

Technology for Safety

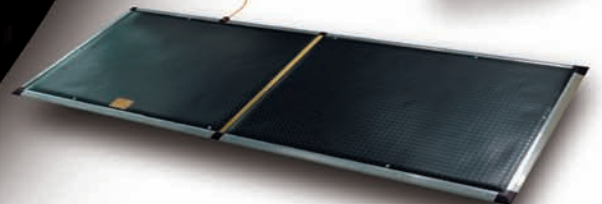
Safety Light Curtains

Safety Mats

Safety Modules

Safety Bus

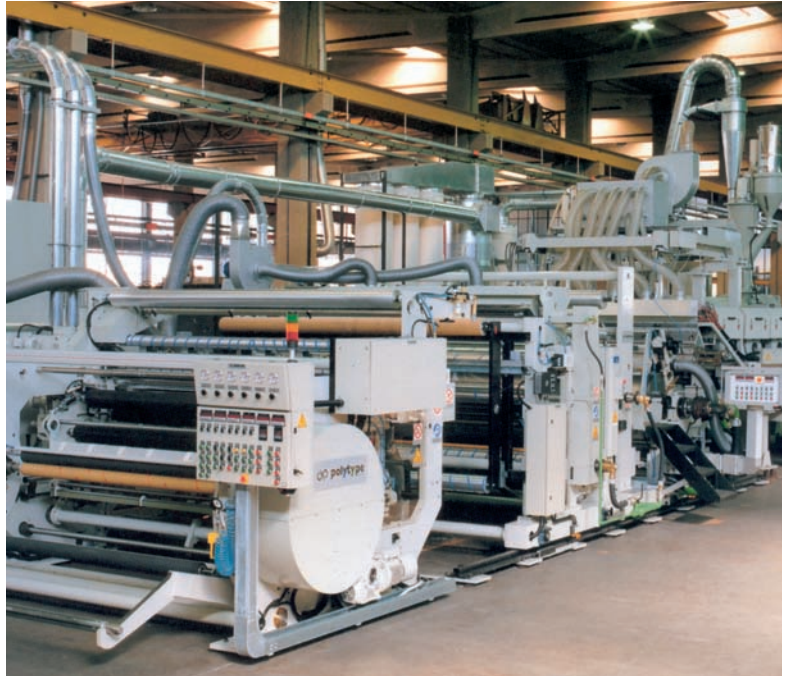
Safety Switches and Accessories





Safety in Automation

In the world of industrial automation, safety is a real philosophy in machine development, not just a generic concept to make sure that operators and all the people around the machine are safe. The milestones about safety are the European Directives and especially the Machinery Directive (EMD 98/37/CE). Including safety devices in any new project, while developing a new machine, is therefore key to reduce risks.



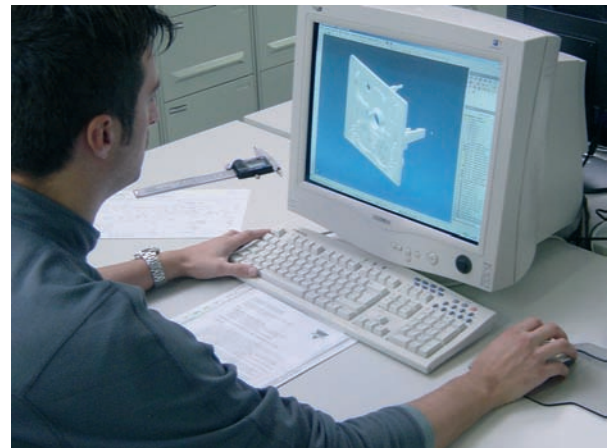
Providing Solutions for Your Safety

The implementation of safety components is not just a way to comply with rules and obtain approval certificates. Carlo Gavazzi's safety devices are designed to meet user's requirements, considering the place where they will be used. Carlo Gavazzi's products ensue from ideas, they are not a simple connection of components.

Our solutions are studied to allow the end-user to forget about the safety issue, because we are always there to assure the highest safety standard.

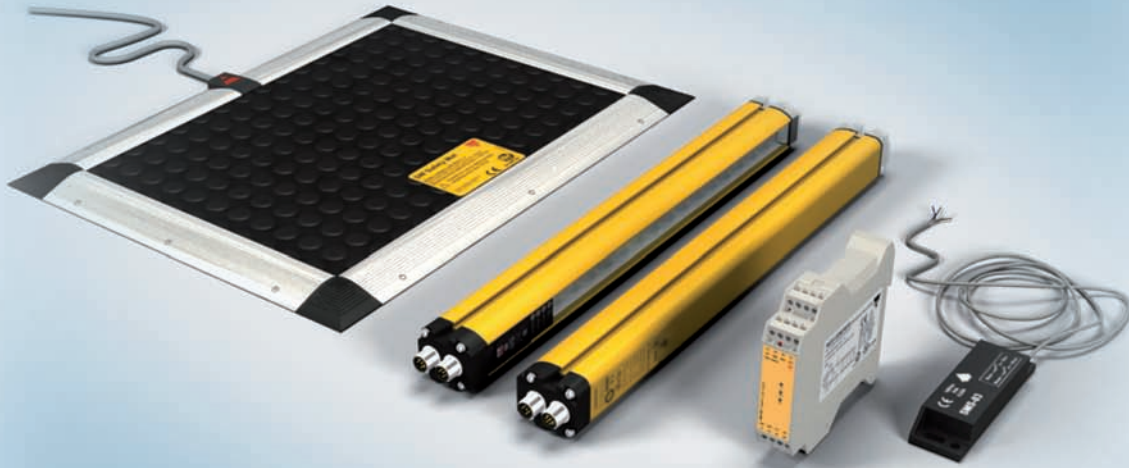
Carlo Gavazzi proposes integrated solutions: our products can be combined to work as the machine safety backbone, with simple and immediate connection procedures. The effectiveness of our devices is assured by our 75-years experience in the safety market and by our ability to always introduce the latest technology and solutions in our products.

The long term relationship with our users – based on listening, communication and reliability – adds value to Carlo Gavazzi's safety devices.



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Risk Reduction Safety Devices from Carlo Gavazzi



Safety Limit Switches

Our PS Series safety limit switches provide information on the status of mobile safety gates, that have to be used to allow access to a dangerous area. If the switches are dirty (i.e.: by food and beverage) or when the application requires the machine to be cleaned up, Carlo Gavazzi's safety magnetic switches provide clean and reliable information on the door status.

Safety Light Curtains

When it is critical to know if personnel have accessed a dangerous area our SB Series safety light curtains provide a wide range of solutions. Devices with different resolutions and sizes succeed in detecting someone entering the dangerous area.

