

ifm electronic



Safety technology – Sensors and system solutions from ifm.

Safety technology

www.ifm.com/gb/safe



ifm electronic





Safety technology from ifm

The optimum solution for every application

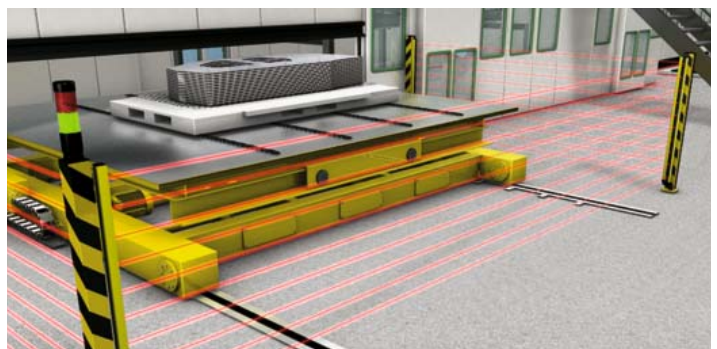
*The name **ifm electronic** stands for a large range of different sensors and systems for automation technology. For more than forty-five years the family-run company has been researching, developing and producing with the aim of optimising technical processes and conserving resources.*

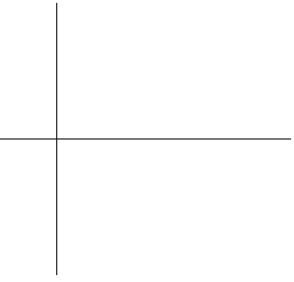
In safety technology ifm is known for innovative and practical solutions for many years. You can, for example, connect inductive and optical safety sensors easily to any safety relay or PLC.

All safety requirements, from the lowest to the highest level, are met over the entire product range.

The functional safety of ifm technology helps you to minimise the risk to your plant or machinery to a defined residual risk.

Feel free to contact us! Fully in line with our slogan "close to you" we or one of our system partners will be glad to answer your questions.





Fail-safe inductive sensors

For industrial applications

4 - 5

Inductive



Safety light curtains Safety light grids

For industrial applications
For hygienic applications

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Light curtains
Light grids



AS-Interface Safety at Work

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AS-Interface
Safety at Work



Safe speed monitoring

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Speed
monitoring



Safety control system SmartPLC

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SmartPLC



Safety control system ecomatmobile

For mobile applications

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ecomatmobile



Introduction Machinery Directive Safety level

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Introduction
Safety



For industrial applications

Direct detection:

Switches when metal is present, no special target needed

Flexible:

M12, M18, M30 and rectangular housings.

Safety compliant:

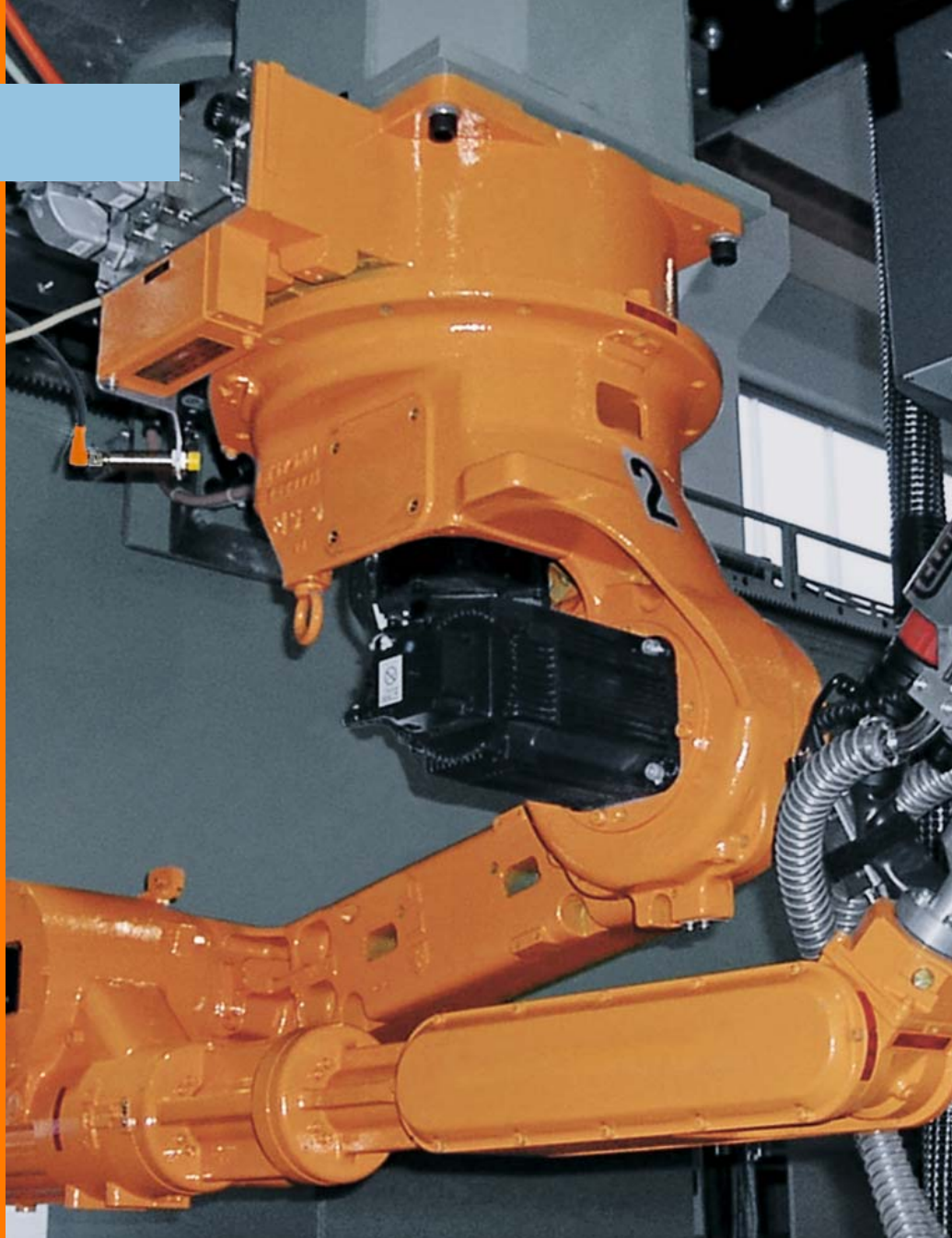
Conformity to IEC 62061 / ISO 13849 and IEC 60947-5-3 safety standards as certified by the German TÜV.

