Safe Camera System SafetyEYE®

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The first safe camera system
for three-dimensional zone monitoring

Three-dimensional monitoring and control.

Business activities

Excellent Components

Sensor technology	▸ Safety switches ▸ Secure safety gate systems ▸ Optoelectronic protective devices ▸ Safe camera systems	
Control and communication	▸ Electronic monitoring relays ▸ Safety relays ▸ Programmable safety and control systems ▸ Industrial communication	
Motion Control	▸ Control systems ▸ Servo amplifiers ▸ Motors	
Operating and monitoring	▸ Control and signal devices ▸ Operator terminals	
Software	▸ System software ▸ User software ▸ Software tools	

Professional Services

Consulting and engineering	▸ Risk analysis ▸ Safety concept ▸ Safety design ▸ System integration ▸ Validation ▸ CE services ▸ International conformity assessment ▸ Plant assessment ▸ Inspection of ESPE	
Training	▸ Seminars ▸ Courses	

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Support

Technical help round the clock!

Technical support is available from Pilz round the clock. This service is provided free of charge beyond standard business hours.

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- Brazil
  +55 11 8245-8267
- Mexico
  +52 55 5572 1300
- USA (toll-free)
  +1 877-PILZUSA (745-9872)

Asia
- China
  +86 21 62494658-216
- Japan
  +81 45 471-2281
- Korea
  +82 2 2263 9540

Australia
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  +61 3 95446300

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  +43 1 7986263-0
- Belgium, Luxembourg
  +32 9 3217575
- England
  +44 1536 462203
- France
  +33 3 88104000
- Germany
  +49 711 3409-444
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  +353 21 4804983
- Italy
  +39 031 789511
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Why does Pilz offer more?

Because the integrality of our business activities is what sets us apart.

Pilz is a solution supplier for all automation functions. Including standard control functions. Developments from Pilz protect man, machine and the environment. That's why all our experience and knowledge goes into individual products as well as consistently sophisticated system solutions.

- Sensor technology
- Control and communication
- Motion Control
- Operating and monitoring
- Software
- Consulting and engineering
- Training

Appropriate services relating to individual components and independent generic services guarantee that our customers obtain customised automation solutions, all from one source.

Pilz is a family business that's closer to its customers.

Pilz has a tradition as a family-run company stretching back over 50 years.
Real proximity to customers is visible in all areas, instilling confidence through individual consultation, flexibility and reliable service.

We are your contact, guide and competency leader en route to an optimum automation solution.

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Contents

Three eyes are better than two ...

These days, man is always separated from the machine when there's danger. As a result, interaction between the two is often only possible via a circuitous route of mechanical or sensory protection devices – at the cost of efficiency.

With the world's first safe camera system, SafetyEYE, it is possible to work without mechanical restrictions, because SafetyEYE is a "sight-based" safety technology for zone monitoring. It combines intelligent sensor technology with effective evaluation, thereby optimising ergonomic interaction between man and machine.

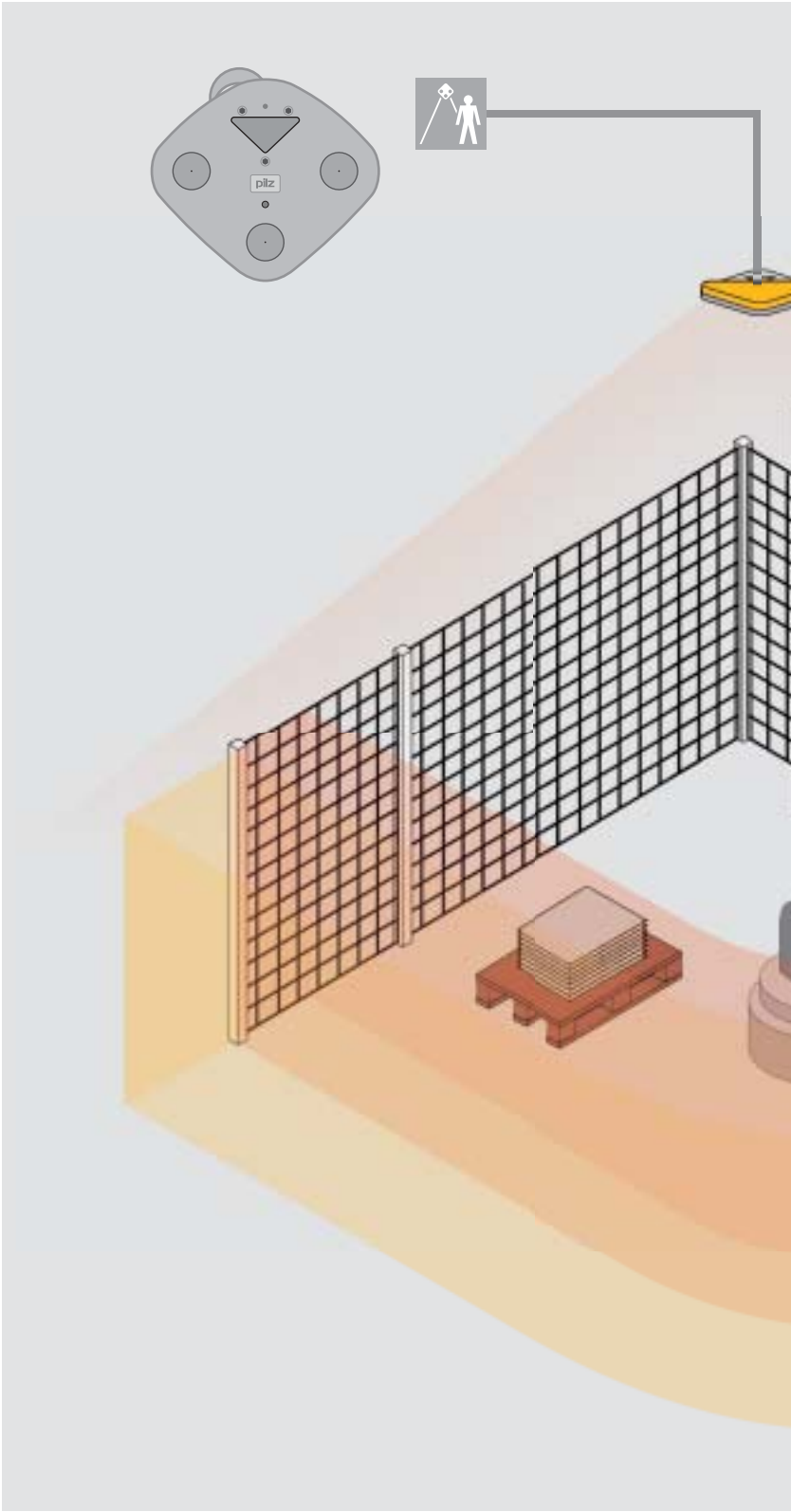
SafetyEYE®. Perfect 3D Protection.

