

## Process Interlocking

Mechanical interlocking prevents human error by guiding the operator through a predefined operating sequence. Interlocks are based on the principle of the exchange of unique keys that only allow the right valves to be operated in the correct, predefined order.

## Mechanical Process Control Unit - MPCU

The MPCU is a mechanically-programmed key exchange system and functions as a 'mechanical PLC'. It is installed in the field to guide operators through complex, non-linear procedures.

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## Application

Mechanical interlocks enforce operation of multiple interrelated valves in a predefined order. Reverse operation can only be done in reverse order. A MPCU enables sequences that require repetitions of steps or reverse operations that are not performed in reverse order.

A MPCU is required when:

- > reverse operation of valves is not in reverse order of initial operation
- > valve is used repeatedly within a sequence
- > valve is opened and directly closed before proceeding to the next sequence step

Some common examples relate to pigging:

- > involving H2S
- > ensuring multiple vent / drain / purge cycles are carried out and not by-passed before the closure door can be opened

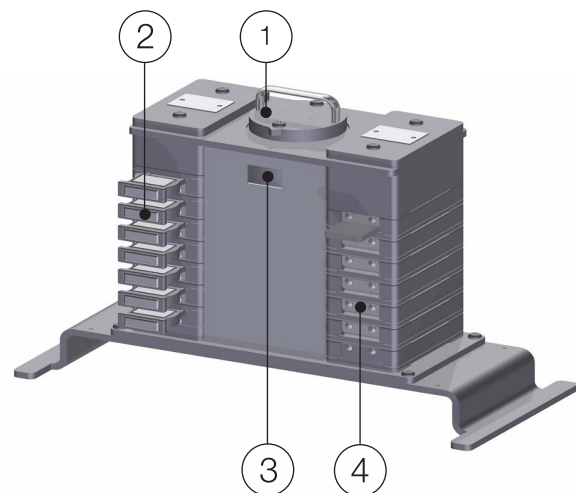
MPCU's are also used in the following processes:

- > reactor sequences
- > filtration skids to preventing vessel implosion
- > asorber / regenerator processes
- > semi-regenerator catalytic reforming units within gas sweetening

## Operation

Operation of a MPCU is as follows:

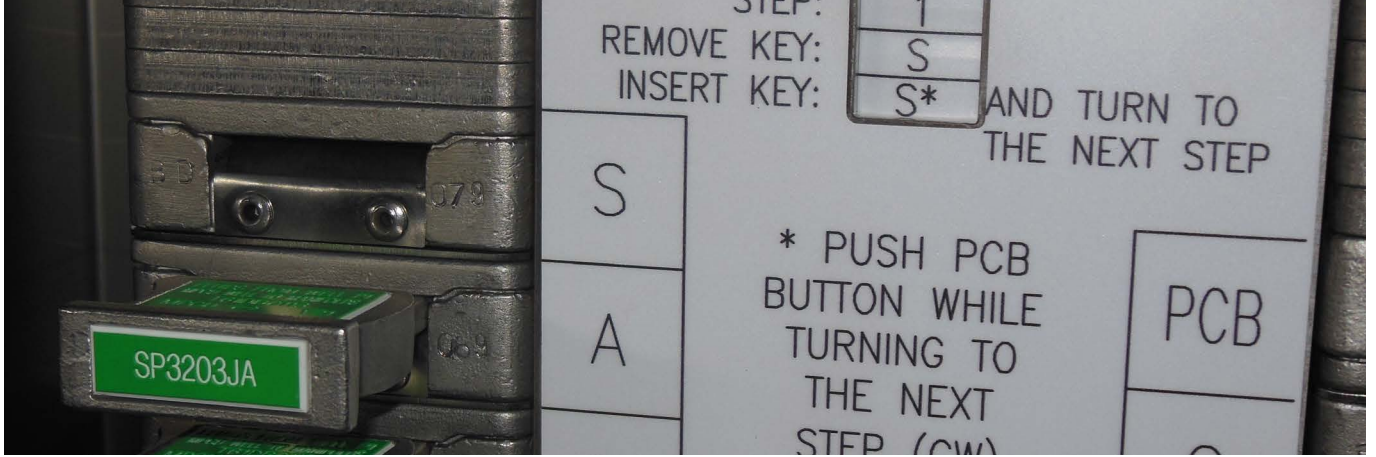
1. Enter key in dedicated key position
2. Turn the knob on top of the MPCU
3. The entered key is now trapped
4. The next key is now released
5. Proceed the valve operation with released key