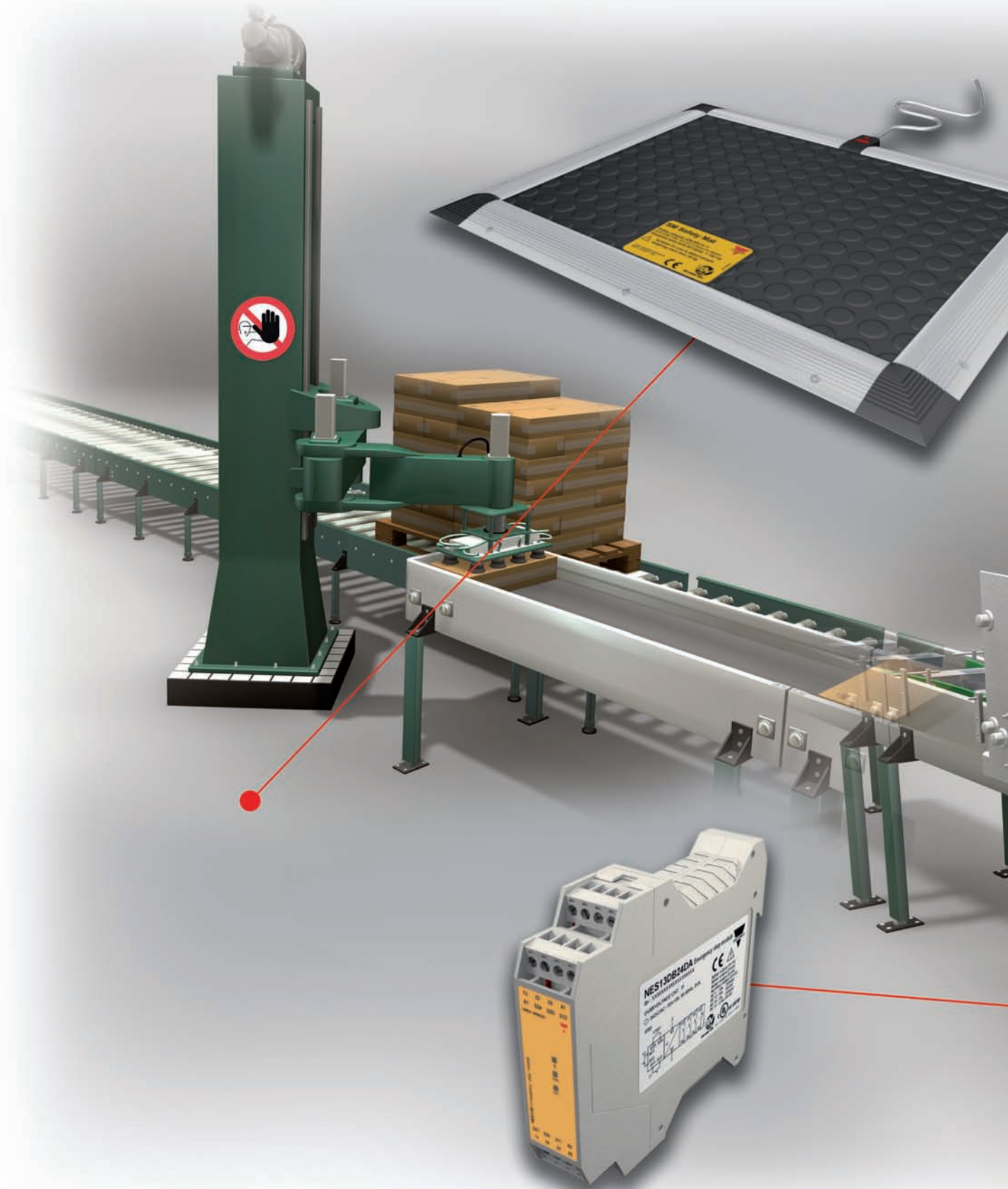
Safety Mats

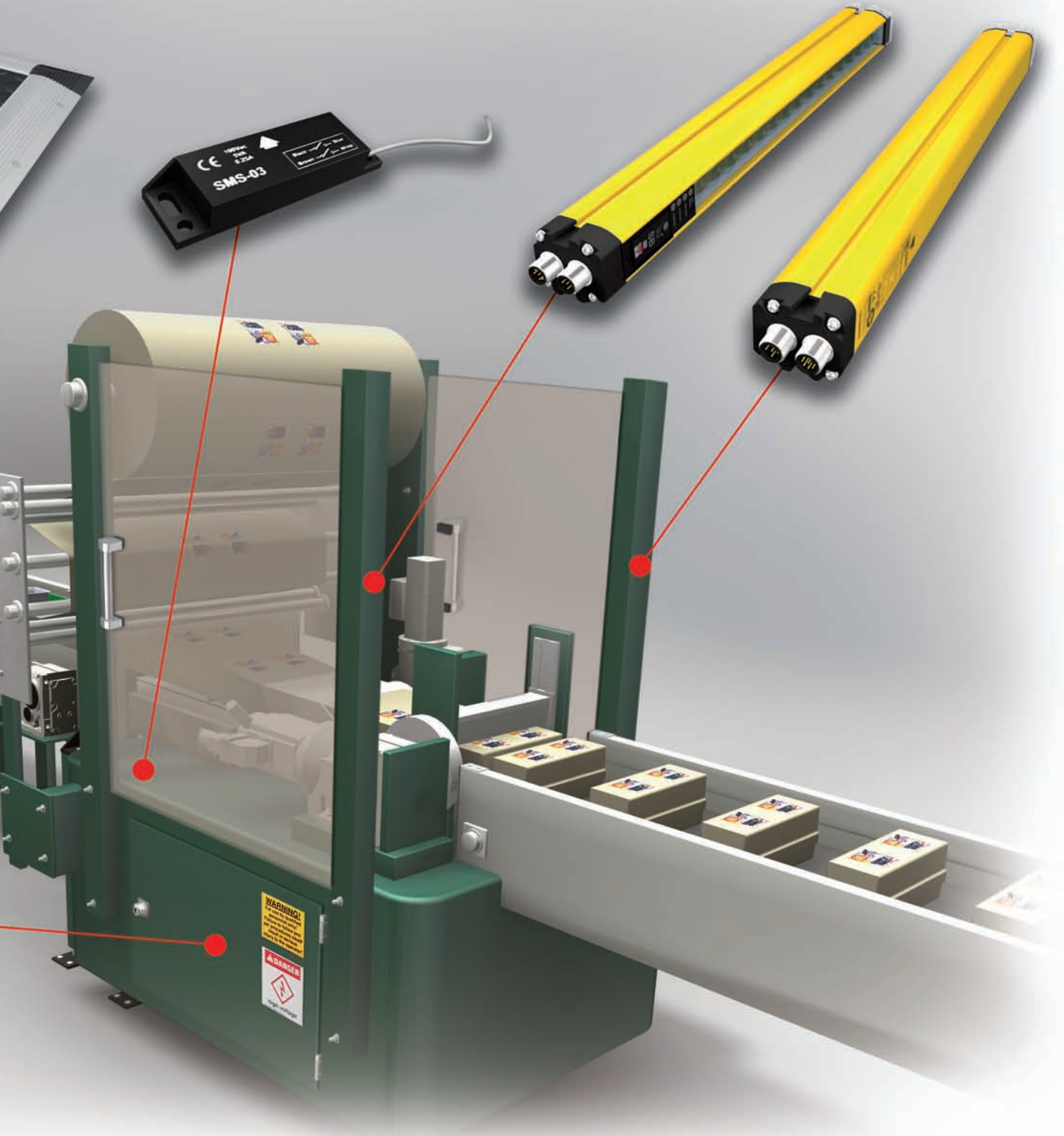
Sometimes, especially in ceramics or wood applications, the dust does not allow the proper working of light curtains. This problem can be solved by Carlo Gavazzi's SM Series safety mats, which cover the floor below the dangerous area, detect the presence of personnel and can then stop the machine. All this information is conveyed to the machine, through our safety modules, which control the machine's functioning.





