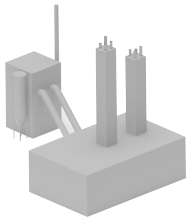
Incomer, Generator & Busbar Interlocking

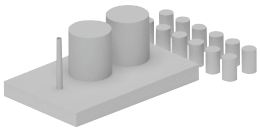
Energy Industry
Application Note

Castell

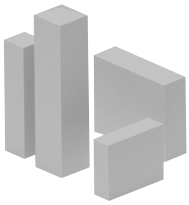

Gas Power

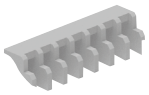

Coal Power

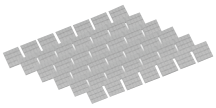

Wind Farm

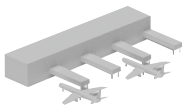

Bio-Energy

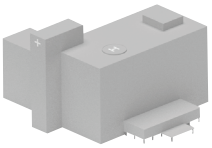

Nuclear Power

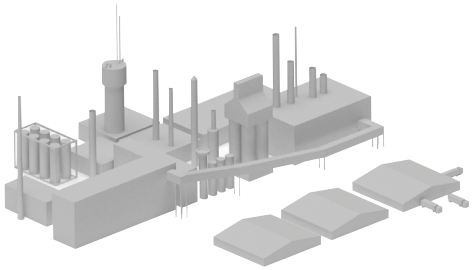

Data Centre

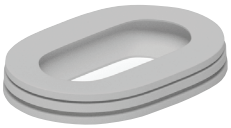

Hydro-Electric

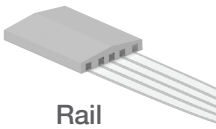

Solar Energy


Airport


Hospital


Industry and Manufacturing


Stadium

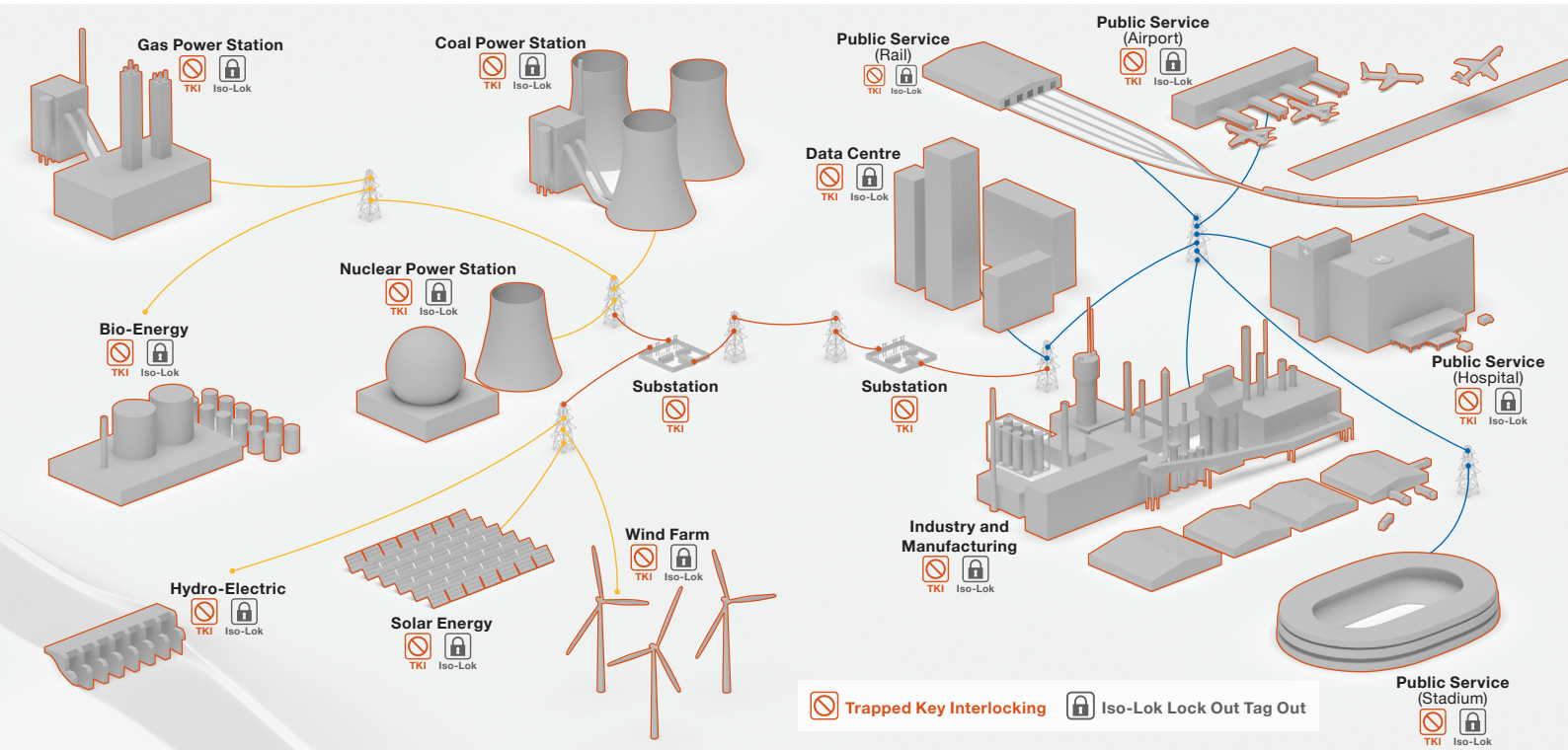

Rail

The Risk

The process of switching incomers and generators on to common supply busbars can have complicated switching schedules whereby you have the danger of circuit breakers being switched to close before opening the necessary other circuit breakers first, for example, switching two incoming feeds on to a common bus bar. This runs the risk of the equipment becoming damaged through fire and arc flashing.

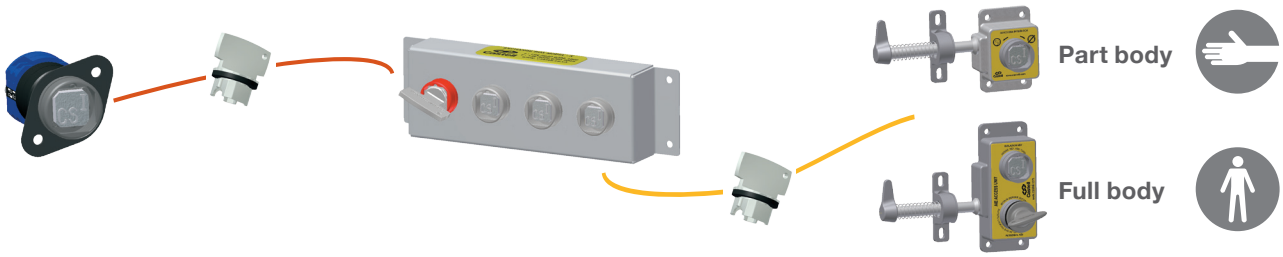
Energy Industry

GENERATION | TRANSMISSION & DISTRIBUTION | INDUSTRIAL & COMMERCIAL SUPPLY



Castell Solution

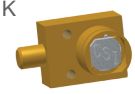
1 Isolation **2 Key Exchange** **3 Access Control**



Benefits

1) Extended system life, due to the stainless steel construction of housings and mechanisms Castell interlock systems offer many years of trouble free operation.
2) High level of risk control, as control is in the hands of the operator/engineer when switching between circuit breakers.
3) Downtime is reduced as operation is mechanical.
4) Improved efficiency, through implementing a process rather than a procedure the system operation is not dependant on verbal communication. The transfer of the key enables operators to know the status.

Products

Isolation		Exchange	Access	
FS/Q 	K 	X 	FS/Q 	K 
KI 	KP 		KI 	KP 
KLP 			KLP 	

Switchgear Interlocking

Incomer Interlocking (1)

Operation

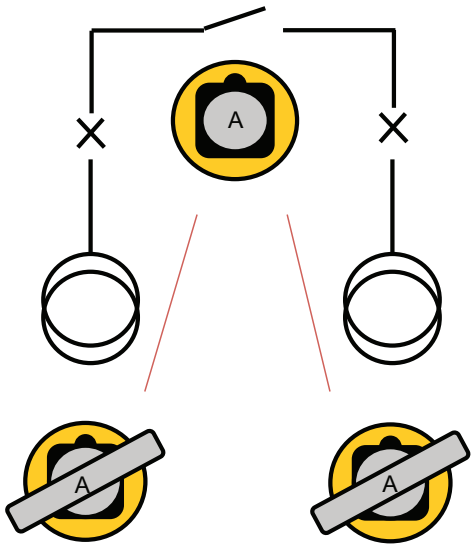
This system will require three locks and two keys. Under normal operation the two keys are trapped with the switches closed so the incomers are supplying.

The system will allow an incomer to be opened (disconnected) and the key released. This key is then transferred to the open bus coupler which can then be closed.

The system ensures that either only two incomers or only one incomer and the busbar are supplying at any time.

The symbols used here are all symbol A.

* All locks can be individually fitted to suit the switchgear



Incomer Interlocking (2)

Operation

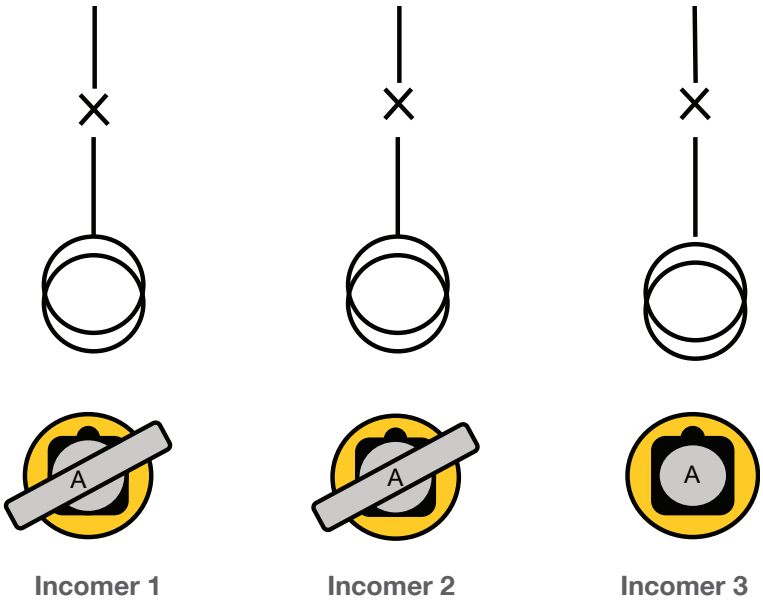
This system will require three locks and two keys. Under normal operation the two keys are trapped with the switches closed so the incomers are supplying.

The system will allow an incomer to be opened (disconnected) and the key released. This key is then transferred to in to the other open incomer which can then be closed.

The system ensures that only two incomers are supplying at any time.

The symbols used here are all symbol A.

* All locks can be individually fitted to suit the switchgear



Switchgear Interlocking

Incomer Interlocking (3)

Operation

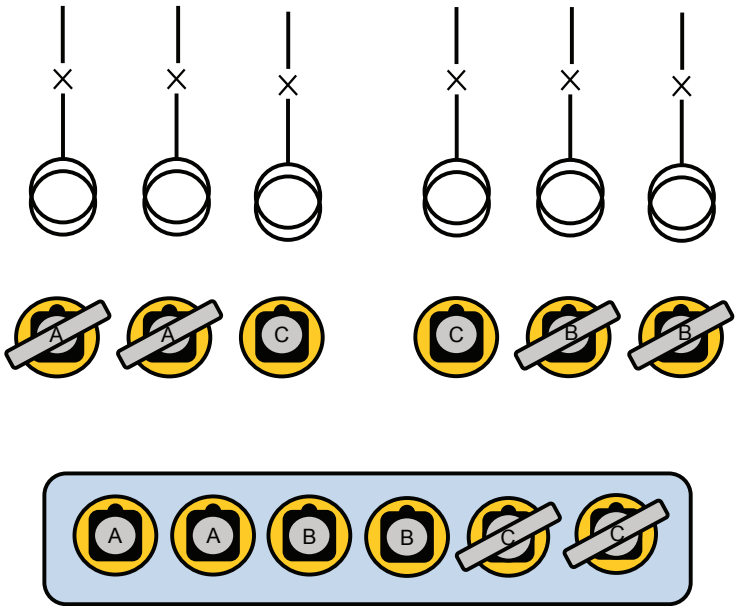
This system will require six locks depending on the breakers. One key exchange box and six keys.

Breakers A and B are closed and the keys are trapped. Keys A and B are removed from the breakers when they are opened and inserted into the key exchange box releasing the C keys.

The C keys are then inserted in the C locks, closing breakers C.

The symbols used here are A, B and C for the incomers.

* All locks can be individually fitted to suit the switchgear



Incomer Interlocking (4)

Operation

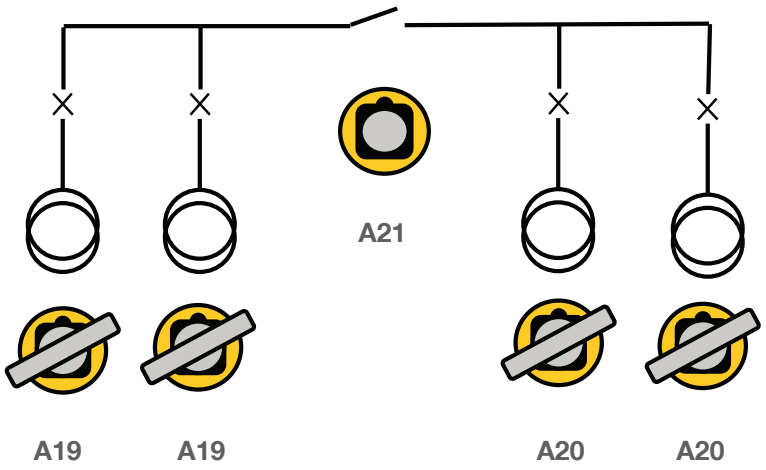
The operation is shown with all incomers closed, the bus coupler open and its key A21 trapped in the W Selector Box.

To change to position 1 from normal, incomers with symbols A19 are inserted and trapped in the W Selctor Box. The asterisks denote that incomers three and four remain closed and need not be returned to the box. Key A21 can now be removed to close the bus coupler switch.

To change to position 2 from normal, incomers with symbols A20 are opened and their keys are inserted and trapped in the W selector box. The asterisks denote that incomers 1 and 2 remain closed and need not be returned to the box. Key A21 can now be removed to close the bus coupler switch.

The symbols used here are A19 and A20 for the circuit breakers and A21 for the bus coupler.

* All locks can be individually fitted to suit the switchgear



Position	Inc 1 A19	Inc 2 A19	Inc 3 A20	Inc 4 A20	BC A21
1	T	T	F	F	F
Normal	F	F	F	F	T
2	F	F	T	T	F

* In neighbouring positions only where the key is free in both positions the key does not need to be returned to the key exchange box.

Switchgear Interlocking

Incomer and Busbar Interlocking (1)

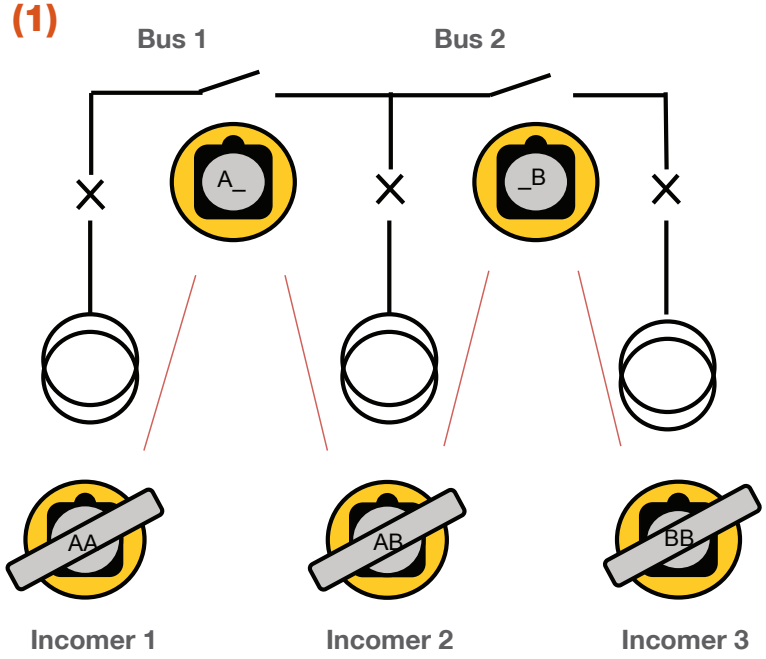
Operation

This system requires five locks and three keys. In the normal operation the keys are trapped in the incomers in the closed position and both bus couplers are open.

