Product Profile
Machine Safety - Jokab Safety products

Power and productivity
for a better world™

ABB

We develop innovative products and solutions for machine safety

We make it simple to build safety systems. Developing innovative products and solutions for machine safety has been our business idea since the company Jokab Safety, now ABB AB, was founded in Sweden in 1988. Our vision is to become "Your partner for machine safety – globally and locally".

Many industries around the world, have discovered how much easier it has become to build protection and safety systems with our components and guidance.
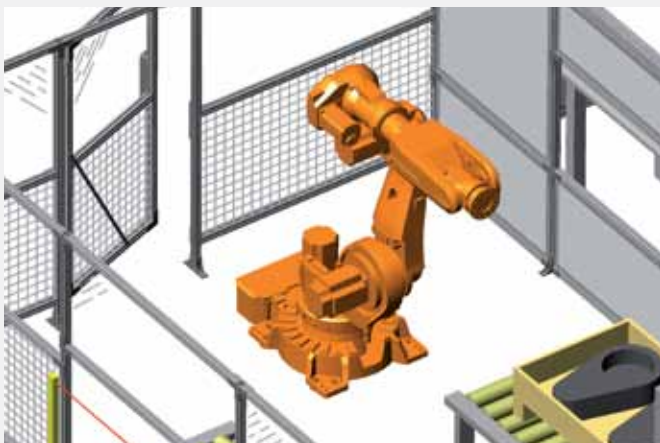
Experience
We have great experience of practical application of safety requirements and standards from both authorities and production. We represent Sweden in standardisation organisations for machine safety and we work daily with the practical application of safety requirements in combination with production requirements. You can use our experience for training and advice.

Systems
We deliver everything from a safety solution to complete safety systems for single machines or entire production lines. We combine production demands with safety demands for production-friendly solutions.

Products
We market a complete range of safety products, which makes it easy to build safety systems. We develop these innovative products continuously, in cooperation with our customers Our extensive program of products, safety solutions and our long experience in machine safety makes us a safe partner.


Standards and regulations

We help to develop standards
Directives and standards are very important to machinery and safety component manufacturers. We therefore participate in several international committees that develop standards, for among other things industrial robots, safety distances and control system safety features. This is experience that we absorb so that the standards will present requirements that benefit production efficiency allied to a high level of safety. We are happy to share our knowledge of standards with our customers.

Do you need to learn about the new safety requirements for robots? If so, please contact us.

Our products revolutionise the market
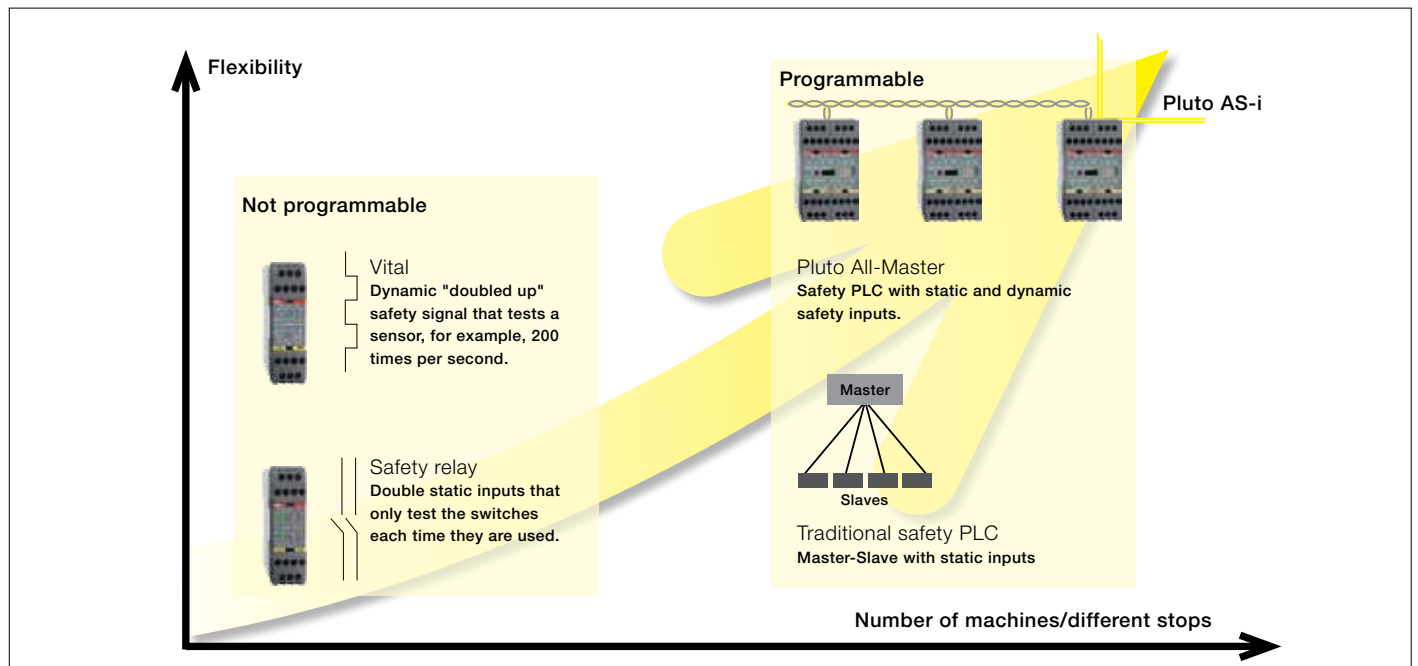
Our dynamic safety circuits and our comprehensive safety PLC are probably the most revolutionary ideas that have happened in the safety field in the control and supervision of protection, in many respects:

- They save on inputs: a dual safety circuit with one conductor instead of two. In addition, many protection devices can be connected to the same input while maintaining the highest level of safety.
- Reliability is better. Our electronic sensors have much longer lives than mechanical switches
- They are safer, since the dynamic safety sensors are checked 200 times per second. Switches on a door can only

be checked each time they are used, for example once per hour or even once a month.
- With the All-Master Safety PLC it is easy to connect and disconnect machinery from a safety viewpoint. Common emergency stop circuits and sensors can be created as soon as the buses are interconnected between our safety PLCs.

We are continuously designing safety systems for difficult environments and creating new safety solutions where practical solutions are missing. New technical improvements give new possibilities and therefore we continuously develop new products.