Integrated Solutions for Safety in Automation



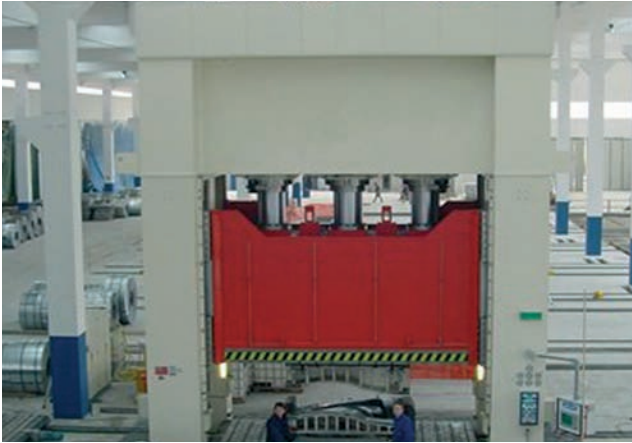


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Our Safety Devices at Work

Light Curtains on Presses



Safety light curtains are widely used in order to protect the working area of presses and punching machines. The Master- Slave cascade connection of the SB4M-SB4N Series provides protection in the dangerous areas and detects presence of operator. All the electronics for Slave unit monitoring (SB4N) are included into the Master (SB4M). Thanks to Carlo Gavazzi's solutions, mounting, wiring and set-up are quick and safe.

Safety Mats on Woodworking Machines



The use of safety mat layouts may be required when woodworking machines, such as CNC work centers and routers, must be protected. In fact, safety mats split into several sections allow obtaining different system response according to machine head position and/or operation. SM Series safety mats are designed to comply with stringent reliability and quality principles in order to deliver the safety function everytime, even after millions of operations. Obtaining the needed layout is always possible and simple, thanks to the wide range of accessories and to the modular design.

Stopping Car Wash Systems in Presence of Danger



In the working area of car wash machines, there are several emergency stop buttons. If a dangerous situation arises, the operator or whoever is nearby the safety button must be able to stop the machine. The NES02 provides the means for connection of multiple E-stop buttons in series. In this way, the needed safety category for the whole machine is assured.

Starting a Press



Presses are dangerous machines, because no gate can be used and light curtains may not be practical. The only way to guarantee safety is to make sure the operator has both hands busy when the machine is in operation. Safety category III C, complying with EN 574, allows ND12D to be used in the most demanding applications.

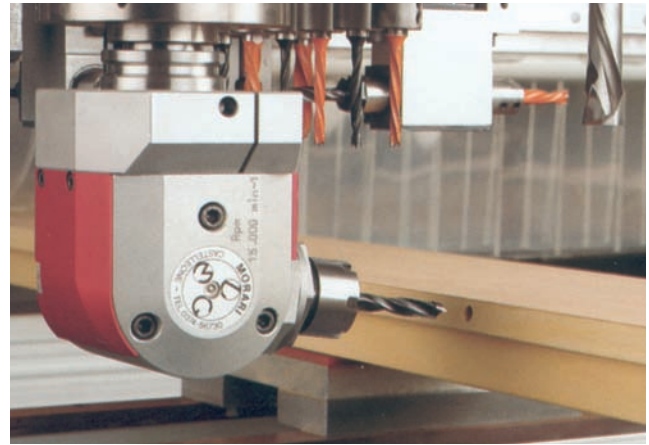
Our Safety Devices at Work

Managing Safety Gates on a Plastics Machine



Generally, safety gates need a safety system guaranteeing top reliability and durability. In plastic machines, the main gate must be often opened – i.e. when the moulded part is not correctly released or at the end of each use – and safety must not be a problem. NES02 and NES13 simply solve the problem allowing the opening of the press motor mains, when the gates are open.

Standstill Motor for Electrical Lock Release



If a fast rotating tool is used – for instance to drill wood or glass – the access to the dangerous area must be allowed only when the tool is immobile. In this event, an electrical lock is released and the operator can access. The MF1C performs this function according to category 3 (EN 954-1). The great advantage of this safety device is that no external mechanical sensor or wiring is required.

Light Curtains in Packaging Machines



The safeguarding of packaging applications often requires that objects such as feed stock, work pieces etc. pass through the sensing field, without the activation of any stop signal. Carlo Gavazzi's SB4B Series light curtains allow up to three adjacent beams to be interrupted at any location along the sensing field. This system operates without triggering any safety output, such as floating or blanking. Quick and safe setting is ensured, thanks to the integrated DIP-switches.

Safety Gates



Machines provided with mobile protections to prevent access to dangerous areas need safety switches, to guarantee immediate shut down in case of gate opening during the working cycle. The SMS Series encoded safety magnetic sensors can be used in this application and provide the highest level of reliability, thanks to the housing's high level of sealing. Contactless technology allows ease of mounting, no wear and a life span of over a hundred million operations.



Safety Light Curtains

Safety light curtains are widely used to protect dangerous points of operation and to safeguard the access. Whenever at least one of the infrared beams generated between emitter and receiver is interrupted, the safety outputs of our device activate, stopping the dangerous motion. Flexibility, ease-of-use and minimum impact on machine productivity make this choice much more effective than mobile material protections.

Resolution, operating distance and safety category are the main parameters to be determined when assessing the application requirements.



Main Advantages

Carlo Gavazzi's commitment in offering a reliable and comprehensive range of safety solutions continues with the new series of safety light curtains. This new set of devices is designed to satisfy each protection issue, thanks to our knowledge of the applications and standard requirements. Carlo Gavazzi can provide the right products and every type of accessory, assuring an easy and effective installation. The safety solutions offered include low risk installations up to complex applications requiring maximum protection and integrated functionalities.



