



Making Energy Safe

Generation, Transmission,
Distribution and Supply



Industry Guide

Why choose Castell for the energy industry?

- Expertise in providing the best possible trapped key solution whatever the industry
- 90 years of experience protecting people and assets in industry
- High quality innovative products
- ISO 9001: 2008 accreditation
- Global team dedicated to providing technical support and assistance in selecting the correct solution
- The widest range of rugged and reliable trapped key interlock products globally
- The ability to produce customised solutions to meet the demands of your specific application
- Safety solutions that last for decades



Founder:
James Harry Castell
1880 - 1953

The original Castell interlock concept dates from 1922 and was developed for the electrical switchgear industry. For over 90 years Castell delivers solutions across the electrical network from power stations to transmission and distribution 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.

Working closely with key switchgear manufacturers has enabled Castell to produce interlocks designed specifically for use on the leading manufacturers own breakers, isolators, switch disconnectors and earth switch mechanisms.

That makes Castell trapped key interlocks be the perfect choice for protecting personnel in the switchgear environment.

The drivers in today's energy industry

Generation

Demand for cleaner energy has resulted in changes in both the sources of generation as well as stricter emission controls on traditional fossil fuel generation. Ageing power plants are being phased out and in place nuclear, renewable and cleaner technology solutions are being constructed.

The wider range of generation technologies creates new requirements for asset, personnel and environmental protection. Ensuring that energy demand is fulfilled whilst people and the environment are protected are the highest priorities.

Responding to those needs requires robust safety systems that have a proven design life of decades.

Transmission & Distribution

Companies are being faced with infrastructure that is coming to end-of-life simultaneously; this means that there is pressure to look at the most efficient and cost effective solutions for their transmission and distribution sectors whilst ensuring a safe working environment. This is coupled with a booming number of generation connection points driven by the increase of renewable generation micro sites.

Typically projects today are delivered through a host of numerous outsourced contractors with the competition for project tenders at an all-time high. The demand for expertise and knowledge in the standards and working practices means that experience is stretched heightening the requirement for robust, efficient safety systems.

Industrial & Commercial Supply

The demand for ever present energy across industry and commerce means that switchgear systems are becoming more complex and include an aspect of continuous supply and self-generation capability. Where multiple incomers are utilised the potential level of complexity is again increased.

Managing more complicated switchgear systems requires robust and reliable safety systems to ensure the correct, safe mode of operation at all time. This ranges from the sequence supplies can be switched in and out to the protection of personnel who maintain the equipment.

How Castell delivers

Interlocking switchgear ensures that personnel can safely operate equipment to the correct procedures. Using a well-designed interlocking scheme will ensure that personnel cannot access potentially dangerous areas without the switchgear system being put in a safe state. A good interlocking scheme will also ensure that the system operates efficiently and effectively and there is no chance of, for example, switching two incoming feeds on to a common bus bar. This ensures that the equipment is not damaged and the risk of fire and arc flash are greatly reduced.