We train both machine builders and machine users
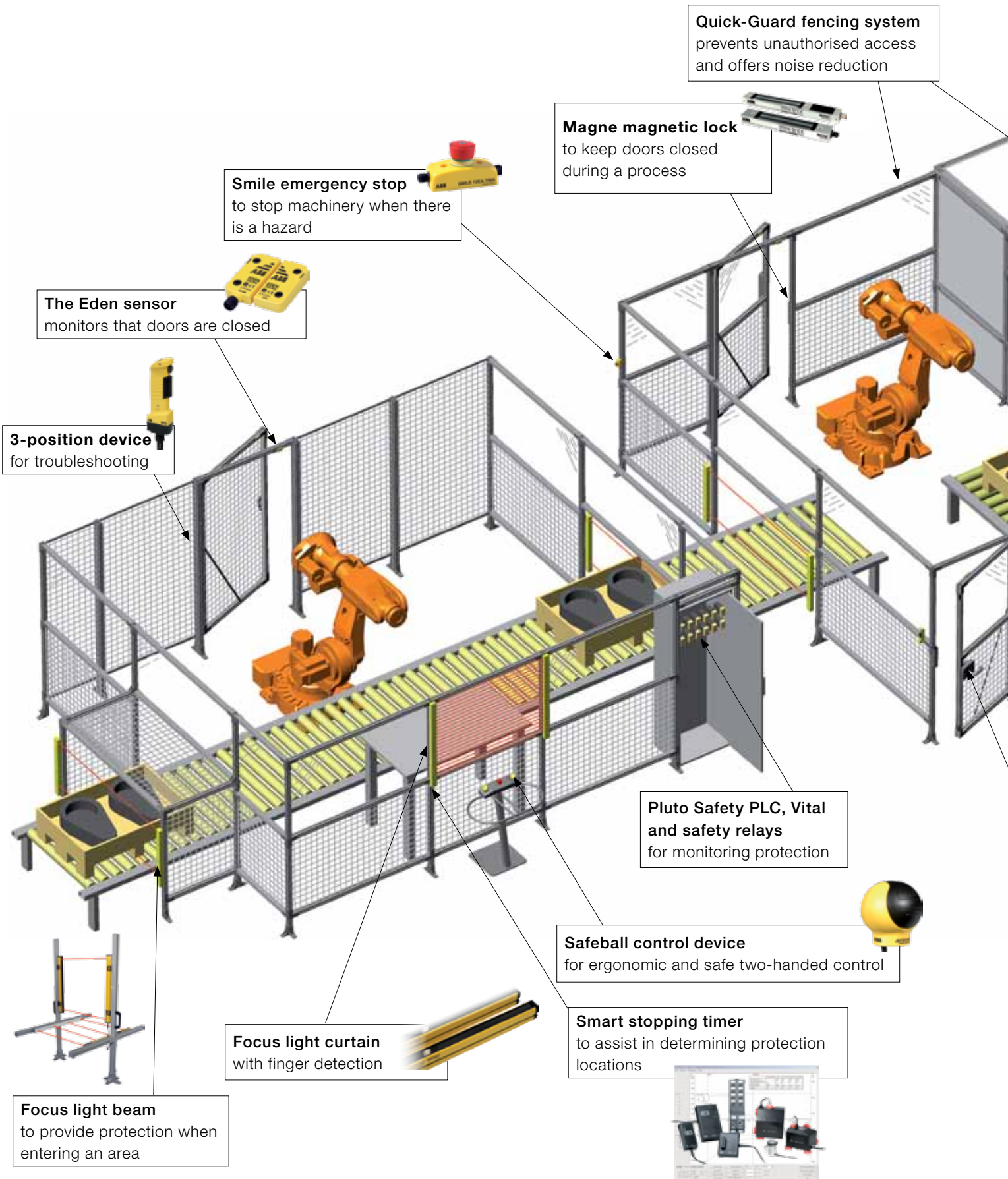
Do you construct machinery?
We can provide the training you need to construct machinery that meets the requirements. Example subjects:
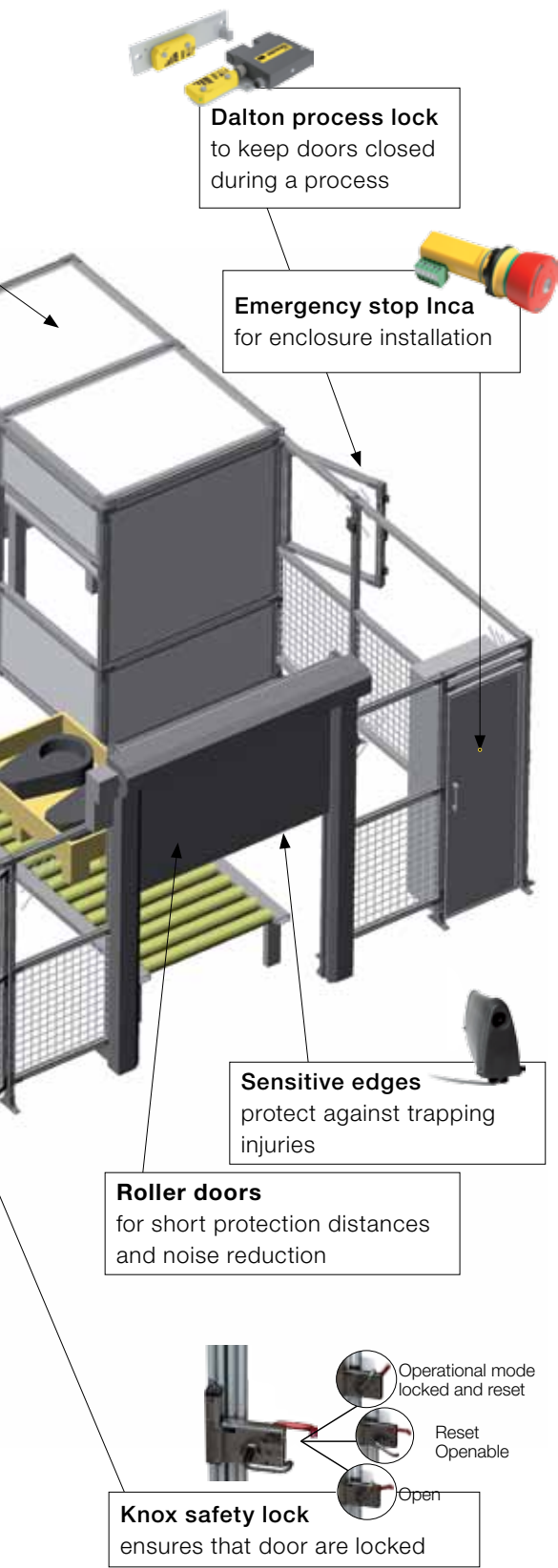- Practical implementation of the requirements in the new Machinery Directive 2006/42/EC, which is valid for machines that was delivered/put into service from the 29th of december 2009
- Risk analysis – in theory and practice
- Control systems safety, standards EN ISO 13849-1 and EN 62061

Do you purchase and use machinery?
As a machinery user it is your responsibility to ensure that the correct requirements are complied with – regardless of whether your machinery is "new" or "old", i.e. CE-labelled or not. Unfortunately many have purchased CE-labelled machinery that does not meet the requirements. Such machinery must not be used. Having it brought into compliance by the supplier can take a long time and be expensive in terms of loss of production, etc. We can educate you on this and help you to set the right demands when buying new or second-hand machinery.

# Production-friendly safety systems from ABB Jokab Safety

Quick-Guard fencing system
prevents unauthorised access
and offers noise reduction

Magne magnetic lock
to keep doors closed
during a process

Smile emergency stop
to stop machinery when there
is a hazard

The Eden sensor
monitors that doors are closed

3-position device
for troubleshooting

**Pluto Safety PLC, Vital
and safety relays**
for monitoring protection

Safeball control device
for ergonomic and safe two-handed control

Smart stopping timer
to assist in determining protection
locations

Focus light curtain
with finger detection

Focus light beam
to provide protection when
entering an area

Dalton process lock
to keep doors closed during a process

Emergency stop Inca
for enclosure installation

Sensitive edges
protect against trapping injuries

Roller doors
for short protection distances and noise reduction

Operational mode locked and reset

Reset Openable

Open

Knox safety lock
ensures that door are locked

Product groups

|	
	Training & Advice Practical application of standards and regulations, along with CE-labelling.
	Pluto Safety PLC A unique All-Master safety PLC for dynamic and static safety circuits.
	Pluto AS-i Programmable safety system AS-i where all units are connected to the same bus cable and the function of the unit is determined in the PLC program.
	Vital safety controller Dynamic safety circuit for multiple protection according to the highest safety category
	Tina adapter units Transformation of static signals to dynamic safety signals, etc.
	Safety relays The market's most flexible safety relays for different protection purposes and categories.
	Stopping time & machinery diagnosis Used for stopping time measurement, annual maintenance and for trouble-shooting machinery.
	Light curtain/light beam/scanner Complete range of light beams, light curtains and scanners.
	Sensors/switches/locks Dynamic non-contact sensors, safety switches, magnetic switches and locks.
	Control devices Ergonomic three-position control units, two-hand control units and foot pedals.
	Emergency stop devices Emergency stop devices for dynamic and static safety circuits.
	Contact strips/Bumpers/Safety mats Sensitive edges, bumpers and safetys mats.
	Fencing systems/SafeCAD/Roller doors A stable and flexible fencing system that is easy to install.

Programmable safety systems
Safety PLC Pluto
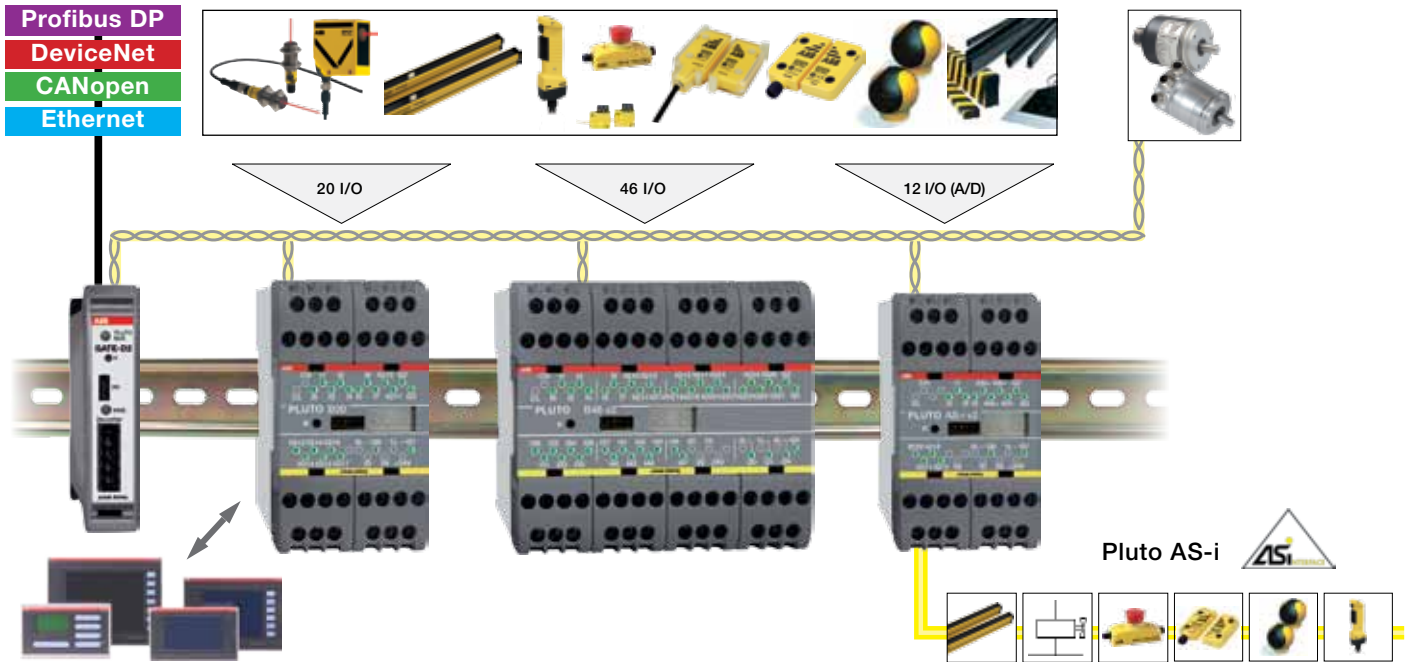
Pluto Safety PLC enables freely programmable functions