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SBA2 and SBM2 Series

Type 2 safety light curtains are available in two different resolutions: for hand (30 mm) and for presence control protection (90 mm). The main features of this series are the built-in control circuits and the integrated test function, automatically running every 500 ms. The operating distance is 15 m. The SBA2 Series (automatic Start/Reset) or the SBM2 Series (manual Start/Reset) can solve a wide range of industrial applications. Extremely compact dimensions (31x32 mm), protected height between 187 and 1510 mm, easy installation and total reliability, assure absolute operator safety.



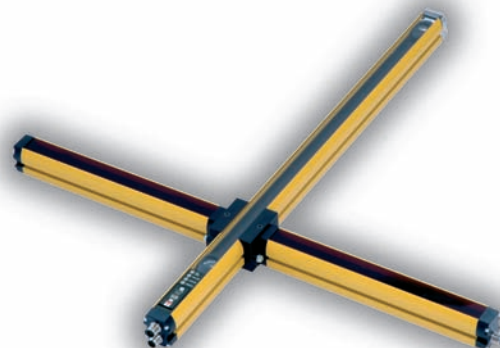
SB4E, SB4B and SB4M Series

The new series of type 4 safety light curtains, for finger and hand protection, is characterized by integrated advanced functions. Thanks to the **EDM** function – available on all versions – the light curtain is able to verify the integrity of all external switching devices. A Fixed or Floating **Blanking** – on the SB4B and SB4M Series – succeeds in deactivating a part of the sensing, allowing material passages or mechanical obstructions, with no machine interruption. The SB4M Series also has a **Cascade** feature to combine multiple light curtains (master and slave), which can be positioned in different areas. Integrated dip-switches guarantee an instant and safe configuration.



SB4T, SB4L and SB4S Series

Type 4 safety devices for body protection are well suited for applications that require material passage through a dangerous area, such as palletizers or depalletizers. Installation and alignment are simple and fast, thanks to pre-assembled, pre-cabled and pre-aligned muting sensors. Available models include 'T' shaped versions for bidirectional muting, 'L' versions for unidirectional muting and a linear family version, without integrated muting sensors. Muting arms are adjustable for the highest flexibility. The integrated DIP-switches guarantee a quick and safe setting of start mode, muting mode, muting time and EDM function.



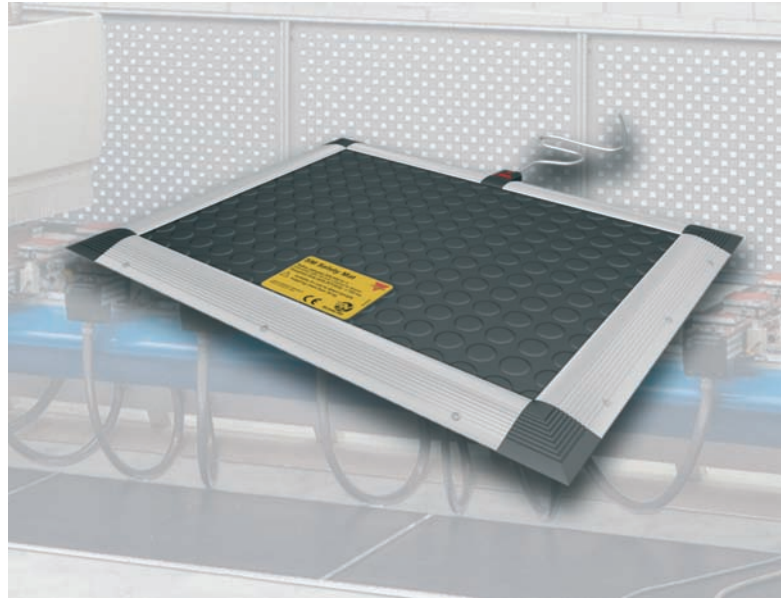


Safety Mats

SM Series safety mats are safeguarding devices designed for the protection and surveillance of potentially hazardous areas, such as the surroundings of industrial machineries.

Their simple structure, matched with a special soldering process - which ensures total sealing of the layers - make SM safety mats also suitable for heavy-duty applications in damp and dusty environments, where almost no other safety devices could be used.

In conjunction with safety control unit NT12D, SM safety mats constitute a reliable and effective solution for area monitoring, in compliance with Safety Category 3 requirements.



Main Advantages

Carlo Gavazzi's safety mats guarantee the control of a whole restricted area and not just a perimeter. This feature is very important, especially when dangerous areas (not visible from the machine control points) must be protected. Safety mats offer customers the opportunity to have integrated solutions, delivering unbeatable reliability and durability, with no maintenance. Additionally, complex shapes and layouts can be put together with the variety of available accessories.

Features

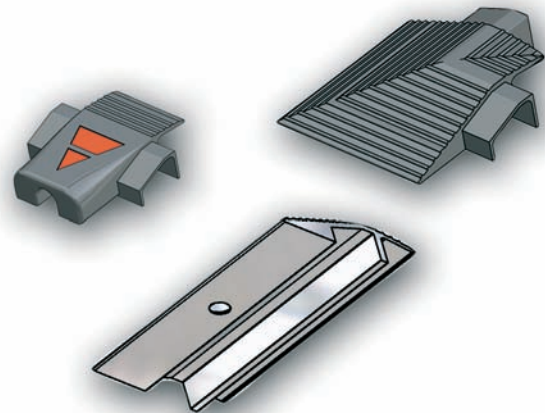
SM safety mats are electrical pressure-sensitive devices, activated by pressure (usually the operator's body weight) and utilized for presence control. The external structure of the mat consists of two generously sized PVC layers, containing two inner conductive surfaces separated by an appropriate insulating material. The special soldering process guarantees the total sealing of the outer shells. The new external fixing trim ensures a firm anchoring to the floor and protects cable routing. The cable connection monitoring is provided by the NT12D safety control module. The simple and robust construction delivers extreme dependability and a life span of more than one million cycles.



Accessories

The concept of modularity was the inspiration for Carlo Gavazzi's new safety mat accessories, designed for easy and safe installation.

The range includes internal and external angular joints, with sections dedicated to cable routing, and linear joints with cable outlet for a quick mounting and full protection of wiring. The 'H' section joining trim is designed to combine more safety mat segments together. The resulting achievement is the desired layout, ensuring sensitivity along the joint side, too. Dedicated colored adhesive tapes are also available for visible mat section delimitations.