Safe output signal:

Two OSSD outputs or clocked output for the series connection of up to 10 sensors.

Evaluation:

Evaluation and diagnosis to SIL 3 / PL e via safety relays or easily via AS-i Safety at Work.



Complete solution

ifm provides the appropriate accessories for every application – from fixing components and protective brackets to evaluation units.

Protective housing for fail-safe inductive sensors

Type E12396

**For product selection go to:
www.ifm.com/gb/inductivesafety**





Fail-safe inductive sensors

Detect metals without contact – robust and wear-free

Unlike conventional safety switches, the ifm safety sensors do not require a special target. Direct detection of metallic work-piece carriers, for example, is no longer a problem.

ifm fail-safe sensors can be connected to safety evaluation units, e.g. to safety relays, programmable logic modules or safe controllers. The G150xS safety relay allows the series connection of up to 10 sensors with clocked output.

The safety sensors are simply connected via standard M12 connectors of the ecolink series.



Inductive

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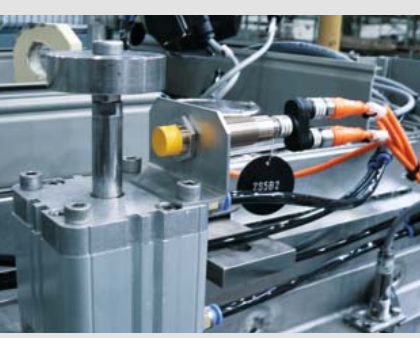
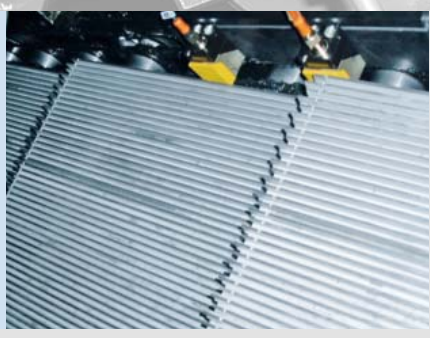
ecomatmobile

Introduction Safety

Fail-safe inductive sensor

Safety on escalators
Safety sensors on escalators are used to detect a missing step. The safety monitor connected via AS-i triggers a safe state of the escalator in case of an error. Compared to the mechanical roller lever switches which are often used the sensors work without contact and thus without mechanical wear.

Type GMxxxS

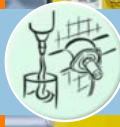


Safe power off
Faults such as coil break or coil short circuit are diagnosed and the sensor passes into the defined safe state. Even a cross fault between the supply voltage and one of the two outputs does not affect the safety function of the sensor.