– Save I/O's by connecting several sensors in series to one input while maintaining the highest safety level
– Write your own programme use TÜV approved function blocks
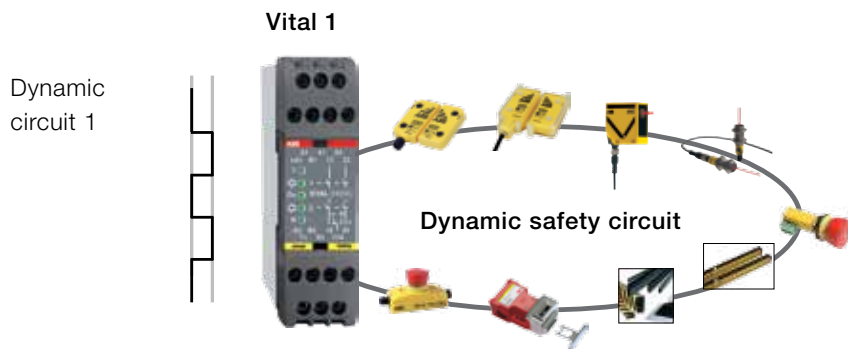– All-Master system with up to 32 Plutos on one bus

Pluto AS-i
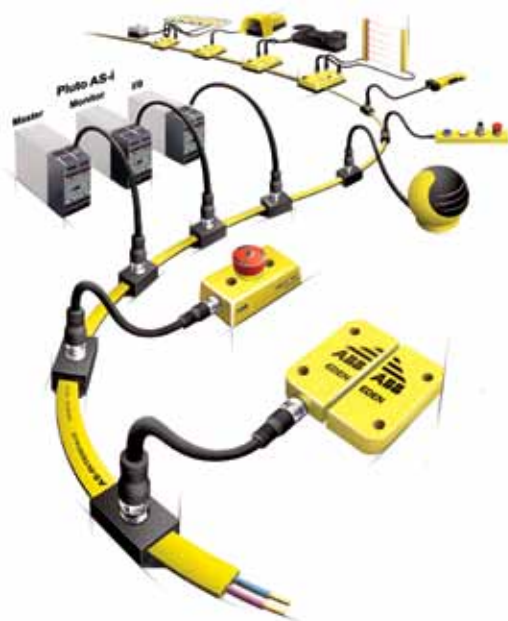
AS-i two-wire bus simplifies function and installation

– Easy to add, remove and move units on the bus
– Power, data and control in the same cable
– Pluto AS-i as master, monitor or safe I/O

Configurable safety systems
Vital safety controller

Vital 1

Dynamic circuit 1

Dynamic safety circuit

Dynamic safety circuits simplifies installation

– Serial connection of sensors while maintaining the highest safety level
– Status indication on each sensor
– Selectable functions on Vital 2 and 3

Vital 2

Dynamic circuit 1   Dynamic circuit 2

Vital 3

Contact circuit 1   Dynamic circuit 2

Safety relays

The RT series
– The RT series consists of universal relays that can perform most of the functions required for safety operations.

The JSB series
This series consists of relays for two hand control, and are compact relays with many outputs, and relays for simultaneous requirements of 0.5.

Safety timers
Relays in this group are used for timed resetting, bypassing and stepping.

Expansion relays
– Relays in this group are used to expand the number of dual output connections, with or without delay functions, and to switch off heavy current loads.

Flexible safety relays give freedom of choice

– One- or two-channel inputs
– Manual or automatic reset
– LED indication for run, I/O, short circuit and undervoltage

Safety PLC Pluto
Pluto with safe bus

Pluto is an All-Master-System for dynamic and static safety circuits where the inputs and other information are shared on a safe bus. Several safety sensors can be connected to one input while still achieving the highest level of safety.
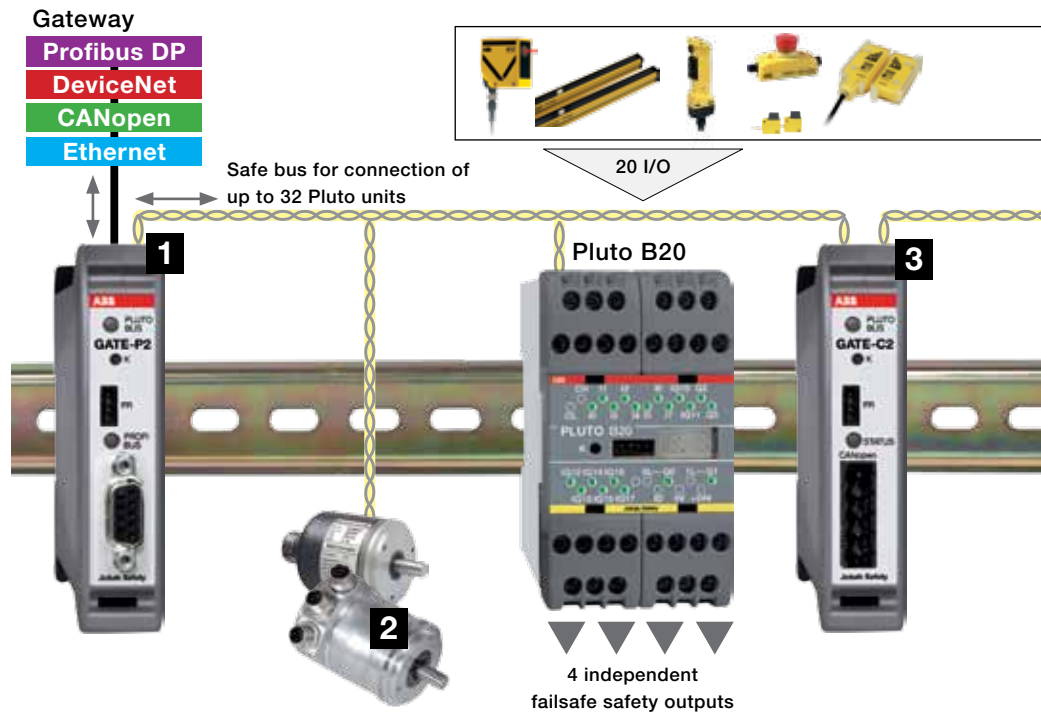
1. Gateway – for two-way safe bus communication between Pluto and other control systems.

2. Absolute encoder – 8 single turn or multi turn absolute encoders can be connected directly to the safety bus.
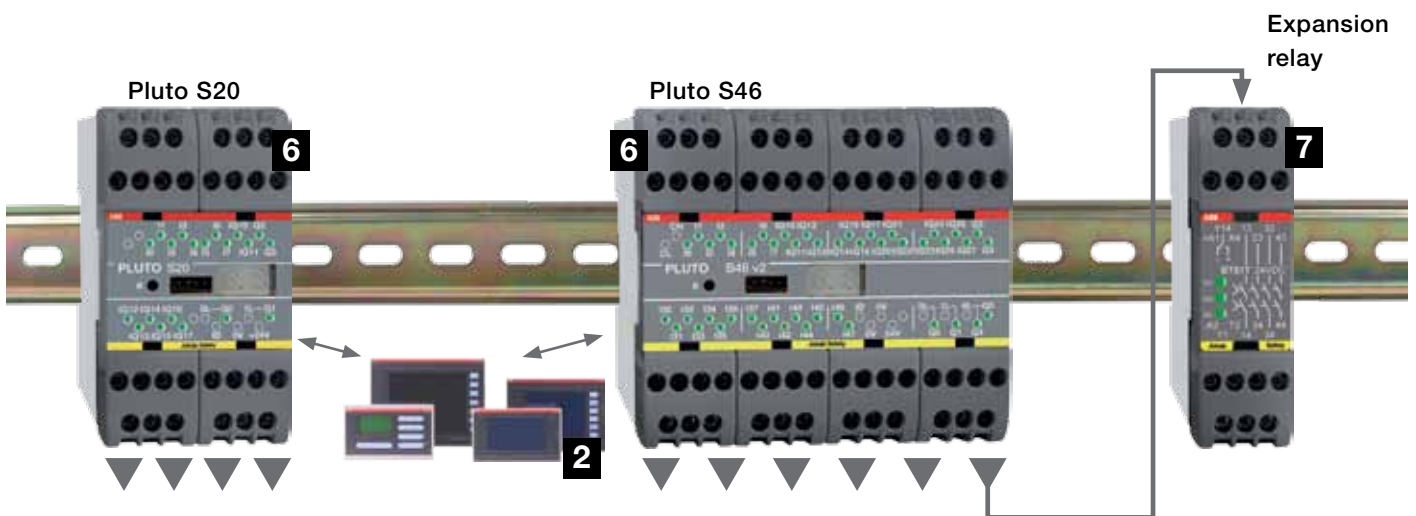
Pluto Manager

Free software at www.abb.com/lowvoltage, Ladder with TÜV-approved function blocks.