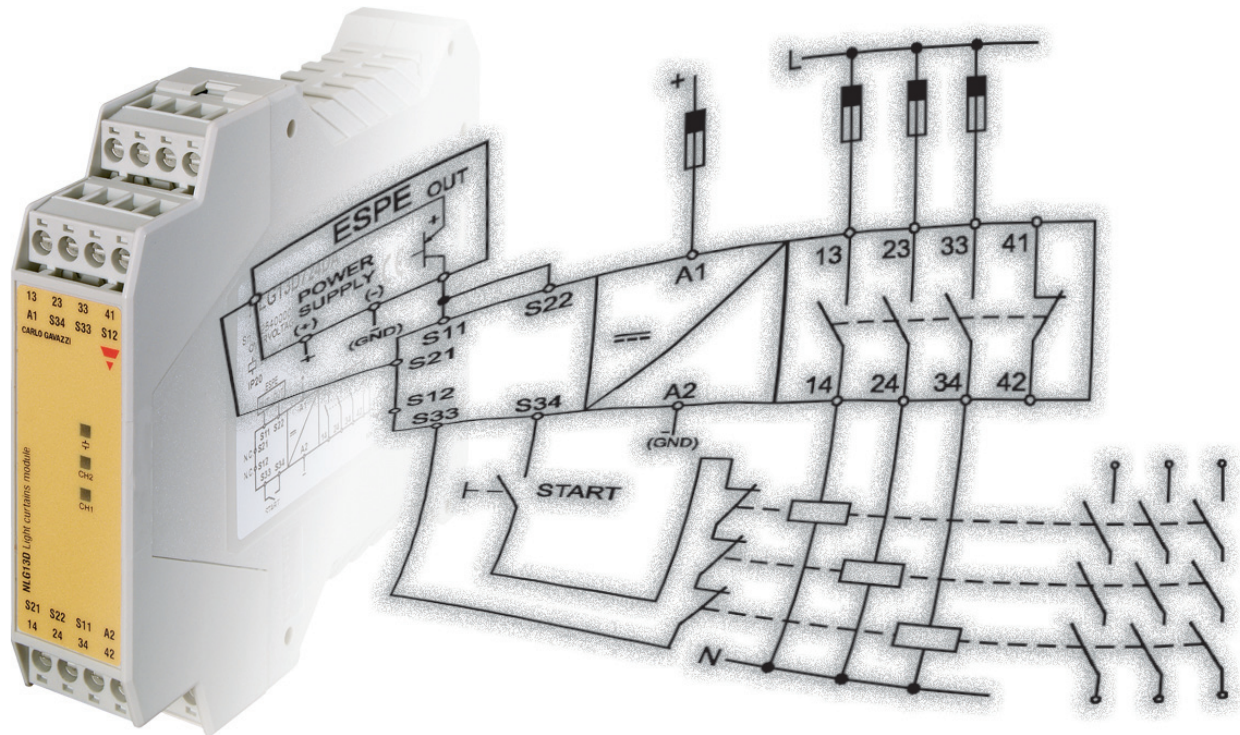




Safety Modules

Safety modules play their role in the risk reduction phase of the machine development process. If, for instance, the installation of a fixed gate appears to be impossible, but a moving gate has to be opened to load and unload the appliance, the machine has to be safely stopped when the gate is open. This is what Carlo Gavazzi's safety gate modules are designed for.

Specialized modules are also available to manage emergency stop buttons, light curtains, two hand controls, or safety mats. Carlo Gavazzi provides easy installation, simple working mode and immediate fault detection with excellent reliability.



NES02D and NSC13D Series


If the safety input device is a mechanical safety switch (like our PS21S safety limit switch for safety gates or the emergency stop button EMPB) the NES02 and NES13 are the ideal solution to operate up to safety category 4, in compliance with EN954. If the input device is a safety magnetic switch like our SMS Series, NSO02 and NSO13 are the ideal counterpart. If one of the contacts is normally closed, the NSC02 and NSC13 are the most effective solution.

NLG02D and NLG13D Series


The NLG02 and NLG13 allow stopping dangerous activities when the operator enters a risky area. These Carlo Gavazzi devices assure absolute safety, accepting the transistor output of our SB Series light curtains and providing a safety relay output.

NT12D Series


Being the natural completion of our SM Series safety mats, the NT12D provides a category 3 certified safety system, complying with EN954. This device monitors the dangerous area for operator access.

MF1C Series


Measuring the regenerated voltage on a motor's coils, is the best way to determine if the tool on a motor's shaft is moving. This operation must be performed safely in order to comply with safety category 3. The MF1C provides this function, allowing for the opening of the lock of a safety gate only when the motion of a motor has come to a complete stop.

ND12D Series


Two-hand (no tie-down) systems are indispensable when there is no way to keep the operator away from the dangerous area. The ND12D two hand module of category IIIC, in compliance with EN 574, is connected to a 2-hand safety button system. This special device allows the machine to function only if both buttons are pressed simultaneously.

NE14D Series


In some cases, extra safety outputs are required to control the machine's operation. The NE14D expansion module provides four additional safety outputs while maintaining the safety category of the system.



Safety Bus

Reduce Down Time and Make Your Plant Safer

The trend is clear: big advantages can be achieved using bus communication in safety related systems. Compared to the traditional serial wiring of normally closed safety switches, the diagnostics are vastly improved. The immediate indication of causes for production interruptions makes it possible to significantly reduce downtime, especially on large machines and plants. Furthermore, a bus solution is safer, because the risk of undetected bridges over normally closed safety contacts is considerably reduced.

A Unique Set of Features

DuplineSafe is based on the Dupline® fieldbus, a system used in more than 120,000 installations worldwide in the harshest industrial environments. Dupline® is particularly known for its reliability, simplicity and ability to transmit signals over long distances. All the features of Carlo Gavazzi's Safety Bus system are especially demanded in safety related systems.

Approved by TÜV Complying to EN61508-SIL3 and EN954-1 Cat. 4

The development of the DuplineSafe products has been carried out in close cooperation with TÜV Rheinland Group.

Configurable Safety Relay

Thanks to the handheld DuplineSafe configuration unit, the user can define the addresses of the input modules, in order to monitor them with the safety relay. In operation mode, the safety relay will trip if one or more of these input contact does not send a valid "contact closed" signal or if any fault on the bus is detected. Several relay output modules can be connected to the same bus, and each of them can be configured to monitor any input module. Thereby it is possible to stop several machines in different locations, activating a single emergency stop switch.

Bus-Powered Input Modules

Bus-powered input modules provide the interface to the safety switches, which may be emergency stop palm buttons, pull-cord switches or other devices with NC contact. The small-dimension IP67-rated housing makes it possible to install the input modules inside or nearby the safety switches, even in rough environmental conditions.

Diagnostics via PLC, PC or Text Display

DuplineSafe Gateways for Profibus-DP and Modbus RTU make it possible to read out the DuplineSafe diagnostics information via a PLC, PC or Text Display.