The symbol sequence will allow appropriate incomers to be open allowing the key to be released, transferred and inserted and trapped to the associated bus coupler allowing it to be closed.

The symbols used here are AA, AB and BB for the Incomers and A_ (A BLANK)and _B (BLANK B) for the bus couplers.

* All locks can be individually fitted to suit the switchgear



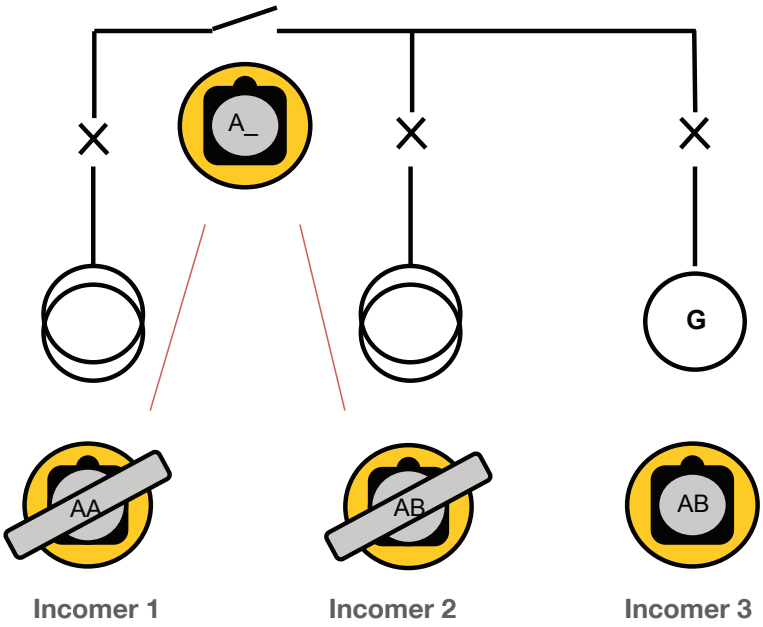
Incomer, Generator and Busbar Interlocking

Operation

The normal operation is the 2 incomers are closed with bus coupler and generator are both open. The symbol arrangement using key symbols AA, AB, A_ (A Blank) on locks with just keys AA AB will ensure safe switching operation. It will not be possible to have Incomer 2 and Generator closed at the same time to avoid paralleling.

The symbols used here are AA and AB for the incomers and A_ (A BLANK) for the bus coupler.

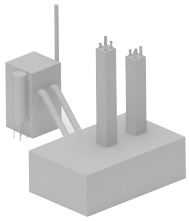
* All locks can be individually fitted to suit the switchgear



Transformer Interlocking

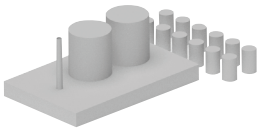
Energy Industry
Application Note

Castell

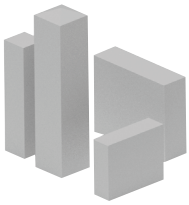

Gas Power


Coal Power


Wind Farm

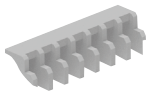

Bio-Energy

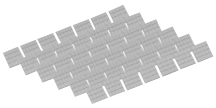

Nuclear Power


Data Centre

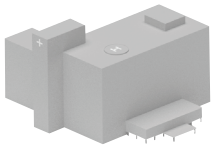
The Risk

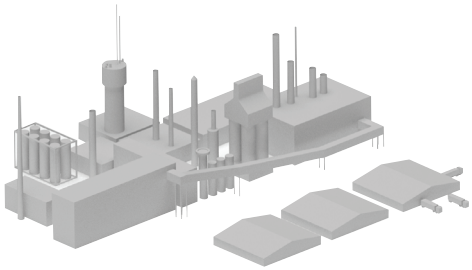
Access can be gained into the transformer room whilst the transformer is in an unsafe state. To maintain this transformer, which is usually housed in its own enclosure or room, it is necessary to isolate and earth the connections before gaining access to the transformer.

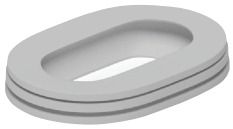

Hydro-Electric

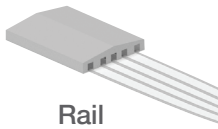

Solar Energy


Airport


Hospital


Industry and Manufacturing


Stadium


Rail

Energy Industry

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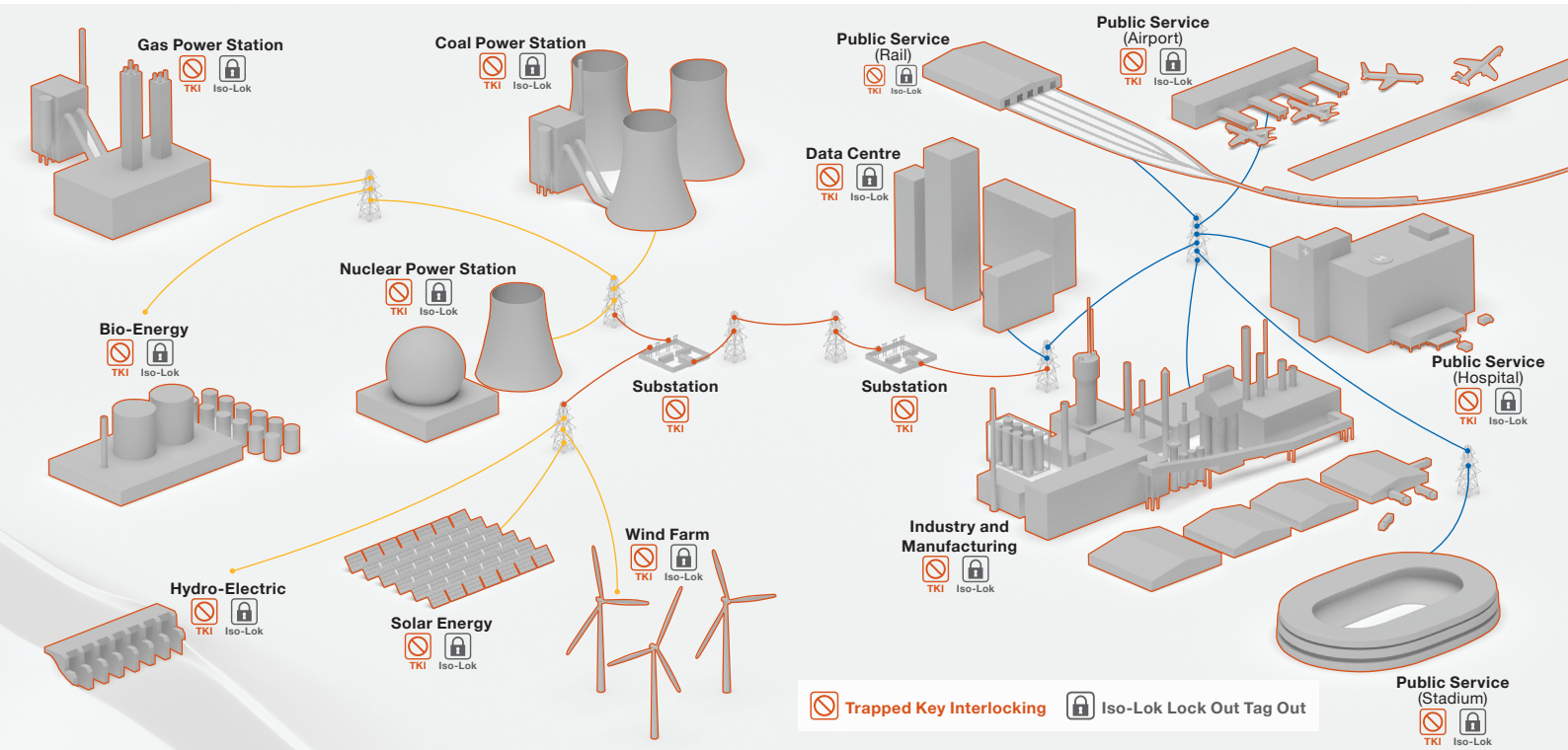
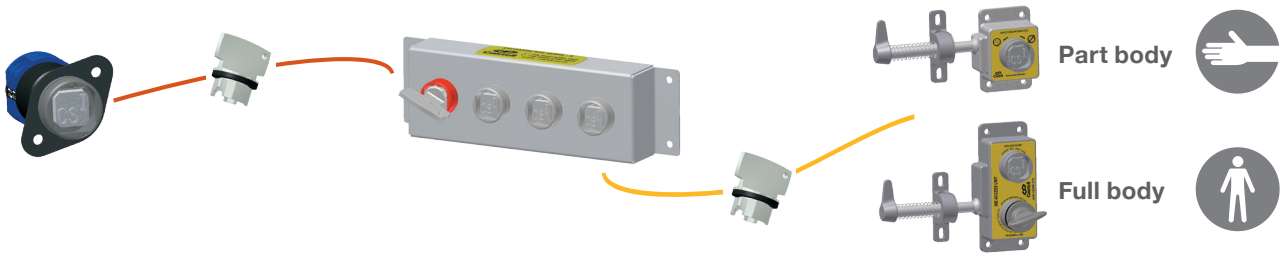


Castell Solution

1 Isolation

2 Key Exchange

3 Access Control



Benefits

1) Extended system life, due to the stainless steel construction of housings and mechanisms Castell interlock systems offer many years of trouble free operation.
2) High level of risk control, as control is in the hands of the operator/engineer when in the dangerous area through the personnel key.
3) Downtime is reduced as access is mechanical.
4) Improved efficiency, through implementing a process rather than a procedure the system operation is not dependant on verbal communication. The transfer of the key enables operators to know the status.

Products

<table>
<tr><th>Isolation</th><th>Exchange</th><th colspan="2">Access</th></tr>
<tr><td colspan="2">Whilst the disconnector is on the A key cannot be removed. Switching the disconnector to the off position will allow the A key to be removed from the K Lock. This A key can then be inserted into the K Lock which will retract the bolt and allow the earthing to be switched on. This will in turn allow the key B to be removed extending the bolt and locking the earthing in to the on position.</td><td>Where there are multiple points of entry an exchange box will be required to enable multiple keys to be released.</td><td colspan="2">The B key can now we used to gain access through AIE. A personnel key will be released to ensure that the operation cannot be reversed whilst personnel are in the transformer housing.</td></tr>
<tr><td>FS/Q
  </td><td>K
  </td><td rowspan="2">X
  </td><td>AI
  </td><td>AIE
  </td></tr>
<tr><td colspan="2">KL
  </td><td colspan="2"></td></tr>
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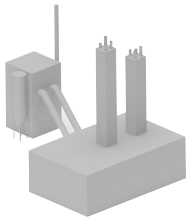
CO_2 Extinguishing System

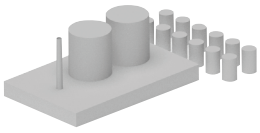
Energy Industry
Application Note

Castell

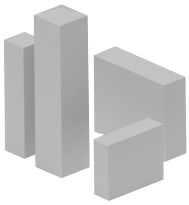

Gas Power

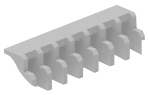

Coal Power


Wind Farm


Bio-Energy


Nuclear Power


Data Centre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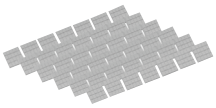
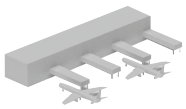
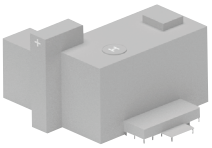
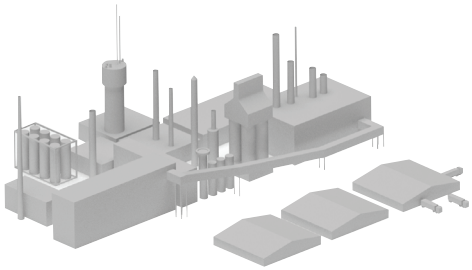
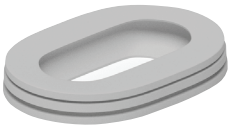
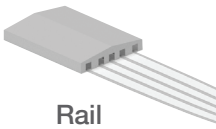

Solar Energy


Airport


Hospital


Industry and Manufacturing


Stadium


Rail

The Risk

CO_2 extinguishing systems are used as fire suppression for plant equipment which poses the danger of inadvertently igniting a fire, e.g. turbines. Access can be gained to the room that contains the CO_2 whilst the CO_2 extinguishing system is still in an active state. So therefore the CO_2 extinguishing system needs to be isolated and put in a safe state before entry to the area can be granted.

Energy Industry

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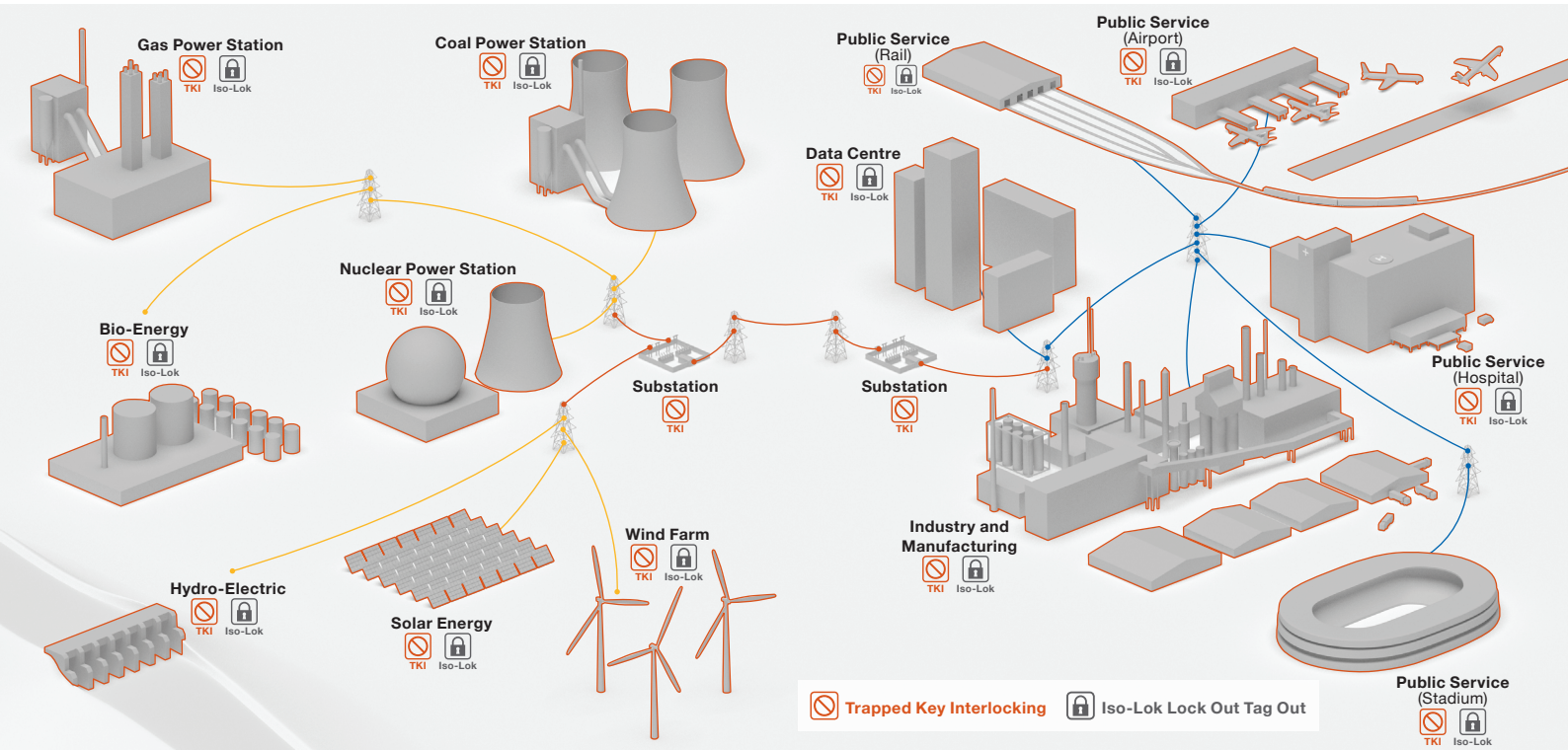
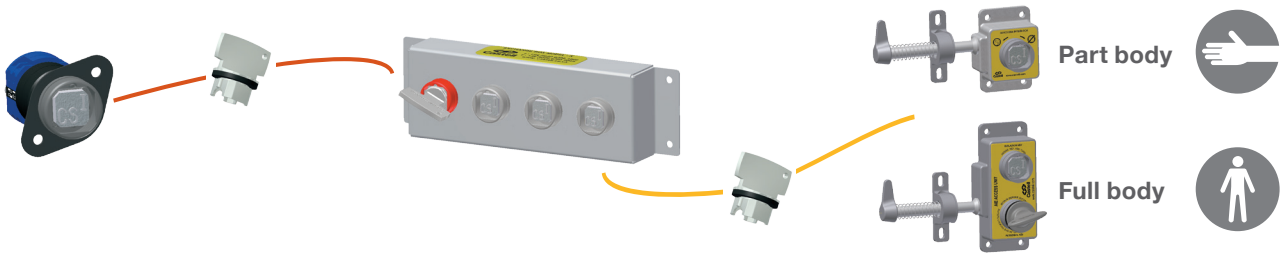


CO_2 Extinguishing System

Energy Industry
Application Note

Castell Solution

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



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3) Downtime is reduced as access is mechanical.
4) Improved efficiency, through implementing a process rather than a procedure the system operation is not dependant on verbal communication. The transfer of the key enables operators to know the status.

