



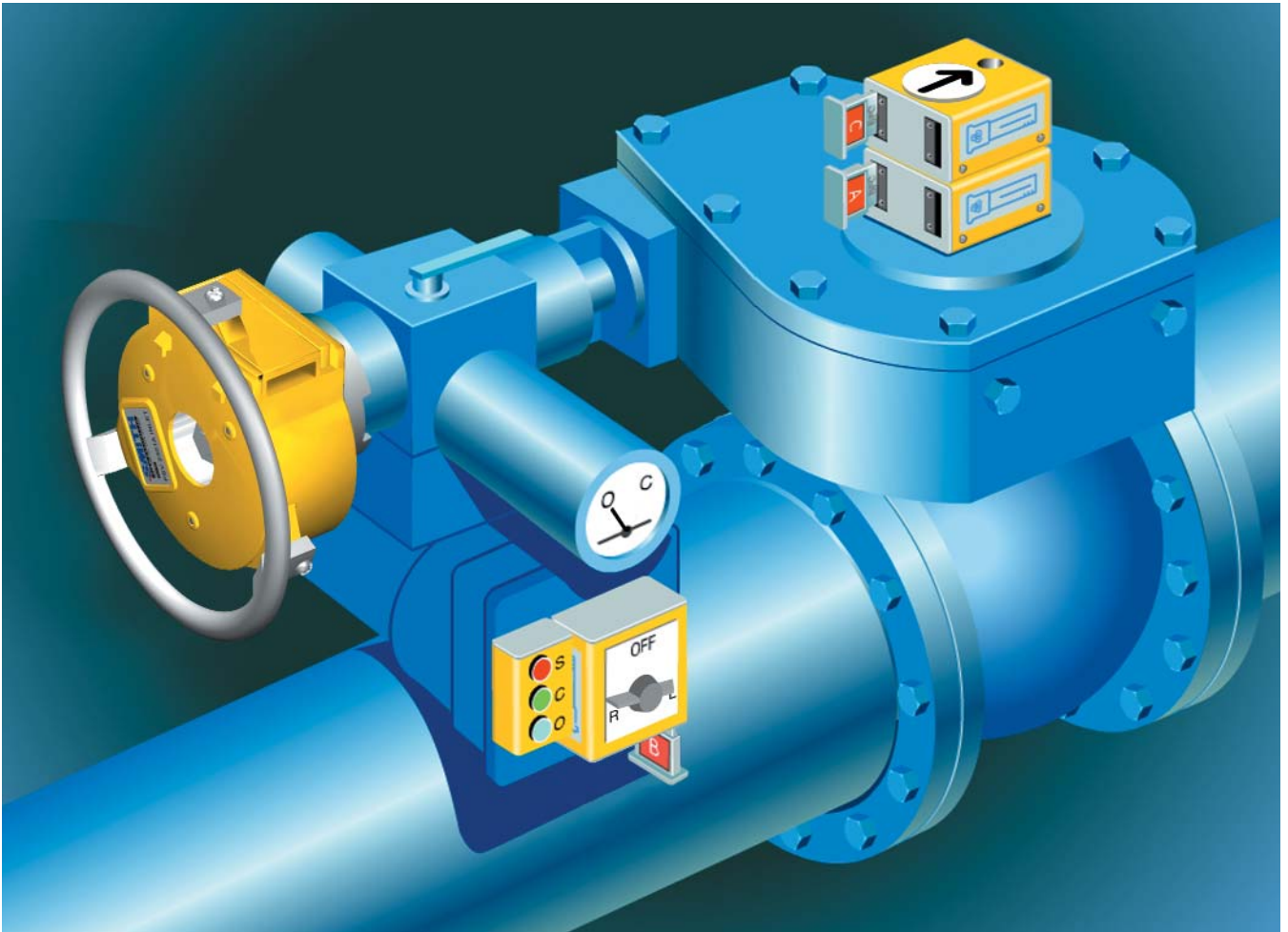
SFC Key Interlocks & Process Management Systems



Mechanical Control Systems for Process, Pipeline & Plant Maintenance Operations



Actuated (Motorised) Valves



Actuated Valves

The most common requirement for key interlocking of power-actuated valves occurs in Pig Launcher/Receiver systems, Scraper Traps and Sand Filter systems etc. where power-actuated valves need to be interlocked with manually-operated valves and the vessel closure.

Because of the ultra-critical nature of such valves, special considerations arise which the design of a key interlock system must address:-

Where such valves are part of an ESD system, the key interlock system must not compromise the valve's fail-safe function.

Where pigging operations occur, the key interlock system must verify the valve's absolute position (Open and/or Closed) **independent of any on-board instrument indication.**

On electrical actuators where the key interlock system de-energises the valve, any anti-condensation heating circuitry etc. **must remain uninterrupted.**

Where actuators are equipped with a manual override facility, the key interlock system must permit operation of the valve in **both modes** (or in a **combination of both modes** - e.g. in the event of a power failure) while maintaining the integrity of the key sequence at all times.

Interlock system design principles

Because actuators generate great torque forces, (b)locking of such valves by mechanical **restraint** is unacceptable - such locking methods would likely induce damage within the motor assembly.

Nonetheless, a key interlock system **must ensure the valve is de-energised and disabled** (in both Remote and Local modes) and that **only** the appropriate sequence key is released for continuation of the procedure dependent on the valve's **verified** (Open or Closed) position.

