



# PROCESSINTERLOCKING





2 “Netherlocks has installed many interlocks to our dangerous situations, by preventing blocking off capacity has been connected to the system.”  
Shin-Etsu PVC B.V.

PSV installations. Valve interlocks avoid the operating PSV until other similar relief  
Michel Immerzeel - Team Leader Mechanical,

### Reliability matters

Netherlocks is the company of choice for successfully implementing highest quality valve safety products. In more than 20 years we have grown to be the leading manufacturer of valve interlocking products, and we have extensive experience in delivering large scale projects all over the world.

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# About Netherlocks

4 “We strive to co-create innovative valve safety solutions, in terms of safety, reliability and predictability”

adding significant value to our customers' value chain  
– Stefan van Diessen, Director R&D/NPD Netherlocks

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## Process safety systems for petrochemical and industrial applications

Netherlocks is a premium supplier of valve safety & control products such as mechanical interlocks, valve position indicators, partial stroke testing devices and portable pneumatic actuators. Our innovative products are used as an industry standard by most of the leading companies in the oil and gas industry, as well as many other process industries throughout the world.

## Research & Development

Netherlocks has a long history of designing customized solutions. Having provided numerous product specials and customized products over the years, the Netherlocks R&D department now focuses on delivering complete valve safety solutions.

Quite often these solutions have become industry standards, such as our Electronic Key Cabinets (EKC). Netherlocks' outside-in product development approach is clearly fuelled by market input and is optimally linked to the diverse valve safety needs of our customers.

## High Quality

Netherlocks products and services are renowned for their high quality, and we consider this level of high production standard as a main focus for the company.

## Innovation

With a dedicated R&D department we strive to continuously develop innovations and product improvements that will better serve the requirements of our clients.

## Service excellence

A continuous Service Excellence program drives us to always provide the best possible service in every stage of a project.

## Local presence

We are continuously expanding our network of local service centers to provide better support from sales, project management and service engineers to the market.



# About process interlocking



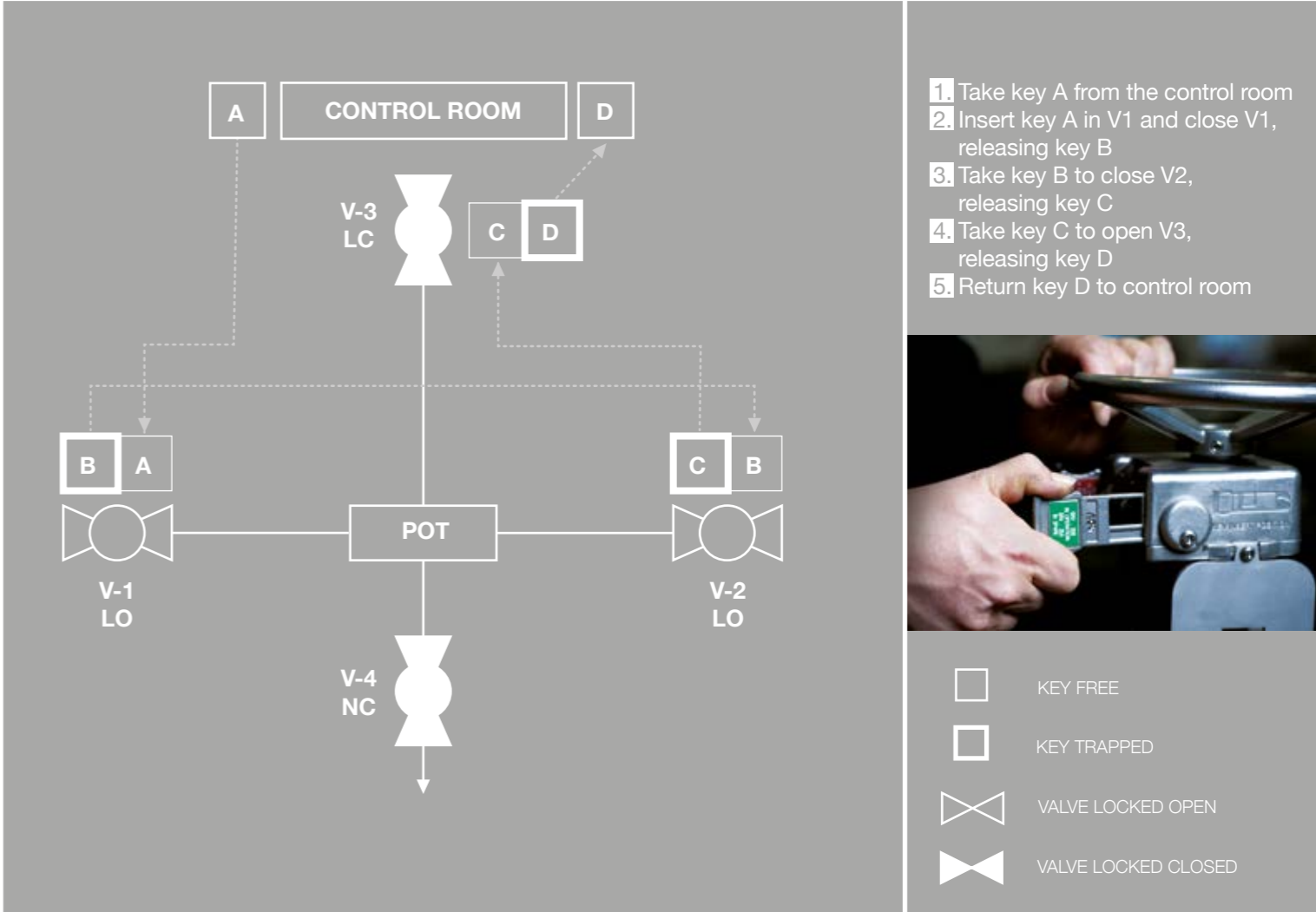
Accidents in the process industry are mostly related to procedures that do not occur frequently, and at the same time, can have catastrophic consequences when performed incorrectly. Start-ups, shut-downs and shift handover processes are all good examples of procedures where slight mistakes or lack of concentration can have severe and disastrous consequences.