Gateway

Profibus DP
DeviceNet
CANopen
Ethernet

Safe bus for connection of up to 32 Pluto units

20 I/O

1

Pluto B20

3

GATE-P2

PLUTO B20

GATE-C2

2

4 independent failsafe safety outputs

Pluto without a safe bus

Expansion relay

Pluto S20

6

Pluto S46

6

7

PLUTO S20

PLUTO S46 v2

2

6. Stand alone Pluto – Same functionality as a other Plutos, but without safe bus connections.
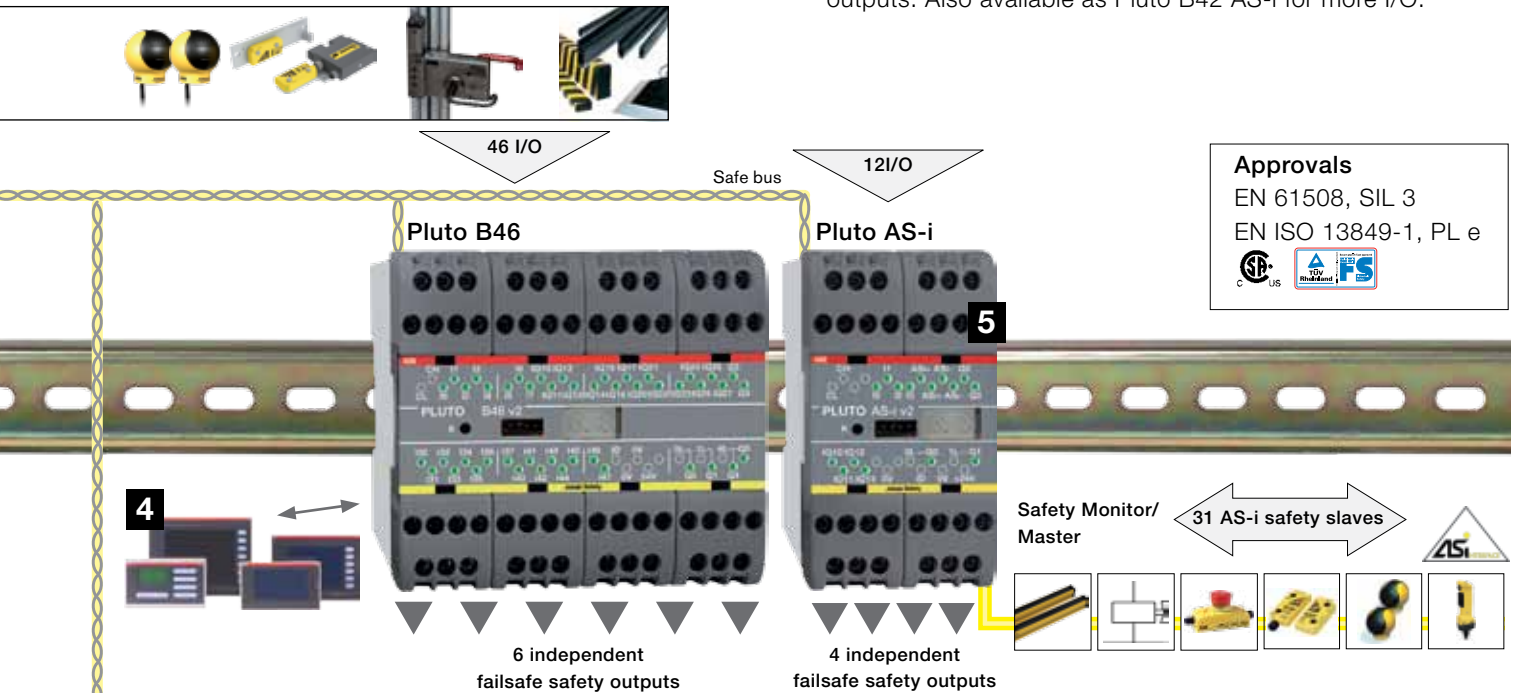
7. Connector expansion – Several expansion relays can be connected to a single Pluto safety output while retaining the safety level.

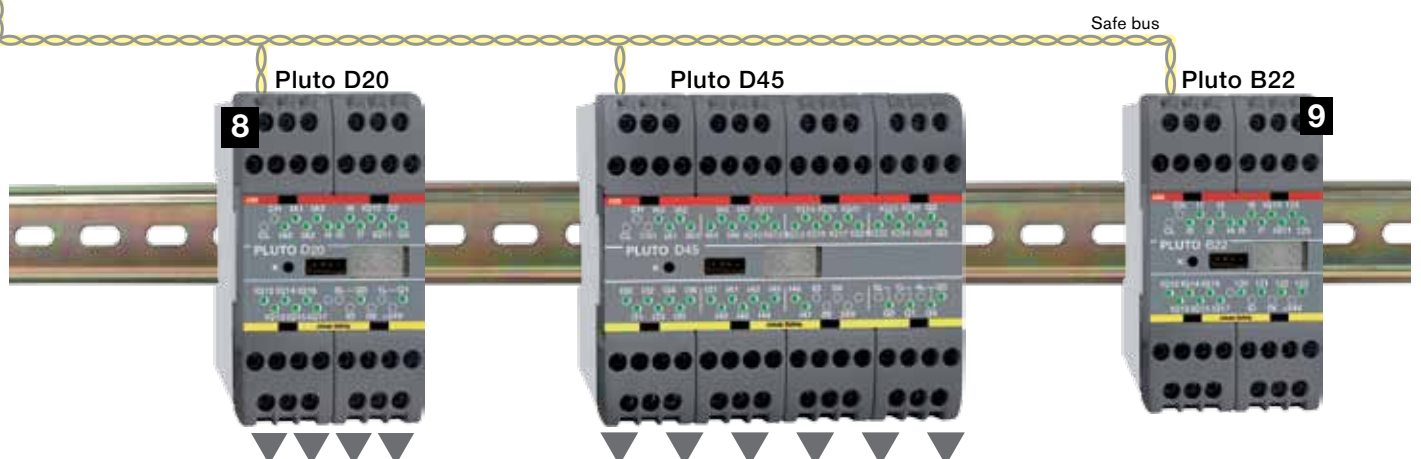**3. Pluto bridge –** With a Gateway it is possible to set up a bus useful:

– increase the safe bus length
– use different safe bus speeds for each section
– filter information from one section to reduce the safe bus loading on other sections.

4. HMI – An HMI operator panel can communicate with Pluto in both directions. Connection can be made direct to the front of the Pluto.

5. Pluto AS-i – Can either be AS-i master on the AS-i bus or work together with an AS-i master as a monitor. It includes AS-i nodes, analogue and digital outputs, as well as safety outputs. Also available as Pluto B42 AS-i for more I/O.

46 I/O

Safe bus

12 I/O

Pluto B46

Pluto AS-i

5

Approvals
EN 61508, SIL 3
EN ISO 13849-1, PL e

4

Safety Monitor/
Master

31 AS-i safety slaves

6 independent
failsafe safety outputs

4 independent
failsafe safety outputs

Pluto without analogue inputs and expansion module

Safe bus

Pluto D20

Pluto D45

Pluto B22

8

9

8. Analogue inputs Pluto D20 and D45 – 4, respectively 8, safe 4-20mA/0-10V analogue inputs. These (D20: IA0 – IA3, D45: IA0 – IA7) can be configured as either "ordinary" failsafe inputs, as analogue inputs 0-10V or as analogue inputs 4-20mA. (For D45 IA0 – IA3 can also be configured as counter inputs, see below.)

9. Pluto B22 – An expansion module without safety outputs increasing the number of safe inputs, replacing Pluto B16

Pluto AS-i
– Safety is now simple!

Pluto AS-i is a version of Pluto with AS-i bus connection. It can either be a master on the AS-i bus or work together with another AS-i master as a monitor. It has digital and analogue inputs and safe outputs. Pluto AS-i can also operate as a safe I/O module for the AS-i bus.

Safety level
Pluto, Urax and products with integrated safety nodes achieve safety level cat. 4/PL e in compliance with EN ISO 13849-1.

