Cosine output
- shield - PE

PART NUMBERS

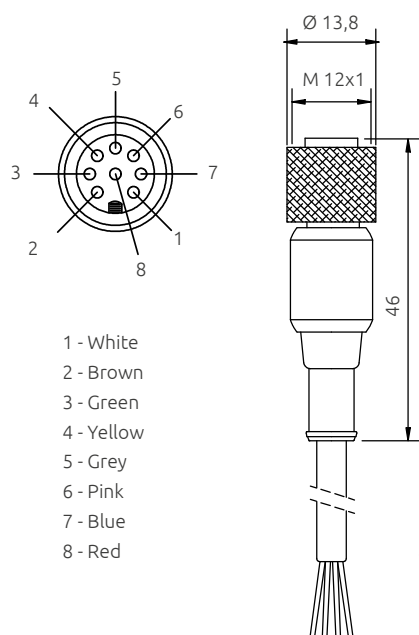
| Code | Description |
|---------|---|
| 1100102 | SC3 24D2048R - 24 V Hollow Shaft version Ø 12 mm |
| 1100103 | SC3 05D2048R - 5 V Hollow Shaft version Ø 12 mm |
| 1100104 | SC3 24B2048R - 24 V Shaft version Ø 10 mm with flat |
| 1100105 | SC3 05B2048R - 5 V Shaft version Ø 10 mm with flat |

CABLES NEEDED

C8D x SH

M12 straight connector, 8 poles, shielded cable

| Model | Code | Description |
|-----------|---------|-------------------------------|
| C8D 5 SH | 1330930 | Pre-wired shielded cable 5 m |
| C8D 10 SH | 1330931 | Pre-wired shielded cable 10 m |
| C8D 15 SH | 1330932 | Pre-wired shielded cable 15 m |

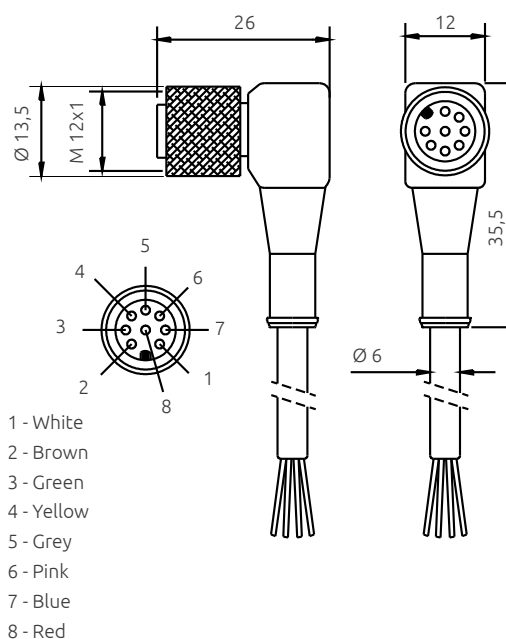


NOTE: cable supplied with M12 8-pole connector at one end only. The other side must be cut off at correct length and crimped with RJ45 connector (not included).

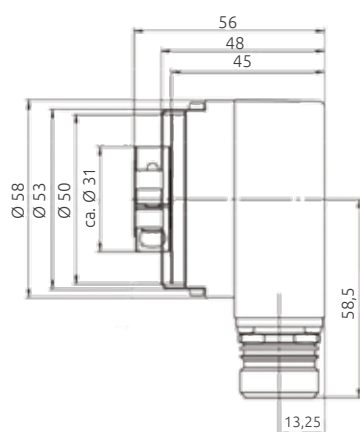
C8D9x SH

M12 90° angled connector, 8 poles, shielded cable

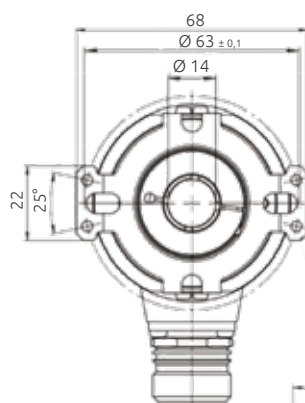
| Model | Code | Description |
|------------|---------|-------------------------------|
| C8D 95 SH | 1330933 | Pre-wired shielded cable 5 m |
| C8D 910 SX | 1330934 | Pre-wired shielded cable 10 m |
| C8D 915 SH | 1330935 | Pre-wired shielded cable 15 m |



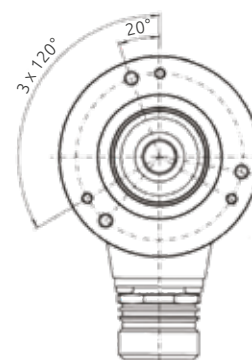
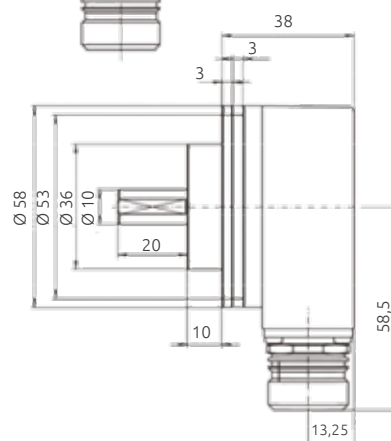
MECHANICAL DATA

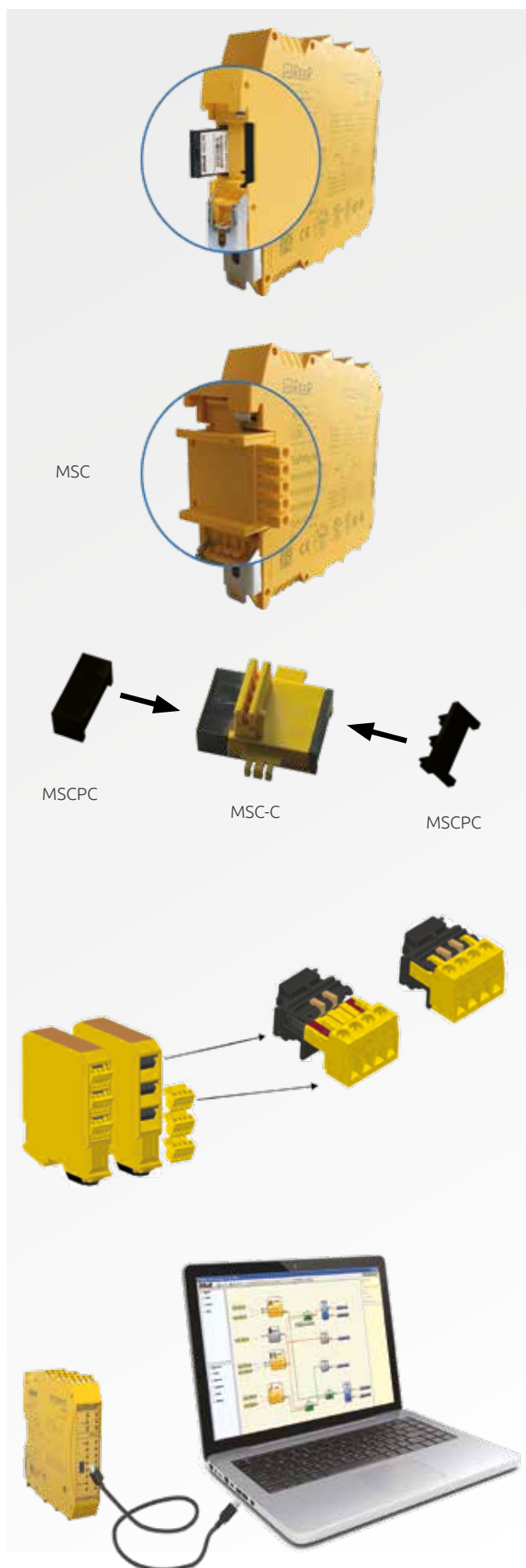


Shaft version with flat



Hollow shaft version





MCM

MOSAIC CONFIGURATION MEMORY

| Models | Ordering codes | Description |
|--------|----------------|---|
| MCM | 1100060 | Mosaic Configuration Memory – Memory Card |

MSC

MOSAIC SAFETY COMMUNICATION

| Models | Ordering codes | Description |
|--------|----------------|--|
| MSC | 1100061 | Mosaic Safety Communication – Connector |
| MSC-C | 1100099 | Mosaic Safety Communication – Connector with terminal end caps (MSCPC) |
| MSCPC | 1100095 | Set of 10 Mosaic terminal end caps |

CPM

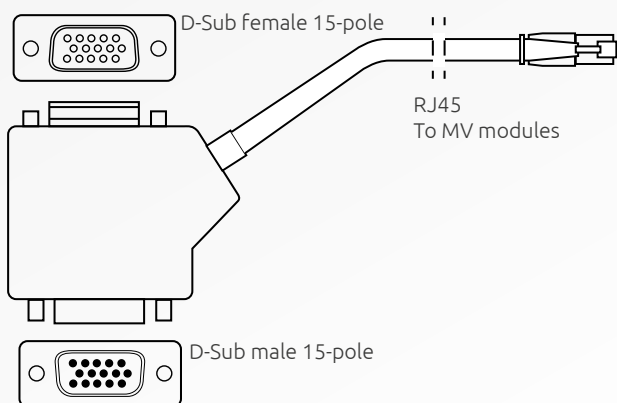
POLARIZING KEYS

| Models | Ordering codes | Description |
|--------|----------------|--|
| CPM | 1100079 | Polarizing keys for Mosaic controller connectors |

CSU

CONFIGURATION CABLE

| Models | Ordering codes | Description |
|--------|----------------|------------------------------------|
| CSU | 1100062 | USB A cable – Mini B, lenght 1,8 m |



MTB

SET OF SCREW TERMINAL BLOCKS

| Models | Ordering codes | Description |
|---------|----------------|--|
| MTB - Y | 1100044 | Set of 6 numbered screw terminal blocks (yellow) |
| MTB - B | 1100045 | Set of 6 numbered screw terminal blocks (black) |

MTBC

SET OF CLAMP TERMINAL BLOCKS

| Models | Ordering codes | Description |
|----------|----------------|--|
| MTBC - Y | 1100046 | Set of 6 numbered clamp terminal blocks (yellow) |
| MTBC - B | 1100047 | Set of 6 numbered clamp terminal blocks (black) |

MCT

SERIAL CABLE FOR MSC BUS TRANSFER

| Models | Ordering codes | Description |
|--------|----------------|---|
| MC25 | 1100063 | MCT serial cable for MSC bus transfer 25 m |
| MC50 | 1100064 | MCT serial cable for MSC bus transfer 50 m |
| MC100 | 1100065 | MCT serial cable for MSC bus transfer 100 m |