## Guarantee predefined operating procedures

Netherlocks process interlocking products eliminate human error by only allowing the right valves to be opened or closed in the correct sequence, leading operators safely through strict work procedures.

- > Create a safer working environment
- > Save costs and prevent product spill or loss due to incorrect switchovers

Netherlocks interlocks guide the operator through a predefined valve operating sequence with **unique keys** for each step



**A process interlocking example: chemical dosing**  
Closed re-circulating water systems (heating or cooling water) need to be dosed with chemicals on a regular basis; this can be done by using a dosing pot.

are applied to the inlet (return) (V1), outlet (flow) (V2) and filling (V3) valves.

To prevent the operator from any contact with the potentially dangerous process flow, valve interlocks

The valve interlocking sequence guarantees that the filling valve can only be opened when the inlet and outlet are closed.



# Applications



Statistics show that 70% of the accidents in the oil & gas industry are caused by human error. Modern industries work at a high speed in hazardous environments and are subject to rapid changes. These same industries are controlled by humans. However, humans are subject to distraction, stress, illness, and any number of other factors – in other words, subject to error.

Netherlocks interlocks are generally used for:

- > Safeguarding people
- > Adherence to procedures
- > Protecting equipment
- > Protecting the environment

## Netherlocks interlocking products **eliminate** human error

Netherlocks interlocking solutions are used for a wide variety of applications, amongst others:

<b>Pressure Safety Valves (PSV)</b>	To guarantee that only one relief valve can be offline/in maintenance
<b>Pig launching / receiving</b>	To guarantee the closure door can only be opened when the vessel is depressurized, free from toxic gasses and isolated
<b>Decoking</b>	To guarantee safe change over from cracking to de-coking of the furnace
<b>Inert gas systems</b>	To prevent that inlet and outlet of tank are closed at the same time
<b>Pump startup</b>	To guarantee that during startup suction valve is open
<b>Flare system / lines</b>	To guarantee that there is always an open path to the flare
<b>Boiler blow-down</b>	To prevent that the drain and vent are opened at the same time
<b>2 out of 3</b>	To guarantee that always two out of three instruments (i.e. pressure gauge, level gauge) are online
<b>Chemical dosing pot</b>	To guarantee that the pot is isolated before filling
<b>Amine absorber</b>	To guarantee that the drain can only be opened when the vessel is isolated
<b>HP fuel gas heater</b>	To guarantee that always one heater is online
<b>Closed drain drum</b>	To prevent that the vent and liquid drain are open at the same time
<b>Overfilling prevention</b>	To guarantee that a vessel cannot be overfilled
<b>Gas train alignment</b>	To prevent cross connection of trains and assure that only the isolation valve of one train can be opened at any time
<b>Pump routing</b>	To guarantee the correct valves are open when pumping from the vessel
<b>Flare system</b>	To prevent air intake into flare system when draining from vessel or reactor
<b>Drain system</b>	To control that only one drain line may be opened to drain the vessel
<b>Vessel filling</b>	To guarantee that only one route at a time is open during filling of the vessel
<b>Vessel isolation</b>	To prevent hydrocarbon outbreak via vent or drain