Zone A

Gateway

| Profibus DP |
| DeviceNet |
| CANopen |
| Ethernet |

Zone A

Zone B
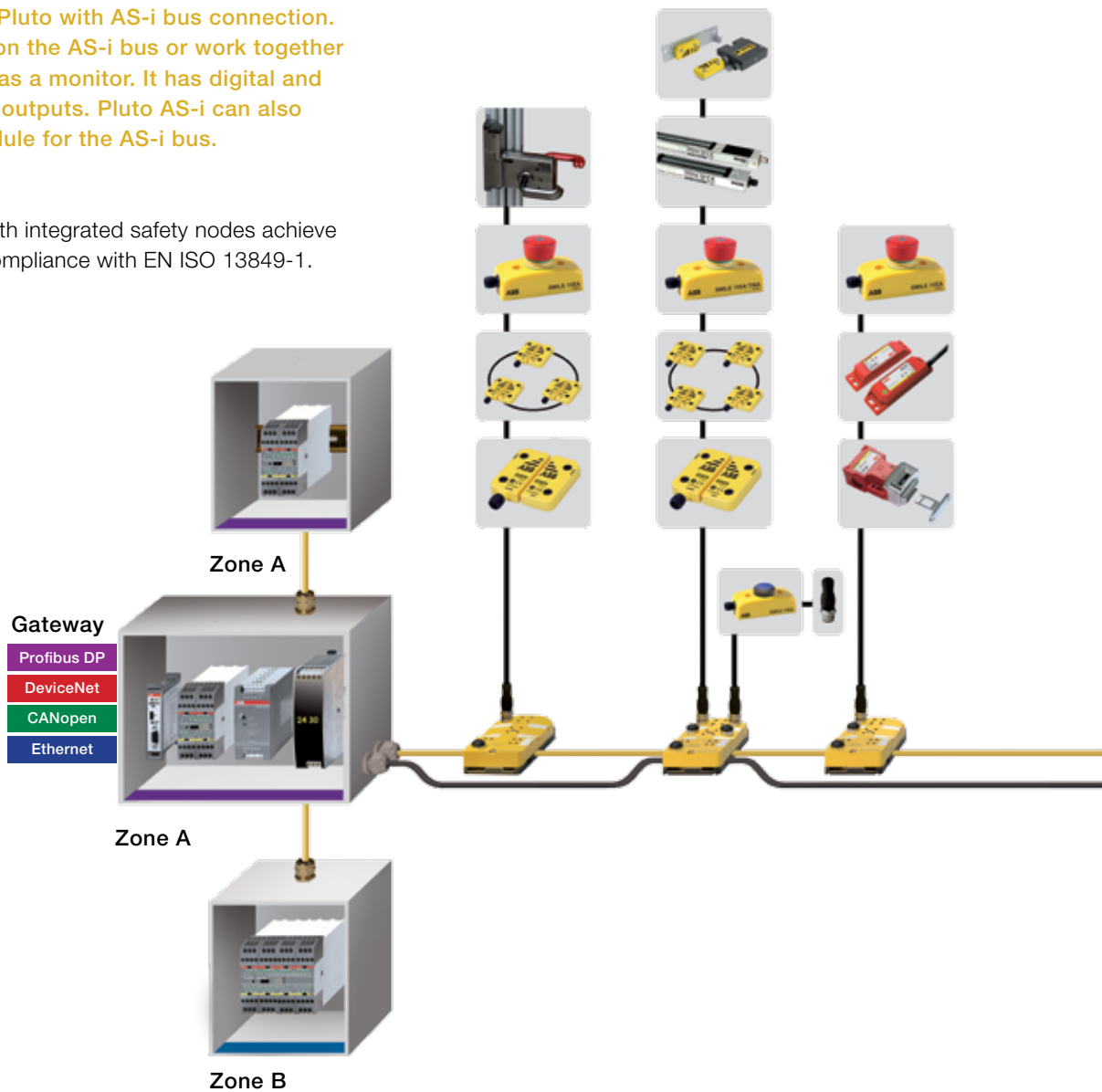
The AS-i system
The AS-i cable can be connected to the safety products separately or through the adaptation device Urax. Some components have an integrated AS-i node and are connected via an M12 connection directly to the yellow AS-i cable. Traditional products without an integrated AS-i node need to be connected via the safety node Urax.

In both cases, the highest level of safety is maintained. The AS-i cable is powered by 30 VDC power supply and connected to a special AS-i power supply unit. Some components have power requirements that are higher than the AS-i cable is able to supply. Therefore, there is also a black cable (AUX 24 VDC) with secondary supply voltage that is able to supply more current.

Adaptation device Urax with integrated safety node
Urax is an adaptation device for safety components that cannot be directly connected to the AS-i bus. You can connect safety components, local reset, and non-safe controls, such as process locks to Urax. Urax is available in several versions, adapted to suit specific safety products.

Possible connections for a complete system:
– all our sensors for AS-i via Urax
– all Pluto PLCs, gateways and absolute encoders through Pluto's safety bus to the Pluto AS-i
– operator panel via the programming port on Pluto
– expansion relay for multiple outputs

Simple connections to the AS-i cable

Adaptation devices are clamped directly to the AS-i cable. Transition from the AS-i cable to M12 units is made via a T connector on the AS-i cable. Cable branches or extensions of the AS-i cable are made using a splitter box.

Sensors with integrated AS-i safety nodes

Some of our products can be ordered with integrated AS-i node.

These are connected to the yellow cable with a M12 contact directly to the yellow AS-i cable via a screw terminal which is clamped to the cable. More information can be found under each product.

Zone C

Zone D
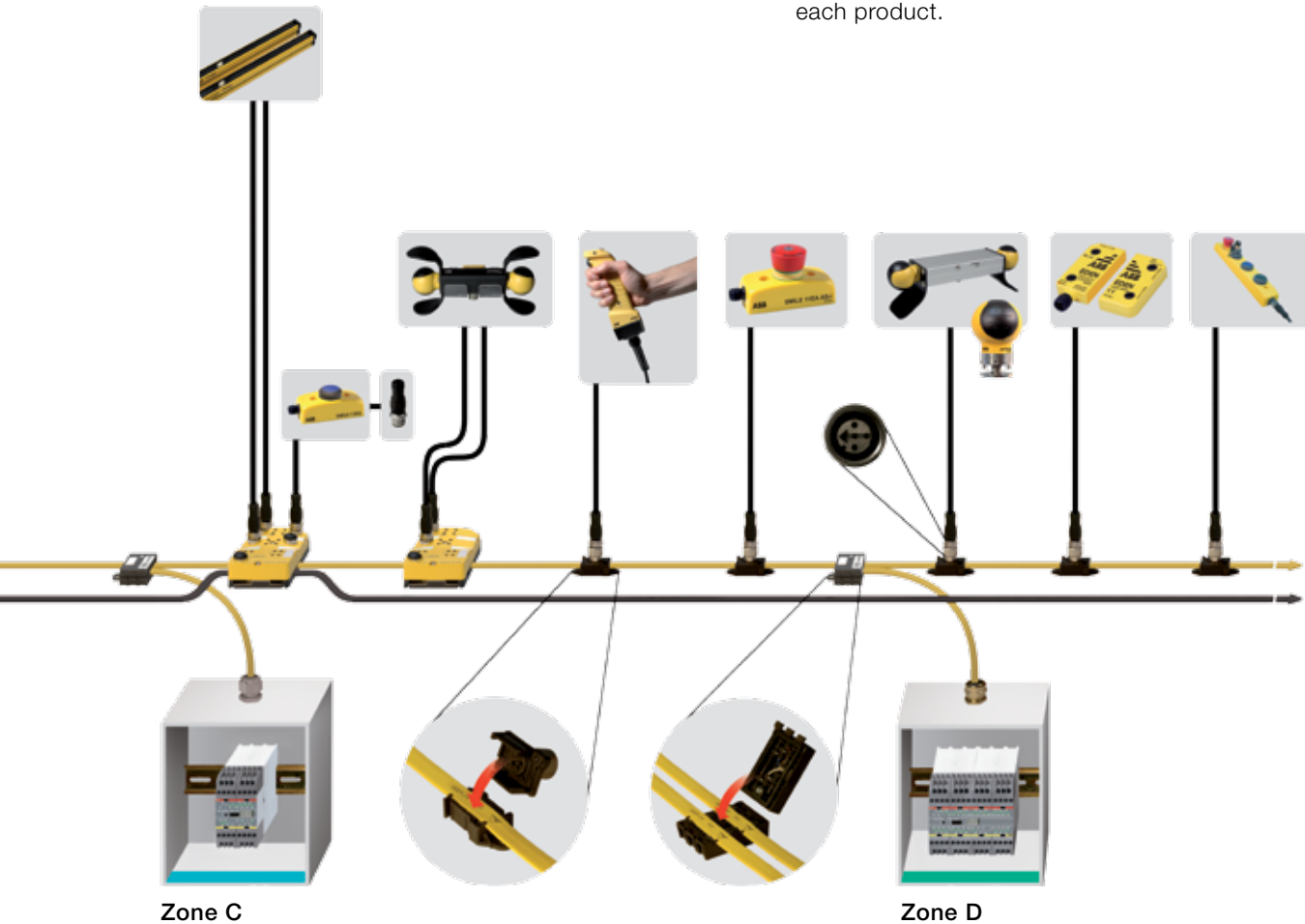
AS-interface - an intelligent cable running system

The field bus system AS-interface came to light in the 90s. The system was the result of a collaboration between several component manufacturers for machine control. The idea was a bus system at a component level where the goal was simplicity and flexibility. Since the system was launched, many new and innovative ideas have been added.