A typical operating sequence is given on the page opposite where it may be observed the interlock system functions 'passively' and relies on the as-built actuator mechanisms to establish and confirm the status of the equipment.

It may also be observed when such valves are in the 'Open' ('Remote' setting) position - the valve is free to operate to 'Closed' without hindrance or interruption by the interlock system.

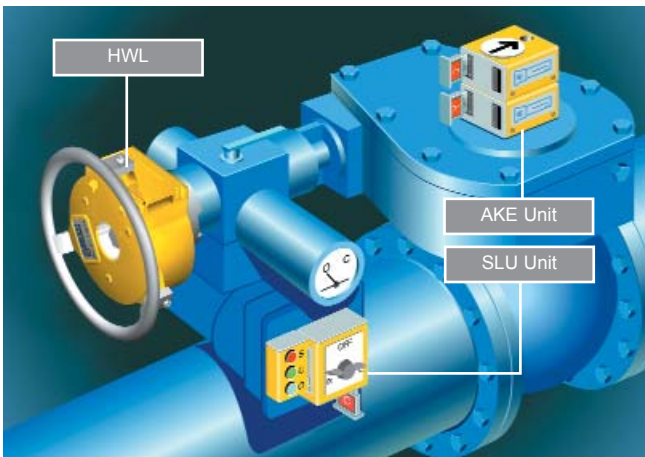
■ Equipment Status:- Valve Open

'SLU' Switch Unit Locked in 'REMOTE'.
'HWL' Handwheel Drive Locked 'OFF'.
'A' Key in Control Room.

To Close Valve:

1. 'A' Key into 'AKE' positional indicator unit.
'B' Key is removed from 'AKE' - 'A' Key trapped.
2. 'B' Key into 'SLU' Switch Unit to unlock.
'SLU' Unit switched to 'LOCAL' ('B' & 'C' Keys trapped).
Operate button to close valve.
3. 'SLU' Unit now switched to 'OFF' - 'C' Key is removed.
'SLU' Unit locked in 'OFF' position trapping 'B' Key.
4. 'C' Key into 'AKE' Unit - remove 'D' Key trapping 'C' Key.
'D' Key is then directed towards continuation of the procedure.

NB The 'D' Key will **not** release unless the valve has completed its **full** stroke to the CLOSED position.



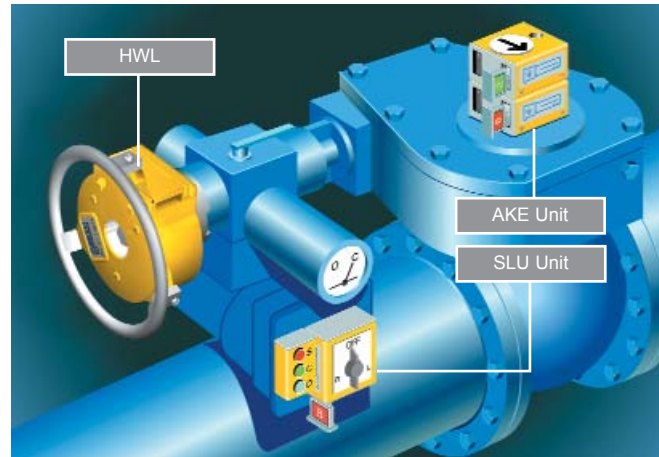
■ Equipment Status:- Valve Closed

'SLU' Switch Unit Locked 'OFF'.
'HWL' Handwheel Drive Locked 'OFF'.
'D' Key in Control Room.

To Open Valve:

1. 'D' Key into 'AKE' positional indicator unit.
'C' Key is removed from 'AKE' - 'D' Key trapped.
2. 'C' Key into 'SLU' Switch Unit to unlock.
'SLU' Unit switched to 'LOCAL' ('B' & 'C' Keys trapped).
Operate button to open valve.
3. 'SLU' Unit now switched to 'REMOTE' - 'B' Key is removed.
'SLU' Unit locked in 'REMOTE' position trapping 'C' Key.
4. 'B' Key into 'AKE' Unit - remove 'A' Key trapping 'B' Key.
'A' Key is then directed towards continuation of the procedure.

NB The 'A' Key will not release unless the valve has completed its full stroke to the OPEN position.



■ Hydraulic & Pneumatic Actuators

A range of comparable designs are also available for spring-return and non-return hydraulic actuators and for spring-return pneumatic actuators.

SFC's range of special process products also includes needle valve locks, temperature and pressure sensing locks and a range of signalling options to meet most process operating requirements.

■ Power Failure Mode

In the event of a power failure at anytime during either of the above procedures, it is essential the integrity of the key sequence is maintained if the valve is operated manually.

This is achieved simply by locking the 'SLU' Unit in the 'OFF' position thereby releasing the 'C' Key. (Even if power is restored, with the 'C' Key free, the valve/actuator will remain disabled).

The 'C' Key is inserted into the freewheeling 'HWL' handwheel assembly - this lock functions on a 'declutching' principle. With the 'C' Key trapped, the 'HWL' drive mechanism may be engaged thereby enabling the valve to be operated.

While the 'C' Key can be removed from the 'HWL' assembly at any time, it has to be exchanged through the 'AKE' unit to secure the continuation key (i.e. the 'A' or 'D' Keys in the above examples)- these keys will only release provided the valve has completed its full stroke.



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