# Mechanical interlocks

10 **Valve characteristics remain unchanged**  
 Netherlocks valve interlocks can be mounted without any alteration to the host valve; the characteristics of the valve remain unchanged. The interlock is installed as an integral part of the valve, with the original valve lever removed and replaced by the Netherlocks interlock with a new sliding lever or hand wheel.

**Single / double key interlocks**  
 Single key locks block a valve in either open or closed position and are commonly used for locking stand alone valves. Double key locks block a valve in both positions and can be interlinked with other double key locks into one operating sequence.

All Netherlocks interlocks have the following features:

- > Lock body and internal components are made of stainless steel 316
- > Robust design, tamperproof, TUV tested
- > No regular maintenance required
- > No grease
- > Total linear concept; linear key and linear moving components
- > Operator friendly



## NDL (Ninety Degree Lock)

- > Fits any type of 90° valve such as ball valves, butterfly valves and plug valves
- > Customized coupling
- > Optional limit switch box
- > Body remains fixed in position
- > New stainless steel sliding lever, replacing the original



## MRL (Multi Rotation Lock)

- > Suitable for all hand wheel and gear operated valves
- > Adjustable counting mechanism
- > Customized coupling
- > New hand wheel, replacing the original
- > Suitable for high rotation (2000+)



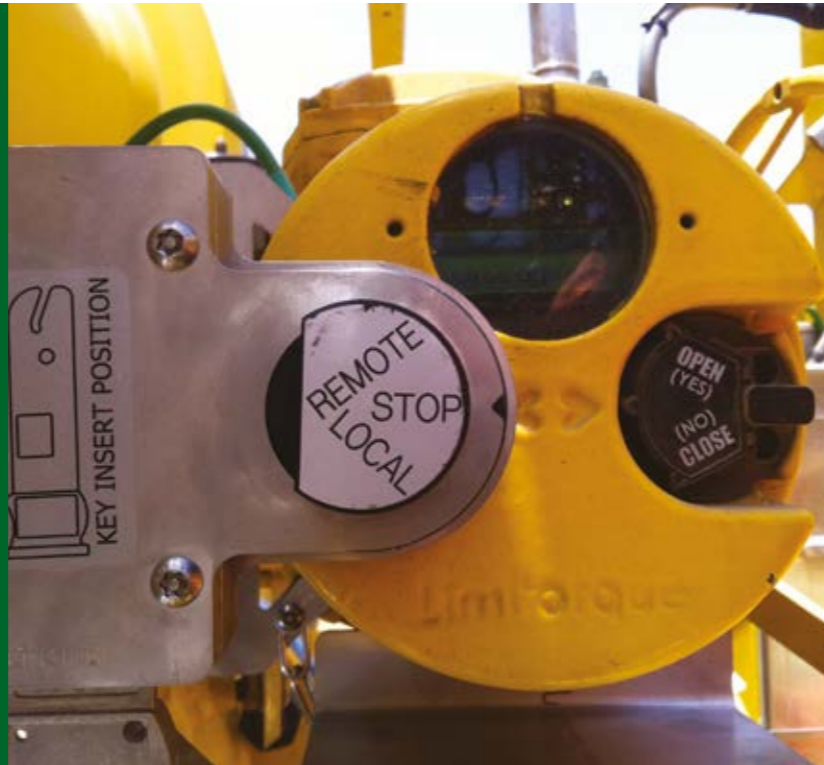
“Our interlocks perform under the toughest conditions for extensive periods of time, without regular maintenance”

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**ALS (Actuator Locking System)**

The ALS is a mechanical system that links a MOV into the mechanical valve interlock steps or process. The ALS is custom made to the specific actuator design. It mechanically blocks the power supply, position indicator and manual override of the actuator, using our standard, linear key mechanism.