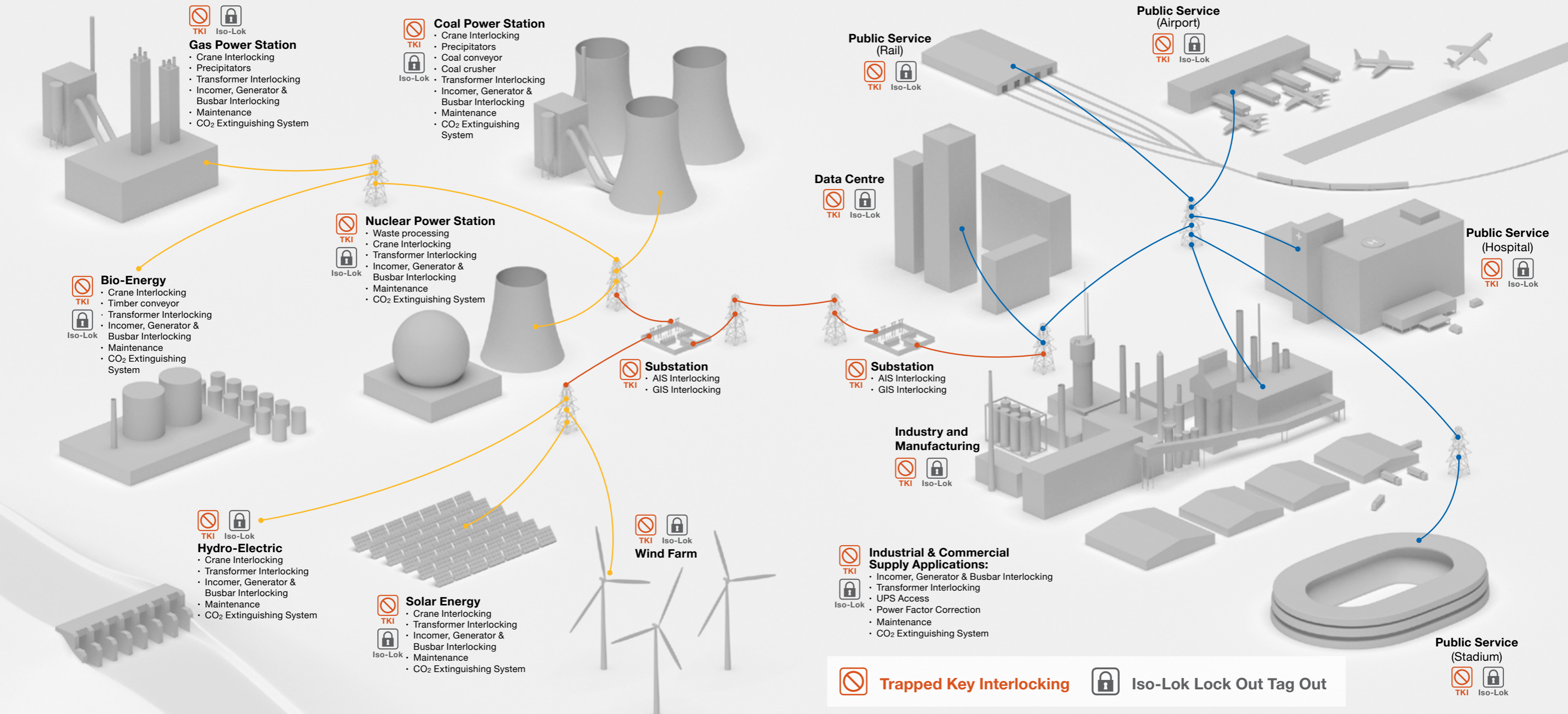
Interlocking in switchgear provides safety for personnel and equipment during following procedures:

- Personnel access
- Switching earthing systems
- Protecting high, medium and low voltage equipment
- Switching incomers on to common supply busbars
- Switching UPS systems and generators on to common supply busbars
- Controlling the supply from multiple incomers
- Maintaining substation equipment

Castell products are used in the following areas:

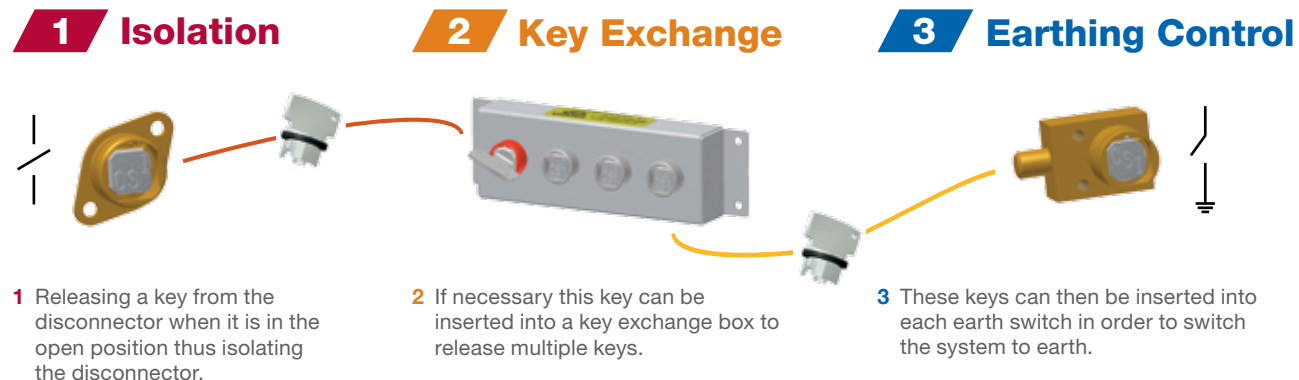
- LV Distribution & Busbar Systems
- HV Transmission & Distribution Sub Stations
- Transformer Isolation & Earthing Systems
- Generator Systems
- Wind Turbine Isolation & Earthing
- Rail Electrification Systems
- Electrostatic Precipitators
- UPS Systems

The schemes in this applications guide are for reference only and the overall system should be designed and reviewed by a competent electrical engineer.