- Inductive safety sensor M18
- Type GGxxxS
- Safety relay
- Type G1502S



For industrial applications



For hygienic areas and viscous media

Compact:

Type OY with very small housing dimensions starting with 28 x 30 mm. Can be installed without dead band.

Long range:

Ranges selectable on the unit. Light curtains up to 20 m, light grids up to 60 m.

Easy connection:

Tried-and-tested M12 connection. The configuration is made via the pin connection.

Flexible solutions:

Standard through-beam systems – transmitter / receiver or active / passive systems with only one connection. Transmitter and receiver in one housing, passive reflector system as counterpart.



Hand and finger protection

For the light curtains type OYxxxS, an effective protection is reached by the small distances between the light beams starting with 14 mm. Typical applications are presses, pick-and-place machines or handling machines. For hygienic areas, versions with protection rating IP 69K are also available.

Safety light curtain, resolution from 14 to 90 mm, protected area height from 160 to 1810 mm.

Type OYxxxS



Blanking

Blanking suppresses individual light beams or up to three neighbouring light beams. Floating blanking even allows different beams to be suppressed.

For product selection go to:
www.ifm.com/gb/lightcurtain
www.ifm.com/gb/lightgrid



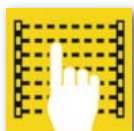
Safety light curtains and safety light grids

Compact, small and reliable

In all applications with dangerous areas requiring finger, hand and operator protection, the small and powerful safety light curtains and light grids from ifm are the first choice.

The main differences of the versions of the OY series are the resolution and the protected area height. Various functions such as range and restart are configured directly on the unit, a PC is not required.

A t-slot on the back allows simple and reliable mounting using the supplied mounting material. The various accessories make low-cost and efficient use easier.



Muting

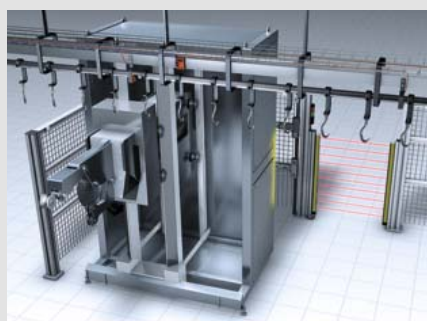
The temporary automatic muting function allows feeding of products to the dangerous area.

Safety light curtain
Resolution 14 to 40 mm
Protected area height 160 up to 1210 mm

Type OYxxxS

Muting relay

Type G2001S

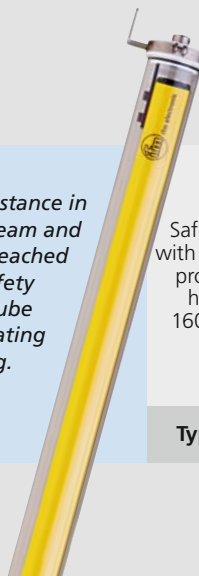


Safety in hygienic areas

The excellent material resistance in cleaning processes with steam and high-pressure cleaners is reached by the enclosure of the safety light grid in a protective tube IP 69K with integrated heating protecting against fogging.

Safety light grid with 2 to 4 beams, protected area height from 160 to 910 mm

Type OY4xxS



Inductive

Light curtains
Light grids

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For industrial applications

Simple:

Modular structure and flexible connection technology ensure easy integration into the AS-Interface system.

Cost-optimised:

A two-wire flat cable transmits safe and non-safe data as well as power. Complex parallel wiring is not necessary.

Flexible:

Can be extended easily and at low cost at any time.

Reliable:

The sophisticated AS-i technology ensures high reliability and machine uptime.



AS-i E-STOP

Type AC010S

Accessory
Protective collar

Type E7004S



Safety stop

Illuminated E-STOP with integrated AS-i connection. Fool-proof to EN ISO 13850. Pull to reset.



Safety inputs

Safe AS-i input module for mechanical contacts. The AS-i flat cable is directly connectable, orientation is possible in three directions.