- > Suitable for linear and rotating actuators
- > Suitable for electric, pneumatic and hydraulic actuators
- > Mechanically locks power supply, emergency override and position indicator
- > Multiple keys are exchanged between the different locked components of the actuator

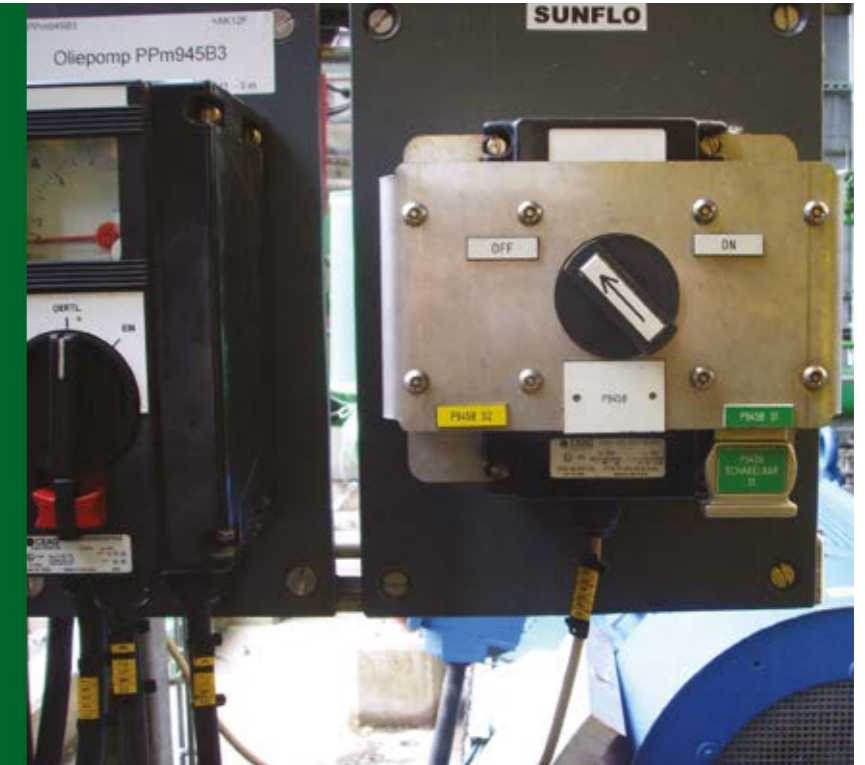


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**ESL (Electrical Switch Lock)**

The ESL controls the use of electrical switches by our standard linear keys. This way electrical switches can be included into valve interlocking operations, for instance to prevent starting up the pump unless the suction valve is open. Only after inserting the dedicated key, the switch can be turned. After turning the switch, a second key is released to continue the sequence and to prohibit the switch again from being operated.

- > No modification of the electrical switch required
- > Suitable for most brands and types of switches
- > Includes electrical switches in valve interlocking sequences
- > Switch ATEX certificate remains valid
- > Available as locked open, locked closed or both



**ASLP (Actuator Switch Lock Panel)**

The ASLP is an electronic locking system, to include MOV's into mechanical valve interlock systems. With the use of our standard linear keys, the ASLP locks the control system of the MOV. After entering the right key, the MOV can be remotely operated. Once the MOV is fully operated, a second key is released to continue the sequence.

- > Suitable for linear and rotating actuators
- > Suitable for electronic, pneumatic and hydraulic actuators
- > Electronically locks power supply and position indicator
- > Only one key insertion required



**CL (Closure Lock)**

The Netherlocks Closure Lock is suitable for every type and size of closure door. Although custom made, the Closure Lock prevents the bleed bolt from being removed and thus the closure from being opened. Only insertion of a dedicated key frees access to the bleed bolt, so it can be removed. This key is only released again after the door is closed and the bleed bolt back in place.

- > Locks the closure door as an integral part of an operating sequence
- > Suitable for every type and size of closure door
- > Bleed bolt removal is integrated in lock design
- > Option for electronic locking until H2S and pressure levels are within acceptable range
- > Option for detecting open position of the closure door with a switch





# Sequence control products



Valve interlocks are frequently used to secure linear valve operating sequences (open valve A, B and C and close in reversed order: C, B, A). Sometimes however, it is required to deviate from this

linear procedure and repeat steps or return to previous steps, not in reversed order. Therefore, additional products are available to guarantee the required operating sequence (non-linear sequence).