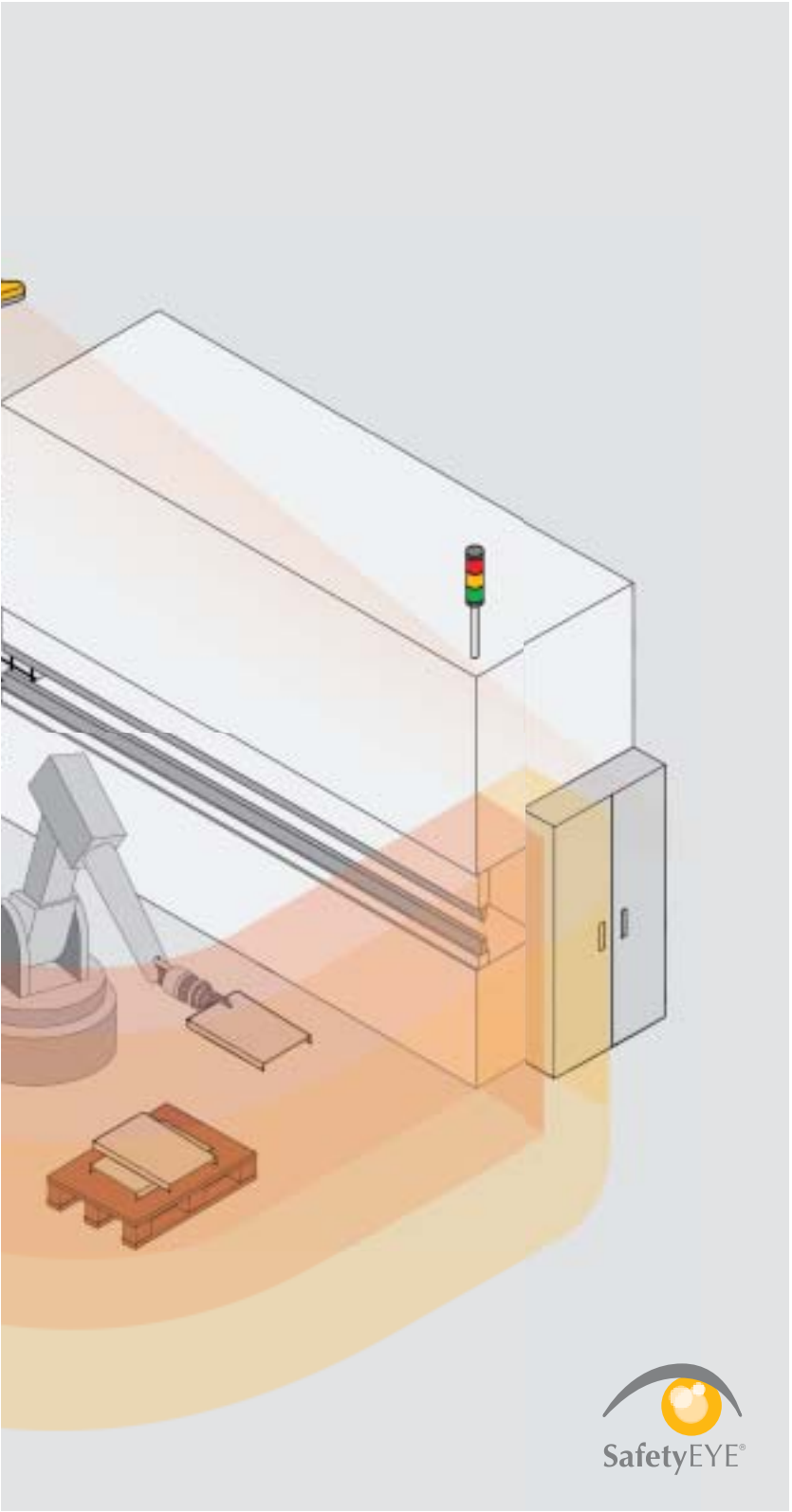
Three dimensions ahead – SafetyEYE®

The safe, complete solution ...

