DEEBAR ®

(Pty) Ltd

ELECTRICAL & MECHANICAL ENGINEERING

"ENSURING YOUR SAFETY"

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ISO 9001 Certified

2023
INDUSTRIAL SAFETY
SOLUTIONS

THE IMPORTANCE OF SAFETY

A serious workplace injury or death changes lives forever, for families, friends, communities, and co-workers. Human loss and suffering is immeasurable. Occupational injuries and illnesses can provoke major crises for the families in which they occur. In addition to the major financial burden, they impose substantial time demands on other family members. Today, when many families are operating with very little free time, resources can be stretched to breaking point.

Every person that leaves for work in the morning should expect to return home at night in good health. Can you imagine the knock on the door to tell you your loved one will never be returning home? Or the phone call to say he's in the hospital and may never walk again? Ensuring that husbands return to their wives, wives to their husbands, parents to their children, and friends to their friends - that is one of the most important reasons to create a safe and healthy work environment. But it isn't the only reason.

REDUCING INJURIES REDUCES COSTS TO YOUR BUSINESS:

If a worker is injured on the job, it costs the company in lost work hours, increased insurance rates, workers compensation premiums and possible litigation. Productivity is lost when other workers have to stop work to deal with the injury. Even after the injured employee has been sent home or taken to the hospital, other employees may be distracted or need to take time off from work to deal with the aftermath of the incident. A single injury can have far-reaching and debilitating effects on your business.

SAFE WORKERS ARE LOYAL WORKERS:

Any business knows that employee debilitation and absenteeism can be major obstacles. When you create a healthy and safe workplace, you reduce those issues in several ways. By budgeting for safety improvements and making safety part of your operational plan, you engender trust. By involving employees in safety decisions, through reporting, committees, walk-throughs and meetings, you show that their opinion matters to you. By following through on their input and improving safety, you prove quite tangibly that you care about their well-being. Workers typically respond by working harder, showing more pride in their jobs and remaining loyal.

SAFETY IMPROVES QUALITY:

Time and again, companies that put safety first turn out higher quality products. In some cases, that's because a safe workplace tends to be a more efficient one, free of debris and tangles of cords. In other cases, it's a matter of focus. By working in a clean, efficient environment, workers are able to reduce distractions and truly focus on the quality of what they do. The result is better products that create customer loyalty, bigger margins and increased sales.

In these ways and others, workplace safety is about much more than legislation. It's about creating the kind of productive, efficient, happy and inspiring workplace we all want to be part of. It's about creating a highly profitable company. That's why it's important.

OUR CORE VALUES

MISSION STATEMENT

Deebar designs and manufactures highly reliable Signalling, Communication, Monitoring Devices, Safety Equipment and Bulk Material Handling Systems for use in harsh environments within the Mining, Power Generation, Automotive and Process Industries and will continually improve its technologies and service by applying creativity to all aspects of its business.

VISION

Deebar intends to continually develop the latest technology for its core client base in which it operates and strives for perfection. In doing so, it will assist in uplifting and improving the quality of life of all its employees & customers.

RELIABILITY & QUALITY

Product reliability is vital and that is what Deebar remains focused on. Centered design, manufacture and service. Along with a comprehensive range of products, Deebar guarantees the highest quality in its products and services.

At Deebar, we are committed to listen to our customers, understand their need and endeavour to deliver results that exceed their expectations. When it comes to products and service we pride ourselves on service and reliability.

Quality means more than providing a product or service, it's a way of doing business and ultimately, a way of ensuring that we satisfy our customers needs.

Corporate Social Responsibility

Deebar has been a part of the South African economy for the better part of 47 years, so, our commitment to our communities, children and country is a long lasting Whilst we believe in building a better future, we are aware of the serious challenges which face our country, and as a business, we recognise the responsibility we have, to contribute to the upliftment and care of South Africa and the people who live here. We place huge emphasis on social investment through our commitment to sustainable development, the impact of which will be felt for many years to come. Deebar is proud to partner with a number of Initiatives supporting abused woman and children, recovering addicts, ex-parolees, the unemployed, destitute and physically challenged persons and elderly. For more information on these initiatives, please see our webpage www.deebar.co.za
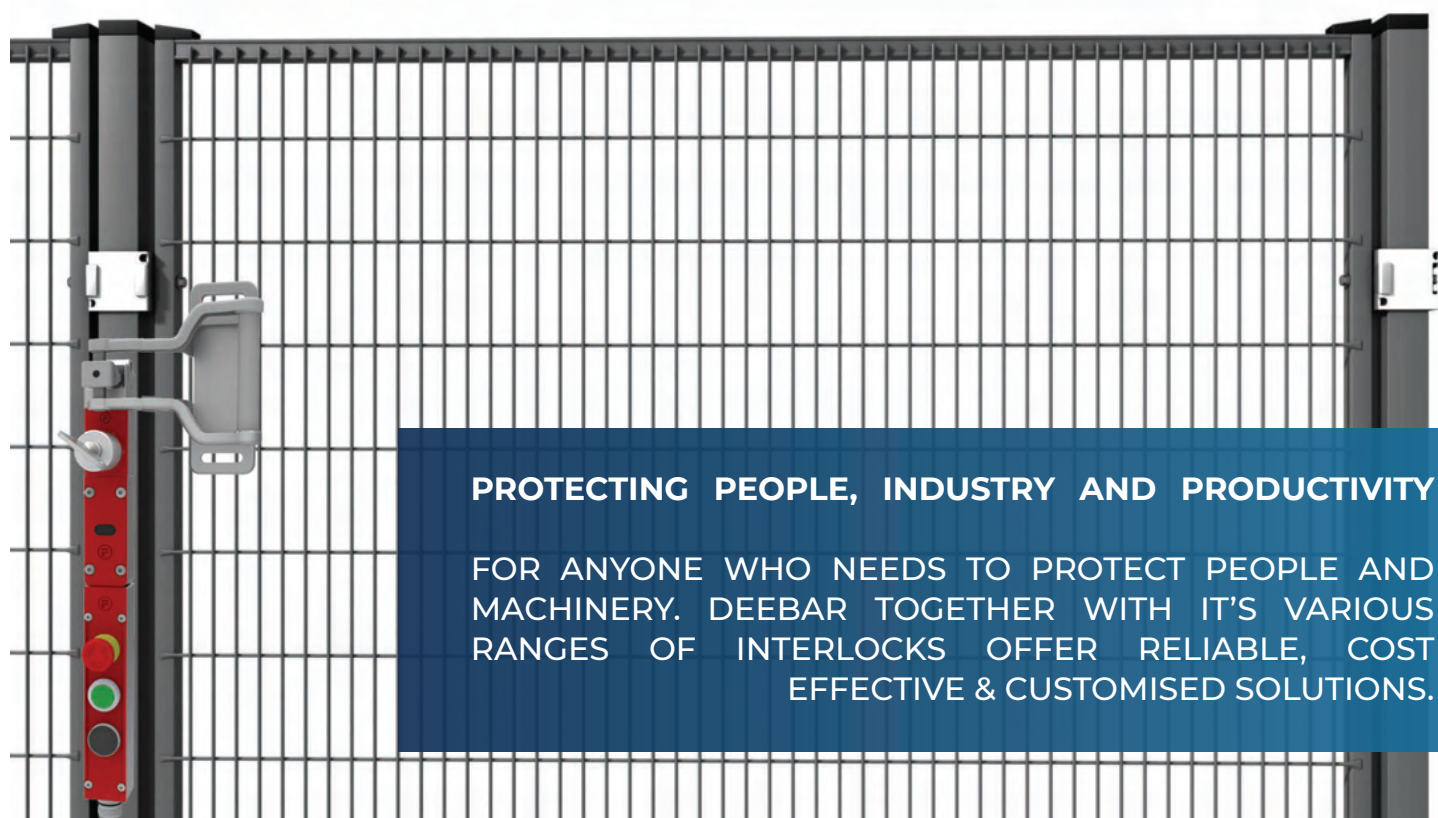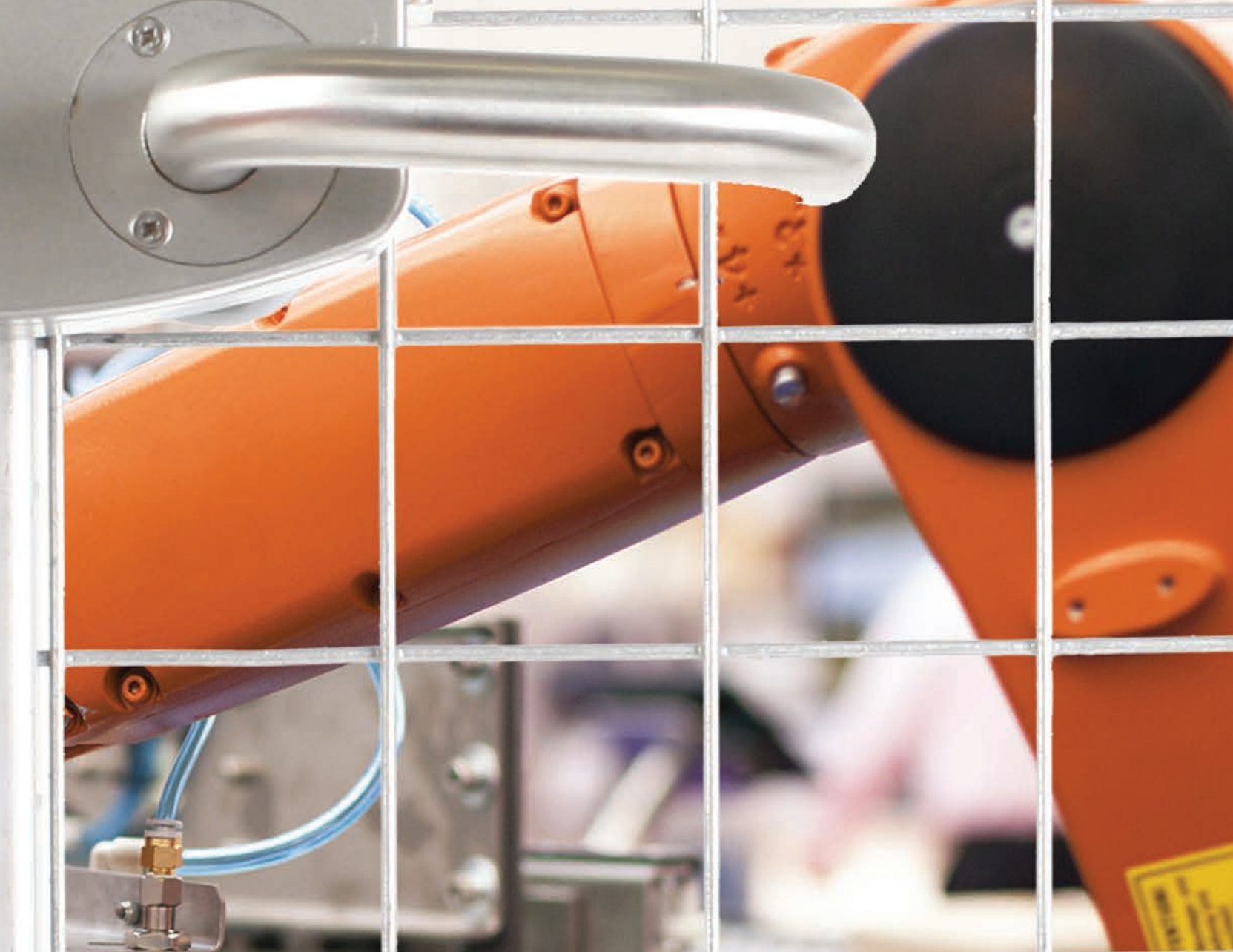
MACHINE
SAFEGUARDING

Machine guarding is a safety feature on or around manufacturing and other engineering equipment, consisting of a shield or device covering hazardous areas of a machine to prevent contact with body parts or to control hazards like chips or sparks from exiting the machine.

Machine guarding provides a means to protect humans from injury while working nearby or while operating equipment. It is often the first line of defense to protect operators from injury while working on or around industrial machinery during normal operations.

Workers who feel comfortable that their machinery is safe will be more productive and contribute more to the future of the business. With fewer injuries your business is able to meet quotas and continue to be profitable.

The type of guarding that is used in your plant can vary depending on the type of work performed. Some machines require specialized guards while others can use more standardized solutions.

Your business can become safer and more efficient through the proper use of machine guarding solutions.

PROTECTING PEOPLE, INDUSTRY AND PRODUCTIVITY

FOR ANYONE WHO NEEDS TO PROTECT PEOPLE AND MACHINERY. DEEBAR TOGETHER WITH IT'S VARIOUS RANGES OF INTERLOCKS OFFER RELIABLE, COST EFFECTIVE & CUSTOMISED SOLUTIONS.

IMPORTANCE OF
SAFEGUARDING

Despite tighter statutory requirements for the guarding of dangerous machinery and an increased awareness for the need to design for operator safety, avoidable industrial accidents continue to occur. In virtually all cases some form of guarding was in use at the time.
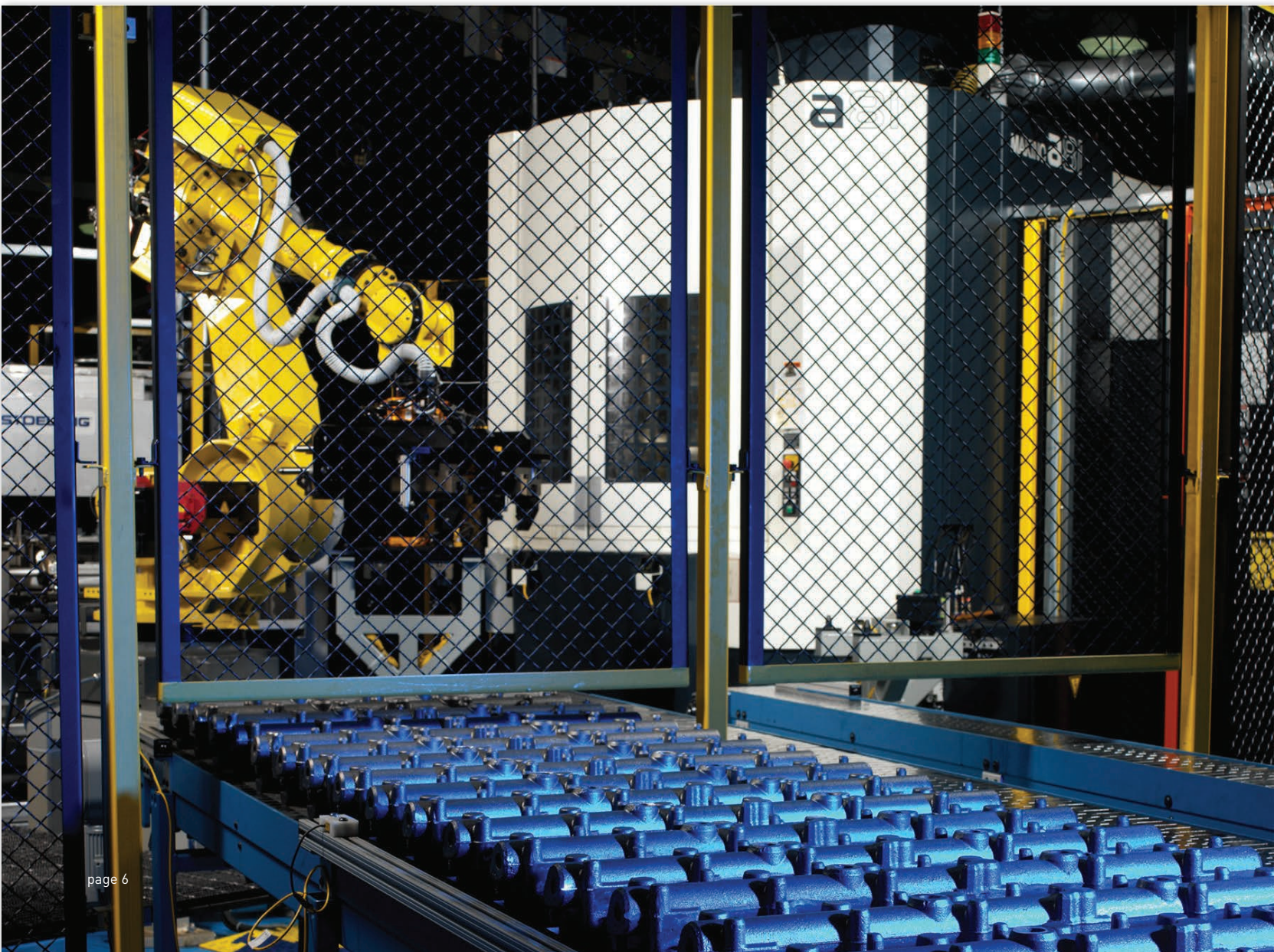
This section explains how and where interlocking can be used to augment existing safety systems, and effectively protect personnel. Later sections describe in detail the use of interlocking systems in industry.
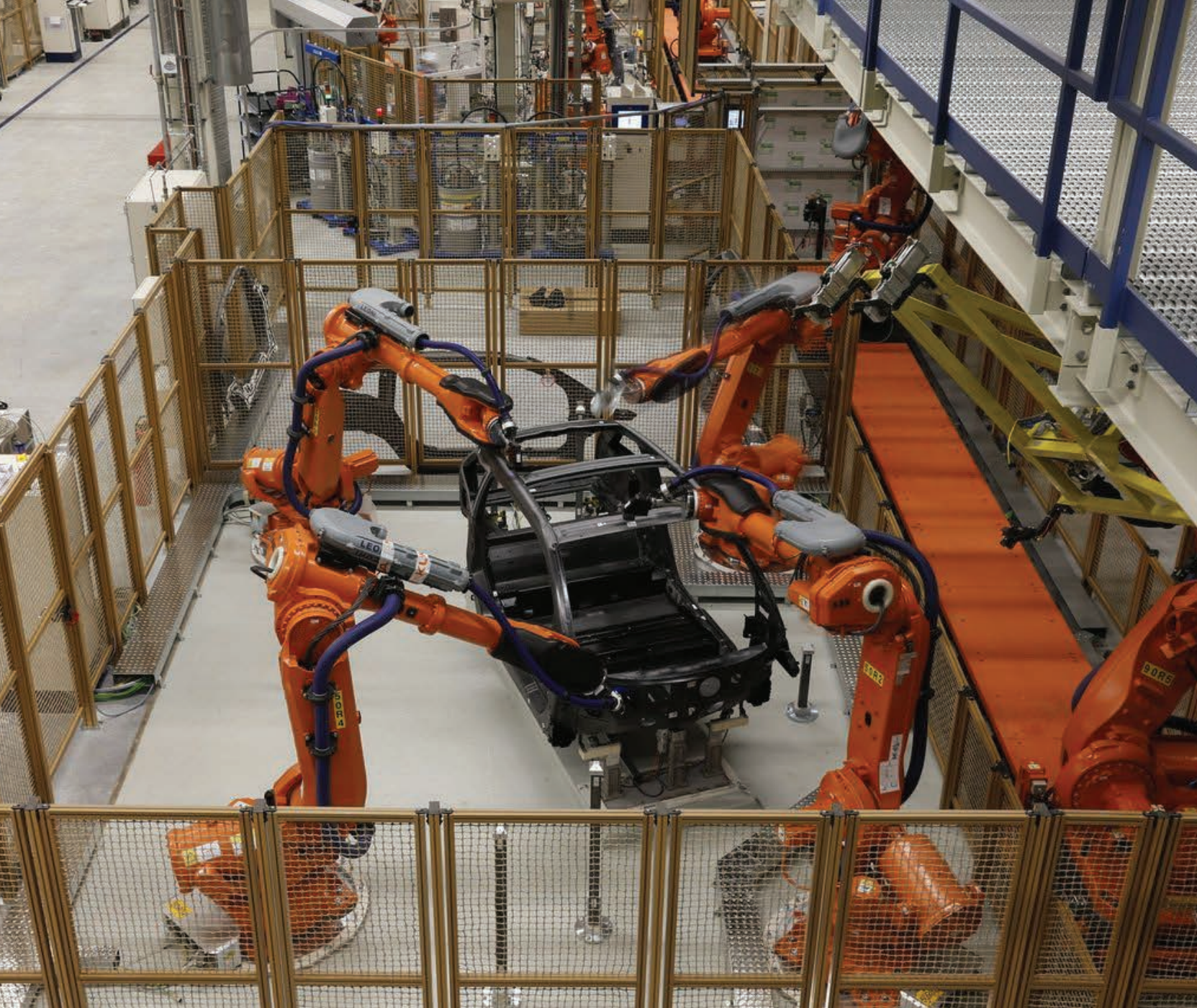
The fundamental principles on which all machine guarding is based, is the construction of a secure barrier to stop a worker being able to come into contact with a dangerous part of a machine.

