

Technical Description 'GL' Type Interlocks

Mechanical Principles.

SFC 'GL' Interlocks for Handwheel-operated Gate, Globe and Gear-operated valves are basically 4-part assemblies:-

- The Totally-Sealed Coded Lock Body.
- The Lock Handwheel.
- The Lock Spindle Adaptor.
- The Lock Anchor.

SFC 'GL' Interlocks are supplied as precision investment castings in 316 stainless steel and are available in a range of three sizes to suit the diameter range of handwheel-operated valves.

Handwheel-operated interlocks differ from lever-operated interlocks to the extent that a lever-operated interlock has a finite movement - i.e. 90°, whereas handwheel-operated interlocks invariably have a number of handwheel revolutions between the lock/valve locking positions - e.g. Open and Closed.

Accordingly, the interlock assembly has to be able to "count" the number of handwheel revolutions in order to trap and release keys at the required positions. Similarly, with Gate and Globe valves, the closed position may vary from time to time through the effects of valve seating wear. Therefore, the lock assembly must be adjustable (in-situ) to compensate for this seating wear.

In these terms therefore, the essential mechanical principles of handwheel-operated interlocks can be defined as three (3) basic parallel functions:-

- **Mechanical Locking of the Valve.**
- **Key Trapping and Releasing Function (i.e. Counting).**
- **Adjustable (In-situ - without removal from host valve).**

Mechanical Locking

The lock handwheel is secured to the lock worm which is in turn secured to the Lock/Valve Coupler.



Bespoke Units - The spindle adaptor is machined as an exact facsimile of the centre detail of the original valve handwheel and is fitted to the valve yoke or gear input shaft in precisely the same manner as the original handwheel.

The locking method based on the SFC 'Coded Card' Key operates on a simple 'rack and pinion' principle. The upper circumference of the worm is castellated and locking is achieved by the engagement of a pawl (stop lever) into one of the castellated recesses of the worm.

The key is "toothed" and acts as a 'rack' - when it is inserted into the lock body it rotates a similarly "toothed" gear peg - i.e. 'the pinion'. The upper end of this gear peg has an eccentric leg that locates in a recess in the locking pawl (stop lever).

When the key is inserted and rotates the gear peg, the eccentric leg disengages the locking pawl (stop lever) from the castellated worm thereby permitting operation of the lock (valve). Conversely, to lock the assembly simply involves withdrawing the key which reverses the mechanical action.

The standard 'GL' lock is based on a dual-keyed construction where the above mechanics are fitted for both key functions. For single-keyed (single locking - L.O. or L.C.) assemblies, only one locking mechanism is fitted in the lock assembly. In such cases, the 'spare' key entry aperture is sealed with a blanking plate to maintain the weatherproof integrity of the lock assembly.

The internal lock mechanism is fitted with an anti-tamper device (anti-override arm) - this device prevents unauthorized tampering with the lock by insertion of screwdrivers or welding rods etc. in any attempt to manipulate the gear peg.

The lock body key entry apertures are fitted with stainless steel weather-strips - these are self-sealing and have the advantage of being internal to the lock body so that they are not prone to damage.

During assembly, the internal lock mechanism is lubricated with a suitable lubricant.

Key Trapping and Releasing Function (i.e. counting).

In process interlocking applications, sequential operating control is dependent on the interlock function of trapping and releasing the appropriate keys relative to the position of the host valve (i.e. open and/or closed positions).



For handwheel-operated valves (e.g. Gate, Globe and Gear-operated) where the handwheel revolves more than one complete revolution, the interlock must be capable of "counting" the number of handwheel revolutions accurately for reliable (repetitive) trapping and releasing of the keys.

The key trapping and releasing function in 'GL' interlocks is achieved very simply by the lateral (inward and outward) travel of the cam lever which engages and disengages with the elliptical hole in the key blade.

This cam lever functions passively within the lock; its movement is caused by the rotation of the cams; at the point where the key is 'free', the cam lever is positioned fully inward and engaged in a V-notch in the rotating cams.

By inserting the key and unlocking the interlock assembly as described in the preceding section, the action of operating the valve rotates the worm. This worm bears a helical thread into which the toothed gear assembly is permanently engaged. The rotating cams are connected to the gear assembly by a shaft ; as the valve is operated, the worm thread drives the gear assembly which in turn rotates the cams.

Therefore, the instant that the valve is operated, the rotating cams rotate and move the cam lever laterally outward to engage in the elliptical hole in the key blade thereby trapping the key. When the valve is operated in reverse and is restored to the original

position the key will again become free. By this simple method, the lock 'counts' the handwheel revolutions.

The foregoing detail describes the functions within a single-keyed lock construction. For dual-keyed assemblies, the components are duplicated in the other half of the (investment cast) lock body.

In dual-keyed assemblies for double locking conditions, the trapping and releasing of respective keys is achieved simply by opposing the set positions of the rotating cams on the common shaft.

The 'setting' of these cams after installation of the lock on the host valve is described as 'setting of key release datum's' for both the Open and Closed positions.

Adjustment (In-situ - without removal from host valve).



SFC 'GL' Interlocks are delivered with the lock key(s) free in any position. This design feature enables the lock to be installed onto its host valve irrespective of the (open or closed) position of the valve. (This design feature is also desirable in certain construction situations to enable random operation of valves during commissioning procedures where the intended normal operating procedures are not observed).

However, after a period of use, the closed position on Gate and Globe valves may have altered by as much as 1½ handwheel turns. The difficulty then arises that when the valve is shut tight, the interlock (closed) key will not release because the valve has travelled past the original set key release position.

In these circumstances, the SFC 'GL' Interlock can be adjusted in-situ using a simple 3mm Allen Key.

The adjustment procedure simply involves operating the valve back to the original key release position - at this point the lock datum set screws are aligned directly underneath the cam cover. Using the special tamperproof tool provided, the cam cover is removed to expose the datum set screws which are eased using a conventional 3mm Allen Key. The valve is then operated again to its shut tight (closed) position and the datum's are retightened in the new position.

This In-situ Adjustment feature is unique to the SFC 'GL' Interlock assembly.