MPD

PULL-DOWN ADAPTER

| Models | Ordering codes | Description |
|----------------------------------|----------------|--------------------|
| MPD | 1350150 | Pull-down resistor |
| Each kit MPD contains 2 adapters | | |

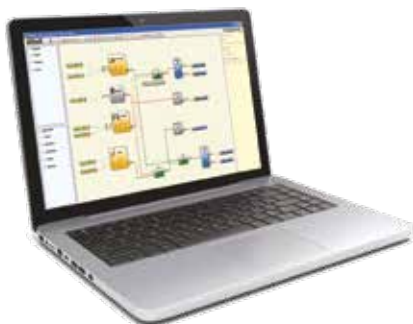
MVSC

SNIFFER CABLE

| Models | Ordering codes | Descrizione |
|---------|----------------|---|
| MVSC1.4 | 1100067 | Sniffer Cable (splitter D-Sub 15-pole / RJ45) 1400 mm for safety speed monitoring MV modules |
| MVSC1.8 | 1100048 | Sniffer Cable (splitter D-Sub 15-pole / RJ45) 1800 mm for safety speed monitoring MV modules |

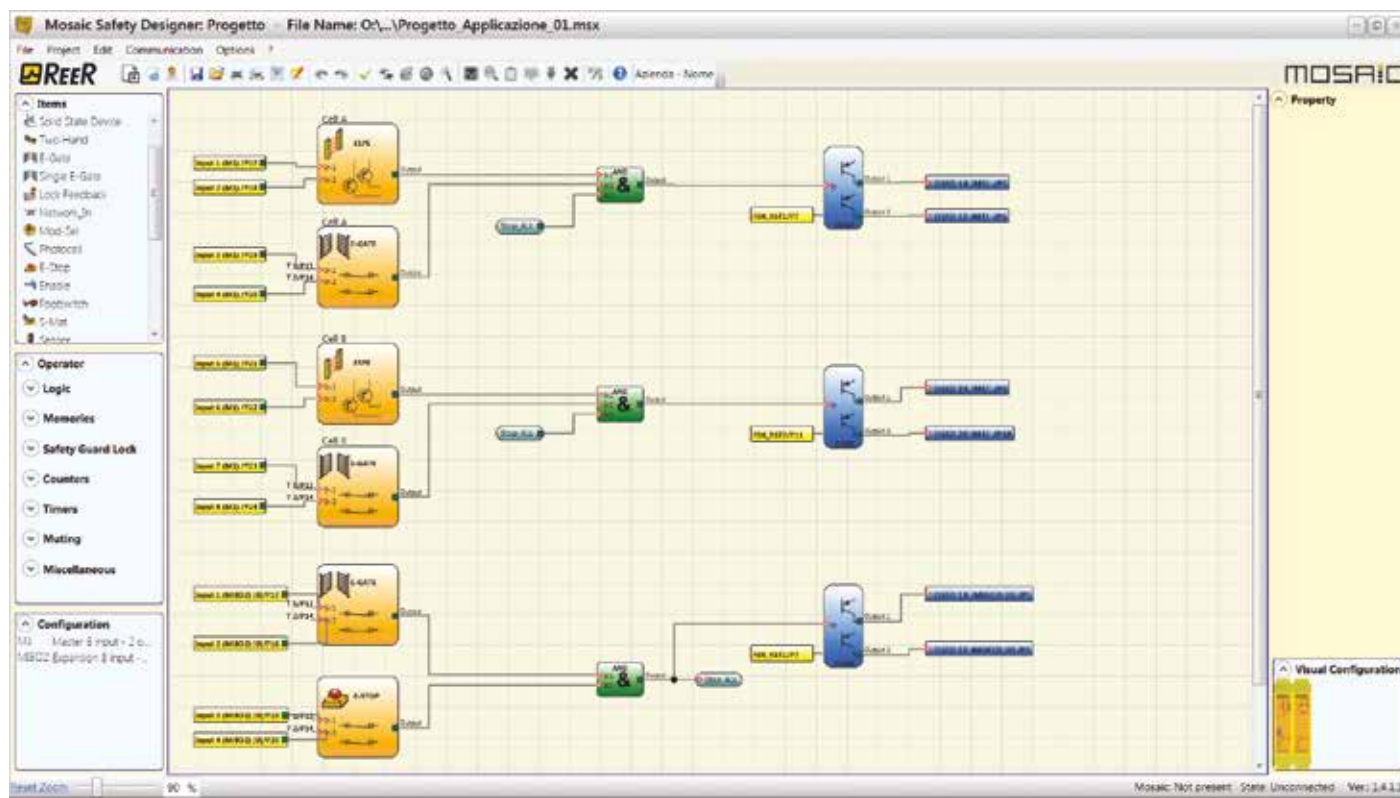
CONFIGURATION SOFTWARE

Mosaic M1 is equipped with a 2.0 USB mini interface for connection to a Personal Computer where MSD software is installed.



- Drag&Drop configuration of all safety functions.
- User-frendly
- Real-time I/O monitoring
- Functional project validation
- Simulation
- Security password - 2-level passwords management for the prevention of unauthorised accesses and therefore of incidental modifications or tampering of the system configuration.
- Reports and log files - Log File with project date of creation and related checksum (CRC 4-digit hexadecimal identification) is stored in the Main unit.
- Project information - Project report with the following information: Project name, configuration, Safety Information (PFHd, MTTFd, DCavg, Resources used

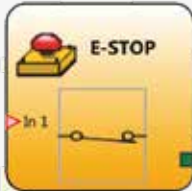
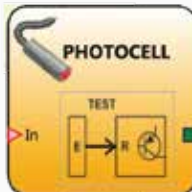

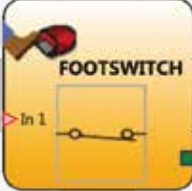
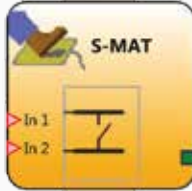
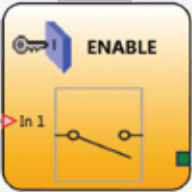
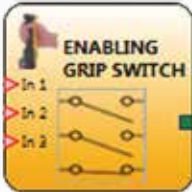
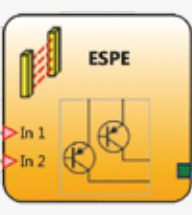
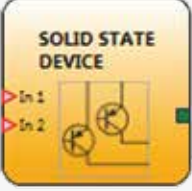

MSD configuration software desktop.




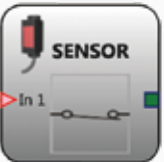


Mosaic MSD

MAIN FUNCTIONAL BLOCKS

Input objects

| | | | |
|--|--|--|---|
|  | <p>E-stop (emergency stop)</p> <p>Configurable for: 1 NC or 2 NC inputs</p> |  | <p>Photocell (Type 2 safety photocell)</p> <p>Input for photocells that need external controller. Specific output test is required</p> |
|  | <p>Single E-gate (safety gate device) E-gate (safety gate device)</p> <p>Configurable for: 2 NC or 1 NC + 1NO inputs</p> <p>More info: Property window on page 28</p> |  | <p>Mod-Sel (safety selector)</p> <p>Configurable for: 2, 3 or 4 position selectors inputs. Specific output test is not required</p> |
|  | <p>Testable Safety Device (for any type of electromechanical sensors)</p> <p>Configurable for: 1 NC, 1 NO, 2 NC or 1 NC + 1 NO inputs</p> |  | <p>Two-Hand (bi-manual control)</p> <p>Configurable for: 2 NO (EN 574 III A) or 2 NO + 2 NC (EN 574 III C) inputs</p> |
|  | <p>Footswitch (safety pedal)</p> <p>Configurable for: 1 NC, 1 NO, 2 NC or 1 NO + 1 NC inputs</p> |  | <p>S-Mat (safety mat or safety edge)</p> <p>4 wires technology. 2 inputs Specific output test is required on 2 wires</p> |
|  | <p>Enable (enable key)</p> <p>Configurable for: 1 NO or 2 NO inputs</p> |  | <p>Enable Grip Switch</p> <p>Configurable for: 2 NC or 2 NO + 1 NC inputs</p> |
|  | <p>ESPE (optoelectronic safety light curtain / laser scanner)</p> <p>Safety optoelectronics sensors with static OSSD, self-controlled output Dual channel inputs</p> <p>More info: Automatic or Manual Reset on page 28</p> |  | <p>Lock Feedback</p> <p>It verifies the lock status of the Guard Lock device for mobile guard or safety gate. More info: Guard Lock operator on page 31</p> <p>In the case where the inputs indicate that the guard is locked the Output will be 1 (TRUE). Otherwise the output is 0 (FALSE)</p> |
|  | <p>Solid State Device</p> <p>Generic safety sensors with static OSSD self-controlled outputs Dual channel inputs</p> |  | <p>Network_In</p> <p>This input must be used in case of connection between Mosaic OSSD output and the input of another Mosaic to realize a network.</p> <p>More info: Network_In on page 28</p> |






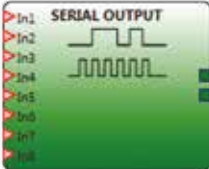
Input objects

| | | | |
|---|---|--|--|
|  | <p>Switch</p> <p>Input for non safety switches or non safety signals. E.g.: restart button, position switch, enable signals etc.</p> |  | <p>Sensor</p> <p>Input for non safety sensors or non safety signals. E.g.: Muting sensors, enable signals etc.</p> |
|  | <p>Fixed input</p> <p>Input fixed to logic level 0 (Low) Input fixed to logic level 1 (High)</p> |  | <p>Fieldbus input</p> <p>Allows to receive signals (up to 8 bits) from the machine control unit via the field-bus module. The signal is connected directly into the diagrams without using any input block. Warning: FIELD BUS inputs are not a safety signals</p> |

Speed monitoring objects

| | | | |
|---|--|--|---|
|  | <p>Stand Still</p> <p>Check that the speed is zero or not greater than the values set</p> |  | <p>Stand Still and Speed Control</p> <p>Check that the speed does not exceed the values set for both the max. speed and zero speed</p> |
|  | <p>Speed Control</p> <p>Check that the speed is not greater than the values set</p> |  | <p>Window Speed Control</p> <p>Check that the speed is not lower or higher than the values set</p> |