However, guarding is only effective while machine operation does not require human intervention. To ensure that when workers need to access a machine they do so under safe controlled conditions, further safety measures must be provided.

Even in highly automated environments there is a frequent need for personnel to gain access to machinery. With an assembly robot, for example, in addition to the need for local programming, there are other day-to-day requirements for regular access to the area around the robot.

Maintenance, servicing, cleaning, part loading, fine tuning and in-production adjustments are just some of the circumstances under which workers must enter perimeter guarding.

As soon as a worker needs to access a machine, a new and unpredictable element enters the safety system.

It should be safe to assume that a maintenance engineer will turn a machine off before unlocking the guard and that a simple "work in progress" indicator will ensure that no one inadvertently restores power to the machine while work is being carried out. It should be possible to rely on common sense and safe working practices.

The history of industrial accidents caused by human error indicates that this is not the case.

Ignorance, forgetfulness or haste can instantly negate the most thorough safe working practice regulations.

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Maintenance, servicing, cleaning, part loading, fine tuning and in-production adjustments are just some of the circumstances under which workers must enter perimeter guarding.

Who is Fortress?

Industry leader innovating automation safety products

Safety specialists active in **international** standards development

Protecting people in more than **40,000** facilities

Operating in **67** countries

Most **robust** and **customisable** solutions

Part of a **global** FTSE 100 group driving international safety

Halma

Fluid Power Safety

Protect people and productivity with the highest level of safety for hazardous pneumatic and hydraulic energy.

Safe Access Solutions

Our range of mechanical, electromechanical and network connected access solutions can be tailored to suit your exact safety needs.

Machine Control & Permissions

Configurable pre-wired or ethernet connected machine control devices make installation quick and simple. Plus, with RFID access control, ensure the right people are performing the right tasks, at the right time.

Machinery Safety Services

Machinery safety and its associated standards, laws, and regulations can be very complex. We support with tailored training and guidance to help you implement the best and safest solutions.

Machinery Safety Services

▶ Customised safety services to fit your requirements

We have a team of machinery safety experts able to answer questions regarding international, European, and U.S. machinery safety standards. We have an array of free safety standard articles and webinars to help you navigate the complexity of the machinery safety standards.

We can provide tailored safety training related to U.S. and international machinery safety standards as well as standards related to specific applications. Contact us if you want to run company wide standards training or would like us to create tailored training for your applications.

We also offer, to existing customers, site surveys. We have a group of application and technical engineers who can help customers inspect Fortress devices to ensure they are installed and functioning as intended, as well as being maintained correctly.

▶ Become a B11 LMSS™ Licensed Machinery Safety Specialist

The B11 Licensed Machinery Safety Specialist certification is a five-module remote training course that sets out the key aspects of designing and implementing machinery safety solutions. This B11 Standards, Inc. certified course will enhance your ability to protect lives and improve your professional competence portfolio.

▶ Course Modules:

1. **Risk Assessment**
   Intro to U.S. legislation and risk assessment
2. **Risk Reduction**
   Once you have a risk assessment, how do you reduce risk?
3. **Functional Safety**
   The application of safe control systems
4. **Integrating Machines & Robotics**
   Increased automation means more complex systems
5. **LOTO & Electrical Safety**
   Lock-Out Tag-Out and alternative methods to achieve safety

Become a safety specialist

B11 LMSS™

Machine Control & Permissions

▶ Do you wish your machine control could be designed in one simple solution with plug and play cabling?

Fortress offers custom designed control devices with hardwired M12 / M23 connection or PROFINET or EtherNet/IP networked communication. Networked solutions can be configured as safe or non-safe I/O modules for external connections (for example to light curtains, enabling switches, and many more).

- Fully customisable and engravable (with text or symbols) buttons, lamps, and switches
- Easily integrate an emergency stop and external safe I/O
- Self-wired, hard-wired, or network connectable
- Robust, durable design utilising metal componentry for long lasting operation

Explore our access control & permissions solutions

Explore our machine control solutions

▶ How do you manage who performs machinery control & hazardous access?

Permission-based technology can be integrated into your system with FRANK - the Fortress RFID Access Network Key - to ensure only authorised personnel access certain areas, perform hazardous tasks or put machines into certain modes.

- FRANK utilises your existing RFID cards to manage users, permissions, and access
- Data can be captured on this platform to offer productivity gains through identifying inefficiencies
- Can be used alongside trapped key systems, electromechanical interlocks or operator controls

Fluid Power Safety

▶ Pneumatic and hydraulic loads can be just as or even more dangerous than electrical energy. So how do you ensure they have the same level of safety?

Fluid power solutions from Fortress provide redundant means of operation, monitoring, and a unique cross link technology to guarantee no single component failure can affect safe isolation. Available for Category 4 (Cat. 4) and Performance Level e (PLe) applications. For run down times of a fluid system, zero pressure monitors are available to ensure safety is maintained.

- Positively driven dual mechanical contacts for reliable spool position monitoring when compared to alternative technology
- Crossed link exhausts to guarantee a path for pressure isolation
- Easily serviceable for minimal downtime
- Robust design for long lasting operation

Explore our solutions
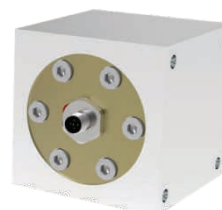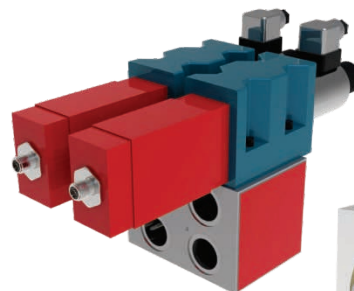
| **Safety Redundancy**	**Retro-fittable**	**Robust & Durable**	**Fully Serviceable**	**Leaders in Fluid Power**
Dual channel safety, dual channel exhaust (pneumatic) and tank outlet (hydraulic)	Can to be installed with no change to existing circuits and control valves	Built for longevity to guarantee a long operational lifetime	Easily serviced by our team to maintain smooth operation	Operating as Fluidsentry for 20 years before joining Fortress

## Heavy duty guard locking with PROFIsafe & CIP Safety

amGard*pro*

The most robust and configurable solution for applications up to Cat. 4, PLe. Combine ergonomic safe access with button controls, personnel protection, RFID access, and escape release functionality all in one device. RFID Safety Keys (RSK) to reduce the risk of lost keys impacting your production.

- TÜV SÜD approved to meet Cat. 4, PLe (incl. guard locking)
- Restart prevention with personnel (safety) key
- Self-wired, hard-wired, or network connectable for installation ease
- Heavy duty design to protect in environments up to IP65 & IP67*

RSK

Our heavy duty options also contains compact products with high coding (Atom & FRNK)
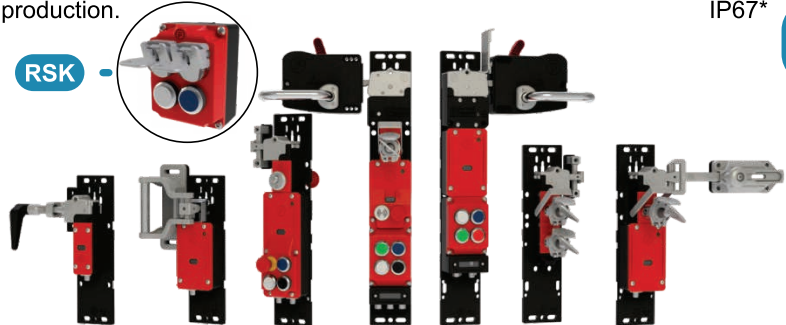
*IP rating is dependent on product configuration.
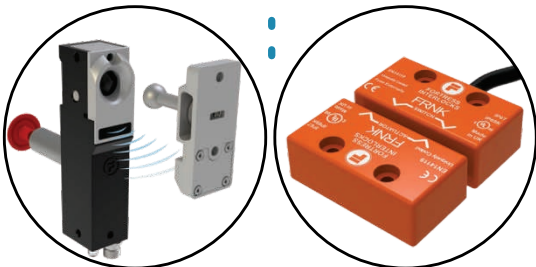
Configurable access & control for machine guarding

tGard

Simple but customisable range available as interlocks with built-in control functionality or standalone prebuilt pushbutton stations. Products are configured to order in a 40mm metal housing for simple mounting in a variety of manufacturing and automation applications.

- TÜV SÜD approved to meet Cat. 3, PLd
- New integrated RFID option to have a high-level coded actuator with more than 1000 variations, giving you guard monitoring up to Cat. 4, PLe
- Quick & easy installation with just two fixings and pre-wired connection

High-Level Coding (HLC)
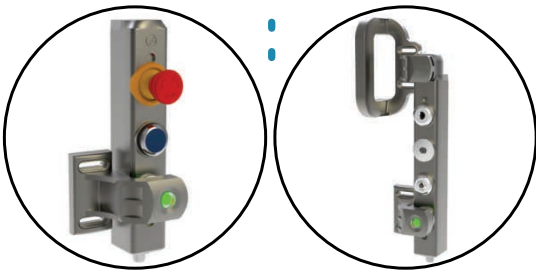
Mechanical trapped key interlocks

mGard

The mechanical range of robust trapped key products can be combined to create simple or complex key sequences to enforce processes at a fraction of the cost to electromechanical alternatives. Isolate all types of energy from a system and use personnel keys to prevent restart.

- TÜV SÜD approved for applications up to Cat. 4, PLe
- Quick & simple installation with no wiring required
- Enforced sequencing protects people and processes

Retrofittable personnel keys can be added to electromechanically systems & light curtains with our interlock blocking solutions (Osbourn)
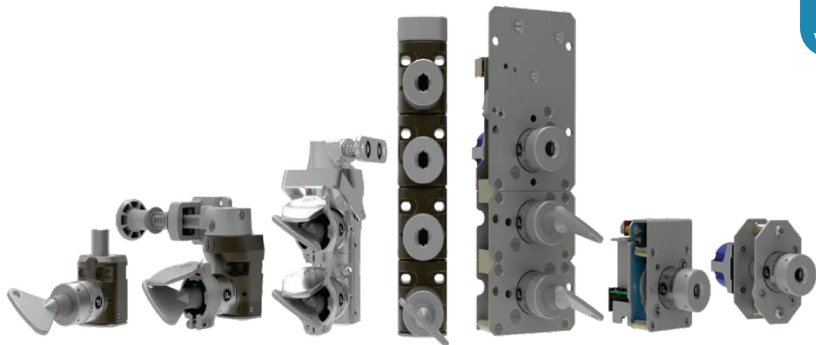
Safe Access Solutions

Hygienic interlocking for washdown environments

Louis

Louis is our range of stainless steel interlocks suitable for clean environments such as food production. Stainless non-contact switches, trapped key products, customisable control stations and the first ever 3-A approved, food safe interlock, the HGL (Hygienic Guard Lock) approved for clean in place procedures.

- All mechanical products work with a large temperature range & highly robust with no electrical parts that can fail
- 3-A approved interlock prevents bacterial growth for interlocking in a non-product food zone
- HGL actuator has high misalignment for easy install & protection against machine wear as well as having over 1000 coding's

Open head design for maximum cleaning access

Actuator backplate gasket to prevent metal-to-metal contact in installation, reducing risk of bacteria growth

Open actuator mechanism for simple cleaning access

FDA compliant, non-toxic plastics and gasket materials used

Optional mounting kit includes stand-off spacers to aid cleaning access as well as additional gasket washers to further prevent metal-to-metal contact

Stainless steel enclosures, sealed to IP67 and IP69

Angled surfaces used throughout to ensure maximum liquid drainage and to prevent pooling
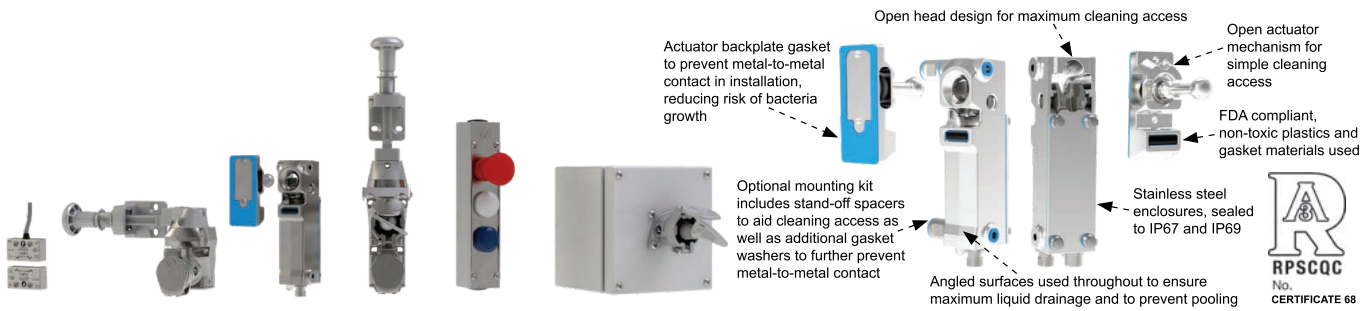
RPSCQC No. CERTIFICATE 68

Interlocks for explosive atmospheres and hazardous locations

Alfred

Alfred is a range of robust and customisable interlocking solutions certified for safe use in explosive atmospheres and hazardous locations. The flameproof and IP69 enclosure guarantees the safe use in the harshest safeguarding conditions to protect your people and productivity.

- Integrated restart prevention for up to three operators
- Certified to ATEX, IECEx, CCCEx, & North American standards
- Monitoring & guard locking devices for use in Zone 1/21
- Fully mechanical access devices for use in Zone 0/20

Controls outside the explosive area

Mechanical products for Zone 0/20

Solenoid interlock in Zone 1/21 for fast access

Keys allow access with a gate switch to ensure safety
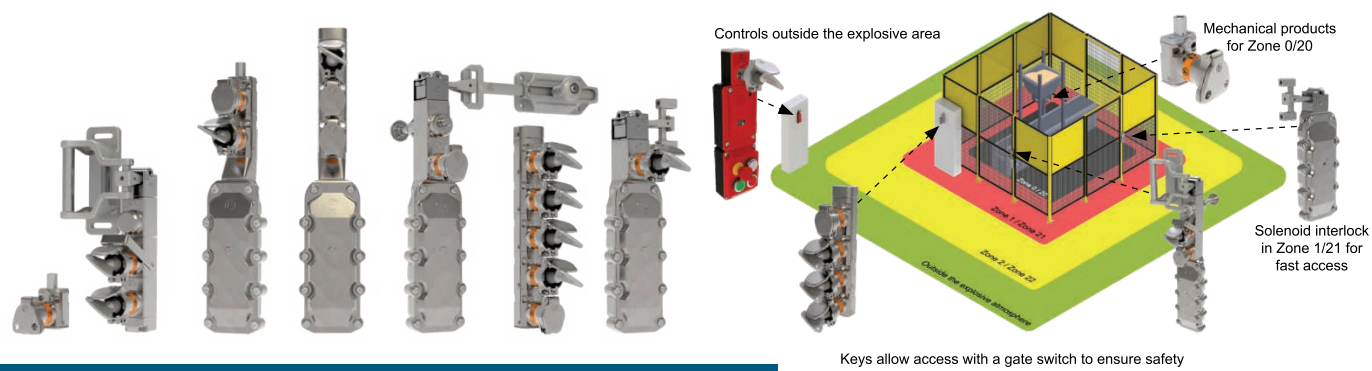
Tailored safety solutions

We are able to accommodate and design tailored safety products to fit your complex requirements. We have a design engineering consultation team happy to help build custom solutions.

- Fast & cost effective engineering team to meet your exact needs
- Achieve your safety requirements & interlocking safety goals
- Using our TÜV SÜD approved mechanisms to build your desired system

Find the right interlock

All our interlocks are designed to be configured to your exact requirements, the QR code will take you to our product wizard to help guide you to which one is your best fit. Contact us directly for tailored safety solutions.

Introduction to mGard

mGard is the only range of trapped key interlocks 3rd party approved as meeting PLe and is perfect for heavy duty applications. Fortress' mGard is suitable for use up to SIL3 (EN/IEC 62061), Category 4 and PLe (EN/ISO 13849-1).

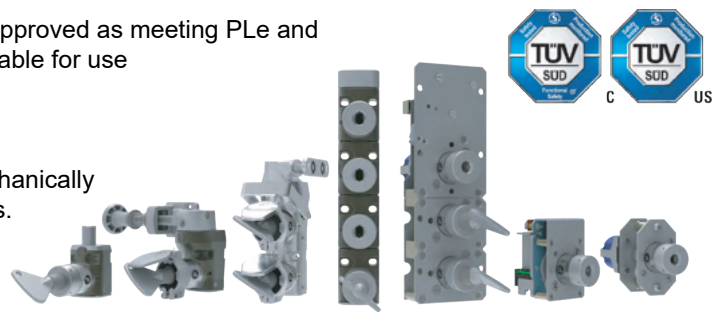Trapped key interlocking is a tried and tested method of mechanically safeguarding dangerous machines and hazardous processes. Mechanical keys eliminate most of the electrical wiring associated with other types of interlocks making it cost effective to install and maintain.

Why Interlocks?

Interlocking is a method of controlling two or more interdependent operations which must take place in a predetermined sequence, if necessary remotely controlled or time delayed. The need for this sequence may be safety to personnel and equipment, or it may be to control processes and productivity.

For Reference-

- ISO 14119 is the interlocking standard that forms part of the machinery directive.

- ISO/TS 19837:2018 is the technical specification relevant to trapped key interlocking.

Why Mechanical?

- One power isolator can be used for multiple doors through the use of a key exchange unit.

- This reduces any fault masking risks and wiring installation required.

- In addition mechanical interlocking is the only method of safeguarding solutions for multiple energy sources.

- Personnel keys can be used to prevent unexpected start up of machinery as per ISO 14118, removing the necessity for escape functions.