When you are protecting people from hazardous machinery and protecting machinery from material damage, safety sensors are absolutely indispensable. Not just to prevent injury, but also to guarantee high plant availability. That‘s why strict safety regulations require health and safety measures to be safe from manipulation and defeat.

A plant is only as reliable as each individual component. That‘s why our components – from sensor to actuator technology and beyond to diagnostics – are totally compatible. They have been approved as an overall system in accordance with the key standards. The safe, complete solution from one source.





PSEN sensor technology, the safe, complete solution.

… in 3D

SafetyEYE is the world‘s first safe camera system to safely monitor and control potentially hazardous work processes for safeguarding man and machine (safety) and to protect objects from unauthorised access (security).

SafetyEYE, in other words, “sight-based” 3D monitoring. SafetyEYE performs both safety-related and standard control functions.

The safe camera system opens up new horizons for production, providing ergonomic processes and efficient results, from the planning stage through to daily operation.

SafetyEYE is ever present: flexible, intelligent and simple to operate.

Keep up-to-date on:

- *Sensor technology*

Webcode 0219

- *Standards*

Webcode 0762

Online information at www.pilz.com

Three-dimensional monitoring and control

The challenge

Conventional safety-related solutions have their limits Optoelectronic protective devices such as light curtains or laser scanners merely monitor planes. This generally makes for a complex structure. To guarantee secure protection, various sensors are co-ordinated and aligned, a whole series of cables are laid and safety fences are often erected for further protection.

If there is no visual contact, the workstation must be further protected, using pressure sensitive mats for example. These take time to install, time in which the plant or machine being safeguarded cannot be used for production.

What‘s more, the sensors are often installed in locations where they obstruct operators and other workers as they carry out their daily work with the machinery, so they adversely affect the ergonomics of the workstation.

Another factor to consider is that conventional sensors merely register violations, so their response behaviour is limited. If an encroachment into the detection zone is identified, the E-STOP is generally switched immediately, as no further evaluation of the potential risk to personnel is possible.

The end result of all this is downtime. Subsequent stations within the production line may also suffer repercussions. This means: their productivity is restricted, both directly and indirectly.

The innovative 3D solution

With the safe camera system SafetyEYE, uninterrupted monitoring of the danger zone can be implemented flexibly, safely and simply. A three-dimensional protective cocoon surrounds the danger zone or the object that is to be monitored. Thanks to its 3D technology, SafetyEYE is able to monitor the entire zone simultaneously.

When installed in an optimum location, in an ideal scenario several machines can be monitored simultaneously through one system.

Conventional safety equipment is replaced, simplifying installation significantly.

Keep up-to-date on SafetyEYE:

Webcode 1902

Online information at www.pilz.com

Minimise barriers, work ergonomically, maintain flexibility: SafetyEYE enables close co-operation between man and machine.

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Barrier-free protection

SafetyEYE detects and reports objects that encroach into freely defined zones. Thanks to the simple, software-based configuration of warning and detection zones, your application can be set up in no time.

As SafetyEYE is installed above the monitored zone, free access to the work area is guaranteed. There's no need for mechanical guards. Installing the system at a height means that, where man and machine are working together, workstations can be designed with ergonomic aspects in mind.

Safeguarding the future – economical and flexible

Another benefit is that the zone being monitored by SafetyEYE can be divided virtually, into almost any number of warning and detection zones. Various actions can be assigned in the event of an object encroaching into these zones.

One potential application could be the following scenario: a worker approaches a machine. The machine is in full production mode but initially, while he is still at a sufficient distance, he receives a warning. If he continues to approach, the work processes will slow down. Only when he reaches the machine's closest protected area will an emergency stop be triggered.

Once detection zones have been defined they can be adapted at any time with the click of a mouse, using the SafetyEYE Configurator.

Recognised technology

The safe camera system SafetyEYE has been recognised as a genuine innovation. In view of the associated prospects for the protection of man and machine, it has already been honoured with numerous awards and nominations.

Act and react – That's the mode of operation

SafetyEYE sensing device

SafetyEYE protects your plant from a bird's eye view, because the sensing device is installed above the zone to be monitored. Where today's applications require a multitude of sensors, the danger zone can be enveloped in a customised protective cocoon.

The zone that is to be monitored is defined by a virtual envelope curve, which is surrounded by warning zones and detection zones. Any person or object who encroaches will be identified immediately and reported.

SafetyEYE –
The intelligent system …

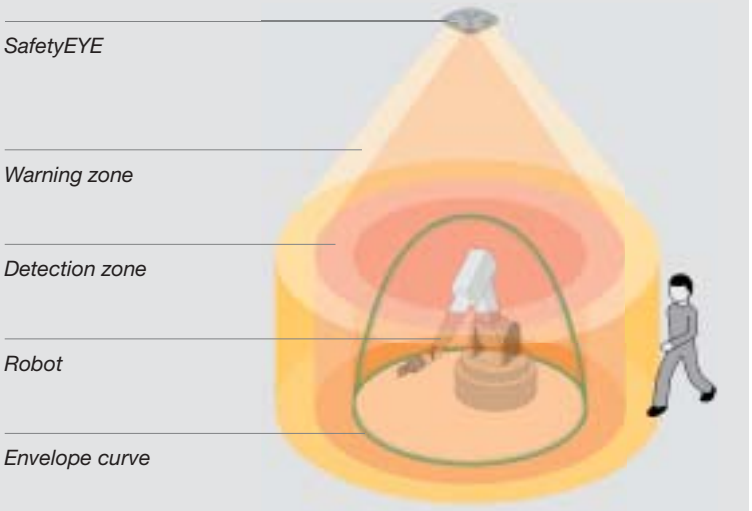
SafetyEYE is a complete solution comprising a sensing device and a control unit. Three highly dynamic cameras on the sensing device supply the image data of the zone that is to be monitored. As with the human eye, several images taken from different perspectives are superimposed to create a spatial perception. So the system can monitor a zone that's roughly conical.