AS-International Association

In 1991, the AS-International Association for organisational cohesion and marketing was founded. The AS-i association works in both an advisory and auditing capacity to ensure the AS-i standard is maintained.

The goal of the AS-i Association is that the AS-interface is to become a world standard for easy communication for components within the automation industry.

The distinguishing feature of the AS-interface is that data communication is mixed with the power supply. This is done in a simple two-wire cable. In 2001 safety was integrated in the AS-interface via the work group Safety at Work, which also includes ABB Jokab Safety.
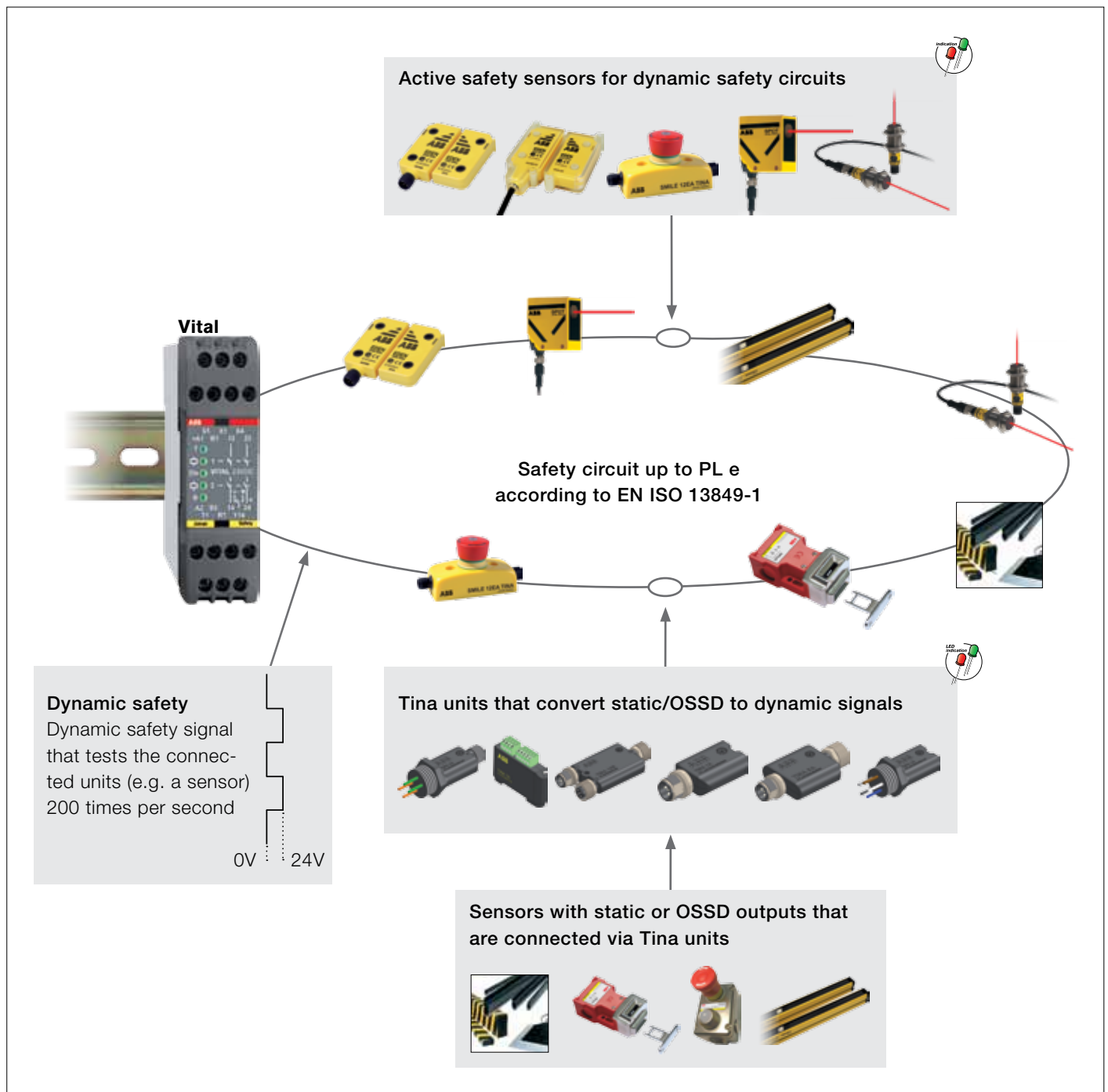
Vital & Tina safety systems
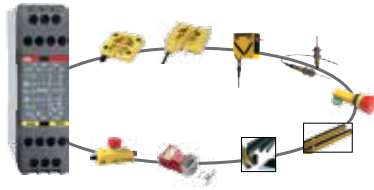## Vital and Tina – dynamic safety circuits

Vital is a safety controller with a dynamic safety circuit that can monitor up to 30 sensors, such as Eden, in accordance with the highest safety level. Vital has selectable manual or automatic resetting and dual outputs. (The Pluto safety PLC has many inputs for dynamic safety circuits.)

Each active sensor and Tina unit has LEDs that indicate OK (green), broken safety circuit (red) or flashing if the loop has been broken by another, earlier, sensor.

Active safety sensors for dynamic safety circuits

Vital

Safety circuit up to PL e according to EN ISO 13849-1

Dynamic safety
Dynamic safety signal that tests the connected units (e.g. a sensor) 200 times per second

0V   24V

Tina units that convert static/OSSD to dynamic signals

Sensors with static or OSSD outputs that are connected via Tina units

Vital 1

Dynamic
circuit 1

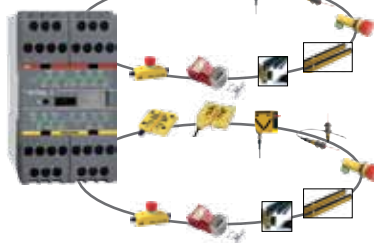– Up to 30 sensors can be connected to the same dynamic safety circuit

Vital 2

Dynamic
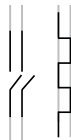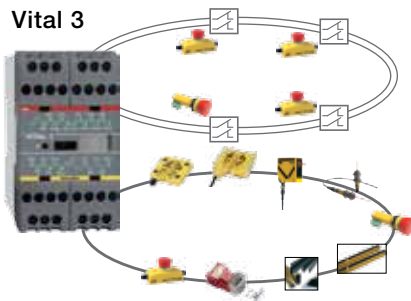circuit 1   Dynamic
                   circuit 2
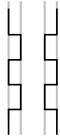
– Two safety circuits are monitored by one module
– Simple system with extensive functionality
– Up to 10 sensors can be connected to each dynamic safety circuit
– Output group 2 can be set for time delay
– Three different modes of operation

Vital 3

Contact
circuit 1   Dynamic
                   circuit 2

– Two safety circuits are monitored by one module
– Devices with two-channel, opening contacts can be connected to one circuit
– Simple system with extensive functionality
– Output group 2 can be set for time delay
– Three different modes of operation

One Vital supervises the entire robot cell!

This example shows a cell that consists of dynamic protection sensors connected to a Vital with the following functions:

Two charging stations

At each charging station a light curtain checks for anyone putting their hand into a risk area, and an Eden sensor checks whether a robot is inside the same risk area. This means that a stop is only ordered if a robot and a person are in the same area. When the station is clear, the person presses the reset button connected to the light curtain.

Fence with Eden-interlocked door

If the door is opened, the robot stops. To reset the robot system, the door must be closed and a supervisory reset button operated.

Three emergency stops with Tina units

If any of the emergency stop buttons is pressed, the robot performs an immediate emergency stop.
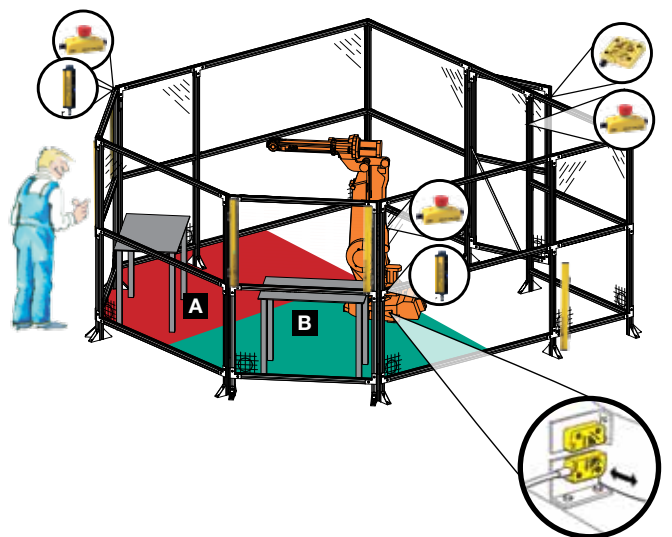
Safety relays
RT-series, JSB-series, safety timers and expansion relays

Safety relays are used for:
– meeting safety requirements
– checking protection arrangements
– providing secure stopping and reliable restarting

We have the most flexible safety relays on the market. Internally they have the highest safety level (according to EN ISO 13849-1, cat.4/PL e).