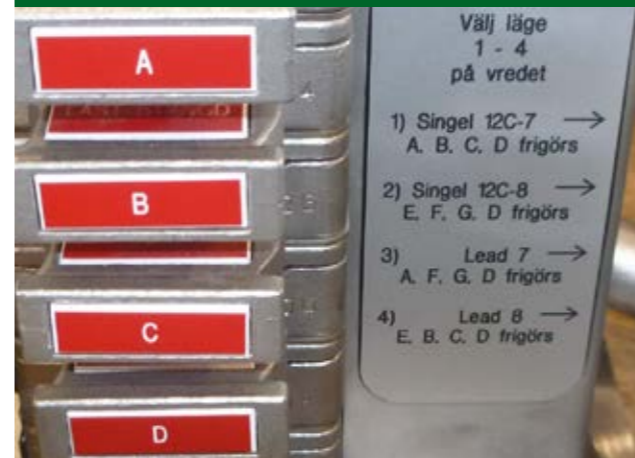
## MPCU (Mechanical Process Control Unit)

- > Mechanically programmed key exchange system
- > Mounted on-site
- > Releases keys according to correct operating procedure
- > For every step a unique key is released
- > Supplied in a cabinet
- > Optional electronic accessories link the MPCU to a Digital Control System (DCS)



## KE (Key Exchange)

- > Insert 1 key to release multiple keys
- > Insert multiple keys to release 1 key
- > Mounted in the field
- > Releasing multiple keys at once creates operational flexibility



The MPCU guides the operator to open and close all valves in a safe order. This will eliminate any error, even when a step has to be repeated at different stages of the process



# Compact Key Cabinet



The Compact Key Cabinet (CKC) stores all starting keys in the control room and offers an immediate visual indication of the status of valves and related systems. Each position is hard-coded, meaning the cabinet codes are identical to the corresponding key codes. This way, the operator cannot insert a key in the wrong position in the cabinet.

### Features

- > Unique compact design: diagonal key insertion
- > Carbon steel powder coated (optional other materials available)
- > Uniquely coded key slots
- > Lockable door
- > Colored key tags
- > Mounted on wall or pedestal
- > Transparent non-combustible door

### Mimic panel

Mimic panels are available in various materials like stainless steel or resopal. They provide detailed information per system and can be installed in the field or in the control room.



### ISI Touch screen

The ISI Touch Screen stores all data in a central place. It enables to display various sequence diagrams, sequence descriptions and additional valve interlock information.



### Electronic switches

Electronic switches or solenoids enable integration with the DCS. The cabinet provides reliable information on the status of every single system or position of a stand-alone valve.



Clear information about the lock system and safety procedures enhances productivity and improves plant safety



## Keys

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The Netherlocks Linear Key is robust and operator friendly



Netherlocks Q-card

### Linear Key

All Netherlocks interlocks are equipped with a linear key. The key is easy to use, robust and fully made out of stainless steel 316. Its design assures low maintenance of your interlocks while at the same time being very reliable under severe circumstances.

### Q-card - allowing testing after installing valve interlocks

The Q-card is a commissioning key and allows the locks to be opened or closed regardless of the sequence. For example: closes all valves during prepressure testing. After all pressure testing is done, the Q-card will be pulled out and replaced by the properly coded key. This is normally done during commissioning. For safety reasons the Q-card cannot be re-used once removed. The Q-card saves time, money and prevents irritation, without reducing safety. There is no need for master keys or spares during installation and testing, since these could jeopardize the plant safety in a later stage.

### Netherlocks master key

Netherlocks offers a master key for emergencies. One master key is available for all locks, group master keys can also be provided for parts of the plant. It is advised to keep the amount of master keys at an absolute minimum in order to keep control and ensure adherence to valve operating procedures.

### Master key cabinet

A master key cabinet allows master keys to be locked at a safe, central location, while at the same time keeping them available in case of emergency.

### Valve interlock registration

Netherlocks registers all necessary information on every individual lock we supply, including client details and valve tag info such as valve sizes, brands and line numbers. Key codes, serial numbers, lock type and other related information are also registered.

- > In case of future extensions we guarantee that key codes will not be duplicated
- > Lost keys can be easily replaced
- > New valve interlocks that are part of an existing sequence can easily be supplied





# Intelligent interlocking



The Netherlocks intelligent interlock product range combines the reliable characteristics of a mechanical safety solution with new electronic features in various process applications. It allows communication and proofing and improves efficiency and safety.

## The Intelligent Interlock System has distinctive features:

- > It increases safety significantly by integrating operator procedures with DCS and SIS
- > It provides live step by step information, guidance and a process overview during the whole procedure
- > It makes operational sequences dynamic by integrating feedback from the DCS (pressure, temperature ect.) to authorize the next step.