Safe AS-i input module

Type AC505S

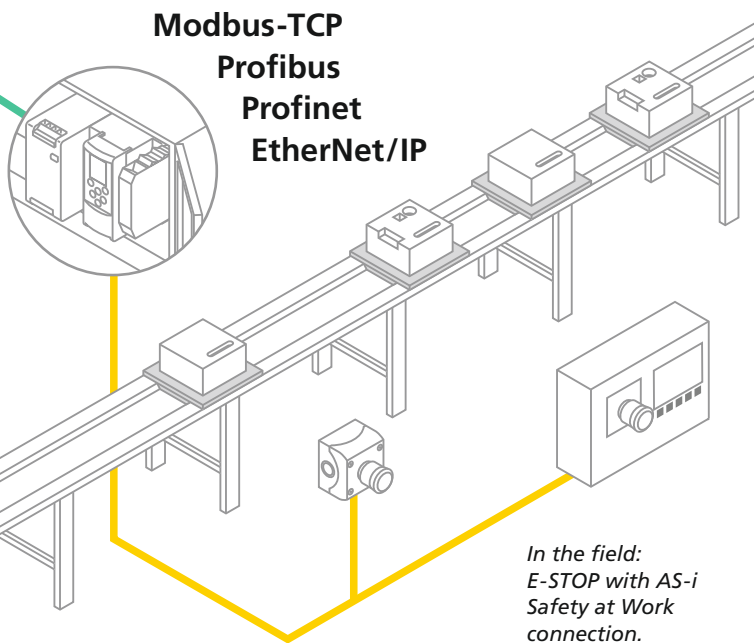
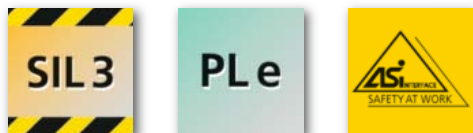


AS-Interface Safety at Work

Less wiring – less cost

Safety at Work is the extension of the existing AS-Interface system for safety applications. The user can integrate all binary safety-related components, e.g. e-stops, safety light grids or protective guard locks etc.

The great advantage is that standard and safety-related components can be used in one system. Only a safety monitor and safe AS-i slaves are added to the existing AS-i system with standard components such as AS-i master, AS-i power supply, AS-i slaves etc. Therefore a mixture of safe and non-safe AS-i slaves is possible without any problems.



In the field:
E-STOP with AS-i
Safety at Work
connection.



In the control cabinet

The central safety components in the control cabinet: AS-i master and AS-i safety monitor.

AS-i
safety monitor

Type AC041S



Safe access

Safe door switch with mechanical securing function and integrated AS-i connection. Rotatable actuating head made of metal. Mechanical release on the front.

Safe AS-i door
switch

Type AC90xS

For product selection go to:
www.ifm.com/gb/as-i-safety

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For industrial applications

Standard sensors:

Safety function even if non safety-related sensors are used. The speed monitors monitor the function of the connected sensors.

Intuitive handling:

Limited to the essential functions. Easy adjustment using a rotary switch. No parameter setting tool required.

Robust:

Can even be used at low temperatures.

Two enable paths:

Control of two separate current paths possible.



Safe fun

Danger at too high speed: the safe speed monitor monitors the carousel for exceeded maximum rotational speed. EN12814 "Fairground and amusement park machinery and structures".

Safe speed monitor
Exceeded maximum speed, setting range 0.5...990 Hz

Type DD110S



Safety in windy conditions

In case of strong wind, the installation is exposed to enormous centrifugal forces, too high speed would destroy it. This is why a safety-related over-speed monitoring to GL 2010, "Richtlinie zur Zertifizierung von Windkraftanlagen" (Directive for the certification of wind turbines), is required.



Safe speed monitoring

Safe monitoring of rotating machines

Rotating machines can often lead to high risks. On the one hand, the rotating parts of a machine can cause a risk of injury against which e.g. a fence is to protect the user. Here, standstill monitors monitor the movements of the machine and open the door only if the machine is safely off.

On the other hand, fast rotating machines cause a high kinetic energy so that the machines can burst if they rotate too fast. In this case, safe speed monitors guarantee that the machine is switched off.

Sometimes there is a potential risk if the machine is not running as fast as it should. In this case speed monitors give a warning if the speed is below the set minimum speed.

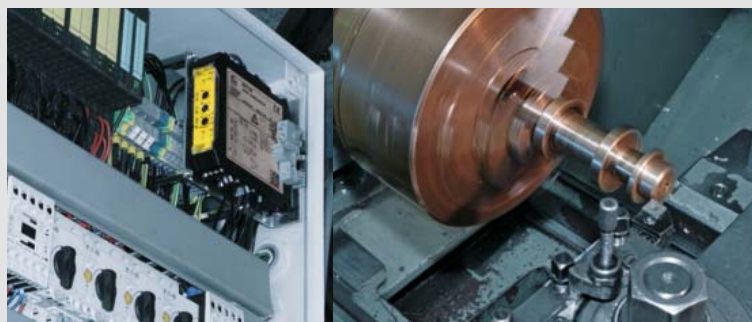


Inductive

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Light grids

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Safety at Work

Speed monitoring



Safety on machine tools

Warning if the speed is below the set minimum speed: the speed monitor monitors the "safe reduced speed" on the spindle to EN 61800-5-2.