Output objects

| | | | |
|---|---|---|---|
|  | <p>OSSD (safety outputs)</p> <p>PNP safety static outputs (dual channel, 400 mA). The 2 outputs cannot operate independently</p> |  | <p>Relay</p> <p>The Output relay is a NO relay output. Relay outputs are closed when the input is equal to 1 (TRUE), otherwise they are open (FALSE)</p> |
|  | <p>Single OSSD (safety outputs)</p> <p>PNP safety static outputs (single channel, 400 mA). The outputs can operate independently</p> <p>Available with M1S, MI8O4 and MO4LHCS8 units.</p> |  | <p>Status (signal output)</p> <p>PNP static outputs (single channel, 100 mA). Can be connected to any point in the project</p> |
|  | <p>Fieldbus Probe Output</p> <p>Allows to send signals (up to 16 bits) to the machine control unit via the field-bus module</p> <p>The signal is connected directly into the diagrams without using any output block</p> |  | <p>Serial Output</p> <p>It makes possible the transmission of information status to a PLC or HM1 without the need to use fieldbus modules. The Serial Output operator outputs the status of up to 8 inputs, serializing the information. Max. number of operators: 4 - total 32 information status</p> <p>The serial line can be: Synchronous (1 clock + 1 data output) Asynchronous (1 Manchester coding data output). For a typical application sample, see HM1 on page 13</p> |









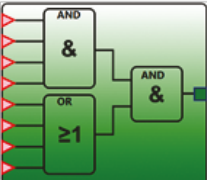
Comments

| | |
|---|--|
|  | <p>Comments and Title</p> <p>Add comments to your projects and sign it with a dedicated title box</p> |
|---|--|






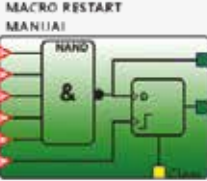
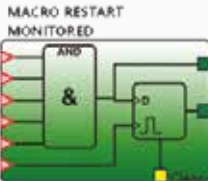
Interpage operator

| | |
|---|--|
|  | <p>Interpage</p> <p>The operator Interpage is used to connect parts of the diagram without trace physically the linking. Simply assign the same link identifier operators to Interpage In and Interpage out</p> <p>Operators Interpage that allow connection of parts of the diagram only by assigning a name to the connection identifier. More info: Interpage operators on page 32</p> |
|---|--|


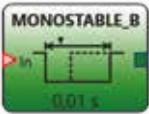






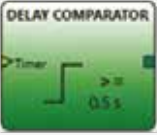
Logical operators - Up to 64 (M1) 128 (M1S) logical operator can be used

| | | | |
|---|--|--|--|
|  | AND Logical AND returns an output of 1 (TRUE) if all the inputs are 1 (TRUE) |  | NAND Logical NAND returns an output of 0 (FALSE) if all the inputs are 1 (TRUE) |
|  | NOT Logical NOT inverts the logical status of the input |  | OR Logical OR returns an output of 1 (TRUE) if at least one of the inputs is 1 (TRUE) |
|  | NOR Logical NOR returns an output of 0 (FALSE) if at least one of the inputs is 1 (TRUE) |  | 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) |
|  | 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) |  | 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 |
|  | Logical Macro Groupings can be created with a maximum of three operators of different types for a total of max. 8 inputs This allows to increase the maximum number of operators used | | |


Memory operators

| | | | |
|---|---|--|---|
|  | D Flip-Flop The D Flip-Flop operator saves the previously set status on output Q |  | User Restart Manual The User Restart Manual operator saves the restart signal according to the Inputs: In, Rising edge input and Clear |
|  | SR Flip-Flop SR Flip-Flop operator brings output Q at 1 with Set, 0 with Reset |  | User Restart Monitored The User Restart Monitored operator is used to save the restart signal according to the inputs |
|  | T Flip-Flop This operator switches the Q output at each rising edge of the T input (Toggle) |  | Macro Restart Manual Used to combine a logic gate chosen by the user with the Restart Manual functional block User Restart Manual |
| | |  | Macro Restart Monitored Used to combine a logic gate chosen by the user with the Restart Manual functional block User Restart Monitored |


Timer operators

| | | | |
|---|--|--|---|
|  | Monostable <p>The Monostable operator generates a level 1 (TRUE) output activated by the rising edge of the input and remains in this condition for the set time</p> |  | Monostable B <p>This operator generates a level 1 (TRUE) output activated by the rising/falling edge of the input and remains in this condition for the set time</p> |
|  | Passing Make Contact <p>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</p> |  | Clocking <p>This operator has up to 7 inputs to control the output Duty Cycle. Related to the selected input, this operator will generate a clock with different duty cycle. It can be used, for example, to pass or receive the status information to or from a PLC More info: Clocking operator on page 29</p> |
|  | Delay <p>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</p> |  | Long delay <p>This operator allows to apply a delay (up to 15 hours) to a signal by setting the output to 1 (TRUE) after the set time, against a change in the level of the input signal Available with M1S</p> |
|  | Delay line <p>When the signal IN is moved to 0 logic level, this operator inserts a delay to a signal carrying the output OUT to 0 after the time set. If before the end of the set time the input IN returns to 1, the output OUT still generates a pulse signal with this duration: about 2 times the response time plus the delayed time set Differences with delay: delay Line operator does not filter any input interruptions less than the set time.</p> |  | Long delay line <p>When the signal IN is moved to 0 logic level, this operator inserts a delay (up to 15 hours) to a signal carrying the output OUT to 0 after the time set. If before the end of the set time the input IN returns to 1, the output OUT still generates a pulse signal with this duration: about 2 times the response time plus the delayed time set Differences with delay: long delay Line operator does not filter any input interruptions less than the set time. Available with M1S</p> |
|  | Delay Comparator <p>This operator allows to compare the value of the Long delay timer with the set threshold value. The output will be kept to 0 (FALSE) until the timer value is lower than the threshold value. The output will be set to 1 (TRUE) for timer values equal to or greater than the threshold value. Warning: the Delay Comparator operator can only be connected to an output of a Long delay operator. Available with M1S</p> | | |

Pre-reset operator

| | |
|---|---|
|  | Pre-reset <p>This operator allows to memorize the status of the input signal following the correct sequence of the two PreReset and Reset signals: transaction (0-1-0) of the PreReset signal followed (within the set time) by the transition (0-1-0) of the Reset signal. The 0-1-0 transition of the signals, to be considered valid, must take place in a time between 500 msec and 5 sec. Available with M1S</p> |
|---|---|

Reset operator

| | |
|--|---|
|  | Reset M1 <p>This operator resets the Mosaic system in presence of errors on the inputs or outputs This operator generates a reset of the system when the corresponding input is a double transition OFF-ON-OFF of less than 5s More info: Reset M1 operator on page 29.</p> |
|--|---|

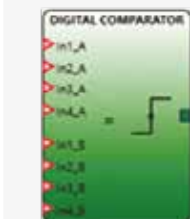
Safety Guard Lock operator



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

[More info: Guard Lock operator on page 31](#)



Digital comparator

The Digital Comparator operator allows to compare a series of input signals (from 2 to 8 max.) with a decimal constant (range 0 to 255).

The input In1 is the LSB (least significant bit) while the input In8 (or lower if the number of inputs selected is less than 8) is the MSB (most significant bit).

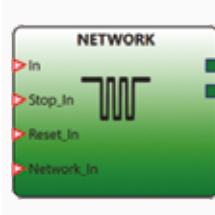
The comparators are: <Less; > = Greater or equal; > Greater; <= Less or equal; = Equal; != Different

Selecting "Signal Comparison", the Digital comparator operator will compare the first four inputs A (In1_A ... In4_A) and the second four inputs B (In1_B ... In4_B).

The comparators are the same as described above.

Available with M1S

Network operator

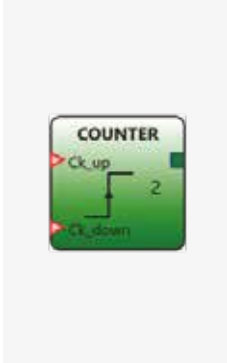


Network

Is a serial connection (Loop) of several Mosaic M1 Master unit (with possible expansions). This operator allows stop and reset commands to be distributed in a simply Mosaic network

[More info: Network operator on page 31](#)

Counter operators



Counter

Counter operator is a pulse counter that sets output Q to 1 (TRUE) as soon as the desired count is reached. There are 3 operating modes: Automatic, Manual, Automatic + Manual



Counter Comparator

This operator allows to compare the counter value with the set threshold value. The output will be kept at 0 (FALSE) until the counter value is lower than the threshold value. The output will be set to 1 (TRUE) for counter values equal to or greater than the threshold value.

Warning: the Counter Comparator operator can only be connected to an output of the Counter operator

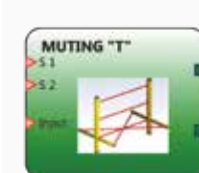
Available with M1S

Muting operator objects



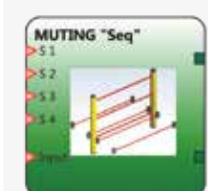
L Muting

With 2 Muting sensors for one-way openings (exit only)
Suitable solution for any applications of pallet exit



T Muting

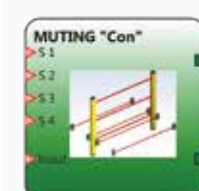
With 2 Muting sensors for two-way openings (entry/exit)
Suitable solution for the most common pallet infeed/outfeed applications



T Muting "Sequential"

With 4 Muting sensors for two-way openings (entry/exit). Suitable solution for transparent material and application with presence of a pallet with reduced width or not centred with respect to the conveyor

[More info: T Muting «Sequential» on page 29](#)



T Muting "Concurrent"

With 4 Muting sensors for two-way openings (entry/exit). Suitable solution for transparent material and application with presence of a pallet with reduced width or not centred with respect to the conveyor

[More info: T Muting «Concurrent» on page 30](#)



Muting Override

Are available two selectable functional mode:
Override with hold to run action
Override with one pulse action

[More info: Muting Override on page 30](#)

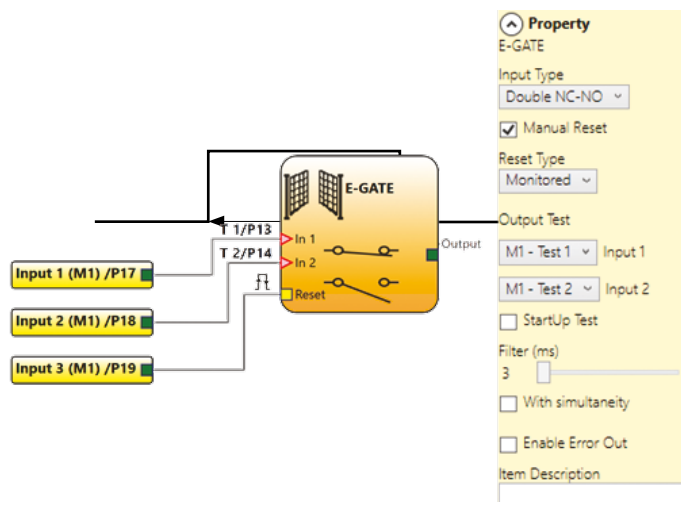
INSIGHTS

A DETAILED LOOK INTO THE MOST INTERESTING FEATURES OF MOSAIC

Property window

The property window of each function block allows configuring each block parameters in a simple and easy way.