## Fundamental elements

The Intelligent Interlock System can be customized with various technologies and features, based on the following fundamental elements:

### EKC (Electronic Key Cabinet)

- > Electronically detects presence of each individual key
- > Enables authorized release of keys
- > Enables visual representation of the status of valves

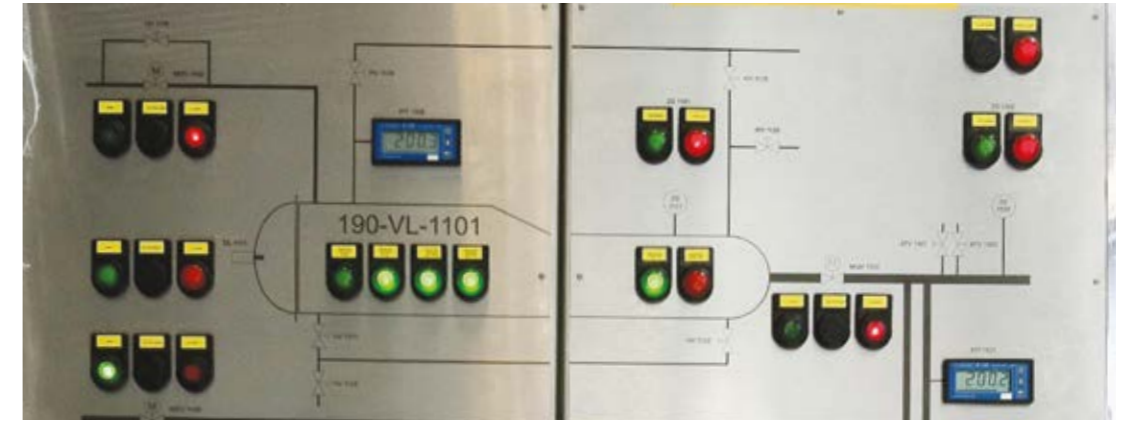
### ASLP (Actuator Switch Lock Panel)

- > Linked directly to the control system of a MOV (Motor Operated Valve)
- > Allows MOV to be remotely operated within a predefined sequence

### ISI (Interlock System Information)

The ISI is a digital touch screen/tablet that provides live information on any of the above mentioned products.

- > Linked to an Electronic Key Cabinet (EKC), it can produce an overview of missing keys
- > It logs when keys are removed and can additionally provide detailed information on each key, such as system numbers or sequence drawings
- > By logging removal and entry of keys, the ISI can also produce valve operation statistics.
- > Linked to a Sequence Control Panel, it guides the operator through the sequence, displays what key needs to be inserted or removed and what the next action in the field should be.







## Sequence Control Panels

A combination of products can be integrated in cabinets or panels, creating a customized (Intelligent) Interlock System. Mechanical key interlocks are still at the basis of the safety system in the field. The extra intelligence offered by the additional electronic systems offers more insight, guidance and control.

### Dynamic sequence

Apart from mechanically guaranteeing a strict adherence to procedure, Intelligent Interlocking allows other input signals, such as H<sub>2</sub>S or pressure levels, to be included in a predefined operating sequence. For instance, in pigging applications, the key to open the closure door is only released after the valves are operated in the correct sequence and the vessel pressure has reached a predefined level.

Also, remotely authorizing the start of an operating sequence can easily be programmed. This way, the panel will only release the starting key after receiving an external authorization signal, for instance from the DCS or SIS.



### MOV locked in sequence

The electronic controls of a MOV can be included in a Sequence Control Panel. This way, the MOV is integrated in a sequence with manually operated valves. The MOV can only be operated at the right moment. This means the MOV is locked without using traditional mechanical valve interlocks

### Real time information

Sequence and valve status information on an ATEX certified screen or tablet provides clear understanding of the operating sequence. The screen visually guides operators through an operating sequence, offering them real-time information about required steps in a sequence, status of involved valves and particular valve locations.

Intelligent interlocking increases safety significantly by integrating operator procedures with DCS and SIS





# Training and service



“Netherlocks offers customized service contracts that allow you to focus on preventative maintenance, saving you money in on-going performance.”



“Netherlocks training programs support operators, maintenance personnel and contractors. They significantly contribute to smooth and trouble-free handling of your interlocks and increase awareness towards process safety.”



As a market leader with over 20 years of experience in designing and manufacturing valve safety products, Netherlocks is dedicated to offering excellent service. We offer assistance in the fields of engineering, installation, maintenance and training.