Safe speed monitor
Exceeded minimum speed, setting range 0.5...990 Hz

Type DU110S

SmartPLC

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Introduction Safety

For product selection go to:
www.ifm.com/gb/safetyrelay



For industrial applications

Double:

Fail-safe PLC and standard PLC in one housing.

Versatile:

Can be used for different functions and apps.

Productive:

High machine uptime due to sophisticated diagnostics.

Connective:

Supports numerous bus systems.

Outputs:

Eight safe local inputs and four safe local outputs.

Clear:

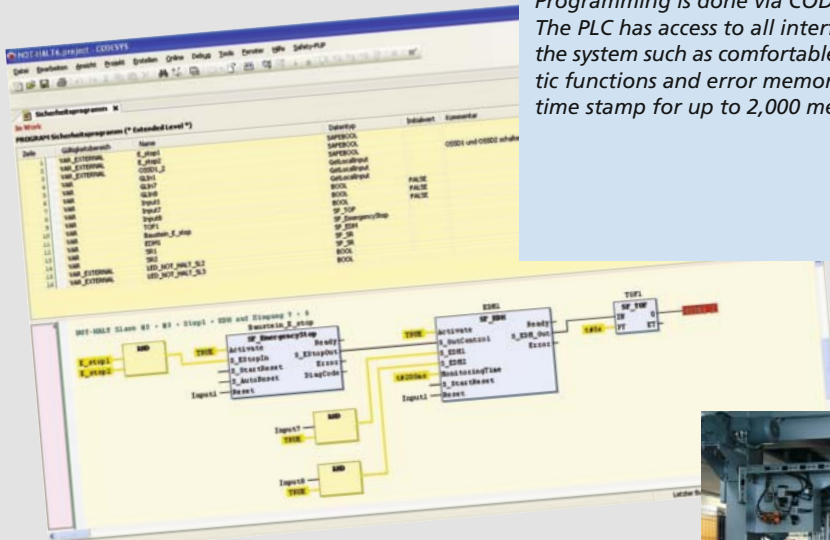
Status display for safe I/Os. Error memory with time stamp for up to 2,000 messages.



For product selection go to: www.ifm.com/gb/as-i-safety

Programming

Programming is done via CODESYS V3. The PLC has access to all interfaces of the system such as comfortable diagnostic functions and error memory with time stamp for up to 2,000 messages.



Complex tasks

Control of a palletiser: the required technology is very complex since operation is fully automatic. The SmartPLC from ifm allows processing of safe and non-safe signals at the same time.



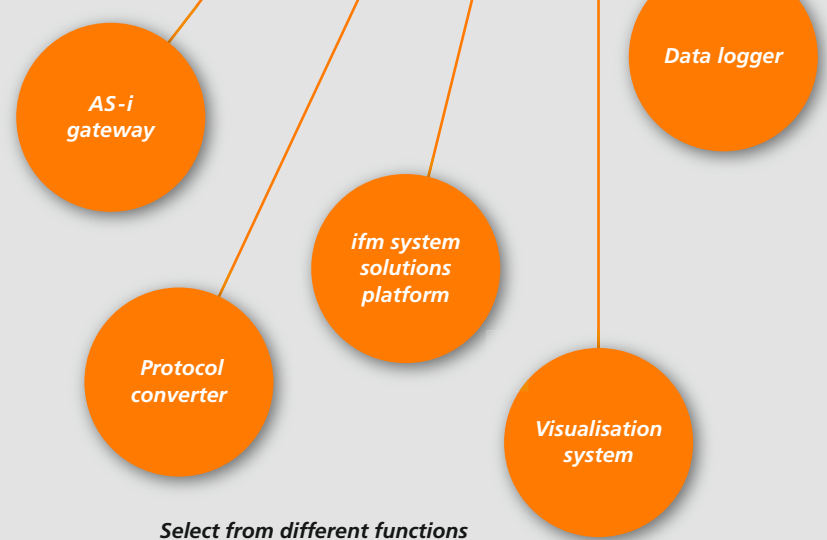
Safety control systems for industrial applications

Fail-safe PLC and standard PLC in one housing. Much additional information included.

The new SmartPLC combines two separate PLCs in one compact housing.

While the one PLC solves safety-related applications, the second PLC either works as a standard PLC or as platform for other tasks.

Both PLCs communicate with each other, so that entire plant controls can be implemented including safety functions and visualisations with one only smart PLC.



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AS-i Profinet gateway with safe preprocessing
Type AC402S
AS-i EtherNet/IP gateway with safe preprocessing
Type AC422S

Select from different functions



Systems for mobile machines

Multi-level safety:

Depending on the severity of the fault the complete installation or only part of it can be put into the safe state.