This allows achieving an important level of customisation for each project tailoring Mosaic behaviour to each particular application.

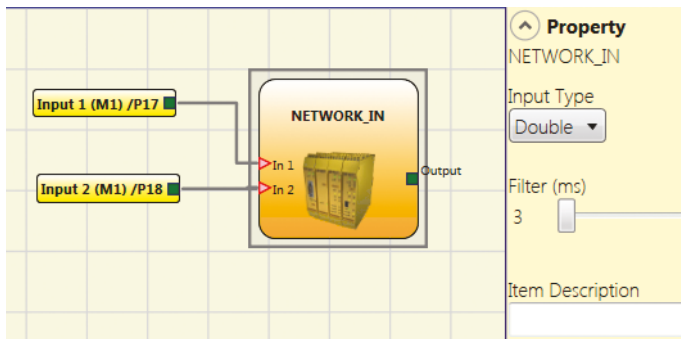


E-gate configuration example

Network_In

This function block creates a network input interface connection, generating on the OUT output a logical level high (1) when the line is high, 0 otherwise.

This input can only be allocated to M1.

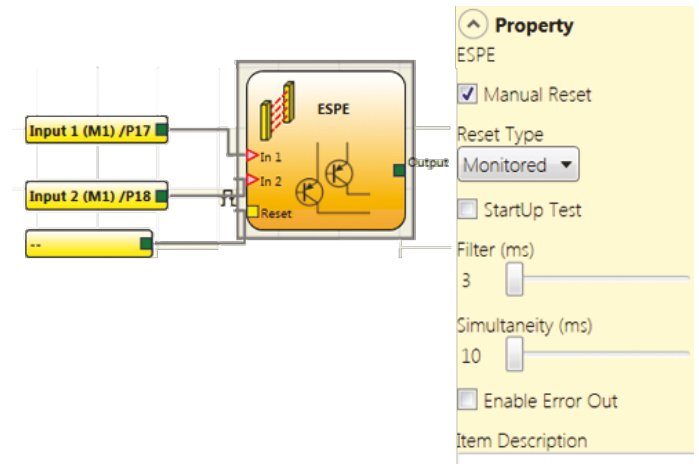


Network_IN Object

They must be physically connected terminals related to an output OSSD or the first Mosaic system status to Network_in inputs of the second Mosaic system.

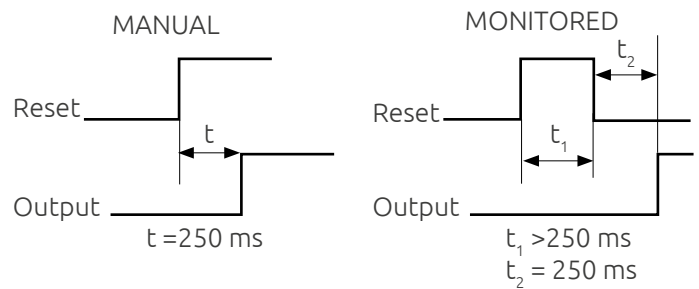
Automatic or Manual Reset

Manual Reset: if selected this enables the input request to reset each time the area protected by the safety light curtain is occupied. Otherwise (Automatic Reset), enabling of the output directly follows the input conditions.



ESPE configuration example

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.

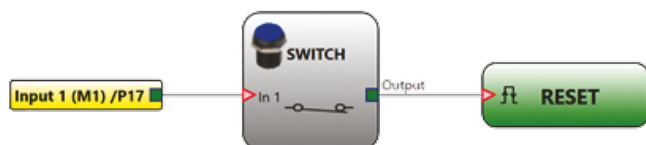


Manual and monitored reset

Reset M1 operator

This operator resets the Mosaic system in presence of errors on the inputs or outputs.

This operator generates a reset of the system when the corresponding input is a double transition OFF-ON-OFF of less than 5s

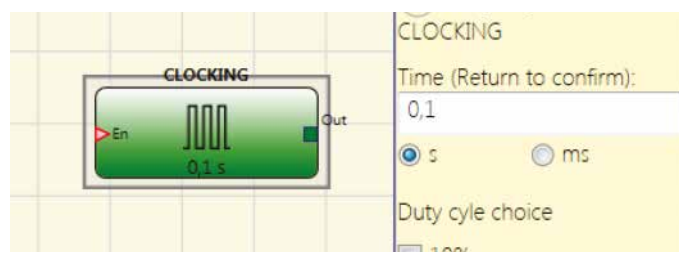


Connection of Reset operator

Clocking operator

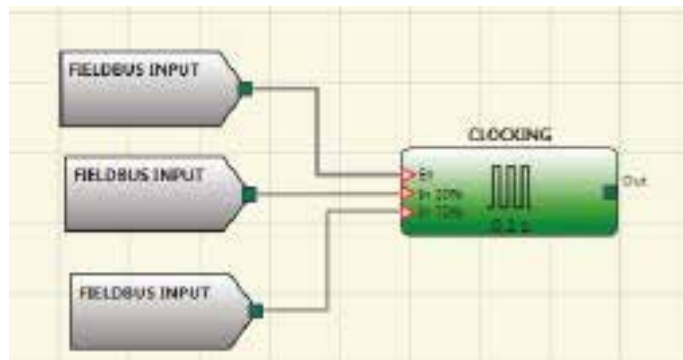
This operator has up to 7 inputs to control the output Duty Cycle.

Related to the selected input, this operator will generate a clock with different duty cycle.



Clocking operator property

It can be used, for example, to pass or receive the status information to or from a PLC.

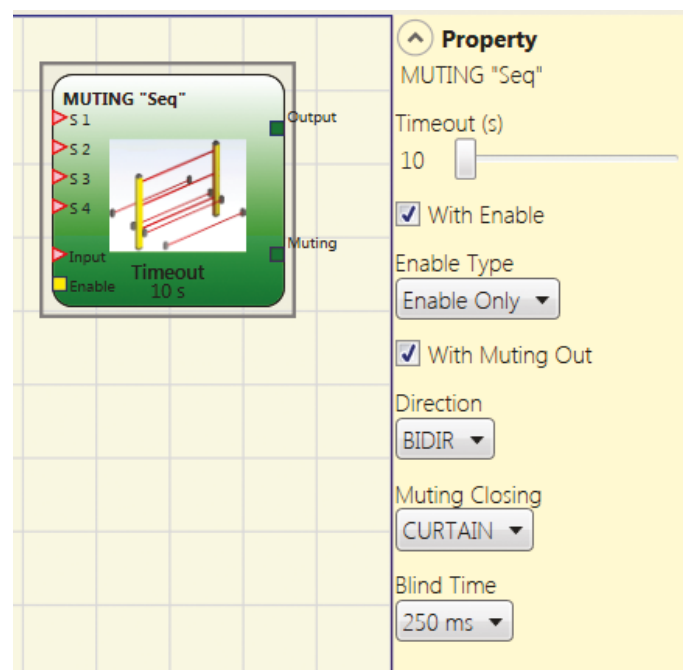


Clocking operator connection sample

T Muting «Sequential»

The activation of the Muting function occurs 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.

Preliminary condition: The Muting cycle can only start if all the sensors are 0 and the inputs are 1 (sensor and light curtain free).



Example of Sequential Muting parameters configuration

Enable only button: It is possible to enable/disable the Muting function depending on the sequence of the machine. This increase the safety.

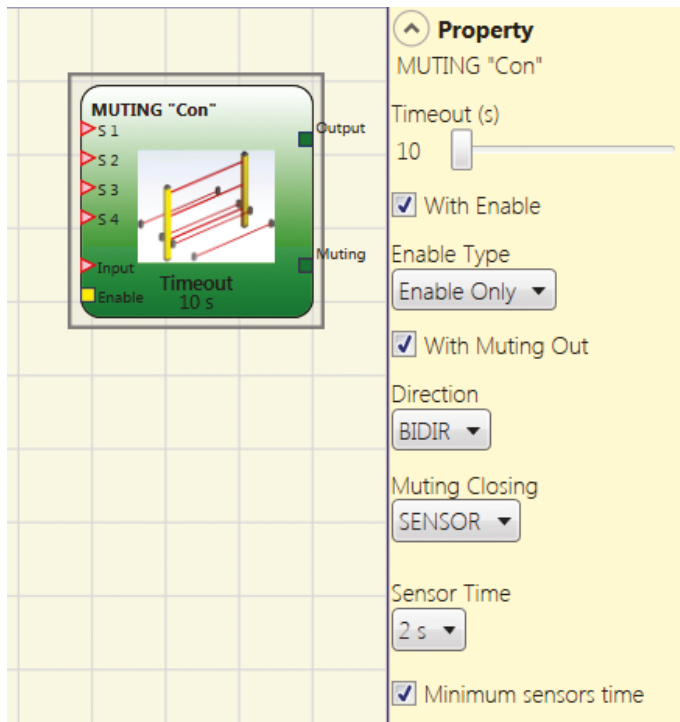
T Muting «Concurrent»

The activation of the Muting function occurs following interruption of the sensors S1 and S2 beams and then of the sensor S3 and S4: the two sensor must be interrupted within a configurable safety timeout (sensor time) the maximum duration of the Muting status is limited by a timeout.

S1 --X sec. --> S2 ---t---S3 --X sec. --> S4

Where t is a value that depends on the "timeout", X is the "sensor time".

Is available the "Minimum sensors time option" that allows you to stop the Muting function if the passage in front of the sensors 1-2 and 3-4 takes place with a time less than 150 ms. In this way it is possible to detect the transit of a person much faster than a pallet.



Example of Sequential Muting parameters configuration

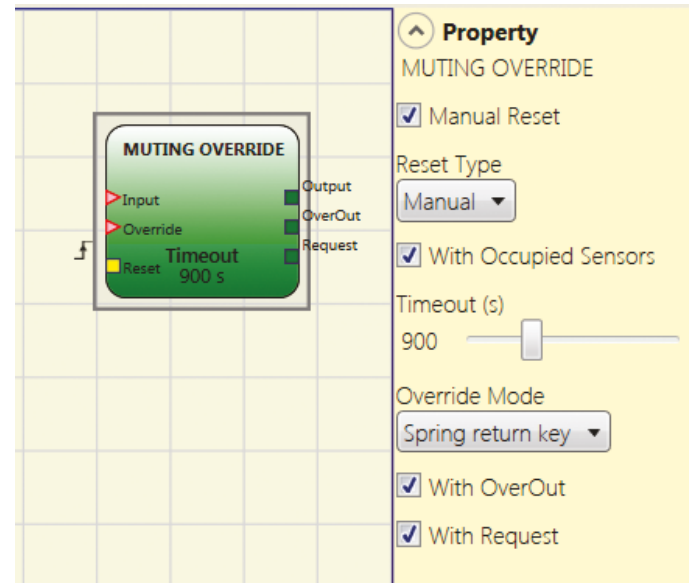
Muting closing button: It is possible to use the light curtain as sensor and anticipate the Muting closure the moment the light curtain is free instead waiting the third Muting sensor.