Key Operated Switch

Key removed, contacts opened

Key Exchange Device

Access Lock

Key trapped, actuator removed

Access lock with Personnel Key

Access key trapped, Personnel key removed, Access door open

mGard Range
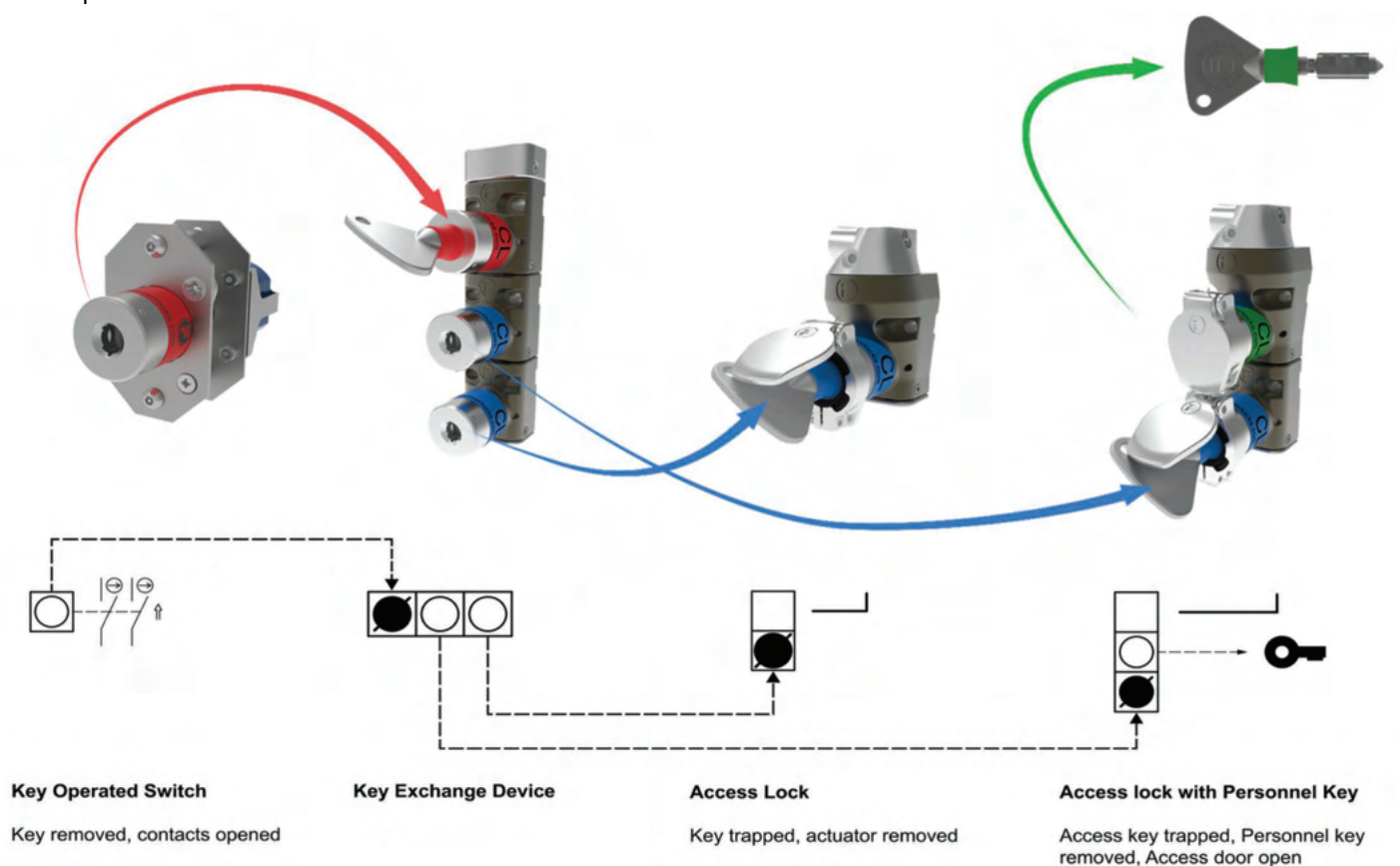
Power Isolation

Power Interlocking

Bolt Interlock with Limit Switch

Circuit Breakers

Valve & Pneumatic Interlocks

Mechanical Bolt Interlock
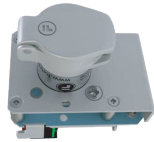
Bolt Interlock with Switch

Knob Operated Switch Control Unit

Key Operated Switch Control Unit

Electronic Time Delay Unit

Voltage Sensing Unit

Control Interlocking

Panel Mounted   Panel Mounted Weatherproof   In Enclosure

Key Switch(es)

Mini Solenoid Controlled Key Switch(es)

Solenoid Controlled Key Switch(es)

ATEX and IECEX Approved Key Switch

ATEX and IECEX Approved Solenoid Controlled Switch

Accessories

Extension Module

Dustcovers (Available as Standard & Padlockable)

Lockout Hasps (For 3x Padlocks)

Back of Board Mounting Kit

Keys & Locks

Masterable

Standard

Colours available for key bow and dustcovers.

Colours available for key seal and lock label.

3 lines of 10 characters available for engravings.

Low Profile

Key Exchange

Modular Key Exchange Unit with Switch(es)

Modular Key Exchange Unit

Door Locks

Multiple Modular Door Interlock

Single Door Interlock

All in One Door Interlocks

Forced Safety Key Door Interlock

Actuators

Self Aligning Actuator

Compressible Actuator

Spring Released Handle Operated Actuator

Handle Operated Actuator

Fixed Actuator

Introduction to amGardpro

A completely configurable safety interlocking solution allows specification of functionality to meet the exact requirements of your application. Pushbutton controls, ethernet connectivity and trapped key options can all be combined together into a single unit – providing a cost efficient solution compared to separate devices.

Fortress amGardpro products are designed, tested and TUV approved for use in Category 4/PLe safe control systems. The robust design and high strength rating of a Fortress interlock does not require additional safety components to be mounted to the gate to meet PLe. The integration of trapped keys within the unit can restrict access or protect employees during whole body access.
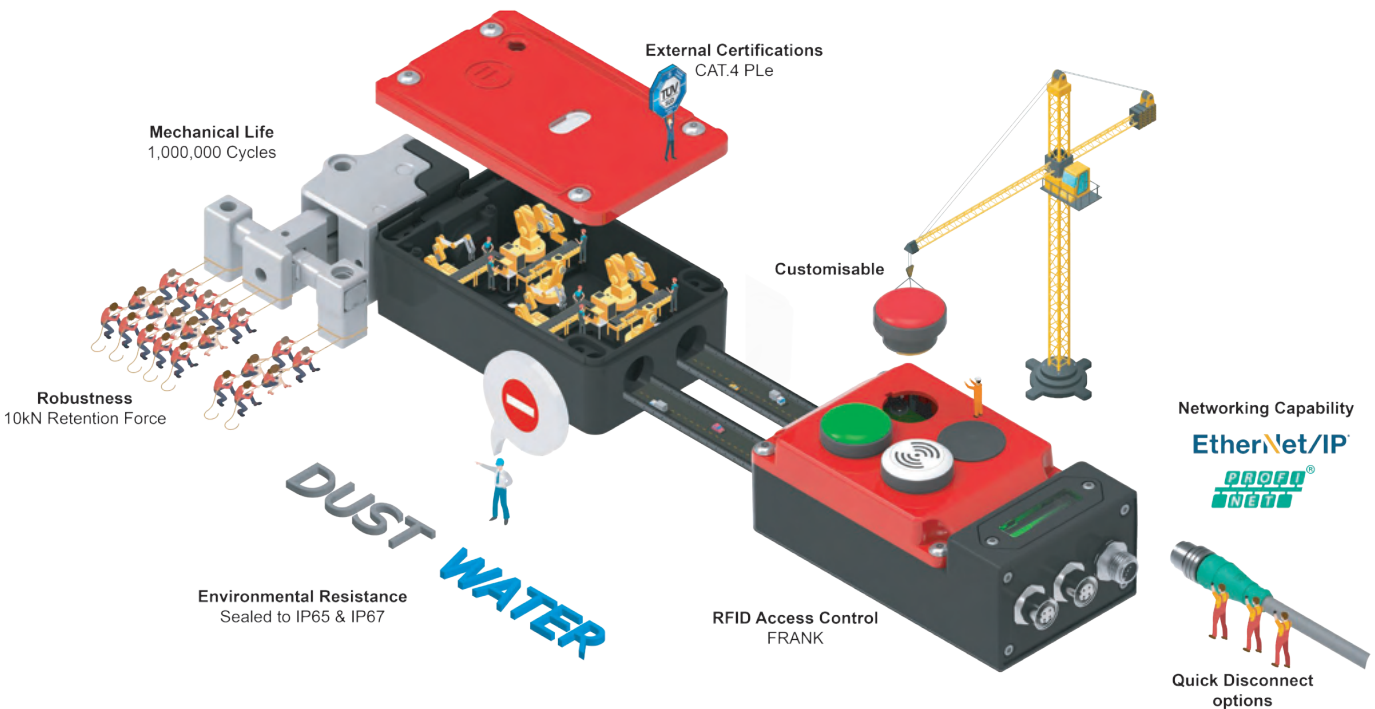
For connectivity, all devices can be specified with a quick disconnect receptacle and ordered with the correct mating cable in a variety of lengths. Or if ethernet architectures are preferred, safety over ethernet protocols can be integrated by using the proNet module which supports PROFINET/PROFIsafe and EtherNet/IP CIP safety.

Frank is the integration of existing site RFID access cards as part of a software based access approval system for manufacturing areas. Data is collected in the Fortress system for data insights that can support efficiency analysis.

Frank is the integration of existing site RFID access cards as part of a software based access approval system for manufacturing areas. Data is collected in the Fortress system for data insights that can support efficiency analysis.

When mounting to machine guarding, mounting plates can be pre-fitted to the Fortress units to reduce fixings required in installation down to two 40mm wide variants are also available to fit narrow profiles.

Note: Our online product configurators are available on our website - **www.fortress-safety.com**

Suited to the demanding environments

Completely configurable

Ethernet connectivity options

External Certifications
CAT.4 PLe

Mechanical Life
1,000,000 Cycles

Customisable

Robustness
10kN Retention Force

DUST WATER

Networking Capability

EtherNet/IP

PROFINET

Environmental Resistance
Sealed to IP65 & IP67

RFID Access Control
FRANK
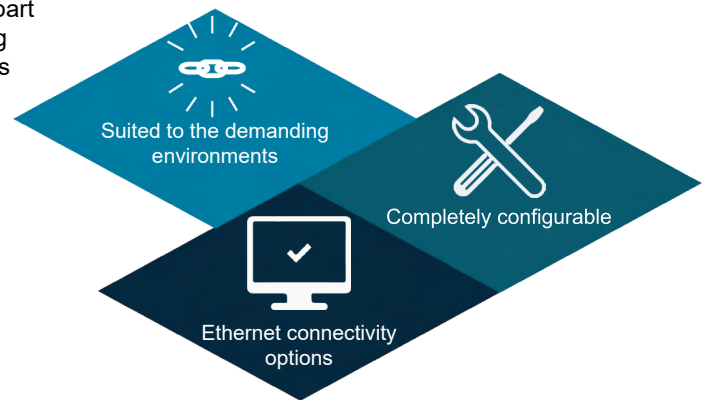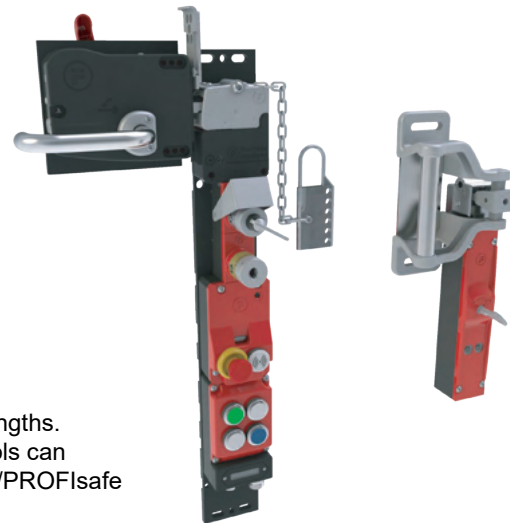
Quick Disconnect options

Guard Switch

2NC, 1NO heavy duty safety switch.

SA4S6ST401

Guard Lock with Forced Extracted Key

Personnel key is required to be taken by the operator before guard opens.

SD2S6EKL3ZL411MPB1

Guard Lock

Heavy duty Power-to-Unlock solenoid safety interlock.

SA2S6ZL411MPB1

Guard Lock with Single Action Escape Release

Ergonomic handle incorporates escape release in a single action. Operating red handle overrides locking mechanism and opens guard.

EI2A6SR411

Guard Lock with Escape Release

Heavy duty safety interlock with escape release. Activation overrides locking mechanism and creates stop command.

HS1S6R2ZR411

Guard Lock with Integrated Ethernet Communication

PROFINET / PROFIsafe connectivity to the interlock. Pushbuttons & emergency stop incorporated at the guard. EtherNet/IP CIP safety also supported.

EI2A6SRP11NDP6EIP7P2NPF10

What is *pro*Net?

Fortress' *pro*Net allows Fortress devices to become distributed I/O on PROFINET or EtherNet/IP networks. Safety information is exchanged using the PROFIsafe or CIP safety. The *pro*Net module can be configured for standalone control functionality, to power external devices via quick disconnects or as part of an amGard*pro* interlock unit.
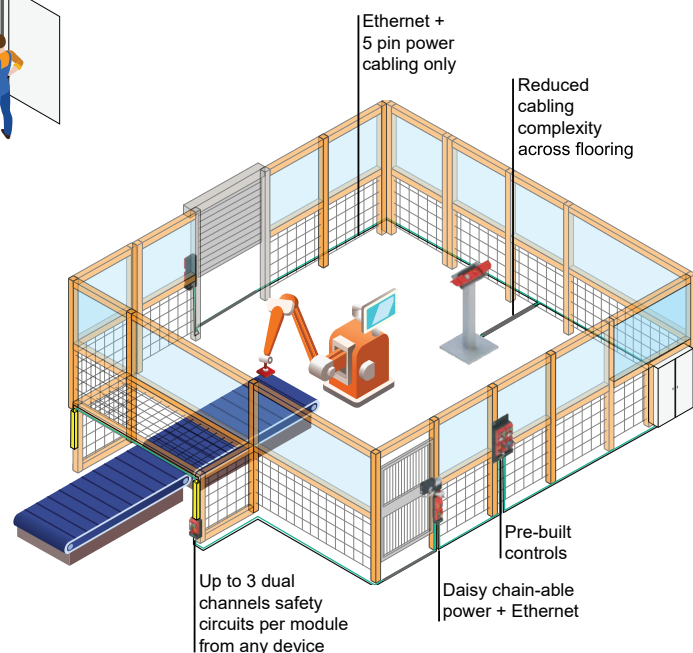
Product Features:
- 3 dual channel safety inputs are supported. Can be utilised for guard locking, emergency stops and enabling switch connection all within one unit.
- Standard I/O for pushbutton / lamp functionality is extendable up to 40 I/O per configuration.
- An integrated network switch facilitates 'daisy-chain' bus topologies with no additional hardware.
- I6 I/O is available as protected external I/O via quick disconnects.
- F-address are set via web interface or DIP switches.
- Diagnostic functions available via web interface (supply voltage, current F-address, ethernet connection statistics).
- Variety of connection options including AIDA specification, M12 and 7/8" receptacles.

Control Stations

Fortress' *pro*Net control stations are configurable network solutions aimed at reducing the cost of installation / ownership of bespoke fabrications with hardwired control functionality.

Costs associated with wiring time, panel building, panel space and the purchasing of enclosures, IO modules, terminals, multi core cables, industrial connectors at the machine or cell for the safety switches, sensors and interlocks can be avoided. Units arrive ready to be plugged into the network via quick disconnects.

Control and safety communication are transmitted over a single ethernet cable plugged into the Fortress unit. 3 dual channel safety inputs are supported with 1 dual channel safety output.

Multi core cabling

Industrial connectors + armoured cable

Wiring time

Ethernet + 5 pin power cabling only

Reduced cabling complexity across flooring

Cable management

Panel Building

Up to 3 dual channels safety circuits per module from any device

Pre-built controls

Daisy chain-able power + Ethernet
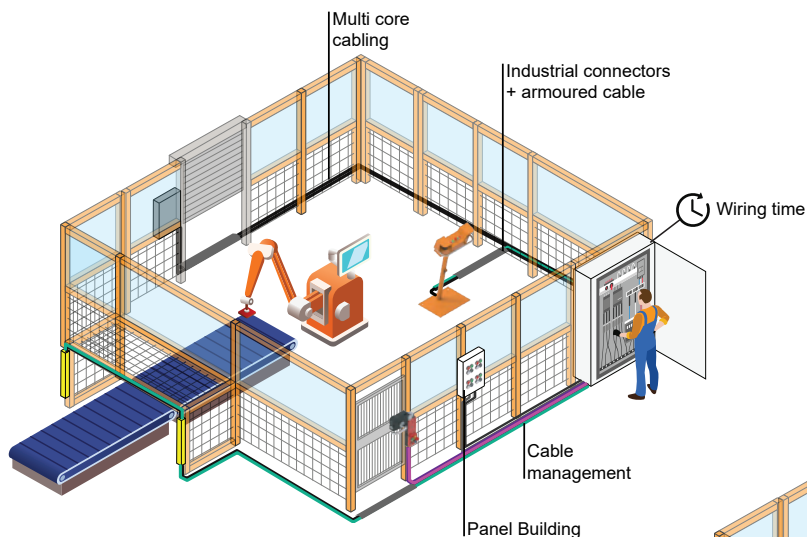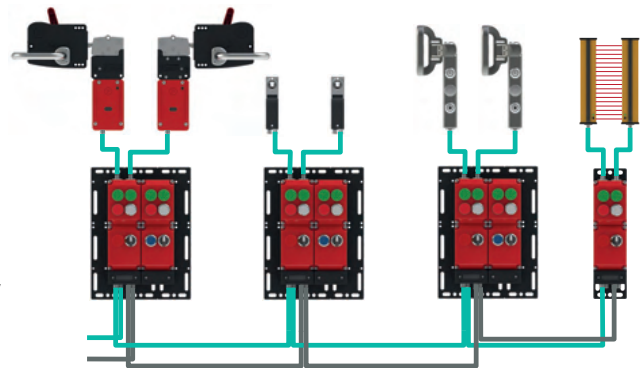
Fortress RFID Access Network Keys

Interlocks control when you can access equipment safely, Frank controls who can access equipment safely.

By integrating readers to suit the existing site RFID access cards into a Fortress device and providing a software based access approval control system; Frank can be integrated into automation systems with simple input / outputs to a PLC.

Data of who, when and where from access events is collated to a central point within facilities to allow for viewable events lists and data insights that can support efficiency analysis.

Fortress supports common card types including:

- 13.56MHz ISO 15693
- 13.56MHz with manufacturer's specific protocol
- 13.56MHz ISO 14443A
- 125kHz with manufacturer's specific protocol

Control Access

Frank system cross-references user credentials

Local controller reports activity to master controller

Machine stops

User requests access using personal employee card

User approved, PLC processes inputs and door unlocks

Manage Productivity

PLC processes inputs, door locked. Local controller reports activity to master controller

Machine restarts

Master controller logs all activity and manages permissions

User finishes task, closes the interlock and badges out using personal employee card

Viewable events list and insights

amGardpro Range

Slimline Linear Insertion Head

Rotary Insertion Head

Linear Insertion Head

Single Action Escape Release Head

Actuator

Slidebar

Rotary Insertion Handle

Ergonomic Handle, Open & Close from Both Sides

Single Action Escape Release Handle

Long Hinged Handle

Ergonomic Handle, No Interior Handle

Short Hinged Handle

Handle Actuator

Tongue

Mechanical Ends

Cap

Accessories

Lock-Out Clip

Drop Down Lock-Out

Mounting Plates

Ergonomic Handle

Hinged Handle

Tongue & Rotary Insertion Handle

Slidebar

80 mm

40 mm

Trapped Key Adaptors

Access Key Adaptor

Safety Key Adaptor

Extracted Key Adaptor

Switches / Locks

Non Solenoid Switch Body

Solenoid Controlled Switch Body

Slimline Solenoid Controlled Switch Body

Option Pods

Networked Option Pod

Option Pod

Key Switch Pod

Slimline Pod

Quick Disconnects

Power & Data Connector Sets

19 Pin M23

12 Pin M12

10 Pin M12

8 Pin M12

5 Pin M12

Mechanical Ends

Foot

Escape Release Adaptors

Pushbutton Reset

Security Tool Reset

Introduction to tGard

tGard is a compact metal bodied system that enables the configuration of interlocks with or without guard locking, mechanical trapped key interlocks, and electrical operator controls either as separate devices or any combination of these three functions in one device.

tGard offers "a customised safety solution, as standard". Each order is defined by a range of tGard elements that include interlock safety switches, High Level Coded RFID, personnel keys, escape release, E-Stops, pushbuttons, selector switches, indicator lamps and a choice of operating handles for hinged and sliding guard doors.

tGard's metal body includes through-holes for quick installation on aluminium profiles, flat surfaces, doors and even back of panels without the need for mounting plates.

tGard is IP65 as standard and has been designed to be fully compliant with machinery safety standards.