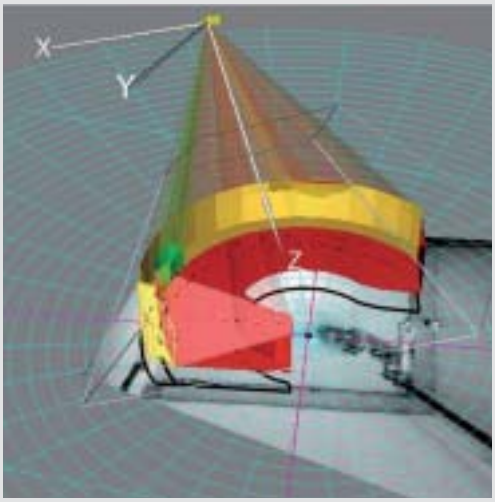
The analysis unit receives the image data via fibre-optic cables. The analysis unit then uses highly complex, safe algorithms to calculate a three-dimensional image. This way it is possible to perceive objects three-dimensionally and to determine their position.

… for monitoring …

This information is then superimposed over the virtual warning and detection zones configured within the system, so that any violation of the configured zone can be identified, for example.

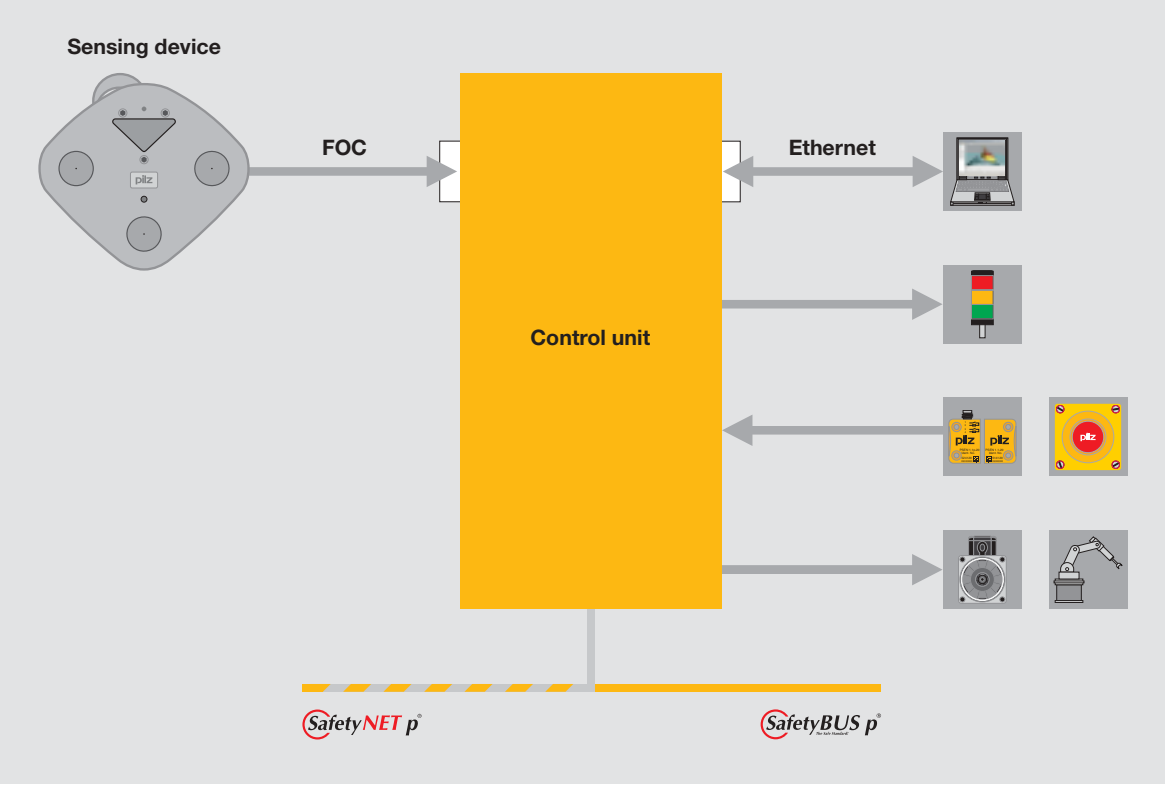
This makes it possible to determine whether there is anyone within the action radius of the hazardous movement (safety) or whether a zone with an increased safety level has been accessed (security).





Leading technology: 3D warning and detection zones at the click of a mouse.

for SafetyEYE®



System structure of the safe camera system SafetyEYE.

… and control

The analysis unit passes the image processing results to the PSS programmable safety and control system. This serves as the interface to the machine controller and controls the whole SafetyEYE operation.

If the analysis unit reports that a zone has been violated, a wide range of measures can be initiated automatically: for example, hazardous movements may be slowed down or brought to an emergency stop, acoustic/optical warning messages may be triggered or an alarm message issued to safety personnel.

SafetyEYE also meets the requirements for decentralised, safe networking in complex applications. Connection to the periphery may be via the safe bus system SafetyBUS p; in future this will also be possible via the safe Ethernet system SafetyNET p.