Muting Override

This function allows you to locally restore the safety function of the light curtain after an engaged of the light curtain not related to a normal Muting sequence.

There are also the following signalling outputs:

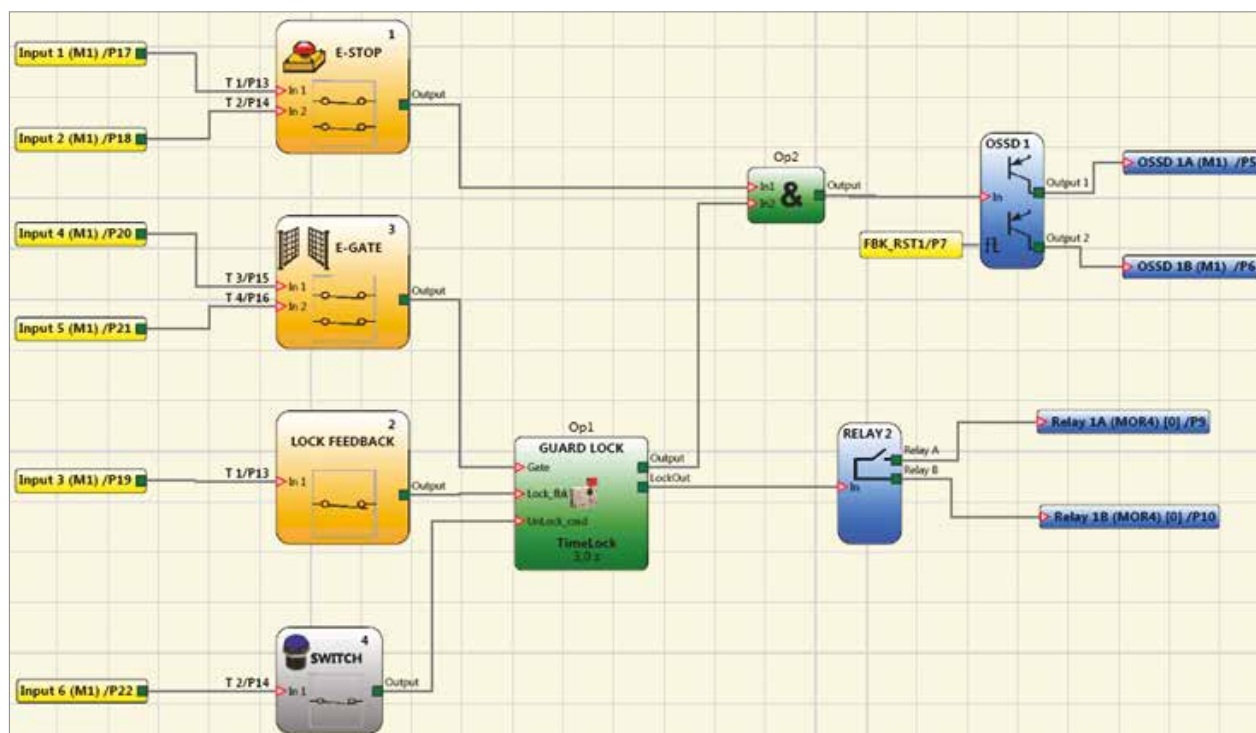
- Request = need to override
- OverOut = override active



Example of Muting override configuration

Guard Lock operator

The Gate input is connected to the functional block e-gate. This is an example of Guard Lock configuration.

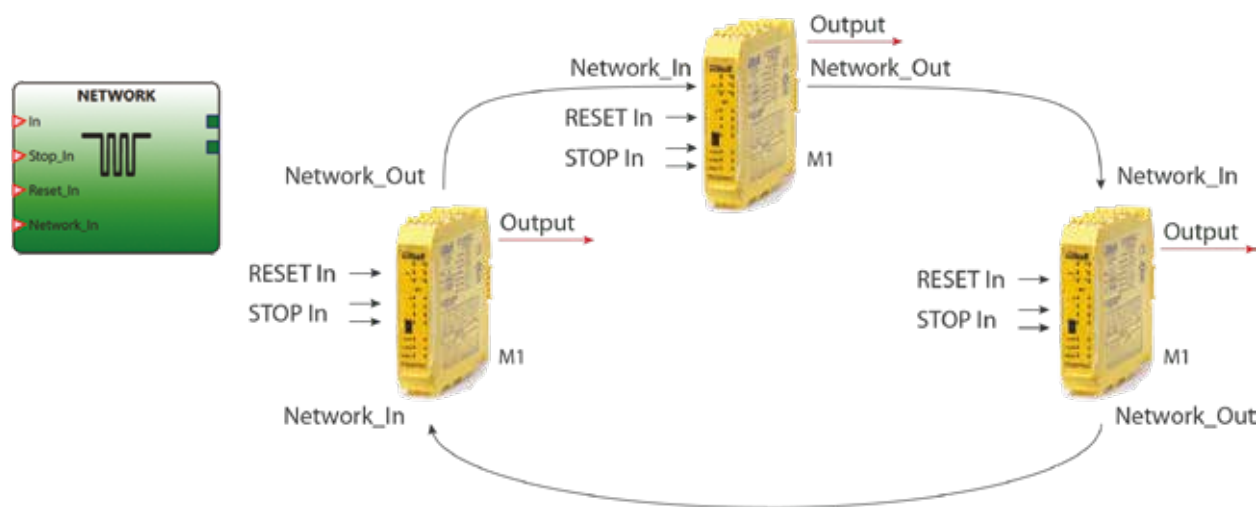


Sample of Guard Lock operator connection

1. The Lock_fbk input is connected to the functional block Lock_fbk (feedback from the lock)
2. The UnLock_cmd input (unlocks command) is connected to an input switch
3. The signal output will be 1 if the door is closed and the guard lock is locked
4. When an unlock command is applied to the input (UnLock_cmd), the output signal will be set to "0" and after a programmable time Time_Lock (2 sec. in the example) the guard lock is unlocked through the LockOut output

Network operator

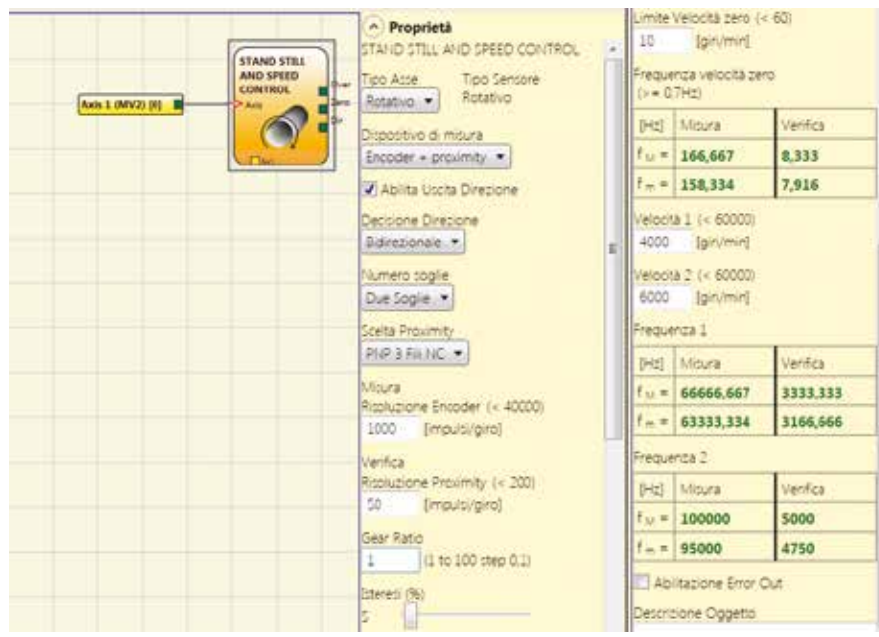
It allows loop connection (Loop) of several Mosaic M1 Master unit (with possible expansions). This operator allows stop and reset commands to be distributed in the Mosaic network.



Network connection

Speed monitoring object configuration example

Example of speed monitoring of one axis. Monitoring of stand still and speed control with selectable 2 thresholds



Speed monitoring object configuration example

Interpage operators

Interpage operators is a label assigning a name to a certain logical interconnection.

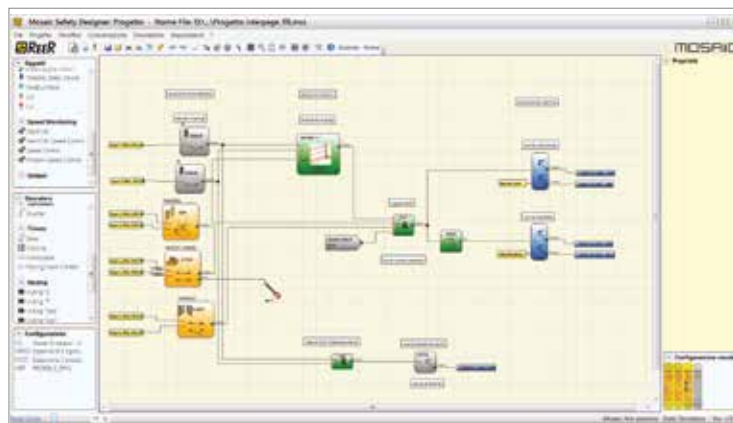
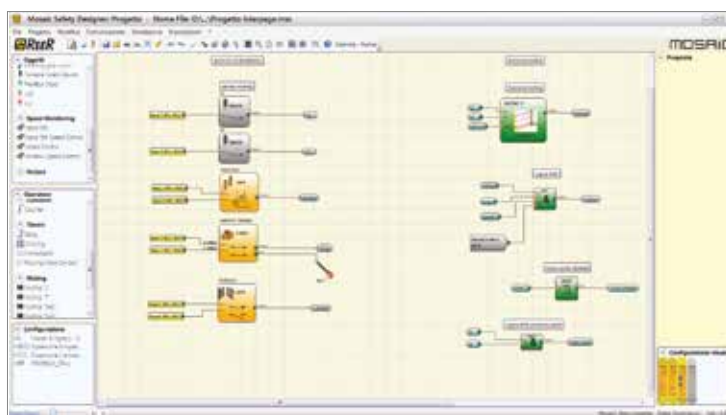
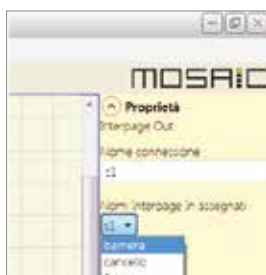


Diagram with wires

Considerable simplification and readability of the diagram.