Configuration Example

Handle Actuator with an internal door knob

Escape Release

Personnel (Safety) Key and Lock
(Proactive inhibit of reset)

Access Key and Lock
(Restricts access to key holders)

Safety contacts & Power-to-Unlock Solenoid

Emergency Stop Element

Pushbutton Control Element

High Level Coded RFID Element
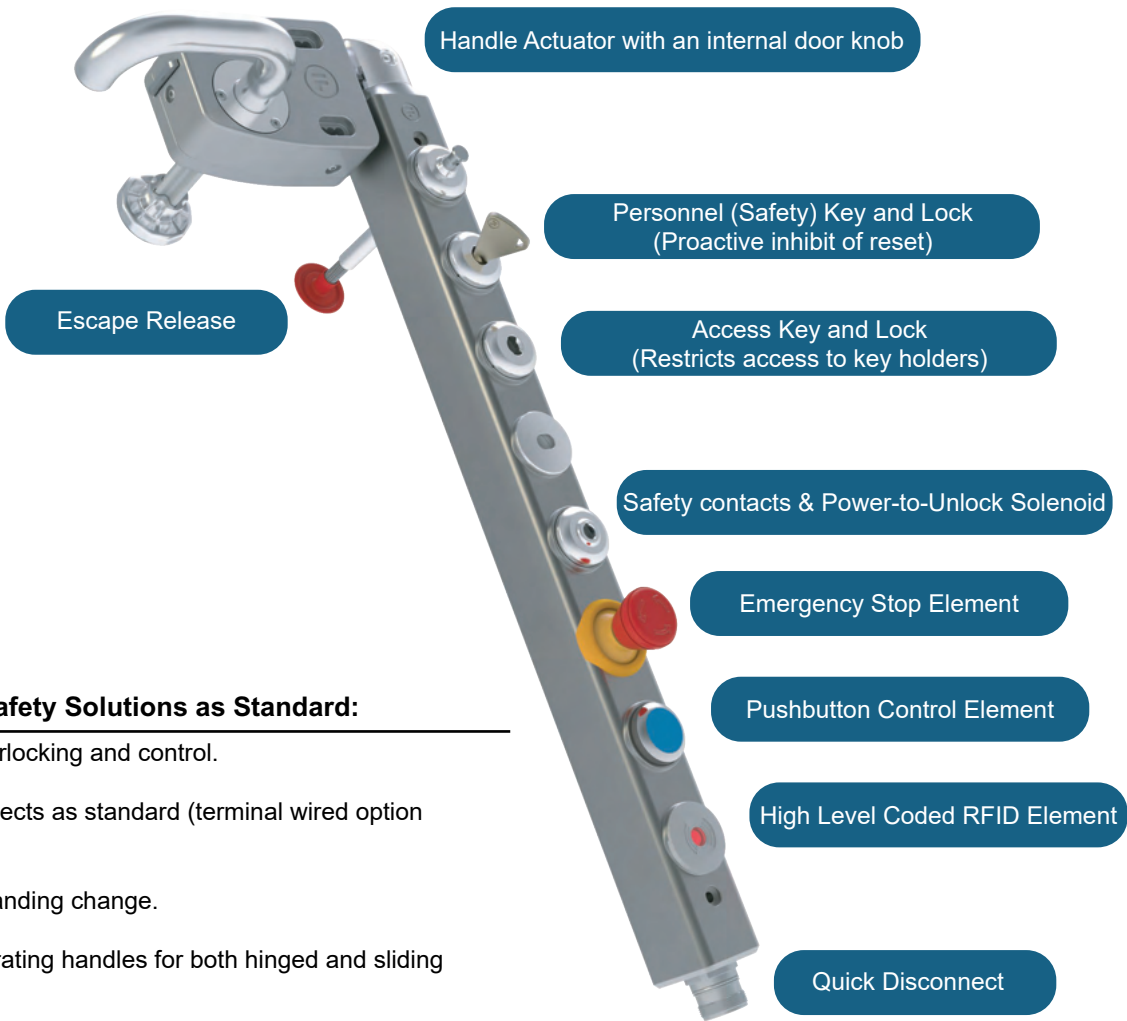
Quick Disconnect

Customised Safety Solutions as Standard:

- Combines interlocking and control.

- Quick Disconnects as standard (terminal wired option available).

- Fast on-site handing change.

- Choice of operating handles for both hinged and sliding guard doors.

- High Level Coded RFID option.

How to Configure

Configuration tools are available on the Fortress website, **www.fortress-safety.com**

THE - Actuator + Head Combined

TRX - Escape Release

TSN - Lock for Personnel (Safety) Key

TSMDL - Solenoid

TEC - E-Stop

TLG - Green Indicator Lamp

TP6 - Blue Pushbutton

TG1 - Red Pushbutton

T2E - Selector Switch

TNR - High Level Coded

TQM - Quick Disconnect

Order of elements in a device:

1. Actuator
2. Head
3. Escape release
4. Locks for personnel (Safety) keys
5. Locks for access keys
6. Interlock safety contacts and solenoid
7. E-Stop
8. 1 x NO 1 x NC blue pushbutton
9. Standard controls (any order)
10. High Level Coded
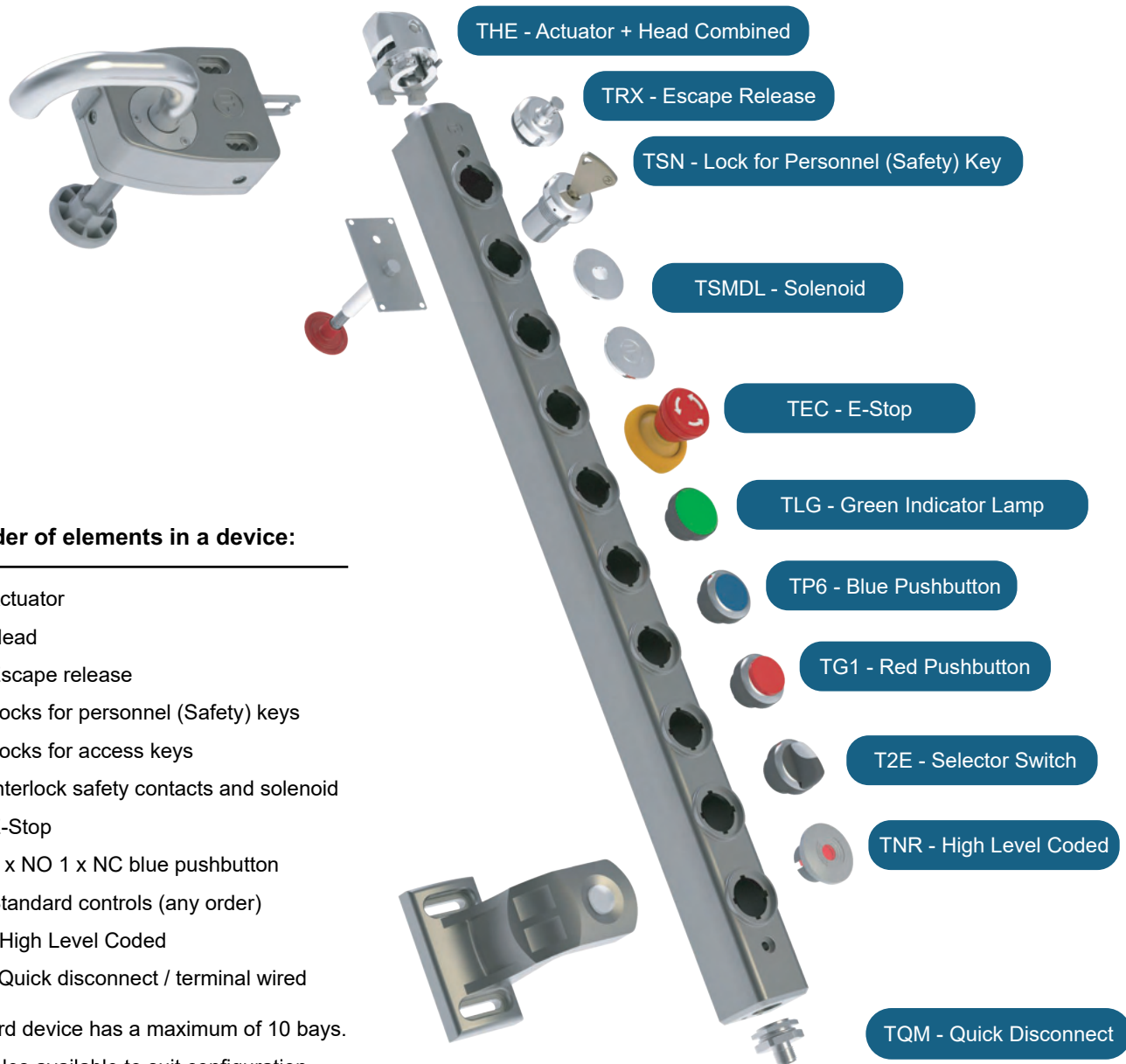11. Quick disconnect / terminal wired

tGard device has a maximum of 10 bays.
Cables available to suit configuration.

Configuration Example

At the end of the selection process, the part numbers drop their "T", except the first item. Example:

THE + TRX + TSN +TSMDL + TEC + TLG + TP6 + TG1 + T2E + TEB + TQM = THERXSNSMDLECLGP6G12ENRQM

When creating a tGard stack, the wiring of connections follow these rules:

1. Safety circuits are in fixed positions on each connector and comprise of volt free circuits for SSR options, or are +24V taken from the supply voltage for OSSD.
2. Inputs / outputs are allocated from the bottom of the stack, ascending.
3. On any one element, the inputs are assigned first, then the output(s).
4. Outputs are +24v, taken from the +24v supply, except for volt free options.
5. Selection of the connector depends upon the wiring requirements for inputs / outputs / safety circuit of the total stack.

tGard Range

Actuators

Heads

Head

Cap

High Coded Actuator

Sliding Actuator

Hinged Actuator

Fixed Actuator

Handle Actuator

Handle Actuator (No Internal knob)

Core Elements

High Level Coded

Lock for Access Keys

Lock for Personnel (Safety) Keys

Escape Release

Blue Pushbutton with 1xNO & 1xNC Contacts

Emergency Stops

Extension Blank Element

Interlock Safety Contacts & Solenoid Locking

Core Elements

Non-Illuminating Switches

3 Position Selector Switch

Mushroom Pushbutton

2 Position Selector Key Switch

2 Position Selector Switch

Indicator Lamps

Pushbuttons

Illuminating Switches

3 Position Selector Switch

2 Position Selector Switch

Pushbuttons

Base Elements

Safety & Control Quick Disconnect Connectors

OSSD

AS- interface

Self Wire

Foot

Keys & Accessories

Packlockable Hasp

Cables

Keys

Teach Token

For more information on the padlockable hasp see head & cap element operating instructions.

Fortress' Hygienic Interlocking Solutions or Louis includes the Hygienic Guard Lock and Non-Contact Switch product offering. Our inspiration for the name is based on Louis Pasteur who was a French biologist, microbiologist and chemist remembered for his remarkable breakthroughs into the causes and prevention of diseases. He is also known by name for the invention of the pasteurisation process.

Louis' discoveries and inventions have saved lives across the world, we want our products to do the very same by providing the best safety solutions possible.

We have often seen safety interlock products not holding up to high intensity wash-down procedures. Fortress is able to not only provide solid state non contact sensors that resist high pressure cleaning, but we have also used RFID actuator coding for guard locking applications to create an extremely robust interlock with hygienic design features which is then ideal for use in a clean-in-place environment.

The Louis Range

Stainless steel safety on guard switching devices have been routine within sterile manufacturing environments, to create insta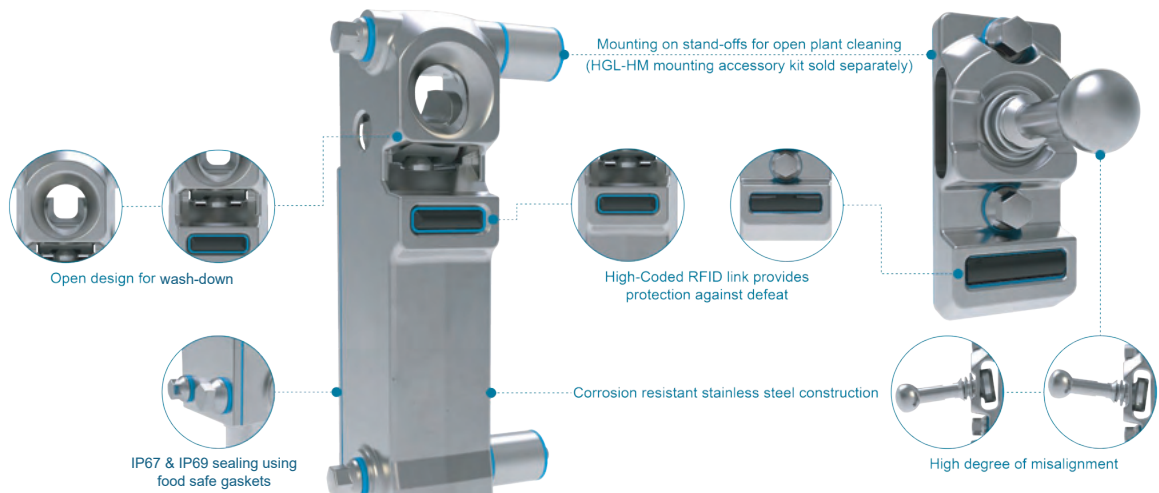nt stop commands upon a guard opening. However, in certain applications, processes do not instantly stop upon opening the guard, such as a mixing blade which will continue to rotate and present a danger upon the guard opening. Fortress now offer a stainless steel safety on guard locking product which has been third party verified for hygienic design and construction as part of the 3-A Replacement Parts and System Component Qualification Certificate (RPSCQC) Program.

The Hygienic Guard Lock (HGL) is designed for controlled access in environments where caustic wash-down processes are commonplace, and bacteria growth must be prevented. The HGL has an open design to maximise access for cleaning and minimise potential bacterial growth locations. The IP67 & IP69 sealing and FDA food contact compliant Silicon Rubber interfaces between stainless steel component, have been carefully selected with open plant cleaning and CIP (clean-in-place) in mind.

Mounting on stand-offs for open plant cleaning
(HGL-HM mounting accessory kit sold separately)

Open design for wash-down

High-Coded RFID link provides protection against defeat

Corrosion resistant stainless steel construction

IP67 & IP69 sealing using food safe gaskets

High degree of misalignment

The Non-Contact safety switch is a magnetically coded, robust stainless steel IP67 and IP69 proximity switch ideal for any environment which requires wash-down procedures or caustic cleaning.

The simple design of these switches minimises surfaces for contaminants to grow and maximises accessibility for cleaning.

Hygienic Guard Lock

High-Coded Versatility	Localised Indication	Robust	Hygienic Design	Maximise Ingress Protection
Over **4x10⁹** RFID codes	Device status outputs via shatter-proof LED	316 and CF8M Stainless steel enclosure construction	Minimises risk of bacteria growth and contamination	IP67 / IP69 protection for use in wash-down

Over **4×10^9** RFID codes

Select a Hygienic Guard Lock beginning HGL-
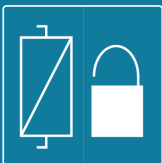
Part Number	Safety on Guard Locking	Connector Option		Safety on Guard Only	Safety on Guard Only
				Power-To-Unlock	Power-To-Lock
HGL-100A2-A			Daisy chain with 2 x 5-Pin M12	HGL-110A2-A	HGL-610A2-A
HGL-100A3-A	24V Power-To-Unlock		8-Pin M12	HGL-110A3-A	HGL-610A3-A
HGL-100A1-A			5-Pin M12	HGL-110A1-A	HGL-610A1-A
HGL-100A4-A			2 x 5-Pin M12	HGL-110A4-A	HGL-610A4-A

NON-CONTACT SWITCH
FMF RANGE

FORTRESS

Non-Contact switches fitted to conveyor machine hatches

Opening hatch will open safety circuits to stop machine

7-10mm operating distance

Able to operate in temperatures up to 125°C

Switch & Actuator IP69 rated manufactured from 316 stainless steel
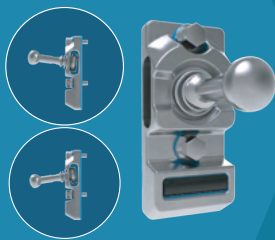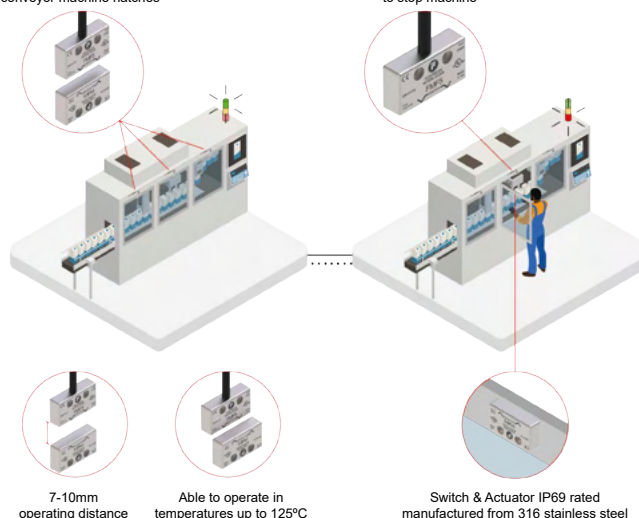
The Non-Contact Safety Switch

The Non-Contact safety switch is a magnetically coded, robust stainless steel IP67 and IP69 proximity switch ideal for any environment which requires wash-down procedures or caustic cleaning.

The simple design of these switches minimises surfaces for contaminants to grow and maximises accessibility for cleaning

High Temperature Non-Contact Switch

Use in temperatures between -25 C and 125 C

316 stainless steel housing

Installation envelope of 29mm x 53mm x 13.5mm

IP67 / IP69 protection for use in wash-down

ENVIRONMENT RESISTANCE

ROBUST

COMPACT

MAXIMISE INGRESS PROTECTION

The FMF range are magnetically operated safety switches

Easy to install and maintain, the FMF are fully encapsulated non-contact switches ideal for long term use in harsh / wet environment.

- Non-Contact Operation
- IP67 Fully Sealed, Washdown
- ABS 2A Switching Capability
- Large Range of Sizes

Technical Specifications	FMF5 / FMF5-SS			FMF7 / FMF7-SS
Contacts	Max 2 NO + 1 NC			Max 2 NO + 1 NC
Safety Contact Rating	24Vdc / 500mA			24Vdc / 500mA
Safety Contact Switching	7mm ON / 17mm OFF			7mm ON / 20mm OFF
Auxiliary Contact Rating	24Vdc / 500mA			24Vdc / 500mA
Auxiliary Contact Switching	7mm OFF / 17mm ON			7mm OFF / 14mm ON
External Fuse (customer supplied)	0.3 Amps Fast Acting			0.3 Amps Fast Acting
Construction	RED ABS or 316 Stainless Steel			RED ABS or 316 Stainless Steel
IP Rating	IP67 / IP69K			IP67 / IP69K
Operating Temperature	-25°C to +55°C	-25°C to +125°C (HT)	-25°C to +70°C (PUR)	-25°C to +55°C
Fixing	M4 Torx security screws, Tightening 1.0NM			M4 Torx security screws, Tightening 1.0NM
Connection	Pre-wired or M12 Leaded Quick Disconnect			Pre-wired or M12 Leaded Quick Disconnect
Vibration / Shock	50 - 100 Hz 10g			50 - 100 Hz 10g

Dimensions

Operation

Operation

The FMF5 & FMF7 safety switches and actuators are designed to approach each other from most angles. When the guard is closed the targets on the printed face of the switch and actuator must be aligned.

MAGNETIC SAFETY SWITCH

The FMF range are magnetically operated safety switches.

Easy to install and maintain, the FMF are fully encapsulated non-contact switches ideal for long term use in harsh / wet enironment.