Can be configured individually:

The behaviour of every single input / output in case of a fault can be configured.

Fast:

The fast bootup and a short error detection time provide sufficient safety in the application.

Safe data exchange:

CAN interfaces with CANOpen, CANSafety and SAE J1939 protocol.

Powerful:

32-bit technology even for complex control tasks.



For product selection go to:
www.ifm.com/gb/safetycontroller



Safety under bridges

Maintenance and repair of bridges: The CAN bus transmits safety-relevant data between the control components. CANOpen Safety allows the transmission of safe data via the same bus cable as that for "normal" communication.



Reduced wiring

The monitoring and processing of safety-related sensor and actuator signals could not be implemented in one individual safe control module. CANOpen Safety prevents complex additional wiring for further external safety components.

SafetyController
80 multifunctional
inputs / outputs

Type CR7132

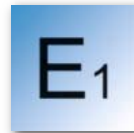
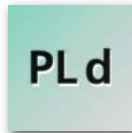
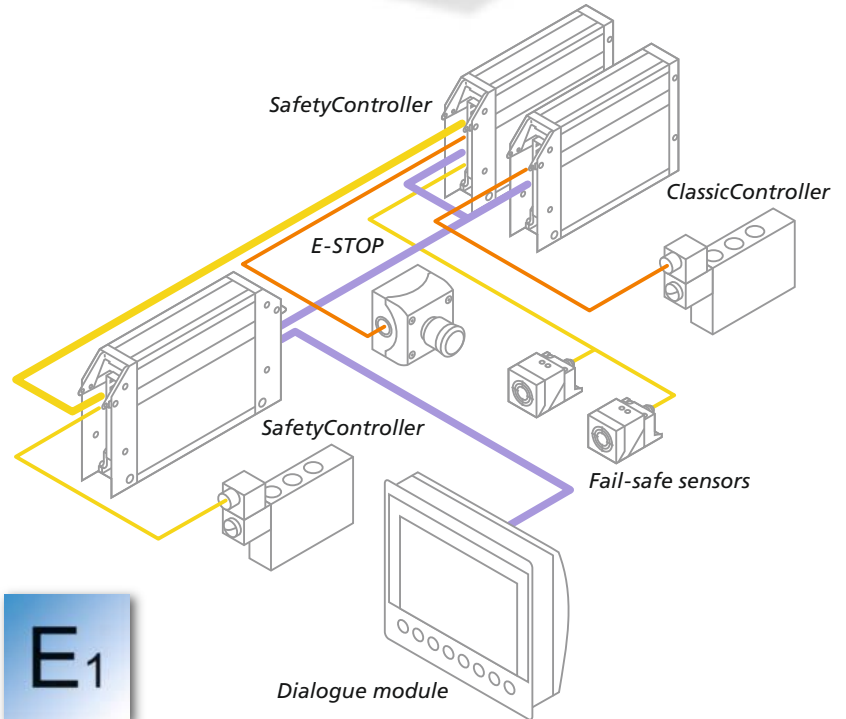


Safety control systems for mobile machines

A sophisticated safety concept

For safety-relevant applications with complex and demanding control functions ifm provides the powerful 32-bit SafetyController. It has been developed according to current safety standards. Hardware and software have been certified by the German TÜV association.

What is special is the programmable, layered error handling (keep alive): The SafetyController can be used so that if there is a serious fault it brings the plant into safe state before shutting down. In case of less serious faults, however, parts of the machine can still be operated in previously defined areas, not all components have to be switched off. The behaviour of the inputs and outputs can be adapted to the application easily and precisely using the CODESYS programming software.



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Safe control of road / rail vehicles

One important requirement is the safe re-railing of the vehicle. In addition to the processing of the sensor and actuator signals the control module also directly processes the e-stop function. A separate e-stop relay is not required.

SafetyController
32 multifunctional
inputs / outputs

Type CR7032



Safe monitoring of the turntable ladder

An ecomatmobile controller controls and monitors the vehicle functions. A SafetyController is responsible for the safe evaluation of the load curves for safe support and monitoring of the vehicle inclination and the rescue platform.

Availability, reliability

Safety, risk

Safety and availability

The EC Machinery Directive

The EC Machinery Directive 2006/42/EC stipulates that machinery should not present a risk.

The Machinery Directive stipulates a uniform protection level for accident prevention for machines when placed on the market within the European economic area. In Germany the implementation in national law is reached by the Machinery Directive (9th product safety provision).

It is no standard or recommended action but an act that has to be adhered to.

The machine manufacturer has to carry out a risk assessment according to EN ISO 12100. Since there is no zero risk, the aim is to achieve an acceptable residual risk. If safety is dependent on control systems, these must be designed so as to minimise malfunction.