To simplify the names assignment a drop-down menu, that lets you choose the name of the "Interpage out" among those assigned to the operators "Interpage In"



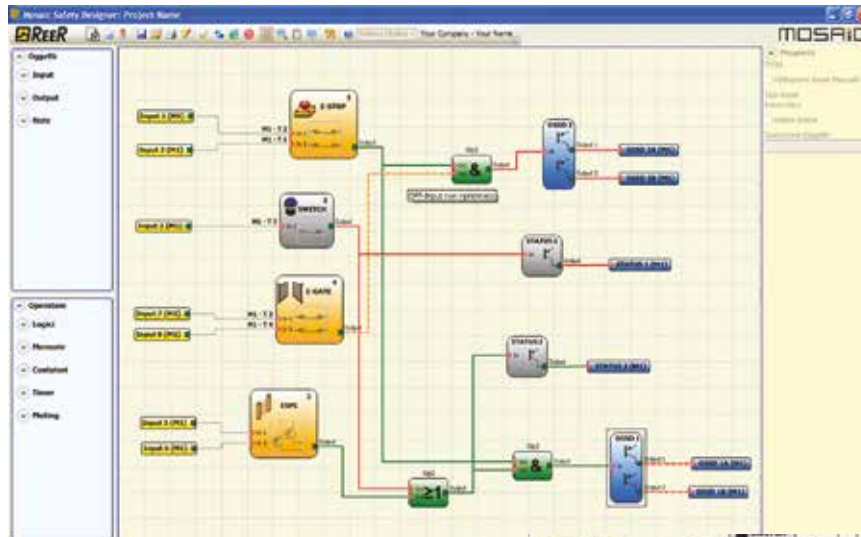
The same diagram with Interpage function applied

Interpage operator advantages

REAL TIME MONITOR

The I/O MONITOR allows the real-time monitoring of all the I/Os of a Mosaic system and the diagnostic information about a working system.

VISUALIZATION



Graphic visualization

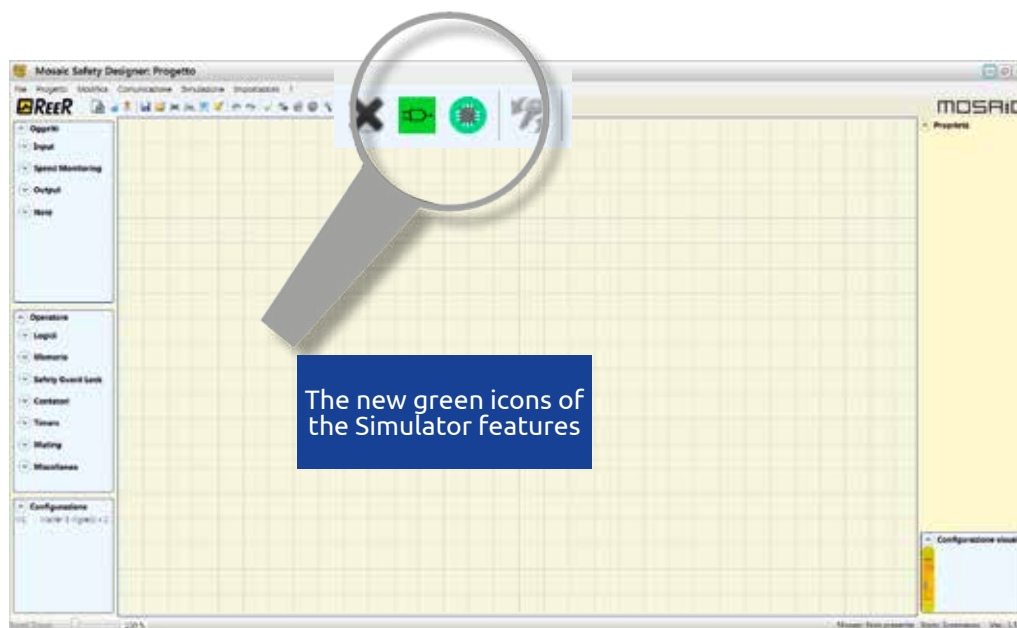
Text visualization

The diagram shows a text-based representation of the same safety system architecture. It uses a grid layout to represent the modules and their connections. The modules are labeled as E-STOP, SWITCH, E-GATE, and E-SPR. The connections are represented by lines and labels. The interface includes a left sidebar with tabs for 'Inputs', 'Outputs', and 'Status', and a top menu bar with 'MOSAIC' and 'REER' logos.

| Module | Block | Type | I/FUT | Status | Diagnostic | Module | Block | Type | Status | Diagnostic | Module | Status | Status | Out Test | Diagnostic |
|--------|-------|--------|-------|--------|------------|--------|-------|------|--------|------------|--------|---------|--------|----------|------------|
| SR1 | 1 | E-Stop | IN1 | ON | | SR1 | Q5501 | ON | | | SR1 | STATUS1 | OFF | SR1 T1 | |
| SR1 | 2 | Switch | IN2 | OFF | | SR1 | Q5502 | OFF | | | SR1 | STATUS2 | ON | SR1 T2 | |
| SR1 | 3 | E-SPR | IN3 | ON | | | | | | | | | | SR1 T3 | |
| SR1 | 4 | E-Gate | IN4 | OFF | | | | | | | | | | SR1 T4 | |

Real-time Monitor

SIMULATION FUNCTION



The Simulator allows to verify the functionality and correct operations of a project created with MSD before the assembly of the machinery.

It allows activate the inputs of the system manually or in a programmed way in order to ensure the outputs gained are correct.



Schematic simulation

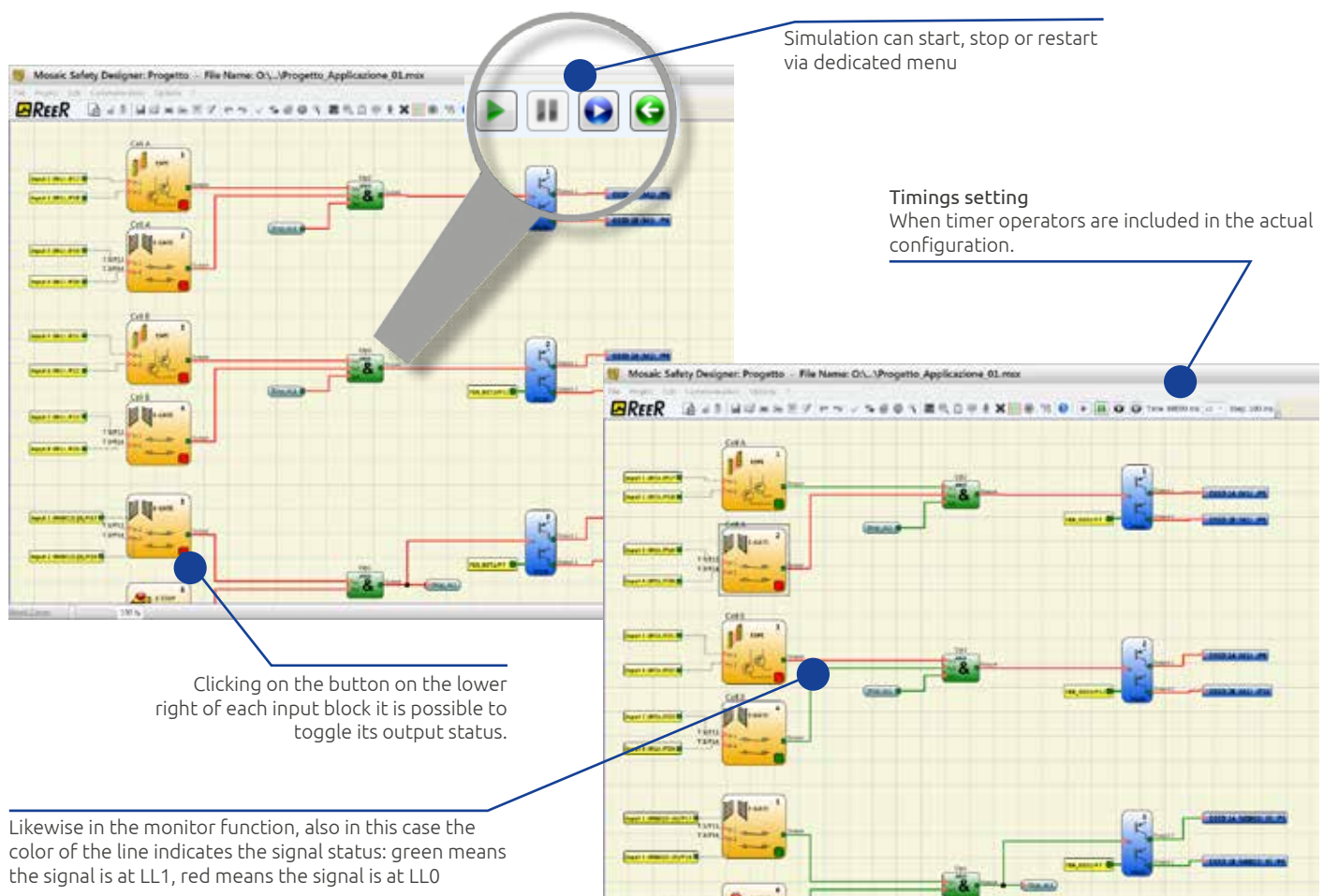


Graphic simulation

NOTE: the simulation feature is available with MSD version 1.5 and M1 firmware version 3.0 or higher.

SCHEMATIC SIMULATION

The schematic simulation allows to “start” the project via a dedicated menu and to operate directly on any of the inputs to verify the logic of the system.



Likewise in the monitor function, also in this case the color of the line indicates the signal status: green means the signal is at LL1, red means the signal is at LL0

MANAGING GRAPHIC SIMULATION

The graphic simulation allows to load a number of programmed inputs status change and to verify the logic of the system as a graphical output diagram. This methodology allows to create templates replicating the exact functionality of a machinery and apply them on different projects.

Template Stimuli

Based on the schematic loaded, it creates a template file to fill with the desired values.

The user can modify the status of the input signals in a certain time.

Parameter Editor

The user must save the file with the required name and open it again with a text editor to modify the parameters.