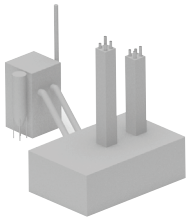
Products

Isolation		Exchange	Access
By turning and releasing Key A from the control panel the CO2 extinguishing system will be deactivated. Key A is now transferred to the MBV CO2 manifold stop valve. By introducing key A into the valve interlock, the valve can be turned and locked in the closed position. Key B can now be removed.		The exchange box allows multiple keys C to be released so access can be gained to multiple areas. These keys can only be released when key B is locked in position.	Key C is transferred to the EDIX access interlock. When key C is inserted and turned, it releases key D and allows the door to be opened. The personal key D is taken into the hazard area. The primary key C remains trapped in the door unit. The EDIX access interlock is connected to a panic bar, which allows immediate exit at all times.
KS 	MBV 	X 	EDIX 

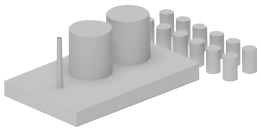
Crane Interlocking

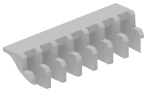
Energy Industry
Application Note


Coal Power


Gas Power


Nuclear Power


Bio-Energy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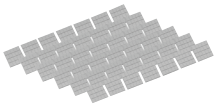
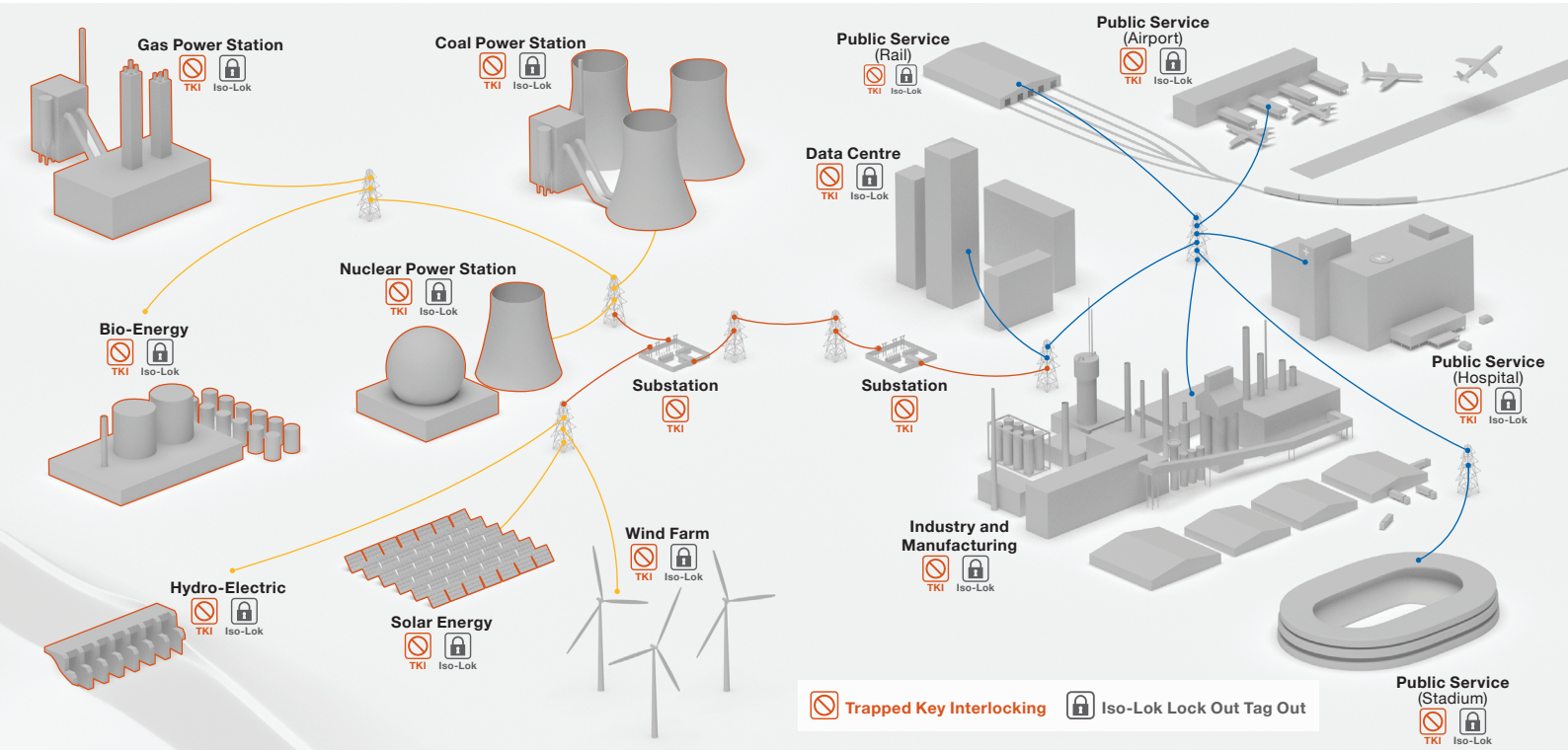

Solar Energy

The Risk

Cranes are used to lift heavy plant equipment when its required to, e.g. turbines. Access can be gained into the room containing crane whilst the crane is in an unsafe state. So therefore the crane needs to be isolated and put in a safe state before entry to the area can be granted.

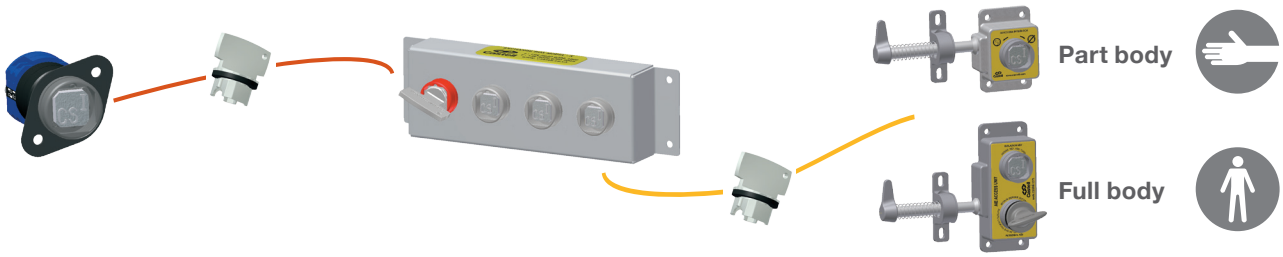
Energy Industry

GENERATION TRANSMISSION & DISTRIBUTION INDUSTRIAL & COMMERCIAL SUPPLY



Castell Solution

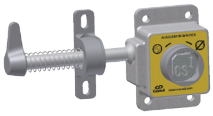
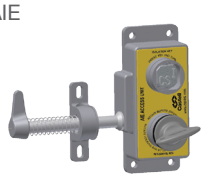
1 Isolation **2 Key Exchange** **3 Access Control**



Benefits

1) Extended system life, due to the stainless steel construction of housings and mechanisms Castell interlock systems offer many years of trouble free operation.
2) High level of risk control, as control is in the hands of the operator/engineer when in the dangerous area through the personnel key.
3) Downtime is reduced as access is mechanical.
4) Efficiency is improved through enabling access when the equipment is ready through the use of the KSS unit. This removes the need for a fixed time delay.

Products

<table>
<tr><th colspan="2">Isolation</th><th>Exchange</th><th colspan="2">Access</th></tr>
<tr><td colspan="2">Isolation of the crane machinery can require that the equipment reaches a home position before safe entry can be gained. If this is the situation then a solenoid controlled KSS unit is required. This device waits for a home signal before the key used to gain access is released. If the equipment can be stopped in any position a simple KS20 switch can be used.</td><td>Where there are multiple points of entry an exchange box will be required to enable multiple keys to be released.</td><td colspan="2">The product used to control access has to be based on the access that can be gained, this will be either a part body or full body access lock.</td></tr>
<tr><td>KS
  </td><td>KSS
  </td><td>X
  </td><td>AI
  </td><td>AIE
  </td></tr>
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  </td></tr>
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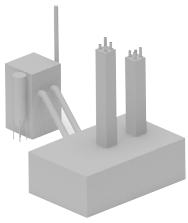
Precipitators

Energy Industry
Application Note

Coal Power



Gas Power

The Risk

The precipitator environment is a very harsh environment in terms of exposure to the elements and the risk that precipitators present with electrodes carrying in excess of 10,000 volts. There is therefore a danger to personnel who need to enter these areas to carry out maintenance.

Energy Industry

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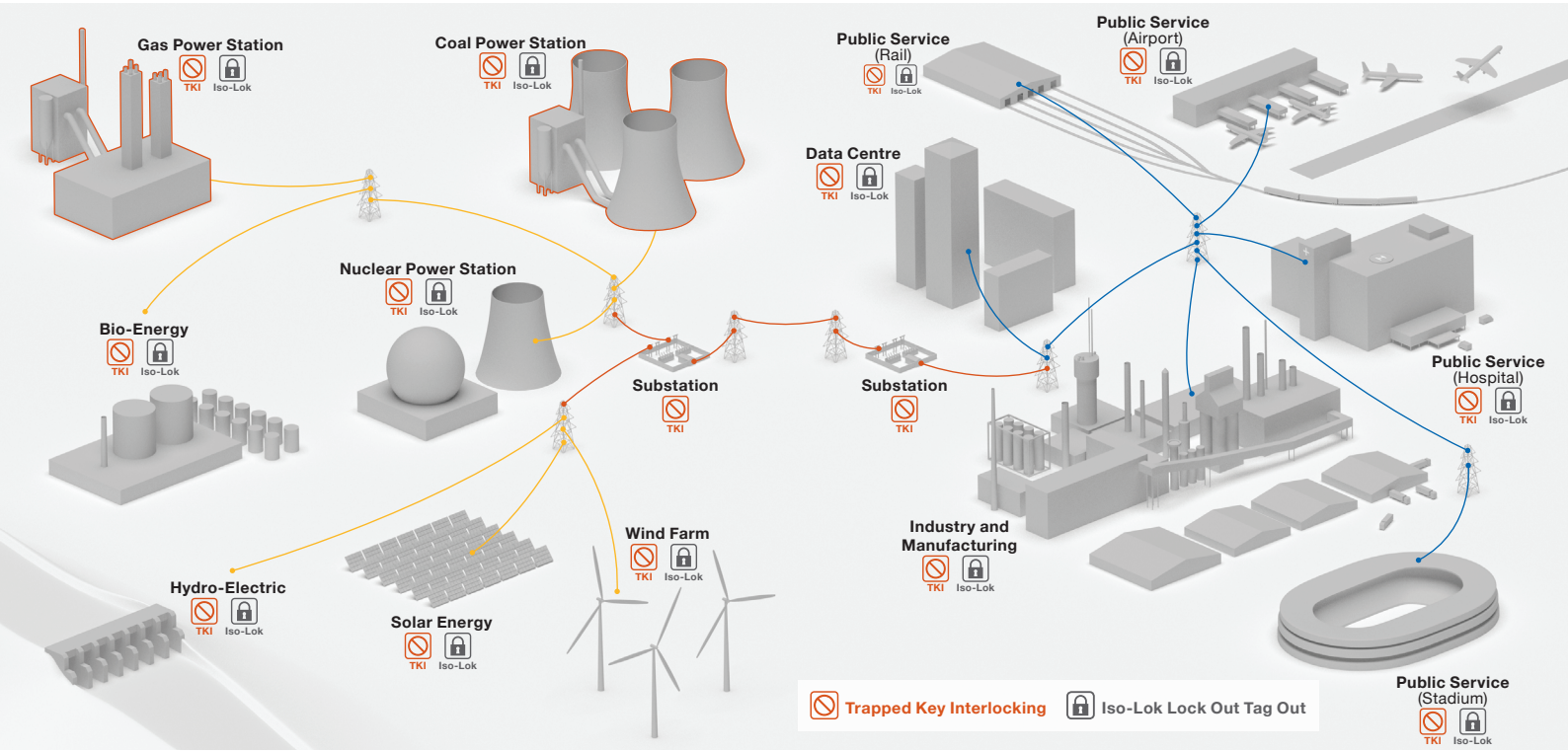
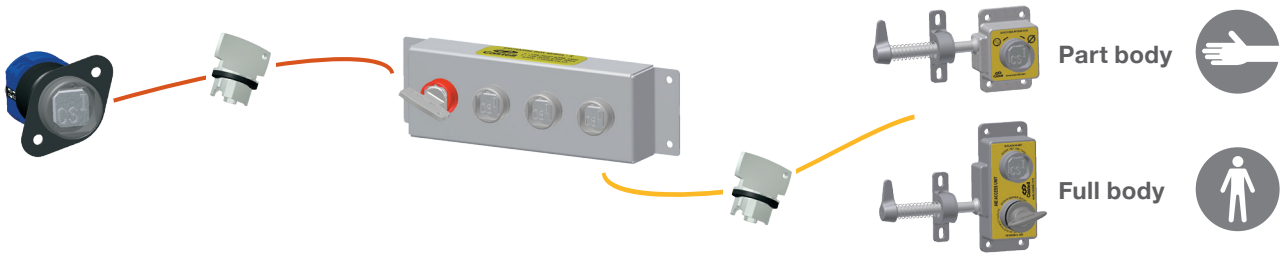


Castell Solution

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



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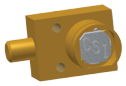
3) Downtime is reduced as access is mechanical.
4) Improved efficiency, through implementing a process rather than a procedure the system operation is not dependant on verbal communication. The transfer of the key enables operators to know the status.

Products

Isolation		Exchange	Access	
The process for isolating precipitators is to firstly isolate the circuit breaker, this will then allow the removal of the circuit breaker key A. The circuit breaker key A is then used to isolate the transformer, when the transformer is isolated the circuit breaker key remains trapped, therefore preventing the circuit breaker returning to the live state. Locking the circuit breaker key in the transformer allows the removal of the transformer key B.		The exchange box allows multiple keys C to be released so access can be gained to multiple areas. These keys can only be released when the transformer key is locked in position.	When access is gained the keys from the exchange box remain trapped in the access locks, this effectively ensures that no power to the electrodes can be turned on whilst access is gained.	
KS 	K 	X 	AI 	AIE 
KL 				

Wind Farm

Energy Industry
Application Note

Wind Farm

The Risk

A typical onshore wind turbine generator installation has a transformer fitted to step-up the output voltage from 690V to 33KV for connection onto the Grid. Access can be gained into the transformer room whilst the transformer is in an unsafe state. To maintain this transformer, which is usually housed in its own enclosure or room, it is necessary to isolate both the HV and LV connections to gain access to the transformer.