## Advice on valve interlocking applications

Valve interlocks are applied in various industries for many different types of applications. Our engineers are experts in this specialized field of engineering and can offer you advice on:

- > Available applications for interlocking
- > Sequence assessment and design
- > Integrating mechanical interlocking into your DCS

## Measuring valves

Netherlocks valve interlocks are custom fitted to their applicable valve, gearbox or actuator. For this, specific measurements are required. By measuring valves and actuators on site, our service team guarantees that all this information is acquired correctly and on time. When measuring on site is not ordered, Netherlocks assists with getting the required data from the involved valve vendors.

## Installation and commissioning

Valve interlocks are safety category 1 products that are not common to most engineers or operators in the field. For proper installation, in-depth knowledge about valve interlock functionality and applied interlocking sequences is essential. Improper installation usually results in non-operable valves, inadequate safety procedures and delay in overall project delivery. The specialized Netherlocks service team is globally available to assist you with:

- > Installation of valve interlocks
- > Supervision of third party installation teams
- > Commissioning of valve interlocked systems

## Training programs

Installing and servicing valve interlocks requires proper training. Operators may not be familiar with these products and their functioning, even when they are exposed to frequently use interlocks. Netherlocks offers various training programs to get acquainted with our products and learn about their operation and servicing.

A Netherlocks training program is always custom-developed to fully adapt to your personal requirements.

During technical seminars or lunch and learns we present various applications and demonstrate how to implement valve interlocks to guarantee a pre-defined operating sequence.

## Service contracts

Netherlocks valve interlocks do not require periodic maintenance. However, timely testing and servicing ensures flawless operation of your Netherlocks products, on a day to day basis. Netherlocks offers standard service contracts that focus on *preventative* maintenance, creating higher efficiency and saving you money in on-going performance.

Service contracts may comprise agreements about:

- > Recurring site surveys
- > Pre-planned preventative maintenance
- > Guaranteed availability of a Netherlocks service engineer
- > Turnaround assistance

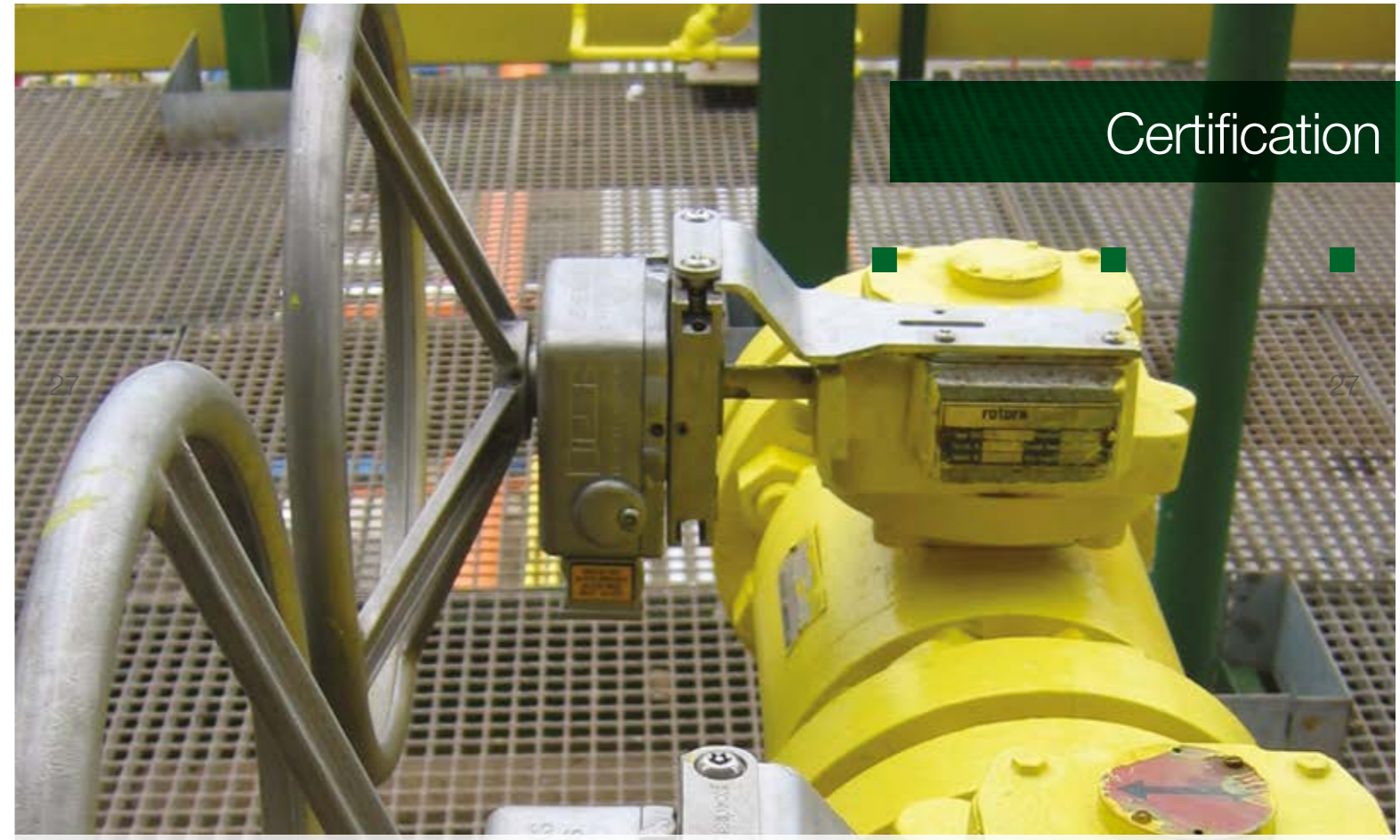
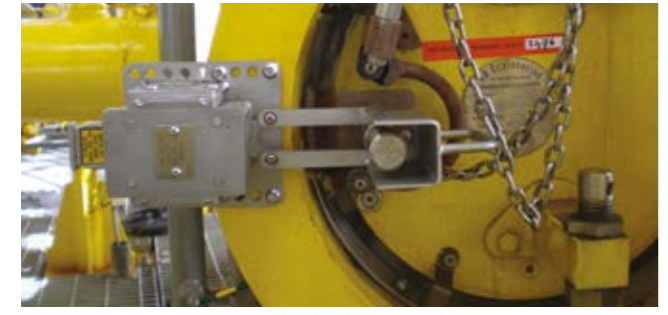
Training	Objectives	Target group
Informative	Insight about functioning of interlocks, Inspecting and resetting of interlocks	> Operators > Shift leaders
Advanced	Internal parts and functions of an interlock, perform field inspection, re-set sequences, assembling of interlocks	> Maintenance > Instrumentation
Service	Measure valves, gearboxes and actuators, (un-) installing, problem solving, setting of sequences	> Valve technicians > Contractors