Versatility and flexibility for safety concepts with optimum compatibility

SafetyEYE has a wide range of application options, far exceeding the options available on previous systems. Whether in the automotive or packaging industry, on presses or handling stations – SafetyEYE opens up new horizons for the widest range of industries and applications.

The system for wide-ranging tasks and low

Ergonomics generate productive energy

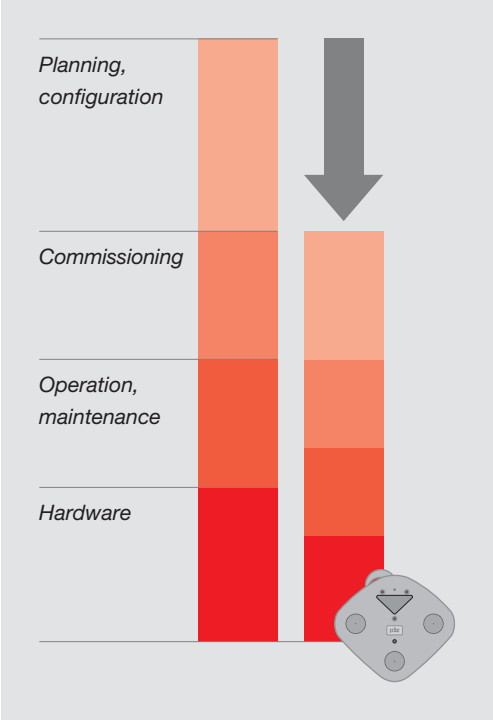
There‘s nothing to stand in the way of efficiency. Man and machine can now work in perfect harmony. Where an intricate combination of multiple sensors was once required, innovative 3D technology and user-friendly software now enables the control of even complex applications with multiple safety zones.

Keeping an eye on your profitability

Control, monitor and protect – you can do all this with just one system. Monitor and control several independent warning and detection zones simultaneously with one SafetyEYE. This reduces components to a minimum, saves on installation and material expenses and reduces costs over the whole lifecycle of the plant.

The future is already in hand

When processes change in an active high-tech operation, your safety and control equipment instantly changes with it, quickly and economically. Warning and detection zones can be adapted thanks to dynamic, automatic switching, while control functions, operator grips or machine operating ranges can also be varied. That way you can remain flexible; once the zones have been defined they can quickly be adapted at the click of a mouse, using the SafetyEYE Configurator.



Your cost saving: Production up and running or are you still wiring?

The safe, complete solution: One sensor for many functions

- Save costs by controlling complex applications with multiple zones and areas
- Selective switching by assigning the output to the protected field

Ergonomic workstations

- Virtual warning and detection zones replace mechanical barriers
- Workstations are freely accessible
- Clear view of the process

costs

Flexible monitoring and control of complex processes

- Simple, intuitive configuration with the SafetyEYE Configurator
- Several protected areas can be monitored simultaneously and independently
- Zones can be grouped as required
- Downtimes are minimised

High level of flexibility when designing or redesigning applications

- System can be easily adapted, even without hardware changes
- Configuration rather than wiring
- Secure investment for the future
- Easy to maintain

User-friendly diagnostics, including evidence

- Live diagnostics
- Facility for immediate testing and diagnostics
- Detailed documentation is included
- Transparency over project changes (version control management, event log, CRC management, date of modifications)
- Software has various password levels

Simple, fast installation and commissioning

- Installed above the monitored zone
- Factory-set calibration
- Stable design
- Coded cable connection and adapter flange
- Flexible swivel arm with quick fastener
- Diagnostic LED
- Fast, simple alignment thanks to live image mode

User-friendly software for high efficiency

- Intuitive and easy to operate
- Projects are configured quickly in a structured format (project check list)
- A range of views (2D/3D) for easy handling
- Precise configuration
- Freely configurable warning and detection zones in 3D
- Safety distances are easily verified

Your benefits at a glance

- Three-dimensional control and monitoring
- High level of safety and protection against manipulation
- Ergonomic workstations for greater productivity
- Efficient work practices for high cost effectiveness
- One safe camera system for many functions
- Wide, flexible range of uses
- Rapid installation and commissioning using just a few user-friendly components
- Simple configuration of 3D warning and detection zones, intuitively at the click of a mouse
- User-friendly diagnostics and evidence

Ingeniously simple – simply ingenious

Detection zones set up rapidly at the click of a mouse

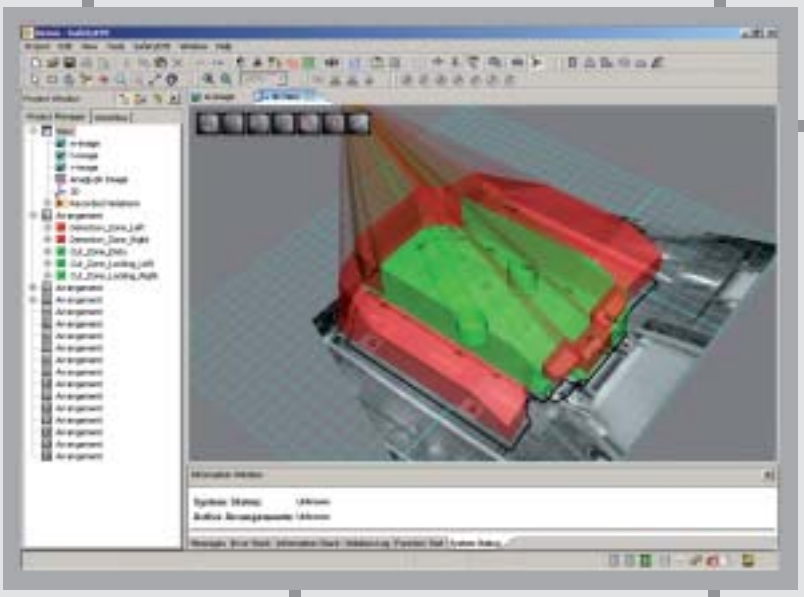
It couldn't be any simpler. Virtual warning and detection zones are set up intuitively using the SafetyEYE Configurator. You define the zones, combine them into groups or switch zone arrangements to suit your needs.