- • Non-Contact Operation
- • IP67 Fully Sealed, Washdown
- • ABS 2A Switching Capability
- • Large Range of Sizes

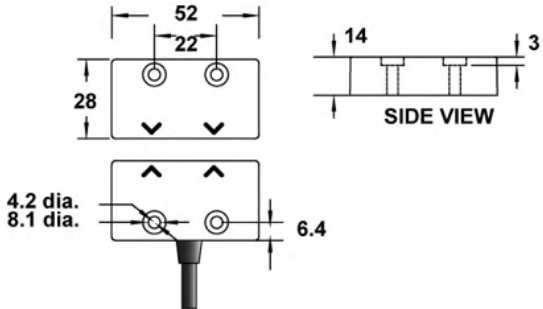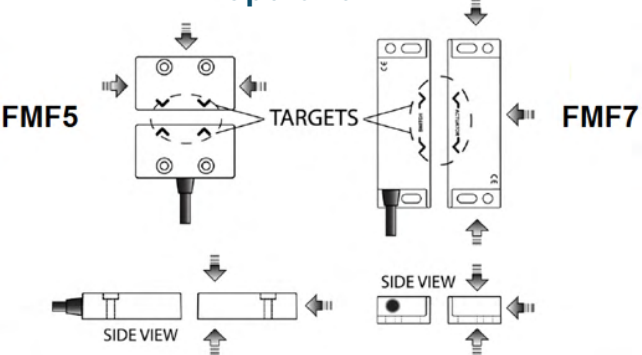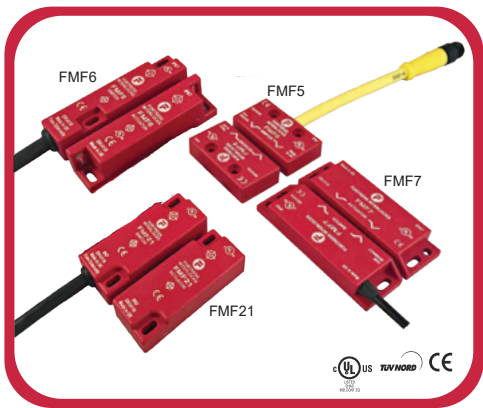| Fortress Item No.	Description
FMF5-21-DC-03M	FMF5-21-DC-03M SWITCH & ACTUATOR
FMF5-21-DC-06M	FMF5-21-DC-06M SWITCH & ACTUATOR
FMF5-21-DC-LQD	FMF5-21-DC-LQD SWITCH & ACTUATOR (NO CABLE)
FMF5-ACT	FMF5-ACT ACTUATOR ONLY
FMF5-SS-21-DC-03M	FMF5-SS-21-DC-03M
FMF5-SS-21-DC-05M	FMF5-SS-21-DC-05M
FMF5-SS-21-DC-LQD	FMF5-SS-21-DC-LQD
FMF5-SS-21-DC-05M-HT	FMF5-SS-21-DC-05M (High Temp)
FMF7-21-DC-03M	FMF7-21-DC-03M SWITCH & ACTUATOR
FMF7-21-DC-06M	FMF7-21-DC-06M SWITCH & ACTUATOR
FMF7-21-DC-LQD	FMF7-21-DC-LQD SWITCH & ACTUATOR (NO CABLE)
FMF7-ACT	FMF7-ACT ACTUATOR ONLY
FMF7-SS-21-DC-03M	FMF7-SS-21-DC-03M
FMF7-SS-21-DC-05M	FMF7-SS-21-DC-05M
FMF6-21-DC-03M	FMF6-21-DC-03M SWITCH & ACTUATOR
FMF6-21-DC-06M	FMF6-21-DC-06M SWITCH & ACTUATOR
FMF6-21-DC-QD	FMF6-21-DC-QD SWITCH & ACTUATOR (NO CABLE)
FMF6-ACT	FMF6-ACT ACTUATOR ONLY
FMF6-SS-21-DC-03M	FMF6-SS-21-DC-03M
FMF6-SS-21-DC-06M	FMF6-SS-21-DC-06M
FMF6-SS-21-DC-LQD	FMF6-SS-21-DC-QD
FMF21-21-DC-03M	FMF21-21-DC-03M SWITCH & ACTUATOR
FMF21-21-DC-06M	FMF21-21-DC-06M SWITCH & ACTUATOR
FMF21-21-DC-QD	FMF21-21-DC-QD SWITCH & ACTUATOR (NO CABLE)
FMF21-ACT	FMF21-ACT ACTUATOR ONLY
FMF21-SS-21-DC-06M	FMF21-SS-21-DC-03M
FMF21-SS-21-DC-03M	FMF21-SS-21-DC-06M
FMF21-SS-21-DC-LQD	FMF21-SS-21-DC-QD

CODED MAGNETIC SAFETY SWITCHES

Fortress Item No.	Description
FEF1-21-DC-03M	FEF1-21-DC-03M SWITCH & ACTUATOR
FEF1-21-DC-06M	FEF1-21-DC-06M SWITCH & ACTUATOR
FEF1-21-DC-LQD	FEF1-21-DC-LQD SWITCH & ACTUATOR (NO CABLE)
FEF1-ACT	FEF1-ACT ACTUATOR ONLY
FEF1-SS-21-DC-03M	FEF1-SS-21-DC-03M
FEF1-SS-21-DC-06M	FEF1-SS-21-DC-06M
FEF1-SS-21-DC-LQD	FEF1-SS-21-DC-LQD
FEF2-21-DC-03M	FEF2-21-DC-03M SWITCH & ACTUATOR
FEF2-21-DC-06M	FEF2-21-DC-06M SWITCH & ACTUATOR
FEF2-21-DC-LQD	FEF2-21-DC-LQD SWITCH & ACTUATOR (NO CABLE)
FEF2-ACT	FEF2-ACT ACTUATOR ONLY
FEF2-SS-21-DC-03M	FEF2-SS-21-DC-03M
FEF2-SS-21-DC-06M	FEF2-SS-21-DC-06M
FEF2-SS-21-DC-LQD	FEF2-SS-21-DC-LQD
FEM40-21-DC-03M	FEM40-21-DC-03M SWITCH & ACTUATOR
FEM40-21-DC-06M	FEM40-21-DC-06M SWITCH & ACTUATOR
FEM40-ACT	FEM40-ACT ACTUATOR ONLY
FED-21-DC-03M-C	FED-21-DC-03M-C SWITCH & ACTUATOR
FED-21-DC-06M-C	FED-21-DC-06M-C SWITCH & ACTUATOR
FED-21-DC-03M-L	FED-21-DC-03M-L SWITCH & ACTUATOR
FED-21-DC-06M-L	FED-21-DC-06M-L SWITCH & ACTUATOR
FED-21-DC-03M-R	FED-21-DC-03M-R SWITCH & ACTUATOR
FED-21-DC-06M-R	FED-21-DC-06M-R SWITCH & ACTUATOR
FED-ACT	FED-ACT ACTUATOR ONLY
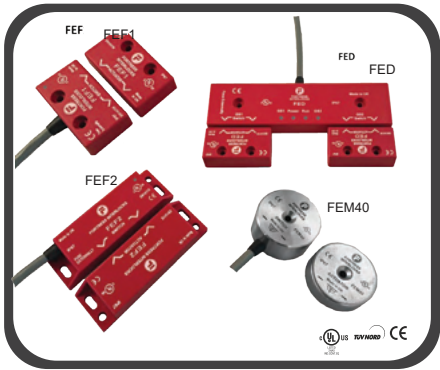
Fortress FE range are magnetically coded, solid state non-contact safety switches for use in machine guarding applications.

The solid state design in even more tolerant to shock and vibration making for a more reliable machine.

- • Non-Contact Operation
- • Solid State Coded Magnetic
- • IP67 Fully Sealed, Washdown
- • ABS or Stainless Steel
- • Dual Colour LED Indication

INDIVIDUALLY CODED OR ONE GENERIC CODE

- Non-Contact Operation
- Volt Free Contacts (Not OSSD)
- LED Guard Indication
- IP67 / IP69K Fully Sealed
- RFID Technology

Based on RFID technology, the FR and FS type switches are designed to provide a higher level of security when machine guarding. Unlike the competition, the FR and FS safety switches feature volt free contacts making them compatible with most safety relays on the market.

These switches also feature LED guard indication, an ingress protection rating of IP69K and multiple housings to suit most applications.

Orange: Individually Coded

Fortress Item No.	Description
FRNK-21-DC-03M	FRNK-21-DC-03M SWITCH & ACTUATOR
FRNK-21-DC-06M	FRNK-21-DC-06M SWITCH & ACTUATOR
FRNK-21-DC-LQD	FRNK-21-DC-LQD SWITCH & ACTUATOR (NO CABLE)
FRNK-ACT	FRNK-ACT ACTUATOR ONLY
FRSO-21-DC-03M	FRSO-21-DC-03M SWITCH & ACTUATOR
FRSO-21-DC-06M	FRSO-21-DC-06M SWITCH & ACTUATOR
FRSO-21-DC-LQD	FRSO-21-DC-LQD SWITCH & ACTUATOR (NO CABLE)
FRSO-ACT	FRSO-ACT ACTUATOR ONLY
FRSR-21-DC-03M	FRSR-21-DC-03M SWITCH & ACTUATOR
FRSR-21-DC-06M	FRSR-21-DC-06M SWITCH & ACTUATOR
FRSR-21-DC-LQD	FRSR-21-DC-LQD SWITCH & ACTUATOR (NO CABLE)
FRSR-ACT	FRSR-ACT ACTUATOR ONLY
FRSG-21-DC-03M	FRSG-21-DC-03M SWITCH & ACTUATOR
FRSG-21-DC-06M	FRSG-21-DC-06M SWITCH & ACTUATOR
FRSG-21-DC-LQD	FRSG-21-DC-LQD SWITCH & ACTUATOR (NO CABLE)
FRSG-ACT	FRSG-ACT ACTUATOR ONLY

Fortress Item No.	Description
FSC-11-DC-03M	FSC-11-DC-03M SWITCH & ACTUATOR
FSC-11-DC-06M	FSC-11-DC-06M SWITCH & ACTUATOR
FSC-20-DC-03M	FSC-20-DC-03M SWITCH & ACTUATOR
FSC-20-DC-06M	FSC-20-DC-06M SWITCH & ACTUATOR
FSC-20-DC-LQD	FSC-20-DC-LQD SWITCH & ACTUATOR (NO CABLE)
FSC-ACT	FSC-ACT ACTUATOR ONLY
FRS-21-DC-03M	FRS-21-DC-03M SWITCH & ACTUATOR
FRS-21-DC-06M	FRS-21-DC-06M SWITCH & ACTUATOR
FRS-21-DC-LQD	FRS-21-DC-LQD SWITCH & ACTUATOR (NO CABLE)
FRS-ACT	FRS-ACT ACTUATOR ONLY

Blue: One Generic Code
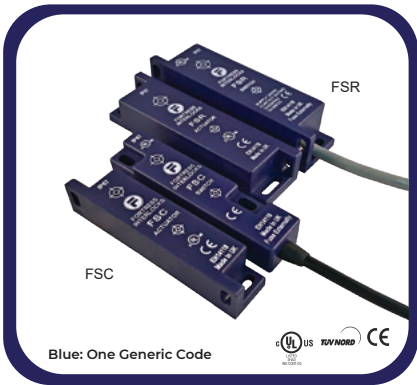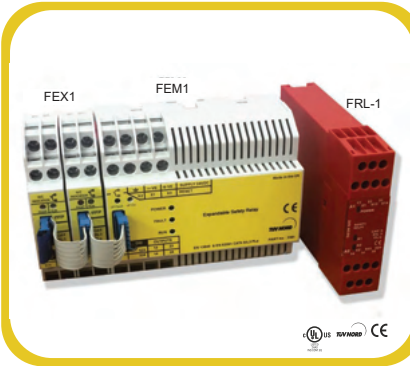
SAFETY RELAYS

Fortress Item No.	Description
FEM1-24VDC	FEM1-24VDC EXPANDABLE SAFETY RELAY
	FEX1 EXTENDER MODULE
FRL-1	FRL-1 SAFETY RELAY 24V AC/DC

FEM1

- Category 4 SIL3 PLe Expandable Safety Relay
- Monitors up to 30 2 N/C Safety Devices
- Guard Fault Indication
- Eliminate Fault Masking
- Volt Free Indication Contacts

FRL1

- Industry Standard Safety Relay
- 24V AC/SC Supply
- Dual Channel Output
- Automatic / Manual-Monitored Reset
- 2 N/C Safety Output / 1 N/C Aux Output

The FEM1 is designed to operate and monitor any device with normally closed outputs. Using the FEX1 extender module, you can monitor up to 30 individal inputs. This product is ideal for anyone looking to eliminate fault masking and achieve a CAT4 SIL3 PL-e safety rating.

What is Atom?

Atom is a compact and ultra-robust RFID high-coded solenoid interlock that we have added to our product portfolio.

Suitable for use in applications up to PLe (Cat.4), **Atom** provides a discreet, easy-to-install solution with monitored inputs and OSSD outputs.

Connection Options:
M12 quick disconnects (QD) are supported in single 5 pin, single 8 pin and double 5 pin configurations with the latter for daisy-chain applications.

Manual auxiliary release can be performed with the override driver bit provided (Power-to-Unlock only).

Mounting Screws and Cable Requirements:
- **4 x M5 security-type mounting screws** for securing Atom switch and actuator. (Please refer to Atom operating instructions for specific detailed requirements).
- **4 x M5 nut / T-nut / threaded hole** for securing Atom switch and actuator.
- **Adhesive threadlocker** to secure mounting screws.
- **Auxiliary release driver bit** (provided) to operate auxiliary release function.
- **Standard M12 cable(s)** to connect and operate Atom switch. (Exact cable depends on connector option).

Dimensional Drawing for Atom with Actuator Unit
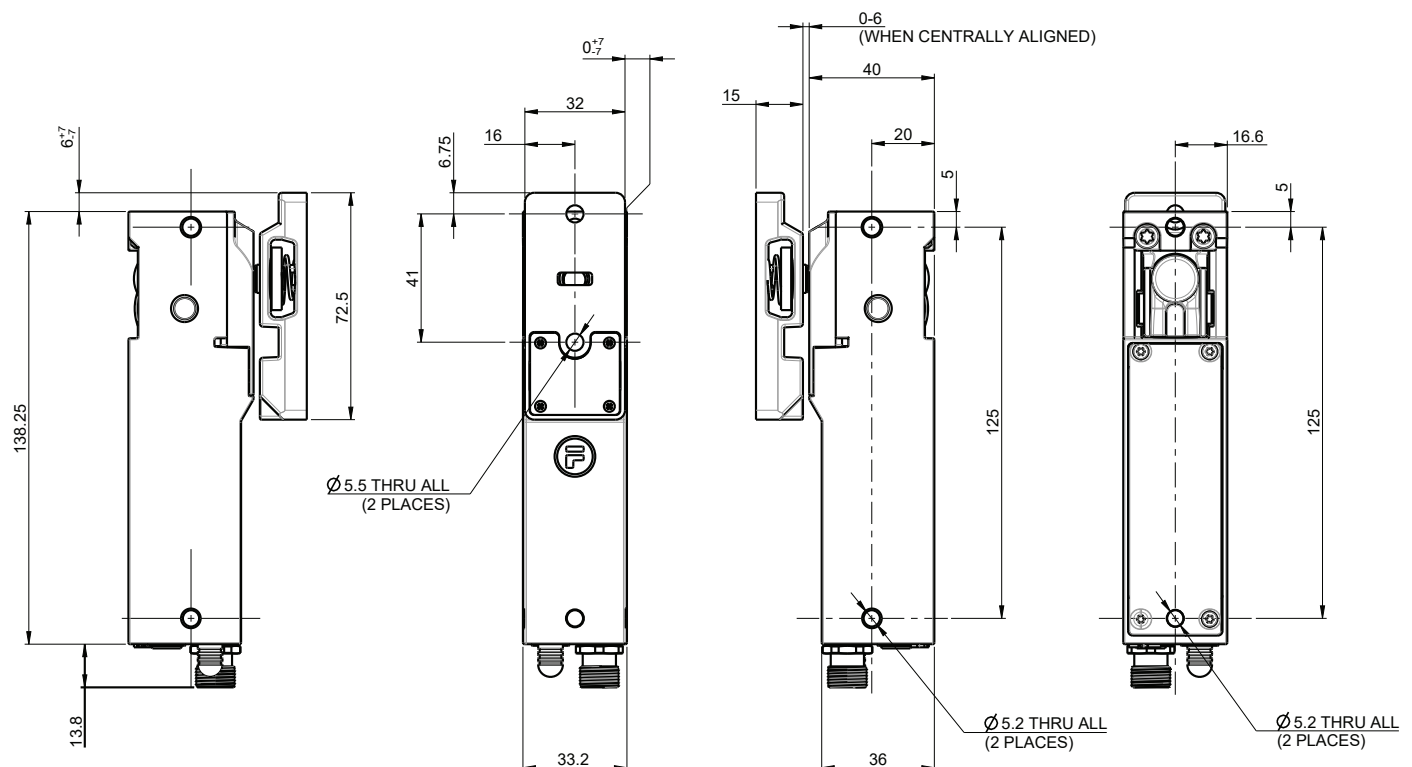
Atom - High Mechanical Misalignment

The **Atom** actuator can pivot and self-centre to operate under a high degree of misalignment.

High maximum retention force of up to 8kN.

Pivoting mechanism is particularly well suited to small radius hinged doors and hatches.
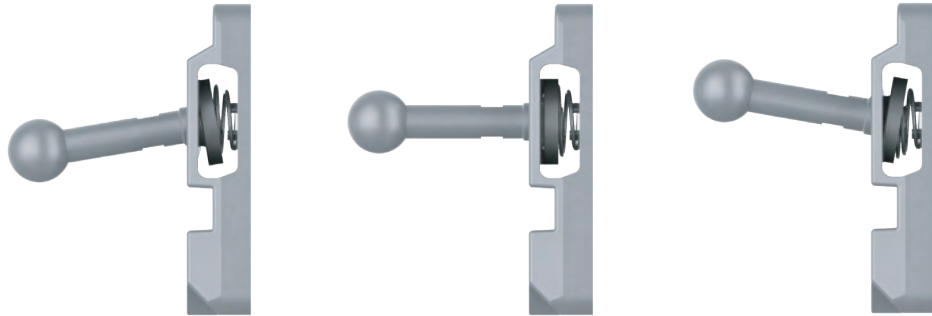
Atom in Action: CNC Machine

If a person requires entry to the machine they must press the 'request to stop' button.

The **Atom** will prevent guard doors from opening whilst the machine is still operating during rundown time.

Once the machine has stopped, the **Atom**'s solenoid is energised which breaks the dual safety circuit to prevent unexpected restart.

Opening the guard door disconnects the RFID connection which prevents inadvertent restart.

High-coded RFID technology prevents any attempts to manually defeat the unit.

When intervention is complete, closing the machine door will re-establish the safety circuits and providing the solenoid is de-energised, the **Atom** unit will then relock and allow for machine restart.

Machinery Safety in Explosive Atmospheres and Hazardous Locations

What is Alfred?

In hazardous locations and explosive atmospheres, installing incorrectly certified equipment can lead to devastating losses; financially through loss of production and damage to facilities to the most extreme cases, where incidents lead to injured personnel or even loss of life.

Alfred is a safeguarding solution which combines machinery safety with protection against explosive atmospheres to keep operators and businesses safe.

The Alfred solution provides mechanical and electromechanical interlocks, or a combination of both for volatile environments, and hazardous locations.

Access to machinery is critical for productivity, however machinery can be dangerous if not correctly guarded.

Processes creating combustible dust as a by-product can pose an explosion risk without correctly certified safeguarding solutions.

Alfred solutions can guarantee safe access and explosion prevention.
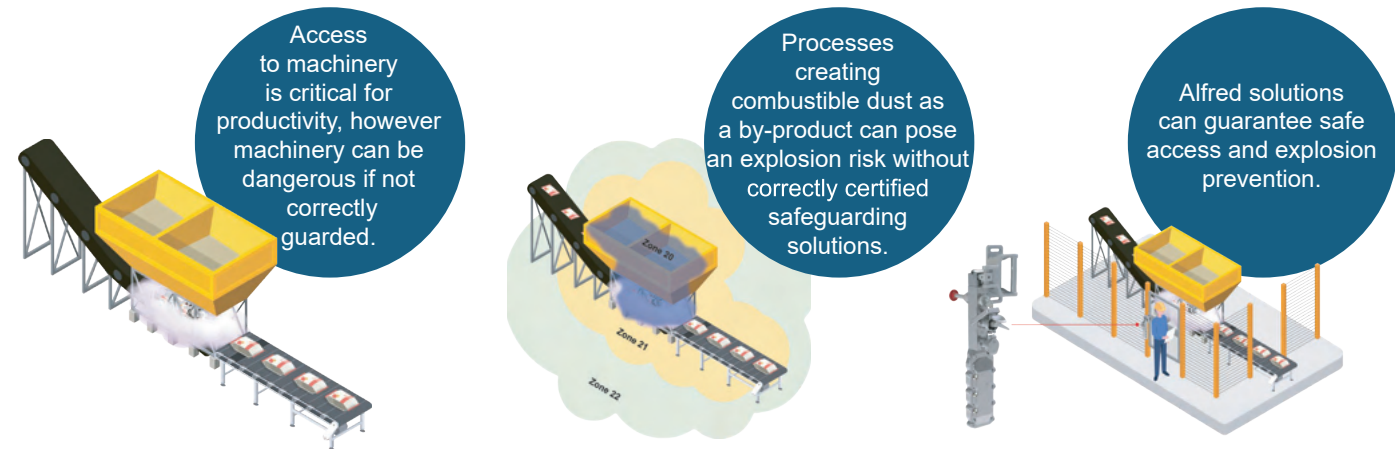
Who are Fortress?