Energy Industry

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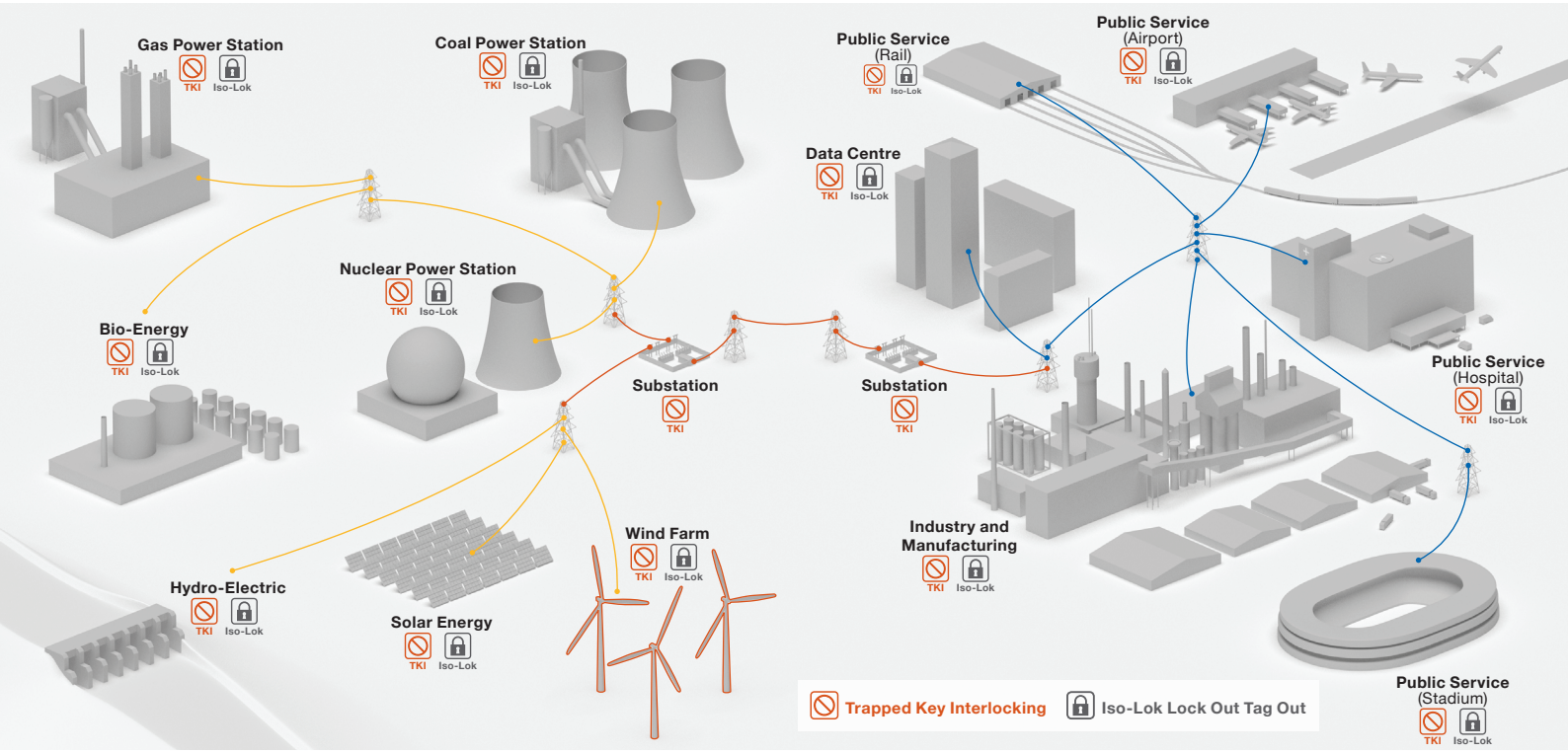
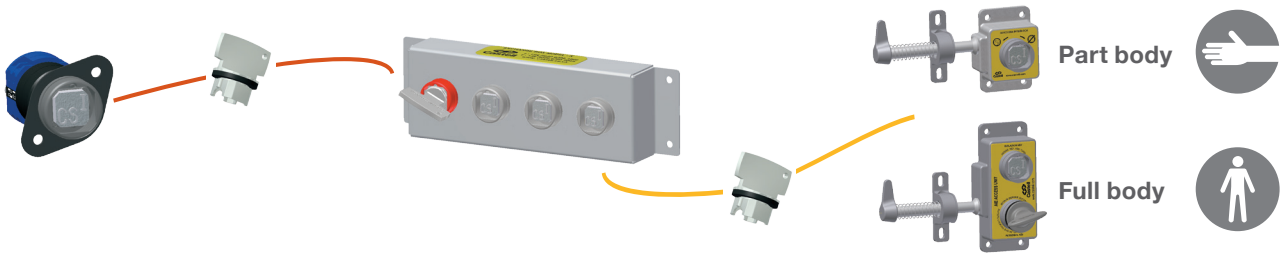


Castell Solution

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



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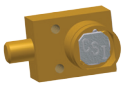
Products

Isolation		Exchange	Access	
When the wind turbine is running and generating electricity the keys are trapped in the HV and wind turbine circuit breaker and access can not be gained to the transformer housing. When the wind turbine and HV circuit breakers are open the keys can then be released.		These keys can be inserted in to the exchange box releasing the transformer housing key.	This key is then inserted into the AI to gain access to the transformer housing.	
FS/Q 	K 	X 	AI 	AIE 

Waste Processing

Energy Industry
Application Note

Castell

Nuclear Power

The Risk

The waste processing area contains automated machinery that collects and distributes waste. Access can be gained into the room containing nuclear waste whilst the machinery that is unloading the waste into the room is in an unsafe state. So therefore the machinery needs to be isolated and put in a safe state before entry to the area can be granted.

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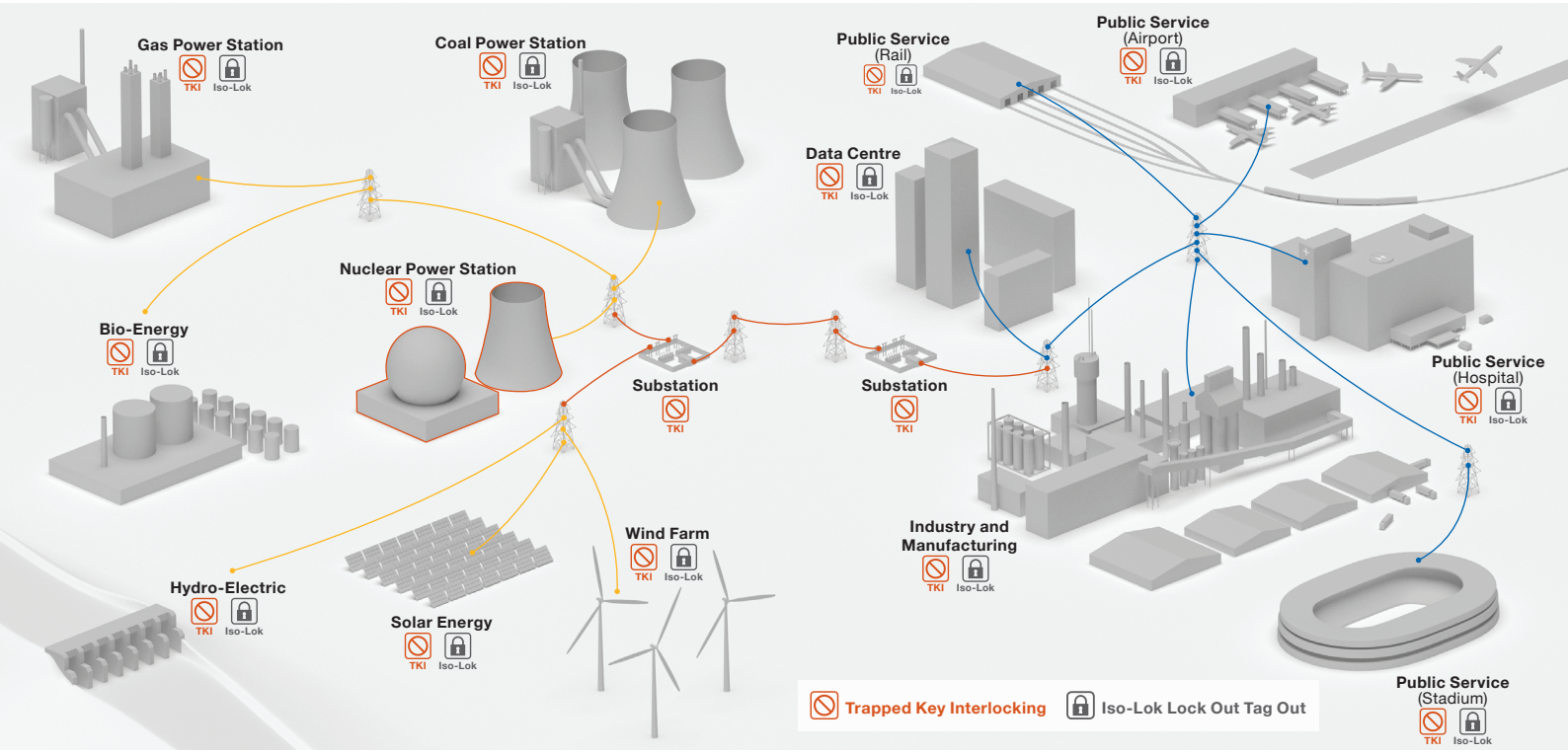
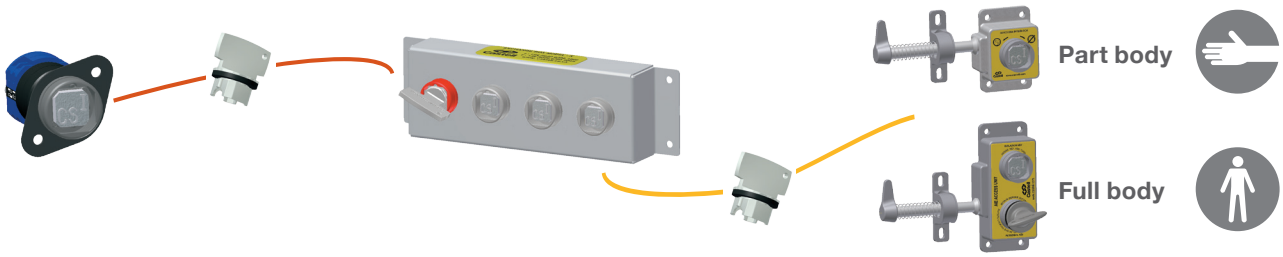


Castell Solution

1 Isolation

2 Key Exchange

3 Access Control



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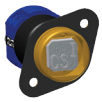
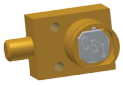
Products

Isolation		Exchange		Access	
Isolation of the waste removal machinery can require that the equipment reaches a home position before safe entry can be gained. If this is the situation then a solenoid controlled KSS unit is required. This device waits for a home signal before the key used to gain access is released. If the equipment can be stopped in any position a simple KS20 switch can be used.		Where there are multiple points of entry and or multiple points of isolation required an exchange box will be needed to enable multiple keys to be inserted prior to access keys being released.		The product used to control access has to be based on the access that can be gained, this will be either a part body or full body access lock.	
KS 	KSS 	X 	Y 	AI 	AIE 
K 		Z 			

Coal Conveyor

Energy Industry
Application Note

Coal Power

The Risk

The coal conveyor is an automated process machine which provides a danger from moving parts on the chain drive at the directional change point. Access can be gained into the area whilst the coal conveyor is in an unsafe state. So therefore the coal conveyor needs to be isolated and put in a safe state before entry to the area can be granted.

Energy Industry

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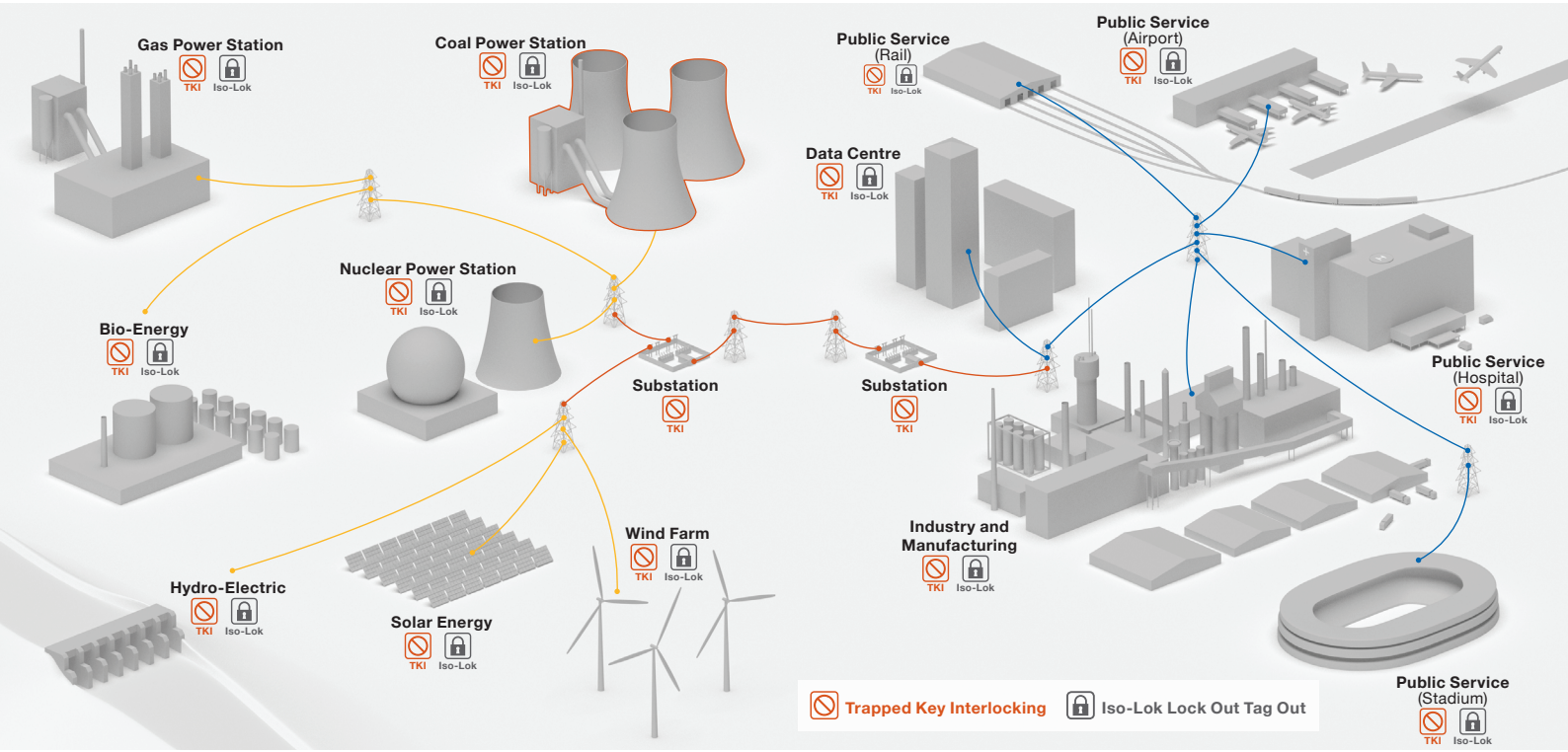
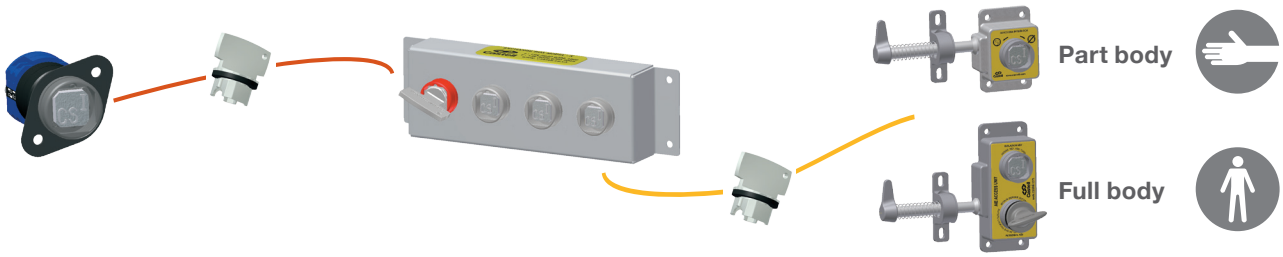


Castell Solution

1 Isolation

2 Key Exchange

3 Access Control



Benefits

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2) High level of risk control, as control is in the hands of the operator/engineer when in the dangerous area through the personnel key.
3) Downtime is reduced as access is mechanical.
4) Efficiency, this is improved through reducing the dependance on fit and electrical contacts. The key can only be released when guarding has been fitted correctly. This reduces the time spent chasing poor contacts prior to machinery restarting.