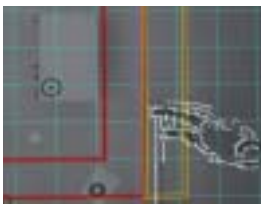
That way you can remain flexible; once zones have been defined they can be adapted at the click of a mouse, using the SafetyEYE Configurator. So monitoring is no longer based on technical needs but on your requirements from the process cycles.

Bring your products to market more quickly than with conventional solutions! With SafetyEYE you save time and costs: during planning, configuration, commissioning, operation and maintenance.

Create and edit projects more quickly and without error

The project wizard actively guides you through the whole workflow. This makes it quicker and easier to create and edit projects.





Violations of warning and/or detection zones are automatically documented

SafetyEYE can record an image of the current situation each time a warning or detection zone is violated. So detection zone violations are easy to record, evaluate and automatically document.

Keep up-to-date on SafetyEYE:

Webcode 2001

Online information at www.pilz.com

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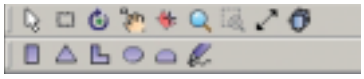
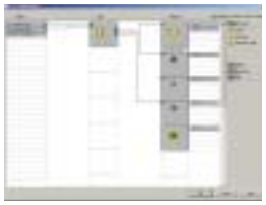
Combine and integrate



Freely define zones in 3D

The SafetyEYE Configurator offers you various pre-defined geometric forms or the option to create detection zones in freehand.

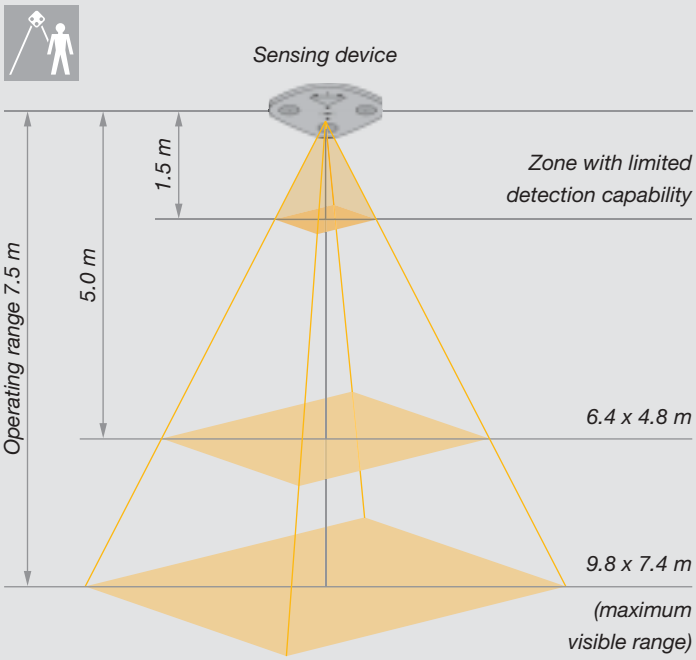


Configuration rather than wiring

Inputs and outputs are freely configurable and can be linked using logic elements via a simple drag and drop function. Rapid commissioning and the minimal wiring work involved will convince you.

Complex process simple to implement

Combine warning and detection zones into complex zone arrangements. Monitor several independent zones and take control using a single sensing device.



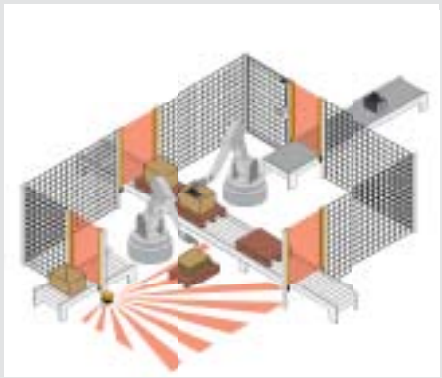
Product features

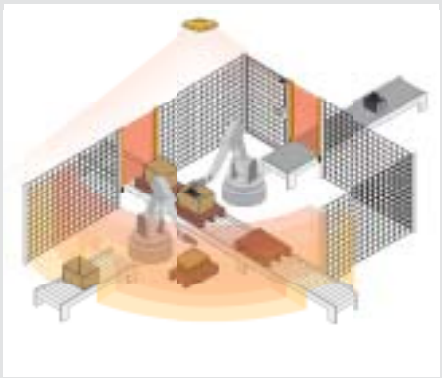
- Body protection
- Maximum visible range approx. 72 m²
- Lighting from 300 lux required, depending on the background
- Designed in accordance with all relevant norms and standards:
  - Category 3 in accordance with EN 954-1
  - SIL2 in accordance with IEC 61508
  - PL d in accordance with EN ISO 13849-1
  - In accordance with DIN EN 61496
- Protection types:
  - Sensing device IP65
  - Analysis unit IP20
- Suitable for worldwide use
- Concept accredited and approved by BG

[1] *in development*

Please note: Arm/leg protection, plus a maximum operating range of 10 m are in development.