RT Series
This series consists of universal relays that have the most common functions used in safety situations.

JSB Series
In this series you can find relays for two hand devices, dual input channel synchronization (0.5 s – 1,5s) and also a small, single channel relay for 12 VDC.

Safety timer relays
The relays in this series are used for time reset, time bypassing and inching.

Expansion relays
These relays are used for expanding the outputs of safety relays. Stop signals can be delayed, outputs are also provided for function indication.
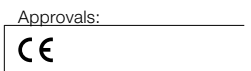
Universal relay RT9 for static safety circuits
– Single or two channel inputs; five input alternatives for switches, contact mats, light curtains, etc.
– Manual or automatic resetting
– Test input for supervision of external contacts
– LEDs for operation, short circuits and under-voltage
– Width 22.5 mm

# Stopping time and Machine diagnosis tool Smart

Smart is a measuring tool that allows the measurement of moving machinery parts and analyses motion sequences and digital signals. Above all it is used to measure machinery stopping times, to permit calculation of the distance where a device such as a light curtain should be located.

Smart has many valuable features for machine diagnosis:
Smart is perfect for periodic monitoring of safety parameters and other conditions for the maintenance and trouble-shooting of machines. Smart can compare old and new graphs, it becomes easy to find out the reasons for machine malfunctions. One can also supervise machines during operation and compare how they perform over time.
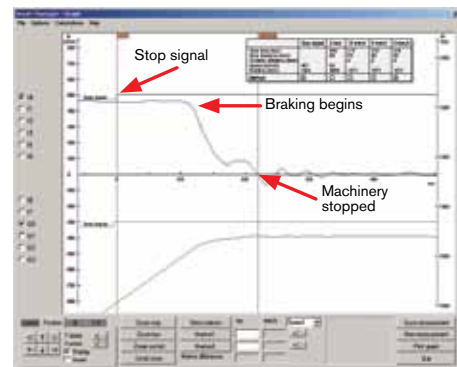
Smart - for stop timing and machine diagnostics

Light beams and Light curtains
Focus II and Spot

Light beams and light curtains are a production friendly safety component that do not physically impact on the actions of the machine operator. Light barrier protection is also a good safety component for use when goods are to be passed in and out of a risk area.

Focus II

Focus II is a competent and cost-efficient choice when it comes to safety light guard protection. Focus II exists both as a light curtain series and as a light beam series. Both series are well equipped regarding functions and accessories.

Focus II is available from 14 mm resolution (finger protection) and can be delivered in lengths up to 2400 mm (safe guarded zone).

Features like Muting (partial or complete bypassing), Manually supervised or automatic reset, pre-reset, External Device Monitoring, Scan codes, Floating blanking and more is all standard functions within Focus II. The light curtains have "Floating blanking" as an option.

Several light beams with Tina units can be connected together in the same safety circuit and supervised dynamically by our Vital safety controller or a Pluto safety PLC.

In order to avoid unnecessary halts in production, the Focus II with double light beam is a good choice, since it is meant for environments with many airborne particles, such as sawdust. Both beams must be obstructed in order to generate a stop signal.

FMI and FMC connection boxes

By using FMI and FMC connection boxes and their M12 connectors it is also easy to install Focus II with muting, reset, etc.

Spot

The Spot Light beam is a single beam light protection that has separate transmitter and receivers adjusted to work with dynamic circuits. Spot exists with the ranges of 10 or 35 m of the beam. This construction allows individually selected positioning/installation. Up to Six pairs of light beams can be connected in series to our Vital safety controller or the Pluto safety-PLC.

For information, there are LEDs on both the transmitter and receiver which indicate the current status, connection between transmitter and receiver and also safety status.

The Focus II with double light beams - prevents nuisance tripping by airborne particles, Focus Wet – for extreme environments, Focus with integrated muting and M12 connector, Bjorn – a strong stand for Focus, Spot 35 and Spot 10.

Connect any Focus light protection...

..via our clever connection boxes...

..to the junction box. With just one cable or M12!

Sensors/Switches/Locks
Eden, Magne, Dalton, Knox

Approvals:

TÜV Nord CE CSP. Intertek

Sensors/Switches/Locks are used to control the gates and hatches around hazardous machinery, and to monitor the position of a machine.

Eden non-contact sensor

Eden is a non-contact sensor with dynamic signal transmission. It has long detecting distance and operates at the highest safety level (cat.4). Several Eden and even light beams can be connected together in the same safety circuit and be dynamically monitored by the Vital safety controller or the Pluto safety-PLC. Eden E manages harsh environments e.g. high-pressure wash-down, high and low temperatures (has been tested up to +100ºC and down to -70ºC).

A non-contact safety sensor for AS-i

Eden AS-i is a new version of Eden adapted for direct attachment to the AS-i bus. Eden AS-i has an integrated AS-i node and is connected via a M12 connection directly to the AS-i cable.

Eden AS-i has a protective encapsulation that enables Eden AS-i to be used in harsh environments. Each Eden AS-i is individually coded which makes it secure against manipulation.
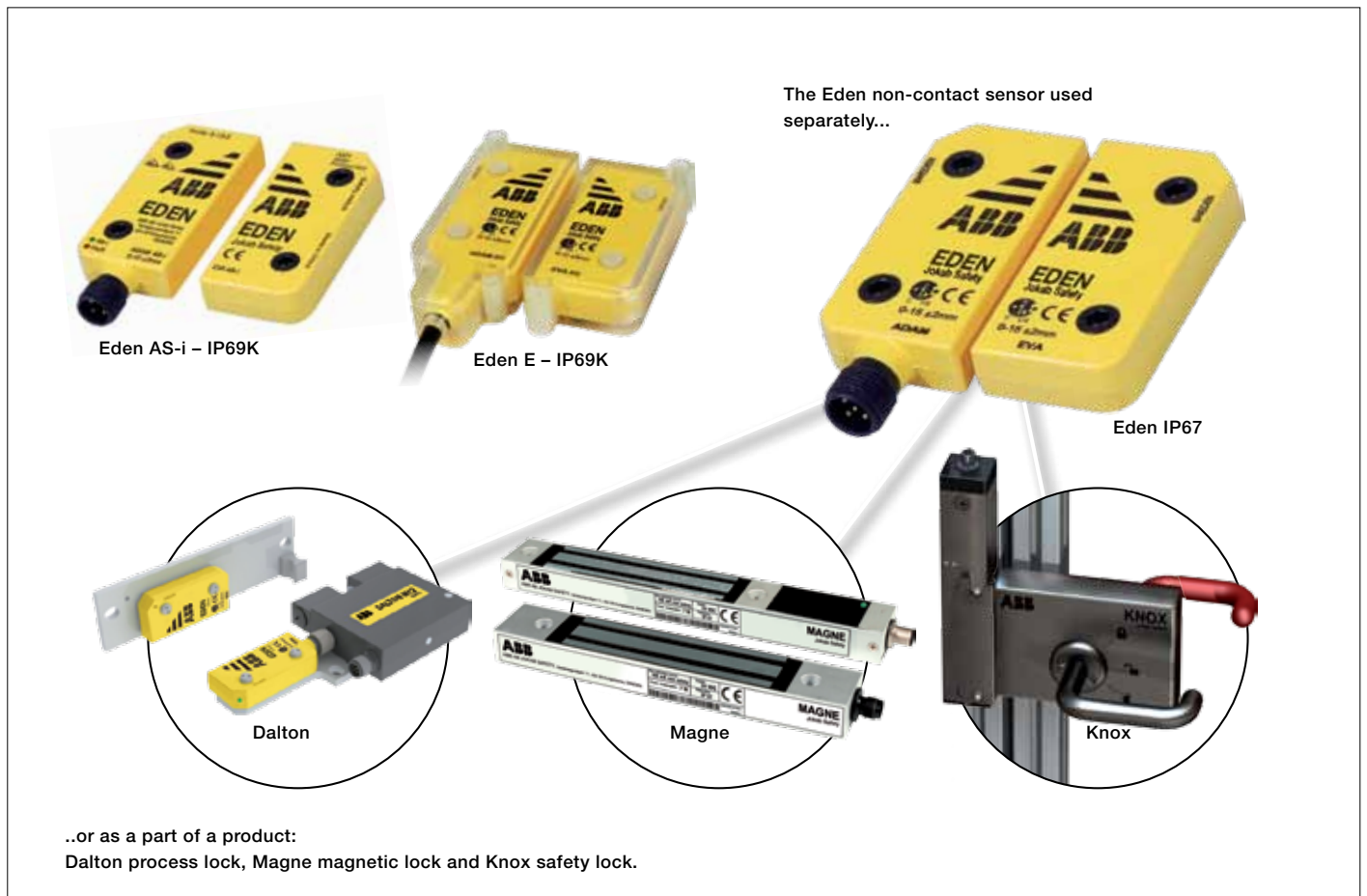
Dalton process lock

Dalton is a small process lock that can operate in most conditions. It can be installed with its opening in different directions, and is easily fitted due to its low height. Status indications are provided by both LEDS and the information output.