Products

<table>
<tr><th colspan="2">Isolation</th><th>Exchange</th><th colspan="2">Access</th></tr>
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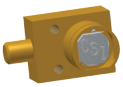
<tr><td>KSD
  </td><td>KS
  </td><td rowspan="2">X
  </td><td>AI
  </td><td>AIE
  </td></tr>
<tr><td colspan="2">K
  </td><td colspan="2"></td></tr>
</table>

Coal Crusher

Energy Industry
Application Note

Coal Power

The Risk

The coal crusher is an automated process machine which also has an continuous CO_2 extinguishing system in place. Access can be gained to the coal crusher area whilst the coal crusher and CO_2 extinguishing system are still in an active state. So therefore the coal crusher and CO_2 extinguishing system needs to be isolated and put in a safe state before entry to the area can be granted.

Energy Industry

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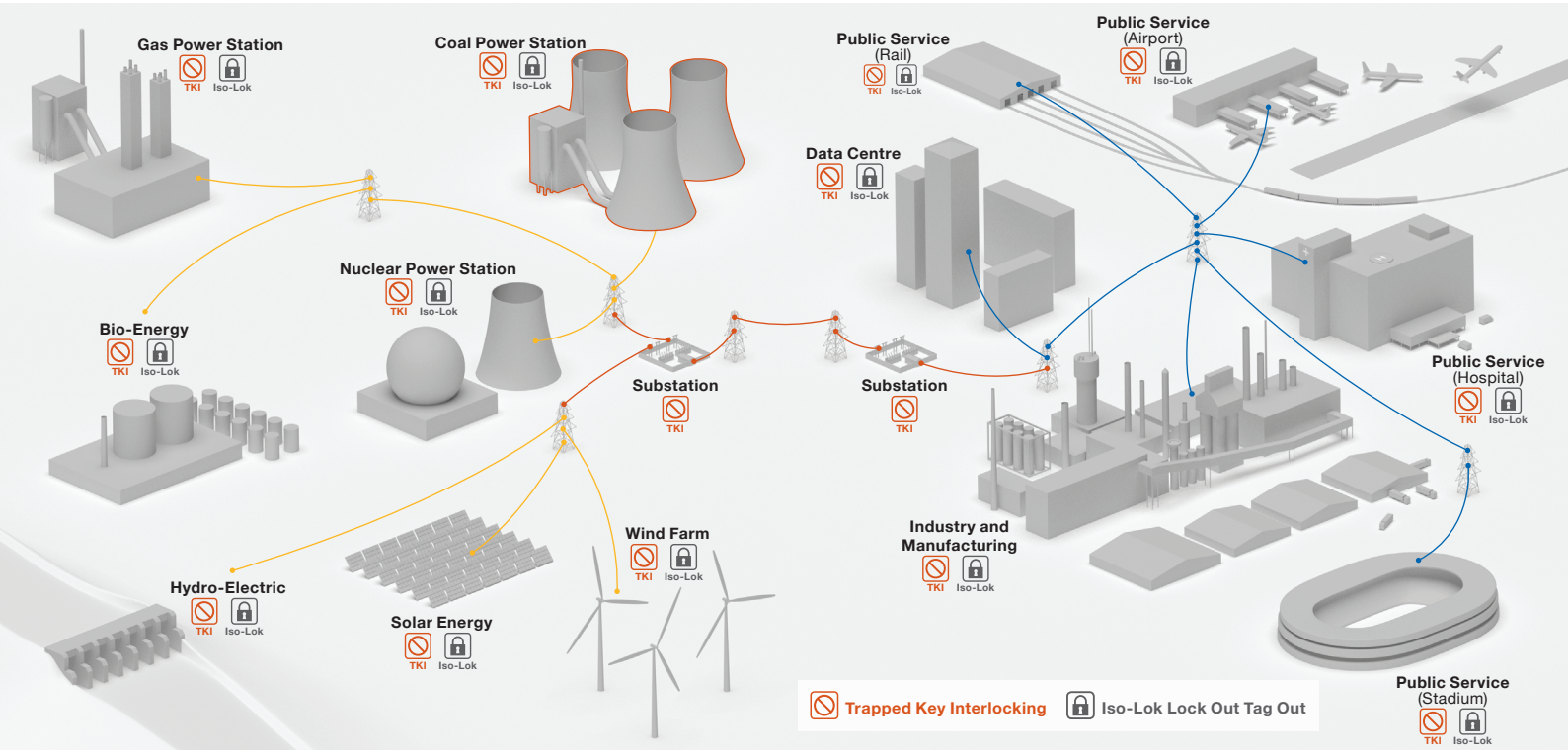
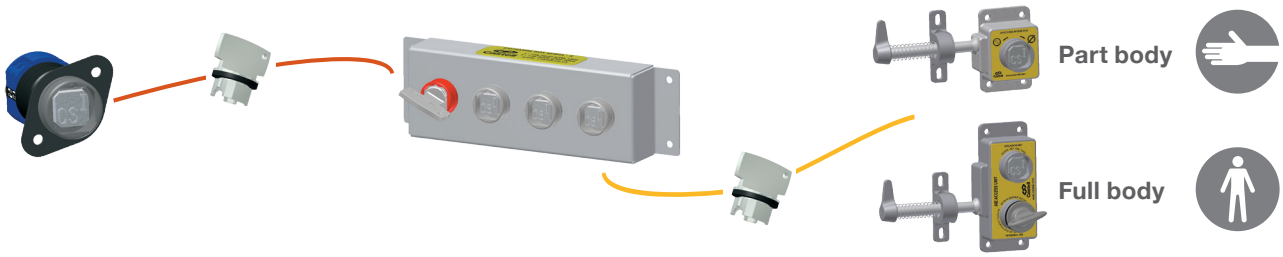


Castell Solution

1 Isolation

2 Key Exchange

3 Access Control



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3) Downtime is reduced as access is mechanical.
4) Improved efficiency, through implementing a process rather than a procedure the system operation is not dependant on verbal communication. The transfer of the key enables operators to know the status.

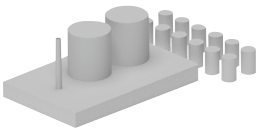
Products

Isolation		Exchange	Access	
By turning and releasing Key A from the control panel the CO_2 extinguishing system will be deactivated. Key A is now transferred to the MBV CO_2 manifold stop valve. By introducing key A into the valve interlock, the valve can be turned and locked in the closed position. Key B can now be removed.		The exchange box allows multiple keys C to be released so access can be gained to multiple areas. These keys can only be released when key B is locked in position.	Key C is transferred to the AIE access interlock. When key C is inserted and turned, it releases key D and allows the door to be opened. The personal key D is taken into the hazard area. The primary key C remains trapped in the door unit.	
KS 	MBV 	X 	AI 	AIE 

Timber Conveyor

Energy Industry
Application Note

Castell



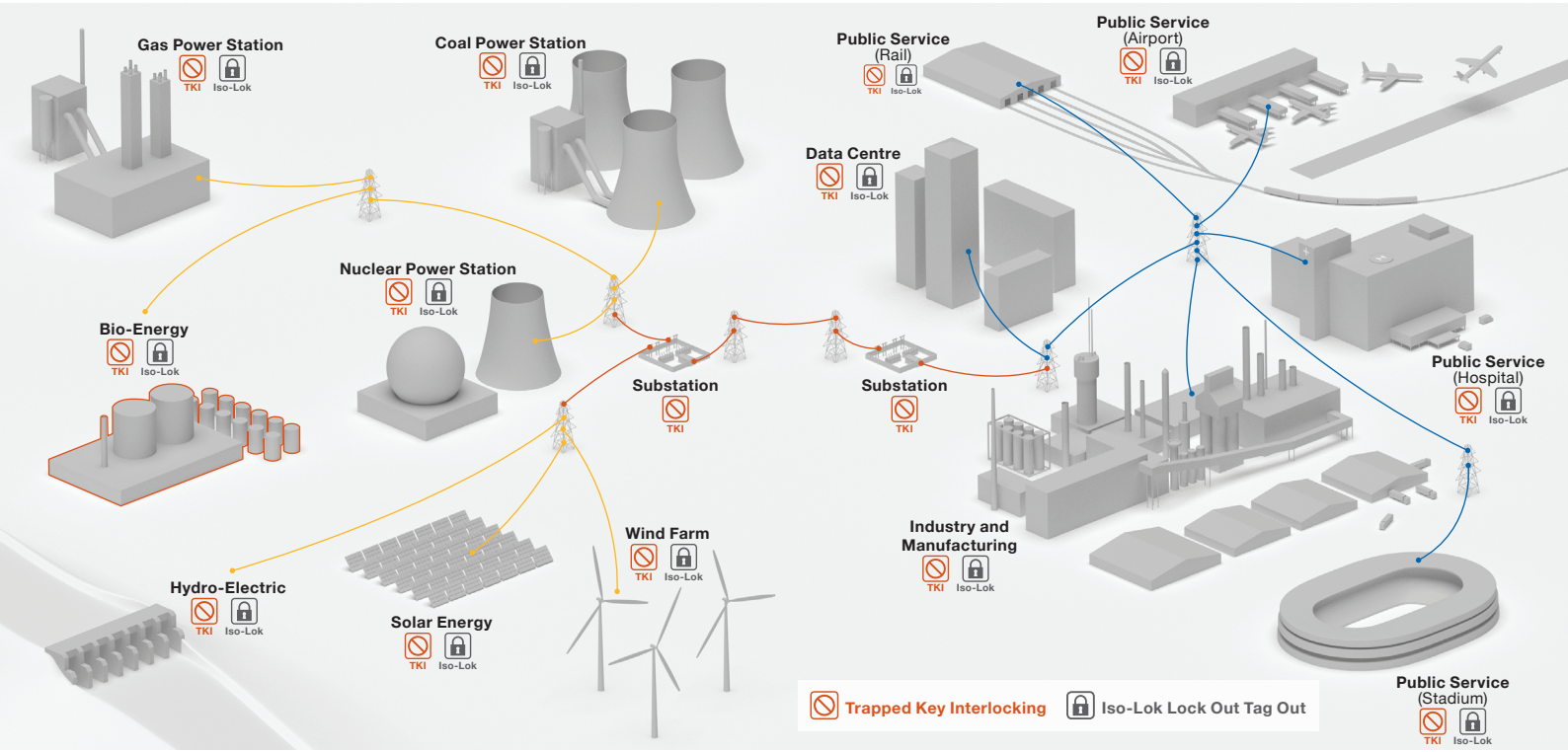
Bio-Energy

The Risk

The timber conveyor is an automated process machine which provides a danger from moving parts on the chain drive at the directional change point. Access can be gained into the area whilst the timber conveyor is in an unsafe state. So therefore the timber conveyor needs to be isolated and put in a safe state before entry to the area can be granted.

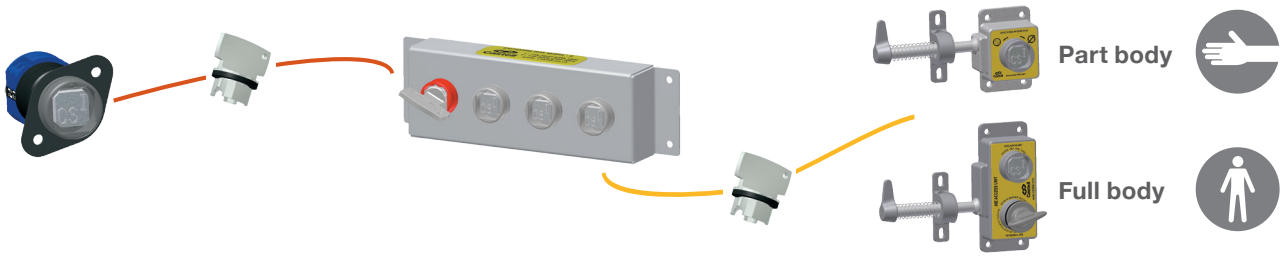
Energy Industry

GENERATION | TRANSMISSION & DISTRIBUTION | INDUSTRIAL & COMMERCIAL SUPPLY



Castell Solution

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



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Products

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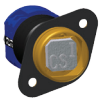
<tr><td>KSD  </td><td>KS  </td><td rowspan="2">X  </td><td>AI  </td><td>AIE  </td></tr>
<tr><td colspan="2">K  </td><td colspan="2"></td></tr>
</table>

Substation

The Risk

Maintenance can be carried out on part of the system by a personnel before the disconnectors surrounding that part have been isolated and the system has been earthed.

Energy Industry

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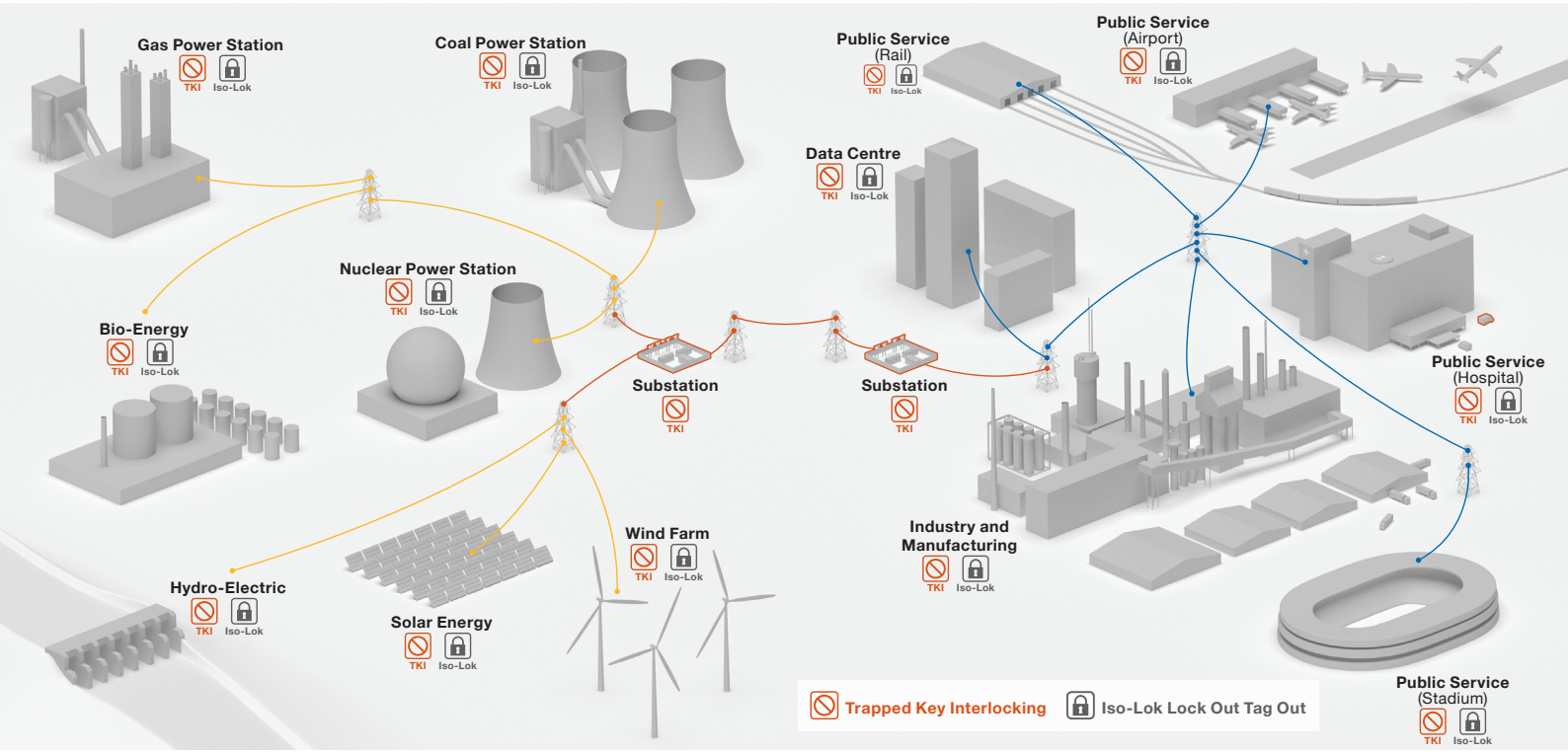


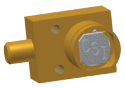
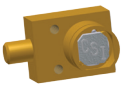
Castell Solution

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

Benefits

1) Extended system life, due to the stainless steel construction of housings and mechanisms Castell interlock systems offer many years of trouble free operation.
2) High level of risk control, as control is in the hands of the operator/engineer when switching between disconnectors / earthing switches
3) Downtime is reduced as operation is mechanical.
4) Improved efficiency, through implementing a process rather than a procedure the system operation is not dependant on verbal communication. The transfer of the key enables operators to know the status.