Fortress are safety experts who design and manufacture customised safety equipment, protecting people working in hazardous workplaces. We educate and offer tailored safety solutions which are reliable and extremely durable, guaranteeing minimal downtime while always keeping your people as safe as possible.

Who is Alfred?

Our inspiration for the range is Alfred Nobel, a world-renowned chemist and inventor, his most famed creation being that of dynamite in 1867. Alfred was appalled to see how his invention was used in military operations. To heal a damaged legacy, he dedicated his fortune to the Nobel Prize, an institution which has since inspired multiple generations. The Nobel Peace Prize most notably celebrates those who have sought peace and resultantly saved countless lives across the world.

Through our Alfred range, we intend to save lives by providing the best safety solutions.

Why Choose Alfred?

Highly Customisable

Contact our team to discuss and design your unique Alfred solution

Proactive Inhibit Functions
Protect from unexpected restart with safety keys

Robust

Stainless steel manufacture with a retention force of 7kN

Reliable

Third party certified to guarantee the highest level of safety and product longevity

Maximise Productivity
Designed to enable efficient access with installation local to processes

How Can I Build My Safeguarding Solution?

1. What type of risk assessment are you using for your product?

| **Zonal** Risk Assessment | **Divisional** Risk Assessment | **Other** | **Why** do I need a Risk Assessment? |

A risk assessment helps to map the levels of exposure to the hazardous by-products of processes. The closer the proximity, the higher the exposure, and the greater the ignition risk. This information helps us best advise you on your safety solution.

2. Where in the hazardous location are you installing your safeguarding device(s)?

A. The **entire solution** within any part of **Zone 1 / 21 or 2 / 22** | The **entire solution** within **Division 2** | An area where **exposure** to the **hazardous substance** is **occasional**
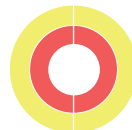
B. A **combination** of **Zone 0 / 20, & Zone 1 / 21** | A **combination** of **Division 1 & Division 2** | An area where **exposure** to the **hazardous substance** is **more frequent**
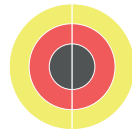
C. Must be **Zone 0 / 20 only** | Must be **Division 1 only** | An area where **exposure** to the **hazardous substance** is **constant**

D. Outside these areas or none of the above? Contact our team and we can support you in designing your safety solution.

3. What are you trying to achieve with your system 'inside' the hazardous location or ex atmosphere?

| A **Mechanical** Solution | **Monitor** an Action | Enforce **Run-Down** through Solenoid Control | **Combined** Sequential System |
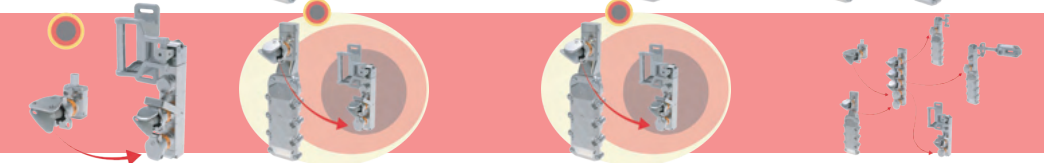
Mechanical Only Solutions

To keep all electrical wiring outside the explosive atmosphere and hazardous location or when installing safeguarding devices into Zone 0, Zone 20, or Division 1, you will need a mechanical only solution.

Trapped key systems eliminate most of the wiring associated with other types of interlocks by using keys to control power and access in sequence.

Mechanical Only solutions for use up to Zone 0 / 20, Division 1
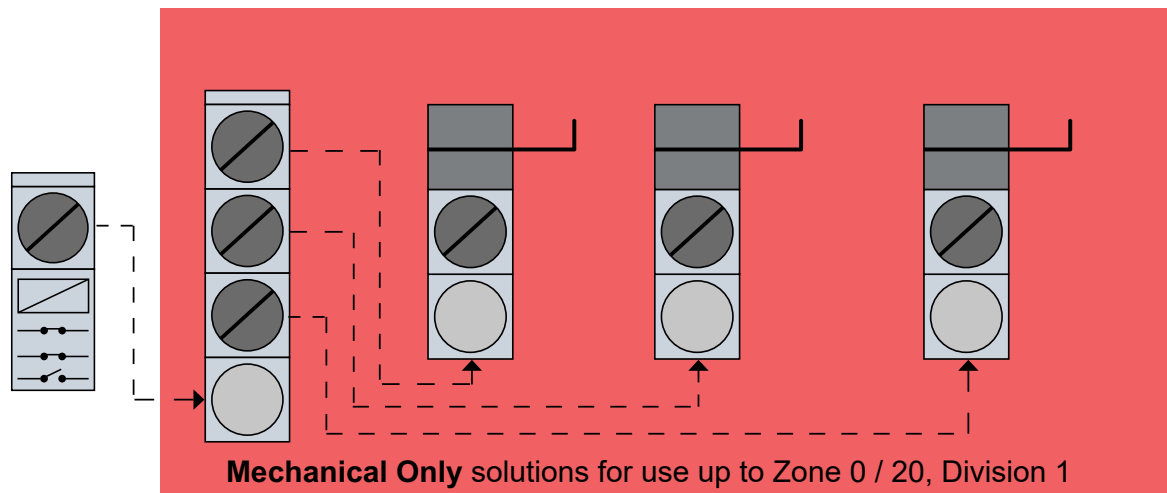
In the example system below, all electrical wiring is kept outside of Zone 2 / 22 or Division 2 (North America) and access is achieved by the release of a solenoid-controlled key shown on the left-hand side of the image, which is inserted into a key exchange, and used to enter the guard through the product shown on the right-hand side.

Keep all **electrical wiring** and switching **outside** the explosive atmosphere.
*Note: Fortress also offer Zone 1, 21, 2, 22 rated switches and solenoids

MACHINE A
AREA B
1103432

The **only third party approved trapped key** interlocks to **SIL 3, Cat 4, PLe**

Use **key exchanges** to link **electrical components** outside the explosive atmosphere with access.

Full 316 stainless steel assembly

Suitable for Zone 0 / 20
Suitable for Division 1

Suitable for Zone 1 / 21
Suitable for Division 1

Suitable for Zone 2 / 22
Suitable for Division 2

Outside the explosive atmosphere

Suitable for use in **all** explosive atmospheres including **Zone 0 / 20**

Rated to **1,000,000** cycles

7kN Head Retention Force

Zone 0 / 20
Zone 1 / Zone 21
Division 1
Zone 2 / Zone 22
Division 2
Outside the explosive atmosphere

Electromechanical Solutions in Hazardous Locations or Ex Atmospheres

Maximising uptime is crucial for productivity. Solenoid locking interlocks and non-locking interlocks with or without trapped keys can be installed for fast and frequent access to the equipment. Controlled access and power isolation solutions within the range have been certified for use up to Zone 1, 21, or Division 2 (North America Only).

In the example below, two access points are guarded by two different devices:
- On the left of the image, a guard lock ensures a run-down time is completed within the cell before access can be granted. The solenoid-controlled lock can be 'unlocked' allowing the guard to be opened.
- On the right side of the image, a safety switch with trapped key adapters monitors the access. An access key needs to be presented to gain access. A safety key carried by the operator prevents restart of equipment. If an operator does become trapped within the safeguarded space, an escape release will override the key mechanism to provide escape.

Suitable for Zone 0 / 20
Suitable for Division 1

Suitable for Zone 1 / 21
Suitable for Division 1

Suitable for Zone 2 / 22
Suitable for Division 2

Outside the explosive atmosphere

Range of interlocks with third party certification up to SIL 3, Cat 4, PLe

Provide **Guard Locking** functionality within **explosive atmospheres**. Prevent access with forced run down using solenoid control.

7kN Head Retention Force

Rated to **1,000,000** cycles

Customise design with **trapped key & escape release** functionality

Provide **Guard Switch** functionality within **explosive atmospheres**. Open safety circuits upon access and feedback to control systems.

Electromechanical solutions with solenoid control for use up to Zone 1 / 21 or Division 2
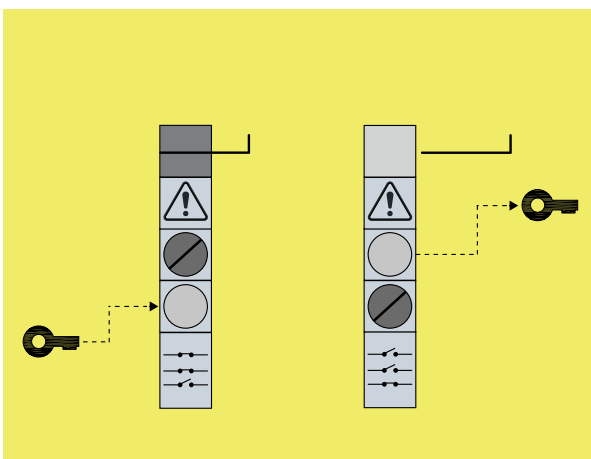
Electromechanical solutions with monitoring switch for use up to Zone 1 / 21 or Division 2

What is the purpose of Osbourn?

*"Providing the functionality & **peace of mind** of safety keys to existing systems and even light curtains **without having to replace,wire or reprogram any devices.**"*

*"Existing equipment needs to be brought up to the latest standards to **protect operators** during **whole body access**, preventing restart until employees are outside the safeguarded space."*

What has driven our development of the Osbourn range?

When operators must perform whole body access, it is crucial they are kept safe whilst inside the danger zone.
ISO 10218-2 section 5.6.3.4 'Manual reset, start/restart and unexpected start-up' states that 'to ensure no one in the safeguarded space before start/reset, use the first practicable option from the following:"

"Give a clear an unobstructed view of the safeguarded space from the start / reset device"
In theory this sounds like a perfect solution, but in practice visibility can be very poor where obstacles and machinery operate, or where low level lighting can distort the view of safeguarded spaces.

"Use presence sensing devices to detect operators throughout the safeguarded space"
For small and simple areas presence sensing is a great option, but can quickly become costly and impractical to guarantee detection in larger spaces with moving parts, blind spots and obstacles.

Measures to lock a guard (gate) in the open position, such as proactive inhibiting functions.

Selecting your Osbourn Device?

1. **Where are you looking to add a retrofittable inhibit function?**

> On a Guard Entry (sliding or hinged guards)

> On a Photo-electric device (such as a light curtain)

2. **Do you have existing safety switch or guard locking interlock?**

> Yes I do, I just want to retrofit a proactive inhibit function

> No, can I create a solution with this functionality in?

> Yes – you might find the solution you need in our amGard*pro* range. Contact us to learn more!

3. **Does your existing system include an escape release function?**

> No? Fantastic! Which type of door are you installing this device to?

> Yes it does, is that an issue?

> Whilst Osbourn interlock blocking solutions cannot operate beside an escape release, our amGard*pro* solution allows this to be easily integrated! Contact us to learn more!

Hinged Guard   **Sliding Guard**

4.

Photo-electric Blocking Solutions

The Photo-electric Blocking Device (PBL) comes in multiple varieties to support installation on different branded light curtains.

The PBL

PBL Mounting Plate

PBL Blocking Plate

Dual Padlockable Dustcover

Personnel Key

Example Part Number: PBL2A-1-1-CLSL-MP1

PBL2 - Actuating to the left

PBL4 - Actuating to the right

How does it operate?

Light Curtain access in normal operation. Unexpected restart is possible whilst operators are within the safeguarded space as nothing inhibits the infrared signal remaking.	The PBL can be mounted beside the transmitter or receiver as a retrofit with just two fixings.	The key is removed which drives the rotation of the blocking plate.	Whilst an operator is inside the safeguarded space with this key, unexpected restart is prevented with the blocking plate.	Protection for additional operators can be achieved through padlocking the lock

Create your PBL Part Number

PBL [A] - [ ] - **1** - **CLSL** - **MP** [ ]

Handing Type

2 | **4**

Mounted right end of safeguarded opening

Mounted left end of safeguarded opening

Mounting to emitters or receivers at either end of your access point, we have the solution to support

Blocker Plate Style

1 | **2** | **3**

+ 20mm | + 40mm

Increase the reach of your PBL with some of our alternative mounting variables

Mounting Plate Style

1 | **2** | **3**

+ 20mm | + 40mm

Protective coverings on light curtains or post mounting can require additional tolerance on the mounting plate.

Hinged Guards (IBL-H)

The IBL-H is designed to add in interlock blocking function to hinged guards which already have interlocks mounted.

The IBL-H

Door Blocking Plate to prevent door opening

Interlock Blocking Plate to prevent existing safety contacts being closed

Example Part Number: IBL2H-1-1-CLSS-MP1

How does it operate?

In normal operation, the door is closed and the **safety contacts** in an existing system are **closed**	When the safety contacts of the existing system are opened the '**Door Blocking Plate**' prevents the door opening until key is removed	Rotating and removing the key performs **two functions** The **Door Blocking Plate** is sprung to allow the door to open	The **Interlock Blocking Plate** is actively driven by the rotation, **preventing the door from closing**	Two padlocks can be added for additional personnel.
	From behind, you can see the door **can be closed** but not **opened**	The **door blocking plate** is sprung to allow the door to open		

Create your IBL-H Part Number

IBL	H	-	1	-	▮	-	CLS	▮	-	MP1

Handing Type

2 — Suitable for guard openings which hinged on the **left**

4 — Suitable for guard openings which hinged on the **right**

Number of Personnel Keys

1   **2**   **3** — Contact us if you require more than 1 personnel key

Dustcover Type

S — Standard stainless steel

L — Add the ability to add two padlocks to your lock

Sliding Guards (IBL-S)

How the moving portion of the door interacts the fixed post can vary between guards. Whilst doors which slide flush to the post are common, others which slide in front or behind that fixed post are present within many guarding applications. In your application, how does the front face of the sliding portion of the door meet the front face of the fixed post? See our mounting options below

The IBL-S

Space

Door slides **in front of** fixed post

Fixed knob mounted to sliding door

IBL-S mounted to fixed post

Door slides **flush** with fixed post

Contact our team to discuss your solution

Door slides **behind** the fixed post

IBL-S mounted to sliding door

Fixed knob mounted to sliding door

Space

How does it operate?

Fixed Knob to control door opening

Personnel Key for operator safety

Claw Plate to prevent door opening

Blocking Plate to prevent door closing

Guard closed

Existing system: Safety contacts **closed**

Sliding door pulled open to end of '**Claw Plate**'. The door is prevented from fully opening by the '**Fixed Knob**'
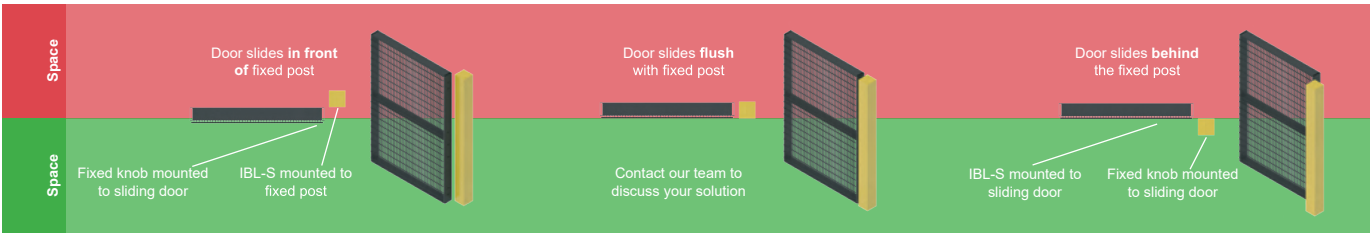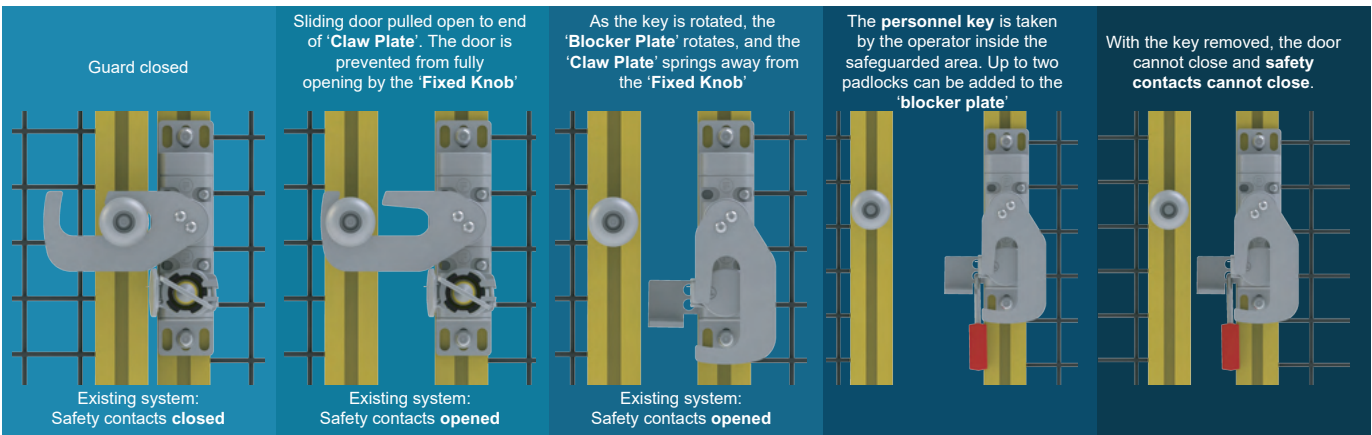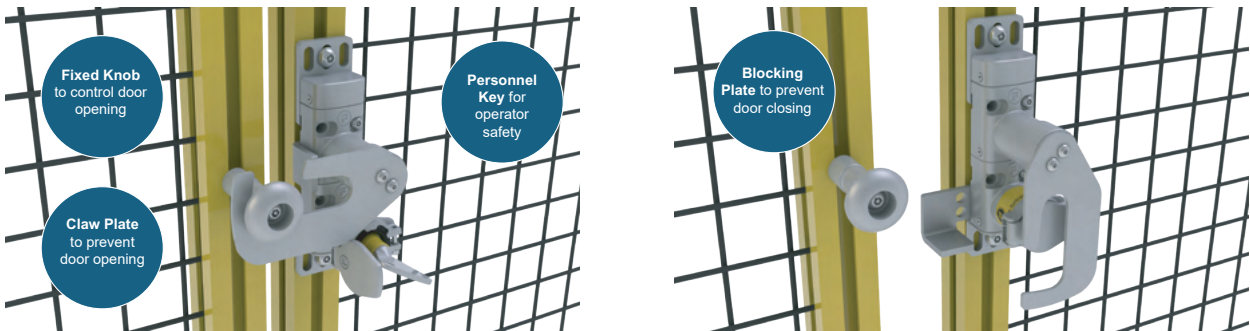
Existing system: Safety contacts **opened**

As the key is rotated, the '**Blocker Plate**' rotates, and the '**Claw Plate**' springs away from the '**Fixed Knob**'

Existing system: Safety contacts **opened**

The **personnel key** is taken by the operator inside the safeguarded area. Up to two padlocks can be added to the '**blocker plate**'

With the key removed, the door cannot close and **safety contacts cannot close**.