Features

Up to 63 safety signals on a single two-wire cable

Bus-powered Input Modules

Immediate and precise safety diagnostics

Up to 5 km transmission distance without Repeater

High noise immunity and reliability

Easy to design, install and commission a system

Several safety relays can read the same input modules

Free topology and no requirement for special cable

Safety signals and standard digital/analog I/O are allowed on the same bus

Benefits

Reduced wiring cost compared to parallel wired system

No need for local power supplies

Machine stops can be fixed faster, leading to higher production efficiency

No need for special modules or special handling when long distances are involved

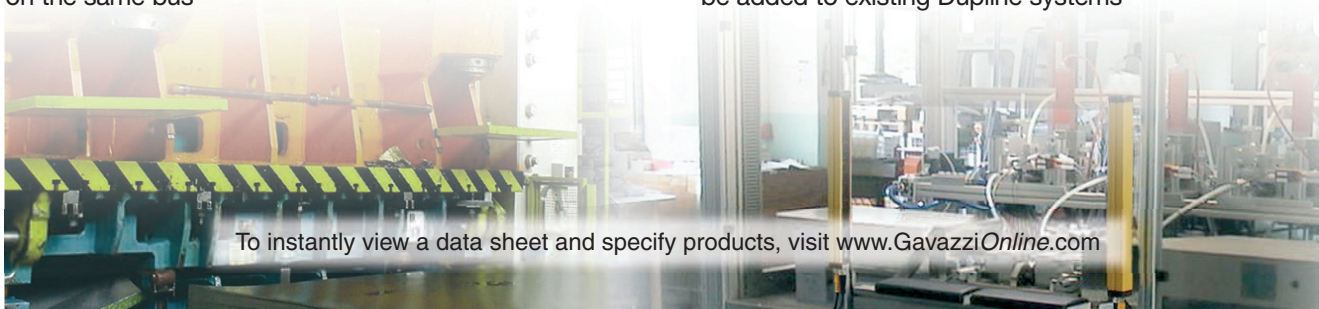
High system availability - false trips avoided

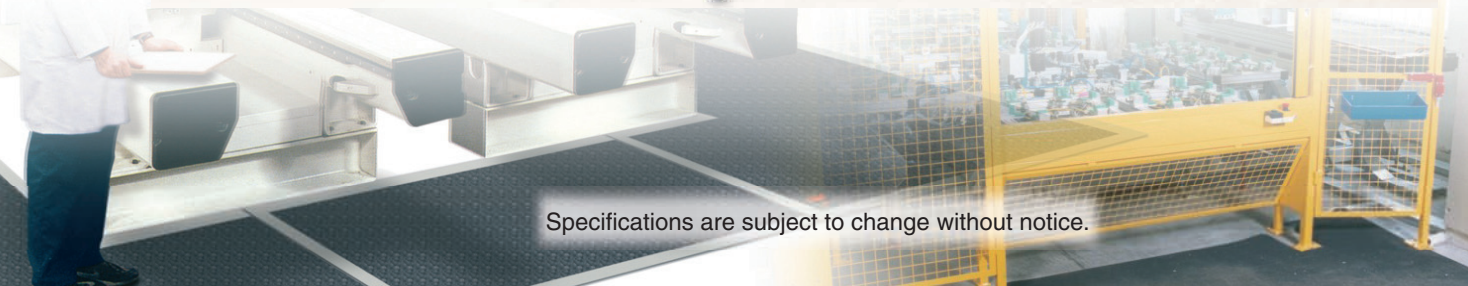
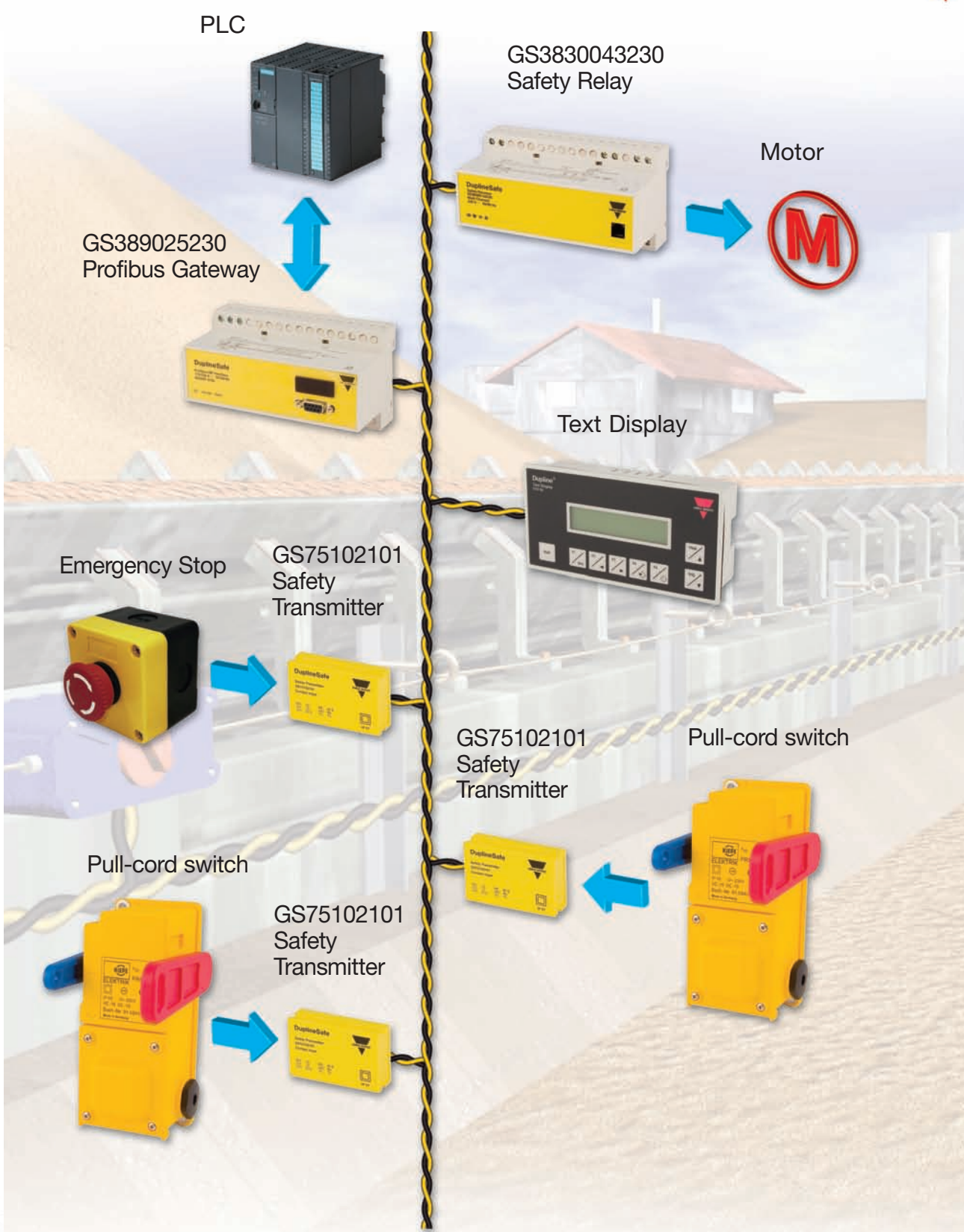
Reduced risk for human error, steep learning curve, no dependence on specialists, and time savings

Easy to use where one safety input can be used to stop several machines at different locations

Easy and flexible wiring with possibility to use existing cables

One bus can handle all signals, and safety functions can be added to existing Dupline systems





Specifications are subject to change without notice.