Products

<table>
<tr><th colspan="2">Isolation</th><th>Exchange</th><th colspan="2">Earthing</th></tr>
<tr><td colspan="2">Releasing a key from the disconnector when it is in the open position thus isolating the disconnector.</td><td>If necessary this key can be inserted into a key exchange box to release multiple keys.</td><td colspan="2">These keys can then be inserted into each earth switch in order to switch the system to earth.</td></tr>
<tr><td>FS/Q
  </td><td>K
  </td><td rowspan="2">X
  </td><td>FS/Q
  </td><td>K
  </td></tr>
<tr><td>KL
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<tr><td colspan="2">KLP
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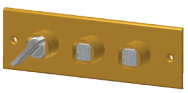
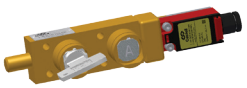
  </td><td colspan="2">KLP
  </td></tr>
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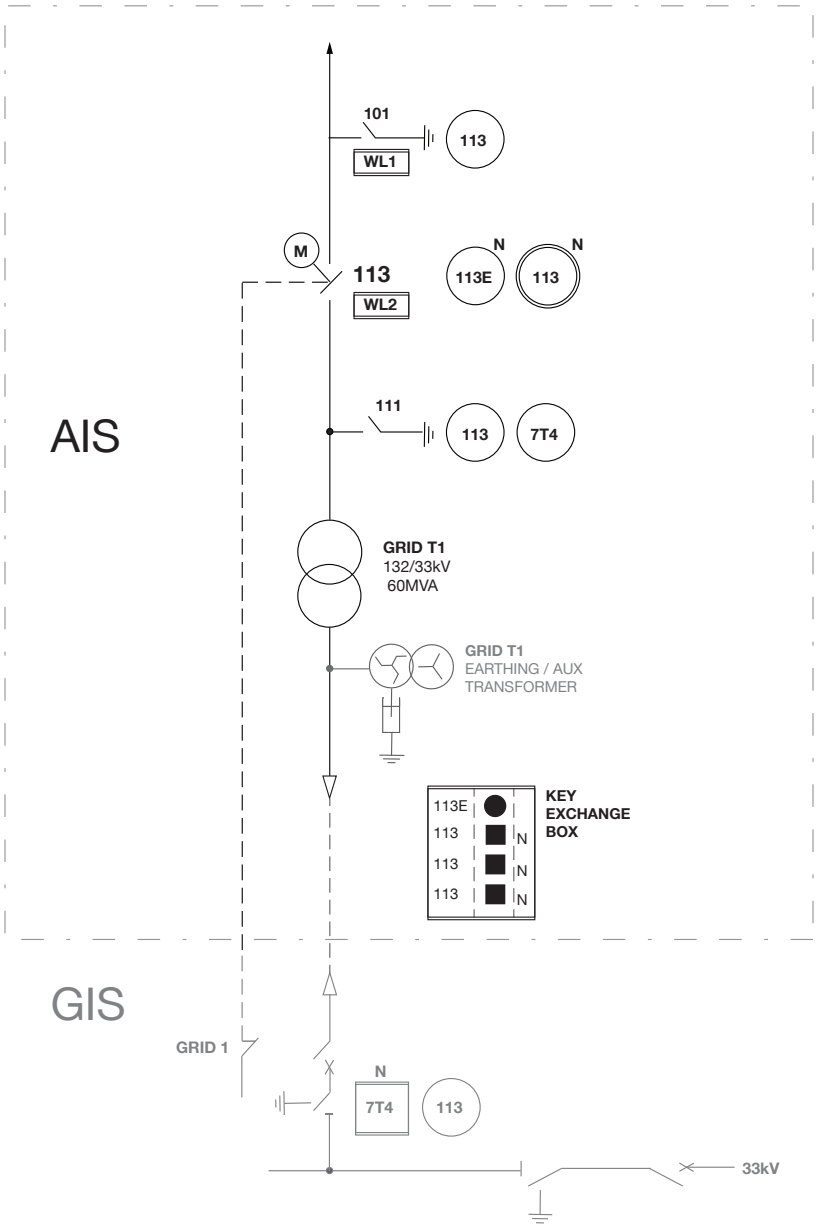
Diagram of AIS Interlocking (Example)



Switchgear Interlocking Symbols

- KEY RELEASED IN OPEN POSITION. TRAPPED IN ALL OTHER POSITIONS.
- LOCKOUT KEY: KEY RELEASED IN OPEN POSITION. TRAPPED IN ALL OTHER POSITIONS.
- KEY TRAPPED IN FULLY OPEN OR FULLY CLOSED POSITIONS. TRAPPED IN ALL OTHER POSITIONS.
- KEY RELEASED WHEN CB CLOSED IN EARTH POSITION. TRAPPED IN ALL OTHER POSITIONS.
- N — NORMAL SERVICE POSITION OF KEY.
- WL1 — WARNING LABEL INSCRIBED: WARNING - THIS EARTH SWITCH IS NOT FULLY INTERLOCKED AND MUST NOT BE OPERATED UNLESS THE CIRCUIT IS SWITCHED OUT AT THE REMOTE END
- WL2 — WARNING LABEL INSCRIBED: WARNING - THIS DISCONNECTOR IS NOT FULLY INTERLOCKED AND MUST NOT BE OPERATED UNLESS THE CIRCUIT IS SWITCHED OUT AT ALL POINTS OF SUPPLY.
- KEY EXCHANGE BOX: KEY SHOWN THUS ●, WHEN INSERTED, WILL RELEASE KEYS SHOWN THUS ■.
- ELECTRICAL BOLT INTERLOCK CIRCUIT. AUXILIARY SWITCHES ON 33kV CB, CLOSED WHEN CB IS OPEN.
- MOTORISED DISCONNECTOR
- TRANSFORMER
- SWITCH DISCONNECTOR WITH INTEGRAL EARTH SWITCH
- SWITCH DISCONNECTOR
- EARTH SWITCH
- CIRCUIT BREAKER

Operation

Switches, circuit breakers, transformers and other apparatus may be interconnected by air-insulated bare conductors strung on support structures. The air space required increases with system voltage. For medium-voltage distribution substations, metal-enclosed switchgear may be used and no live conductors exposed at all.

Mechanical interlocks are normally used to control the sequence of operation of the switch disconnectors and earth switches to ensure safe operation for both personnel and plant security.

I.e. earth switch 111 shown above cannot be switched to earth until the switch disconnector 113 and the GRID1 CB are switched and locked in open position releasing key 7T4. Keys 113 and 7T4 can then be inserted into earth switch 111, which can now be closed.

Standard locks used for this application are single, double or multiple deadlocks such as K and KL (with Q-type lock portions).

Substation

The Risk

Maintenance can be carried out on part of the system by a personnel before the disconnectors surrounding that part have been isolated and the system has been earthed.

Energy Industry

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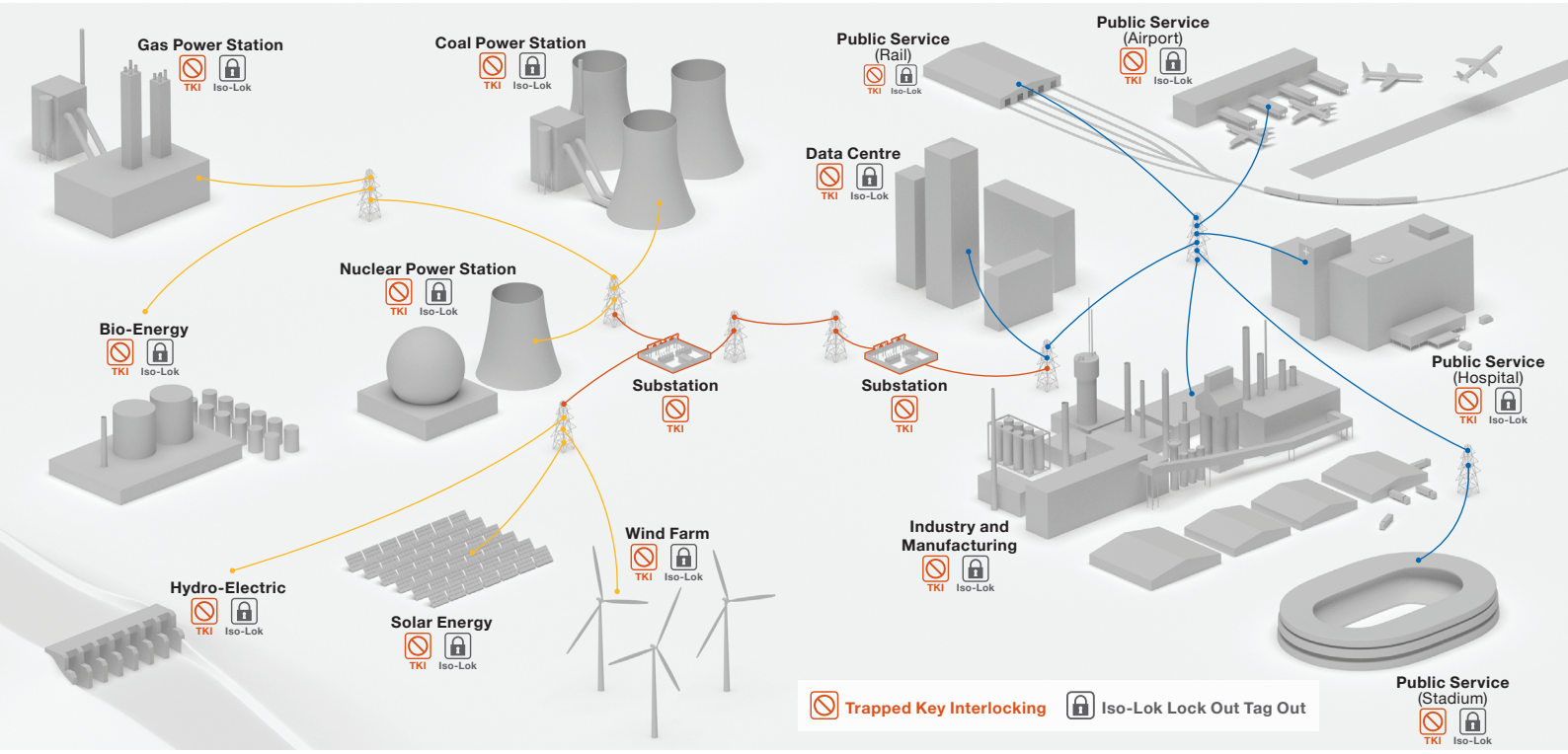


Castell Solution

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

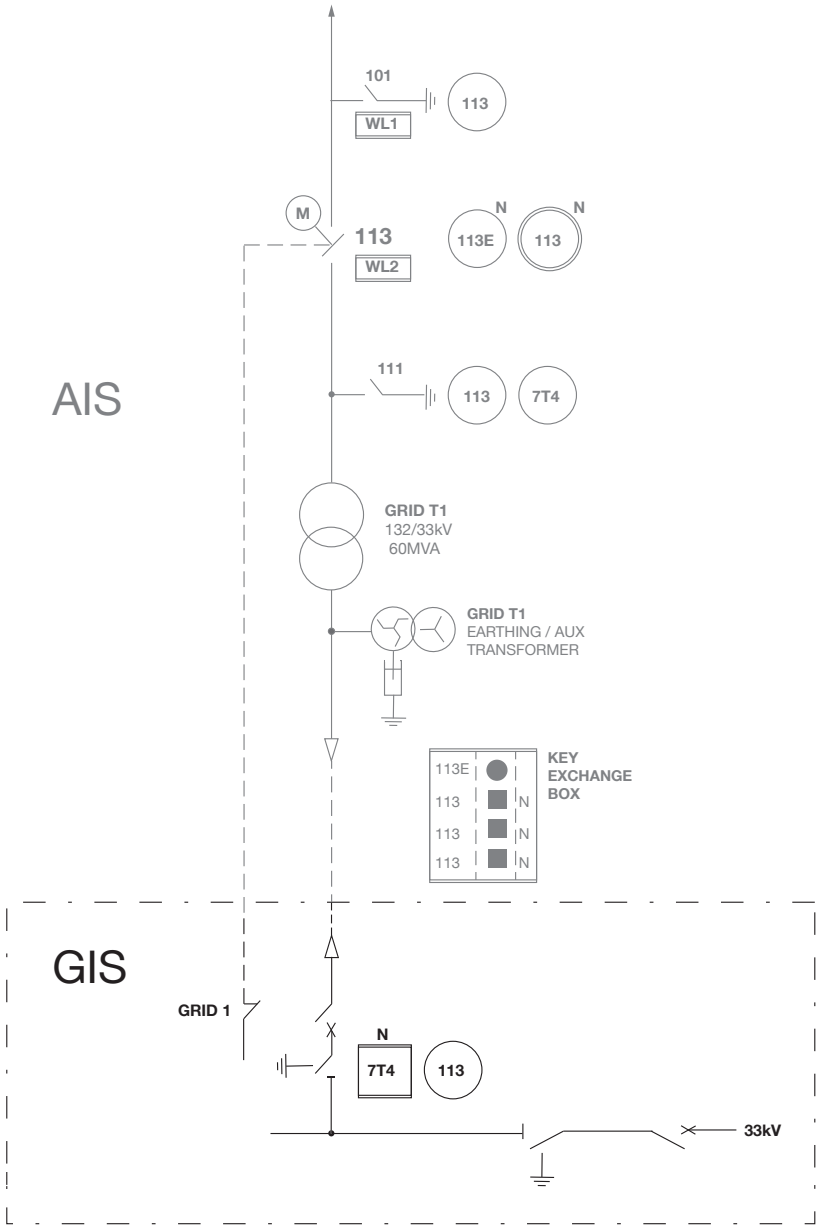
Benefits

1) Extended system life, due to the stainless steel construction of housings and mechanisms Castell interlock systems offer many years of trouble free operation.
2) High level of risk control, as control is in the hands of the operator/engineer when switching between disconnectors / earthing switches.
3) Downtime is reduced as operation is mechanical.
4) Improved efficiency, through implementing a process rather than a procedure the system operation is not dependant on verbal communication. The transfer of the key enables operators to know the status.