Create your IBL-S Part Number

| IBL | S | - | 1 | - | | - | CLS | L | - | MP1 |

Handing Type

| 2 | 4 |

Suitable for sliding guards which slide to the **left**

Suitable for sliding guards which slide to the **right**

Number of Personnel Keys

| 1 | 2 | 3 |

Contact us if you require more than 1 personnel key

Dustcover Type

| L |

Add the ability to add two padlocks to your lock
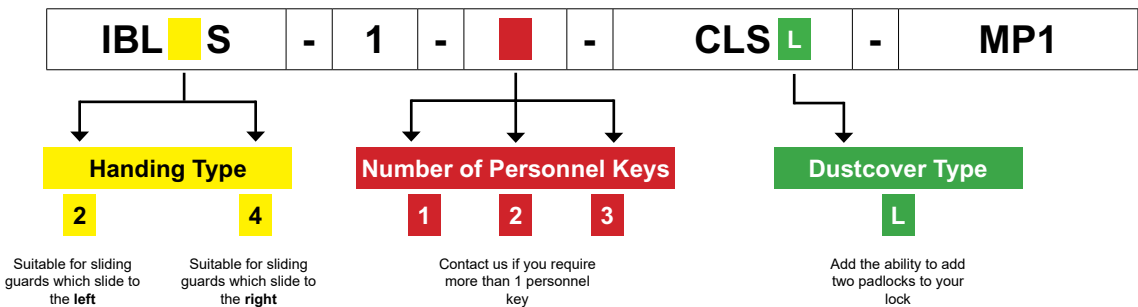
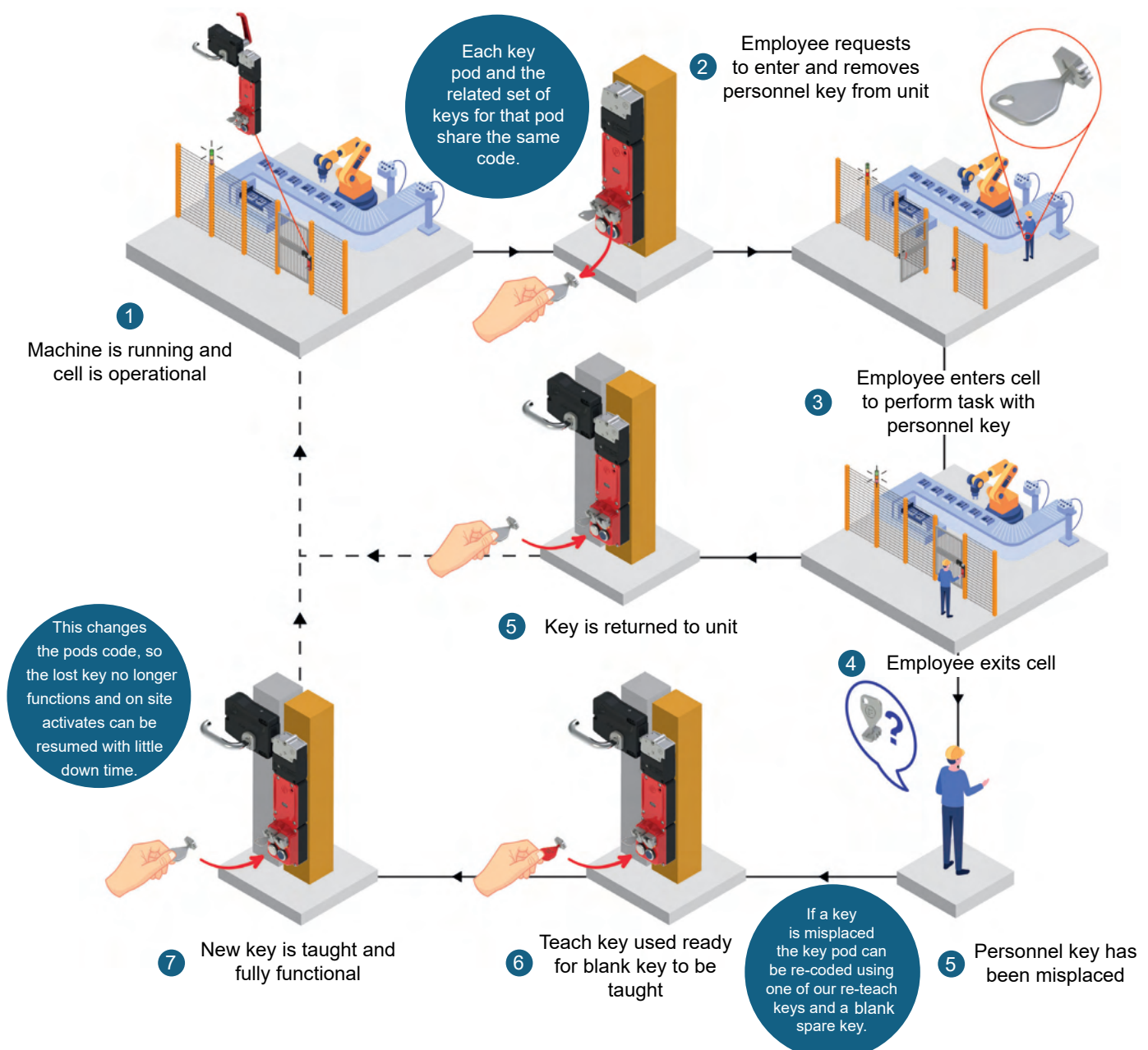# Protect Against Unexpected Start-Up and Personnel Key Loss

Protecting individuals from machines starting up unexpectedly is a key consideration in any machine safety risk assessment.

ISO/TS 19837:2018 helps to define means of preventing hazardous situations such as unexpected start-up and introduces the concept of a personnel key. It defines a personnel key as 'keys released from a trapped key operating device and retained by a person to prevent a hazardous situation i.e. unexpected start-up'.
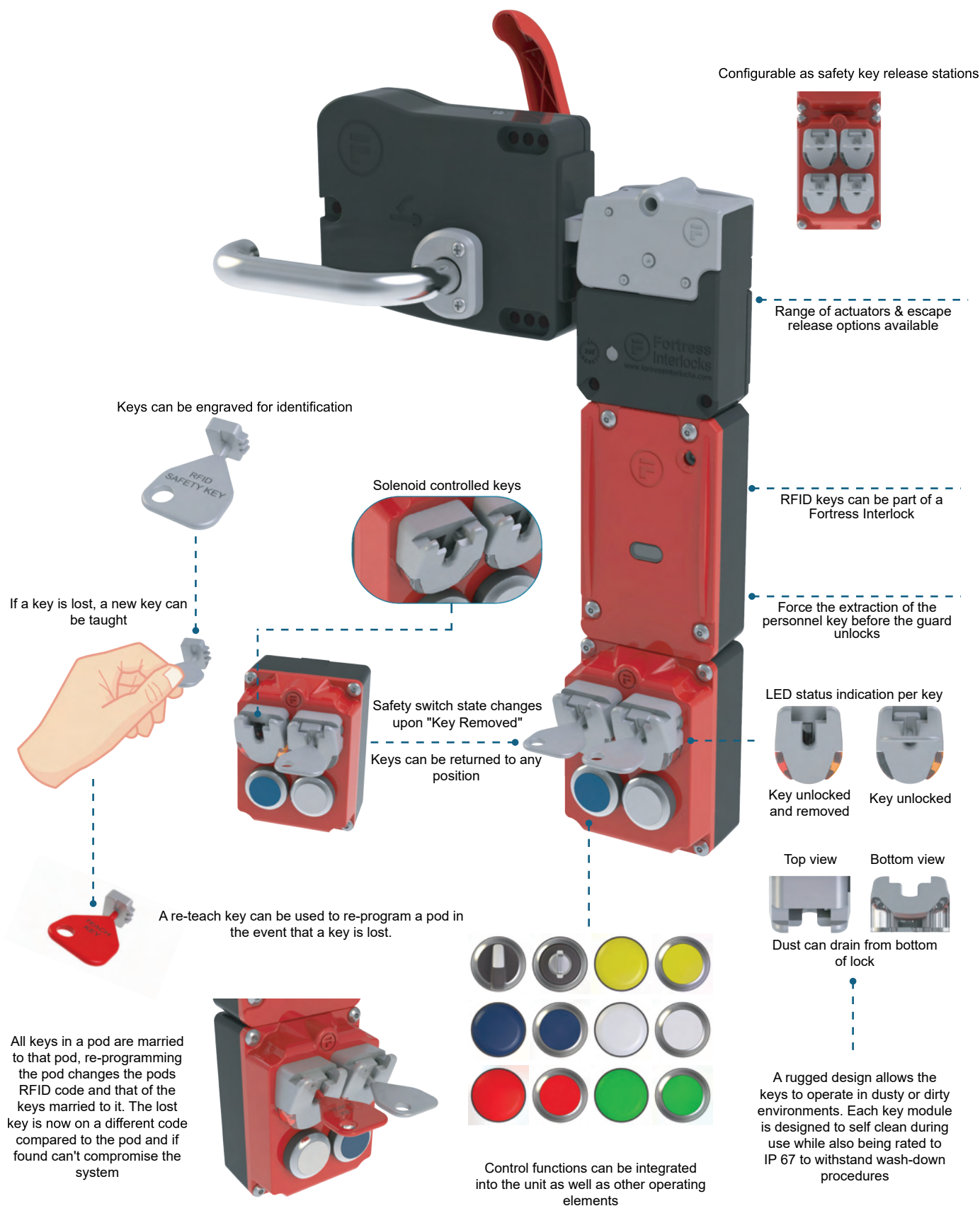
Fortress RFID Keys

Fortress's RFID Safety Key (RSK) is a compact key pod with ability to act as a standalone key station or integrate within a Fortress amGard*pro* interlock. The RSK can be hard-wired or communicate via a PROFINET/ PROFIsafe or Ethernet/IP / CIP networks. RSK key pods help to reduce key management processes.

The RSK can be hard-wired, it can have OSSD inputs and outputs, or it can communicate over Ethernet using either PROFINET/ PROFIsafe, Ethernet IP / CIP safety or Ethercat Network Protocols. RSK Key pods can help to improve key management processes, keys can be stored as an unprogrammed blank key that does not compromise the safety of a system. If a key is lost from a key pod, the key pod can be re-programmed to accept a blank key. The key that has been lost would now be on a different code compared to it's old key pod and can not compromise the system.

Each key pod and the related set of keys for that pod share the same code.

2 Employee requests to enter and removes personnel key from unit

1 Machine is running and cell is operational

3 Employee enters cell to perform task with personnel key

5 Key is returned to unit

4 Employee exits cell

This changes the pods code, so the lost key no longer functions and on site activates can be resumed with little down time.

7 New key is taught and fully functional

6 Teach key used ready for blank key to be taught

If a key is misplaced the key pod can be re-coded using one of our re-teach keys and a blank spare key.

5 Personnel key has been misplaced

Protect Against Unexpected Start-Up - Reprogrammable Personnel Keys

Configurable as safety key release stations

Range of actuators & escape release options available

Keys can be engraved for identification

Solenoid controlled keys

RFID keys can be part of a Fortress Interlock

If a key is lost, a new key can be taught

Force the extraction of the personnel key before the guard unlocks

Safety switch state changes upon "Key Removed"

Keys can be returned to any position

LED status indication per key

Key unlocked and removed

Key unlocked

A re-teach key can be used to re-program a pod in the event that a key is lost.

Top view

Bottom view

Dust can drain from bottom of lock

All keys in a pod are married to that pod, re-programming the pod changes the pods RFID code and that of the keys married to it. The lost key is now on a different code compared to the pod and if found can't compromise the system

Control functions can be integrated into the unit as well as other operating elements

A rugged design allows the keys to operate in dusty or dirty environments. Each key module is designed to self clean during use while also being rated to IP 67 to withstand wash-down procedures

Trapped key interlocking ensures that a process is followed and cannot be circumvented or short cut. The transfer of a key ensures that wherever personnel find themselves, in either starting or shutting down operations, they can be assured that they are safe. There are three simple steps in using trapped key components in an integrated safety system, what is being isolated, how many access points are there and what type of access is required. A key is used to start the process and remains trapped whilst the machine is running. The only way to remove the key is to isolate the hazard. This key is then used to gain access to the dangerous area and remains trapped in position while the gate or door is opened. The key can only be removed when the gate or door has been shut. In this way the key is either trapped when the machine is running and access cannot be gained, or the key is trapped while access is gained and the machine cannot be started.

The three points of trapped key interlocking

1 Isolation **2** Key Exchange **3** Access Control

Part body

Full body

Designing interlock components into an integrated safety system

To design interlock components into an integrated safety system there are a number of key questions that need to be addressed.

- What is the operational flow to start and stop equipment?
- What is being isolated
- Is there more than one system that needs to be isolated to make access safe?
- Is there a time delay required for safe access?
- How many access points are there?
- What is the type of access? Full body or part body?
- Severity of the possible injuries?
- What is the possibility of avoiding the hazard?
- What is the nature of the hazard?
- What energy sources are present?
- What is the operating environment?
- Use risk assessments as a guide to how the integrated safety system functions.

Today's production environment is very demanding. Pressures on supply chain efficiency and output are major considerations when developing manufacturing systems, Castell's approach to delivering solutions for machine guarding applications is to ensure that fast safe access cam be gained. This means that efficiency is maintained whilst safety is not compromised.

Through this approach and the design of innovation products Castell'ssystems can be found in a vast range of applications across the globe. Working closely with industry Castell has ensured that products are available with the correct specifications, such as materials and finishes, to ensure a reliable operation for the environment.
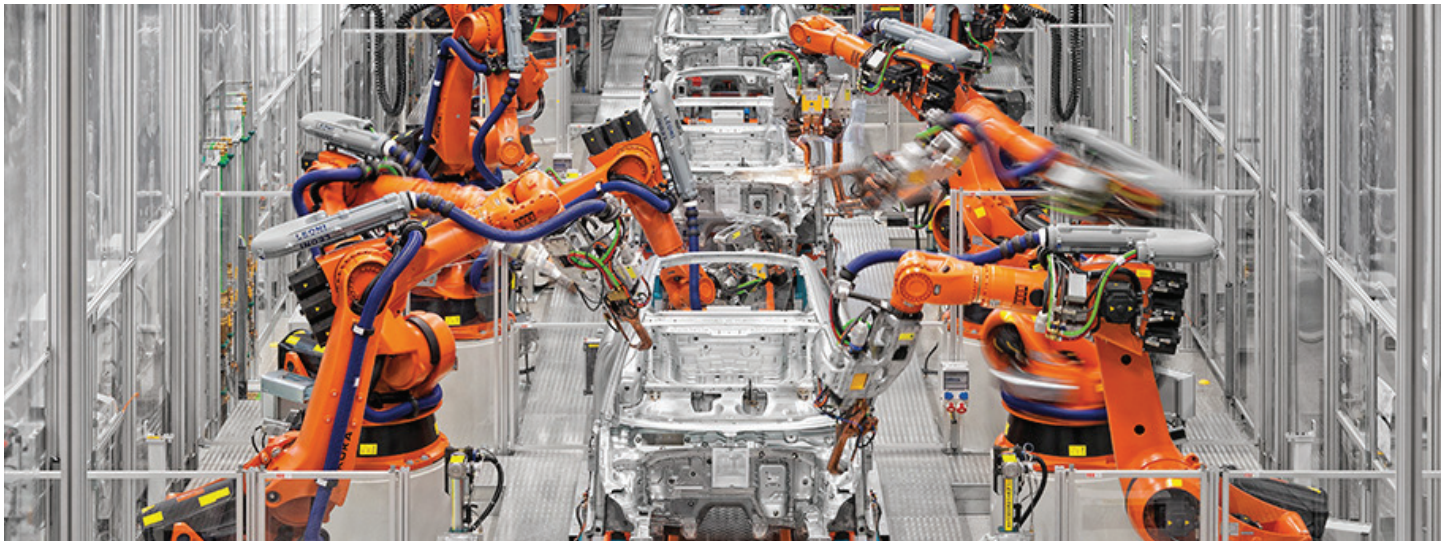
Some of the areas where Castell products can be found are:

- Water and Recycling
- Food and Beverage
- Aggregates and Mining
- Paper, Pulp and Wood
- Automotive and Electronics
- Pharmaceutical and Chemical
- Steel, Aluminum and Precious Metal

Typical application areas:

Robot cells I Conveyors I Palletizers I Gas Turbines I Freezer Rooms I Automated Warehouse Power Press I Spray Booths I Industrial Mixers I Pressure Vessels I Recycling I Rotating Machinery I Mixers and Blenders Crushers I Bottling I Packaging

The original Castell interlock concept dates from 1922 and was developed for the electrical switchgear industry. This remains today a very important part of the Castell product portfolio. Castell delivers solutions across the electrical network from power stations to transmission equipment and from sub stations to incomer rooms. The ability to work across HV, MV and LV means that a Castell system can be used as a single solution to provide personnel safety and ensure equipment is used in the correct mode.

Our range of products has been developed over 90 years to provide the industry with interlocks of high quality and integrity. Working closely with key switchgear manufacturers has enabled Castell to produce interlocks designed specifically for use on the leading manufacturers own breakers, isolators, disconnectors and earth mechanisms.

Castell products are available in a range of materials and inishes, to ensure the correct specication interlocks. High temperature locks for use on electrostatic precipitators, stainless steel and weatherproof locks for use in sub-stations, chrome plated locks for areas where aesthetics are important and brass as standard for locks in dry, clean, non-corrosive environments.

Castell products are used in the following areas:

- Wind Turbine Isolation & Earthing
- Rail Electrification Systems
- Electrostatic Precipitators
- UPS Systems
- LV Distribution & Busbar Systems
- HV Transmission & Distribution Sub Stations
- Transformer Isolation & Earthing Systems

Switchgear Castell has developed products to suit the following companies' equipment:
ABB I Alstom I Terasaki I Schneider Electric I Siemens I Hawker Siddeley I George Ellison

Product Overview

Isolation

Power Isolation

KSD

Control Switching

KS   KSE

Motion Sensing

BEMF   MSI

Solenoid Controlled Switching

KSS   KSSE   KSUPS

Time Delay Interlocking

DAE   TDI   TDR

Valve Interlocking

MBV   PSBV

Mechanical Isolation

K   KL   KF   KLF   KC

KLC   KP   KLP   FS / Q

Key Exchange

Key Exchange Boxes

X   B   Y   Z   W

Access Control

Part Body Access

AI   AI-HD   D   KE   AIS/Her cules   Olympus

Full Body Access

AIE   AIE-HD   BD   EDIX   KLE   AIES

Castell

The Future of Safety is Here

Salvo™

Efficient & Safe Loading

Salvo Efficient & Safe Loading

Salvo prevents the accidental drive-away of a vehicle during loading or unloading of goods at a loading bay.

The Salvo links the articulated trailer to the loading bay door during the loading or unloading of goods.

The Salvo comprises of two sections:
- The lock that controls the movement of the articulated trailer Salvo Susie
- The lock that controls the opening of the loading bay door SCP$^+$

Additionally, a data gathering and analysis software can be added to the system - Salvo DockMonitor.

The Salvo Susie is fitted to the emergency air line coupling when the trailer has been reversed into position at the bay. After successful fitment, a Salvo coded key is released from the Salvo Susie, locking the unit firmly onto the coupling. The coded Salvo key can only be released once the Salvo Susie has been fitted to the brake coupling. The coded Salvo key is then taken to the corresponding loading bay door and used to open the door.

The secret of the Salvo system is that only one Salvo key exists per bay, thus ensuring that the door can only be opened ONCE the trailer has been secured in place. To ensure the integrity of the system, each bay will have a different code.

Salvo Susie ② ③ ④
The Salvo Susie is a key operated mechanical lock designed to fit on to all UK trailer, emergency brake line connectors. Its purpose is to prevent re-connection of the air brake hose, thereby immobilising the trailer. When fitted, the Salvo Susie can only be removed with the permit Salvo key.

Salvo Control Panel ⑤
The Salvo Control Panel (SCP$^+$) is the main interface between the Salvo couplings and associated bay door controls. The SCP$^+$ comprises of a wall mounted panel with easy to use Castell interlock key switch to allow operation of the bay. There is also panel indication to indication status and operation. Installation is via plug in terminals on the inside door of the panel. ⑥ When bay door is open, the Salvo key is trapped in the SCP$^+$.

Salvo Wireless DockMonitor ⑦
Wireless technology now removes the expensive and cumbersome fit of hard wiring.