Simulation with Stimuli

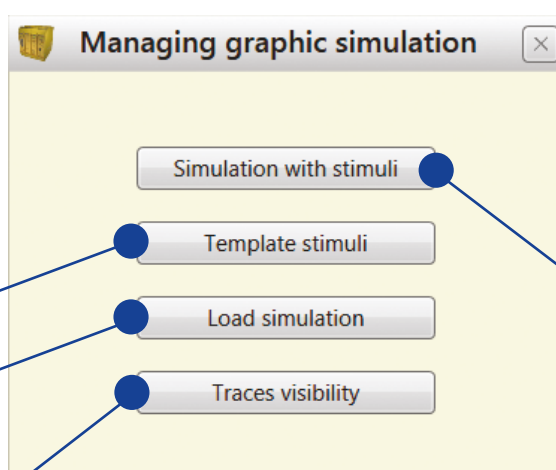
Load the template file saved and starts the simulation.

```
// E-Stop
Input6
0:0
500:1
1000:0
1500:1

// OSSD
Fbk_rst1
0:0
500:1
1000:0
1500:1

// OSSD
Fbk_rst2
0:0
500:1
1000:0
1500:1

// OSSD
Fbk_rst3
0:0
500:1
```



```
// E-Stop
Input6
0:0
500:1
1000:0
1500:1

// OSSD
Fbk_rst1
0:0
500:1
1000:0
1500:1

// OSSD
Fbk_rst2
0:0
500:1
1000:0
1500:1

// OSSD
Fbk_rst3
0:0
500:1
```

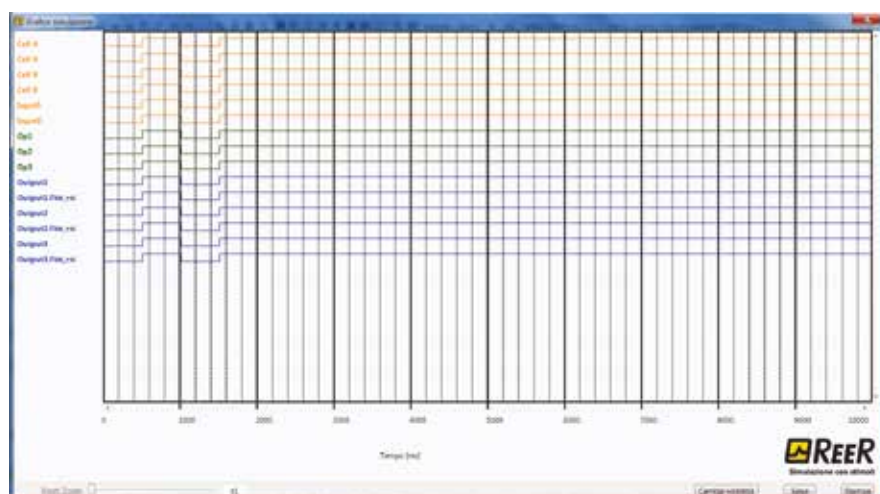
Load simulation

With this feature is it possible to load a previous completed simulation.

Traces visibility

With this option the user could select the traces (waveform signal) to be displayed in the graph or not.

At the end of the simulation a graph with all the resulting signals is showed.



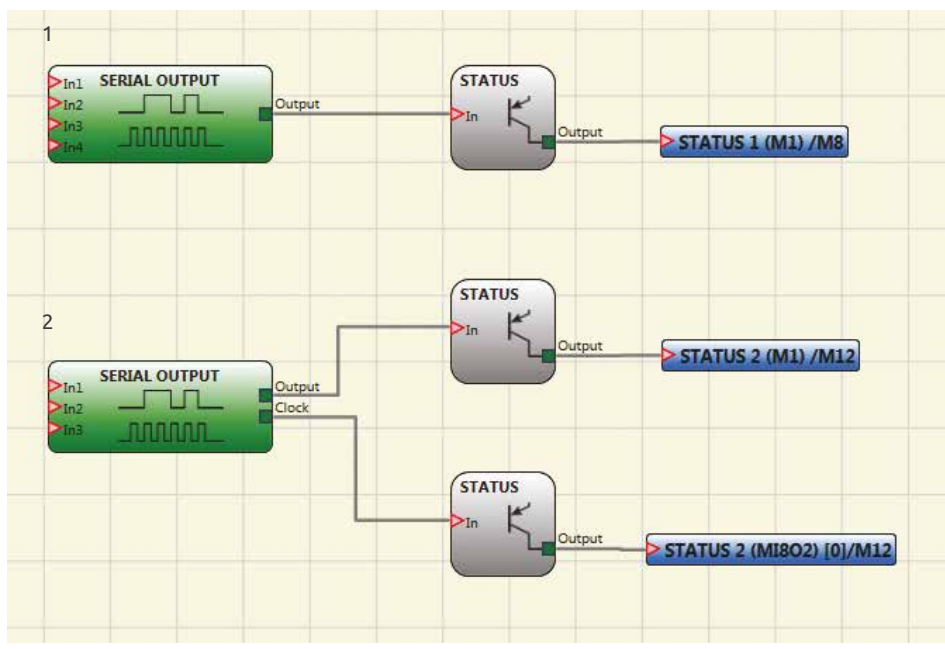
HSD SOFTWARE

MESSAGES EDITOR FOR HM1 DISPLAY

HSD is the editor software that allows programming of the device HM1

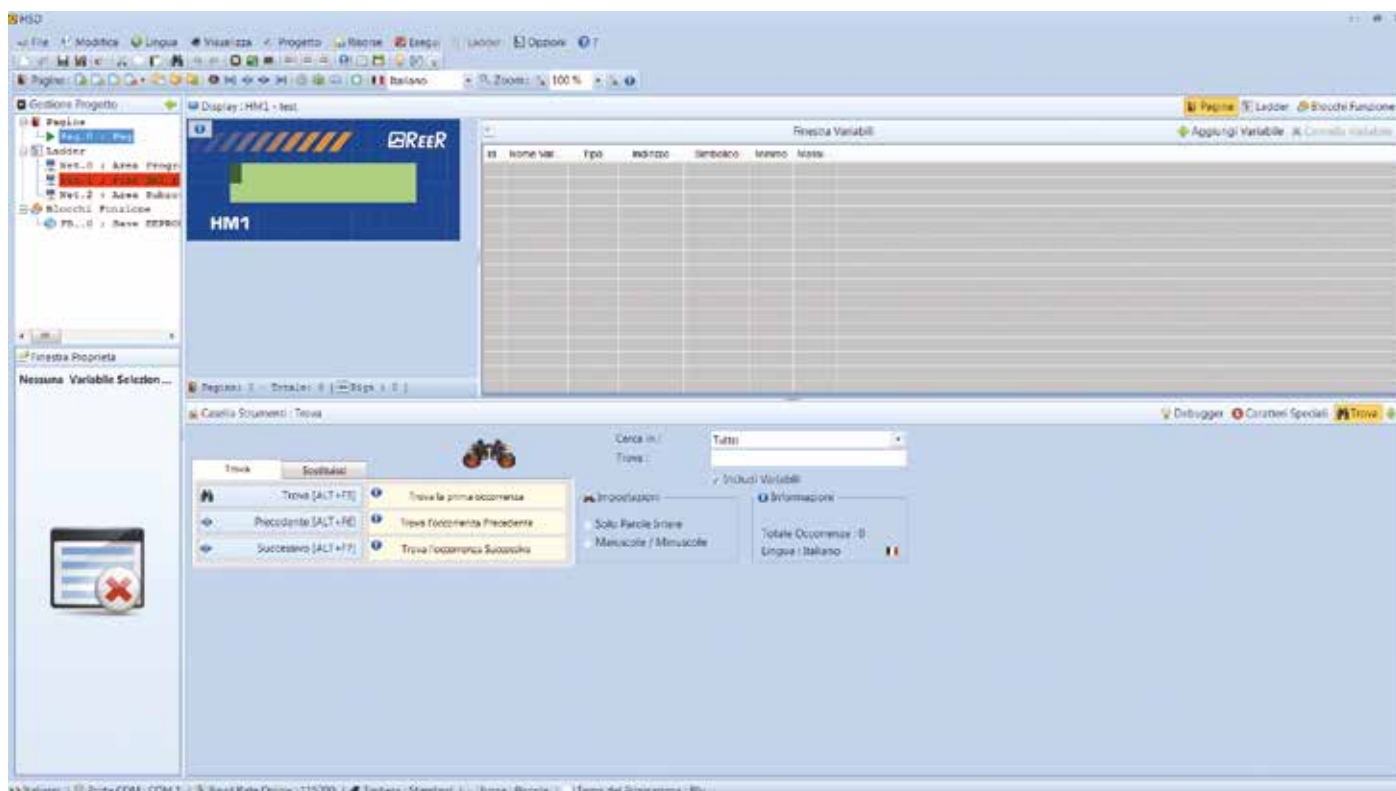
HM1 can be connected to Mosaic system in 3 ways:

1. Wired to a status output connected to the serial operator, asynchronous serial connection. Max 32 status displayed. See picture 1
2. Wired to 2 status outputs connected to the serial operator, synchronous serial connection. Max 16 status displayed. See picture 2
3. Wired to the serial MBx module via RS 485 serial port, All I/O statuses and diagnostic displayed



HM1 connections type

The digital signals from the output status or serial can be converted to display messages on the display HM1 through this HSD editor software.



HSD main screen

APPLICATION EXAMPLES

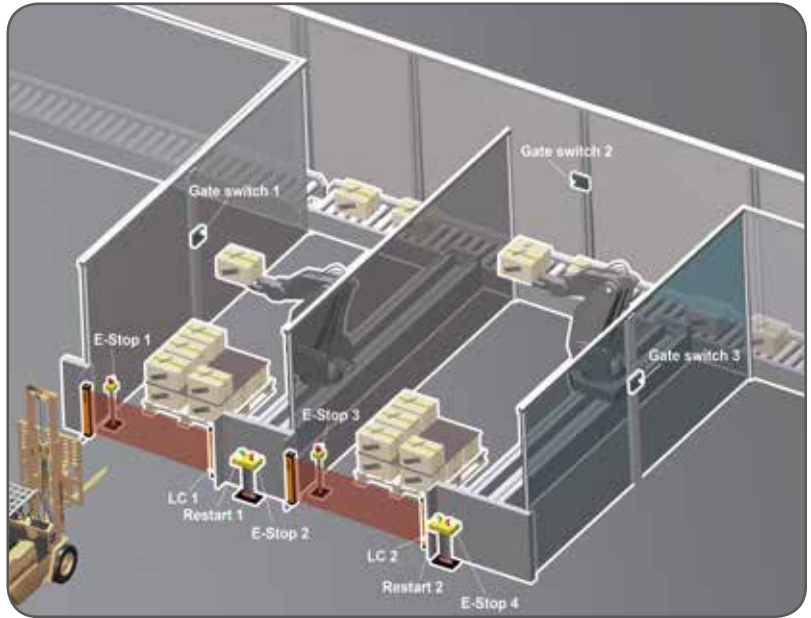
SAFETY MANAGEMENT OF A PALLETIZING SYSTEM WITH TWO ROBOTIC CELLS

The system comprises a conveyor that transports boxes to two robotic palletization cells.