For the design of the control systems two standards are available for the user:

EN62061 describes the design of electrical and electronic control systems for machines.

EN 13849-1 describes the design of safety-related parts of a controller irrespective of technology and energy used (electric, pneumatic, hydraulic, mechanical etc.).

Classification is made either in the Safety Integrity Level (SIL 1-3 in EN 62061) or in the Performance Level (PL a-e in EN ISO 13849-1).

Step 1

Definition of the characteristics of the machine:

- Which functions are to be fulfilled by the machine?
- Who shall use the machine?
- What are the intended use and possible faults or misuse?

Risk assessment to EN 62061

	Frequency and / or exposure times to hazard		Probability of hazardous event	
	F		W	
	≤ 1 h	5	often	5
	> 1 h to ≤ 1 day	5	likely	4
	> 1 day to ≤ 2 weeks	4	possible	3
	> 2 weeks to ≤ 1 year	3	rarely	2
	> 1 year	2	negligible	1
Consequences	Extent of injury S	Class C = C + W		
		3-4	5-7	8-10
Death, losing an eye or arm	4	SIL2	SIL2	SIL2
Permanent, losing fingers	3	other measures		SIL1
Reversible, medical attention	2	other measures		
Reversible, first aid	1	other measures		



Right assessment and consistent implementation

Risk analysis

Step 2

Risk analysis:

Without any protective measures a risk will lead to harm.

The designer has to divide the total function of the machine into sub-functions and assess the risk of every individual sub-function as follows:

- Which risks do the individual sub-functions have
- Assess the environmental conditions and the conditions of use of the sub-functions

Which events can cause a damage?

Step 3

Risk assessment:

For each hazardous situation the risk has to be assessed:

- Extent of injury (light, serious, lethal)
- Probability of occurrence depending on:
 - number of people concerned
 - frequency of the event
 - means of escape of the people concerned
 - possibility of prevention or limitation

Step 4

Risk assessment:

If during the risk assessment it is found that a sub-function is too dangerous, measures how to minimise the risk have to be defined.

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Risk assessment to EN 13849

Probability of avoidance P	
impossible	5
possible	3
likely	1

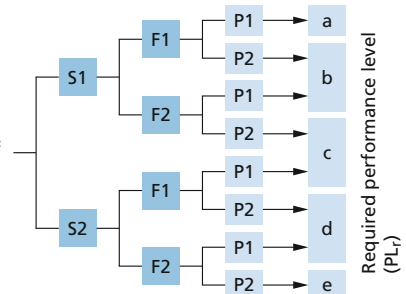
F	
11-13	14-15
SIL3	SIL3
SIL2	SIL3
SIL1	SIL2
	SIL1

Severity of injury S	
slight (normally reversible) injury	S1
serious (normally irreversible) injury	S2

Frequency and / or exposure to a hazard F	
seldom to less often and / or the exposure time is short	F1
frequent to continuous and / or the exposure time is long	F2

Possibility of avoiding the hazard or limiting the harm P	
possible under specific circumstances	P1
scarcely possible	P2