Products

<table>
<tr><th colspan="2">Isolation</th><th>Exchange</th><th colspan="2">Earthing</th></tr>
<tr><td colspan="2">Trapping a key into the solenoid controlled interlock will send a signal to open the disconnector thus isolating the disconnector.</td><td>-</td><td colspan="2">A signal will then be sent from the earth switch once the earth switch is closed thus releasing a lock out key.</td></tr>
<tr><td>KSS  </td><td>KSSE  </td><td rowspan="2">-</td><td>KSS  </td><td>KSSE  </td></tr>
<tr><td colspan="2">KSUPS  </td><td colspan="2">KSUPS  </td></tr>
</table>

Diagram of GIS Interlocking (Example)



Switchgear Interlocking Symbols

- KEY RELEASED IN OPEN POSITION. TRAPPED IN ALL OTHER POSITIONS.
- LOCKOUT KEY: KEY RELEASED IN OPEN POSITION. TRAPPED IN ALL OTHER POSITIONS.
- KEY TRAPPED IN FULLY OPEN OR FULLY CLOSED POSITIONS. TRAPPED IN ALL OTHER POSITIONS.
- KEY RELEASED WHEN CB CLOSED IN EARTH POSITION. TRAPPED IN ALL OTHER POSITIONS.
- N — NORMAL SERVICE POSITION OF KEY.
- WL1 — WARNING LABEL INSCRIBED: WARNING - THIS EARTH SWITCH IS NOT FULLY INTERLOCKED AND MUST NOT BE OPERATED UNLESS THE CIRCUIT IS SWITCHED OUT AT THE REMOTE END
- WL2 — WARNING LABEL INSCRIBED: WARNING - THIS DISCONNECTOR IS NOT FULLY INTERLOCKED AND MUST NOT BE OPERATED UNLESS THE CIRCUIT IS SWITCHED OUT AT ALL POINTS OF SUPPLY.
- KEY EXCHANGE BOX: KEY SHOWN THUS ●, WHEN INSERTED, WILL RELEASE KEYS SHOWN THUS ■.
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- MOTORISED DISCONNECTOR
- TRANSFORMER
- SWITCH DISCONNECTOR WITH INTEGRAL EARTH SWITCH
- SWITCH DISCONNECTOR
- EARTH SWITCH
- CIRCUIT BREAKER

Operation

For higher voltages, gas-insulated switchgear reduces the space required around live busbars. Instead of bare conductors, bus and apparatus are built into pressurized tubular containers filled with sulfur hexafluoride (SF6) gas. This gas has a higher insulating value than air, allowing the dimensions of the apparatus to be reduced.

Solenoid controlled interlocks are normally used with GIS Switchgear as there are no mechanical parts to interlock, but only electrical signals, which are sent dependant upon the position of the switches.

I.e. GRID 1 key 7T4 can only be released when key 113 inserted and trapped sending signal to controls allowing switch to be opened and put into earth position. Signal is then sent to 7T4 releasing the key 7T4.

Standard locks used for this application are solenoid controlled locks KSUPS or KSS (with Q-type lock portions).

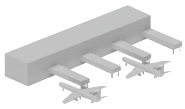
UPS Access

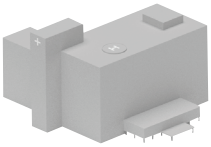
Energy Industry
Application Note

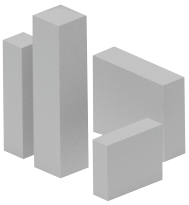
Castell

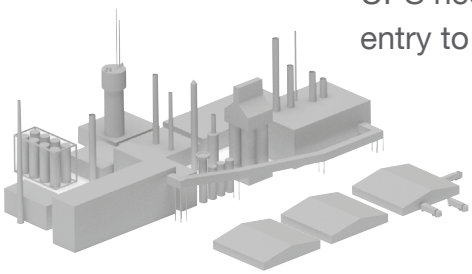
The Risk

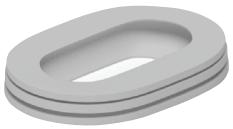
In applications such as UPS changeover systems or where a machine has to finish a cycle prior to isolation access can be gained into the UPS room whilst the UPS is in an unsafe state. So therefore the UPS needs to be put in a safe state before entry to the area can be granted.

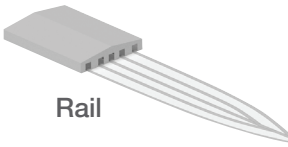

Airport


Hospital


Data Centre


Industry and Manufacturing


Stadium


Rail

Energy Industry

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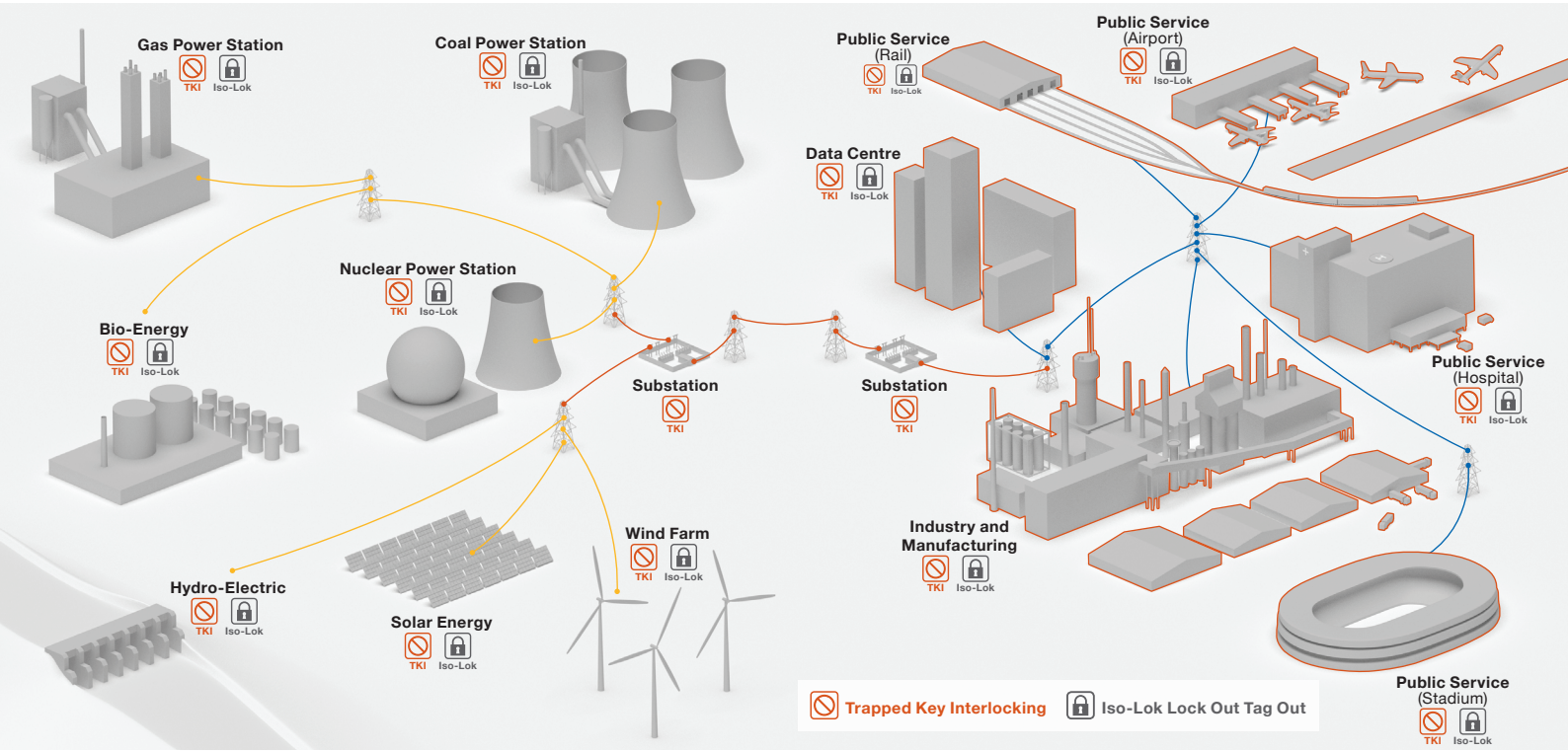
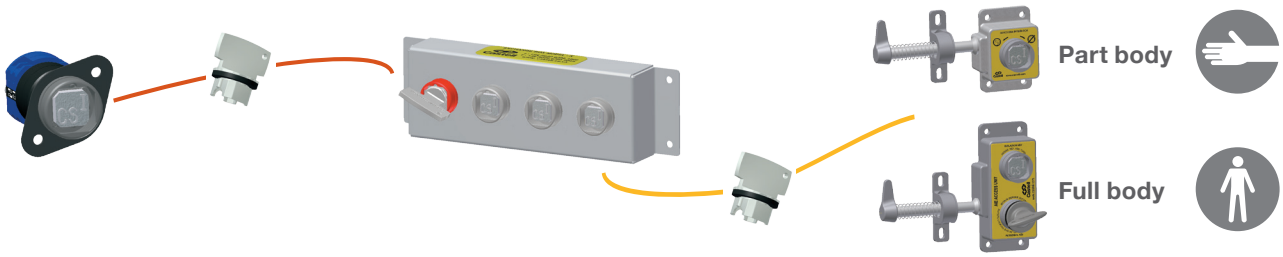


Castell Solution

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



Benefits

1) Extended system life, due to the stainless steel construction of housings and mechanisms Castell interlock systems offer many years of trouble free operation.
2) High level of risk control, as control is in the hands of the operator/engineer when in the dangerous area through the personnel key.
3) Downtime is reduced as access is mechanical.
4) Improved efficiency, through implementing a process rather than a procedure the system operation is not dependant on verbal communication. The transfer of the key enables operators to know the status.

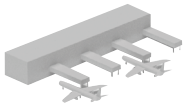
Products

Isolation		Exchange	Access	
While the UPS is running, the key is in trapped in the KSUPS unit. The key can only be turned and released when the UPS is in a safe state to allow access. This will energise the solenoid via remote electrical signal. Turning the key changes the condition of the switch and releases the key		Where there are multiple points of entry an exchange box will be required to enable multiple keys to be released.	Key can then be transferred to the AIE access interlock. This allows access to the hazardous area.	
KSUPS 	KSS 	X 	AI 	AIE 

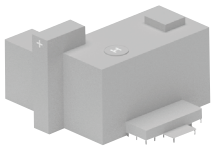
Power Factor Correction

Energy Industry
Application Note

Castell



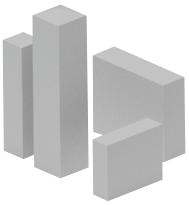
Airport



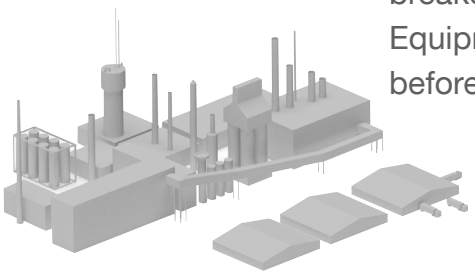
Hospital

The Risk

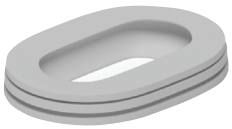
Power Factor Correction Equipment is usually supplied by a HV circuit breaker. Access can be gained to the Power Factor Correction Equipment room whilst the equipment is in an unsafe state. Therefore the HV circuit breaker suppling the Power Factor Correction Equipment needs to be put in a safe state before entry to the area can be granted.



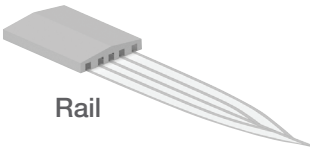
Data Centre



Industry and Manufacturing



Stadium



Rail

Energy Industry

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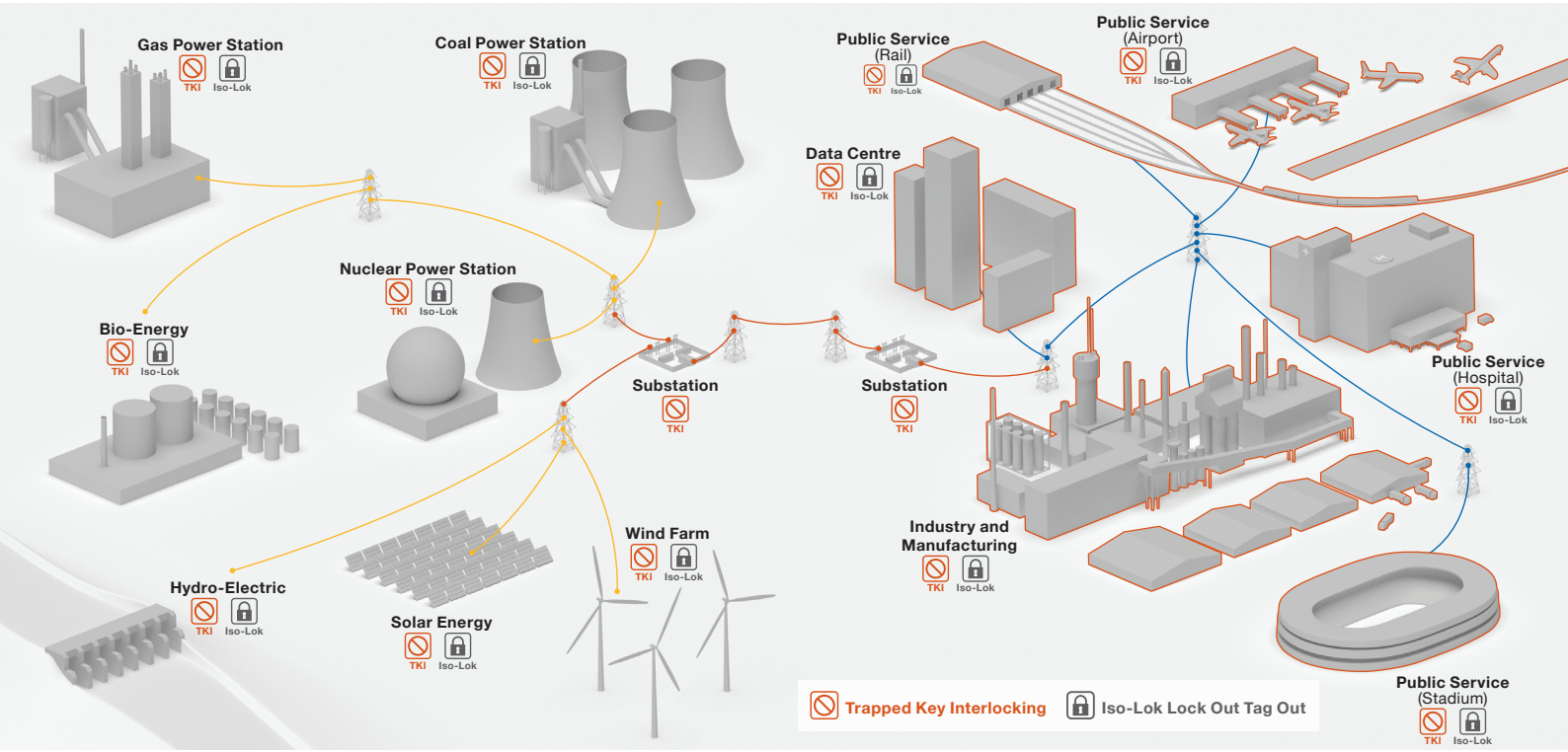
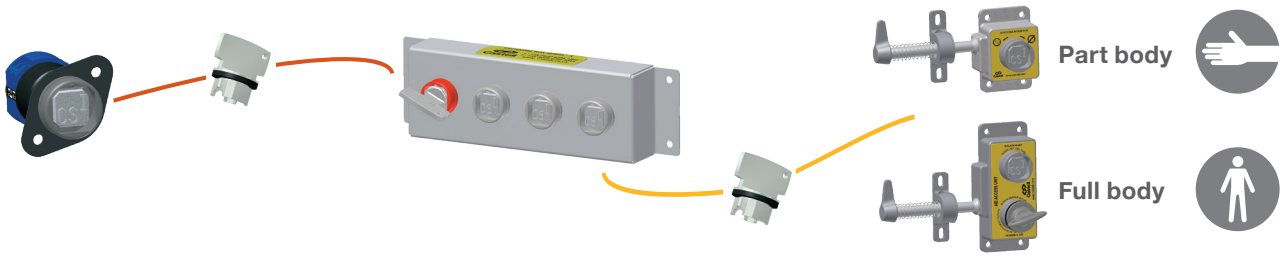


Castell Solution

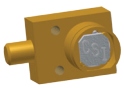
1 Isolation **2 Key Exchange** **3 Access Control**

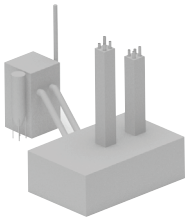


Benefits

1) Extended system life, due to the stainless steel construction of housings and mechanisms Castell interlock systems offer many years of trouble free operation.
2) High level of risk control, as control is in the hands of the operator/engineer when in the dangerous area through the personnel key.
3) Downtime is reduced as access is mechanical.
4) Improved efficiency, through implementing a process rather than a procedure the system operation is not dependant on verbal communication. The transfer of the key enables operators to know the status.