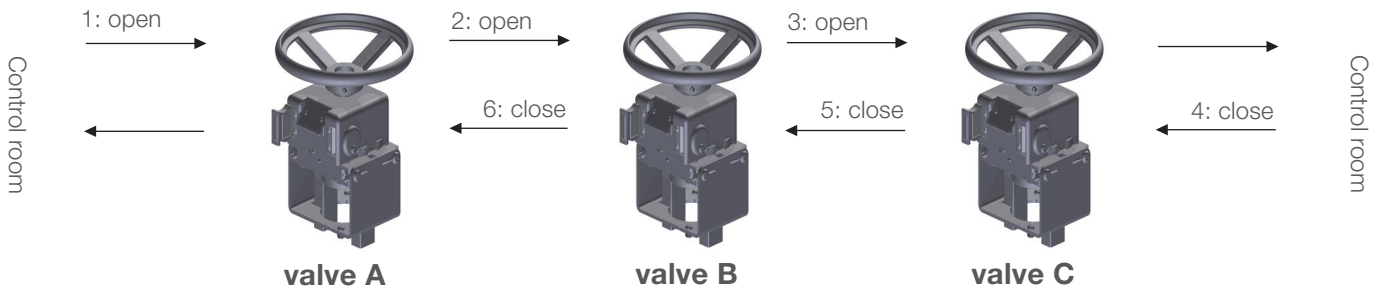
### Legend

- 1 Rotary knob
- 2 Operating keys
- 3 Indicator window showing which key to remove and which to insert
- 4 Free key slots





**Linear sequence**



**Example**

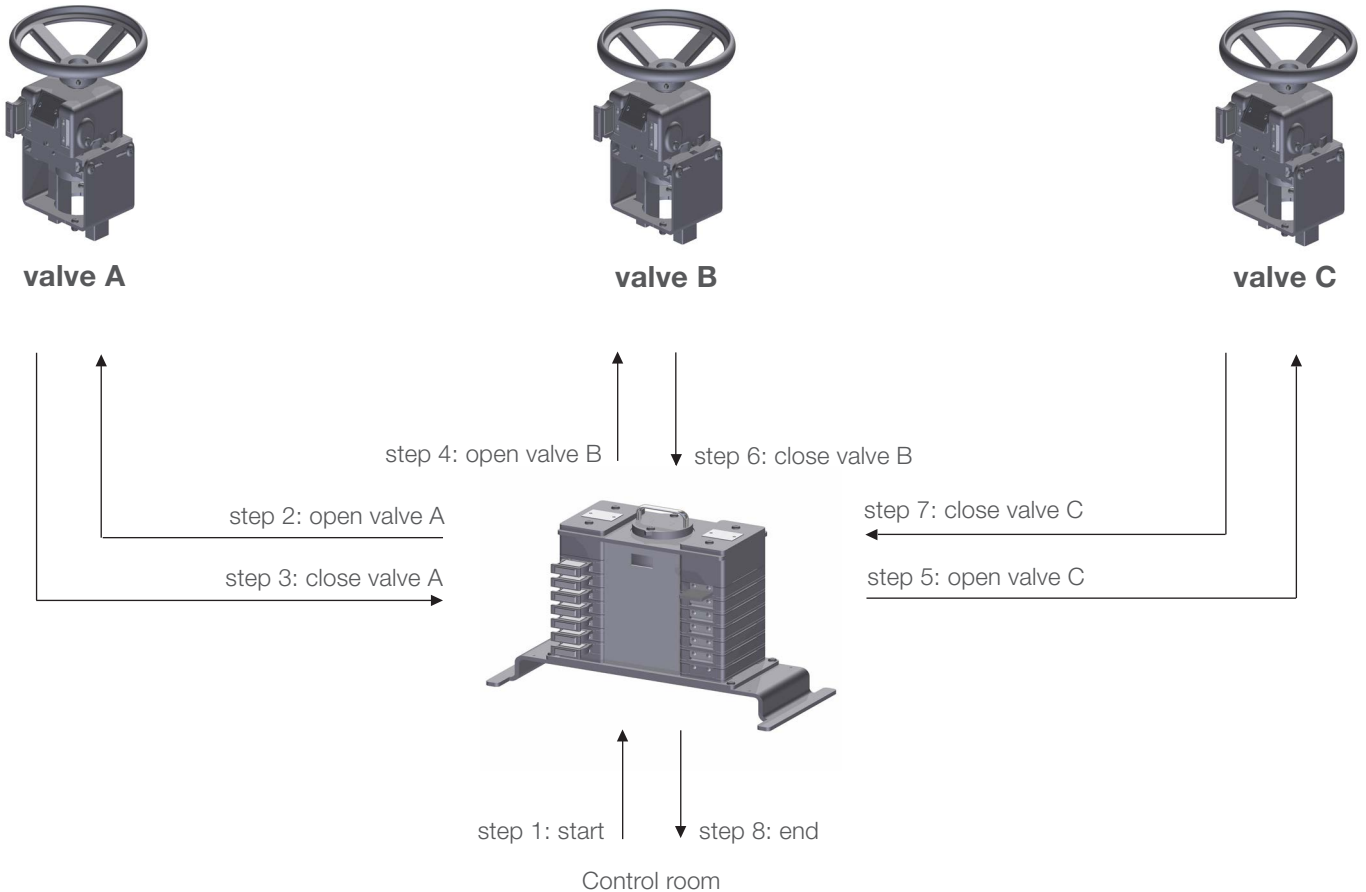
Open valve A > open valve B > open valve C  
Close valve C > close valve B > close valve A