Safety Magnetic Sensors

The SMS Series encoded safety magnetic sensors are designed to monitor the position of hinged, sliding or removable guards of industrial applications.

Carlo Gavazzi's safety sensors – connected to a monitoring safety module – provide a method to stop or disconnect the dangerous motions, if the mobile protections are opened or displaced.

The multiple flux coding ensures the correct activation of the sensor with dedicated magnetic units only. This system – in conjunction with redundancy frames used in the design – makes the SMS Series suitable for safety gate applications up to safety category 4, complying with EN 954-1.



Main Advantages

Carlo Gavazzi's safety magnetic sensors are the right answer, in the presence of harsh industrial environments with damp and dusty conditions, or in case of applications where high hygiene standards are needed.

The SMS Series is the solution wherever stringent hygienic standards need to be maintained, thanks to the dirt and water resistant sealed body, and to its shape, which has no dust collecting cavities. These easy to clean units provide high security performances. Contactless technology means tremendous durability and allows concealed assembling on non-magnetic materials: this feature avoids many mounting problems which affect mechanical switches.

Multiple flux coding and redundancy ensure safe and protected installations, preventing incidental access.



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The Range

Thanks to our long experience on designing magnetic-based sensors, Carlo Gavazzi is able to offer an extensive range of safety magnetic sensors, covering a large variety of safety gate applications in different industrial contexts.

The wide range of products includes versions with rectangular or cylindrical housings, made in thermoplastic material. The whole series is characterised by multiple flux coding, activation with the

dedicated magnetic unit only (CLS series), long life (contactless), sealed to IP67, excellent tolerances to misalignment, insensitive to dirt and suitable for concealed installation. A very important feature is the unbeatable durability and reliability of all Carlo Gavazzi's devices.



Rectangular Series

Several models are available, ranging from single to double channel, 1NO, 2NO or 1NO + 1NC contacts. Carlo Gavazzi offers versions with signalling auxiliary outputs, LED indication and pig-tail output connection with M12 connector. The safety rating ranges between 2 and 4, in compliance with EN954-1. The devices can be operated with CLS magnetic unit series.

Cylindrical Series

The M18 or M30 versions range from single to double channel, 1NO, 2NO or 1NO + 1NC contacts.

Options include LED indication and pig-tail output connection with M12 connector. The safety rating ranges between 1 to 4 in compliance with EN954-1. The devices can be operated with CLSA magnetic unit series.





Safety Limit Switches

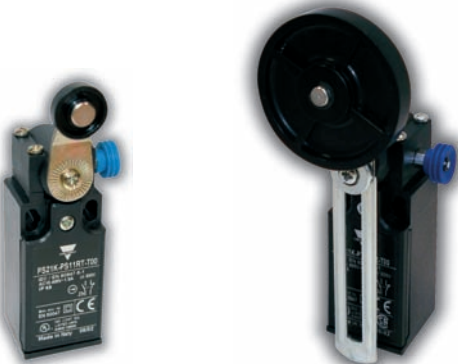
Safety limit switches supervise security of industrial machines, that often cannot rely upon secure working areas because an inadequate down-time does not occlude access.

Carlo Gavazzi's safety limit switches assure the control of the hazardous areas access points, by intervening on the control circuit. In particular, the operators' safety is preserved when the machine immediately comes to a complete stop as the mobile protector (covers, cases, doors, grids, etc.) is opened or a rope is pulled.



Safety Limit Switches with Pull Button Reset

These devices are designed to be used for the detection and monitoring of faults in hoisting machines, electric lifts, freight elevators, escalators, conveyor belts, etc. The limit switches protect the operators working on dangerous machines, by opening the control circuit. The normally closed safety contacts remain in the open position, once the switch has been activated. The return to the initial operating state can take place only by manually activating the pull button reset.



Main Advantages

The limit switches are available in different sizes and materials. They are developed in reinforced UL-V0 thermoplastic fiber-glass, zinc alloy (Zamack) or aluminum body. IP65 (thermoplastic) and IP66 (metal) assures a high degree of protection, that allows use of the limit switches in different kinds of environments. The contact block, Zb type, is consistent with the safety requirements of the IEC 947-5-1 with NC contact with positive opening operation.

Others main advantages are:

- Minimum Actuation Force/Torque
- Minimum Force to achieve Positive Opening Operation
- Precise operating points (consistency)
- Immune to electromagnetic disturbances



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Emergency Stop Push Button

The emergency stop switches are devices that users employ to initiate the complete shutdown of a machine, system, or process. Pushbuttons are relatively large devices that open or close a switch, when pressed.

Usually a double-pole, single-throw (DPST) contact block is used to turn off the power.

The twist-to-reset switches require users to twist a button, in order to reset the switch and resume operation.



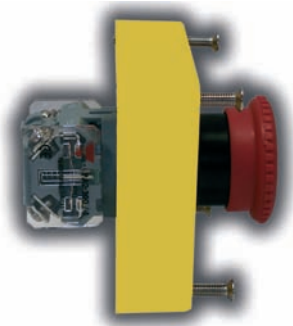
Main Features

The emergency stop push button must be pressed, in order to be locked. Then, the device has to be twisted clockwise, in order to be released.

The high degree of protection (IP65) makes this device effective in different kinds of environment. Five different ways of cable entry (PG13.5 / M20) offer different solutions for installation.