Magne magnetic lock

Magne is a magnetic lock that is suitable for industrial applications and that can withstand demanding conditions. It can electrically keep a door closed against a force of up to 1500 Newtons, and in addition has no magnetic field when the current is switched off.

Knox safety lock

A strong and robust safety lock with a new combined reset and locking function, with emergency opening from the inside.

The Eden non-contact sensor used separately...

Eden AS-i – IP69K

Eden E – IP69K

Eden IP67

Dalton

Magne

Knox

..or as a part of a product:
Dalton process lock, Magne magnetic lock and Knox safety lock.

Sensors and Switches
Sense and MKey-series

MKey - Safety interlock switches

The MKey interlock safety switches are design to provide position interlock detection and locking for moving guards. The switches have rotary heads which provides ease of mounting and offer different actuator entry positions. Lockable MKey models is available in both spring lock versions and magnetic lock versions.

The magnetic non-contact switch, Sense, is small in size which makes it easy to position and hide on gates and hatches. It is resistant to both dirt and water and has no dust collecting cavities which makes it useful in environments where hygiene is paramount. Its design makes it useful to operate in most environments that require the highest level of safety.

MKey5 with standard Key for SS head, MKey8 with flexible Key with SS housing, Sense7 and MKey9 with standard Key for SS head.

Control devices
Safeball and JSHD4

A control device is used so that a machine operator will be able to directly start and stop a hazardous machinery movement.

Single/two-handed control device

"Safeball" – a unique world-wide control device providing the highest level of safety (category IIIc as a two-handed device in accordance with EN 574). It's ergonomic shape fits all hand sizes and provides many grip possibilities. Safety is obtained by having two buttons on each ball, i.e. double safety function for each hand.

Safeball is installed with a ball joint wich can be rotated and angeled, Movable two-handed device with Eden sensor for positioning *control*
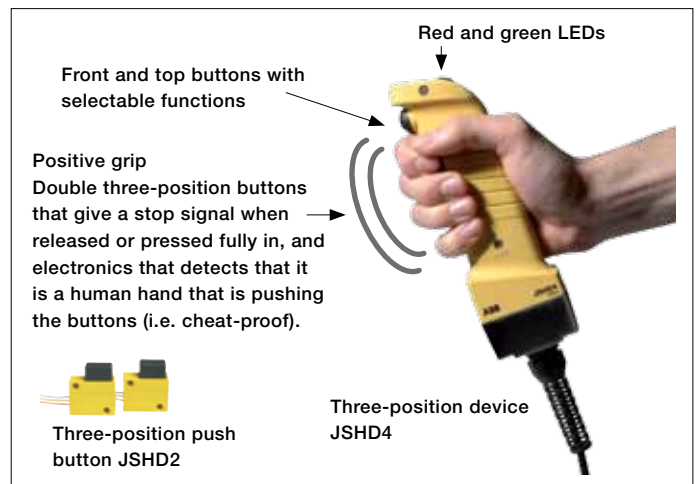
Three-position device

The JSHD4 is a three-position device where the two safety three-position switches (JSHD2) are integrated. The buttons has its normal operation in the distinct middle position and stop function in either an unaffected position (upper position) or in a fully pressed position (lower position).

The JSHD4 is ergonomically designed with two non-safe buttons (for machine control), two information LEDs, and as an option; electronics that detects that it is a human hand that is pushing the buttons (i.e. cheat-proof).

The two JSHD2 three-position switches in the enabling device are also used in the programming units for both new and old industrial robots.

Red and green LEDs

Front and top buttons with selectable functions

Positive grip
Double three-position buttons that give a stop signal when released or pressed fully in, and electronics that detects that it is a human hand that is pushing the buttons (i.e. cheat-proof).

Three-position push button JSHD2

Three-position device JSHD4

E-stops
Smile series, LineStrong, EStrongZ and INCA

An emergency stop device is used to permit anyone to stop machinery if it breaks down or if someone is in danger.

Robust emergency stops for the right environment.
ABB Jokab Safety can offer several emergency stop depending on application or environment. Many of them are equipped with LED indication and some of them are already adjusted for dynamic safety circuit.

– Small - easily installed on fencing system or walls
– On cabinet - with easily connection in cabinet
– Stainless - for severe environments
– Long Distance - Wires up to 200 m on one switch.

LineStrong3D, LineStrong2, Smile 12EA Tina, EStrongZ LED, INCA and Smile 41

Contact strips/Bumpers/Safety mats
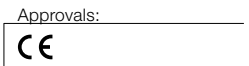
Our sensitive edges and bumpers are used to protect against crush injuries where there are moving machine parts, automatic hatches and doors.

Our mats are used for personal protection around robots, production lines, machinery, etc.

Contact strips/Bumpers/Safety mats
Our sensitive safety contact edges are available in any length (up to 25 m) and in several sizes. A safety edge is normally used on doors and hatches.

Bumpers are used for the same reason as a safety contact edge but with the requirement for longer stopping length. Bumpers are available in different shapes and in black or black with yellow strips.

Safety mats are used to keep people away from a protected area near a dangerous machine or movement. When person is standing on a mat the connected safety relay will not activate. Safety mats exists with built-in ramp edge rail or without. Safety mats can are cost-efficient and easy to install. Two or several mats can be joined together to "built" a bigger area.

Safety edge in GE-series can be in length up to 25 m.

Bumpers for long stop distances
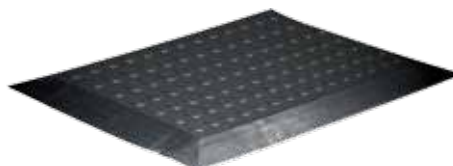
Safety mats with built-in ramps that can easily be cut off as necessary.

Safety Fence Systems
Quick-Guard®, Quick-Guard® E and SafeCAD®

Quick-Guard is a very flexible fencing system consisting of a minimum of different components, e.g. aluminium profiles, patented brackets, net-locks, mesh, solid or noise reduction panels. Using these components there are almost no limitations as to what can be built.

Due to our patented screw-lock system, we can supply all brackets pre-mounted with fixing screws and nuts. No holes need to be drilled in the profiles and all cutting is straight. This makes assembly and modification very easy.
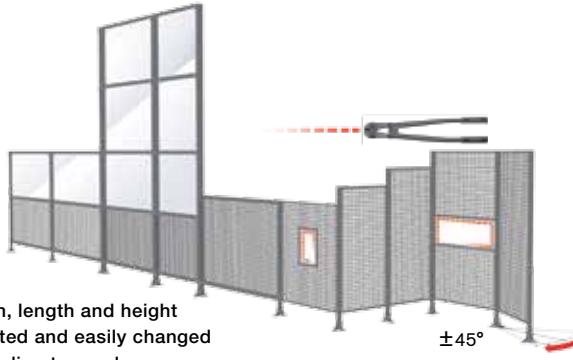
Standard components with endless possibilities

Light aluminium profiles allow ergonomic assembly

Fixings with pre-mounted screws and nuts mean easy assembly

Width, length and height adapted and easily changed according to needs
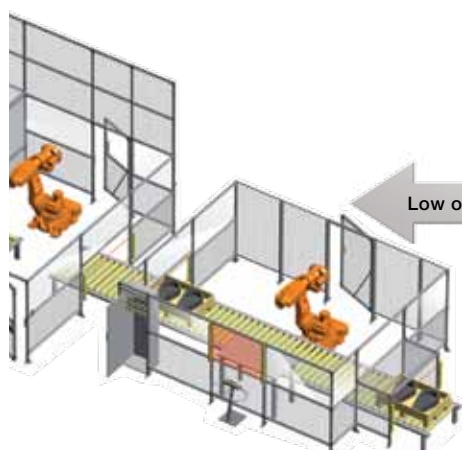
±45°

Short delivery times

Flexible

Low overall cost

Easy to adjust the position of fittings
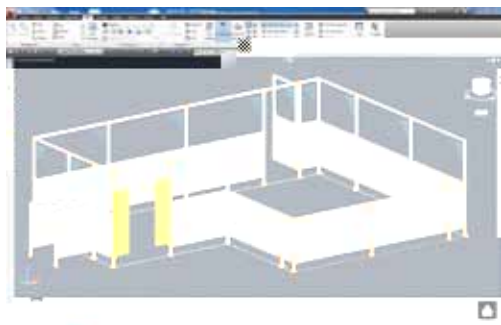
The T-slot and patented nut makes it easy to attach fittings to the fencing profiles

Choose from a large selection of hatches and doors

Mesh, Plastic, Glass, Plate and/or Sound absorbing

SafeCAD is a plug-in program for AutoCAD®.With AutoCAD we can easily tailor your protection solution together.

Contact us

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