The machine is completely protected by a fence with three access gates (one for each robotic cell and one for the conveyor area) equipped with a safety switch. When the gate of the robotic cell is open, the corresponding robot stops. When the conveyor area gate is open the entire plant stops.

The completed pallets are collected by a forklift truck through the access gate which is protected by a safety light curtain. The access of the forklift truck for collecting the pallet, when the robot is stopped in the rest position, by reason of the safety light curtains, prevents the robot to start.

In all other phases of processing, occupation of each light curtain causes the related robot to stop. The related manual restart control is located close to each light curtain. The system is equipped with four emergency push buttons (e-stop).



Total safety devices: 2 safety light curtains, 2 restart buttons for the safety light curtains, 3 safety gate switches, 4 emergency push buttons.

Using conventional components – safety relay modules – to build up the safety circuit, it would be necessary to use at least six safety modules, wired to each other in order to perform the required functions: 2 safety relays for the light curtains, 3 safety relays for the gate switches, 1 safety relay for the emergency stop chain.

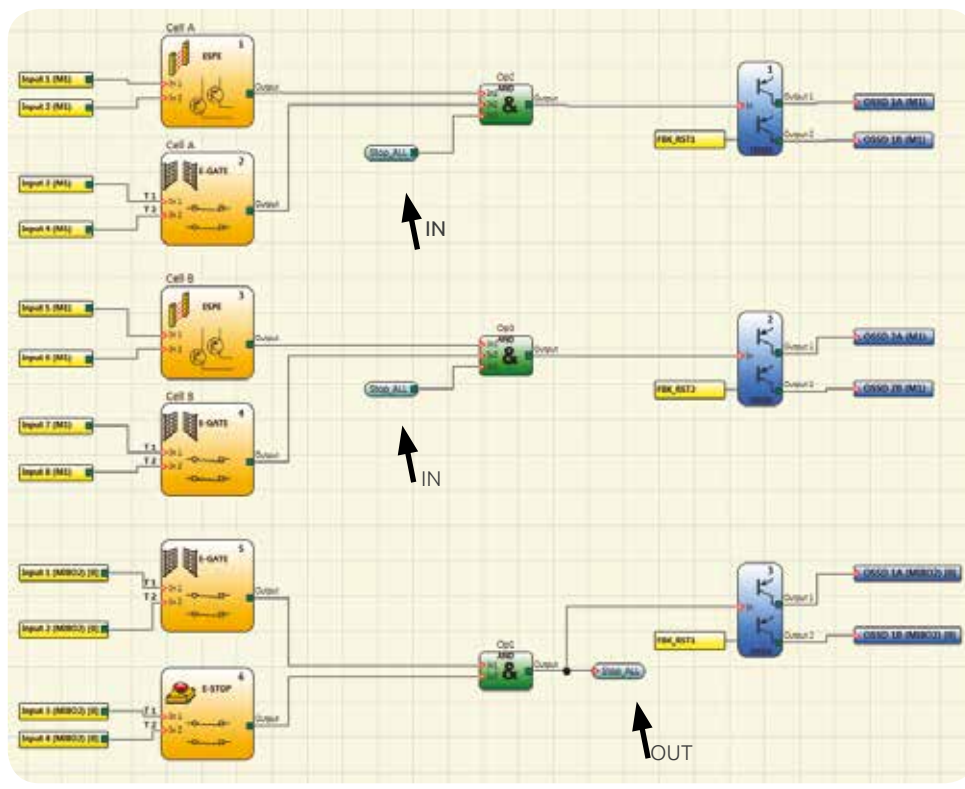
Solution with Mosaic

Using Mosaic to build up the safety circuit, it is sufficient to use:

- 1 M1 Master unit
- 1 MI802 expansion unit

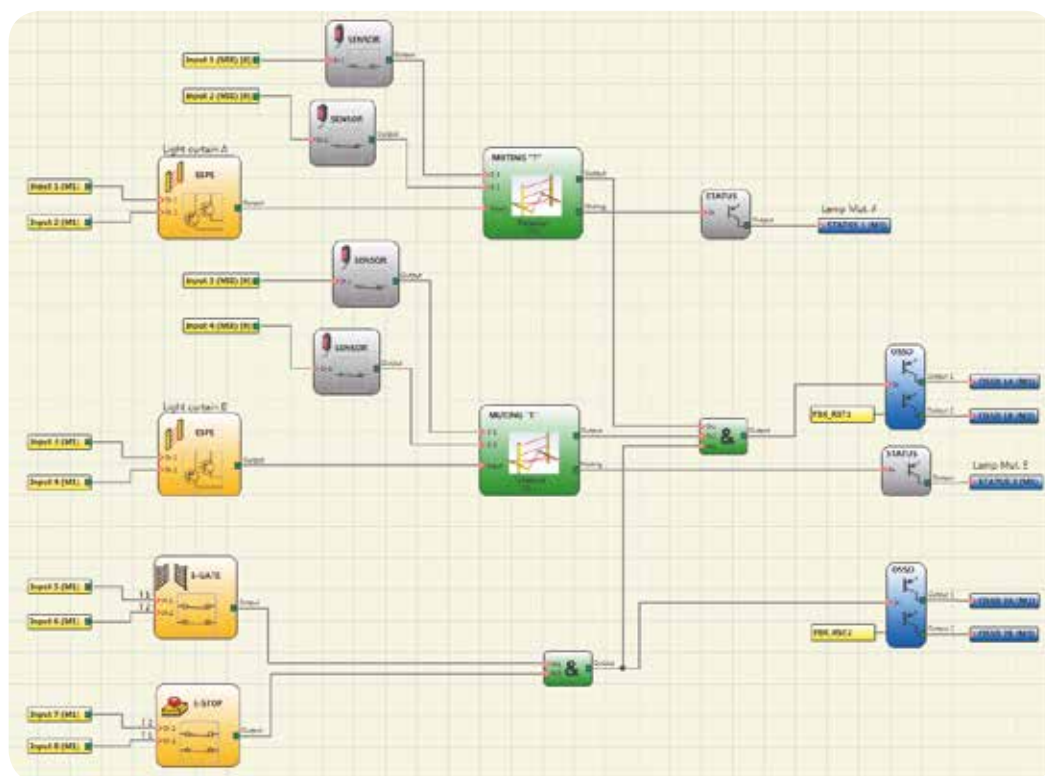
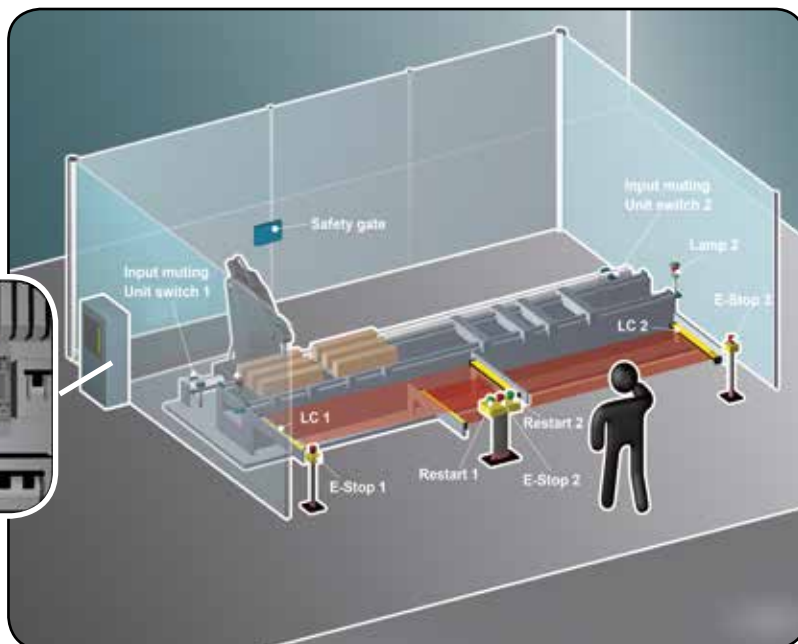
Note 1: the Reset buttons are not displayed on the diagram because they are directly connected to the feedback of the OSSD safety outputs (inputs FBK_RST1, FBK_RST2). The 4 E-STOP are connected in series and in the diagram they are represented with a single block.

Note 2: 3 operators Interpage (2 In and 1 Out) were included in the diagram. These allow you to link the inputs and outputs of the logic gates "&" without having to draw the line.



16 inputs - 4 OSSD pairs - 8 test outputs - 4 signal outputs

Using conventional components – safety relay modules – to build up the safety circuit, four safety modules would be necessary: 2 safety modules for the safety light curtains with Muting function, 1 safety module for the gate switch, 1 safety module for the emergency stop.



The diagram also shows 2 status outputs used to drive the indication lights of the active Muting.

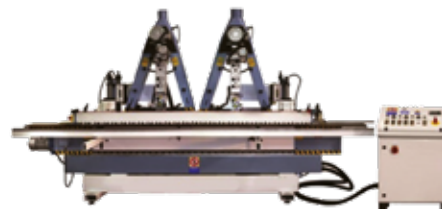
APPLICATION EXAMPLES

TYPICAL APPLICATIONS

Pallets
production
machines



Wood-working
machines



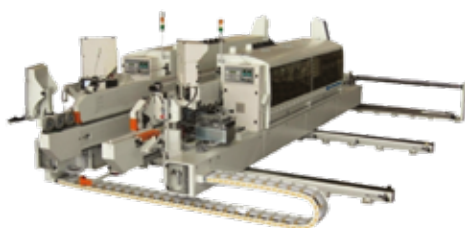
Painting ma-
chines for
wood-working
industry



Handling
machines for
wood-working
plants



Wood-working
machines
squaring
edgebanders



Robots



Plastic film
production
machines



AGVs
(Automatic
Guided
Vehicle)



Pad printing
machines



Bending
machines



Palletising systems



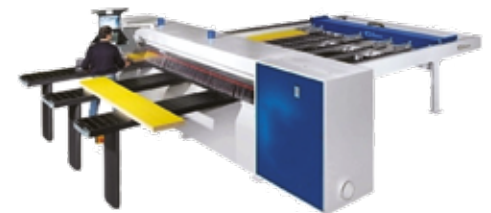
Palletising and bottling plants



Lifts


Crate
packer/unpa-
cker and
palletising
systems

Beam drilling
and sawing
machines

Panel sizing
saws

Vertical lift
storage system

Rail dependent
storage and
retrieval
equipment

Industrial
boilers

Industrial
thermal
processes




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