starting point for the assessment of the risk reduction



Draft and implementation

Step 5

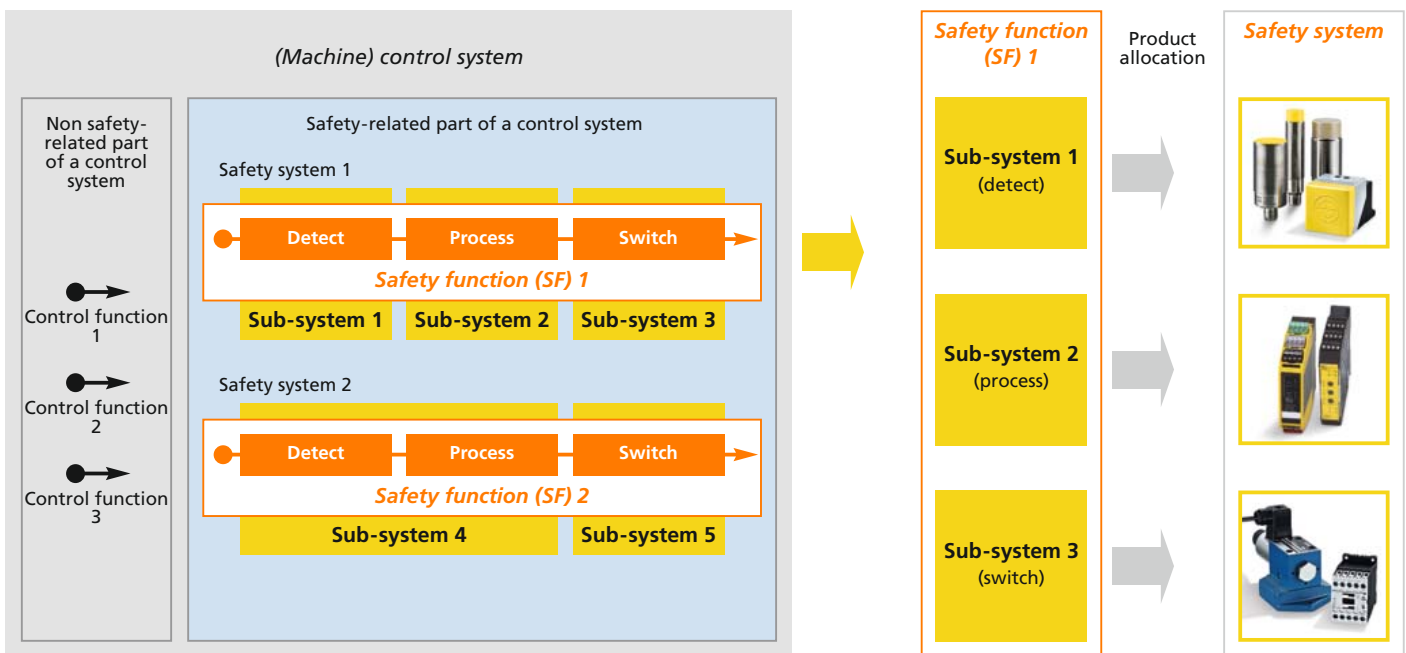
Determine the safety functions:

Appropriate safety functions are allocated to the risks.

Step 6

Definition of the sub-systems (controller architecture) to EN 13849-1 / EN 62061

Define the sub-system architecture for every safety-related control function:

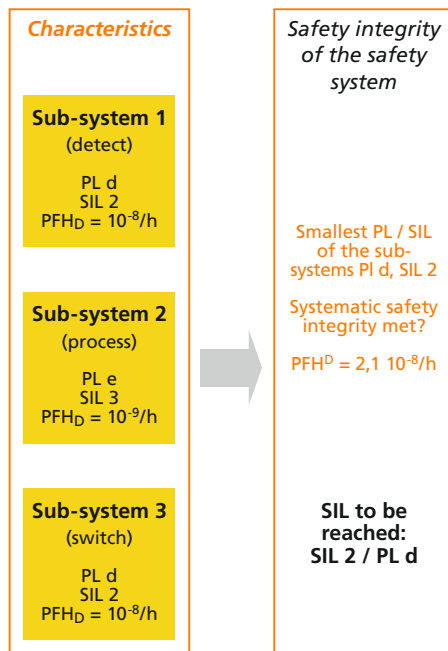




Right assessment and consistent implementation

Step 7

Definition of the characteristic values:



Verification and validation

Step 8

Verification:

Determine the performance level (PL) reached or the safety integrity level (SIL) reached from the characteristic values according to the standard used.

Does the safety level reached correspond to the value defined in the risk analysis?

$$PL \geq PL_r$$

$$SIL \geq SIL_r$$

Step 9

Validation:

During validation, it has to be proven that the theoretically defined measures for risk minimisation have really been implemented.

In general, this is made by practical tests on the machine:

- Are the safety-related output signals generated correctly?
- Does the behaviour in case of a fault correspond to the circuit category?
- Simulation of all dangerous faults.
- Are the dimensions of the production equipment sufficient?

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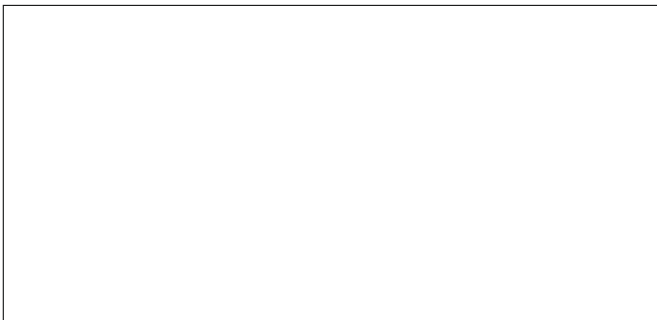
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ifm – close to you!

Overview
ifm product range:



Position sensors



**Sensors for
motion control**



Industrial imaging



Safety technology



Process sensors



**Industrial
communication**



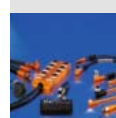
Identification systems



**Condition monitoring
systems**



**Systems for
mobile machines**



**Connection
technology**



Accessories