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## Non-linear sequence



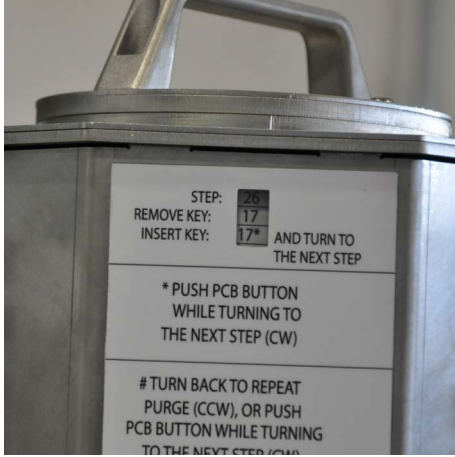
### Example

Open valve A > close valve A > open valve B > open valve C > close valve B > close valve C

### MPCU steps

- > Upon receipt of authorization, retrieve start key from control room
- > Insert start key into the MPCU, turn the knob and retrieve next key (step 1)
- > Open valve A by inserting key; next key will be released after opening valve A (step 2)
- > Insert key in the MPCU, turn the knob and retrieve same key again
- > Close valve A by inserting key; next key will be released after closing valve A (step 3)
- > Insert key in the MPCU, turn the knob and retrieve next key
- > Open valve B by inserting key; next key will be released after opening valve B (step 4)
- > Insert key in the MPCU, turn the knob and retrieve next key
- > Open valve C by inserting key; next key will be released after opening valve C (step 5)
- > Insert key in the MPCU, turn the knob and retrieve next key
- > Close valve B by inserting key; next key will be released after closing valve B (step 6)
- > Insert key in the MPCU, turn the knob and retrieve next key
- > Close valve C by inserting key; next key will be released after closing valve C (step 7)
- > Insert key in the MPCU, turn the knob and retrieve next key
- > Return key to the control room (step 8)





## MPCU features

- > Does not require periodic maintenance
- > Tamperproof design
- > Cabinet protects MPCU against sand, dirt, snow, ice, moist, etc.
- > Withstands the most extreme operating environments
- > Mounted on site
- > Enforces non-linear sequences

### SPECIFICS

Body	Internal components	Cabinet	Programmable	Mounting	Size & weight	Cabinet coating	Cabinet door
AISI 316	AISI 316	Carbon coated steel	No	On site	Variable (depends on number of programmed process steps)	Epoxy-polyester powder coated, RAL 7035	Lockable, plain door
		Option: > AISI 304 > AISI 316				Only in combination with carbon coated steel	Option: > glass door