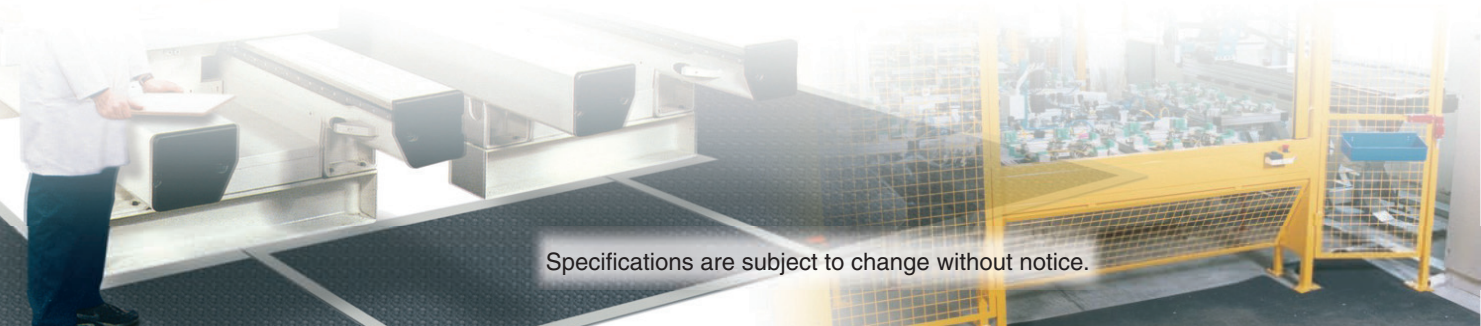
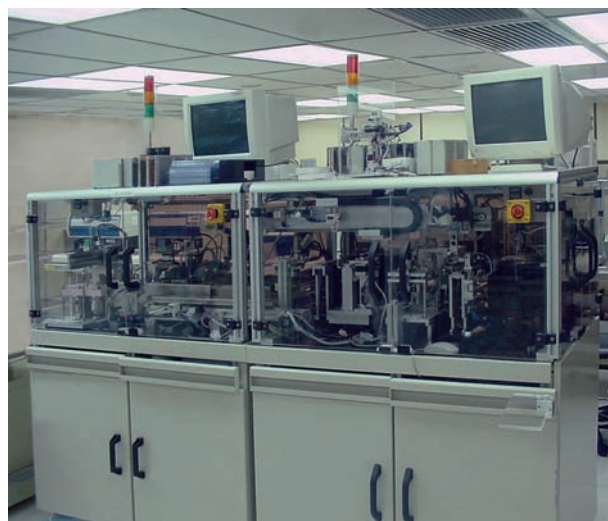
Others main advantages are:

- 4 captive screws
- Double insulation
- Contact block with forced opening NC contact



Applications

It is designed to protect operators working on dangerous machines, by opening the control circuit. In compliance with the EN418 (safety of machinery – emergency stop), it allows switching off of the electric power by pushing the RED Emergency Stop Push Button.



The Complete Product Package



Sense

Inductive Proximity Sensors
 Tripleshield™ Capacitive Sensors
 Photoelectric Sensors
 Inductive Loop Detectors
 Ultrasonic Sensors
 Radar Sensors
 Level Sensors
 Limit Switches
 Magnetic Switches



Switch

Solid State Relays
 Contactors and Overloads
 Manual Motor Starters
 Motor Controllers
 Variable Frequency Drives
 Electromechanical Relays
 Pilot Devices
 Cam Switches
 Rotary Disconnects



Control

Energy Management
 Digital Panel Meters
 PID Controllers
 Switching Power Supplies
 Time Delay Relays
 Current Monitoring Relays
 Voltage Monitoring Relays
 Three Phase Monitoring Relays
 Current Transformers
 Enclosures



Safety

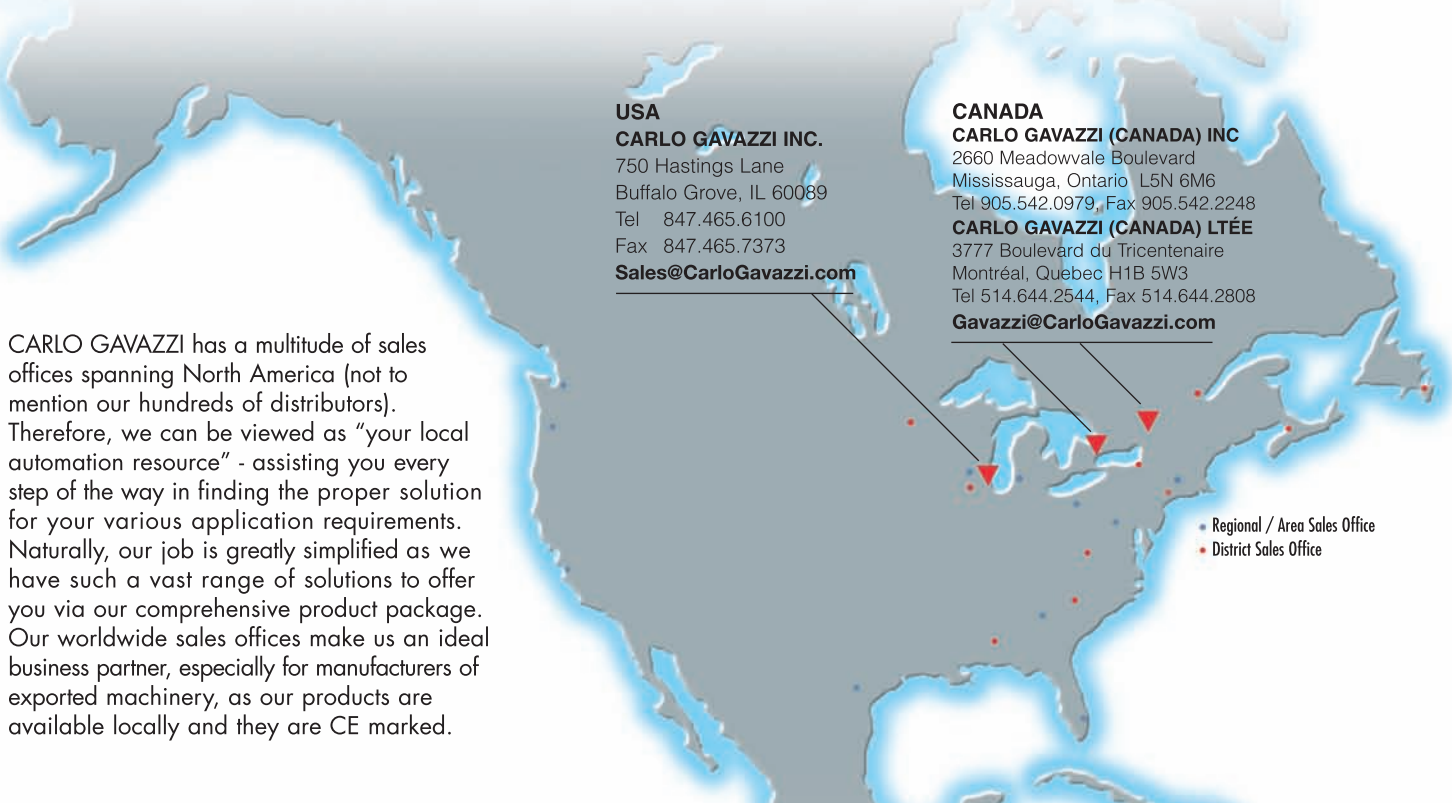
Control Modules
 Interlock Switches
 Magnetic Sensors
 Light Curtains
 Stack Lights
 Mat Systems



Fieldbus

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CARLO GAVAZZI has a multitude of sales offices spanning North America (not to mention our hundreds of distributors). Therefore, we can be viewed as "your local automation resource" - assisting you every step of the way in finding the proper solution for your various application requirements. Naturally, our job is greatly simplified as we have such a vast range of solutions to offer you via our comprehensive product package. Our worldwide sales offices make us an ideal business partner, especially for manufacturers of exported machinery, as our products are available locally and they are CE marked.

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Safety Brochure 6/07

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