Products

Isolation		Exchange	Access	
When the HV circuit breaker is open the A key can be removed and inserted in to the TDI time delay unit. After a preprogrammed time the B keys are released.			These B keys can be used to gain access to the PFC equipment.	
FS/Q 	K 		AI 	AIE 
KL 	TDI 			

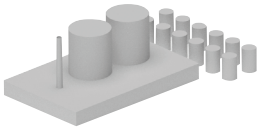


Gas Power

Coal Power

The Risk

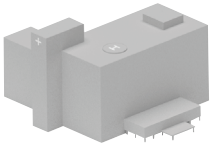
During maintenance enginners can be working on an area plant or equipment that is remote from the point of isolation. This may create hazards that are not normally present when the machinery is in normal operation.



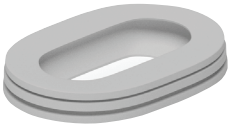
Bio-Energy

Nuclear Power

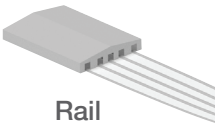
Airport



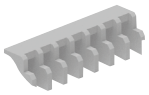
Hospital



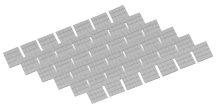
Stadium



Rail

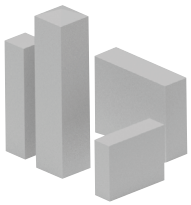


Hydro-Electric



Solar Energy

Wind Farm



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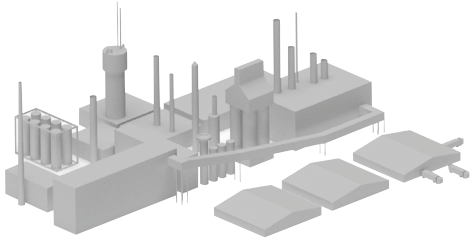
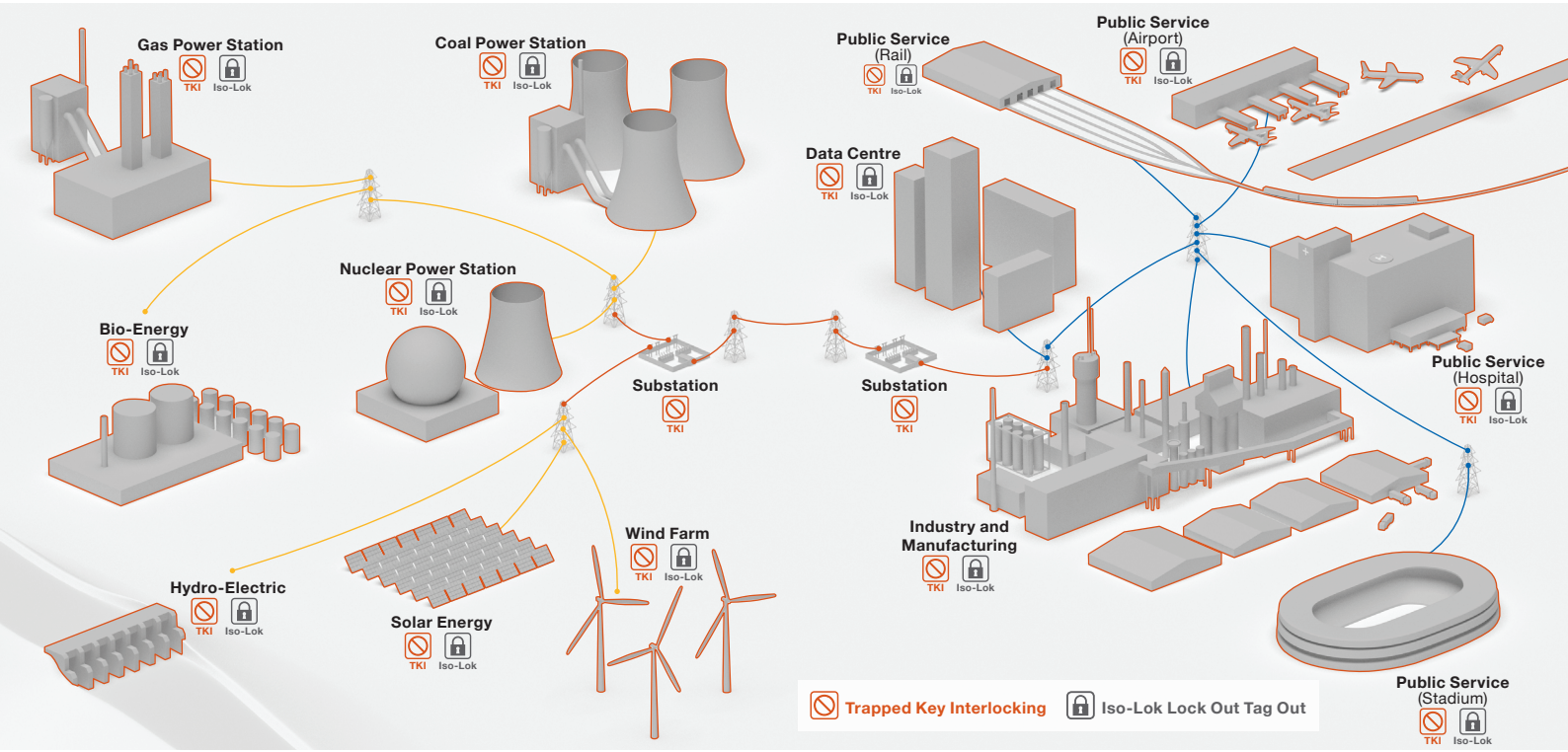


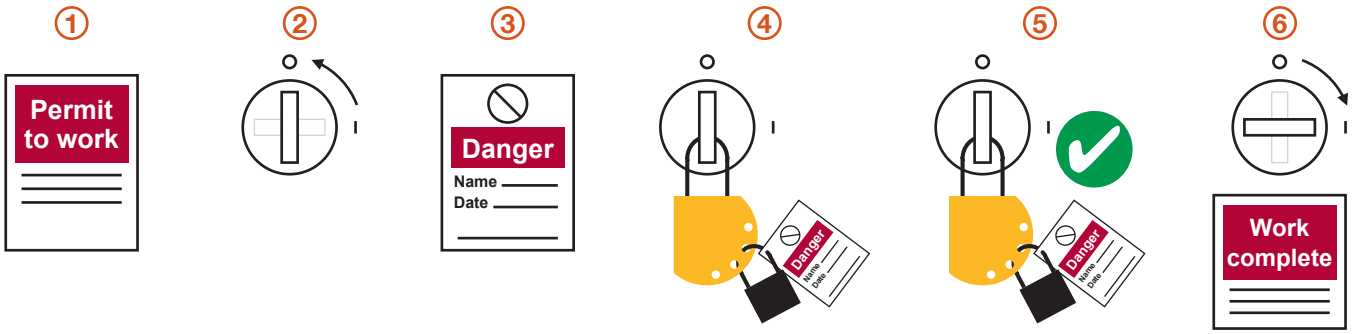
Industry and Manufacturing

Energy Industry

GENERATION TRANSMISSION & DISTRIBUTION INDUSTRIAL & COMMERCIAL SUPPLY



Castell Solution



1. Notify personnel when service work is to be carried out.

2. Isolate power on equipment/ energy sources.

3. Assign tags with information relating to the work to be carried out.

4. Lock out equipment using tags, padlocks, and clasps.

5. Test to ensure equipment is isolated.

6. When the work is complete; communicate equipment is back in use.

Benefits

1) Lock out tag out offers a lower level of safety compared to trapped key interlocks. This makes the system more suitable for engineering intervention.
2) Castell provide Iso-Lok padlocks in a range of materials including stainless steel and brass. This ensures protection can be provided whatever the enviroment demands. The stainless steel range is suitable for the food industry.
3) Iso-Lok Padlocks are high quality hand built padlocks that are high integrity and are built to ensure that there is no chance of clashing (where one key fits a padlock with a differnet differ code).
4) Castell record all Iso-Lok differ codes for each padlock sold. This means that Castell can ensure that the same differ code is never shipped to a site unintentionally.

Products

Isolation

The use of Iso-Lok padlocks and clasps can be used to isolate machinery by engineers. In a lock out tag out system where each engineer has individual padlocks the clasp allows each engineer working on the equipment to use their padlock to lock out the machine. This ensures the machine cannot be turned on until each engineer has finished their task and removed their padlock.

Padlocks

Clasps

Cabinet

Valve

Station

LV & MV Switchgear OEM Equipment

Energy Industry
Application Note

Castell

ABB

	Castell Part Number
E Max	PDS01388(S)
SACE Megamax Range F1-F2	PDS000800
OESA/OETL	K-FSB-6.4-3

Eaton

	Castell Part Number
OMA Breaker	FS1B-CW-65 FS1S-CW-65
Sovereign Range SMM300	K-FSB-0-1
MEM 63A-200A	K-FSB-6.4-4
MEM 315A-800A	K-FSB-12.7-1
Magnum	PDS02499
C-H-OMA	FS1B-CW-65-9.5-22

GE

	Castell Part Number
M Pact Air Circuit Breaker	FS1B-CW-45-9.5-22 (post 1996)

Harvey Hubble

	Castell Part Number
Isolator Handle	K-FSB-6.4-4

MEM

	Castell Part Number
Glasgow	K-FSB-6.4-4

Mitsubishi

	Castell Part Number
ACB	FS1B-CW-65-9.5-22
Moulded Case ACB	CL1157

Moeller

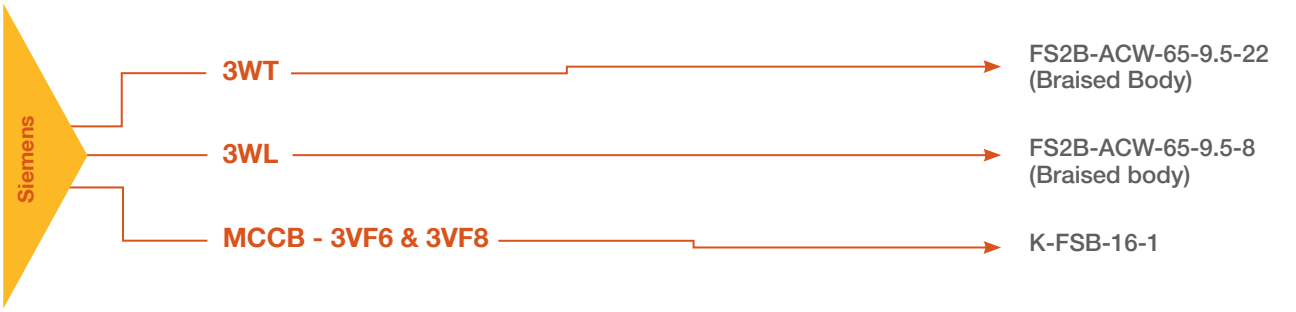
	Castell Part Number
NZM 7/10/12 (H)=K	K-FSB-12.7-1

Terasaki

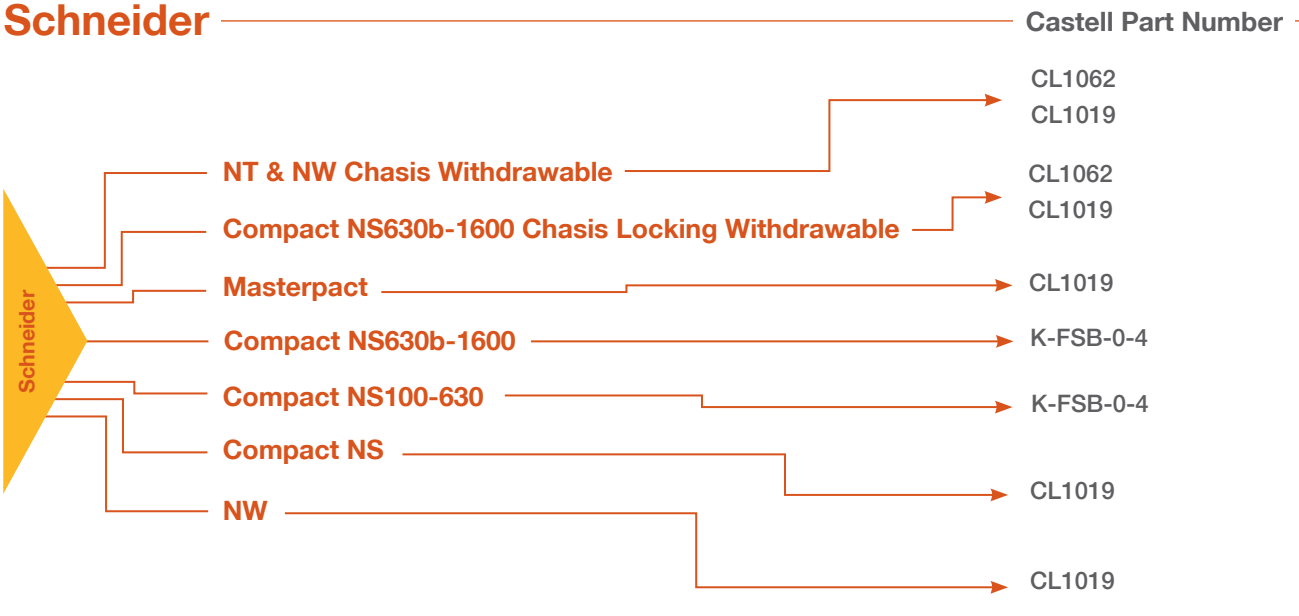
	Castell Part Number
RA8240	FS2B-CW-90-9.5-22
XFHA34-RO-3D5	K-FSB-13.5-3
XS400NJ MCB (ext Handle)	K-FSB-13.5-3
AT6-AT40	FS2B-CW-65-STD

Socomec

Siemens



Schneider



Switch Disconnector & Earth Switch Manufacturer's Interlocks Specifications

Disconnector & Earth Switch Manufacturer	Castell Interlock	Interlock Description
Alstom GRID (UK)	K	Bolt Interlock (Single Key)
	KL	Bolt Interlock (Double or Multiple Key)
	KP	Bolt Interlock with Safety Switch (Single Key)
	KLP	Bolt Interlock with Safety Switch (Double Key)
Acrastyle (UK)	K	Bolt Interlock (Single Key)
	KL	Bolt Interlock (Double or Multiple Key)
	KP	Bolt Interlock with Safety Switch (Single Key)
	KLP	Bolt Interlock with Safety Switch (Double Key)
Hapam (Holland)	K	Bolt Interlock (Single Key)
	KL	Bolt Interlock (Double or Multiple Key)
	KP	Bolt Interlock with Safety Switch (Single Key)
	KLP	Bolt Interlock with Safety Switch (Double Key)
Gevea (Sweden)	K	Bolt Interlock (Single Key)
	KL	Bolt Interlock (Double or Multiple Key)
	KP	Bolt Interlock with Safety Switch (Single Key)
	KLP	Bolt Interlock with Safety Switch (Double Key)
Ruhrtal (Germany)	K	Bolt Interlock (Single Key)
	KL	Bolt Interlock (Double or Multiple Key)
	KP	Bolt Interlock with Safety Switch (Single Key)
	KLP	Bolt Interlock with Safety Switch (Double Key)
Lucy Switchgear (UK)	Q	Switchgear Interlock
Siemens (UK / Germany)	KSUPS	Solenoid Controlled Switch
ABB (UK / Germany)	KSUPS	Solenoid Controlled Switch
	KSS	Solenoid Controlled Switch (Single Key)
	KSSE	Solenoid Controlled Switch (Double or Multiple Key)

****All locks are available in various specifications to suit individual applications.**
Please see our full product catalogue for more information or our data sheets on www.castell.com/downloads