Using the latest wireless technology, Salvo Wireless DockMonitor can measure, display and record data that will enable you to access and monitor live bay usage information. This enables you to spot and implement efficiencies in your business avoiding the unnecessary costs associated with expansion or additional resources.
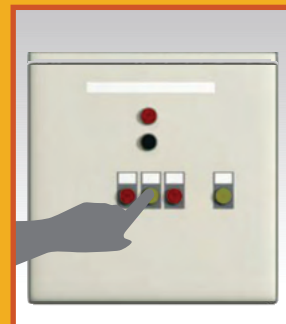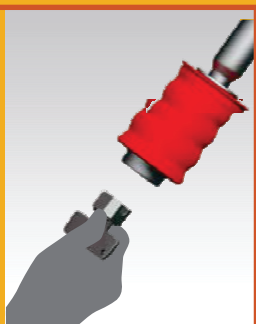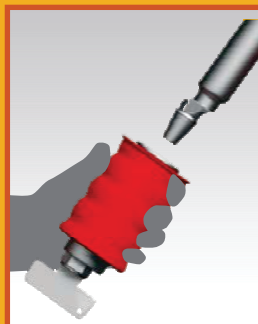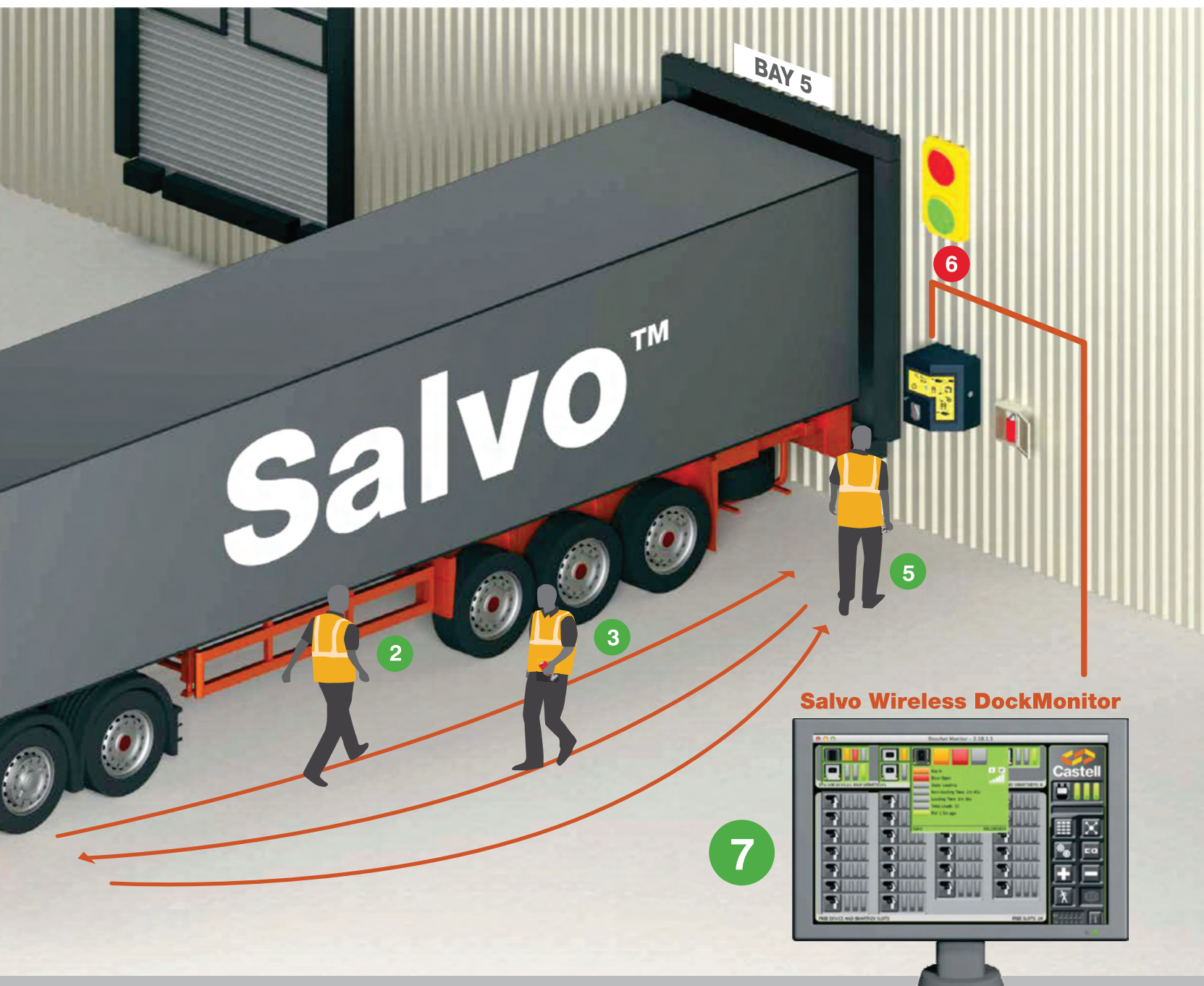
Castell

1 The driver reverses the vehicle onto the loading bay as normal.

The Salvo Susie is collected from the storage area. (Usually located next to the bay area.)

The Salvo Susie is then taken to the brake line coupling end of the trailer.

BAY 5

6

5

3

2

Salvo Wireless DockMonitor

7

4

5

6

The Salvo Susie is placed over the emergency airline coupling releasing the trapped Salvo key and locking the Salvo Susie on. The trailer brakes are locked on. The Salvo key is then taken back to the Salvo Control Panel (SCP+) at the loading bay.

When the Salvo key is inserted and turned in the Salvo Control Panel (SCP+) the loading bay becomes energised (with no key inserted the bay door will not open).

The loader can now operate the loading bay door and dock leveller. When the bay door is open the Salvo key is trapped in the Salvo Control Panel (SCP+).

Telux

BENEDICT GMBH

BENEDICT produces Low Voltage Switchgear that distinguish themselves from their competitors through their special features. Decades of experience in Research and Development are the basis for the excellent reliability of the Contactors, Thermal Overload Relays, Motor Starters, Motor Circuit Breakers, Load Disconnectors, Cam Switches, Push Buttons and Pilot Lights.

From a single product to a complete application solution, the Benedict range fully addresses the demands of factory automation and control environments. Benedict's extensive product range offers everything to meet the needs of today's OEMs, panel builders and end users.

With humble beginnings in the early 1920's, Benedict & Jäger has been a trusted brand globally for nearly 100 years. Low voltage control gear is what we do. We invite you to give us a call to discuss your requirements.

THE BETTER CONTACT, RELIABLE AND SAFE

BENEDICT produces Low Voltage Switchgear that distinguish themselves from their competitors through their special features. Decades of experience in Research and Development are the basis for the excellent reliability of the Contactors, Thermal Overload Relays, Motor Starters, Motor Circuit Breakers, Load Disconnectors, Cam Switches, Push Buttons and Pilot Lights.

LOW VOLTAGE SWITCHGEAR

From a single product to a complete application solution, the Benedict range fully addresses the demands of factory automation and control environments. Benedict extensive product range offers everything to meet the needs of today's OEMs, panel builders and end users.

TELUX ROTARY CAM SWITCHES

Telux switches, offer endless possibilities for custom rotary cam switches. From simple on-off switches, to complex custom multi-step switches, we can help build the perfect switch for your application.

An effectively limitless number of configurations including the typical.

Change Over Switches, Star Delta Switches, Isolator Switches, Motor Control Switches, Multi Step Switches and On/Off Switches.

Advantages:
• Drive shaft made of solid aluminium.
• Customized versions promptly available.
• Assembled locally avoiding delays.

PUSH BUTTONS & PILOT LIGHTS

Benedict offers a broad selection of pushbuttons, selector switches and signal lamps in both 22mm and 30mm. Variations include illuminated actuators, emergency stop buttons and monoblock LED's, but the options are endless.

CONTACTORS

Benedict contactors are engineered to operate under the toughest conditions including heat, cold, dust, sand, high humidity and shock. Our compact, IEC style contactors offer maximum performance with a minimal footprint. With UL ratings from 5A to 1215A (covering up to 900 hp) and over 50 coil voltage options.

AC MAIN & DISCONNECT SWITCHES

Where highest safety and current carrying capacity are required, Main Switches and Disconnect Switches by Benedict come into use. Compact designs and box terminals for large cable cross-sections guarantee versatile applications.
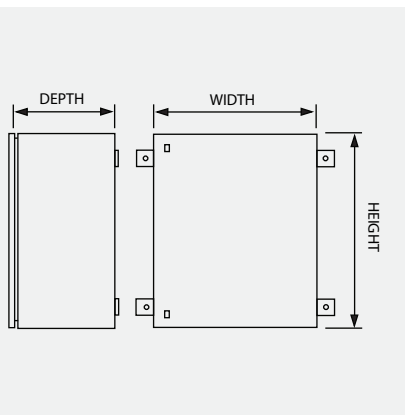
ENCLOSURES

DEEBAR® (Pty) Ltd
ELECTRICAL & MECHANICAL ENGINEERING
"ENSURING YOUR SAFETY"

MILD STEEL ENCLOSURES IP65

PART NUMBER	HEIGHT	WIDTH	DEPTH
DEE - V15-2520	250	200	150
DEE - V15-3025	300	250	150
DEE - V20-4030	400	300	200
DEE - V20-5040	500	400	200
DEE - V25-6040	600	400	250
DEE - V25-6050	600	500	250
DEE - V25-7050	700	500	250
DEE - V25-8060	800	600	250
DEE - V30-1008	1000	800	300
DEE - V30-1208	1200	800	300

STAINLESS STEEL ENCLOSURES IP65 MATERIAL: POLISHED 304
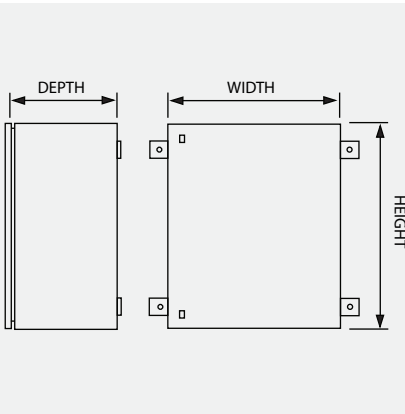
PART NUMBER	HEIGHT	WIDTH	DEPTH
DEE - BOS-SS0	300	200	115
DEE - BOS-SS1	350	250	145
DEE - BOS-SS2	450	300	195
DEE - BOS-SS3	550	400	195
DEE - BOS-SS4	650	450	245
DEE - BOS-SS5	750	550	245
DEE - BOS-SS6	950	700	245
DEE - BOS-SS7	1150	850	245

DISTRIBUTION BOARDS
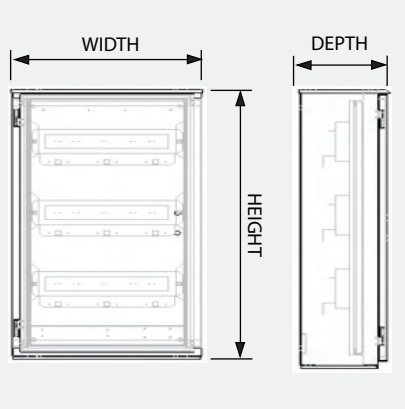
PART NUMBER	5KA HEINEMAN (26MM MODULE)	2,5KA HEINEMAN (13MM MODULE)	DIN RAIL MOUNTED (13MM MODULE)
DEE - VIP 4-9	(27 WAY) 3 X 9	(54 WAY) 3 X 18	(39 WAY) 3 X 13
DEE - VIP 5-9	(36 WAY) 3 X 12	(72 WAY) 3 X 24	(54 WAY) 3 X 18
DEE - VIP 6-9	(45WAY) 3 X 15	(90 WAY) 3 X 30	(63 WAY) 3 X 21
DEE - VIP 8-9	(69 WAY) 3 X 23	(138 WAY) 3 X 46	(99 WAY) 3 X 33

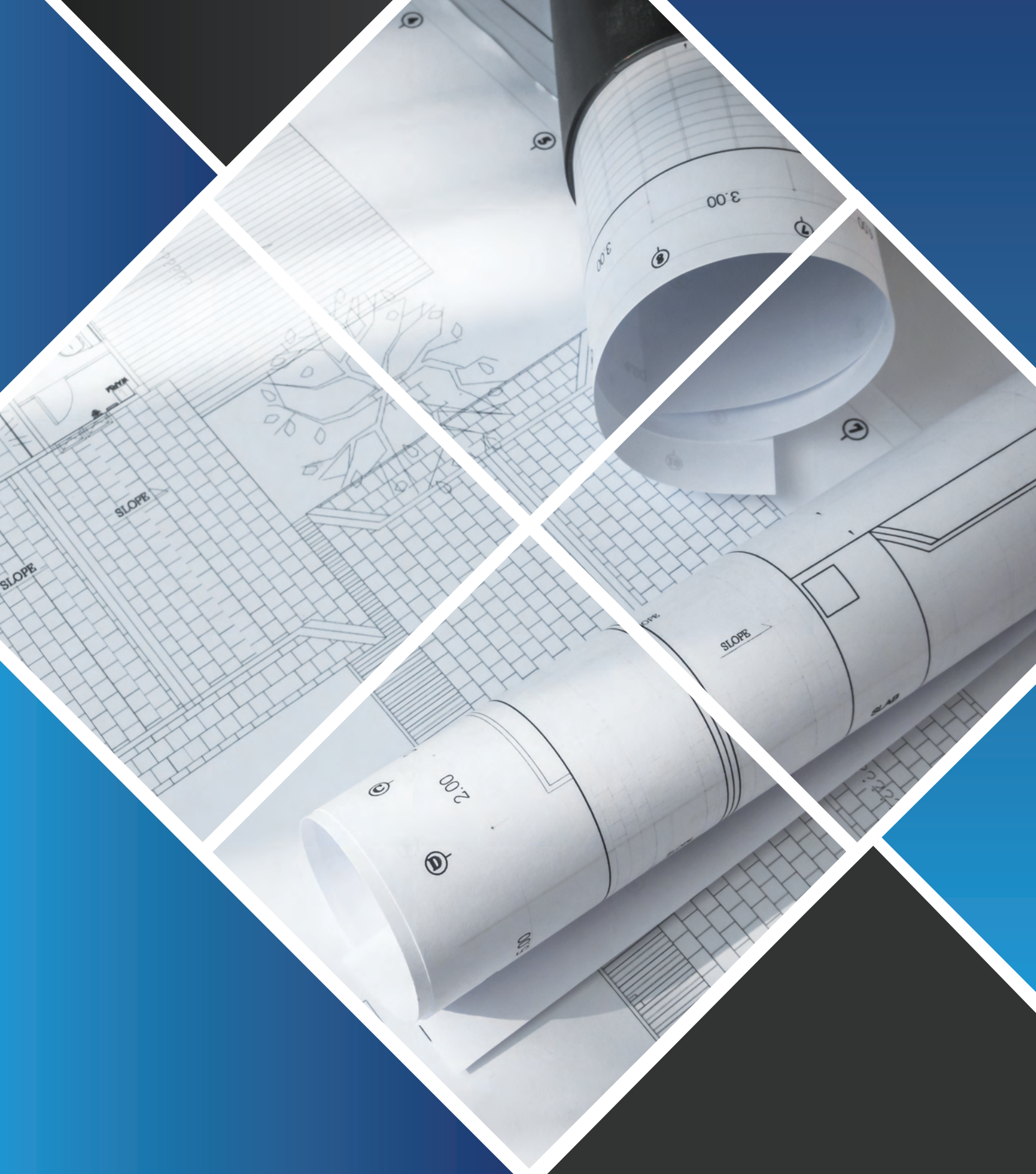| CODE OUTDOOR	CODE INDOOR	SIZE W x H x D
DEE - VIP 4-9 O	DEE - VIP 4-9 I	400 X 900 X 200
DEE - VIP 5-9 O	DEE - VIP 5-9 I	500 X 900 X 200
DEE - VIP 6-9 O	DEE - VIP 6-9 I	600 X 900 X 200
DEE - VIP 8-9 O	DEE - VIP 8-9 I	800 X 900 X 200

FLOOR STANDING ENCLOSURES
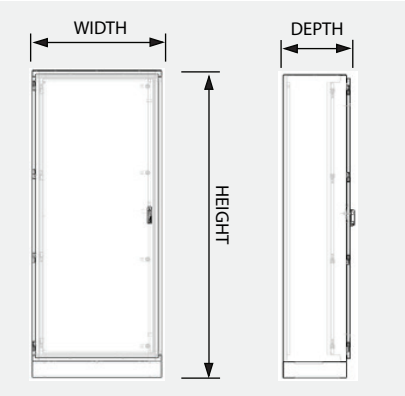
PART NUMBER	HEIGHT	WIDTH	DEPTH
DEE - FW-14-8-4	400	800	1400
DEE - FW-16-6-4	400	600	1600
DEE - FW-18-8-4	400	800	1800
DEE - FW-18-8-6	600	800	1800
DEE - FW-20-10-6	600	1000	2000

CHASSIS SIZE
1310 x 710
1510 x 510
1710 x 710
1710 x 710
1910 x 910

- 2mm mild steel with 3 fixed sides
- standard colours: (b26) orange
- includes 100mm plinth, fixed chassis plate, removable top and bottom glandplate
- lockable 3 point leverlock system
- IP54 construction

Pressure Equivalent Table

P.S.I	bar	kPa
1	0.06	6.89
5	0.34	34.48
10	0.68	68.96
20	1.37	137.93
30	2.06	206.89
50	3.44	344.82
75	5.17	517.24
100	6.89	689.65
125	8.62	862
150	10.34	1034
175	12.06	1206
200	13.79	1379
250	17.24	1724
300	20.68	2068

1kPa = 0.01 bar
1MPa = 10.00 bar
$1kg/cm^2$ = 1.00 atm

1P.S.I = 6.895 kPa
1kPa = 0.145 P.S.I
$1kg/cm^2$ = 14.223 P.S.I

Cable Ratings

3 & 4 Core Copper PVC/SWA/PVC 600/100V Cables - SABS 1507/1990

Cable Size	PROPERTIES				Gland Size		
	Current Ratings			Volt Drop			
(mm^2)	Ground A	Ducts A	Air A	(mV/A/m)	3 Core	4 Core	5 Core
1.5	23	18	18	25.080	0	0	0
2.5	30	24	24	15.363	0	0/1	2
4	38	31	32	9.561	1	1	2
6	48	39	40	6.391	1	2	3
10	64	52	54	3.793	2	2	
16	82	67	72	2.390	2	2/3	
25	126	101	113	1.515	3	3	
35	147	120	136	1.097	3	3/4	
50	176	144	167	0.817	4	4	
70	215	175	207	0.576	4	4/5	
95	257	210	253	0.427	4/5	5	
120	292	239	293	0.348	5	5/6	
150	328	369	336	0.294	5	6	
185	369	303	384	0.250	6	6	
240	422	348	447	0.211	6	7	
300	472	397	509	0.189	6/7	7	

Utilization Categories IEC 947-4-1

Category	A.C. Contractors / Relays
AC-1	Non-inductive or slightly inductive loads, resistance furnaces
AC-2	Slip-ring motors: Starting, plugging
AC-3	Squirrel-cage motors: Starting, switching off motors during running
AC-4	Squirrel-cage motors: Starting, plugging, inching
AC-11	Electromagnets for contractors, valves, solenoid actuators

Category	A.C. Switches / Isolators
AC-20	Connecting and disconnecting under no-load conditions
AC-21	Switching of resistive loads including moderate overloads
AC-22	Switching of mixed resistive and inductive loads including moderate overloads
AC-23	Switching of motor loads or other highly inductive loads

IP Rating for Enclosures

1st Digit	Protection from Solid Objects
0	No Protection
1	Protected against Solid objects larger than Ø 50mm
2	Protected against Solid objects larger than Ø 12mm
3	Protected against Solid objects larger than Ø 2.5mm
4	Protected against Solid objects larger than Ø 1mm
5	Protected against Dust
6	Dust Tight (Total Protection)

2nd Digit	Protection from Moisture
0	No Protection
1	Protected against Dripping Water
2	Protected against Dripping Water when tilted up to 15°
3	Protected against Spraying Water
4	Protected against Splashing Water
5	Protected against Water Jets
6	Protected against Heavy Seas / Powerful Water Jet
7	Protected against Temporary Immersion
8	Protected against Continuous Submersion

EXAMPLE

Protection against dust ———

IP 5 4

Protection against effects of splashing water

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"ENSURING YOUR SAFETY"

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