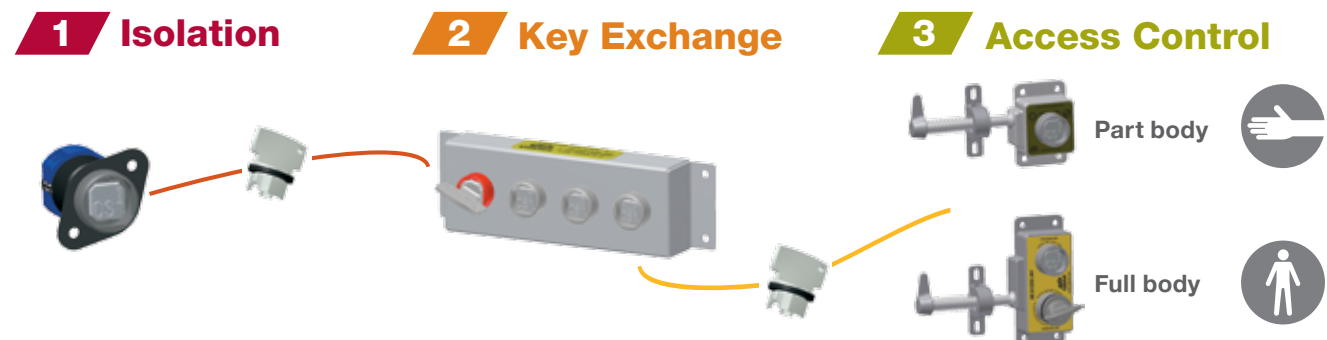


How to design a system

Substation trapped key interlocking usually follows the following sequence:



In applications where part or full body access by personnel is required the following sequence can be used:



To design an interlock system there are a number of key questions that need to be addressed. These are:

- 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 hazards?
- What are the energy sources present?
- What is the operating environment?

Part Body Access

A part body access lock has only one lock and the isolation key is used to open this. Whilst the access lock is open the key cannot be removed and therefore the process can not be started. Only once the lock is closed can the isolation key be removed and the process restarted.

Full Body Access

Full body access locks have two locking mechanisms; the first step in the process is to insert the isolation key. This will allow the personnel key to be removed and then access can be granted by opening the bolt. The isolation key can only be removed once the personnel key has been inserted. Therefore whilst the personnel key is removed and the lock is open the process can not be started. Only once the lock is closed and the personnel key returned can the isolation key be removed and the process restarted.

Coding a System

The coding of the system is an important aspect of the design as this ensures the integrity and safety of the interlocking system. Castell's Trapped Key Interlocks allow for in excess of 50,000 combinations. With this level of available codes entire factories and plants can have trapped key systems with out codes being repeated. It is highly recommended that each site keeps a record of the key codes to ensure that codes are not reused in areas of the site. The isolation, access and personnel keys all need to be coded differently so the process of safe access is ensured. For example in a simple system code 'A' is used for isolation key, this is then transferred to the exchange box where the code 'B' keys are released for access, 'C' keys are then released from the Access Locks for personnel keys. Coding in this way ensures the access process can not be short cut and the system has integrity. Master keys can be offered for the use of FS locks if necessary. If the system is required to be non-masterable then it is advised to use Q locks.



Trapped Key Interlocking (for substations)

Isolation

FS / Q



K



KL



KP



KLP

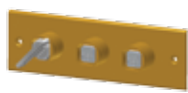


Exchange

X



B



Earthing Control

FS / Q



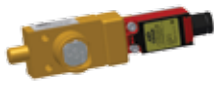
K



KL



KP



KLP



Trapped Key Interlocking (other)

Isolation

KSUPS



KS



KSS



KSSE



KSD



TDI



FS / Q



K



KL



MBV



KP



KLP



Exchange

X



Y



Z

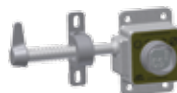


W



Access

AI



AIE



EDIX



Iso-Lok Lock Out Tag Out

Padlocks



*Clasps



*Key/Padlock Cabinets



*Available in stainless steel and a variety of sizes upon request.



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