### Every valve safety procedure is unique

Netherlocks will always provide a custom-made solution. We have a wide variety of standard locking devices which are directly available for guaranteeing nearly any operating procedure. For some other applications however, additional products are required. In this case, we will adapt our standard products or we will design entirely new products; Netherlocks specials. When designing specials, the Netherlocks

bolt lock is the main building block. Our design philosophy enables us to always be able to include every step in the operating sequence, whether it is mechanically or electromechanically controlled. The bolt lock is straightforward in design; it is operated by the Netherlocks linear key and can easily be used as a modular building block for closure locks, actuator locking systems, key exchange units and many other locking devices and special designs that our customers require.



Netherlocks procedures and products comply with the latest safety regulations and certificates.

### Total linear concept

Netherlocks has eliminated nearly all rotating movements from the lock designs. Keys are inserted linearly and the internal locking mechanism consists only of linear moving components. This reduces internal wear and tear and makes the mechanism less vulnerable for dirt and sand. Lubrication with grease is not required, regular maintenance or lubrication is also not necessary. The internal lock mechanism cannot be obstructed by dried out grease or damaged by the blend of grease and dirt.

### Procedure certificates

- > All Netherlocks internal procedures are fully documented in accordance with the NEN-EN-ISO-9001 certificate criteria
- > S.C.C. (Safety Certificate Contractors) is implemented in our daily practice and all service engineers are fully trained to do industrial service work on- and offshore

- > Less wear and tear
- > No grease
- > Less vulnerable for sand and dirt

### Product certificates

- > Netherlocks interlocks are TUV certified
- > Netherlocks Multi Rotation Lock (MLR-S) complies with Fire Test, ANSI/API Standard 607, ISO 10497

Netherlocks valve interlocks are successfully used on a wide variety of locations both on- and off-shore, such as Alaska, Russia, the Middle East and the North Sea.





[www.netherlocks.com](http://www.netherlocks.com)

Reliability matters



Process interlocking



Valve positioning



Partial stroke testing



Valve operation