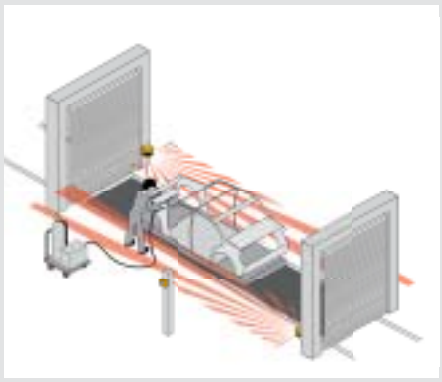
Innovative technology for your safety

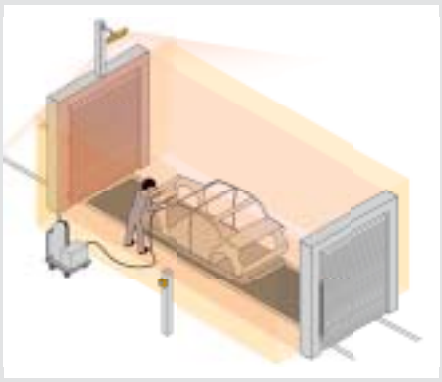




Three-dimensional safety with many functions

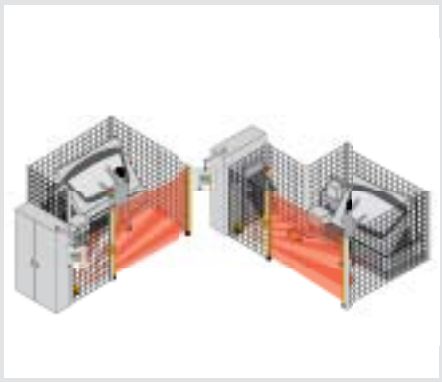
The camera-based technology enables zones to be monitored. Virtual warning and detection zones replace mechanical barriers. SafetyEYE – the system for a range of functionalities.

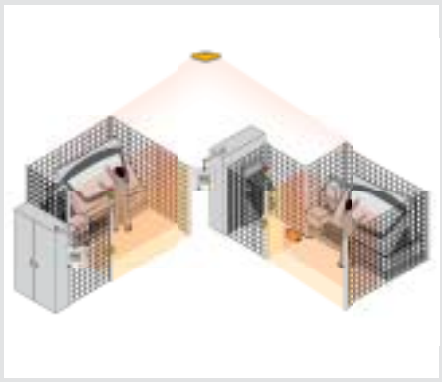




Uninterrupted monitoring from a bird‘s eye view

Warning and detection zones are adapted to the requirements of the application – flexibly, safely and simply. The result is a high level of safety and protection against manipulation.



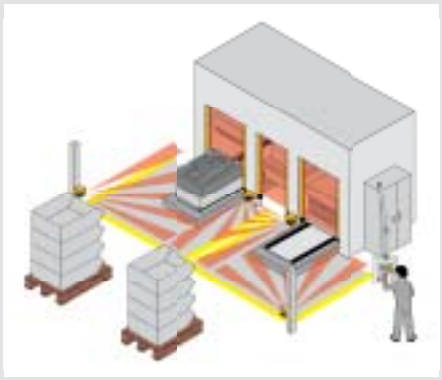


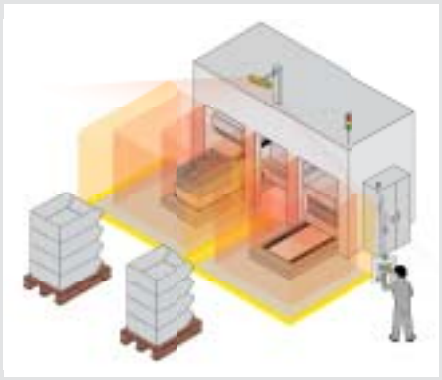
Ergonomic workstations

As SafetyEYE is installed above the monitored zone, there are no mechanical guards in the danger zone itself. This enables workstations to be designed ergonomically.

One sensor for several work areas

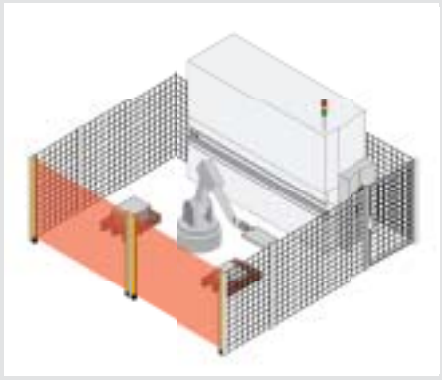
With just one system you can monitor and control several work areas independently in 3D. SafetyEYE is geared towards your processes and boosts their efficiency.

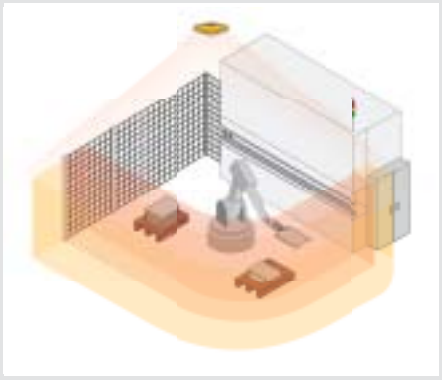




Clear path for forklift equipment

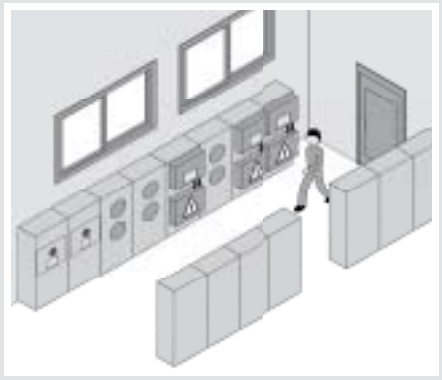
With SafetyEYE you have a clear view of the process, which guarantees better access. The integrated diagnostic function reduces downtimes to a minimum.





Innovative security for zones

Monitor zones and control centres using just a few user-friendly components. The result is a safe, complete solution, including for security applications.



Technical details – SafetyEYE®

Starter set

PSEN se Starter Set 1

Type	Designation
PSEN se Starter Set 1	Starter set

Sensing device

PSEN se SU AM1 65

PSEN se PA 250

PSEN se SU AM1 65	Sensing device
PSEN se PA 250	Swivel arm for installing the sensing device

Analysis unit and programmable safety and control system

PSEN se AU AM1

CompactFlash card

PSS SB 3075-3 ETH-2 SE

PSEN se AU AM1	Analysis unit, 19" module for rack-mounting
CompactFlash card	Min. 64 MByte memory capacity for saving the project, 2 pieces contained in the PSEN se Starter Set 1
PSS 3047-3 ETH-2 SE	Programmable safety and control system with preinstalled user program for SafetyEYE
PSS ZKL 3047-3	Screw connectors (1 set)
PSS SB 3075-3 ETH-2 SE	Programmable safety and control system with preinstalled user program for SafetyEYE and a SafetyBUS p interface
PSS ZKL 3075-3	Screw connectors (1 set)

Dimensions (H x W x D) in mm	Protection type [1]	Ambient temperature [2]	Supply voltage	Included in the Starter Set	Order number
-	-	-	-		581300
63.0 x 292.0 x 292.0	IP65	0 … 50 °C	-	◆	581100
-	-	-	-	◆	581150
399.2 x 482.6 x 415.0	IP54 [3] / IP20 [4]	0 … 40 °C	115 … 230 VAC	◆	581101
-	-	-	-	◆	310386
246.4 x 123.6 x 162.0	IP20	0 … 60 °C	24 VDC	◆	300123
-	-	-	-	◆	300900
246.4 x 160.2 x 162.0	IP20	0 … 60 °C	24 VDC		300253
-	-	-	-		300910

Please note: This leaflet considers the current development status.
Please refer to the Internet for the latest technical details.

[1] EN 60529 [2] EN 60068-2-14 [3] Mounting (e.g. control cabinet) [4] Housing

Technical documentation on SafetyEYE:

Webcode 1902

Online information at www.pilz.com

Technical details – SafetyEYE®

Indicator light unit

PIT si 3.1

Type	Designation
PIT si 3.1	Indicator light unit

Cable

PSEN se Cable FO 15

PSEN se Cable FO 15	Data and supply voltage cable for connecting the sensing device to the analysis unit
PSEN se Cable FO 30	
PSEN se Cable FO 50	
PSEN se Cable ETH Crossover 5	Ethernet connection cable for connecting the analysis unit to the configuration PC
PSEN se Cable ETH Patch 1	Ethernet connection cable for connecting the analysis unit to the programmable safety and control system
PSEN se Cable ETH Patch 5	
PIT si Cable 15	Connection cable for connecting the indicator light unit to the programmable safety and control system
PIT si Cable 30	

Setup markers, reference markers, test pieces, configuration software and documentation

PSEN se SM 10/
PSEN se RM 10

SafetyEYE
Configurator

PSEN se SM 6	Setup markers
PSEN se SM 10	
PSEN se RM 6	Reference markers
PSEN se RM 10	
PSEN se TO Body 140	Test piece
SafetyEYE Configurator CD and documentation	Configuration software SafetyEYE Configurator and SafetyEYE documentation
SafetyEYE Configurator CD	Configurations software SafetyEYE Configurator
SafetyEYE Configurator basic licence	Basic licence for the SafetyEYE Configurator
SafetyEYE Configurator copy licence	Copy licence for the SafetyEYE Configurator

Special features	Included in the Starter Set	Order number
-	◆	581 190

15 m, FOC for data, copper cables for 12 V supply voltage		581 102
30 m, FOC for data, copper cables for 12 V supply voltage	◆	581 103
50 m, FOC for data, copper cables for 12 V supply voltage		581 104
5 m, crossed	◆	581 110
1 m, shielded, 2 cables are supplied with the Starter Set	◆	581 112
5 m, shielded, 1 cable is supplied with the Starter Set	◆	581 111
15 m, minimum 4-core		581 195
30 m, minimum 4-core		581 196

For 1 ... 6 m distance between sensing device and user plane, 5 pieces per pack	◆	581 160
For 4 ... 10 m distance between sensing device and user plane, 5 pieces per pack	◆	581 161
For 1 ... 5 m distance between sensing device and user plane, 6 pieces per pack	◆	581 170
For 4 ... 9 m distance between sensing device and user plane, 6 pieces per pack	◆	581 171
-	◆	581 182
CD containing the configuration software SafetyEYE Configurator and SafetyEYE documentation	◆	581 250
CD containing the configuration software SafetyEYE Configurator		581 250D
-		581 250B
-		581 250K

Please note: This leaflet considers the current development status.
Please refer to the Internet for the latest technical details.

Technical documentation on SafetyEYE:

Webcode 1902

Online information at www.pilz.com

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